Draft Combined 2018/2020 Integrated Report

UTAH DEPARTMENT *of* ENVIRONMENTAL QUALITY
WATER QUALITY

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Abbreviations

Abbreviation	Definition
<	less than
>	greater than
≤	less than or equal to
≥	greater than or equal to
AGRC	Automated Geographic Reference Center
ATTAINS	The Assessment, Total Maximum Daily Load (TMDL) Tracking and Implementation System. This EPA-maintained database is an online system for accessing information about the conditions of the Nation's surface waters.
AU	assessment unit
BMP	best management practices
Ca	calcium
CFR	Code of Federal Regulations
Chl-a	chlorophyll *a*
CWA	Clean Water Act
DEQ	Utah Department of Environmental Quality
DO	dissolved oxygen
DWQ	Utah Division of Water Quality
E	expected
E. coli	Escherichia coli
EPA	U.S. Environmental Protection Agency
GIS	geographic information systems

Abbreviation	Definition
GSL	Great Salt Lake
GRAMA	Government Records Access and Management Act
HAB(s)	harmful algal bloom(s)
HH	human health
HUC	hydrologic unit
IR	integrated report
kg	kilogram
L	liter
Mg	magnesium
mg	milligram
mg/kg	milligram per kilogram
mg/l	milligram per liter
ml	milliliter
MLID	monitoring location identifier
MPN	most probable number
NHD	National Hydrologic Dataset
O	observed
O/E	observed/expected
Pc	probability of capturing
ppm	parts per million
QA	quality assurance

Abbreviation	Definition
QA/QC	quality assurance/quality control
QC	quality control
QAPP	quality assurance project plan
RIVPACS	River Invertebrate Prediction and Classification System
SAP(s)	sample analysis plan(s)
SD	standard deviation
SDD	Secchi disk depth
SOP(s)	standard operating procedure(s)
T	temperature
TDS	total dissolved solids
TMDL	total maximum daily load
TP	total phosphorus
TSI	trophic state index
UAC	Utah Administrative Code
UDOH	Utah Department of Health
USGS	U.S. Geological Survey
WMU	watershed management unit
WQP	(EPA's) Water Quality Portal
WQS	water quality standard
µg/l	microgram per liter

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Introduction

PURPOSE

Section 305(b) of the Clean Water Act (CWA) requires states to submit a biennial report to the Environmental Protection Agency (EPA) on the quality of their waters. The Draft Combined 2018/2020 Integrated Report (IR) prepared by the Utah Division of Water Quality (DWQ) to meet this federal requirement is a comprehensive analysis of the condition of the state's flowing surface waters, canals, lakes, reservoirs, and ponds.

Section 303(d) of the CWA requires states to submit a list of waterbodies that do not meet the state's water quality standards as part of the IR. This list guides the state's development of water quality improvement plans (Total Maximum Daily Load plans or TMDLs) for impaired waterbodies to bring them into compliance with their beneficial uses and water quality standards.

The IR supports DWQ's commitment to protecting and improving the water quality of Utah's flowing surface waters of the state, canals, lakes, reservoirs, and ponds by providing critical information and thorough analyses of water quality conditions, waterbody impairments, statewide trends, and emerging issues. DWQ uses these data to identify areas with impairments and prioritize projects, TMDLs, and best management practices (BMPs) to improve and enhance water quality in affected areas.

SCOPE

The Draft Combined 2018/2020 IR reports on 913 assessment units (AUs), over 82.5 thousand miles of flowing surface waters of the state and canals, and nearly 1.5 million lake, reservoir, and pond acres. The water quality assessment data covers the period between October 1, 2010 and September 30, 2018 and includes updates from previous reports. The data used in the report were collected by DWQ, 12 agencies, and numerous public and private stakeholder groups and individuals.

METHODS

The State of Utah sets water quality standards that support designated beneficial uses for Utah's flowing surface waters of the state, canals, lakes, reservoirs, and ponds. These designations protect water quality for different uses, including drinking water, recreation, aquatic life, and agriculture. Waterbodies are protected for several combinations of beneficial uses, such as recreation and aquatic life.

DATA COLLECTION

The IR uses water quality data collected by DWQ and a number of public and private entities to determine whether assessed waterbodies in the state meet water quality standards and support their designated beneficial uses. Data submitted or obtained by DWQ during the IR data compilation process are integrated into DWQ's assessments and subject to DWQ's data management and quality assurance and quality control (QA/QC) processes. Datasets may include laboratory results for water chemistry sampling for conventional (e.g., temperature) and toxic (e.g., metals) parameters, monitoring data specific to lakes, reservoirs, ponds, or flowing surface waters, potential causes of impairments, and macroinvertebrate surveys.

DWQ combines data from individual monitoring sites into a larger spatial scale or Assessment Unit (AU). The Division collects all readily available and credible water quality data for each AU and prepares the data for assessment. Data are assessed according to specific conventional and toxic parameters against beneficial use criteria established in state regulations. DWQ uses these data to categorize the state's assessment units to determine designated beneficial use attainment. The state uses five EPA-approved categories in its assessment determinations:

- Category 1: All beneficial uses attained.
- Category 2: Some beneficial uses attained but there are insufficient data to determine if all beneficial uses are supported.
- Category 3: Insufficient or no data to make a determination.
- Category 4: Impaired for one or more beneficial uses. Does not require the development of a TMDL because one has already been completed (4A), uses are expected to be attained within a reasonable timeframe (4B), or the impairment is not caused by a pollutant (4C).
- Category 5: Impaired for one or more beneficial uses by a pollutant. Requires the development of a TMDL.

Waters determined to be impaired are placed on the state's 303(d) list and prioritized for TMDL development. The TMDLs calculate the pollution reduction levels needed to support designated beneficial uses and meet water quality standards. Once a TMDL is completed and approved by EPA, the assessment unit covered under the TMDL is transferred from Category 5 (impaired) to Category 4A (approved TMDL in place).

DELISTINGS

DWQ reviews the data submitted during the IR process to determine whether assessment units identified as impaired in previous IRs are now meeting their designated beneficial uses. If DWQ finds during its assessment that waterbodies previously listed as impaired are now meeting water quality standards, it provides a list of the sites proposed for removal from the 303(d) list (Category 5) in the report. DWQ can delist a previously impaired parameter, waterbody, or segment within a waterbody that is currently meeting water quality standards if it can demonstrate good cause to stakeholders and EPA. Good cause includes one or more of the following:

- The impairment was resolved through the implementation of nonpoint source projects and/or revised effluent limits.
- Revised water quality standards and/or beneficial uses put the waterbody into attainment of those standards and/or uses.
- A new listing method consistent with state water quality standards and classifications and federal listing requirements changed the previous listing.
- New data led to a reassessment that demonstrated that applicable standards and uses are being met.
- Flaws in the original analysis led to an incorrect listing.
- Improved modeling applications demonstrated that applicable standards and uses are being met.

AU RESEGMENTATION

When site-specific assessments within a single AU conflict, DWQ may determine that it is appropriate to re-segment (i.e., -split‖) an existing AU polygon into two or more new AUs rather than aggregate those conflicting assessments into a single AU scale category. AUs where water quality criterion exceedances are clearly isolated to a relatively small, hydrologically distinct portion of the larger AU may be re-segmented to more accurately reflect that variation in water quality. This results in a higher resolution and overall more accurate assessment. DWQ does not consider it appropriate to re-segment an AU when exceedances are observed in multiple locations throughout an AU, or where impaired sites are not hydrologically distinct from unimpaired portions of the AU.

PUBLIC COMMENT PROCESS

DWQ engages its stakeholders early in the process as part of its ongoing commitment to work with the public to safeguard human health and protect and enhance Utah's waters. Communities and others affected by the decisions under CWA 305(b) and 303(d) are asked to participate in the IR process during three public involvement opportunities before the Division submits the IR to EPA.

1. Public Comment on Assessment Methods
DWQ held a public comment period on the 303(d) Assessment Methods from November 7, 2018, to December 21, 2018, to solicit public input on the assessment methods for the Combined 2018/2020 IR. DWQ received comments from eight different individuals and groups for a combined total of approximately 215 unique comments. DWQ's Response to Comments, as well as the comments submitted, can be found on the Integrated Report Program webpage.

2. Publicly Submitted Data Notification
DWQ issues a formal public notification during each IR cycle through website postings and listservs requesting data and information that can be used for the assessment. Whenever possible, DWQ tries to obtain all data and information with sufficient time to compile the information during odd-numbered years. This provides the Division with adequate time to obtain clarification where necessary and ensures that outside sources of information are used to the greatest extent possible for IR assessments. The Combined 2018/2020 IR Call for Data ran for 60 days from May 21, 2019, to July 20, 2019. Data submitters registered on the DWQ Call for Data website and were provided detailed instructions on how to submit data accurately and effectively to EPA's Water Quality Exchange.

3. Public Comment on 305(b) and 303(d) Decisions
DWQ provides another formal public notification at the end of the IR report writing process, requesting comments on the placement of AUs in the five categories. DWQ responds to the comments in a summary and can revise the IR based on the public's feedback. Public comments and DWQ's response are then submitted to EPA along with the 305(b) report and 303(d) listing decisions.

FINDINGS

DWQ compiled all existing and readily available data and conducted designated beneficial use assessments to determine which waters in the state are supporting or not supporting these uses. The figures, charts, and graphs below offer a view of the state's total waterbody miles and acreage, areas and water quality parameters assessed, waterbodies proposed for delisting, and AUs subject to resegmentation.

State Map

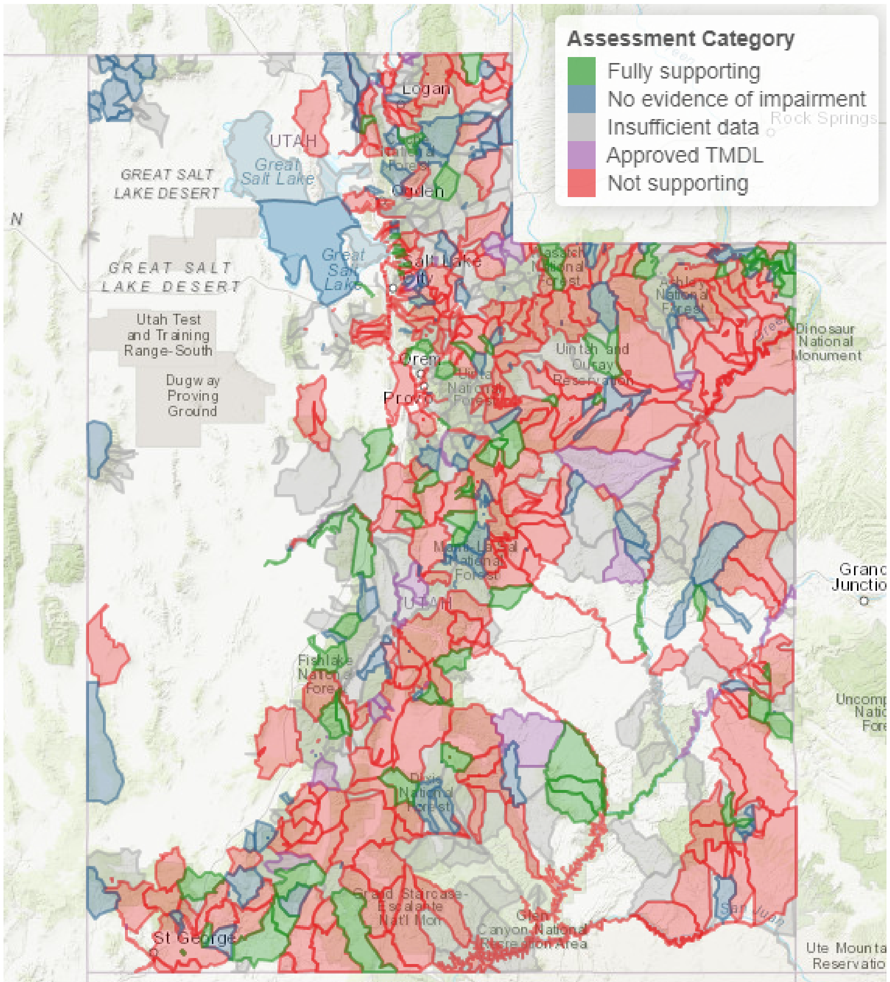


Figure 1. Utah's defined assessment units and assessment categories.

Data Reviewed

- Number of data records downloaded from EPA's Water Quality Portal: 1.36 million
- Number of data records that passed screening and data preparation checks for assessment: 432,280
- Number of data records rejected during the secondary review process: 35,281
- Number of data records in the core assessment dataset for the period of record following screening, secondary review, and daily aggregation: 348,003
- Number of unique assessments by site, use, parameter, and criterion: 61,388

Assessment Totals (Flowing Surface Waters of the State, Canals, Lakes, Reservoirs, and Ponds)

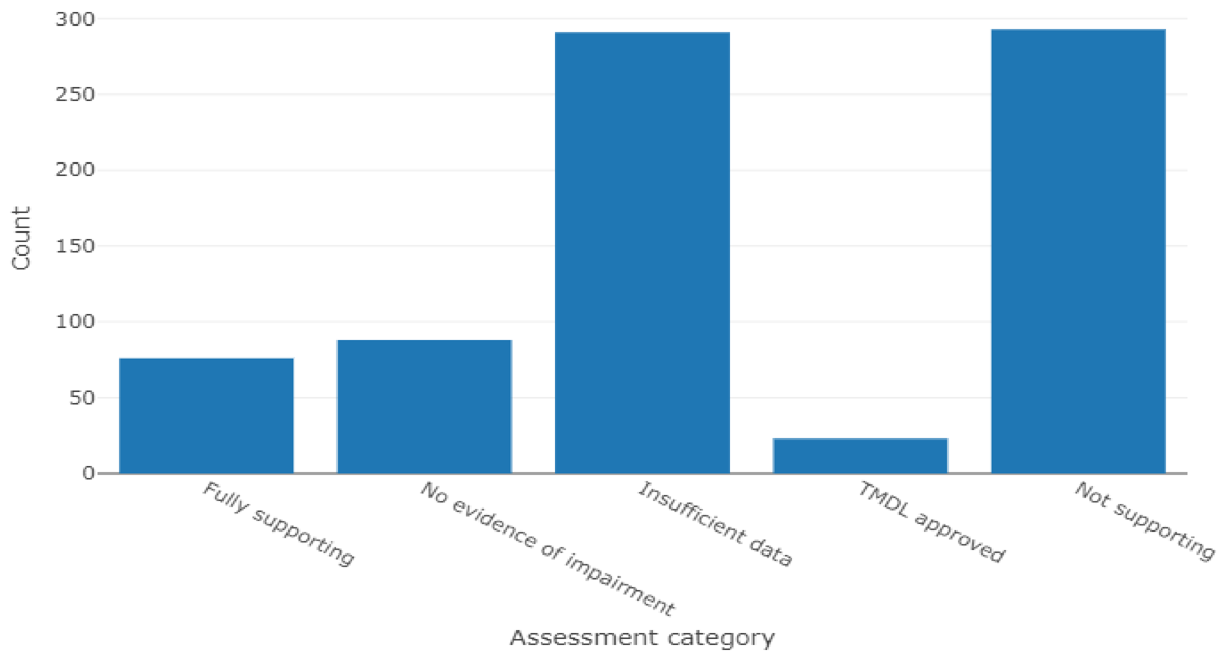
- Total AUs reported on: 913
- Total AUs fully supporting (Category 1): 79
- Total AUs partially supporting (Category 2): 130
- Total AUs with insufficient data (Category 3): 318
- Total AUs with a plan in place (Category 4): 32
- Total AUs impaired (Category 5): 354

Flowing Surface Waters of the State and Canals

Assessments

- Total assessment units (AUIDs) reported on: 771
- Total miles reported on: 82,339
- Total monitoring locations assessed and reported on during the period of record: 1,929

EPA Assessment Categories for 2018/2020 IR



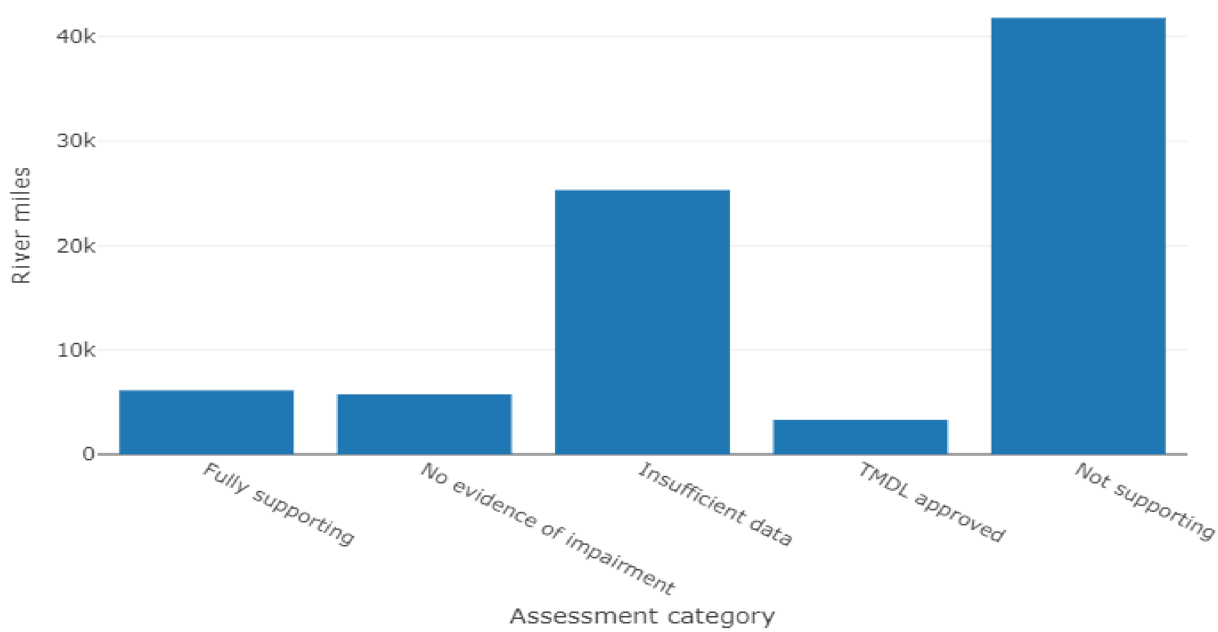


Figure 2. Counts and mileages of the State's flowing surface waters and canals in assessment categories.

Impaired Parameters

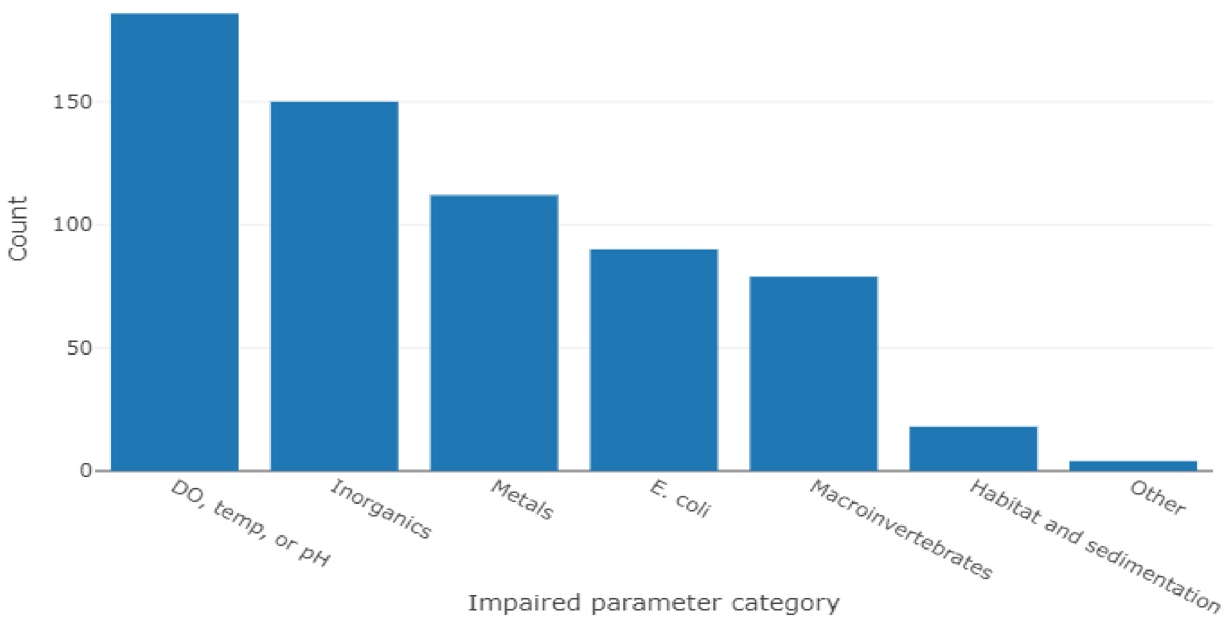
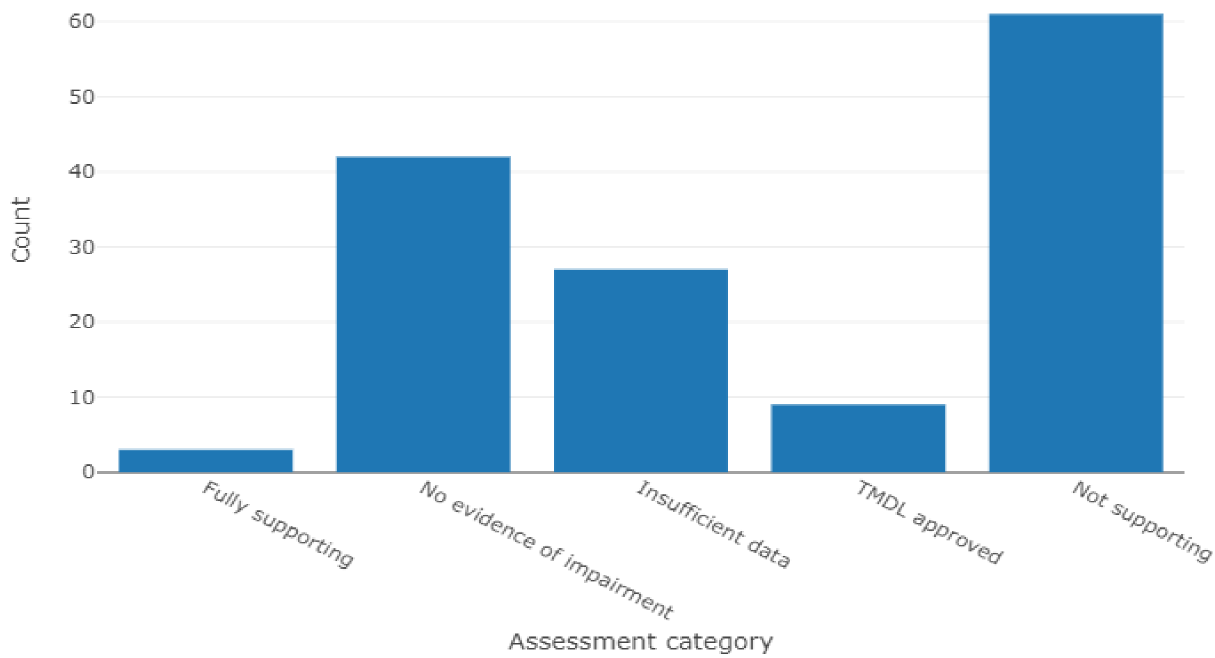


Figure 3. Impairment counts by parameter category for the State's flowing surface waters and canals.

Lake, Reservoir, and Pond Assessments

Assessments

- Total AUs reported on: 142
- Total acres reported on: 1.46 million (includes Great Salt Lake at 1.1 million acres)



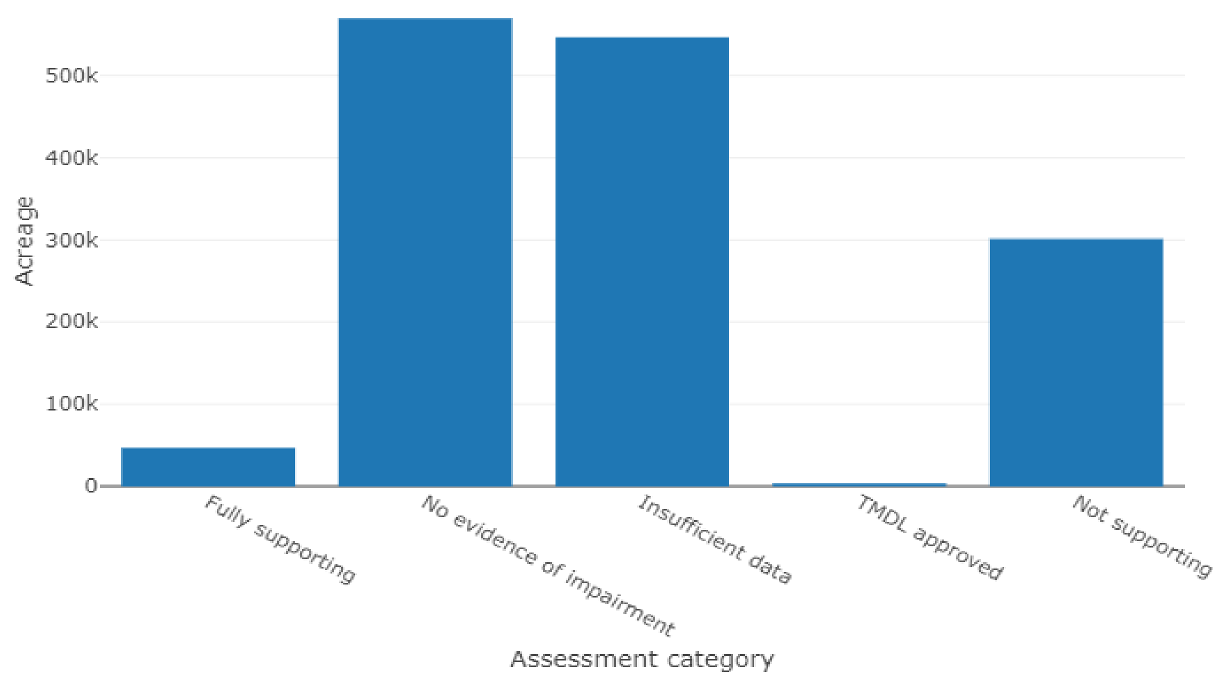


Figure 4. Counts and acreages of lakes, reservoirs, and ponds in assessment categories.

Impaired Parameters

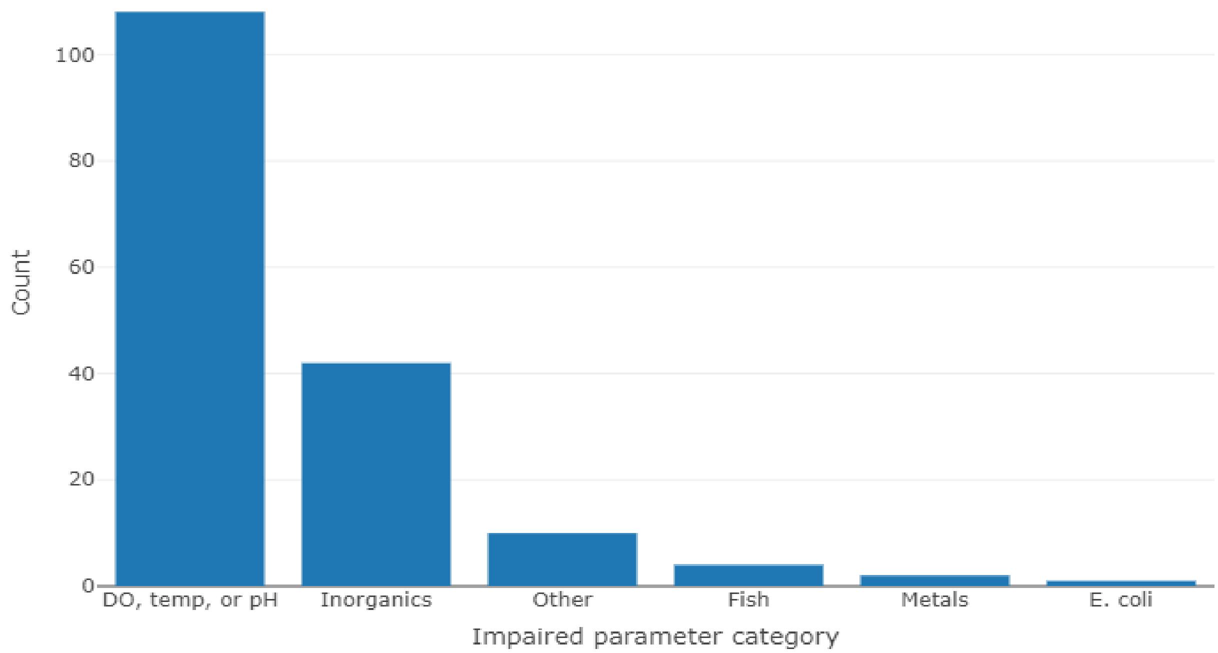


Figure 5. Counts and acreages of lakes, reservoirs, and ponds in assessment categories.

DELISTINGS

Forty-seven AUs were delisted for one or more parameters in the state's flowing surface waters and canals. Seven AUs were delisted for one or more parameters in Utah's lakes, reservoirs, and ponds.

RECOMMENDATIONS

Priority Waters

The CWA requires the development of total maximum daily load (TMDL) plans for all impaired waterbodies on the 303(d) List but recognizes the limitations in data, time, and staff resources to accomplish this task. Taking these limitations into account, the CWA requires states to prioritize where they will dedicate resources toward TMDL development. DWQ prioritizes impairments or risks to human and ecological health as described in the Division of Water Quality's (DWQ) 303(d) vision document. These priorities focus on the protection and restoration of waters designated for culinary, recreational, and aquatic wildlife uses.

Chapter 1: 303(d) Assessment Methods

Introduction

THE CLEAN WATER ACT AND THE INTEGRATED REPORT

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

- **Statewide reporting under CWA 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 CWA Section 303(d):** Section 303(d) requires states to identify waters that are not attaining beneficial uses according to state water quality standards (Utah Administrative Code [UAC] R317.2.7.1). The Utah Section 303(d) List (hereafter the 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 303(d) List, DWQ also identifies waterbodies that:

- have water quality problems but DWQ cannot confirm due to uncertainty regarding the nature of the data, insufficient sample size, or other factors,
- 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 U.S. Environmental Protection Agency (EPA) identified waterbody assessment classifications are described and summarized in Table 1.

ASSESSMENT CATEGORIES FOR SURFACE WATERS

DWQ uses five categories defined by EPA to assess surface waters of the state (EPA, 2005). These categories are described in Table 1.

Table 1. U.S. Environmental Protection Agency categorization of assessed surface waterbodies for integrated report purposes.

EPA Assessment Category	Assessment Category Description
1	**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	**No Evidence of Impairment**. Some, but not all, beneficial uses assigned to a waterbody are evaluated against one or more numeric criteria and each assessed use is found to be fully attaining applicable water quality standards.
3	Insufficient Data and/or Information. There are insufficient data and information to conclude support or nonsupport of a use. The application of this category may be applied when: (1) the dataset is smaller in size and has water quality criteria exceedances OR no water quality criteria exceedances, (2) a secondary review was applied to a waterbody that was not attaining, (3) water quality criteria and/or beneficial use support assessment methods are not yet developed (or are undergoing development or revisions) and therefore use attainment has not been determined, (4) waterbodies were assessed against water quality parameters and characteristics that require further investigations as defined in UAC R317-2, (5) assessment units (AUs) lack use designations, have improper use designations, or contain other inconsistencies in the dataset. In cases where no recent data are available, historic-listing determinations will be maintained.
4A	**TMDL-Approved**. Waterbodies that are impaired by a pollutant and have had TMDL(s) 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 still listed in Category 5 with an Approved TMDL.
4B	**Pollution Control**. Consistent with 40 Code of Federal Regulations (CFR) 130.7(b) (I) (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 attainment in 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 Categories 5 and 4A. Therefore, an AU with a pollution control in place can be listed in Categories 4B, 4A, and 5.
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 Categories 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 Categories 4A, 4B, and 5. Therefore, an AU with a pollution control in place can be listed in Categories 4C, 4B, 4A, and 5.

EPA Assessment Category	Assessment Category Description
5	**Not Supporting**. The concentration of a pollutant, or several pollutants, exceeds numeric water quality criteria, or beneficial uses are non-attaining based on violation of the narrative water quality standards. In addition, waterbodies identified as -threatenedǁ may also be placed in this category. In the case of a -threatenedǁ waterbody, one or more of its uses are likely to become impaired by the next IR cycle. Water quality may be exhibiting a deteriorating trend if pollution control actions are not taken. In the event that DWQ categorizes a waterbody as -threatenedǁ, documentation of a listing rationale will be provided. Both impaired and threatened waterbodies constitute Utah's formal Section 303(d) List and are prioritized for future TMDL development.
5-Alt	**TMDL Alternatives**. The 303(d) program vision promotes the identification of alternative approaches to TMDL development for impaired waters where these approaches would result in a more rapid attainment of water quality standards. Note: This category is only referred to in DWQ's -303(d) Vision Documentǁ.

UTAH'S NUMERIC CRITERIA AND BENEFICIAL USES

To determine the appropriate assessment categories for a waterbody (see Table 1), DWQ must first evaluate the impacts of measured pollutant concentrations on environmental and human health. Under UAC R317-2, Utah has developed and adopted 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 a waterbody for public water supply, aquatic wildlife, recreation, and agriculture, EPA and DWQ developed several beneficial use classifications (see UAC R317-2-6). Currently, DWQ designates five uses of surface waters within the state:

- Class 1. Protected for use as a raw water source for domestic water systems.
- Class 2. Protected for recreational use and aesthetics.
- Class 3. Protected for use by aquatic wildlife.
- Class 4. Protected for agricultural uses including irrigation of crops and stock watering.
- Class 5. The Great Salt Lake (GSL).

Subclassifications for several of these categories exist and are further defined in Table 2.

Table 2. Subclassifications of Utah's beneficial uses.

Beneficial Use Subclassification	Use Definition
1C*	Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water
2A	Protected for frequent primary contact recreation where there is a high likelihood of ingestion of water or a high degree of bodily contact with the water. Examples include, but are not limited to, swimming, rafting, kayaking, diving, and water skiing.
2B	Protected for infrequent primary contact recreation. Also protected for secondary contact recreation where there is a low likelihood of ingestion of water or a low degree of bodily contact with the water. Examples include, but are not limited to, wading, hunting, and fishing.
3A*	Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
3B*	Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.
3C*	Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain.
3D*	Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain.
3E*	Severely habitat-limited waters. Narrative standards will be applied to protect these waters for aquatic wildlife.
4	Protected for agricultural uses including irrigation of crops and stock watering.
5A	Gilbert Bay Geographical Boundary -- All open waters at or below approximately 4,208-foot elevation south of the Union Pacific Causeway, excluding all of the Farmington Bay south of the Antelope Island Causeway and salt evaporation ponds. Beneficial Uses -- Protected for frequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain.

Beneficial Use Subclassification	Use Definition
5B	Gunnison Bay Geographical Boundary -- All open waters at or below approximately 4,208-foot elevation north of the Union Pacific Causeway and west of the Promontory Mountains, excluding salt evaporation ponds. Beneficial Uses -- Protected for infrequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain.
5C	Bear River Bay Geographical Boundary -- All open waters at or below approximately 4,208-foot elevation north of the Union Pacific Causeway and east of the Promontory Mountains, excluding salt evaporation ponds. Beneficial Uses -- Protected for infrequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain
5D	Farmington Bay Geographical Boundary -- All open waters at or below approximately 4,208-foot elevation east of Antelope Island and south of the Antelope Island Causeway, excluding salt evaporation ponds. Beneficial Uses -- Protected for infrequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain.
5E	Transitional Waters along the Shoreline of the Great Salt Lake Geographical Boundary -- All waters below approximately 4,208-foot elevation to the current lake elevation of the open water of the Great Salt Lake receiving their source water from naturally occurring springs and streams, impounded wetlands, or facilities requiring a UPDES permit. The geographical areas of these transitional waters change corresponding to the fluctuation of open water elevation. Beneficial Uses -- Protected for infrequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain.
***Footnote: There are human health (HH) criteria associated with these beneficial uses in UAC R317-2. For uses with a HH criteria, (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.**	

For 303(d) assessment purposes, every beneficial use with numeric criteria and credible and readily available 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 may assign default beneficial uses as articulated in UAC R317-2-13.9, 13.10, 13.11, 13.12, and 13.13. Alternately, these undefined waterbodies may be classified as an EPA Category 3 or not reported in the IR if an Assessment Unit has not been established.

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 website.

PRIORITY AND ASSESSED PARAMETERS

To make the list of pollutants with numeric criteria in UAC R317-2 more manageable for monitoring and assessment purposes, DWQ developed a priority parameter list that is recommended for 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 that limit the ability to assess all parameters in UAC R317-2.
- Significant monitoring and/or analytical costs associated with processing a sample or measuring a pollutant.
- Logistical constraints due to monitoring location and holding times for certain parameters.

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 IR period of record.

To view DWQ's list of priority parameters, please refer to Appendix 1. Please be aware that priority parameters can change from one reporting cycle to the next if laboratory and financial constraints and monitoring priorities within a sampling area change.

Assessment Process and Time Frames

DEVELOPING THE METHODS

This document describes Utah's most up-to-date assessment methods that will be applied to Utah's current IR cycle. Although many of the methods described have been applied in past assessment cycles, other methods are new or modified from previous reporting cycles. Some of the assessment method revisions are simply intended to clarify ongoing DWQ practices. Other more substantive revisions may be based on comments that were raised during the previous IR's 303(d) Assessment Methods and draft IR public comment periods.

DWQ updates and revises the 303(d) methods when concerns are raised or when program developments are released by DWQ staff. Additional modifications or clarifications to the Assessment Methods may also be made based on feedback provided by EPA during and after a reporting cycle or from the EPA's cycle-specific 303(d) guidance memorandum.

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

PUBLIC REVIEW OF THE METHODS PROCESS AND SCHEDULE

The development and acceptance of the Assessment Methods includes a public review process and occurs on the following schedule:

a. DWQ releases the proposed methods during an even numbered year, for a 30-day public comment period. The notice for public comments on the methods are advertised on DWQ's News and Announcements and Public Notices website, the Water Quality Assessments Program and Current Assessment Methods & Guidance websites, and DWQ's listserv.
b. DWQ compiles and responds to the comments received within the 30-day public comment period. DWQ's responses to comments are posted on the Current Assessment Methods & Guidance website.
c. If substantial revisions to the methods are adopted by DWQ based on comments received in the 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 website, the Water Quality Assessments Program and Current Assessment Methods & Guidance websites, and DWQ's listserv.
d. Following the conclusion of the public comment period(s), DWQ posts responses to comments on the Assessment Methods webpage. Any changes or additions that were made in response to public comments will be documented and issued with the draft IR and 303(d) List. If stakeholders have concerns with the final Assessment Methods released during the draft IR, the public should submit their comments during the next IR cycle when future calls for public comments on 303(d) assessment methodologies are issued.

Concerns and comments not received through the above processes may not be considered for current and future 303(d) methods updates and modifications.

CALL FOR READILY AVAILABLE DATA AND SCHEDULE

DWQ issues a request for all readily available data (i.e., the IR Call for Data) after November 1 of even-numbered years.

Existing and Readily Available Data Defined

As mandated in 40 CFR 130.7(b)(5) DWQ assembles and evaluates all existing and readily available data in determining whether a waterbody is supporting or not supporting the assigned beneficial uses and numeric criteria in UAC R317-2. For the purposes of the IR, existing and readily available data may include:

- Data and information referenced in 40 CFR 130.7(b)(5)(i), (iii), and (iv)
- Data collected by DWQ or DWQ cooperators for assessment purposes.
- Data collected for other DWQ programs, such as waste load allocations, TMDL development, watershed planning, and use attainability analysis.
- Data collected for narrative assessments (see Narrative Assessment: Biological Assessments and Narrative Standards for All Waters)
- Data obtained through EPA's Water Quality Portal (WQP)
- Data and information obtained through the IR's public Call for Data
- Data and information submitted to EPA's Water Quality Exchange System or DWQ's Call for Data to support a credible data submission (e.g., Tables 5-8)
- Data included in the Data Types Matrix in Table 10.

Data and information (as described above) that are not brought forward during the IR's Call for Data or presented to DWQ in accordance with the schedule as outlined in this document and on the Water Quality Assessments Program website will not be treated as readily available for the purpose of assessment decisions during the current assessment cycle.

Data that are submitted to DWQ or obtained by DWQ during the IR data compilation process are integrated into DWQ's assessments as described in Table 3 and subject to DWQ's data management and quality assurance and quality control (QA/QC) processes. Should any data and information not be included in the assessment process, DWQ will clearly document which dataset (or datasets) were not included and why (as described and required in 40 CFR 130.7(b)(6)(iii)).

Table 3. DWQ's data availability matrix.

Data Availability	Description	Processing required	Uses for Assessments
Readily available	Data are incorporated into EPA's WQP database and can interface directly with DWQ's IR data processing and assessment tools. Data is submitted by stakeholders or data submitters through DWQ's data submission templates or electronic submission processes, which are provided on the Assessment's Call for Data website[1,2]	None	Fully incorporate into DWQ's assessment tools.
	Additional -other‖ sources of data included in the Data Types Matrix in Table 10 that described the waterbodies in 40 CFR 130.7(b)(5)(i), (iii), and (iv) and are submitted through DWQ's electronic submission process as described on the Assessment's Call for Data website.	None	Fully incorporate into DWQ's Conflicting Assessments of Water Quality Standards and Secondary Reviews processes
Readily available (additional processing may be required by DWQ)	Quantitative data and information may be stored in and routinely uploaded to a queriable, regularly maintained database that is available on the web or electronically submitted to DWQ during the public call for data. Database format is consistent and allows repeatable queries with predictable results (e.g. parameter names, location descriptions, and parameter units are consistent), making development of automated interface tools practicable.	Full incorporation into IR assessment tools requires DWQ development of interface tools for aggregating, translating, and harmonizing data to appropriate formats. In particular, sampling locations and dates, parameter names, fractions, units, analysis methods and detection limits require translation and interpretation prior to assessment.	Fully incorporate into IR assessment tools if interface tools have been developed[2]. If interface tools are still in the development phase, (1) screen data for exceedances for the waterbodies described in 40 CFR 130.7(b)(5)(i), (iii), and (iv), or (2) manually assess data for specific sites, dates, and parameters at the request of stakeholders or data submitters for waterbodies described in 40 CFR 130.7(b)(5)(i), (iii), and (iv). Results are fully incorporated into DWQ's Conflicting Assessments of Water Quality Standards and Secondary Reviews

Data Availability	Description	Processing required	Uses for Assessments
[1] DWQ data submission templates and processes are designed to allow for data and information that may not fit the data structure of EPA's Water Quality Exchange System or may be used to support a credible data review (Tables 5-8) or perform a narrative or high frequency data assessments. [2] DWQ requests data submitters inform the Division which data system contains their data, so DWQ can work with submitters prior to the IR's call for data to develop interface tools.			

DEVELOPING THE COMPONENTS OF THE DRAFT INTEGRATED REPORT AND 303(D) LIST

Following the response to public comments on the draft 303(d) Assessment Methods, and the compilation of all existing and readily available data, DWQ reviews all data and assigns a credible data ―grade‖. All non-rejected, credible data are then assessed for the release of the following IR and associated 303(d) components.

The minimum reporting elements included in the Integrated Report and available for public review and comment are the final 303(d) Assessment Methods, 305(b) Summary, and 303(d) Assessment Results .

Final 303(d) Assessment Methods

The final version of the publicly-vetted 303(d) Assessment Methods including any changes or additions that were made in response to the assessment method public comment period(s) will be posted on the Water Quality Assessments Program website.

305(b) Summary

At a minimum, this summary will address the following elements for current assessments (and previous assessments where new data and information did not result in an EPA-defined categorical change):

- A unique identifier assigned to the Assessment Unit by DWQ.
- The name and location description of the Assessment Unit.
- An indicator of whether the Assessment Unit is currently active, or if the Assessment Unit identifier has been retired and is being kept for historical tracking purposes and is part of an Assessment Unit History of another Assessment Unit.
- The geographic state within which the Assessment Unit is contained.
- The waterbody type for the Assessment Unit.
- The size (and the unit of measure) for the assessed waterbody type.
- The EPA-defined assessment category for each defined and evaluated Assessment Unit.

303(d) Assessment Results

At a minimum, the following information will be provided for current assessments (and previous assessments where new data and information did not result in an EPA-defined categorical change):

- The minimum elements discussed above in the above 305(b) Summary.
- The cycle the Assessment Unit was last assessed, which can include any conclusions related to this Assessment Unit and delisting decisions (if appropriate).
- The beneficial use(s) designated to the Assessment Unit and the EPA-defined assessment categories associated with the beneficial use after assessment.
- The name of the parameter assessed, the beneficial use associated with the assessed parameter, and the EPA-defined assessment category status for the parameter and beneficial use.
- An indicator of the water quality trend representing the beneficial use or parameter assessment.
- A flag indicating whether or not the cause of the attainment status is a pollutant.
- The agency responsible for identifying the EPA-defined assessment category status for the waterbody.
- The IR cycle the Assessment Unit was first listed for a cause.
- The name of the source of the EPA-defined assessment category status, and if that source has been confirmed.
- The reason(s) and the agency responsible for identifying the delisting of a waterbody and cause.

305(b) Summary and 303(d) Assessment Metadata

To support DWQ's decision to list or not list waters, DWQ will provided (at a minimum) the following supporting information and documentation as referenced in CFR 130.7 (b)(6):

- A description of (or access to) the data records and information used in the IR's current period of record,
- A rationale for (and access to) any data and information that was obtained or submitted to DWQ during the call for data but did not meet DWQ's readily available or credible data requirements and was not used for 305(b) and 303(d) assessments, and
- A rationale for (and access to) any rejected data records and information

For archiving purposes and to assist with the review of the IR and 303(d) List, DWQ will also provide the following as time and resources allow*:*

- The assessment method type and the assessment method context (as defined in ATTAINS).
- Geolocation information on waterbodies that were assessed.
- The date and version of UAC R317-2 that were used in the assessment cycle.
- The list of approved TMDLs that were used in the assessment cycle.
- A fact sheet summarizing the Final IR results.

Note: On January 1 of odd-numbered years, DWQ will -freeze‖ and establish file versions of several working files to maintain consistency and data integrity. These files include geographic information system (GIS) point files of monitoring locations, layers of AUs, beneficial uses, and water quality standards.

PUBLIC REVIEW OF THE 303(D) LIST

There will be a formal public review process for the IR and 303(d) List with the following steps:

a. Any person who has a pollution-control mechanism plan for a waterbody and would like to submit that plan for consideration and EPA approval as a Category 4B must submit that information to DWQ by July 1 of even-numbered years (Appendix 5). 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 may not be received in time to be included in the current IR cycle.
b. Waters and pollutants that are considered for a potential Category 4A (approved TMDLs) must be approved by DWQ's Water Quality Board per UAC R317-1-7 and by EPA per 40 CFR 130.7 by September 30 of even-numbered years. TMDLs that are approved by DWQ and EPA after that date will be considered in future IRs.
c. After July 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 on DWQ's News and Announcements and/or Public Notices website, the Water Quality Assessments Program website, and DWQ's listserv.
d. Stakeholders who wish to submit data for listing or delisting considerations are encouraged to submit that data and information during the Assessment Program's Call for Data. However, DWQ may consider data that are submitted during the public comment period of the draft IR and 303(d) List when the commenter can show that submitted data results could result in a change to a specific waterbody assessment decision. Data that are submitted during the public comment period for the draft IR must be submitted in the format articulated in this document and on the IR Call for Data website and be of Grade A or B quality to be used in an assessment decision (see the Data Quality Matrices at the IR Call for Data website). Submitted information during the public comment period will undergo a secondary review (see Secondary Review and Appendix 3).
e. At the close of the 30-day public comment period, DWQ will compile and respond to comments that were received within the 30-day public comment period.

f. 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 offer a second public comment period of 30 days or fewer. 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 website, the Water Quality Assessments Program website, and DWQ's listserv.
g. 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 IR Program's 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 during the next IR cycle.
h. EPA has 30 days to approve or disapprove the 303(d) List after receiving DWQ's formal submission letter, IR chapters, 303(d) List, categorization of non-303(d) waterbodies, public comments received and DWQ's response to them, delisting tables and justifications, list of approved TMDLs/pollution-control mechanisms, and GIS files 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 IR website.
i. Any concerns and comments not received through the above processes will not be addressed in the IR.

FINALIZING THE INTEGRATED REPORT AND 303(D) LIST

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

- A final version of 303(d) Assessment Methods, including the public comments received and DWQ's response to comments.
- 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 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 Methods website is needed, DWQ may require a Government Records Access and Management Act 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 follows:

… 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:

- flowing surface waters of the state,
- canals as identified in site-specific standards or named in the list of waters with designated use classifications in UAC R317-2, and
- lakes, reservoirs, and ponds.

All other waters are currently reported through other programs within DWQ. For more information on these waterbodies and their reports, please refer to DWQ's website.

WATERBODY TYPES

Utah assesses surface waters of the state at the monitoring-site level and then summarizes the site-level assessments up to a larger spatial scale (i.e., the Assessment Unit (AU) scale). To determine what sites are appropriate for assessments, the monitoring locations are categorized by considering the definitions in Table 4.

Table 4. Assessed waterbody types used for categorizing monitoring locations.

Assessed Waterbody Type	Description
Flowing surface waters of the state*	A surface body of water moving under gravity flow. Perennial, intermittent and ephemeral surface waters are included in this type. Springs and seeps are also included in this waterbody type provided they are flowing and connect, contribute, or are influencing water quality in a downstream river or stream.
Canals (general, irrigation, transport, or drainage)*	A human-made water conveyance with flowing water. 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 use classifications in UAC R317-2-13.
Lakes, reservoirs, and ponds*	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 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.
***Footnote: Sites associated with these waterbody types that have readily available and credible data are also subject to secondary reviews, which are described in the Secondary Review section and Appendix 3.**	

ASSESSMENT UNITS

Assessment Unit Delineation and Identification

Surface waters identified appropriate for 303(d) assessments have been delineated into discrete units called assessment units (AUs). AUs are used in identifying waters of the state that have been assessed to determine whether or not they are supporting their designated beneficial uses. Lakes, reservoirs, and ponds have been delineated as individual AUs and their size is reported in acres. Flowing surface waters of the state and canals have been delineated by specific rivers or one or more surface water reaches in subwatersheds. When using subwatersheds to delineate flowing surface water AUs, the new U.S. Geological Survey (USGS) 5th-level (10 digit) and 6th-level (12-digit) hydrologic unit codes (HUCs) for Utah are used. These HUCs allow for the aggregation of surface water reaches into individual AUs that are hydrologically based watersheds. The 5th- and 6th-level HUCs were developed by individuals representing state and federal agencies, and have been certified by the Natural Resources Conservation Service.

Additional Guidelines for Delineating Assessment Units

When delineating AUs for flowing surface waters of the state, DWQ follows the guidelines listed below with the first two guideline statements being fixed rules.

- The entire AU is within a single 8-digit USGS HUC.
- Each AU comprises reaches having identical designated beneficial use classifications. For example, for a waterbody that has beneficial uses of Class 1C, 2B, and 3A in one portion and Class 2B and 3B in another portion, this waterbody would have at least two distinct AUs because of the difference in beneficial use classifications.
- Large flowing surface waters of the state, such as the Green River, Colorado River, and portions of other large rivers (e.g., the Bear River and Weber River) were delineated into "linear" or "ribbon" AUs containing no tributaries. Where a major tributary enters these rivers or hydrological features such as dams exist, the river is further delineated into two or more AUs.
- Tributaries and headwaters were delineated primarily using the 5th- and 6th-level HUC boundaries to define the AUs.
- Additional AUs were defined by combining or splitting 5th- or 6th-level watersheds using hydrological and ecological changes such as geology, vegetation, or land use.
- Small tributaries to larger flowing surface waters that could not be incorporated into a watershed unit were combined into separate unique AUs.
- AU boundaries generally follow hydrologic units, but may also be delineated to reflect beneficial use designation changes, major tributaries or other observed hydrologic or chemical changes, administrative boundaries, such as at some U.S. Forest Service boundaries, or notable road crossings as stated in Water Quality Standards, UAC R317-2-13.

Individual AUs for flowing surface waters of the state were assigned a unique identification code for indexing. Each AU identifier begins with the prefix ―UT‖ followed by the associated 8-digit HUC and ending in a 3-digit DWQ sequential number. Similarly, lake, reservoir, and pond AUs were identified by adding the prefix ―UT-L-‖ to the 8-digit HUC followed by a 3-digit sequential number.

Figure 6 illustrates one example of the results of using the above guidelines to delineate and identify AUs within a major watershed. The Weber River was delineated as a linear AU from its confluence with Chalk Creek upstream to the Wanship Dam and then designated as UT16020101-017. South Fork Chalk Creek (UT16020101-011) in the Chalk Creek watershed was delineated by combining two 12-digit HUCs comprising the South Fork Chalk Creek sub-basin. The first AU (UT16020101-010) in the Chalk Creek watershed above Echo Reservoir was delineated using the confluence of the South Fork as the upstream endpoint. This necessitated splitting the 12-digit HUC into two AUs, one for Chalk Creek below the confluence with South Fork (UT16020101-010) and another AU for Chalk Creek above the South Fork confluence and below the Huff Creek confluence to form UT16020101-012. An example of small tributary streams that could not be combined into a hydrological based AU is illustrated by the UT16020101-019 AU. These are very small tributaries, and the Weber River is not reflective of their stream order or the habitat that they flow through. Echo Reservoir (UT-L-16020101-001) and Rockport Reservoir (UT-L-16020101-002) are examples of lake or reservoir AUs.

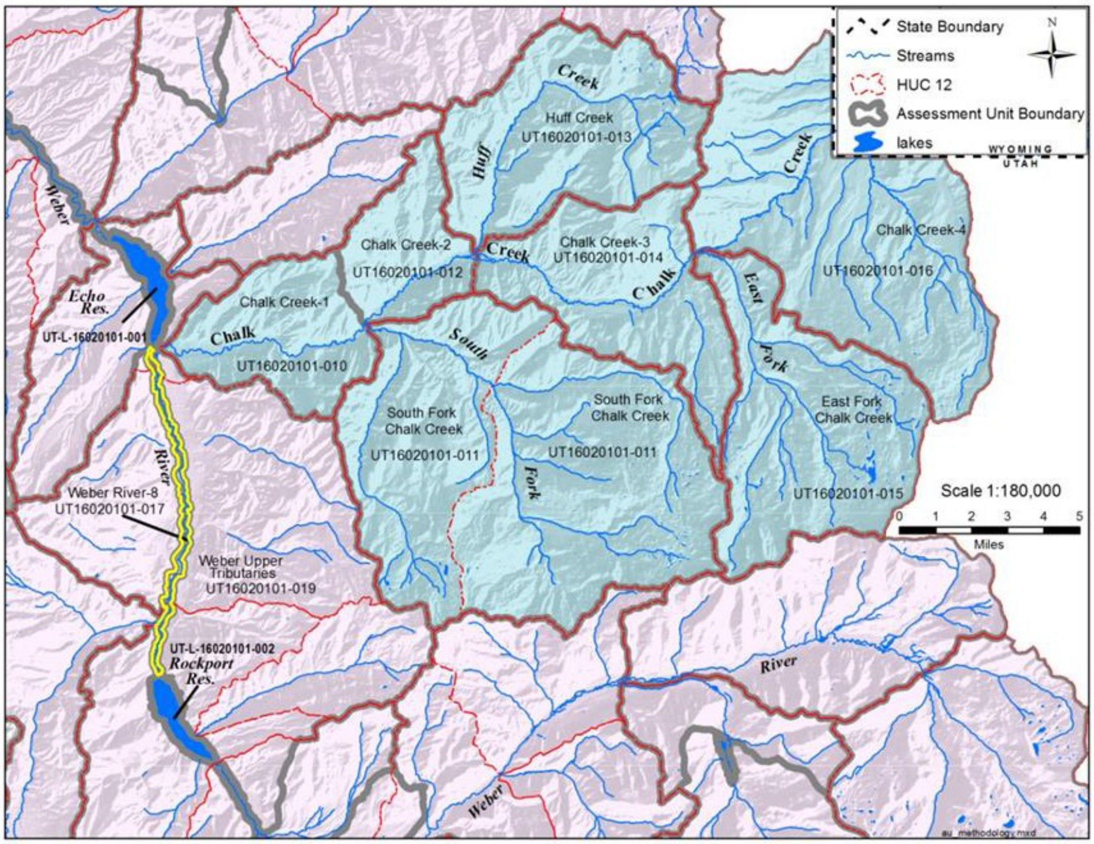


Figure 6. Utah Division of Water Quality assessment unit delineations.

Assessment Unit Datum

Digital data representing all established AUs are stored as subwatershed polygons in GIS-formatted spatial data files. These data are georeferenced as North American Datum 1983 in Universal Transverse Mercator (Zone 12 North) projection, and units are in meters. Maps depicting statewide AUs on letter-sized paper require scales at approximately 1:2,200,000. Digital maps can be shown at various scales depending on the selected zoom magnification.

AU Stream Mileage Estimation for Flowing Surface Waters and Canals

For reporting purposes, flowing surface water assessments are summarized by stream mileage in each assessment category. Stream mileage within each AU is estimated using a streams GIS layer generated by the Utah Automated Geographic Reference Center (AGRC). This layer was derived from the high resolution (1:24,000 scale) National Hydrologic Dataset (NHD). Stream mileage within an AU is estimated as the sum of the lengths of all perennial and intermittent streams and canals identified in the site-specific numeric criteria in UAC R317-2-14 or named in the list of waters with designated use classifications in UAC R317-2-13. The NHD based layer is used only to estimate stream mileage within an AU and is not used to define individual monitoring locations as perennial or intermittent or remove monitoring locations from the assessment process on that basis.

WATERS WITHIN AND SHARED WITH OTHER STATES

Though readily available data may exist 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. Assessment Units or sites on lands under tribal jurisdiction are not assessed in the IR. Assessed surface waters of the state (as defined in Table 4) that flow into Utah but originate outside of Utah‘s borders will be assessed using DWQ monitoring locations residing within state boundaries. Lakes, reservoirs, and ponds 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.

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.

Data Quality

CREDIBLE DATA DEFINED

To be considered for 303(d) water quality assessments, all readily available data and information that are submitted to the Water Quality Assessment Program or obtained during the assessment program's data compilation process must be of high quality.

DWQ's assessment program defines credible data as a complete and validated data submission consisting of:

- water quality samples and field measurements (data) that are collected following the adherence and documentation of appropriate quality assurance (QA) and quality control (QC) procedures,
- environmental data that are representative of water quality conditions at the time of sampling, and
- field sample collection, processing, and laboratory analyses that are documented and follow established protocols, procedures and methods, which are available when needed/requested.

To ensure that the data and information used by the assessment program is of high quality, the assessment program relies on documentation from project planners, sample collectors, and laboratories to assist in documenting that the data are of known quality and defensible. External entities are not obligated to collect data under the specifications of any of DWQ's or EPA's currently established quality assurance protocols to be considered credible. However, all sources of data must meet the definition of credible data. DWQ will evaluate the credibility of data using the criteria and documentation described in the following sections.

Please note that the definition of credible data outlined in this document is specific to the Water Quality Assessment Program (the ‗assessment program') and does not restrict other programs (e.g. water quality standards development, TMDLs, etc.).within DWQ from using data for other Division reporting analyses and actions. For example, data used for a Watershed Plan may not necessarily meet the credible data requirements for the assessment program but may meet the needs of a Watershed Plan.

COMPONENTS FOR CREDIBLE DATA

Quality Assurance Program Plan Guidance and Example

The assessment program requires that all assessment related decisions that use data are supported by a Quality Assurance Project Plan (QAPP). QAPPs, *"integrate all technical and quality aspects of a project, including planning, implementation, and assessment." The purpose of a QAPP is to document planning results for environmental data operations and to provide a project-specific "blueprint" for obtaining the type and quality of environmental data needed for a specific decision or use. The QA Project Plan documents how quality assurance (QA) and quality control (QC) are applied to an environmental data operation to assure that the results obtained are of the type and quality needed and expected"* (EPA, 2002).

DWQ does not require that entities follow a specific QAPP, However, external entities should be prepared to share the QAPP that was relied upon for data collection associated with a particular data submission. External entities may choose to follow one of the example QAPPs below or develop a QAPP specific to their entity or sampling program(s).

Example QAPPs

- Environmental Protection Agency's Quality Assurance Quality Program Guidance & Requirements. EPA's requirements and guidance documents for ensuring that all environmental data is of a known quality and defensible. The Water Quality Assessment Program encourages DWQ staff and cooperators and all other parties interested in submitting high quality data to the assessment program to review QA/R-5 and QA/G-5.

- DWQ Quality Assurance Program Planning (QAPP). DWQ's document outlining the minimum Quality Assurance and Quality Control (QA/QC) requirements for environmental data generated by DWQ and used by most of its cooperators.

Sampling Analysis Plan Guidelines and Examples

Sampling Analysis Plans are the second type of documentation the assessment program requires when compiling information for assessments and other programmatic decisions. SAPs*, "are intended to assist organizations in documenting the procedural and analytical requirements for one-time, or time limited, projects involving the collection of water, soil, sediment, or other samples taken to characterize areas of potential environmental contamination. It combines the basic elements of a Quality Assurance Project Plan (QAPP) and a Field Sampling Plan"* (EPA, 2014).

DWQ does not require that entities follow a specific SAP, However, external entities should be prepared to share the SAP that was relied upon for data collection associated with a particular data submission. External entities may choose to follow one of the example SAPs below or develop a SAP specific to their sampling program(s).

Example SAPs

- EPA's Sampling Analysis Plan Guidance & Requirements.
- DWQ's recommended Sampling Analysis Plan Requirements. Currently used by DWQ cooperators and internally at DWQ, this document contains information on what DWQ looks for in a SAP (see Appendix 2)

Standard Operating Procedures Guidelines and Examples

Standard Operating Procedures (SOPs) are documented procedures that describe in full detail the routine operations of a monitoring program. The assessment program requires SOPs as part of data submission packages to provide for consistency and comparability across sampling techniques from many disparate data sources.

DWQ does not require that entities follow a specific SOP, However, external entities should be prepared to share the SOPs that were relied upon for data collection associated with a particular data submission. External entities may choose to follow the example SOPs below or develop SOPs specific to their sampling program(s).

Example SOPs

- EPA's Guidance for Preparing Standard Operating Procedures (G-6). EPA's guidance on how to develop and provide the necessary documentation when generating an SOP. DWQ recommends referring to EPA's guidance if using a SOP different than DWQ's.
- DWQ Standard Operating Procedures . DWQ generates SOPs for any procedure that becomes routine, even when published methods are utilized. The use of SOPs ensures data comparability, defensibility, accuracy, and reduces bias. DWQ has published the following final SOPs, which can be found on DWQ's website:

    a. Aquatic Benthic Macroinvertebrate Collection in Rivers and Stream
    b. Calibration, Maintenance, and Use of Hydrolab Multiprobes (SOP includes an example of a multi-probe calibration form).
    c. Chain-of-Custody Samples
    d. Collection and Handling of Escherichia coli (E. coli) Samples
    e. Collection and Preparation of Fish Tissue Samples for Mercury Analysis
    f. Collection of Lake Water Samples

g. Collection of Water Chemistry Samples
h. *Escherichia coli (E. coli)* and Total Coliform Quantification using the IDEXX Quanti-Tray/2000 System
i. Filtering Water Column Chlorophyll-a Samples
j. Hydrolab Data Collection in Lakes
k. Phytoplankton collection to detect Harmful Algal Blooms
l. Secchi Disk Depth Measurements
m. Stream Flow Measurement

Sampling Observations and Laboratory Comments

To assist DWQ in determining data quality, the assessment program requires documentation on field conditions which may affect data quality or laboratory comments on QA/QC issues encountered during analysis. Appendix 2 includes an example of sampling observations DWQ recommends documenting in the field for grab sample collections, and the credible data matrices included in Table 5 - Table 9 describe additional sampling and laboratory observations and comments required by the assessment program.

Monitoring Location Information

To assess a waterbody against the numeric criteria assigned in UAC R317-2, DWQ must review all of the monitoring location information associated with datasets. This process involves validating the location's geospatial information in GIS, assigning beneficial uses to DWQ-validated locations, and merging monitoring locations and their associated data where locations are representative of the same waterbody or segment. Information that must be included with a monitoring location measurement is as follows:

- Monitoring Location ID (Organization's unique identifier for the sample site),
- Waterbody type description, and
- Monitoring location latitude/longitude measurements and associated metadata as defined on the Assessment Program's Call for Data website.

If, during DWQ's geospatial review of the monitoring location information, a monitoring location has insufficient or inaccurate information (e.g., it cannot be mapped or is improperly recorded by the sampler in the field), the monitoring location and its associated data will not be included in the assessment.

CREDIBLE DATA MATRICES

Where beneficial uses can be assigned to a DWQ-validated 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, each credible-data matrix considers the field and laboratory QA/QC 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 metadata associated with the sample measurement, DWQ assigns a grade level (A–C) to the associated sample measurement(s).

Measurements that receive an A or B grade are considered to be of high quality by DWQ and will be considered and used by DWQ in the process of assigning an EPA-derived assessment category to a waterbody (i.e., the IR's 305(b) and 303(d) assessments). Measurements that receive a C grade are considered by DWQ to be of insufficient quality for assessment and 303(d) listing purposes. Details on the required data quality criteria for inclusion in the IR and use by the water quality assessment program are included in Table 5.

Table 5. Data validation criteria for water quality field grab sample parameters.

Data Quality Grade	Quality Assurance	Essential Metadata[1]	Calibration Documentation	Field Documentation	Flow Data	Calibration: Water Temperature Methods*	Calibration: pH Methods*	Calibration: Dissolved Oxygen, Percent Saturation for Calibrated Meter*	Calibration: Dissolved Oxygen, Concentration Methods for Calibrated Meter*
A	QAPP, SAP(s), and SOP(s) or equivalents are available for DWQ review if requested	Essential metadata is included with the data submission.	Available for DWQ review if requested for all field parameters	Available for DWQ review if requested	Submitted or available for DWQ review if requested	Checked against NIST A ≤ ± 0.1 ºC R ≤ 0.01 ºC	Calibrated pH Probe A ≤ ± 0.2 R ≤ 0.01	0-200 %Sat: A ≤ ± 1% R ≤ 0.1%	0-8 mg/L: A ≤ ± 0.01mg/L > 8mg/L: A ≤ ± 0.02 mg/L R ≤ 0.01
B	QAPP, SAP(s), and SOP(s) or equivalents are available for DWQ review if requested	Essential metadata is provided to DWQ upon request.	Available for DWQ review if requested, for field parameters	Unavailable	Not submitted or unavailable	A ≤ ± 0.5 ºC R ≤ 0.05 ºC	Calibrated pH Probe A ≤ ± 0.5 R ≤ 0.05	0-200 %Sat: A ≤ ± 2% R ≤ 0.2%	0-20 mg/L: A ≤ ± 0.1 mg/L R ≤ 0.1
C	QAPP, SAP, or SOP is unavailable Not Submitted	Essential metadata is missing from the data submission and is unavailable.	Unavailable	Unavailable	Not submitted or unavailable	A ≥ ± 0.5 ºC R ≥ 0.05 ºC OR not a calibrated meter, missing, or rejected data	Not a calibrated meter, missing, or rejected data	Not a calibrated meter, missing, or rejected data	Not a calibrated meter, missing, or rejected data

[1] Essential metadata elements are sample location (latitude/longitude), sample date and time, parameter name, result value and unit.
***Footnote: A = accuracy, R = range**

Table 6. Data validation criteria for water quality high frequency dissolved oxygen data.

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Data Quality Grade	Quality Assurance Quality Assurance Project Plan (QAPP)	Essential Metadata[1]	Calibration Documentation	Data QA/QC Information or Report	Field Documentation	Flow Data	Calibration: Dissolved Oxygen*, Percent Saturation for Calibrated Meter	Calibration: Dissolved Oxygen*, Concentration Methods for Calibrated Meter
A	QAPP, SAP(s), and SOP(s) or equivalents are available for DWQ review if requested	Essential metadata is included with the data submission.	Mandatory-calibration record(s) (e.g., field records of calibration and/or fouling)	Documentation describing the QA/QC process on the raw data	All pertinent deployment data (i.e., information necessary for interpreting data)	Submitted or available for DWQ review if requested	0-200%: A ≤ ± 1% R ≤ 0.1%	0-8 mg/L: A ≤ ± 0.01 mg/L > 8mg/L: A ≤ ± 0.02 mg/L R ≤ 0.01
B	QAPP, SAP(s), and SOP(s) or equivalents are available for DWQ review if requested	Essential metadata is provided to DWQ upon request.	Mandatory-calibration record(s) (e.g., field records of calibration and/or fouling)	Documentation describing the QA/QC process on the raw data	All pertinent deployment data (i.e., information necessary for interpreting data)	Not submitted or unavailable	0-200%: A ≤ ± 2% R ≤ 0.2%	0-20 mg/L: A ≤ ± 0.1 mg/L R ≤ 0.1
C	QAPP, SAP, or SOP is unavailable	Essential metadata is missing from the data submission and is unavailable.	Unavailable	Unavailable	Unavailable	Not submitted or unavailable	missing, or rejected data R ≤ 0.2%	R ≤ 0.1

[1] **Essential metadata elements are sample location (latitude/longitude), sample date and time, parameter name, result value and unit.**
***Footnote: A = accuracy, R = range**

Please note: **Raw and QA/QC data records *must be* submitted to qualify for consideration in 303(d) assessments.**

Table 7. Data validation criteria for water quality chemistry grab sample parameters.

Data Quality Grade	Quality Assurance Project Plan (QAPP)	Essential Metadata[1]	Laboratory Method	Detection Limits	Lab Certification	QC Data	Laboratory Comments	Field Documentation	Metals*	Organics*	Inorganics*
A	QAPP, SAP(s), and SOP(s) or equivalents are available for DWQ review if requested	Essential metadata is included with the data submission.	Standard Methods	Below applicable water quality standard	Utah Bureau of Laboratory Improvement certification, NELAC, or equivalent	Available for DWQ review if requested	Laboratory Comments Associated with Sample	Available for DWQ review if requested	Chronic: Aluminum submitted with Ca and Mg OR Lab Hardness and field pH; Cadmium, Chromium (III), Copper, Lead, Nickel, Silver, and Zinc submitted with Ca and Mg OR Lab Hardness	Pentachlorophenol submitted with field pH	Total Ammonia as N submitted with field pH or field Temperature
B	QAPP, SAP(s), and SOP(s) or equivalents are available for DWQ review if requested	Essential metadata is provided to DWQ upon request.	Standard Methods	Below applicable water quality standard	Documentation of laboratory procedures	Available for DWQ review if requested	Laboratory Comments Associated with Sample	Unavailable	Chronic: As above, but Aluminum submitted without Hardness or field pH will be assessed at 750 ug/l; As above, but samples submitted without Ca, Mg, or Lab Hardness **	Pentachlorophenol submitted without field pH	Total Ammonia as N submitted with field pH or field Temperature
C	QAPP, SAP, or SOP is unavailable	Essential metadata is missing from the data submission and is unavailable.	Missing or Non-Standard Methods	Above applicable water quality standards	No certification or laboratory documentation	Unavailable	No Laboratory Comments	Unavailable	Chronic: As above, but Aluminum without Hardness or field pH will not be assessed;	Pentachlorophenol submitted without field pH	Total Ammonia as N submitted with field pH or field Temperature

[1] Essential metadata elements are sample location (latitude/longitude), sample date and time, parameter name and fraction, parameter units, analytical method, result value or non-detect limitation, and laboratory name.
***Footnote: Please also refer to UAC R317-2 to confirm that all the necessary data is submitted to DWQ, so correction factors and equations may be fully calculated for 303(d) assessment purposes.**
****Footnote: Please refer to the 303(d) Assessment Methods for corrections to assessment due to missing values of hardness or pH.**

Table 8. Data validation criteria for macroinvertebrate data.

Data Quality Grade	Quality Assurance Project Plan (QAPP)	Essential Metadata[1]	Field Documentation	Qualified taxonomy lab
A	EPA Approved Lab QAPP available for DWQ review if requested; SAP and SOP or equivalents available for DWQ review if requested	Essential metadata is provided to DWQ upon request.	Available for DWQ review if requested	Required
B	Lab QAPP or equivalent is available for DWQ review if requested; SAP and SOP or equivalents available for DWQ review if requested	Essential metadata is provided to DWQ upon request.	Unavailable	Required
C	QAPP, SAP, or SOP is unavailable	Essential metadata is missing from the data submission and is unavailable.	Unavailable	Unavailable

[1] Essential metadata elements are sample location (latitude/longitude), sample date and time, parameter name and fraction, analytical method, result value and unit, and laboratory name.

Table 9. Data validation criteria for Escherichia coli (E. coli) data.

Data Quality Grade	Quality Assurance	Essential Metadata[1]	EPA Approved Method	Lab Documentation	QA/QC
A	QAPP, SAP(s), and SOP(s) or equivalents are available for DWQ review if requested	Essential metadata is provided to DWQ upon request.	IDEXX Colilert	Bench Sheet Present and Complete	Information on holding time, incubation*, and expiration dates provided.
B	QAPP, SAP(s), and SOP(s) or equivalents are available for DWQ review if requested	Essential metadata is provided to DWQ upon request.	IDEXX Colilert or EasyGel	Bench Sheet Present, incomplete, or not available	Not provided
C	QAPP, SAP, or SOP is unavailable	Essential metadata is missing from the data submission and is unavailable.	IDEXX Colilert or EasyGel	Unavailable	Not provided

[1] Essential metadata elements are sample location (latitude/longitude), sample date and time, parameter name and fraction, analytical method, result value and unit, and laboratory name.
***Footnote: "incubation" refers to data and information that is recorded on DWQ's E. coli bench sheets and relates to time and temperature (i.e., time samples were placed in and taken out of the incubator and the temperature of the incubator when samples were placed in and taken out of it). For an example of how DWQ records this information, please refer to Appendix 3 of DWQ's Standard Operating Procedure for Escherichia coli (E. coli) and Total Coliform Quantification Using the IDEXX QUANTI-TRAY/2000 System (https://deq.utah.gov/legacy/monitoring/water-quality/docs/2014/05May/SOP_EcoliSampleAnalysis_5.1.14_Rev%201.2.pdf).**

Data Submission Process

TYPE OF DATA TO SUBMIT

As referenced in 40 CFR 130.7(b)(5), the assessment program considers all existing and readily available data as defined in Table 3. Both quantitative and qualitative data may be used to evaluate whether physical, chemical, and biological characteristics of a water body are sufficient to support that water bodies designated uses. However, based on the type of data submitted to or obtained by DWQ during the Assessment Program's Call for Data for generating the Integrated Report, the data may not be appropriate for assessments. As recommended in EPA's July 29, 2005, guidance (EPA, 2005), DWQ considers several quantitative and qualitative types of data described in Table 10 for water quality assessments and analyses.

Table 10. Summary of data types considered by the assessment program.

Assessment Program Data Uses	Quantitative Data	Qualitative Data	Other
305(b) and 303(d) Assessments (Grade A and B Data in credible data matrices)	(1) Assessment Parameters contained in Utah Water Quality Standards (UAC R317-2) and Safe Drinking Water Act Standards (see Appendix 1), (2) Segment-specific ambient monitoring of Analytical, Physical, and/or Biological Conditions, (3) Simple Dilution Calculations, and (4) Human Health/Consumption closures, restrictions, and/or advisories	(1) Observed Effects (e.g. fish kills), (2) Complaints and comments from the public, and (3) Human health/consumption closures, restrictions, and/or advisories	Landscape Analysis (when applicable)
Monitoring Planning and Training (Grade C and D Data in credible data matrices)	See above	See above	(1) Landscape Analysis (when applicable), (2) Technical Reports, (3) White Papers, (4) Articles from Refereed Journals, and (5) Other Scientific Publications

PERIOD OF RECORD

DWQ uses water years to define the period of record. DWQ uses the same definition as the U.S. Geologic Survey (https://water.usgs.gov/nwc/explain_data.html) and defines the water year as the 12-month period between October 1 and September 30 of the following year. For the 2018/2020 IR, the period of record is October 1, 2010 to September 30, 2018 (water years 2011-2018).

Data and information from the IR's period of record are considered to be most reflective of the current conditions of a waterbody. Provided the data from this record period meet the interpretive, sampling, and analytical considerations and protocols outlined in this document and on the Assessment Program's Call for Data website, DWQ will analyze and assign EPA- derived assessment categories to the assessed waterbodies from this record period (see Table 1).

Older Data and Information

DWQ will not consider data and other information older than the period of record in the current IR and 303(d) List, unless the data is used to support a secondary review of an impairment determination. Instead, DWQ will encourage the data submitter to collect newer information and submit that data and information in future calls for data. The IR‘s period of record does not preclude DWQ from using older or longer term datasets for programs other than assessments (e.g. water quality standards development, TMDLs, etc.).

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 above period of record 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 April 1 of even-numbered years.

DATA SUBMISSION TOOLS

To ensure the inclusion of data in DWQ‘s assessment process, it is important for data to be submitted in a form that are amenable to the Assessment Program‘s existing data-management and QA capabilities. Please refer to the Table 3 and the water quality assessment program‘s Call for Data website for more information on how to submit data for consideration in the IR.

Data Preparation for Conventional and Toxic Assessments for All Waters

Following the readily available and credible data reviews, DWQ compiles all high quality credible data within the period of record of concern and begins standardizing, validating, and preparing the data for assessments. To assist reviews and increase transparency to reviewers, raw data and accompanying metadata are not altered; instead, a series of database comments and flags are used. Though High Frequency Dissolved Oxygen (DO) and E. coli assessments are considered conventional assessments (see Table 11), these parameters have data preparation protocols that are unique to those datasets. Please refer to the High Frequency and E. coli assessment sections of this document for more details.

RESULTS BELOW DETECTION LIMITS

Environmental chemistry laboratories often 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 laboratory result values that are empty and have detection limits higher than the 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 the detection limit is above the water quality standard, the data will not be used in the assessment.

DUPLICATE AND REPLICATE RESULTS

Datasets often contain duplicate and replicate sample results due to QA/QC procedures, 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 are retained in the assessment dataset and flagged as rejected because of replicate or duplicate values.

INITIAL ASSESSMENT: MONITORING LOCATION SITE LEVEL

DWQ determines attainment or nonattainment of numeric standards by assessing credible data at the monitoring location site level against the numeric criteria in UAC R317-2. 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 then summarized and combined following the procedures outlined in the Determination of Impairment: All Assessment Units section of this report.

Assessments Specific to Flowing Surface Waters of the State and Canals

CONVENTIONAL PARAMETER ASSESSMENTS

Currently, DWQ assesses five parameters within UAC R317-2 as conventional parameters and assesses them against the beneficial use–specific criteria established in UAC R317-2. Several waterbodies with conventional numeric criteria have site-specific standards articulated in self-explanatory footnotes within DWQ's surface water standards (UAC R317-2). Site-specific standards that require further clarification for 303(d) assessment purposes are noted and explained in Table 11.

Table 11. Conventional parameters and associated designated uses as identified for assessment purposes.

Parameters	Designated Use	Notes
DO*	Aquatic life	DO measurements collected by instantaneous/ grab samples are assessed against the 30-day averages in UAC R317-2 and follow the assessment process in Figure 2 and the "Assessments Specific to Lakes, Reservoirs, and Ponds" section of the methods. DO measurements that are collected by high frequency data probes are assessed against the 30- and 7-day averages and minimums in UAC R317-2 and follow the assessment process in Figures 3-5. Note: for high frequency DO assessments, DWQ assumes early life stages are present for the 7-day and minimum. Some site-specific standards have been generated, which are used for assessment purposes.
Maximum temperature*	Aquatic life	Some site-specific standards have been generated, which are used for assessment purposes
pH*	Domestic, Recreation, Aquatic life	Criteria are identical across uses.

Parameters	Designated Use	Notes
Total dissolved solids (TDS)**	Agriculture	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: (1) For South Fork Spring Creek from the confluence with Pelican Pond Slough Stream to U.S. Route 89, two seasonal assessments are not performed. Instead, each sample is compared to the monthly corrected criteria in the footnote in UAC R317-2. (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, the site is not attaining site-specific criteria. If TDS is not exceeding, total sulfate is assessed. (3) Quitchupah Creek from the confluence with Ivie Creek to Utah State Route 10: If TDS exceeds the site-specific standard, it is not attaining site-specific criteria. If TDS is not exceeding, total sulfate is assessed. (4) Blue Creek and tributaries, Box Elder County, from Bear River Bay, Great Salt Lake to Blue Creek Reservoir. The only site to be assessed within this area is 4960740. (All other sites within this area description will not be assessed for TDS). Site-specific standard associated with sulfate for the following areas: (1) 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, it is not attaining. (2) Quitchupah Creek from the confluence with Ivie Creek to Utah State Route 10: When TDS is not exceeding site-specific criteria and total sulfate exceeds site-specific criteria, it is not attaining.
Sulfate**	Agriculture	Site-specific standard associated with sulfate for the following areas: (1) 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, it is not attaining. (2) Quitchupah Creek from the confluence with Ivie Creek to Utah State Route 10: When TDS is not exceeding site-specific criteria and total sulfate exceeds site-specific criteria, it is not attaining.
***Footnote: Indicate that assessments are performed from field measurement only.** ****Footnote: Indicate that assessments are performed from lab measurements only.**		

Grab Sample Assessments

A minimum of 10 samples for conventional parameters are required to determine if a site is attaining or not attaining water quality standards (Figure 7). Where locations have sufficient sample sizes of 10 or more, 10% of the total samples are calculated. This 10% calculation becomes the maximum number of samples that can exceed the numeric criterion. For example, if there are 10 samples in a dataset for a site, one sample can exceed the criterion and the site still supports uses. If more than 10% of the total samples collected exceed the criterion, the site is not attaining the beneficial use and the next beneficial use is assessed. If 10% or less of the total samples collected exceed the criterion, the site is attaining its beneficial use and the next beneficial use is assessed. In the case of waterbodies with site-specific standards for TDS and sulfate, both criteria must be met or the waterbody will be listed as not supporting its agricultural use.

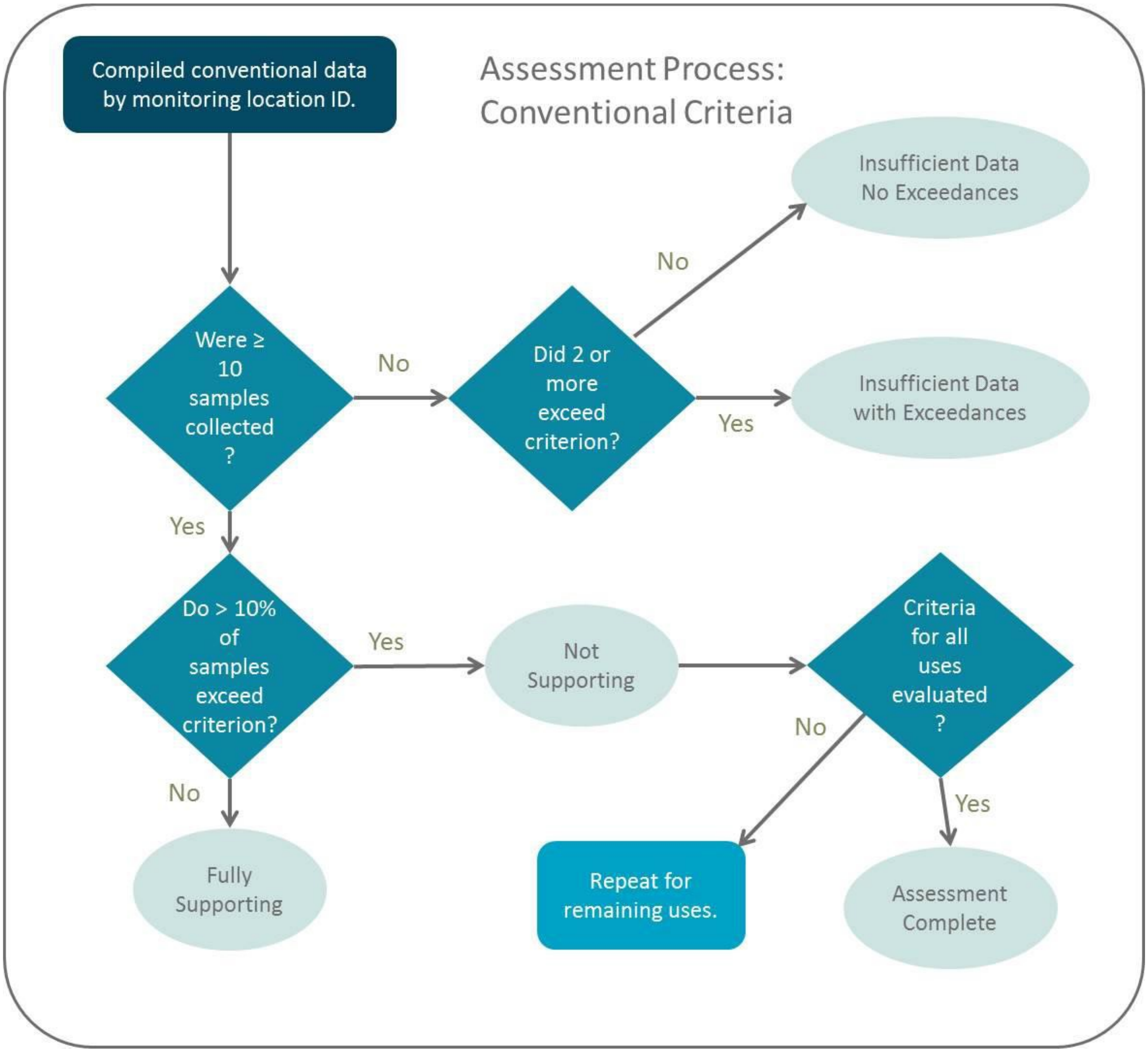

Figure 7. Overview of the assessment process for conventional parameters using grab sample data.

High Frequency Assessments for Dissolved Oxygen

Data Preparation

High frequency data are often screened and corrected to account for sensor drift, calibration shift, strange anomalous points, and battery issues before data analysis and interpretation begins. These data screens are particularly important for dissolved oxygen (DO) sensors because they are subject to bio-fouling, especially in nutrient-rich water where they have the higher potential to become covered in algae growth. When bio-fouling occurs, it results in erroneous logger measurements or sensor drift. For assessments, DWQ will use corrected high frequency data as documented by the data submitter. If during the assessment DWQ determines that additional corrections may be required, DWQ will contact the data submitter for clarification and additional information.

Data sufficiency

To ensure that daily minima are captured and that daily averages can be accurately calculated, high frequency data must capture complete days. DWQ defines a complete day as a calendar day (i.e. 12:00 am – 11:59 pm) in which at least one measurement is made in each hour. Incomplete days will not be included in the high frequency DO assessment.

Assessment Process

For each complete day in a dataset, a daily minimum and daily average are calculated. Moving 7 and 30 day averages are then calculated from the daily averages for each 7 or 30 day period within the dataset. These values are then compared to the applicable daily minimum, 7-day average, and 30-day average criteria to determine use impairment or support.

A site is considered to be not attaining the daily DO minimum criterion if more than 10% of the total daily minima within the period of record are below the applicable standard (Figure 8).

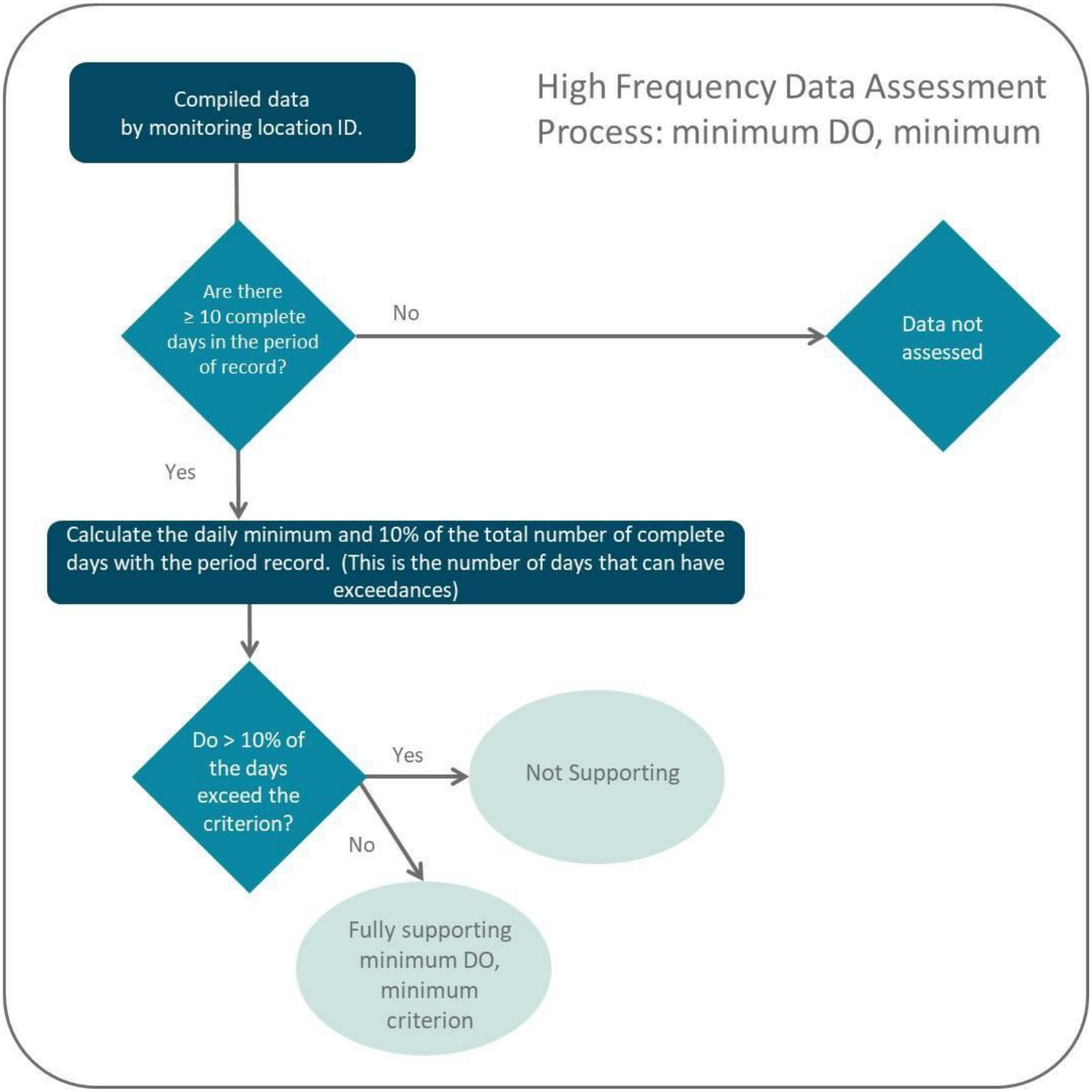

Figure 8. Overview of the assessment process for the minimum dissolved oxygen, minimum using high frequency data.

A site is considered to be not attaining the 7-day average criterion if more than 10% of the 7-day averages within the period of record are below the applicable standard (Figure 9).

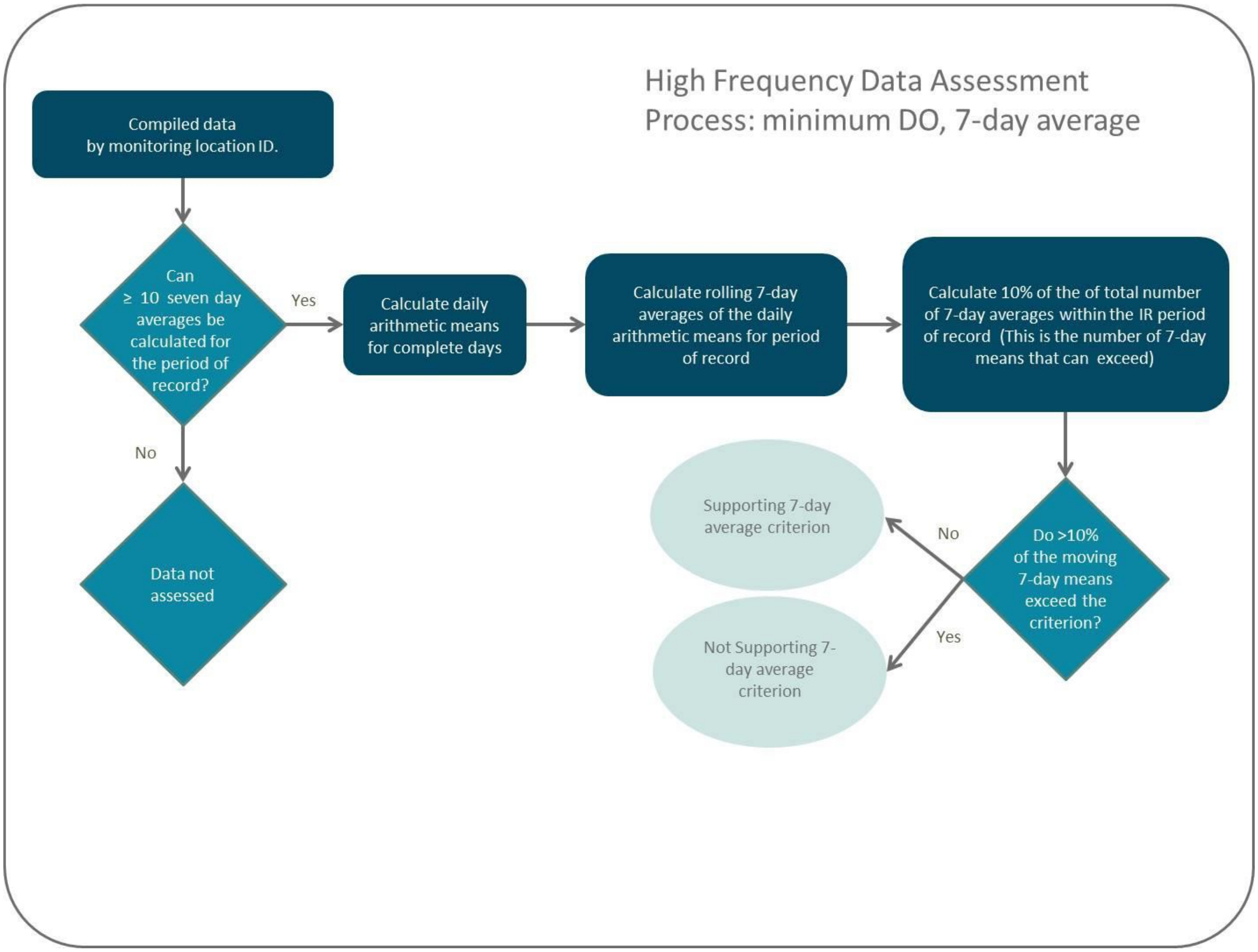

Figure 9. Overview of the assessment process for the minimum dissolved oxygen, 7-day averages using high frequency data.

A site is considered to be not attaining the 30-day average criterion if greater than 10% of the 30-day averages within the period of record are below the applicable standard (Figure 10).

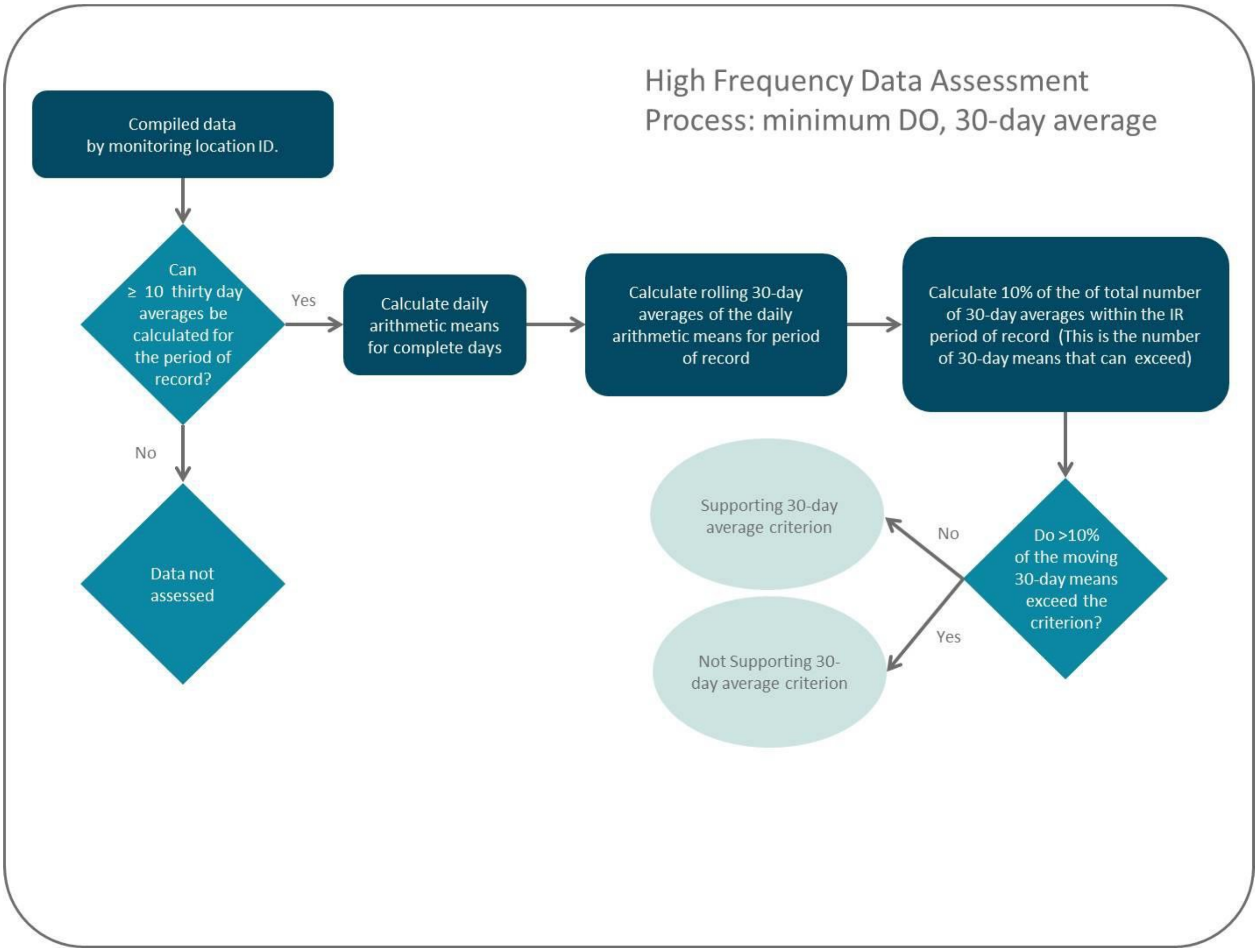

Figure 10. Overview of the assessment process for the minimum dissolved oxygen, 30-day averages using high frequency data.

A site is considered not supporting if it is not attaining either of daily minimum, 7-day average, or 30-day average criteria. A site is considered fully supporting if less than 10% violation is observed for all three criteria.

This process (Figure 8 - Figure 10) is repeated until each beneficial use has been assessed.

Analyzing Multiple DO Datasets at a Site

During the initial assessment of DO at a site, DWQ assesses grab and high frequency independently of each other. During the secondary reviews of determining impairment, DWQ reviews these assessments in context of one another. These processes are discussed in greater detail in Determinations of Impairment: All Assessment Units.

NARRATIVE STANDARDS: 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 using water chemistry sampling and associated standards that are protective of aquatic organisms. Now, DWQ uses an empirically based model that directly assesses attainment of aquatic life uses by quantifying the integrity 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. 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 least human-caused disturbance are typically set using reference sites as controls, or benchmarks. The biological integrity of sites can be evaluated by comparing the biological composition observed at a site against a subset of ecologically 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 waterbodies with similar ecological, 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 depends 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 (Hawkins, 2006; Hawkins et al., 2010).

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 4-year project was initiated to create a biological classification of unpolluted running waters in Great Britain based on the macroinvertebrate fauna (Clarke et al., 1996; Furse et al., 1984; Moss et al., 1999; Wright, 1995).

Over the past 30 years, equivalent RIVPACS models have been developed for aquatic ecosystems throughout the world, including Australia (Davies et al., 2000; Marchant and Hehir, 2002; Metzeling et al., 2002) 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 adopted 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) of least human-caused disturbance. 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 (Figure 11).

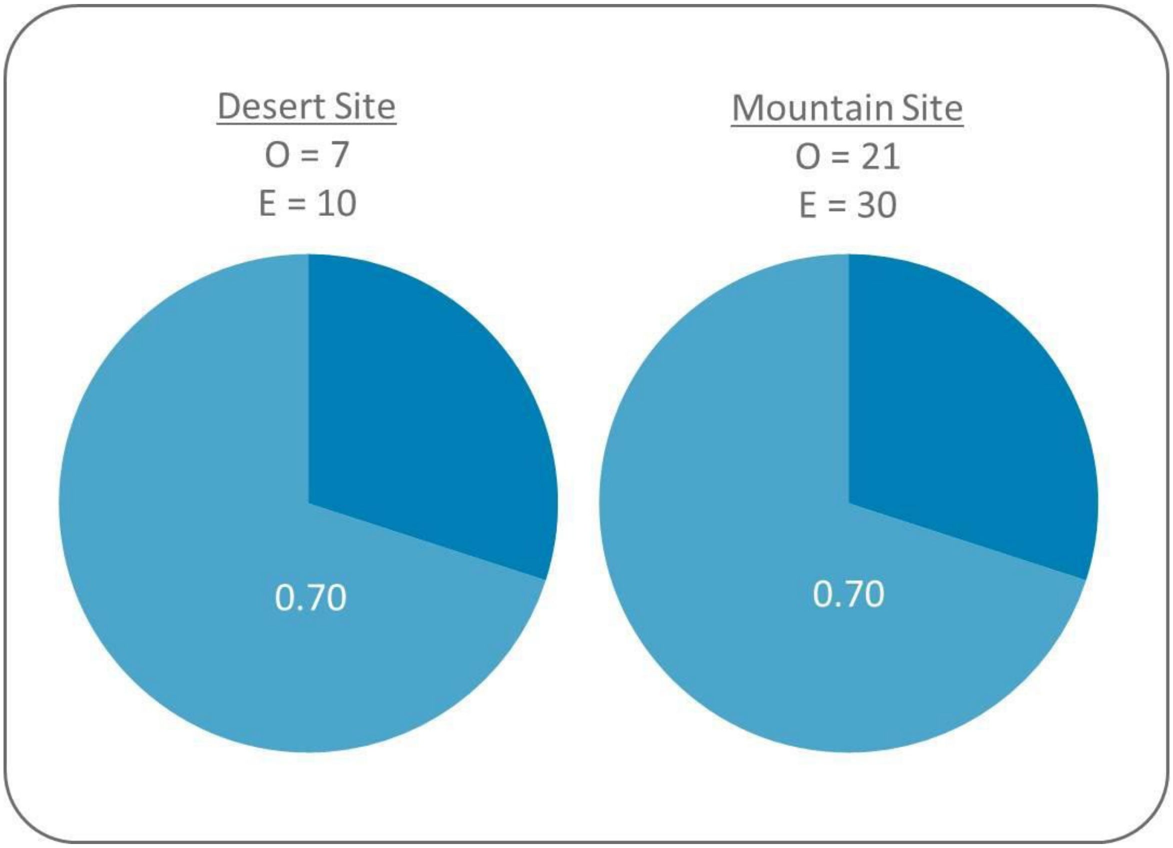

Figure 11. A hypothetical example of O/E as a standardization of biological assessments.

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 on a site-specific scale. This is particularly important for Utah, where streams vary considerably from high-altitude mountain environments to the arid desert regions. 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 (Clarke et al., 1996; Moss et al. 1999; Wright et al., 1993; Wright 1995). 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.

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 waterbodies. 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 Methods. 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% chance of occurring at a site given the site‘s specific environmental characteristics. Using a Pc limit set at greater than 50% 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; Ostermiller and Hawkins, 2004; Hawkins, 2006; Van Sickle et al., 2007, Hawkins et al., 2015; Hawkins and Yuan, 2016; Mazor et al., 2016).

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. Site-specific, 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 location, on a site-specific basis, 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 15 variables that resulted in the most precisely predictive model (Table 12).

Table 12. Final predictor variables used in model construction.

General Category	Description
Geography	Mean watershed elevation (meters) from National Elevation Dataset.
Geography	Minimum watershed elevation (meters) from National Elevation Dataset.
Geography	Watershed area in square kilometers.
Geography	Latitude of the sample location.
Climate	Watershed average of the mean day of year (1–365) of the first freeze derived from the PRISM data.
Climate	Watershed average of the annual mean of the predicted mean monthly precipitation (millimeters) derived from the PRISM data.
Climate	Watershed average of the annual maximum 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.
Climate	Average of the annual mean of the predicted maximum monthly air temperature at the sample location derived from PRISM data.

General Category	Description
Climate	Watershed average of the annual mean of the predicted maximum monthly air temperature derived from PRISM data.
Climate	Watershed average of the annual mean of the predicted minimum monthly air temperature derived from PRISM data.
Climate	Watershed average of the annual mean of the predicted mean monthly relative humidity derived from PRISM data.
Climate	Average of the annual mean of the predicted mean monthly air temperature at the sample location derived from PRISM data
Climate	Watershed maximum of mean 1961–1990 annual number of wet days.
Vegetation	Watershed maximum of mean 2000–2009 annual enhanced vegetation index.

The RIVPACS model used for the current 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 1,800 samples collected across the state by various agencies.

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 current 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 1.00, which means that the model has high precision calculating O/E values. 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 (Figure 12). The goal of this assessment process is to characterize each AU as fully supporting or not supporting aquatic life beneficial uses.

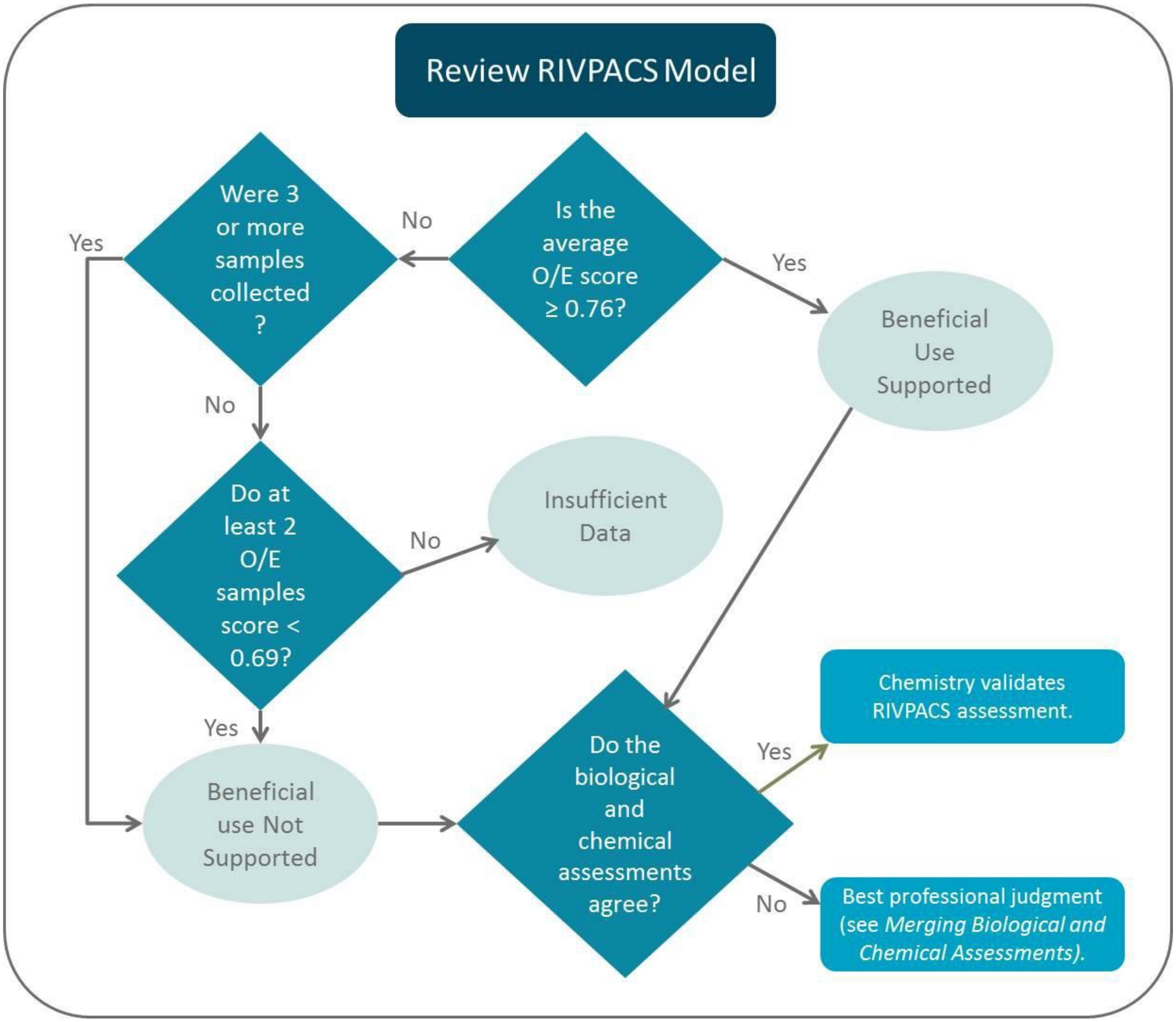

Figure 12. Decision tree for making biological assessment decisions.

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 (see the Assessment Unit Re-segmentation discussion for more information on that process). 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 thresholds, or O/E scores that indicate whether or not a site is meeting biological beneficial uses (Table 13). For these assessments, the 10th and 5th percentiles of reference sites were used. Essentially, the data used for the current 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 8 years since the most recent year of available data. 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 reduce 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 13. 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 8 years	Mean O/E score ≥ 0.76	Fully Supporting	Threshold based on 10th percentile of reference sites.
≥ 3 samples collected over 8 years	Mean O/E score < 0.76	Not supporting	Threshold based on 10th percentile of reference sites.
< 3 samples	Mean O/E score ≥ 0.69–≤ 0.76	Insufficient Data	Lower threshold based on 5th percentile of reference sites.
< 3 samples	2 O/E scores < 0.69	Not Supporting	Threshold based on 5th percentile of reference sites
< 3 samples	< 2 O/E scores < 0.69	Insufficient Data	Threshold based on 5th percentile of reference sites

AUs not meeting biological thresholds will be assessed as non-supporting. 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 5% 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 Category 3 (insufficient data and information with exceedances), which indicates that there are insufficient data to make an assessment. All sites listed as Category 3 with exceedances will be given a high priority for future biological monitoring.

Assessments Specific to Lakes, Reservoirs, and Ponds

ASSESSMENT OVERVIEW

Lakes, reservoirs, and ponds 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). 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 affects how conventional water quality parameters are assessed (UAC R317-2-14). Therefore, each waterbody is evaluated for thermal stratification and assessed appropriately.

The assessment of Utah lakes and reservoirs consists of two tiers:

- **Tier 1**: The tier I assessment is the preliminary determination of support status for recreational use (Class 2), aquatic life (Class 3), and agricultural (Class 4) classes based on conventional parameters, such as DO, temperature, pH, toxic parameters, and E. coli. When Tier I data are not available, DWQ may rely on 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**: The tier II assessment looks further into the weight of evidence criteria (trophic state index [TSI], fish kills, and algal composition) using secondary reviews. 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.

TIER I ASSESSMENT

Drinking Water Use Support

Drinking Water Use support is assessed by evaluations of pH, toxics, E. coli, and harmful algal blooms (HABs). For further information regarding drinking water use assessments for Toxics, E. Coli and HABs, please review the Toxics Parameter Assessments for All Waters, Escherichia Coli Assessment for All Waters, and Harmful Algal Blooms (HAB) assessment sections. The evaluation process of pH is the same as the requirements for Aquatic Life Uses, which are described in the second paragraph below.

Recreational Use Support

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 the paragraph below. For further information regarding recreational use assessments for E. Coli and HABs, please review the Escherichia Coli Assessment for All Waters and Harmful Algal Blooms (HAB) assessment sections.

Aquatic Life Use Support

Lake monitoring routinely involves collecting pH, temperature, and DO measurements at approximately1-meter intervals throughout the water column, from the surface to the lake bottom (note that the measurement interval may be modified in the field depending on waterbody depth). These water column measurements are compared against Utah water quality standards to assess beneficial use support (Figure 13). For waterbodies that are thermally stratified, a separate process is used to determine whether sufficient habitat is available for aquatic life (Figure 14).

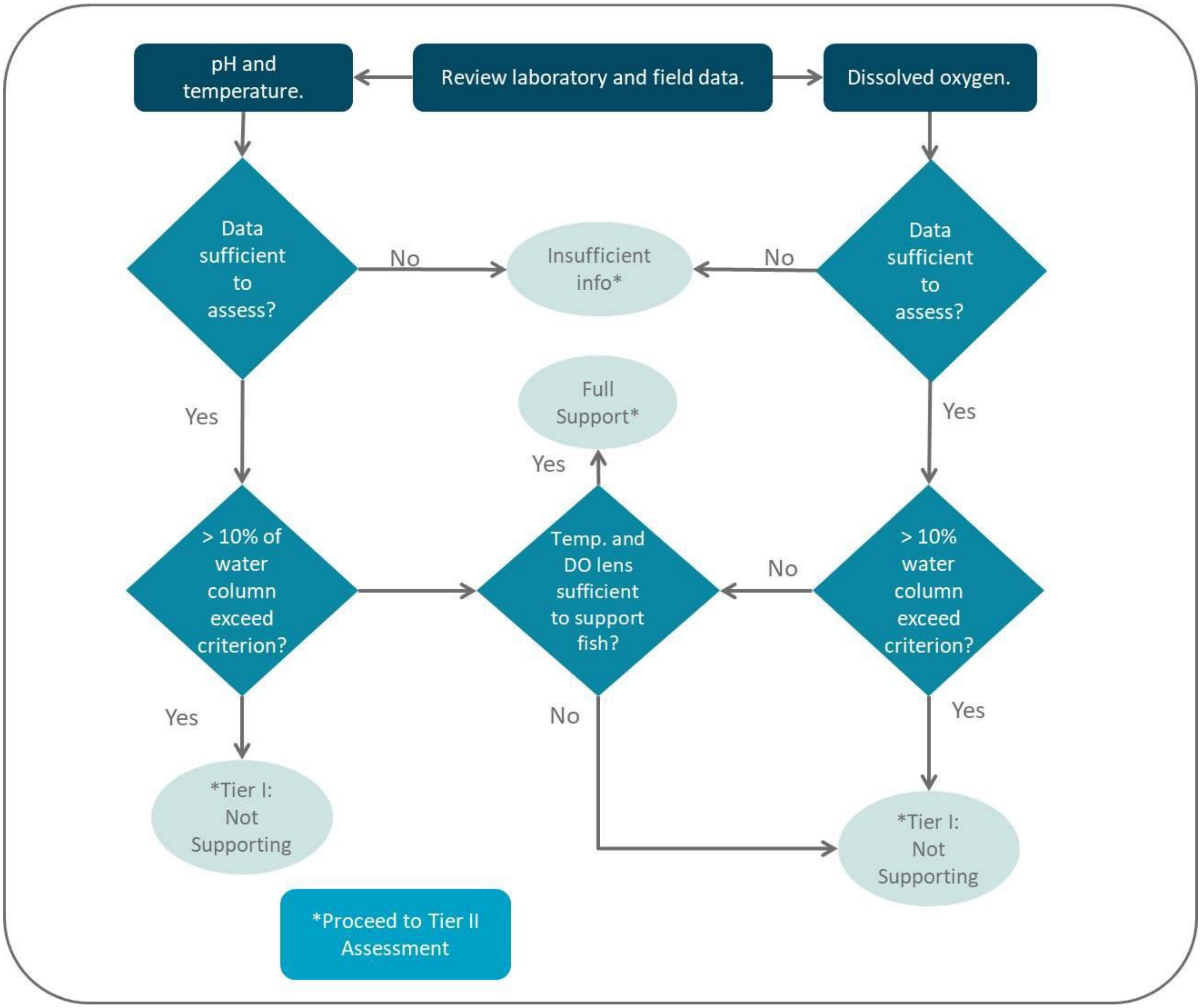

Figure 13. Process using conventional (nontoxic) parameters to assess lakes that are mixed.

pH, All Lakes and Reservoirs

Beneficial Use Supported

The beneficial use is supported if the number of violations are less than or equal to 10% of the measurements (see Figure 14, 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 (Figure 14, Panel B).

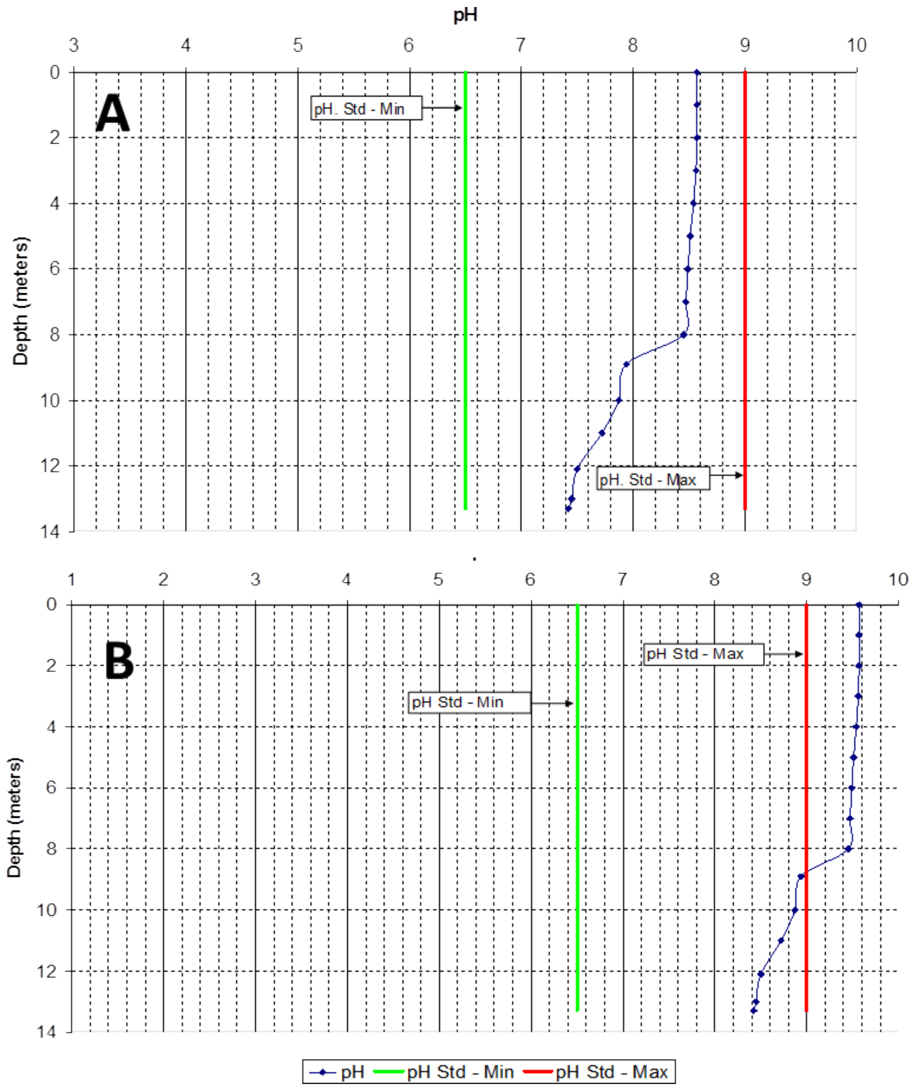

Figure 14. Plots of pH measurements (blue dots) against lake depth for a waterbody meeting (Panel A) and violating (Panel B) the pH water quality standards.

Temperature and Dissolved Oxygen, Mixed Lakes and Reservoirs

Temperature

The criteria used to assess the beneficial use support are based on profile data. If the temperature criterion is exceeded in more than 10% of the measurements with a minimum of two discrete measures exceeding criteria from any individual sampling event, the site is considered to be 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% of the measurements (see Figure 15, Panel A).

Beneficial Use Not Supported

The beneficial use is not supported if more than 10% of the measurements violate the temperature standard (see Figure 15, Panel B).

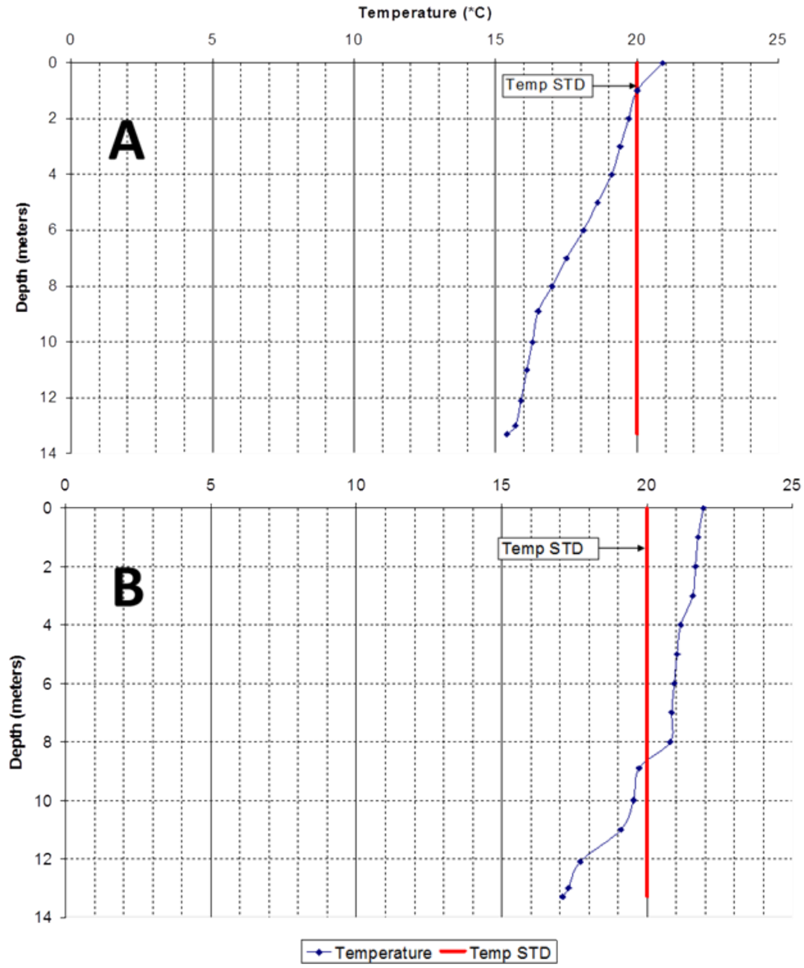

Figure 15. Plots of temperature measurements (blue dots) against lake depth for two sites to provide an example of assessment procedures. Note: The red line illustrates a temperature criterion of 20 degrees Celsius: Class 3A beneficial use. Panel A (top) illustrates a site meeting the beneficial use because less than 10% of the temperature measures are greater than the criterion, whereas Panel B (bottom) illustrates a site not meeting the beneficial use because greater than 10% of the temperature measures exceed the criterion.

Dissolved Oxygen

Like the temperature assessment, the DO assessment uses data that are gathered from profiles. The DO assessment uses the minimum criteria 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 assessments for stratified lakes and reservoirs follow the stratified lakes and reservoirs assessment methods below:

Beneficial Use Supported

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

Beneficial Use Not Supported

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

Stratified Lakes and Reservoirs

Temperature and Dissolved Oxygen: Aquatic Life Use Assessment

When sample locations demonstrate stratification, a separate assessment technique for temperature and DO is used to ensure that sufficient habitat for aquatic life exists. Habitat is considered sufficient if at least 3 continuous meters of the water column are meeting the criteria for both temperature and DO. The rationale for a conclusion of beneficial use support based on the existence of adequate habitat follows the decision diagram (Figure 16). Figure 17 provides an example of supporting and not supporting the beneficial use based on the DO and temperature data above the thermocline.

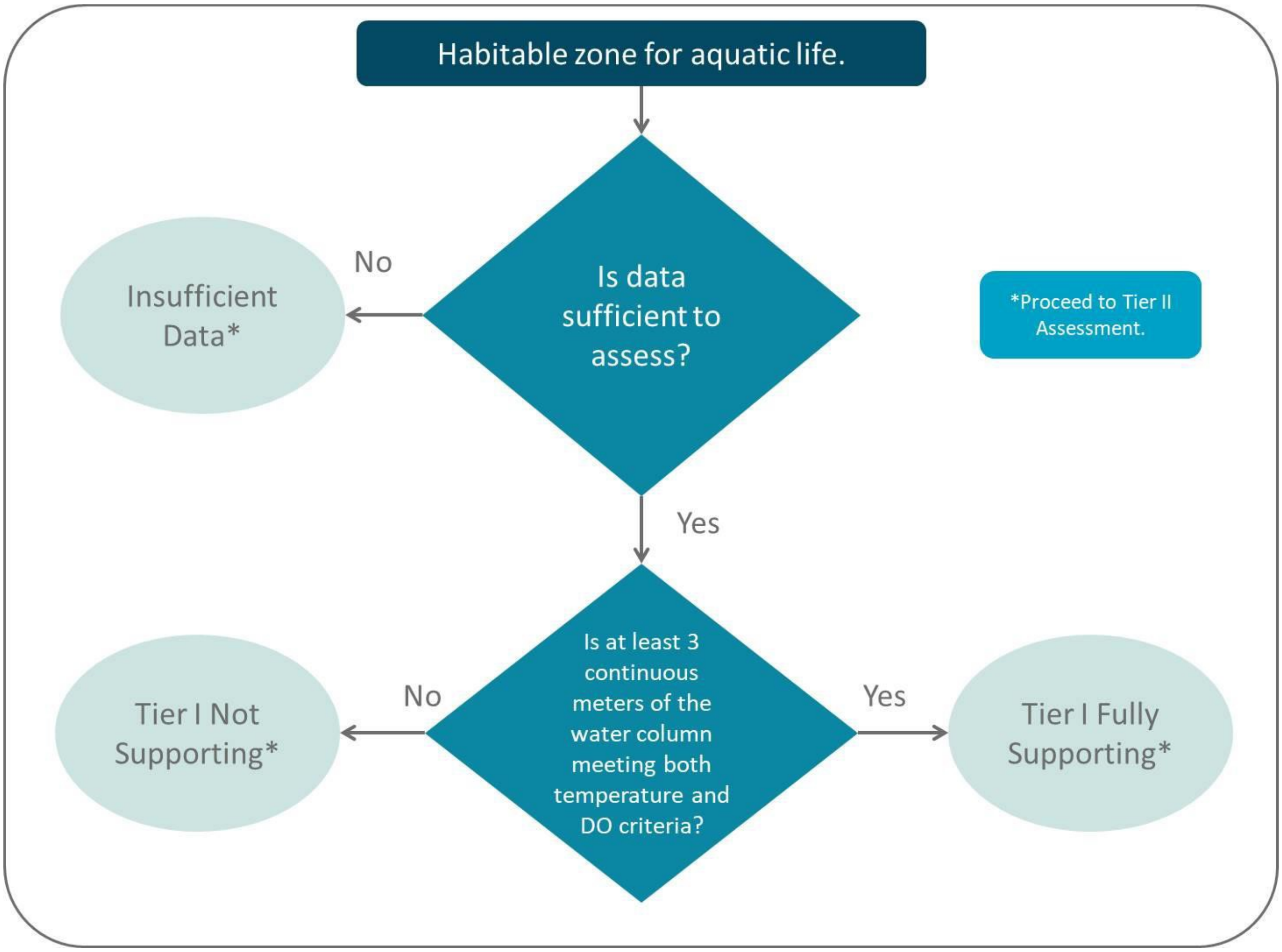

Figure 16. Beneficial use support based on the existence of adequate habitat.

Beneficial Use Supported

The beneficial use is supported if there is sufficient habitat, defined as 3 continuous meters of the water column meeting the criteria for both temperature and DO.

Beneficial Use Not Supported

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

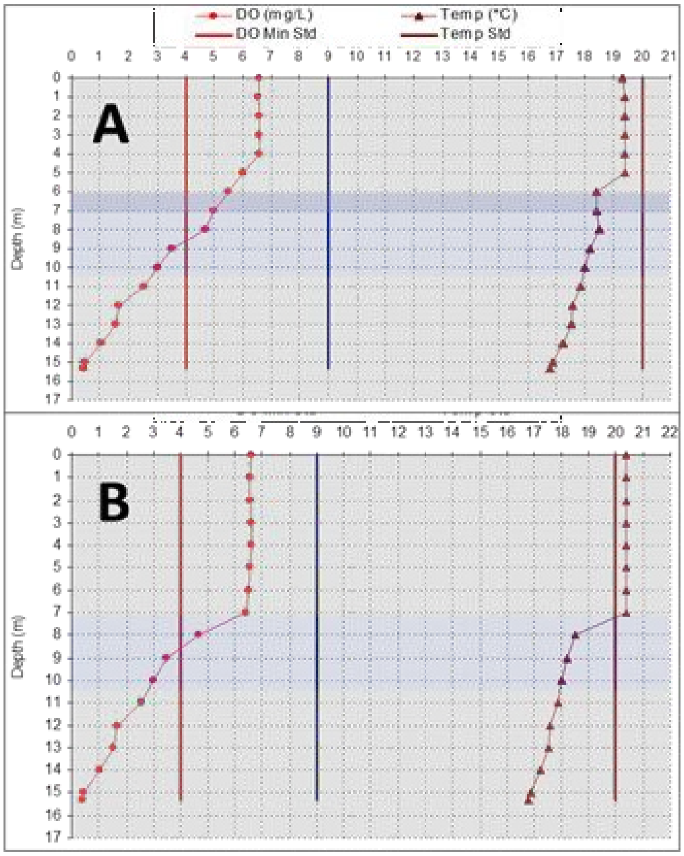

Figure 17. Concept of the habitable zone where both DO and temperature are suitable for aquatic life. The site depicted on the top (Panel A) would be considered supporting because the lens where both temperature and DO provide sufficient habitat (>=3 m). Conversely, the site on the bottom (Panel B) is not meeting aquatic life uses because although there are regions in the water column where dissolved oxygen and temperature criteria are met separately, the region of overlap in the water column where both temperature and dissolved oxygen criteria (approximately 8 meters depth) is less than 3 meters thick.

Total Dissolved Solids: Agricultural Use Support

The following rules are used to determine whether a lake is supporting its agricultural beneficial use (Figure 18):

Beneficial Use Supported

The beneficial use is supported if the standard is exceeded in 10% or fewer of TDS samples.

Beneficial Use Not Supported

The beneficial use is not supported if the TDS standard is exceeded in more than 10% of TDS samples.

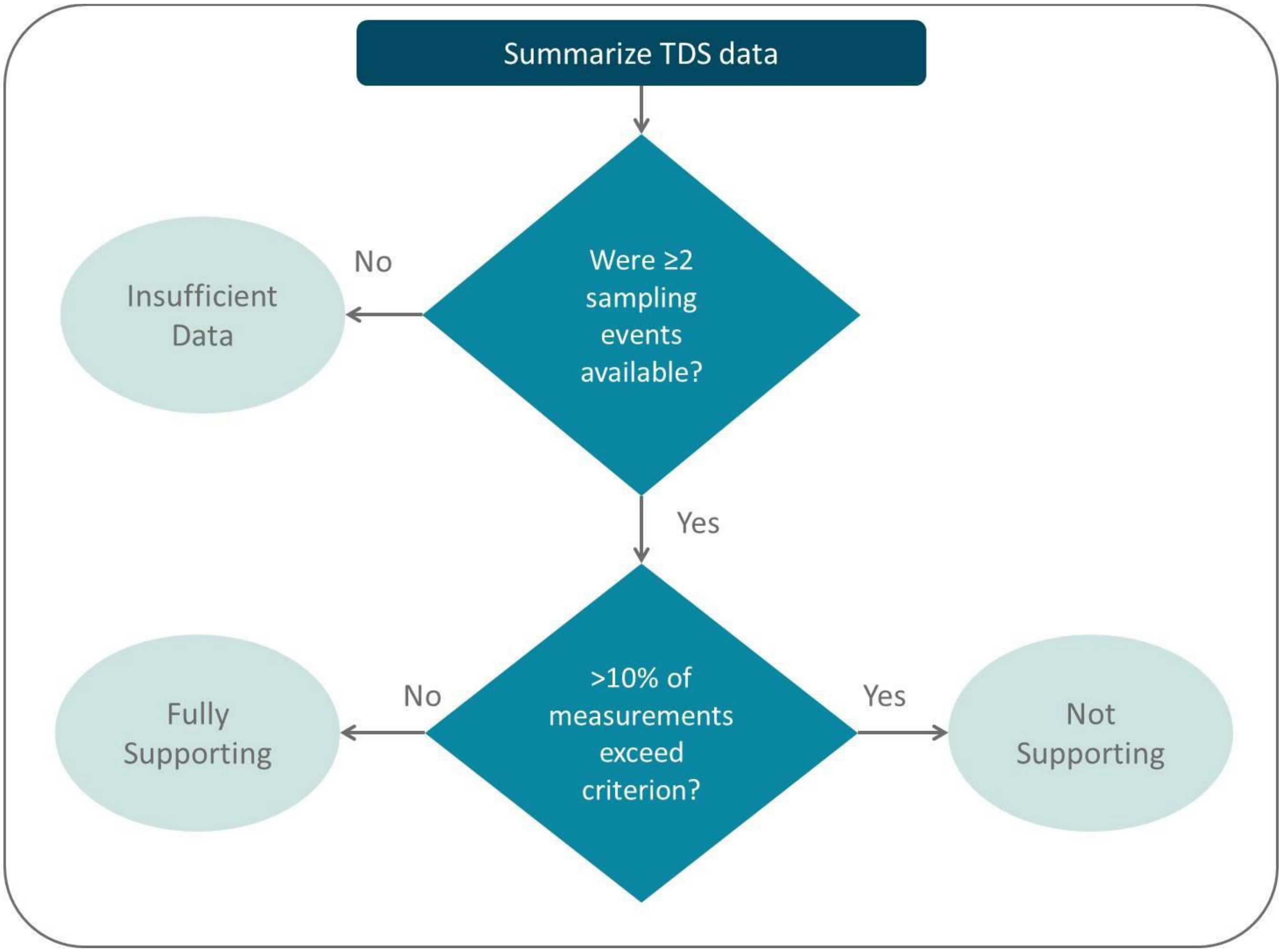

Figure 18. Assessment process to determine support of the agricultural beneficial use with TDS data.

TIER II ASSESSMENT

Weight of Evidence Criteria

The weight of evidence criteria allows DWQ to use key lines of evidence in assessing a waterbody's use support including evaluations of Utah's narrative standard.

The weight of evidence evaluation consists of three components:

- Increasing trophic state index (TSI) trend over the long term (approximately 10 years) or a TSI-Chl-a greater than 50 (see Carlson's Trophic State Index section below for more information).
- The observation of water quality–based fish kills (see the Narrative Standards for All Waters for more information) or winter DO measures not meeting the criterion when measured.
- Evaluation of phytoplankton community.

These three components are evaluated following Figure 19.

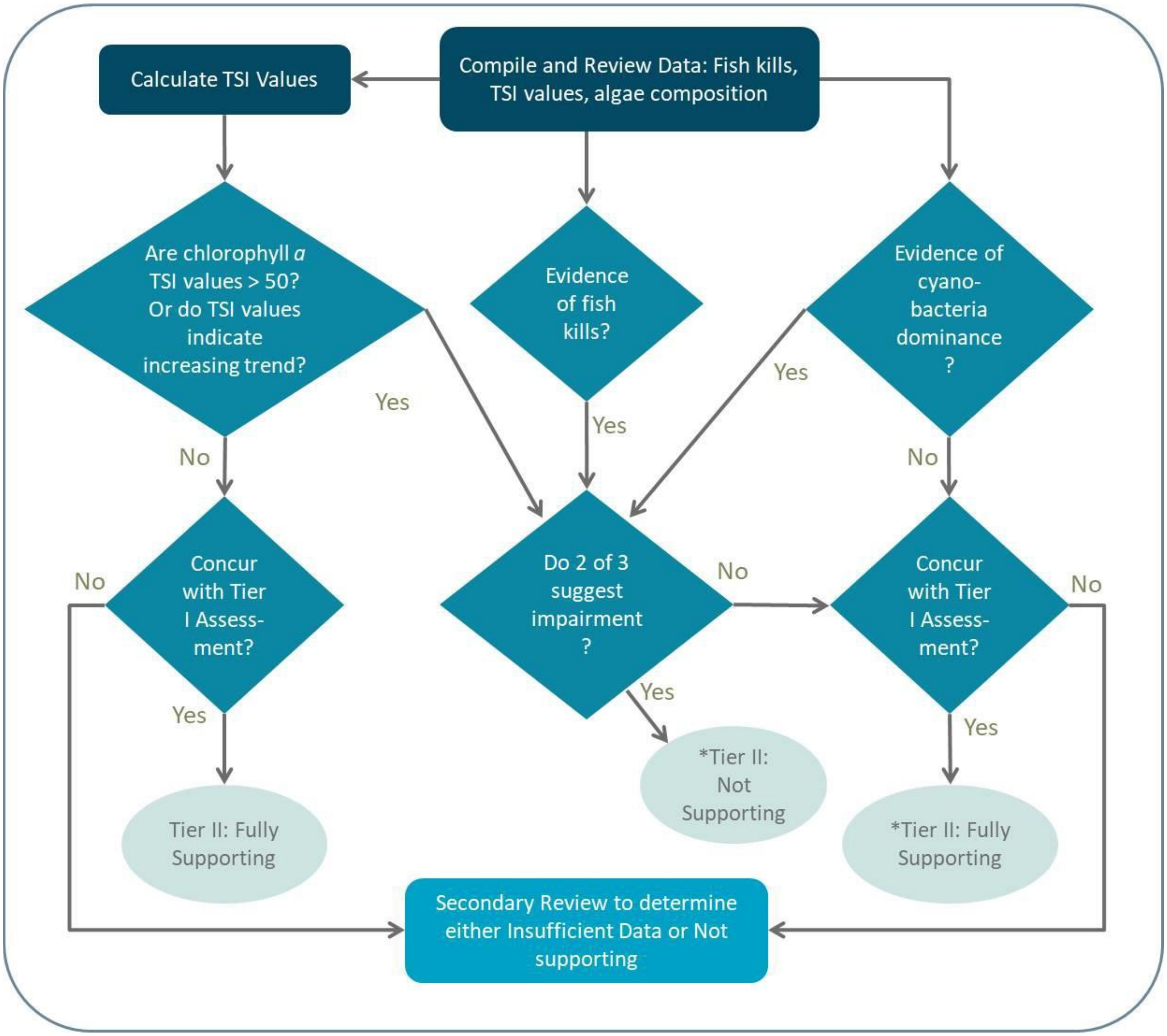

Figure 19. Tier II assessment process for lakes, reservoirs, and ponds.

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 about 100, with increasing values indicating a more eutrophic condition. TSIs are calculated independently for each indicator (i.e., Secchi disk, chlorophyll a, and total phosphorus) and are not averaged. Chlorophyll a (TSI-Chl-a) is generally considered the most reliable indicator of trophic status, followed by Secchi disk (TSI-SDD), and total phosphorus (TSI-TP) (Carlson, 1977).

Carlson's TSI estimate for chlorophyll a is calculated using the following equation:

- Trophic Status Based on Chlorophyll a (TSI-Chl-a): TSI-Chl-a = 9.81 ln (Chl-a) + 30.60, where Chl-a = chlorophyll a concentrations in µg/l.

Phytoplankton Community

DWQ routinely collects phytoplankton to evaluate the composition and relative abundance of algae and cyanobacteria. These data are used to identify waterbodies potentially undergoing cultural eutrophication that may negatively impact beneficial uses. Phytoplankton data are used in the Tier II assessment process because they may reflect nutrient availability and nutrient ratios. The observation that a waterbody has a diverse assemblage of diatoms or green algae relative to cyanobacteria or other potentially harmful taxa is used as a line of evidence that the waterbody is supporting its designated uses. In contrast, a phytoplankton assemblage dominated by cyanobacteria may be indicative of eutrophication, an increased potential for harmful algal blooms, and a loss of aquatic biodiversity.

GREAT SALT LAKE

GSL is assigned its own beneficial use class (Class 5) and is further divided into five subclasses (5A–5E) that represent the four main bays (Gilbert, Gunnison, Bear River, and Farmington) and transitional waters (UAC R317-2-6). The only numeric water quality criterion currently applicable to GSL is a selenium bird egg tissue criterion for Gilbert Bay (Class 5A). In addition to this criterion, the beneficial uses of GSL are protected and assessed by Utah's narrative water quality standard (UAC R317-2-7.2). The Great Salt Lake Water Quality Strategy outlines the process for monitoring and criteria development for GSL.

Gilbert Bay Bird Egg Tissue Assessment

Bird eggs are collected annually from representative locations within the Gilbert Bay AU or from Gilbert Bay adjacent transitional wetlands (UAC R317-2-6.5) during each nesting season. Selenium concentrations from eggs collected each year are assessed against the criterion in UAC R317-2-14. Gilbert Bay's beneficial use will be identified as impaired if the geometric mean of selenium concentrations from five or more eggs collected in any year exceeds the 12.5 mg/kg criterion. DWQ will identify Gilbert Bay's beneficial use as threatened and initiate preliminary TMDL studies to evaluate selenium loading sources if the geometric mean of selenium concentrations from five or more eggs collected in any year exceeds 9.8 mg/kg dry weight. If Gilbert Bay is identified as impaired for selenium, five consecutive nesting seasons meeting selenium criteria will be considered sufficient for delisting the impairment.

The Gilbert Bay selenium criterion also includes thresholds below 9.8 mg/kg that trigger management actions (Table 14). DWQ evaluates egg concentrations against these thresholds to inform management decisions, but these thresholds are not used for use attainment determinations in the IR.

Eggs are also collected as part of discharge monitoring programs for certain dischargers to GSL. Eggs collected as a part of these programs are specifically intended to characterize discharge outfall conditions and are therefore not relevant to assessing more general GSL conditions. Eggs collected under these programs are only used for evaluating discharge permits and are not used in 303(d) assessment of the GSL AUs.

Table 14. Selenium trigger levels and DWQ responses (UAC R317-2-14.2(14)).

Se concentration (mg/kg dry weight)	DWQ Response
< 5.0	Routine monitoring with sufficient intensity to determine if selenium concentrations within the Great Salt Lake ecosystem are increasing.
5.0	Increased monitoring to address data gaps, loadings, and areas of uncertainty identified from Great Salt Lake selenium studies.
6.4	Initiation of a Level II Antidegradation review by the State for all discharge permit renewals or new discharge permits to Great Salt Lake. The Level II Antidegradation review may include an analysis of loading reductions.

Se concentration (mg/kg dry weight)	DWQ Response
9.8	Declare aquatic life use as threatened. Initiate preliminary TMDL studies to evaluate selenium loading sources.
12.5	Declare aquatic life use as impaired. Formalize and implement TMDL.

Toxics Parameter Assessments for All Waters

DWQ identifies toxics as all parameters within UAC R317-2 that are not defined as conventional parameters (see Table 11 and the Lakes, Reservoirs, and Ponds Assessment section).

To ensure protection of designated uses, data are compared against one or more toxic criteria, depending on the beneficial use. For 303(d) assessment purposes, one daily measurement at each monitoring location is compared to the chronic and/or acute criteria. In lakes, DWQ targets dissolved metals sample collection to 1 meter above the bottom at the deepest site of the waterbody, as this location is the most likely to identify dissolved metal exceedances if they exist in a lake. However, where additional metals data are available for other lake locations or depths, they are also assessed following these methods. 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 (see footnotes in 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. Data without a hardness value are removed from assessments.

- **Aluminum, chronic only**: If either a field pH or calculated or laboratory hardness is missing, the aluminum acute default value of 750 microgram per liter (µg/l) provided in Table 2.14.2 of UAC R317-2 will be applied. Otherwise, the following pH and hardness combination and numeric criteria are applied:

    a. pH ≥ 7.0 and (calculated or laboratory reported) hardness ≥ 50 parts per million (ppm): 750 µg/l.
    b. pH < 7.0 and (calculated or laboratory reported) hardness ≥ 50 ppm: 87 µg/l.
    c. pH ≥ 7.0 and (calculated or laboratory reported) hardness < 50 ppm: 87 µg/l.
    d. pH < 7.0 and (calculated or laboratory reported) hardness < 50 ppm: 87 µg/l.

- **Ammonia, chronic**: DWQ assumes fish early life stages are present at all monitoring locations and the following equation is used: ((0.0577/(1+107.688-pH)) + (2.487/(1+ 10pH-7.688))) * MIN (2.85, 1.45*100.028*(25-T)). Where (1.45*100.028*(25-T)) is ≤ 2.85, (1.45*100.028*(25-T)) is applied and if (1.45*100.028*(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.

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 sufficient data (4 or more samples) with two or more exceedances of the acute and/or chronic criteria will result in nonattainment of the beneficial use. 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 fewer than four samples and one or zero samples are exceeding the acute or chronic criteria, sites will be placed in category 3, insufficient data (Figure 20).

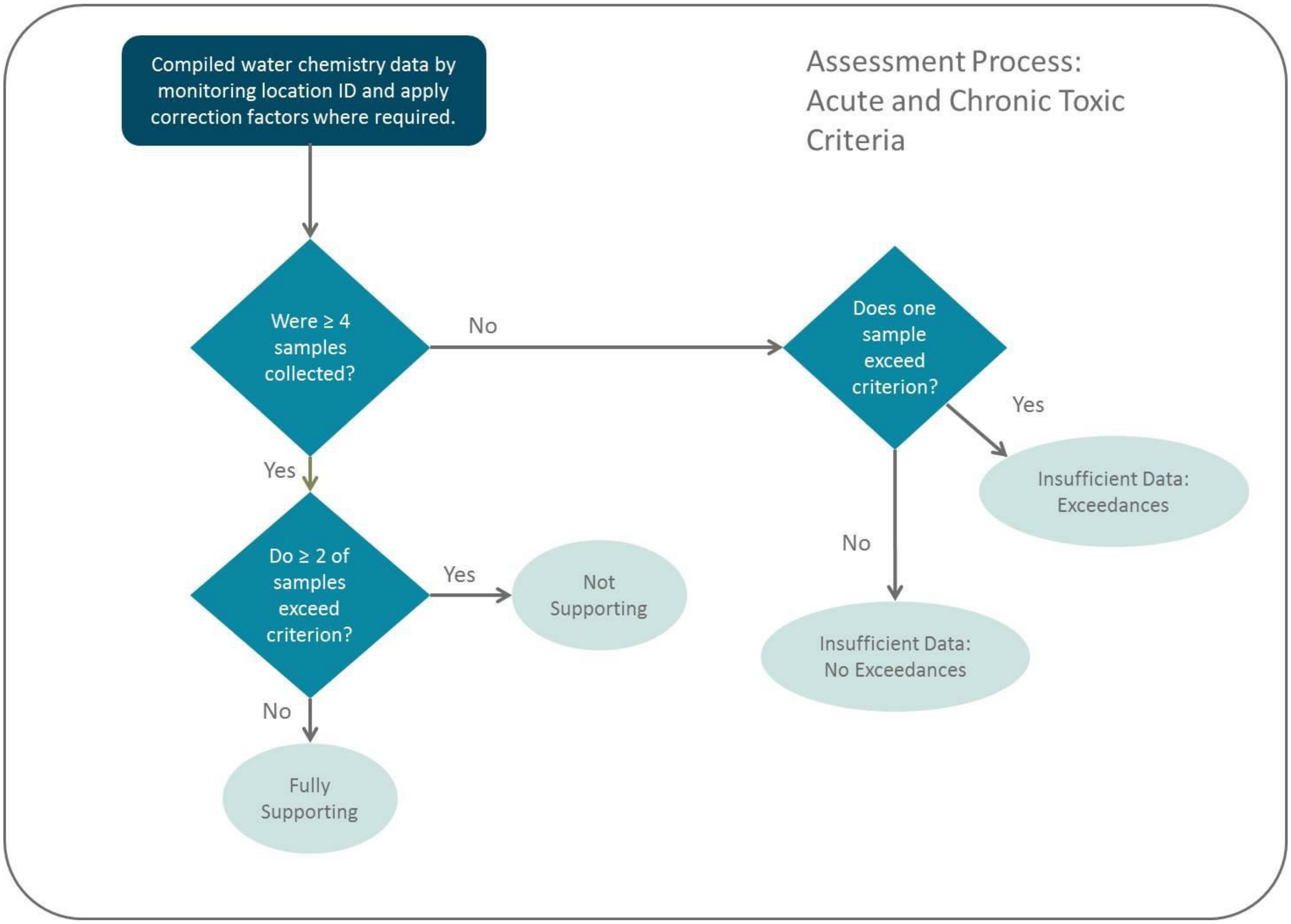

Figure 20. Overview of the assessment process for toxic parameters.

Escherichia Coli Assessment for All Waters

DATA PREPARATION

Following a credible data review and additional QA/QC checks as outlined in DWQ's Quality Assurance Program Plan for Environmental Data Operations (DWQ, 2014), 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 QA/QC and assessment procedures outlined in this document, the raw data and accompanying metadata 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.

Escherichia coli Collection Events and Replicate Samples

Due to sampling design, datasets at a single monitoring 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 one of the following:

- The daily most probable number (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 replicate samples were taken and there is a quantified MPN value reported from a dilution and the MPN value reported is greater-than-detect, the quantified MPN value will be used as the collection event for assessment purposes. In this scenario, 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 is 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 1 to allow for the calculation of a geometric mean. Similarly, E. coli data that are reported as greater than detect (> 2,419.6) will be treated as 2,420 to allow for the calculation of the geometric mean.

Use Designation

Once the data are compiled, 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. 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 is to gather information regarding health advisories and/or closures issued during the recreation season. If there were two or more E. coli–related beach closures and/or health advisories in a recreation season, or if a health advisory and/or closure was issued for recreational access to a waterbody for two or more weeks, the waterbody is considered impaired and no further assessment is conducted

(Figure 21). If there were fewer than two closures or advisories, or if the closure lasted less than two weeks, the assessment process continues using E. coli concentrations.

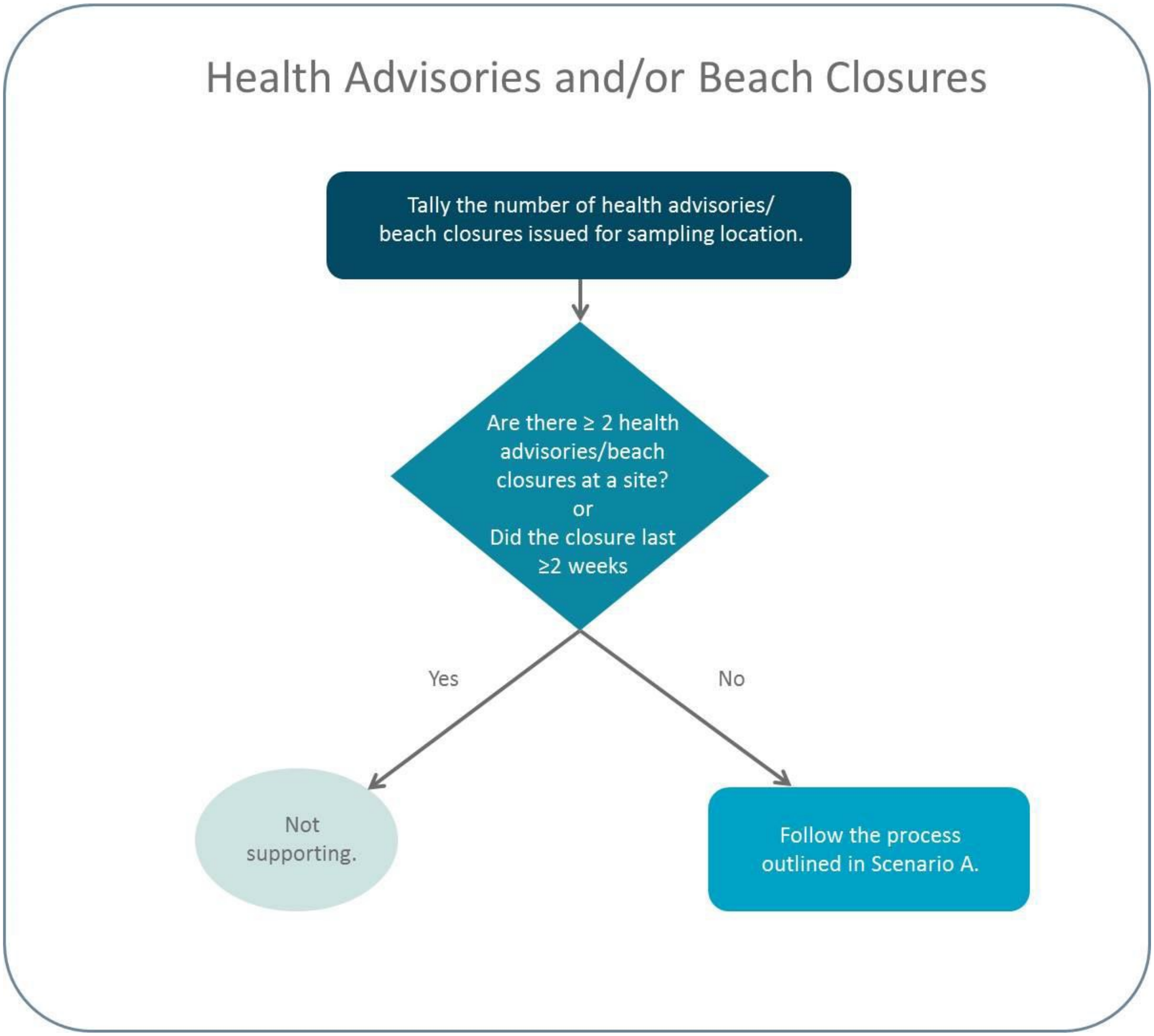

Figure 21. Considering E. coli related beach closures and/or health advisories.

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

- **Scenario A**: A seasonal assessment against the maximum criterion (Figure 22).
- **Scenario B**: A 30-day geometric mean assessment (Figure 23).
- **Scenario C**: A seasonal geometric mean assessment (Figure 24).

Scenario A

Each monitoring location is assessed against the maximum criterion if there are five or more collection events (see Figure 22).

Step 1: Calculate 10% of collection events. If there are greater than or equal to 5 collection events within the recreation season, then the following calculations are performed:

- Divide the total number of collection events in the recreation season by 10 and round to the nearest whole number. This is the number of collection events that can exceed the maximum criteria. For example, if there were 6 collection events in a recreation season, then one sample can exceed the maximum criteria. If there were 15 collection events in a recreation season, then two samples can exceed the maximum criteria.

Step 2: Determine the number of times the collection event exceeded the max criteria.

- If more than 10% of the collection events exceeded the maximum criteria, the monitoring location is not supporting beneficial uses.
- If less than 10% of the collection events exceeded the maximum criteria, the site is then assessed using Scenario B and C.
- If there are less than 5 collection events in the recreation season, a tally of collection events exceeding the max criteria determines if the site is placed in the category of insufficient data with exceedances, or insufficient data without exceedances.

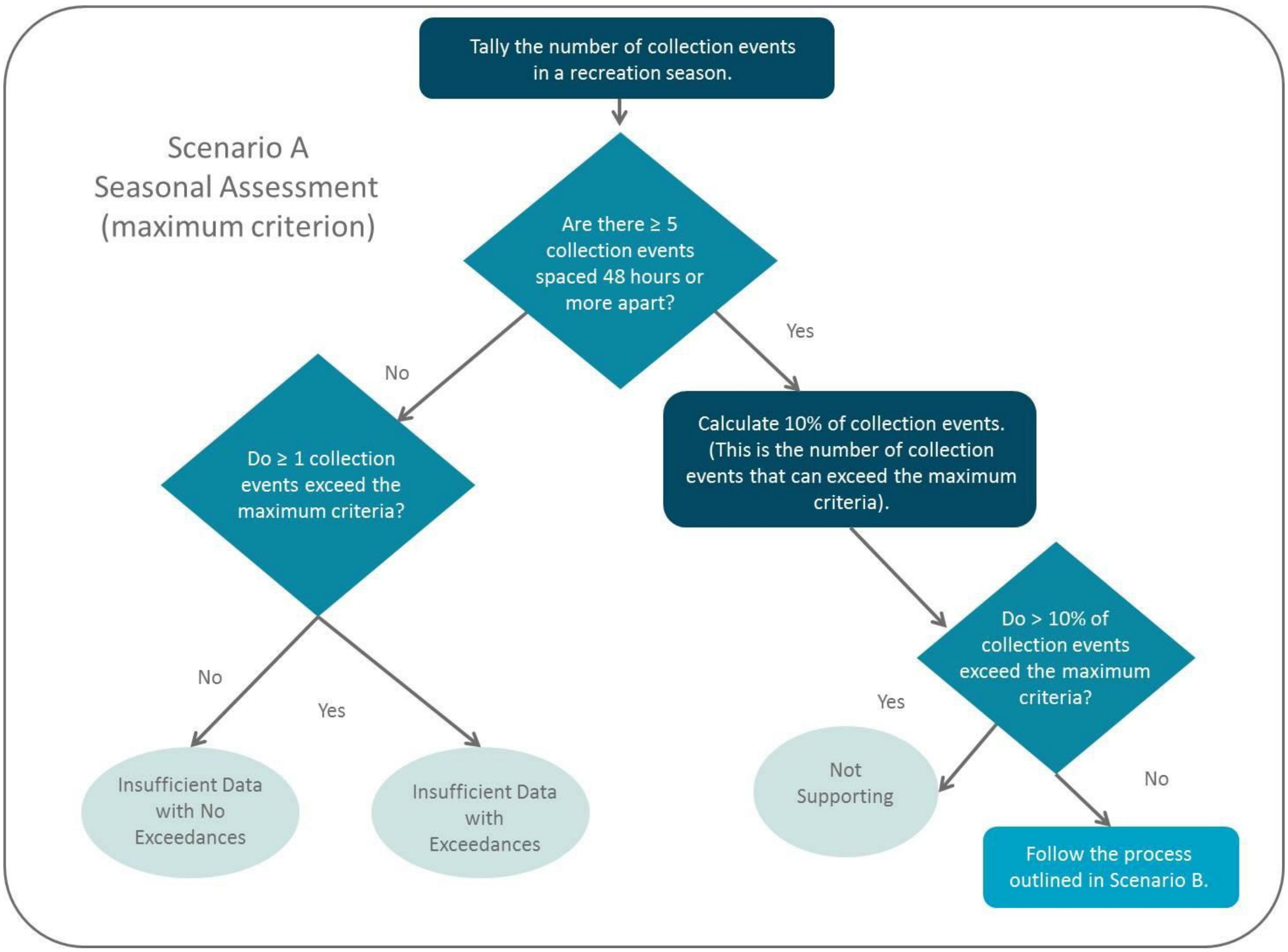

Figure 22. Scenario A: a seasonal assessment using the maximum criterion at a monitoring location.

Scenario B

If less than 10% of the collection events exceed the maximum criterion, the site is then assessed using the 30-day geometric mean criterion (see Figure 23). 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.

Step 1: Determine if there are ≥5 collection events within a 30-day period.

- Count the number of collection events collected between each sample date (day 1) and the sample date plus 29 days (day 30).

Step 2: Determine if the collection events are representative (must have ≥5 collection events within a 30-day period).

- Count the number of collection events collected between each sample day (day 0) and the sample date plus 2 days (day 3).
- If there are two collection events within this period, only one sample will be considered representative.

Step 3: Calculate the 30-day geometric mean.

- If there are ≥5 representative samples in a 30-day period, then all collection events will be used to calculate the 30-day geometric mean.
- If ≥1 30-day geometric mean exceeds the 30-day criteria, the site is not supporting beneficial uses. If there are not representative data for Scenario B, or if the 30-day geometric mean did not exceed the 30-day criteria, the site is assessed using Scenario C.

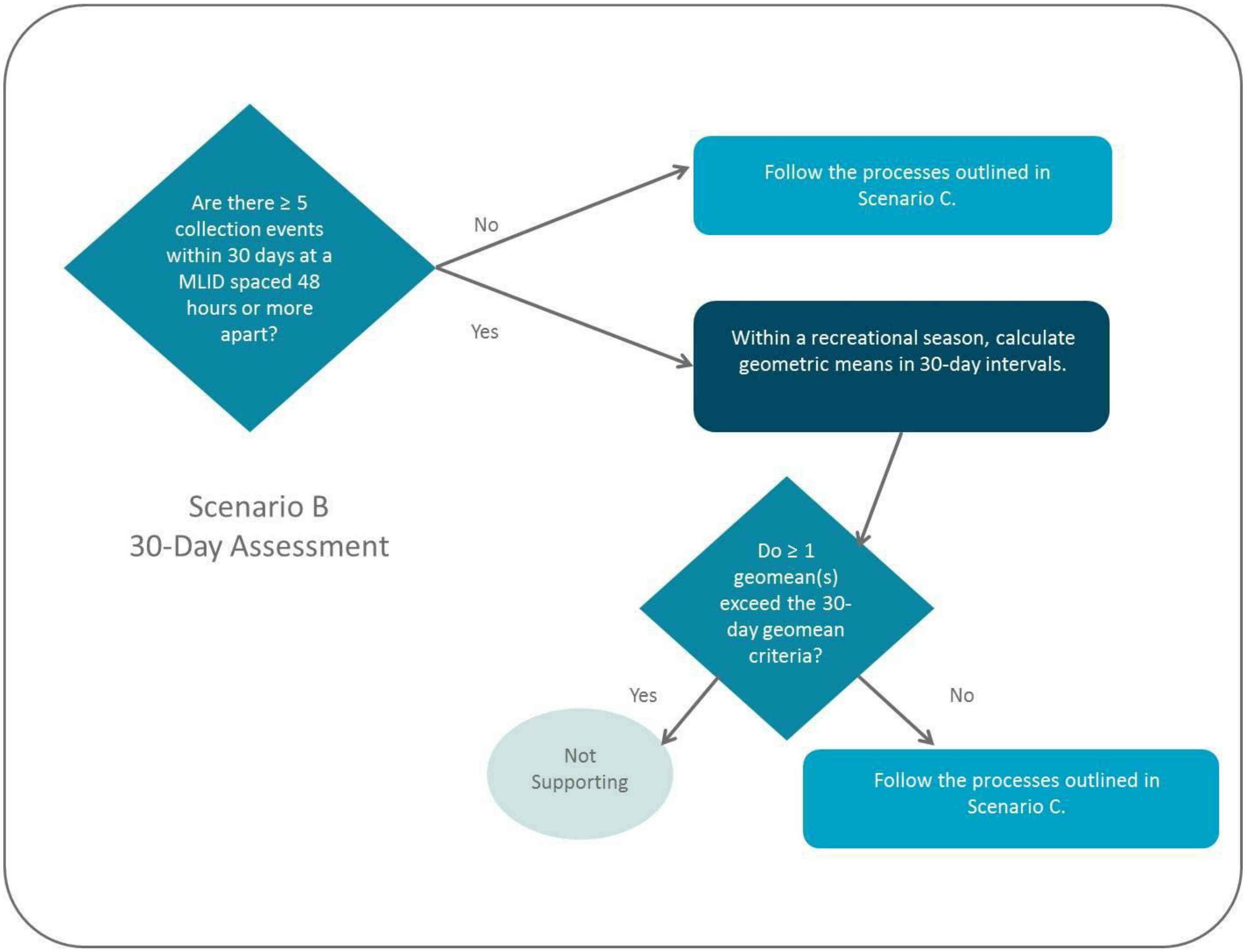

Figure 23. Scenario B: an assessment using the 30-day geometric mean for monitoring locations with five or more collection events within 30 days.

Scenario C

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 five collection events during the defined recreational season. 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 fewer than 10) (see Figure 24).

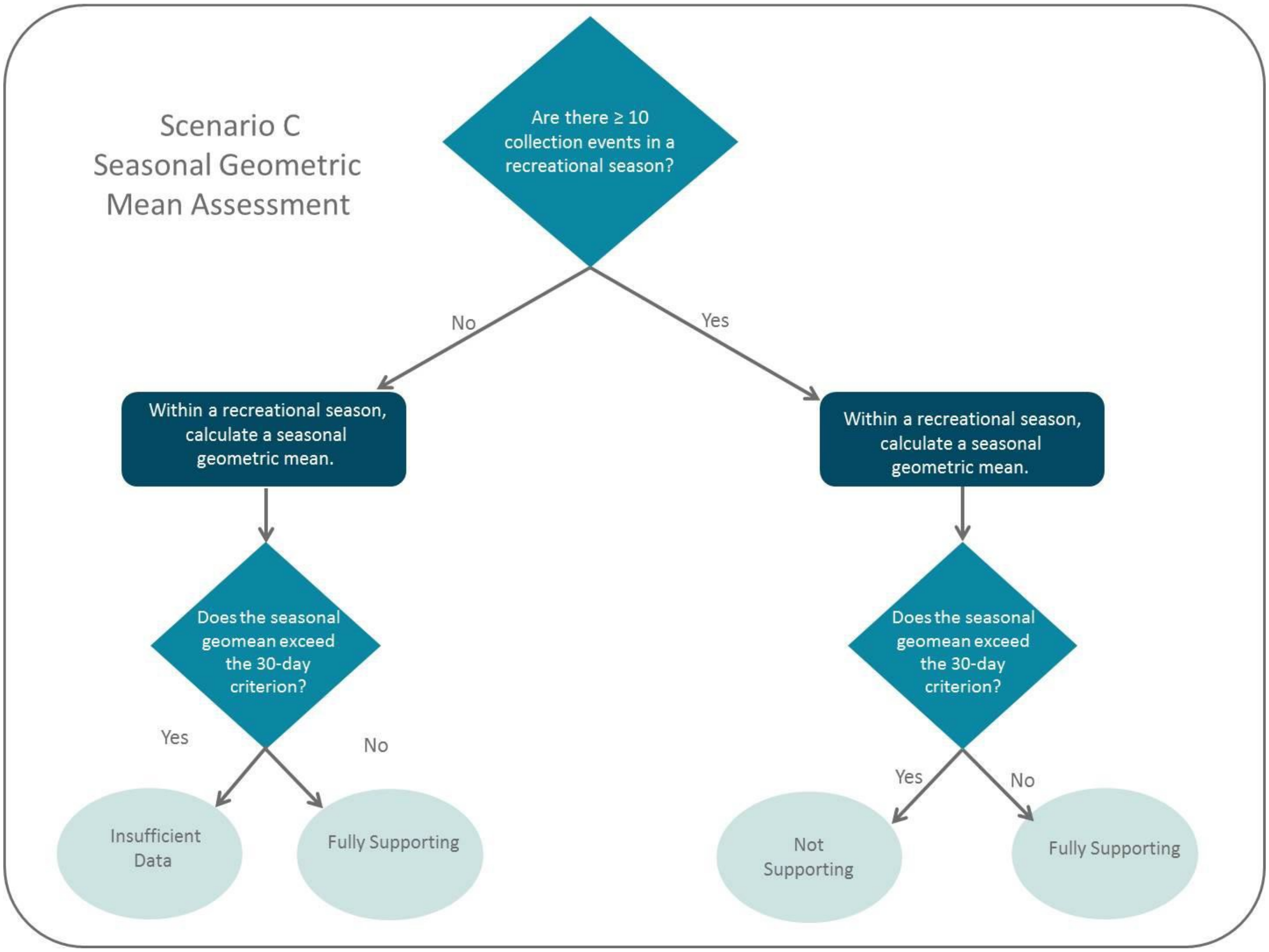

Figure 24. Scenario C: A seasonal geometric mean assessment.

Summarizing Assessment Results

When determining the attainment of a monitoring location with assessment results across multiple years, the following rules are applied (in the following order):

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, reservoir, or pond has two or more posted health advisories or beach closures during any recreation season.
- Any monitoring location where E. coli concentrations from 10% 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 geomean exceeds the 30-day geometric mean criterion (minimum of 10 collection events).

Insufficient Data or Information Assessment Considerations (Category 3, with exceedances)

- Sites with four or fewer samples in all seasons evaluated will be listed as insufficient data, provided impairment is not suggested by a posted health advisories or beach closures.

Combinations of Category 3 (with no exceedances), 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's process for merging assessment results from multiple locations within an AU is discussed in more detail in Determinations of Impairment: All Assessment Units).

Supporting (Category 1 or 2)

- No evidence of impairment by any assessment approach for all recreation seasons over period of records. A fully supporting determination can be made with a minimum of five collection events during the recreational season.

Combining E. coli with Other Parameter Assessment Results

Until the determination of impairment and the review of additional supporting information are completed by reviewers, parameter assessments at an individual monitoring location and results from multiple monitoring locations within the same AU are not summarized and combined (see Determination of Impairment for more details).

Pollutions Indicator Assessments for All Waters

Several parameters and beneficial uses in UAC R317-2 are identified as pollution indicators and have footnotes indicating that further investigations should be conducted to develop more information when levels are exceeded. To capture this footnote in the assessment process, DWQ reviews preliminary pollution indicator assessments during the Secondary Review process to determine whether or not pollution indicators demonstrate clear and convincing evidence of supporting or not supporting the beneficial uses assigned to the waterbody in UAC R317-2. Secondary reviews incorporate pollution indicator data into assessment category determinations, relying on multiple lines of evidence including pollution indicator thresholds, the presence or absence of other indicator-associated water quality issues, potential pollutant sources, and other site or watershed specific knowledge to determine whether listing or delisting on a pollution indicator parameter is appropriate or whether to prioritize waterbodies for additional monitoring.

Narrative Standards for All Waters

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 the following:

It shall be unlawful, and a violation of these rules, for any 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, Harmful Algal Blooms (HABs), 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 Escherichia Coli Assessment for All Waters section. DWQ will also apply a cyanobacterial cell count threshold for determining impairments due to harmful algal blooms.

DRINKING WATER CLOSURES

If the Utah 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 the Utah Division of Wildlife Resources 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.

HARMFUL ALGAL BLOOMS (HAB)

In fresh waters, HABs are typically composed of cyanobacteria; a phylum of photosynthetic bacteria sometimes called blue-green algae. Exposure to cyanobacteria or cyanotoxins through skin contact, inhalation, or ingestion can have negative impacts on the health of people and animals. Epidemiological studies have linked cyanobacteria exposure to negative health impacts in humans including respiratory inflammation, gastrointestinal distress, vomiting, headaches and ear aches, and skin irritations (e.g. Pilotto et al., 1997, Stewart et al., 2006, Levesque et al. 2014, Lin et al., 2016). In addition, some species of cyanobacteria such as *Dolichospermum sp., Aphanizomenon sp., Nodularia sp., Microcystis sp., and Planktothrix sp.*, can produce cyanotoxins that can produce liver, kidney, or neurological damage in humans and animals.

The goal of DWQ's HAB assessment method is to identify waterbodies that experience HAB events that impair class 2 recreational uses. Potential impacts of HABs on aquatic life uses are currently addressed through eutrophication-related aspects of general lakes, reservoirs, ponds, flowing surface waters or the State, and canal assessment methods (e.g. dissolved oxygen, pH, and lake Tier II assessments). However, HAB specific assessment methods may consider direct impacts on aquatic life (e.g., toxic effects of cyanobacteria or cyanotoxins on wildlife) in the future as more information becomes available.

Though the Narrative Standard speaks to a broad range of undesirable conditions, the potential for negative human or animal health effects and the formation of algal scums are the primary considerations in DWQ's HAB assessment methods.

DWQ's HAB assessment methods rely on three independent indicators to determine beneficial use support: cyanobacteria cell counts, cyanotoxin concentrations, and waterbody access or use limitations. In some circumstances, additional supporting indicators such as chlorophyll a concentrations or reports of human or animal health effects may also be considered in determining beneficial use support or impairment. For example, longer-term chlorophyll a concentration data in a waterbody can help estimate the frequency and potential of HAB occurrences in a waterbody which allows an assessment to differentiate an anomalous HAB in an otherwise low productivity waterbody from high productivity waterbodies where HABs are likely to occur more frequently.

DWQ's HAB assessment methods apply to waterbodies with frequent primary contact recreational uses, including those currently designated with 2A uses and those where existing frequent primary contact recreational uses have been documented. Waterbodies currently designated with a class 2B use where existing frequent primary contact usage has been documented will be considered for a classification change to 2A. DWQ is currently evaluating the applicability of existing HAB assessment benchmarks for infrequent primary contact recreational uses.

DWQ collects samples during HAB events for use in recreational use assessments using DWQ's HAB Standard Operating Procedures (SOP, DWQ 2016). These samples are most representative of recreational uses and potential recreational exposure to HABs. Samples collected outside the HAB SOP can be used to identify impairment of recreational uses in some cases, but because they may not adequately represent recreational uses, are not used to determine full support. Multiple exposure pathways to cyanobacteria and cyanotoxins exist through recreational activities such as swimming, wading, boating, or water-skiing. DWQ's assessment methods rely on EPA's draft recommended criteria for microcystin and cylindrospermopsin (EPA 2016) and guidelines recommended by Utah Department of Health for anatoxin-a (UDOH 2016, Table 15). These thresholds are subject to revision following finalization of EPA's draft criteria or continued development by DWQ and other agencies. Thresholds for additional cyanotoxins may continue to be added to the assessment methods as they become available.

Table 15. Cyanotoxin thresholds used for recreational use assessments.

Recreational Cyanotoxin Guidelines (µg/L)		Source
Microcystin	4	EPA 2016
Cylindrospermopsin	8	EPA 2016
Anatoxin-a	20	UDOH 2016

Beneficial Use Supported

The beneficial use is fully supported if, over the period of record:

- Cyanobacteria cell counts have not exceeded 20,000 cells/mL, AND
- Cyanotoxin concentrations have not been identified above recreational use thresholds (Table 15), AND
- A warning, danger, or closure has not been issued for recreational access to a waterbody.

Beneficial Use Not Supported

The beneficial use is not supported if, in representative samples for recreational uses, in two or more years in the period of record:

- The cyanobacteria cell count exceeded 100,000 cells/mL in two or more weeks (i.e. in samples collected 7 or more days apart), OR

- Cyanotoxin concentrations above recreational guidelines (Table 15) have been reported for two or more weeks (i.e. in samples collected 7 or more days apart), OR
- A warning, danger, or closure has been issued for recreational access to a waterbody for two or more weeks.

Insufficient Data and Information with Exceedances (IR Category 3)

The waterbody will be categorized 3 if:

- For less than two weeks, or only in one year: the cyanobacteria cell count exceeded 20,000 cells/mL, cyanotoxin concentrations exceeded recreational use thresholds (Table 15), or a warning, danger, or closure has been issued for recreational use for less than 2 weeks. These waterbodies will be prioritized for further sampling and evaluation.

FISH TISSUE ASSESSMENTS AND CONSUMPTION HEALTH ADVISORIES

DWQ has collected fish tissue samples for mercury analysis in waterbodies throughout the state since 2000. Since that time, consumption advisories have been issued for 24 waterbodies.

DWQ currently uses the EPA-published ambient water quality criterion for methylmercury for the protection of people who eat fish and shellfish. This criterion is 0.3 milligram (mg) methylmercury per kilogram (kg) fish tissue wet weight. If all fish (small and large) of the same species at a monitoring location have a mean mercury concentration of > 0.3 mg/kg, additional statistical tests are used to determine if a consumption advisory is necessary. If the mean is < 0.3 mg/kg, no advisory is issued. In several instances, size class advisories have been issued when it is apparent that only the larger size class exceeds the safe consumption criterion.

For locations with a mean mercury concentration of > 0.3 mg/kg, the p-value is considered. The p-value refers to the probability of obtaining a result equal to or greater than those that were measured at that location. DWQ uses a p-value of 0.05 to be 95% certain an advisory is not unnecessarily issued. Therefore, if a species has a mean of > 0.3 mg/kg and a p-value < 0.05, then a consumption advisory is issued. If a species has a mean of > 0.3 mg/kg but a p-value of > 0.05, then an advisory is not issued. The consumption advisories are based on long-term consumption; therefore, the mean is the most appropriate and commonly used parameter to estimate exposure.

In an effort to control for false negatives, DWQ calculates 95% confidence limits of the mean mercury concentration. If the upper confidence limit is above 0.3 mg/kg, that site is targeted for additional sampling.

When an advisory is warranted, DWQ sends the data to the Utah Department of Health toxicologist who uses the mean mercury concentration to calculate the actual consumption recommendations. Those calculations are based on the following:

- Average Adult Weight: 70 kg (154 pounds) | Average Adult Meal Size: 227 grams (8 ounces)/meal
- Average Child Weight: 16 kg (35 pounds) | Average Child Meal Size: 113 grams (4 ounces)/meal

Consumption amounts are calculated for three target populations: Pregnant Women and Children < 6, Women of Child Bearing Age and Children 6–16, and Adult Women Past Child Bearing Age and Men >16.

Mercury Assessment Process

The current approach for making assessments of aquatic life use support for mercury is different than the consumption advisory process. The assessment is based on the U.S. Food and Drug Administration recommended 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/l in previous studies by EPA

(EPA, 1985). Utah's water quality standard for mercury is 0.012 µg/l as a 4-day average. Therefore, the corresponding fish tissue concentration of 1.0 mg/kg is used for assessment.

Beneficial Use Supported (Category 1)

- No fish consumption advisories for mercury are in place.
- Mean fish tissue mercury concentration for all individuals of the same species at a location is less than 0.3 mg/kg and p-value is < 0.5.

Insufficient Data with Exceedances (Category 3)

- Fish consumption advisories for mercury are in place, but the mean fish tissue mercury concentration for all individuals of the same species at a location is less than or equal to 1.0 mg/kg.

Beneficial Use Not Supported (Category 5)

- Fish consumption advisory for mercury is in place.
- Mean fish tissue mercury concentration is greater than 1.0 mg/kg.

For additional information and the most up-to-date list of consumption advisories, please visit fishadvisories.utah.gov.

Determinations of Impairment: All Assessment Units

Following the initial assessment of credible data against the numeric criteria in UAC R317-2, each use and parameter within a waterbody is assigned a provisional EPA-derived assessment category. To verify the use and parameter-specific assessment results and consolidate the often multiple parameter assessments into one result per waterbody, DWQ must consider the quantity of data and the extent to which such data demonstrate 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.
- Independent applicability.
- Multiple lines of evidence and several levels of secondary reviews.

INDIVIDUAL ASSESSMENT OF WATER QUALITY STANDARDS

In determining whether or not a waterbody is supporting or not supporting the beneficial uses assigned in UAC R317-2, DWQ first considers the individual use and parameter-specific assessment results from the monitoring location level data. Each use and parameter assessed for the waterbody is assigned a provisional EPA-derived assessment category. 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.

Following the review of the individual water quality standard assessments for a beneficial use, DWQ looks across the multiple parameter-specific assessment results that exist for a location and consolidates the results into a preliminary assessment at the individual site level. That is, DWQ assigns one EPA-derived assessment decision category as defined in Table 1 to each monitoring location.

CONFLICTING ASSESSMENTS OF WATER QUALITY STANDARDS

To address the possibility of conflicting results among different types of data (e.g., biological versus conventionals, toxics versus E.coli) at the site- and AU-level, DWQ applies the policy of independent applicability and goes through a series of considerations to determine if the discrepancies are because of:

- differences in data quality, or
- 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 use attainability analysis.

Figure 25 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 that resulted in accepting one dataset and the resulting assessment result, sites with conflicting assessment results may be listed as Category 3 (insufficient data and information) to better understand the seemingly conflicting lines of evidence. Specific assumptions regarding model applicability applied during the biological assessment process are discussed in the Biological Assessment section. Similarly, if the application of water effects ratio, justifiable site-specific criteria change, or change in beneficial uses based on a use attainability analysis cannot rectify the difference in the assessment results, then a Category 3 may be warranted. All evaluations of conflicting assessment decisions will be made in consultation with EPA on a case-by-case basis.

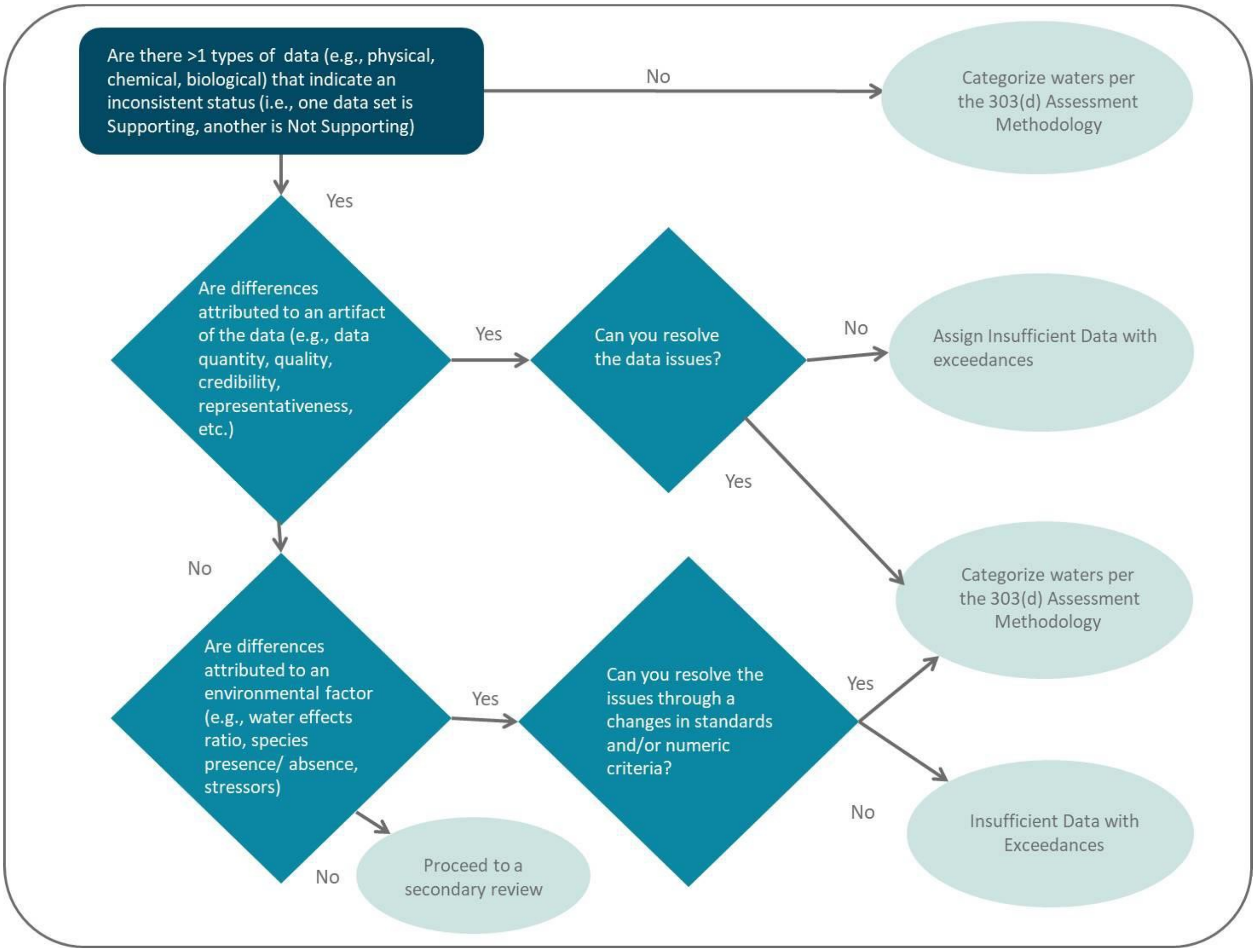

Figure 25. Overview of independent applicability process. Note: These judgment decisions are based in part on EPA's Consolidated Assessment and Listing Methods guidance published in 2002.

AGGREGATION OF SITE-SPECIFIC ASSESSMENTS TO ASSESSMENT UNIT CATEGORIES

For reporting purposes, DWQ aggregates all site-specific water quality assessments within an AU to a single assessment category for that AU as described in Table 1. A flow chart describing this process is presented in Figure 26 (see Appendix 4 for additional detail).

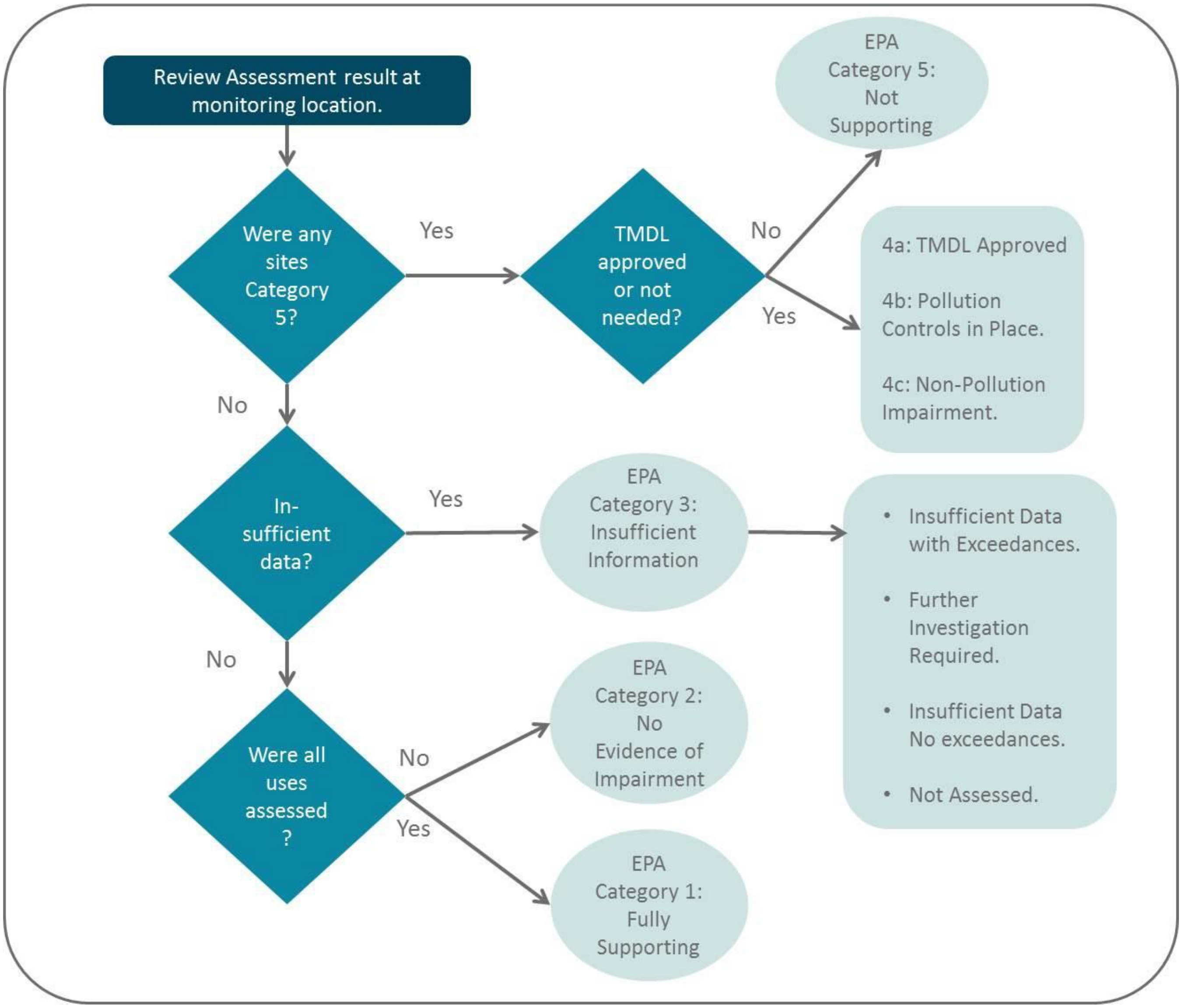

Figure 26. Process of assigning EPA categories to AUs based on results of monitoring location assessments.

SECONDARY REVIEW

Following the consolidation of all of the individual assessment results and the assignment of preliminary assessment category(s) for an AU, DWQ conducts a secondary review of listing determinations. The secondary review process allows the application of site/waterbody specific knowledge and additional data quality controls to evaluate the extent to which data used in the preliminary assessment demonstrates clear and convincing evidence of supporting or not supporting the beneficial uses assigned to the waterbody in UAC R317-2. In addition to the internal secondary review process, DWQ recognizes that input from reviewers during public comment periods may also provide key information regarding the data used in listing decisions. To ensure consistency in its use among different professionals, the secondary process will be applied in a select number of scenarios using a standard set of guidelines as outlined in Appendix 3.

If as a result of the secondary review, documentation can be provided of evidence sufficient in strength to modify the basis and result of the preliminary assessment, the preliminary assessment decision based on the data assessment procedures outlined in this document will be overwritten. For example, preliminary listings for Category 5 or Category 1 and Category 2 waters could be re-assigned as Category 3, insufficient data and information.

Where 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.

For tracking and transparency to the public, DWQ will document the original category assignment and a justification for the secondary review.

Assessment Unit Re-segmentation

In cases where site-specific assessments within a single AU conflict, DWQ may determine that it is appropriate to re-segment (i.e. ‐split‖) an existing AU polygon into two or more new AUs rather than aggregate those conflicting assessments into a single AU scale category. In particular, AUs where water quality criterion exceedances are clearly isolated to a relatively small, hydrologically distinct portion of the larger AU may be re-segmented to more accurately reflect that variation in water quality. For example, a large AU with an impairment isolated to a single tributary may be re-segmented into two AUs: one for the impaired tributary and another for the rest of the existing AU. Assessment categories for both AUs are then determined following standard aggregation (Figure 22 and the delisting procedures discussed in the Delistings section. This results in a higher resolution and overall more accurate assessment. DWQ does not consider it appropriate to re-segment an AU when exceedances are observed in multiple locations throughout an AU or where impaired sites are not hydrologically distinct from unimpaired portions of the AU.

If after aggregating all of the assessments into one EPA-derived assessment category for an AU, DWQ determines 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 analysis will be categorized as follows:

- **Whole AU is Not Supporting (Category 5)**: If data from multiple sites or tributaries within an AU indicate multiple (or a combination of) not supports (Category 5) and insufficient data with exceedances (Category 3), DWQ will recommend that the AU not be re-segmented and the entire AU be listed as not supporting.
- **Only Not Supporting Tributaries are listed as Not Supporting (Category 5)**: If data from one or more tributaries indicate a combination of any of the following, DWQ may recommend the AU be re-segmented into two AUs and that only the tributaries with data indicating impairment are listed as not supporting.
- **Insufficient Data with Exceedances (Category 3)**
- **No Evidence of Impairments (Category 2)**
- **Supporting (Category 1)**
- **Needs Further Investigations (Category 3)**
- **Insufficient Data with No Exceedances (Category 3)**
- **Not Assessed (Category 3)**

The rest of the AU will be assigned a category following procedures as outlined in Figure 26.

Identifying Causes of Impairments

Once an AU is assigned an EPA-derived assessment category that is representative of conditions with the AU, DWQ will determine if the impairment or impairments are driven by pollutants, pollution, unknown, or natural causes (see Table 1). DWQ will identify causes of impairment defined by a pollutant that has specific numeric water quality criteria identified in UAC R317-2. Pollution is a generalized term for causes of water quality impairment that can include multiple pollutants and other factors such as the absence or lack of water, riparian vegetation, and other modifications that affect a waterbody‘s ability to support aquatic habitat and other designated uses. 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 the section below.

POLLUTANTS

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

… 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. (UAC R317-2)

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 DO, temperature, pH, and biological scores, the cause will be assigned as the parameter that was assessed until such time as a TMDL or pollution prevention plan identifies an alternative 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 (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 in section 303(d) Vision and TMDL Priority Development and on DWQ‘s website.

POLLUTION

Where DWQ can identify that an impairment was not driven by a pollutant, DWQ may 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 with 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 in section Category 4C.

UNKNOWN SOURCES

For the purpose of the IR, sources of pollution contributing to an impairment will be reported in the 303(d) list to EPA as ―unknown‖ until such time as a TMDL or special study identifies the sources and any additional causes 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) is currently included in the IR's TMDL-approved (Category 4A), pollution control (Category 4B), non-pollutant impairment (Category 4C), or delisting 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 that is provided to the public for review and comment, submitted to the Utah Water Quality Board for approval, provided to the Legislative Natural Resources, Agriculture, and Environment Interim Committee for review if implementation costs exceed $10 million or the full State Legislature for approval if implementation costs exceed $100 million, and ultimately to EPA for their approval. Information on DWQ's process for developing and implementing a TMDL can be found on DWQ's Watershed Management Program 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**:
  a. The only impairments within the waterbody or segment within the waterbody are included in the approved TMDL.
  b. There are additional impairments within the waterbody or segments within the waterbody that are addressed in a Category 4B demonstration plan (described in section Category 4B and Appendix 5) 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.
  c. 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:**
  d. 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 in Appendix 5 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:**

  a. 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:**

  b. The only impairments within the waterbody or segment within the waterbody are included in the approved Category 4B demonstration plan.
  c. 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:**

  d. 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 (or impairments) is 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 and 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:**

  a. 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:**

    b. 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:**

    c. 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:**

    d. 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.
    e. 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 will not require the future development of a TMDL.

DELISTINGS

The fourth and final alternative DWQ has at its disposal 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:**

    a. Because of the implementation of nonpoint source projects and/or revised effluent limits, the waterbody has improved such that post-implementation data indicate 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:**

    b. 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 Methods:**

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

- **Reassessment (new data and information):**

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

- **Geo-location Information Error:**

e. Inappropriate listing of a water that is located within Indian lands as defined in 18 United States Code 1151.

- **Analysis Errors:**

f. Flaws in the original analysis of data and information that led to the waterbody-pollutant combination being incorrectly listed. Such flaws may include the following: (1) Calculation errors in the data assessment methods outlined in the 303(d) Assessment Methods from that Assessment cycle, (2) errors produced when reviewing credible and representative data information, (3) mapping errors generated during the validation of monitoring location information and assigning AU designations, (4) discrepancies between the beneficial use assignments in UAC R317-2 and the IR geo-location information files for internal and external data, (5), wrong identification and assessment of a waterbody type, and (6) application of the wrong numeric criteria to a beneficial use.

- **New Modeling:**

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

- **Effluent Limitations:**

h. 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:**

i. There is other relevant information that supports the decision not to include the segment on the Section 303(d) List.

In order to first justify a delisting of an AU for a given parameter based on new data, the dataset must be of sufficient quantity and quality to make an assessment. 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 3).
- 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 3).
- 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 3).
- 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 3).

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 3).
- 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 3).
- 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 3).
- 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 3).

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

- 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 were collected between when the AU and/or parameter were first listed and the period of record considered in the current assessment cycle.

As part of the demonstration of good cause process, DWQ will review the data from all assessed sample locations (as defined in Table 4) in the three above scenarios to confirm whether or not there were exceedances at the sample sites. Where exceedances occur, DWQ must demonstrate that the exceedances no longer exist, no longer are of concern, or that water quality has improved. If a sample site had exceedances (and newer data do not exist), DWQ will provide documentation and a justification as to why the site was not re-sampled and/or whether water quality conditions have improved. If documentation cannot be provided, the AU and parameter will not be delisted, and the previous categorical assignment will carry forward.

Delisting Categorical Pollutant Causes

In the case of TMDLs or special studies which identify parameters contributing to a cause of impairment, but are not the original cause for listing on the 303(d) list, there may be good cause justification for delisting the categorical cause if the original impaired parameter is no longer impaired and a linkage of the additional causes can be documented in a TMDL or other study. For instance, in some circumstances DWQ has identified phosphorus as a contributing cause of impairment to an existing dissolved oxygen listing and subsequently made a categorical listing for phosphorus as a cause on subsequent 303(d) lists. Since DWQ does not have assessment methods for phosphorus, a delisting based on process outlined here is not feasible. Therefore, if the assessment results for the original DO listing can justify a delisting, any additional parameters associated with that cause may also be delisted with proper documentation of a direct linkage.

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. For EPA review and approval, DWQ applies several delisting codes (also included in Appendix 6).

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 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 Government Records Access and Management Act (GRAMA) requirements.

PREVIOUS CATEGORICAL LISTINGS

303(d) Listings

Without 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 delisting (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 (or uses) that is failing to meet water quality standards, providing the priority of developing a TMDL, and indicating the assessment 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 delisting (demonstration of good cause), DWQ will do so as outlined by the policies and procedure described throughout 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 . This includes carrying forward the following:

- Previous TMDL-approved (Category 4A), pollution control (Category 4B), and non-pollutant impairment (Category 4C) categorizations that do not demonstrate good cause.
- Previous categorizations that have insufficient data with exceedances (Category 3), require further investigations (Category 3), have insufficient data with no exceedances (Category 3), are not assessed (Category 3), show no evidence of impairment (Category 2), or are supporting (Category 1).
- Historical Category 3 waters that had insufficient data with exceedances will remain in that category unless there is new data for assessment.

Waterbodies or segments within a waterbody that are supporting or show no evidence of impairment (Categories 1 and 2, respectively) may carry forward for six consecutive assessment (or two 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. Data older than the period of record may not be reflective of current conditions, 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 with no exceedances (Category 3).

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 CWA Section 303(d) 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 collaborative framework for implementing the CWA 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 anti-degradation program, nonpoint source implementation program, and 401 water quality certification program). In response to the release of this document, DWQ engaged with stakeholders and developed 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 status and development of TMDLs.

Please refer to Appendix 7 for how DWQ prioritized the future developments of TMDLs on DWQ's 303(d) List.

Revision Requests between Cycles

Barring unforeseen circumstances, DWQ will only propose to revise the IR and 303(d) List 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) List, whether it is an addition or deletion to the final 303(d) List. However, such revisions may only be considered if failing to either add a segment to the list or delete a segment from the list before 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.

Chapter 2: Assessments Specific to Lakes, Reservoirs, and Ponds

UTAH DEPARTMENT of ENVIRONMENTAL QUALITY

Draft Combined 2018/2020 Integrated Report: Lakes, Reservoirs, and Ponds 305(b) and 303(d)

Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Bear River	UT-L-16010101-001_00	Woodruff Reservoir	Woodruff Reservoir	2	No Evidence of Impairment					92
Bear River	UT-L-16010101-002_00	Birch Creek	Birch Creek	2	No Evidence of Impairment					62
Bear River	UT-L-16010101-007_00	Little Creek Reservoir	Little Creek Reservoir	2	No Evidence of Impairment					67
Bear River	UT-L-16010101-030_00	Whitney Reservoir	Whitney Reservoir	3	Insufficient Data					129
Bear River	UT-L-16010201-003_00	Bear Lake	Bear Lake	1	Fully Supporting					35,414
Bear River	UT-L-16010202-002_00	Cutler Reservoir	Cutler Reservoir	4	Approved TMDL	Lakes tier II	3B	Low	2004	1,356
						Minimum Dissolved Oxygen	3B	Low	2004	1,356
						Total Phosphorus as P	3B	Low	2004	1,356
Bear River	UT-L-16010202-013_00	Newton Reservoir	Newton Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2006	172
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	172
						Total Phosphorus as P	3A	Low	1998	172
Bear River	UT-L-16010203-005_00	Hyrum Reservoir	Hyrum Reservoir	5	Not Supporting	Max. Temperature	3A	Low	1994	446
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	446
						Total Phosphorus as P	3A	Low	1998	446
Bear River	UT-L-16010203-009_00	Porcupine Reservoir	Porcupine Reservoir	2	No Evidence of Impairment					180
Bear River	UT-L-16010203-012_00	Tony Grove Lake	Tony Grove Lake	5	Not Supporting	Max. Temperature	3A	Low	2006	25
						Minimum Dissolved Oxygen	3A	Low	1996	25
						pH	3A	Low	2004	25
Bear River	UT-L-16010204-033_00	Mantua Reservoir	Mantua Reservoir	5	Not Supporting	Harmful algal blooms	2B	Low	2020	514
						Max. Temperature	3A	Low	2008	514
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	514
						pH	3A	Low	1998	514
						Total Phosphorus as P	3A	Low	1998	514

* Impairment confirmed by water quality samples and advisories.

Draft Combined 2018/2020 Integrated Report: Lakes, Reservoirs, and Ponds 305(b) and 303(d)

Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Cedar/Beaver	UT-L-16030006-002_00	Upper Enterprise Reservoir	Upper Enterprise Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2012	353
						Minimum Dissolved Oxygen	3A	Low	2014	353
						pH	3A	Low	2016	353
Cedar/Beaver	UT-L-16030006-008_00	Newcastle Reservoir	Newcastle Reservoir	5	Not Supporting	Fish Tissue (Mercury)	3A	Low	2010	159
						Max. Temperature	3A	Low	2012	159
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1996	159
						Total Phosphorus as P	3A	Low	1996	159
Cedar/Beaver	UT-L-16030006-017_00	Yankee Meadow Reservoir	Yankee Meadow Reservoir	2	No Evidence of Impairment					56
Cedar/Beaver	UT-L-16030006-019_00	Red Creek Reservoir (Iron Co)	Red Creek Reservoir (Iron Co)	5	Not Supporting	Total Phosphorus as P	3A	Low	2006	59
Cedar/Beaver	UT-L-16030007-011_00	Minersville Reservoir	Minersville Reservoir	5	Not Supporting	Max. Temperature	3A	Low	1994	1,071
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	1,071
						pH	3A	Low	2014	1,071
						Total Phosphorus as P	3A	Low	1998	1,071
Cedar/Beaver	UT-L-16030007-020_00	Kents Lake	Kents Lake	4	Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	39
						Total Phosphorus as P	3A	Low	1998	39
Cedar/Beaver	UT-L-16030007-024_00	Reservoir	Reservoir	2	No Evidence of Impairment					8
Cedar/Beaver	UT-L-16030007-025_00	Three Creeks Reservoir	Three Creeks Reservoir	5	Not Supporting	pH	3A	Low	2006	55
Cedar/Beaver	UT-L-16030007-027_00	LaBaron Lake	LaBaron Lake	4	Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	22
						Total Phosphorus as P	3A	Low	2014	22
Cedar/Beaver	UT-L-16030007-028_00	Puffer Lake	Puffer Lake	4	Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	58
						pH	3A	Low	2014	58

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Colorado River Southeast	UT-L-14030004-001_00	Dark Canyon Lake	Dark Canyon Lake	2	No Evidence of Impairment					5
Colorado River Southeast	UT-L-14030005-004_00	Kens Lake	Kens Lake	3	Insufficient Data					78
Colorado River Southeast	UT-L-14070006-001_00	Lake Powell	Lake Powell	5	Not Supporting	pH	3B	Low	2016	150,143
Colorado River Southeast	UT-L-14080201-002_00	Blanding City Reservoir	Blanding City Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2012	92
						Minimum Dissolved Oxygen	3A	Low	2020	92
Colorado River Southeast	UT-L-14080201-007_00	Recapture Reservoir	Recapture Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2020	221
						Minimum Dissolved Oxygen	3A	Low	2020	221
Colorado River Southeast	UT-L-14080203-002_00	Monticello Lake	Monticello Lake	5	Not Supporting	Max. Temperature	3A	Low	2020	5
						Minimum Dissolved Oxygen	3A	Low	2016	5
						pH	3A	Low	2006	5
Colorado River Southeast	UT-L-14080203-009_00	Lloyds Reservoir	Lloyds Reservoir	2	No Evidence of Impairment					90

* Impairment confirmed by water quality samples and advisories.

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Colorado River West	UT-L-14060007-001_00	Fairview Lakes	Fairview Lakes	2	No Evidence of Impairment					104
Colorado River West	UT-L-14060007-004_00	Lower Gooseberry Reservoir	Lower Gooseberry Reservoir	5	Not Supporting	Total Phosphorus as P	3A	Low	2010	64
Colorado River West	UT-L-14060007-005_00	Scofield Reservoir	Scofield Reservoir	5	Not Supporting	Harmful algal blooms	2B	Low	2020	2,670
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	2,670
						pH	3A	Low	2014	2,670
						Total Phosphorus as P	3A	Low	1998	2,670
Colorado River West	UT-L-14060009-001_00	Ferron Reservoir	Ferron Reservoir	2	No Evidence of Impairment					54
Colorado River West	UT-L-14060009-004_00	Duck Fork Reservoir	Duck Fork Reservoir	2	No Evidence of Impairment					42
Colorado River West	UT-L-14060009-017_00	Joes Valley Reservoir	Joes Valley Reservoir	3	Insufficient Data					1,052
Colorado River West	UT-L-14060009-018_00	Huntington Reservoir	Huntington Reservoir	2	No Evidence of Impairment					163
Colorado River West	UT-L-14060009-023_00	Miller Flat Reservoir	Miller Flat Reservoir	2	No Evidence of Impairment					161
Colorado River West	UT-L-14060009-024_00	Cleveland Reservoir	Cleveland Reservoir	2	No Evidence of Impairment					147
Colorado River West	UT-L-14060009-025_00	Electric Lake	Electric Lake	2	No Evidence of Impairment					451
Colorado River West	UT-L-14060009-026_00	Millsite Reservoir	Millsite Reservoir	3	Insufficient Data					367
Colorado River West	UT-L-14060009-034_00	Huntington Lake North	Huntington Lake North	2	No Evidence of Impairment					235
Colorado River West	UT-L-14070003-006_00	Fish Lake	Fish Lake	2	No Evidence of Impairment					2,586
Colorado River West	UT-L-14070003-010_00	Johnson Valley Reservoir	Johnson Valley Reservoir	4	Approved TMDL	Total Phosphorus as P	3A	Low	1998	672
Colorado River West	UT-L-14070003-015_00	Mill Meadow Reservoir	Mill Meadow Reservoir	4	Approved TMDL	Total Phosphorus as P	3A	Low	1998	160
Colorado River West	UT-L-14070003-018_00	Cook Lake	Cook Lake	2	No Evidence of Impairment					10
Colorado River West	UT-L-14070003-019_00	Forsyth Reservoir	Forsyth Reservoir	4	Approved TMDL	Total Phosphorus as P	3A	Low	1998	165
Colorado River West	UT-L-14070003-027_00	Donkey Reservoir	Donkey Reservoir	5	Not Supporting	pH	3A	Low	2020	24
Colorado River West	UT-L-14070003-044_00	Lower Bowns Reservoir	Lower Bowns Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2012	108
						Minimum Dissolved Oxygen	3A	Low	2010	108
						pH	3A	Low	2006	108
						Total Ammonia as N	3A	Low	2020	108
						Total Phosphorus as P	3A	Low	2012	108
Colorado River West	UT-L-14070005-008_00	Posy Lake	Posy Lake	2	No Evidence of Impairment					12
Colorado River West	UT-L-14070005-011_00	Wide Hollow Reservoir	Wide Hollow Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2008	156
						Minimum Dissolved Oxygen	3A	Low	2010	156
						pH	3A	Low	2008	156

* Impairment confirmed by water quality samples and advisories.

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Great Salt Lake only	UT-L-16020310-001_00	Gilbert Bay	Gilbert Bay	2	No Evidence of Impairment					559,422
Great Salt Lake only	UT-L-16020310-002_00	Gunnison Bay	Gunnison Bay	3	Insufficient Data					386,813
Great Salt Lake only	UT-L-16020310-003_00	Bear River Bay	Bear River Bay	3	Insufficient Data					67,287
Great Salt Lake only	UT-L-16020310-004_00	Farmington Bay	Farmington Bay		Insufficient Data					77,243

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Jordan River	UT-L-16020204-024_00	Lake Mary	Lake Mary	2	No Evidence of Impairment					19
Jordan River	UT-L-16020204-026_00	Little Dell Reservoir	Little Dell Reservoir	2	No Evidence of Impairment					221

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Lower Colorado River	UT-L-15010008-001_00	Gunlock Reservoir	Gunlock Reservoir	4	Approved TMDL	Total Phosphorus as P	3B	Low	1998	221
Lower Colorado River	UT-L-15010008-008_00	Baker Dam Reservoir	Baker Dam Reservoir	5	Not Supporting	Max. Temperature	3A	Low	1992	44
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	44
						Total Phosphorus as P	3A	Low	2002	44
Lower Colorado River	UT-L-15010008-018_00	Kolob Reservoir	Kolob Reservoir	2	No Evidence of Impairment					238
Lower Colorado River	UT-L-15010008-024_00	Quail Creek Reservoir	Quail Creek Reservoir	3	Insufficient Data					588
Lower Colorado River	UT-L-15010008-025_00	Sand Hollow Reservoir	Sand Hollow Reservoir	1	Fully Supporting					1,260

* Impairment confirmed by water quality samples and advisories.

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Sevier River	UT-L-16030001-001_00	Navajo Lake	Navajo Lake	5	Not Supporting	pH	3A	Low	2016	631
Sevier River	UT-L-16030001-006_00	Panguitch Lake	Panguitch Lake	5	Not Supporting	pH	3A	Low	2020	1,182
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	2000	1,182
						Total Phosphorus as P	3A	Low	2000	1,182
Sevier River	UT-L-16030001-011_00	Piute Reservoir	Piute Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2008	2,152
						Total Phosphorus as P	3A	Low	2006	2,152
Sevier River	UT-L-16030002-002_00	Tropic Reservoir	Tropic Reservoir	2	No Evidence of Impairment					182
Sevier River	UT-L-16030002-004_00	Otter Creek Reservoir	Otter Creek Reservoir	5	Not Supporting	Max. Temperature	3A	Low	1994	2,495
						pH	3A	Low	2006	2,495
					Approved TMDL	Total Phosphorus as P	3A	Low	1998	2,495
Sevier River	UT-L-16030002-005_00	Lower Box Creek Reservoir	Lower Box Creek Reservoir	5	Not Supporting	pH	3A	Low	2010	22
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	2004	22
						Total Phosphorus as P	3A	Low	1998	22
Sevier River	UT-L-16030002-007_00	Pine Lake	Pine Lake	5	Not Supporting	pH	3A	Low	2016	85
Sevier River	UT-L-16030002-011_00	Koosharem Reservoir	Koosharem Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2020	341
						Minimum Dissolved Oxygen	3A	Low	2020	341
						pH	3A	Low	2020	341
					Approved TMDL	Total Phosphorus as P	3A	Low	1998	341
Sevier River	UT-L-16030003-005_00	Barney Lake	Barney Lake	3	Insufficient Data					21
Sevier River	UT-L-16030003-006_00	Manning Meadow Reservoir	Manning Meadow Reservoir	5	Not Supporting	pH	3A	Low	2016	85
						Total Phosphorus as P	3A	Low	1994	85
Sevier River	UT-L-16030003-007_00	Sevier Bridge Reservoir (Yuba Lake)	Sevier Bridge Reservoir (Yuba Lake)	3	Insufficient Data					8,992
Sevier River	UT-L-16030003-012_00	Redmond Lake	Redmond Lake	2	No Evidence of Impairment					240
Sevier River	UT-L-16030003-016_00	Rex Reservoir	Rex Reservoir	2	No Evidence of Impairment					35
Sevier River	UT-L-16030004-001_00	Ninemile Reservoir	Ninemile Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2008	185
						Minimum Dissolved Oxygen	3A	Low	1998	185
						pH	3A	Low	2008	185
						Total Phosphorus as P	3A	Low	1996	185
Sevier River	UT-L-16030004-002_00	Gunnison Reservoir	Gunnison Reservoir	2	No Evidence of Impairment					1,258
Sevier River	UT-L-16030004-005_00	Palisade Lake	Palisade Lake	5	Not Supporting	Max. Temperature	3A	Low	1992	80
Sevier River	UT-L-16030005-021_00	Gunnison Bend Reservoir	Gunnison Bend Reservoir	2	No Evidence of Impairment					497
Sevier River	UT-L-16030005-026_00	D.M.A.D. Reservoir	D.M.A.D. Reservoir	2	No Evidence of Impairment					773

* Impairment confirmed by water quality samples and advisories.

Draft Combined 2018/2020 Integrated Report: Lakes, Reservoirs, and Ponds 305(b) and 303(d)

Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Uinta Basin	UT-L-14040106-001_00	Hoop Lake	Hoop Lake	3	Insufficient Data					171
Uinta Basin	UT-L-14040106-002_00	Spirit Lake	Spirit Lake	3	Insufficient Data					42
Uinta Basin	UT-L-14040106-016_00	Sheep Creek Lake	Sheep Creek Lake	2	No Evidence of Impairment					81
Uinta Basin	UT-L-14040106-019_00	Browne Lake	Browne Lake	5	Not Supporting	pH	3A	Low	2020	48
Uinta Basin	UT-L-14040106-021_00	Flaming Gorge Reservoir	Flaming Gorge Reservoir	5	Not Supporting	pH	3A	Low	2020	12,525
Uinta Basin	UT-L-14040106-026_00	Crouse Reservoir	Crouse Reservoir	2	No Evidence of Impairment					111
Uinta Basin	UT-L-14040106-031_00	Beaver Meadow Reservoir	Beaver Meadow Reservoir	3	Insufficient Data					106
Uinta Basin	UT-L-14040106-032_00	Long Park Reservoir	Long Park Reservoir	3	Insufficient Data					301
Uinta Basin	UT-L-14040106-033_00	Matt Warner Reservoir	Matt Warner Reservoir	5	Not Supporting	Harmful algal blooms	2B	Low	2020	364
						Lakes tier II	3A	Low	2020	364
						Max. Temperature	3A	Low	1996	364
						pH	3A	Low	2020	364
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	364
						Total Phosphorus as P	3A	Low	1998	364
Uinta Basin	UT-L-14040106-034_00	Calder Reservoir	Calder Reservoir	5	Not Supporting	Lakes tier II	3A	Low	2016	94
						Max. Temperature	3A	Low	2010	94
						pH	3A	Low	2016	94
						Total Ammonia as N	3A	Low	2020	94
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	94
						Total Phosphorus as P	3A	Low	1998	94
Uinta Basin	UT-L-14040107-001_00	Meeks Cabin Reservoir	Meeks Cabin Reservoir	2	No Evidence of Impairment					17
Uinta Basin	UT-L-14040107-003_00	Marsh Lake	Marsh Lake	2	No Evidence of Impairment					42
Uinta Basin	UT-L-14040107-004_00	Bridger Lake	Bridger Lake	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	1996	19
						pH	3A	Low	2016	19
Uinta Basin	UT-L-14040107-005_00	Lyman Lake	Lyman Lake	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	1996	35
Uinta Basin	UT-L-14040107-006_00	China Lake	China Lake	5	Not Supporting	Max. Temperature	3A	Low	2000	27
						Minimum Dissolved Oxygen	3A	Low	1996	27
Uinta Basin	UT-L-14040107-007_00	Stateline Reservoir	Stateline Reservoir	2	No Evidence of Impairment					274
Uinta Basin	UT-L-14060003-002_00	Scout Lake	Scout Lake	3	Insufficient Data					19
Uinta Basin	UT-L-14060003-003_00	Pyramid Lake	Pyramid Lake	3	Insufficient Data					15
Uinta Basin	UT-L-14060003-006_00	Mirror Lake	Mirror Lake	3	Insufficient Data					53
Uinta Basin	UT-L-14060003-011_00	Marshall Lake	Marshall Lake	3	Insufficient Data					19
Uinta Basin	UT-L-14060003-012_00	Hoover Lake	Hoover Lake	3	Insufficient Data					19
Uinta Basin	UT-L-14060003-112_00	Moon Lake	Moon Lake	3	Insufficient Data					786
Uinta Basin	UT-L-14060003-230_00	Big Sand Wash Reservoir	Big Sand Wash Reservoir	3	Insufficient Data					394
Uinta Basin	UT-L-14060003-293_00	Butterfly Lake	Butterfly Lake	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2020	5
						pH	3A	Low	2016	5
Uinta Basin	UT-L-14060003-296_00	Upper Stillwater Reservoir	Upper Stillwater Reservoir	2	No Evidence of Impairment					301
Uinta Basin	UT-L-14060003-297_00	Paradise Park Reservoir	Paradise Park Reservoir	5	Not Supporting	pH	3A	Low	2020	147
Uinta Basin	UT-L-14060004-001_00	Strawberry Reservoir	Strawberry Reservoir	5	Not Supporting	pH	3A	Low	2020	15,614
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	15,614
						Total Phosphorus as P	3A	Low	1998	15,614
Uinta Basin	UT-L-14060004-003_00	Red Creek Reservoir	Red Creek Reservoir	2	No Evidence of Impairment					147
Uinta Basin	UT-L-14060004-004_00	Lake Canyon Lake	Lake Canyon Lake	5	Not Supporting	Arsenic	1C	Low	2016	29
						Boron	4	Low	2016	29
						pH	3A	Low	2016	29
						Total Dissolved Solids	4	Low	2016	29
Uinta Basin	UT-L-14060004-006_00	Starvation Reservoir	Starvation Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2020	3,343
						Minimum Dissolved Oxygen	3A	Low	2020	3,343

* Impairment confirmed by water quality samples and advisories.

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Draft Combined 2018/2020 Integrated Report: Lakes, Reservoirs, and Ponds 305(b) and 303(d)

Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Uinta Basin	UT-L-14060004-007_00	Currant Creek Reservoir	Currant Creek Reservoir	2	No Evidence of Impairment					274
Uinta Basin	UT-L-14060010-001_00	Pelican Lake	Pelican Lake	5	Not Supporting	pH	3B	Low	2004	1,114
						Total Phosphorus as P	3B	Low	2012	1,114

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Draft Combined 2018/2020 Integrated Report: Lakes, Reservoirs, and Ponds 305(b) and 303(d)

Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Uinta Basin	UT-L-14060010-002_00	Brough Reservoir	Brough Reservoir	5	Not Supporting	Fish Tissue (Mercury)	3A	Low	2020	136
						Max. Temperature	3A	Low	2008	136
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	136
Uinta Basin	UT-L-14060010-003_00	Ashley Twin Lakes	Ashley Twin Lakes	2	No Evidence of Impairment					32
Uinta Basin	UT-L-14060010-005_00	Oaks Park Reservoir	Oaks Park Reservoir	3	Insufficient Data					338
Uinta Basin	UT-L-14060010-006_00	Steinaker Reservoir	Steinaker Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2008	745
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	745
Uinta Basin	UT-L-14060010-007_00	East Park Reservoir	East Park Reservoir	3	Insufficient Data					179
Uinta Basin	UT-L-14060010-008_00	Red Fleet Reservoir	Red Fleet Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2010	478
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	478
Uinta Basin	UT-L-14060010-009_00	Stewart Lake	Stewart Lake	5	Not Supporting	Selenium	3B	Low	2016	158

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Utah Lake	UT-L-16020201-001_00	Mona Reservoir	Mona Reservoir	3	Insufficient Data					1,562
Utah Lake	UT-L-16020201-004_01	Utah Lake other than Provo Bay	Utah Lake other than Provo Bay	5	Not Supporting	Harmful algal blooms	2A	Low	2016	87,984
						Lakes tier II	3B	Low	2020	87,984
						PCB in Fish Tissue	3B	Low	2010	87,984
						Total Dissolved Solids	4	Low	2006	87,984
						Total Phosphorus as P	3B	Low	1994	87,984
Utah Lake	UT-L-16020201-004_02	Provo Bay portion of Utah Lake	Provo Bay portion of Utah Lake	5	Not Supporting	Harmful algal blooms	2A	Low	2020	3,611
						Lakes tier II	3B	Low	2020	3,611
						PCB in Fish Tissue	3B	Low	2010	3,611
						pH	3B	Low	2016	3,611
						Total Ammonia as N	3B	Low	2016	3,611
						Total Phosphorus as P	3B	Low	1994	3,611
Utah Lake	UT-L-16020201-005_00	Tibble Fork Reservoir	Tibble Fork Reservoir	3	Insufficient Data					11
Utah Lake	UT-L-16020201-006_00	Silver Lake Flat Reservoir	Silver Lake Flat Reservoir	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2020	33
Utah Lake	UT-L-16020202-001_00	Salem Lake	Salem Lake	5	Not Supporting	E. coli*	2A	Low	2016	19
						Health Advisory (E. coli)	2A	Low	2020	19
Utah Lake	UT-L-16020202-002_00	Big East Lake	Big East Lake	5	Not Supporting	Max. Temperature	3A	Low	2012	26
						Minimum Dissolved Oxygen	3A	Low	1996	26
						pH	3A	Low	2020	26
						Total Phosphorus as P	3A	Low	2012	26
Utah Lake	UT-L-16020203-001_00	Deer Creek Reservoir	Deer Creek Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2006	2,562
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	2,562
Utah Lake	UT-L-16020203-002_00	Trial Lake	Trial Lake	5	Not Supporting	pH	3A	Low	2020	62
Utah Lake	UT-L-16020203-003_00	Jordanelle Reservoir	Jordanelle Reservoir	5	Not Supporting	pH	3A	Low	2016	2,989
Utah Lake	UT-L-16020203-004_00	Mill Hollow Reservoir	Mill Hollow Reservoir	5	Not Supporting	pH	3A	Low	1992	18
						Total Phosphorus as P	3A	Low	1992	18
Utah Lake	UT-L-16020203-005_00	Washington Lake	Washington Lake	3	Insufficient Data					107
Utah Lake	UT-L-16020203-006_00	Wall Lake	Wall Lake	3	Insufficient Data					72

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Draft Combined 2018/2020 Integrated Report: Lakes, Reservoirs, and Ponds 305(b) and 303(d)

Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
Weber River	UT-L-16020101-001_00	Echo Reservoir	Echo Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2012	1,337
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1996	1,337
						Total Phosphorus as P	3A	Low	1994	1,337
Weber River	UT-L-16020101-002_00	Rockport Reservoir	Rockport Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2012	1,060
						pH	3A	Low	2020	1,060
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	2006	1,060
Weber River	UT-L-16020101-003_00	Lost Creek Reservoir	Lost Creek Reservoir	2	No Evidence of Impairment					370
Weber River	UT-L-16020101-005_00	Reservoir	Reservoir	2	No Evidence of Impairment					207
Weber River	UT-L-16020102-004_00	Willard Bay Reservoir	Willard Bay Reservoir	1	Fully Supporting					10,109
Weber River	UT-L-16020102-014_00	Pineview Reservoir	Pineview Reservoir	5	Not Supporting	Max. Temperature	3A	Low	1994	3,010
					Approved TMDL	Minimum Dissolved Oxygen	3A	Low	1998	3,010
						Total Phosphorus as P	3A	Low	1998	3,010
Weber River	UT-L-16020102-020_00	East Canyon Reservoir	East Canyon Reservoir	4	Approved TMDL	Total Phosphorus as P	3A	Low	1988	640
Weber River	UT-L-16020102-021_00	Causey Reservoir	Causey Reservoir	2	No Evidence of Impairment					127

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Draft Combined 2018/2020 Integrated Report: Lakes, Reservoirs, and Ponds 305(b) and 303(d)

Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Lake, Reservoir, and Pond Acres
West Desert / Columbia	UT-L-16020304-002_00	Rush Lake	Rush Lake	2	No Evidence of Impairment					242
West Desert / Columbia	UT-L-16020304-003_00	Stansbury Lake	Stansbury Lake	5	Not Supporting	Total Dissolved Solids	4	Low	2016	91
West Desert / Columbia	UT-L-16020304-004_00	Settlement Canyon Reservoir	Settlement Canyon Reservoir	5	Not Supporting	pH	3A	Low	2020	26
West Desert / Columbia	UT-L-16020304-005_00	Grantsville Reservoir	Grantsville Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2020	95
						Minimum Dissolved Oxygen	3A	Low	2020	95

* Impairment confirmed by water quality samples and advisories.

Draft Combined 2018/2020 Integrated Report: Resegmented Assessment Units for Lakes, Reservoirs, and Ponds				
Watershed Management Unit	**Original Assessment Unit ID**	**New Assessment Unit ID**	**New Assessment Unit Name**	**New Assessment Unit Description**
There are no proposed assessment unit (AU) splits for the Draft Combined 2018/2020 IR. Proposed splits for lake, reservoir, and pond AUs will be considered in future IRs.				

UTAH DEPARTMENT of ENVIRONMENTAL QUALITY

Draft Combined 2018/2020 Integrated Report: Delistings for Lakes, Reservoirs, and Ponds							
Watershed Management Unit	**Assessment Unit ID**	**Assessment Unit Name**	**Assessment Unit Description**	**Assessed Parameter**	**Cycle Delisted**	**EPA Justification**	**DWQ Delisting Comment**
Bear River	UT-L-16010203-009_00	Porcupine Reservoir	Porcupine Reservoir	Max. Temperature	2018/2020	Attaining WQS with new data	New data
Colorado River West	UT-L-14070003-015_00	Mill Meadow Reservoir	Mill Meadow Reservoir	pH	2018/2020	Attaining WQS with new data	New data
Colorado River West	UT-L-14070003-019_00	Forsyth Reservoir	Forsyth Reservoir	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data	New data
Lower Colorado River	UT-L-15010008-001_00	Gunlock Reservoir	Gunlock Reservoir	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data	New data
Sevier River	UT-L-16030001-001_00	Navajo Lake	Navajo Lake	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data	New data
Uinta Basin	UT-L-14060003-230_00	Big Sand Wash Reservoir	Big Sand Wash Reservoir	Max. Temperature	2018/2020	Attaining WQS with new data	New data
Uinta Basin	UT-L-14060003-230_00	Big Sand Wash Reservoir	Big Sand Wash Reservoir	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data	New data
Weber River	UT-L-16020102-020_00	East Canyon Reservoir	East Canyon Reservoir	Max. Temperature	2018/2020	Attaining WQS with new data	New data
Weber River	UT-L-16020102-020_00	East Canyon Reservoir	East Canyon Reservoir	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data	New data

Chapter 3: Assessments Specific to Flowing Surface Waters of the State and Canals

UTAH DEPARTMENT *of* ENVIRONMENTAL QUALITY

Draft Combined 2018/2020 Integrated Report: Flowing Surface Waters of the State and Canals 305(b) and 303(d)

Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Flowing Surface Waters of the State and Canal Miles
Bear River	UT16010101-001_00	Bear River West	Bear River west side tributaries from Sixmile Creek north	5	Not Supporting	Max. Temperature	3A	Low	2020	17
						E. coli	2B	Low	2020	17
Bear River	UT16010101-002_00	Six Mile Creek - Bear	Sixmile Creek from reservoir to headwaters	5	Not Supporting	E. coli	2B	Low	2016	26
						Minimum Dissolved Oxygen	3A	Low	2020	26
						Max. Temperature	3A	Low	2020	26
Bear River	UT16010101-003_00	Little Creek - Bear	Little Creek and tributaries from confluence with Bear River to headwaters	2	No Evidence of Impairment					30
Bear River	UT16010101-004_00	Sage Creek	Sage Creek and tributaries from confluence with Bear River to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2010	33
						E. coli	2B	Low	2014	33
						Minimum Dissolved Oxygen	3A	Low	2020	33
						Macroinvertebrates	3A	Low	2020	33
Bear River	UT16010101-005_00	Otter Creek	Otter Creek and tributaries from Bear River to headwaters	3	Insufficient Data					54
Bear River	UT16010101-006_00	Bear River-4	Bear River from Woodruff Creek north to Sage Creek Junction	5	Not Supporting	Max.Temperature	3A	Low	2014	19
					Approved TMDL	Total Phosphorus as P	3A		2000	19
						Minimum Dissolved Oxygen	3A		2020	19
Bear River	UT16010101-007_00	Big Creek	Big Creek and tributaries from Bear River to headwaters	5	Not Supporting	pH	3A	Low	2006	62
						E. coli	2B	Low	2014	62
Bear River	UT16010101-008_00	North Woodruff	Bear River west side tributaries between Woodruff and Big Creek	2	No Evidence of Impairment					43
Bear River	UT16010101-009_00	Bear River-5	Bear River from Woodruff Creek upstream to Utah-Wyoming border	5	Not Supporting	Max. Temperature	3A	Low	2020	4
Bear River	UT16010101-010_00	Birch Creek - Bear	Birch Creek and tributaries from confluence with Woodruff Creek to headwaters	3	Insufficient Data					24
Bear River	UT16010101-011_00	Woodruff Creek-1	Woodruff Creek from mouth to Birch Creek confluence	2	No Evidence of Impairment					22
Bear River	UT16010101-012_00	Unnamed Creek	Unnamed tributary to Saleratus Creek	3	Insufficient Data					4
Bear River	UT16010101-013_00	Woodruff Creek-4	Woodruff Creek and tributaries from Woodruff Creek Reservoir to headwaters	3	Insufficient Data					46
Bear River	UT16010101-014_00	Woodruff Creek-3	Woodruff Creek Reservoir tributaries excluding Woodruff Creek	3	Insufficient Data					0
Bear River	UT16010101-015_00	Woodruff Creek-2	Woodruff Creek and tributaries from Birch Creek confluence to Woodruff Creek Reservoir	2	No Evidence of Impairment					7
Bear River	UT16010101-016_00	Saleratus Creek	Saleratus Creek and tributaries from confluence with Woodruff Creek to headwaters	5	Not Supporting	Max.Temperature	3A	Low	2012	71
					Approved TMDL	Minimum Dissolved Oxygen	3A		1998	71
Bear River	UT16010101-017_00	Dry Creek	Dry Creek and tributaries from confluence with Saleratus Creek to headwaters	3	Insufficient Data					40
Bear River	UT16010101-018_00	Sutton Creek	Sutton Creek and tributaries from Utah-Wyoming border to headwaters	3	Insufficient Data					68
Bear River	UT16010101-019_01	Yellow Creek Tributaries-1	Yellow Creek tributaries (e.g. Thief, Chicken, Spring Creeks) above Barker Reservoir and Yellow Creek below Barker Reservoir	2	No Evidence of Impairment					35

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Flowing Surface Waters of the State and Canal Miles
Bear River	UT16010101-019_02	Yellow Creek Tributaries-2	Yellow Creek tributaries (e.g. Thief, Chicken, Spring Creeks) above Barker Reservoir and Yellow Creek below Barker Reservoir	2	No Evidence of Impairment					0
Bear River	UT16010101-021_00	Bear River-6	Bear River and tributaries from Utah-Wyoming border to Hayden Fork - Stillwater Fork confluence	5	Not Supporting	Aluminum	3A	Low	2020	36
Bear River	UT16010101-022_00	Mill Creek	Mill Creek and tributaries from Utah-Wyoming border to headwaters	1	Fully Supporting					94
Bear River	UT16010101-023_00	West Fork Bear River	West Fork Bear River and tributaries from confluence with Bear River to headwaters	3	Insufficient Data					78
Bear River	UT16010101-024_00	Hayden Fork	Hayden Fork and tributaries from confluence with Stillwater Creek to headwaters	3	Insufficient Data					19
Bear River	UT16010101-025_00	Stillwater Fork	Stillwater Fork and tributaries from confluence with Hayden Fork to headwaters	5	Not Supporting	pH	2B;3A;4	Low	2020	37
Bear River	UT16010101-026_00	East Fork Bear River	East Fork Bear River and tributaries from confluence with Hayden Fork to headwaters	1	Fully Supporting					66
Bear River	UT16010101-027_00	Bear River East	Bear River east side tributaries from Woodruff to near Sage Creek Junction	2	No Evidence of Impairment					65
Bear River	UT16010101-028_00	Yellow Creek	Yellow Creek and tributaries from Utah-Wyoming border to headwaters	5	Not Supporting	Macroinvertebrates	3A	Low	2008	26
Bear River	UT16010102-001_00	Bear River North	Bear River tributaries in HUC 16010102	3	Insufficient Data					2
Bear River	UT16010201-001_00	Bear Lake West	Bear Lake west side tributaries	5	Not Supporting	Macroinvertebrates	3A	Low	2016	22
Bear River	UT16010201-002_00	Laketown	Laketown and Big Creek and other tributaries from Bear Lake to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2008	46
						Macroinvertebrates	3A	Low	2020	46
Bear River	UT16010201-003_00	South Eden	South Eden Creek from Bear Lake to headwaters	2	No Evidence of Impairment					15
Bear River	UT16010201-004_00	North Eden	North Eden Creek and tributaries from Bear Lake to headwaters	5	Not Supporting	E. coli	2B	Low	2020	21
Bear River	UT16010202-001_00	Worm Creek	Worm Creek from confluence with Cub River to Utah-Idaho state line	2	No Evidence of Impairment					4
Bear River	UT16010202-002_00	Newton Creek	Newton Creek from confluence with Cutler Reservoir to Newton Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2008	12
					Approved TMDL	Total Phosphorus as P	3A		1996	12
Bear River	UT16010202-003_00	Hopkins Slough	Hopkins Slough from confluence with Bear River to headwaters	3	Insufficient Data					40
Bear River	UT16010202-004_00	Bear River-3	Bear River from Cutler Reservoir to Idaho state line	5	Not Supporting	Sediment	3B;3D	Low	1998	25
						E. coli	2B	Low	2020	25
					Approved TMDL	Total Phosphorus as P	3B;3D		1998	25
Bear River	UT16010202-005_00	Summit Creek Lower	Summit Creek and tributaries from confluence with Bear River to USFS boundary	3	Insufficient Data					19
Bear River	UT16010202-006_00	City Creek	City Creek and tributaries and other Bear River east side tributaries south toward Summit Creek to headwaters	3	Insufficient Data					25
Bear River	UT16010202-007_00	Cherry Creek - Bear	Cherry Creek and tributaries from confluence with Cub River to headwaters	3	Insufficient Data					30

UTAH DEPARTMENT of ENVIRONMENTAL QUALITY

Draft Combined 2018/2020 Integrated Report: Flowing Surface Waters of the State and Canals 305(b) and 303(d)

Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Flowing Surface Waters of the State and Canal Miles
Bear River	UT16010202-008_00	High Creek Lower	High Creek and tributaries from confluence with Cub River to USFS boundary	4A	Approved TMDL	Total Phosphorus as P	3A		1998	10
Bear River	UT16010202-009_00	Spring Creek Lewiston	Spring Creek (Lewiston) and tributaries from confluence with Cub River to Utah-Idaho border	4A	Approved TMDL	Total Phosphorus as P	3B		1998	5
						Minimum Dissolved Oxygen	3B		2020	5
Bear River	UT16010202-010_00	Cub River	Cub River from confluence with Bear River to Utah-Idaho state line	5	Not Supporting	Sediment	3B	Low	1998	15
						E. coli	2B	Low	2020	15
					Approved TMDL	Total Phosphorus as P	3B		1998	15
Bear River	UT16010202-011_00	Summit Creek Upper	Summit Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					13
Bear River	UT16010202-012_00	High Creek Upper	High Creek and tributaries from U.S. Forest Service boundary to headwaters	3	Insufficient Data					14
Bear River	UT16010202-013_00	Clarkston Creek	Clarkston Creek and tributaries from Newton Reservoir to Utah-Idaho State Line	3	Insufficient Data					30
Bear River	UT16010202-014_00	The Slough	The Slough and tributaries from Cutler Reservoir to headwaters	2	No Evidence of Impairment					10
Bear River	UT16010202-015_00	Clay Slough	Clay Slough and tributaries from Cutler Reservoir to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2012	41
						pH	2B;3B;3D;4	Low	2012	41
						Minimum Dissolved Oxygen	3B;3D	Low	2012	41
Bear River	UT16010203-001_00	Cutler West	Cutler Reservoir west side tributaries	3	Insufficient Data					20
Bear River	UT16010203-002_00	Swift Slough	Swift Slough and tributaries from Cutler Reservoir to headwaters	2	No Evidence of Impairment					48
Bear River	UT16010203-005_00	Logan River-1	Logan River and tributaries, except Blacksmith Fork drainage, from Cutler Reservoir to Third Dam	5	Not Supporting	E. coli	2B	Low	2020	69
					Approved TMDL	Total Phosphorus as P	3A		1998	69
Bear River	UT16010203-006_00	Logan River-2	Logan River and tributaries from Third Dam to headwaters	5	Not Supporting	pH	2B;3A;3D;4	Low	2020	102
Bear River	UT16010203-007_00	Little Bear-3	Little Bear River west side tributaries from Cutler Reservoir To Hyrum Reservoir	3	Insufficient Data					35
Bear River	UT16010203-008_00	Spring Creek-Hyrum	Spring Creek and tributaries from confluence with Little Bear River to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2006	51
						Macroinvertebrates	3A	Low	2008	51
						Total Dissolved Solids	4	Low	2020	51
					Approved TMDL	Total Ammonia as N	3A;3D		1998	51
						E. coli	2B		2020	51
Bear River	UT16010203-009_00	Little Bear River-1	Little Bear River from Cutler Reservoir to Hyrum Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2008	28
Bear River	UT16010203-010_00	Little Bear-4	Little Bear River east side tributaries from Hyrum Reservoir to East Fork Little Bear confluence	3	Insufficient Data					30
Bear River	UT16010203-011_00	Little Bear River-2	Little Bear River from Hyrum Reservoir to East Fork Little Bear confluence	1	Fully Supporting					12
Bear River	UT16010203-012_00	Little Bear River Tributaries	West side tributaries to Little Bear River above Hyrum Reservoir	2	No Evidence of Impairment					7
Bear River	UT16010203-013_00	South Fork Little Bear	South Fork Little Bear and tributaries from confluence with Little Bear River to headwaters, except Davenport Creek	3	Insufficient Data					36

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Bear River	UT16010203-014_00	East Fork Little Bear-1	East Fork Little Bear River and tributaries from confluence with Little Bear to Porcupine Reservoir	1	Fully Supporting					32
Bear River	UT16010203-015_00	Davenport Creek	Davenport Creek and tributaries from confluence with South Fork Little Bear to headwaters	3	Insufficient Data					46
Bear River	UT16010203-016_00	Porcupine Creek	Porcupine Creek and tributaries from Porcupine Reservoir to headwaters	2	No Evidence of Impairment					6
Bear River	UT16010203-017_00	East Fork Little Bear-2	East Fork Little Bear River and tributaries from Porcupine Reservoir to headwaters	2	No Evidence of Impairment					41
Bear River	UT16010203-018_00	Blacksmith Fork-2	Blacksmith Fork and tributaries from confluence with Left Hand Fork Blacksmith Fork to headwaters	2	No Evidence of Impairment					70
Bear River	UT16010203-019_00	Left Hand Fork Blacksmith Fork	Left Hand Fork Blacksmiths Fork and tributaries from confluence with Blacksmiths Fork to headwaters	3	Insufficient Data					43
Bear River	UT16010203-020_00	Blacksmith Fork-1	Blacksmiths Fork and tributaries from confluence with Logan River to Left Hand Fork Blacksmiths Fork	5	Not Supporting	E. coli	2B	Low	2016	47
Bear River	UT16010204-001_00	Box Elder Creek-1	Box Elder Creek from the confluence with Black Slough to Brigham City Reservoir (the Mayor's Pond)	5	Not Supporting	E. coli	2B	Low	2020	6
Bear River	UT16010204-002_00	Bear River Lower-East	Bear River east side tributaries from Malad confluence south	5	Not Supporting	Total Dissolved Solids	4	Low	2012	94
Bear River	UT16010204-003_00	Bear River-1	Bear River from Great Salt Lake to Malad River confluence	5	Not Supporting	Total Dissolved Solids Macroinvertebrates	4 3B	Low Low	2008 2010	5 5
Bear River	UT16010204-004_00	Bear River Lower-West	Bear River west side tributaries from Malad River confluence south	3	Insufficient Data					19
Bear River	UT16010204-005_00	Box Elder Creek-2	Box Elder Creek from Brigham City Reservoir (the Mayor's Pond) to headwaters	3	Insufficient Data					18

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Bear River	UT16010204-006_00	Malad River-1	Malad River from confluence with Bear River to Utah-Idaho state line	5	Not Supporting	Total Ammonia as N	3C	Low	2020	51
						Macroinvertebrates	3C	Low	2020	51
						E. coli	2B	Low	2020	51
Bear River	UT16010204-007_01	Middle Bear East-1	Bear River east side tributaries from Malad River confluence north to HUC boundary	5	Not Supporting	E. coli	2B	Low	2020	45
Bear River	UT16010204-007_02	Middle Bear East-2	Bear River east side tributaries from Malad River confluence north to HUC boundary	1	Fully Supporting					26
Bear River	UT16010204-008_01	Bear River-2-1	Bear River from Malad River confluence to Cutler Reservoir	5	Not Supporting	Macroinvertebrates	3B	Low	2008	61
Bear River	UT16010204-008_02	Bear River-2-2	Bear River from Malad River confluence to Cutler Reservoir	5	Not Supporting	Macroinvertebrates	3B	Low	2008	2
						Minimum Dissolved Oxygen	3B;3D	Low	2014	2
						Total Dissolved Solids	4	Low	2020	2
Bear River	UT16010204-010_01	Malad River-2-1	Malad River tributaries	2	No Evidence of Impairment					57
Bear River	UT16010204-010_02	Malad River-2-2	Malad River tributaries	2	No Evidence of Impairment					72
Bear River	UT16010204-011_01	Mantua Reservoir Tributaries-1	Big Creek from confluence with Box Elder Creek to Mantua Reservoir	3	Insufficient Data					1
Bear River	UT16010204-011_02	Mantua Reservoir Tributaries-2	Big Creek from confluence with Box Elder Creek to Mantua Reservoir	5	Not Supporting	E. coli	2B	Low	2020	3
Bear River	UT16010204-013_00	Salt Creek-Bothwell	Salt Creek and tributaries from Salt Creek Waterfowl Managment Area to headwaters	3	Insufficient Data					24

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Cedar-Beaver	UT16030006-001_00	Coal Creek - C/B	Coal Creek and tributaries from Main Street in Cedar City (SR130) to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2016	65
Cedar-Beaver	UT16030006-002_00	Pinto Creek	Pinto and Little Pinto Creeks and their tributaries from Newcastle Reservoir to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2014	41
						Aluminum	3A	Low	2014	41
						Minimum Dissolved Oxygen	3A	Low	2016	41
						E. coli	2B	Low	2016	41
Cedar-Beaver	UT16030006-003_00	Summit Creek-Iron	Summit Creek and tributaries from collection pond at 6060 feet elevation to headwaters	2	No Evidence of Impairment					24
Cedar-Beaver	UT16030006-004_00	Parowan Creek	Parowan Creek and tributaries from the south end of Main Street in Parowan to headwaters	2	No Evidence of Impairment					44
Cedar-Beaver	UT16030006-005_00	Little Creek (Iron Co.)	Little Creek and tributaries from irrigation diversion at mouth to headwaters	3	Insufficient Data					17
Cedar-Beaver	UT16030006-006_00	Shoal Creek	Shoal Creek and tributaries from Enterprise to headwaters	3	Insufficient Data					74
Cedar-Beaver	UT16030006-007_00	Red Creek (Iron Co.)	Tributaries of Red Creek Reservoir, Iron County	5	Not Supporting	E. coli	2B	Low	2020	7
Cedar-Beaver	UT16030006-008_00	Red Creek Lower (Iron Co.)	Red Creek and tributaries (Iron Co.) below Red Creek Reservoir	3	Insufficient Data					11
Cedar-Beaver	UT16030006-009_00	Cottonwood Canyon-Parowan Valley	Cottonwood Canyon-Parowan Valley	2	No Evidence of Impairment					6
Cedar-Beaver	UT16030007-001_00	Beaver River-1	Beaver River Below Minersville Reservoir	3	Insufficient Data					14
Cedar-Beaver	UT16030007-002_00	Beaver River-2	Beaver River and tributaries from Minersville Reservoir to USFS boundary	5	Not Supporting	Macroinvertebrates	3A	Low	2008	208
						E. coli	2B	Low	2016	208
						Aluminum	3A	Low	2016	208
					Approved TMDL	Max. Temperature	3A		1998	208
						Minimum Dissolved Oxygen	3A		2014	208
Cedar-Beaver	UT16030007-003_00	Beaver River-3	Beaver River and tributaries from USFS boundary to headwaters	3	Insufficient Data					224
Cedar-Beaver	UT16030007-004_00	Pine Creek-Tushar	Pine Creek and tributaries from I-15 to headwaters	3	Insufficient Data					9

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Jordan River	UT16020201-002_01	American Fork River-2	American Fork River and tributaries from Tibble Fork Reservoir to headwaters	3	Insufficient Data					29
Jordan River	UT16020201-002_02	Mary Ellen Gulch	American Fork River and tributaries from Tibble Fork Reservoir to headwaters	5	Not Supporting	Zinc	3A	Low	2020	4
						Copper	3A	Low	2020	4
						Cadmium	3A	Low	2020	4
Jordan River	UT16020201-008_00	Jordan River-8	Jordan River from Narrows to Utah Lake	5	Not Supporting	Total Dissolved Solids	4	Low	2006	12
						Arsenic	1C;HH1C	Low	2014	12
Jordan River	UT16020201-015_00	Dry Creek-Alpine	Dry Creek and tributaries from USFS boundary to headwaters	5	Not Supporting	pH	2B;3A;4	Low	2014	12
Jordan River	UT16020204-001_01	Jordan River-1	Jordan River from Farmington Bay upstream contiguous with the Davis County line	5	Not Supporting	Macroinvertebrates	3B;3D	Low	2008	16
						E. coli	2B	High	2010	16
						Copper	3B;3D	Low	2014	16
						Total Dissolved Solids	4	Low	2016	16
					Approved TMDL	Minimum Dissolved Oxygen*	3B;3D		2002	16
Jordan River	UT16020204-001_02	North Canyon Creek	Jordan River from Farmington Bay upstream contiguous with the Davis County line	5	Not Supporting	Macroinvertebrates	3B;3D	Low	2008	2
						E. coli	2B	High	2010	2
						Copper	3B;3D	Low	2014	2
						Total Dissolved Solids	4	Low	2016	2
					Approved TMDL	Minimum Dissolved Oxygen	3B;3D		2002	2
Jordan River	UT16020204-002_00	Jordan River-2	Jordan River from Davis County line upstream to North Temple Street	5	Not Supporting	E. coli	2B	High	2006	0
						Macroinvertebrates	3B	Low	2008	0
					Approved TMDL	Minimum Dissolved Oxygen*	3B		2002	0
Jordan River	UT16020204-003_00	Jordan River-3	Jordan River from North Temple to 2100 South	5	Not Supporting	E. coli	2B	High	2006	1
						Total Phosphorus as P	3B	Low	2008	1
						Macroinvertebrates	3B	Low	2008	1
					Approved TMDL	Minimum Dissolved Oxygen*	3B		2008	1
Jordan River	UT16020204-004_00	Jordan River-4	Jordan River from 2100 South to the confluence with Little Cottonwood Creek	5	Not Supporting	Total Dissolved Solids	4	Low	2008	5
						Macroinvertebrates	3B	Low	2010	5
						E. coli	2B	High	2014	5
Jordan River	UT16020204-005_00	Jordan River-5	Jordan River from the confluence with Little Cottonwood Creek to 7800 South	5	Not Supporting	Total Dissolved Solids	4	Low	2006	8
						Max. Temperature	3A	Low	2006	8
						E. coli	2B	High	2006	8
Jordan River	UT16020204-006_01	Jordan River-6	Jordan River from 7800 South to Bluffdale at 14600 South	5	Not Supporting	Total Dissolved Solids	4	Low	2006	17
						Max. Temperature	3A	Low	2006	17
						Macroinvertebrates	3A	Low	2008	17
Jordan River	UT16020204-006_02	Big Willow Creek	Jordan River from 7800 South to Bluffdale at 14600 South	5	Not Supporting	Total Dissolved Solids	4	Low	2006	1
						Max. Temperature	3A	Low	2006	1
						Macroinvertebrates	3A	Low	2008	1
Jordan River	UT16020204-006_03	Dry Creek	Jordan River from 7800 South to Bluffdale at 14600 South	5	Not Supporting	Total Dissolved Solids	4	Low	2006	1
						Max. Temperature	3A	Low	2006	1
						Macroinvertebrates	3A	Low	2008	1

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Jordan River	UT16020204-007_00	Jordan River-7	Jordan River from Bluffdale at 14600 South to Narrows	5	Not Supporting	Max. Temperature	3A	Low	2004	22
						Macroinvertebrates	3A	Low	2008	22
						Total Dissolved Solids	4	Low	2020	22
Jordan River	UT16020204-009_00	City Creek-1	City Creek and tributaries from Memory Park to SLC WTP	3	Insufficient Data					5
Jordan River	UT16020204-010_00	City Creek-2	City Creek and tributaries from filtration plant to headwaters	5	Not Supporting	Cadmium	3A	Low	2010	11
Jordan River	UT16020204-011_00	Red Butte Creek Upper	Red Butte Creek and tributaries from Red Butte Reservoir to headwaters	2	No Evidence of Impairment					10
Jordan River	UT16020204-012_00	Emigration Creek	Emigration Creek and tributaries from stream gage at Rotary Glen Park (40 44 58.49N, 111 48 36.29W) to headwaters	4A	Approved TMDL	E. coli	2B		2008	17
Jordan River	UT16020204-013_00	Parleys Canyon Creek-2	Parleys Canyon Creek and tributaries from Mountain Dell Reservoir to headwaters	5	Not Supporting	Cadmium	3A	Low	2014	20
Jordan River	UT16020204-014_00	Mountain Dell Creek-1	Mountain Dell Creek from Mountain Dell Reservoir to Little Dell Reservoir	2	No Evidence of Impairment					2
Jordan River	UT16020204-015_00	Mountain Dell Creek-2	Mountain Dell Creek and tributaries from to Little Dell Reservoir headwaters	2	No Evidence of Impairment					10
Jordan River	UT16020204-016_00	North Canyon	North Canyon Creek and tributaries from USFS boundary to headwaters.	1	Fully Supporting					1
Jordan River	UT16020204-017_00	Mill Creek2-SLCity	Mill Creek and tributaries from Interstate 15 to USFS Boundary	5	Not Supporting	E. coli	2B	High	2002	14
						Macroinvertebrates	3A	Low	2010	14
Jordan River	UT16020204-018_00	Mill Creek3-SLCity	Mill Creek and tributaries from USFS boundary to headwaters	2	No Evidence of Impairment					26
Jordan River	UT16020204-019_00	Big Cottonwood Creek-1	Big Cottonwood Creek and tributaries from Jordan River to Big Cottonwood WTP	5	Not Supporting	Max. Temperature	3A	Low	2006	25
						Macroinvertebrates	3A	Low	2014	25
						E. coli	2B	High	2014	25
Jordan River	UT16020204-020_00	Big Cottonwood Creek-2	Big Cottonwood Creek and tributaries from Big Cottonwood WTP to headwaters	5	Not Supporting	Copper	3A	Low	2014	60
						Cadmium	3A	Low	2014	60
Jordan River	UT16020204-021_00	Little Cottonwood Creek-1	Little Cottonwood Creek and tributaries from Jordan River confluence to Metropolitan WTP	5	Not Supporting	Total Dissolved Solids	4	High	2006	28
						Max. Temperature	3A	Low	2006	28
						Macroinvertebrates	3A	Low	2008	28
						E. coli	2B	High	2014	28
						Cadmium	3A	Low	2014	28
Jordan River	UT16020204-022_00	Little Cottonwood Creek-2	Little Cottonwood Creek and tributaries from Metropolitan WTP to headwaters	5	Not Supporting	pH	1C;2B;3A	Low	2014	30
						Copper	3A	Low	2014	30
						Cadmium	3A	Low	2014	30
					Approved TMDL	Zinc	3A		1998	30
Jordan River	UT16020204-023_00	Bingham Creek	Bingham Creek and tributaries from confluence with Jordan River to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2014	55
						Selenium	3D	Low	2014	55

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Jordan River	UT16020204-024_01	Midas Creek	Butterfield Creek and tributaries from confluence with Jordan River to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2014	59
						Selenium	3D	Low	2014	59
						E. coli	2B	High	2014	59
Jordan River	UT16020204-024_02	Butterfield Creek	Butterfield Creek and tributaries from confluence with Jordan River to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2014	25
						Selenium	3D	Low	2014	25
						E. coli	2B	High	2014	25
Jordan River	UT16020204-025_00	Parleys Canyon Creek-1	Parleys Canyon Creek and tributaries from 1300 East to Mountain Dell Reservoir	5	Not Supporting	E. coli	1C;2B	High	2010	14
						Macroinvertebrates	3A	Low	2014	14
Jordan River	UT16020204-026_00	Mill Creek1-SLCity	Mill Creek from confluence with Jordan River to Interstate 15 crossing	5	Not Supporting	Macroinvertebrates	3C	Low	2014	3
						E. coli	2B	High	2014	3
Jordan River	UT16020204-027_00	Coon Creek	Perennial portion of Coon Creek	3	Insufficient Data					10
Jordan River	UT16020204-028_00	Barneys Canyon Creek	Barney Canyon Creek and tributaries from mouth to headwaters	3	Insufficient Data					10
Jordan River	UT16020204-029_00	Rose Creek	Rose Creek and tributaries from confluence with Jordan River to headwaters	5	Not Supporting	E. coli	2B	High	2014	37
Jordan River	UT16020204-030_00	Bells Canyon	Bells Canyon Creek and tributaries from Lower Bells Canyon Reservoir to headwaters	3	Insufficient Data					5
Jordan River	UT16020204-031_00	Little Willow Creek	Little Willow Creek and tributaries from Draper Irrigation Company diversion to headwaters	2	No Evidence of Impairment					7
Jordan River	UT16020204-032_00	Surplus Canal	Surplus Canal from Great Salt Lake wetlands to diversion from Jordan River	3	Insufficient Data					21
Jordan River	UT16020204-033_00	Emigration Creek Lower	Emigration Creek and tributaries from 1100 East (below Westminster College) to stream gage at Rotary Glen Park (40 44 58.49N, 111 48 36.29W) above Hogle Zoo	5	Not Supporting	E. coli	2B	High	2014	4
Jordan River	UT16020204-034_00	State Canal	State Canal from Farmington Bay to confluence with the Jordan River	5	Not Supporting	Minimum Dissolved Oxygen*	3B;3D	Low	2014	16
						Total Dissolved Solids	4	Low	2016	16
						Total Ammonia as N	3B;3D	Low	2016	16
Jordan River	UT16020204-035_00	Red Butte Creek Lower	Red Butte Creek and tributaries from 1100 East Street to Red Butte Reservoir	5	Not Supporting	Macroinvertebrates	3A	Low	2014	4
Jordan River	UT16020204-036_00	Lee Creek	Lee Creek from Great Salt Lake to headwaters near 2100 South	1	Fully Supporting					10

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Lower Colorado River	UT15010003-001_00	Cottonwood Canyon	Cottonwood Canyon from Utah-Arizona state line to headwaters	5	Not Supporting	Minimum Dissolved Oxygen	3C	Low	2014	15
						Max. Temperature	3C	Low	2014	15
Lower Colorado River	UT15010003-002_00	Kanab Creek-1	Kanab Creek and tributaries from state line to the confluence with Fourmile Hollow near the White Cliffs	5	Not Supporting	Total Dissolved Solids	4	Low	2008	38
Lower Colorado River	UT15010003-003_00	Kanab Creek-2	Kanab Creek and tributaries from the confluence with Fourmile Hollow near the White Cliffs to Reservoir Canyon	5	Not Supporting	Total Dissolved Solids	4	Low	2014	31
						Boron	4	Low	2014	31
						Selenium	3C;4	Low	2016	31
Lower Colorado River	UT15010003-004_00	Johnson Wash-1	Johnson Wash and tributaries from Utah-Arizona state line to Skutumpah Canyon confluence	5	Not Supporting	Total Dissolved Solids	4	Low	2008	53
						Selenium	3C	Low	2014	53
						Boron	4	Low	2014	53
Lower Colorado River	UT15010003-005_00	Johnson Wash-2	Johnson Wash and tributaries, from (including) Skutumpah Canyon to headwaters	5	Not Supporting	Zinc	3A	Low	2014	41
						Total Dissolved Solids	4	Low	2014	41
						Minimum Dissolved Oxygen	3A	Low	2014	41
						Max. Temperature	3A	Low	2014	41
						Lead	3A;4	Low	2014	41
						Copper	3A;4	Low	2014	41
						Macroinvertebrates	3A	Low	2016	41
Lower Colorado River	UT15010003-006_00	Kanab Creek-3	Kanab Creek and tributaries from Reservoir Canyon to headwaters	3	Insufficient Data					4
Lower Colorado River	UT15010008-001_00	Santa Clara-1	Santa Clara River from confluence with Virgin River to Gunlock Reservoir	5	Not Supporting	Max. Temperature	3B	Low	2008	32
						Boron	4	Low	2008	32
						Arsenic	1C;HH1C	Low	2014	32
					Approved TMDL	Total Dissolved Solids	4		1998	32
Lower Colorado River	UT15010008-002_00	Santa Clara-2	Santa Clara River and tributaries from Gunlock Reservoir to Baker Dam Reservoir (includes Magotsu Creek)	5	Not Supporting	Max. Temperature	3A	Low	2008	61
						Minimum Dissolved Oxygen	3A	Low	2014	61
Lower Colorado River	UT15010008-003_00	Santa Clara-3	Santa Clara River and tributaries from Baker Dam Reservoir to headwaters	5	Not Supporting	Aluminum	3A	Low	2014	77
Lower Colorado River	UT15010008-004_00	Virgin River-2	Virgin River and tributaries from Santa Clara River confluence to Quail Creek diversion, excluding Quail, Ash, and La Verkin Creeks	5	Not Supporting	Boron	4	Low	2008	94
						Total Dissolved Solids	4	Low	2014	94
Lower Colorado River	UT15010008-005_00	Quail Creek	Quail Creek and tributaries from Quail Creek Reservoir to headwaters	3	Insufficient Data					9
Lower Colorado River	UT15010008-006_00	Leeds Creek	Leeds Creek and tributaries from confluence with Quail Creek to headwaters	2	No Evidence of Impairment					21
Lower Colorado River	UT15010008-007_00	Ash Creek-1	Ash Creek and tributaries from confluence with La Verkin Creek to springs near Toquerville	5	Not Supporting	Max. Temperature	3A	Low	2016	42
Lower Colorado River	UT15010008-008_00	Ash Creek-2	Ash Creek and tributaries from springs near Toquerville to Ash Creek Reservoir	3	Insufficient Data					20
Lower Colorado River	UT15010008-009_00	Ash Creek-3	Ash Creek and tributaries from Ash Creek Reservoir to headwaters	1	Fully Supporting					82

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Lower Colorado River	UT15010008-010_00	La Verkin Creek	La Verkin Creek and tributaries from confluence with Virgin River to headwaters (excludes Ash Creek)	5	Not Supporting	Macroinvertebrates	3B	Low	2016	67
Lower Colorado River	UT15010008-011_00	Virgin River-3	Virgin River and tributaries from Quail Creek Diversion to North Creek confluence	1	Fully Supporting					1
Lower Colorado River	UT15010008-012_00	Virgin River-4	Virgin River and tributaries from North Creek confluence to Norh Fork Virgin River	2	No Evidence of Impairment					11
Lower Colorado River	UT15010008-013_00	North Fork Virgin River-2	North Fork Virgin River and tributaries from Deep Creek confluence to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2014	39
					Approved TMDL	E. coli*	1C;2A		2020	39
Lower Colorado River	UT15010008-014_00	North Creek-Virgin	North Creek and tributaries from confluence with Virgin River to headwaters	5	Not Supporting	pH	1C;2B;3C;4	Low	2014	53
						Macroinvertebrates	3C	Low	2016	53
Lower Colorado River	UT15010008-015_00	North Fork Virgin River-1	North Fork Virgin River and tributaries from confluence with East Fork Virgin River to Kolob Creek confluence	5	Not Supporting	Max. Temperature	3A	Low	2010	73
					Approved TMDL	E. coli	1C;2A		2020	73
Lower Colorado River	UT15010008-016_00	Kolob Creek	Kolob Creek and tributaries from confluence with North Fork Virgin River to headwaters	3	Insufficient Data					21
Lower Colorado River	UT15010008-017_00	Deep Creek	Deep Creek and tributaries from confluence with North Fork Virgin River to headwaters	2	No Evidence of Impairment					79
Lower Colorado River	UT15010008-018_00	East Fork Virgin-1	East Fork of Virgin River and tributaries from confluence with North Fork Virgin River to Carmel Junction	1	Fully Supporting					55
Lower Colorado River	UT15010008-019_00	East Fork Virgin-2	East Fork Virgin River and tributaries from Carmel Junction to Glendale	1	Fully Supporting					33
Lower Colorado River	UT15010008-020_00	East Fork Virgin-3	East Fork Virgin River and tributaries from Glendale to headwaters	2	No Evidence of Impairment					38
Lower Colorado River	UT15010009-001_00	Fort Pearce Wash	Fort Pearce Wash and tributaries within Utah, from Virgin River confluence to headwaters, exlcuding Short Creek	5	Not Supporting	Total Dissolved Solids	4	Low	2012	25
Lower Colorado River	UT15010009-002_00	Short Creek	Short Creek and tributaries from the Utah-Arizona border (near Hildale) to headwaters	3	Insufficient Data					13
Lower Colorado River	UT15010010-001_00	Virgin River-1	Virgin River from state line to Santa Clara River confluence	5	Not Supporting	Max. Temperature	3B	Low	2006	2
						Boron	4	Low	2008	2
						Total Dissolved Solids	4	Low	2014	2
Lower Colorado River	UT15010010-002_00	Beaver Dam Wash	Beaver Dam Wash and tributaries from Motoqua to headwaters	2	No Evidence of Impairment					49

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Lower Sevier River	UT16030003-001_00	Sevier River-19	Sevier River west side tributaries from Sevier Bridge Dam to Salina Creek confluence	3	Insufficient Data					78
Lower Sevier River	UT16030003-002_00	Willow Creek - Axtell	Willow Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					25
Lower Sevier River	UT16030003-003_00	Salina Creek-1	Salina Creek and tributaries from confluence with Sevier River to USFS boundary	4A	Approved TMDL	Total Dissolved Solids	4		1998	14
Lower Sevier River	UT16030003-004_01	Sevier River-16-1	Sevier River east and west side tributaries from Salina Creek confluence to Rocky Ford Reservoir (excludes Lost Creek)	3	Insufficient Data					5
Lower Sevier River	UT16030003-004_02	Sevier River-16-2	Sevier River east and west side tributaries from Salina Creek confluence to Rocky Ford Reservoir (excludes Lost Creek)	3	Insufficient Data					26
Lower Sevier River	UT16030003-004_03	Sevier River-16-3	Sevier River east and west side tributaries from Salina Creek confluence to Rocky Ford Reservoir (excludes Lost Creek)	3	Insufficient Data					2
Lower Sevier River	UT16030003-005_00	Lost Creek-1	Lost Creek and tributaries from confluence with Sevier River upstream approximately 6 miles	5	Not Supporting	Total Dissolved Solids	4	Low	2012	7
						Copper	3B	Low	2016	7
						Boron	4	Low	2016	7
						Copper	3C;3D	Low	2020	7
Lower Sevier River	UT16030003-006_00	Salina Creek-2	Salina Creek and tributaries from USFS boundary to headwaters	5	Not Supporting	pH	2B;3A;4	Low	2020	194
Lower Sevier River	UT16030003-007_00	Beaver Creek-1 Sevier	Beaver Creek and other west side tributaries to Sevier River below USFS boundary from Clear Creek upstream to HUC boundary	1	Fully Supporting					40
Lower Sevier River	UT16030003-008_00	Lost Creek2-Salina	Lost Creek and tributaries from ~6 miles upstream to USFS boundary	3	Insufficient Data					9
Lower Sevier River	UT16030003-009_00	Sevier River-11	Sevier River west side tributaries from the Annabella Diversion upstream to Sevier River confluence with Clear Creek and below USFS boundary	3	Insufficient Data					39
Lower Sevier River	UT16030003-010_00	Lost Creek3-Salina	Lost Creek and tributaries from USFS boundary to headwaters	5	Not Supporting	E. coli	2B	Low	2020	46
Lower Sevier River	UT16030003-011_00	Sevier River-12	Sevier River west side tributaries from approximately due West of Salina Creek confluence upstream to Clear Creek confluence and above USFS boundary	3	Insufficient Data					60
Lower Sevier River	UT16030003-012_00	Sevier River-17	Sevier River from Yuba Dam upstream to confluence with Salina Creek	4A	Approved TMDL	Total Phosphorus as P	3B		2000	10
						Total Dissolved Solids	4		2000	10
						Sediment	3C		2000	10
Lower Sevier River	UT16030003-013_00	Monroe Creek	Sevier River east side tributaries above USFS boundary from Mill Creek-Water Creek area upstream to Durkee Creek	1	Fully Supporting					108
Lower Sevier River	UT16030003-014_00	Sevier River-14	Sevier River east side tributaries from Rocky Ford Reservoir upstream to Annabella Diversion and below USFS boundary	2	No Evidence of Impairment					76

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Lower Sevier River	UT16030003-015_00	Sevier River-8	Sevier River from Rocky Ford Reservoir upstream to Annabella Diversion	3	Insufficient Data					35
Lower Sevier River	UT16030003-016_00	Sevier River-10	Sevier River east side tributaries below USFS boundary from Anabella Diversion upstream to Clear Creek confluence	3	Insufficient Data					33
Lower Sevier River	UT16030003-017_00	Sevier River-6	Sevier River from Clear Creek confluence to HUC unit 1603003-1603001 boundary	5	Not Supporting	Max. Temperature	3A	Low	2006	10
Lower Sevier River	UT16030003-018_00	Clear Creek-I70	Clear Creek and tributaries from confluence with Sevier River to headwaters	5	Not Supporting	Aluminum	3A	Low	2014	138
						Max. Temperature	3A	Low	2016	138
Lower Sevier River	UT16030003-019_00	Sevier River-9	Sevier River from Annabella Diversion to Clear Creek confluence	3	Insufficient Data					15
Lower Sevier River	UT16030003-020_00	Beaver Creek2-Piute	Beaver Creek and other west side tributaries to Sevier River above USFS boundary from Clear Creek upstream to HUC boundary	1	Fully Supporting					68
Lower Sevier River	UT16030003-021_00	Manning Creek	Manning Creek and tributaries from confluence with Sevier River to headwaters	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2014	26
Lower Sevier River	UT16030003-022_00	Sevier River-5	Sevier River east side tributaries from Manning Creek confluence to HUC unit boundary	3	Insufficient Data					29
Lower Sevier River	UT16030003-023_00	Sevier River-18	Sevier River east side tributaries from Sevier Bridge Dam to Salina Creek confluence, excluding San Pitch River and waters above USFS boundary	3	Insufficient Data					106
Lower Sevier River	UT16030003-024_00	Sevier River-15	Sevier River form confluence with Salina Creek upstream to Rocky Ford Reservoir	3	Insufficient Data					14
Lower Sevier River	UT16030003-025_00	Sevier River-13	Sevier River west side tributaries from Rocky Ford Reservoir upstream to Annabella Diversion and below USFS boundary	3	Insufficient Data					66
Lower Sevier River	UT16030003-026_00	Sevier River-7	Sevier River east side tributaries from the Clear Creek confluence upstream to Manning Creek confluence	5	Not Supporting	pH	2B;3A;4	Low	2014	4
						Max. Temperature	3A	Low	2014	4
Lower Sevier River	UT16030003-027_00	Peterson Creek	Petersen Creek and tributaries from confluence with Sevier River to USFS boundary	5	Not Supporting	Total Dissolved Solids	4	Low	2016	23
						Copper	3B	Low	2016	23
						Copper	3C;3D	Low	2020	23
Lower Sevier River	UT16030004-001_00	San Pitch-1	San Pitch River and tributaries from confluence with Sevier River to tailwaters of Gunnison Reservoir (excluding all of Sixmile Creek and Twelvemile Creek above USFS boundary)	4A	Approved TMDL	Total Dissolved Solids	4		2014	63
Lower Sevier River	UT16030004-002_00	Twelve Mile Creek	Twelvemile Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					73
Lower Sevier River	UT16030004-003_00	Six Mile Creek - Sevier	Sixmile Creek and tributaries from confluence with San Pitch River to headwaters	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2012	45
						Max. Temperature	3A	Low	2012	45

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Lower Sevier River	UT16030004-004_00	South Creek	South Creek (Manti Creek) and tributaries from USFS boundary to headwaters	3	Insufficient Data					35
Lower Sevier River	UT16030004-005_01	San Pitch-3-1	San Pitch River and tributaries from Gunnison Reservoir to U132 crossing and below USFS boundary	5	Not Supporting	Total Ammonia as N	3C;3D	Low	2016	153
						E. coli	2B	Low	2016	153
						pH	2B;3C;3D;4	Low	2020	153
						Minimum Dissolved Oxygen	3C;3D	Low	2020	153
					Approved TMDL	Total Dissolved Solids	4		1998	153
Lower Sevier River	UT16030004-005_02	San Pitch-3-2	San Pitch River and tributaries from Gunnison Reservoir to U132 crossing and below USFS boundary	5	Not Supporting	Total Ammonia as N	3C;3D	Low	2016	0
						E. coli	2B	Low	2016	0
					Approved TMDL	Total Dissolved Solids	4		1998	0
Lower Sevier River	UT16030004-006_00	Oak Creek-1	Oak Creek and Canal Creek and tributaries from Chester Ponds to USFS boundary	3	Insufficient Data					32
Lower Sevier River	UT16030004-007_01	Upper Willow Creek	Ephraim Creek and tributaries from USFS boundary to headwaters	2	No Evidence of Impairment					37
Lower Sevier River	UT16030004-007_02	Ephraim Creek	Ephraim Creek and tributaries from USFS boundary to headwaters	2	No Evidence of Impairment					8
Lower Sevier River	UT16030004-008_00	Pleasant Creek	Pleasant Creek and tributaries from confluence with San Pitch River to headwaters	1	Fully Supporting					67
Lower Sevier River	UT16030004-009_00	San Pitch-5	San Pitch River and tributaries from U-132 to Pleasant Creek confluence, excluding Cedar Creek, Oak Creek, Pleasant Creek and Cottowood Creek	5	Not Supporting	E. coli	2B	Low	2016	130
						Max. Temperature	3A	Low	2020	130
Lower Sevier River	UT16030004-010_00	Oak Creek-2	Oak Creek and Canal Creek and tributaries from USFS boundary to headwaters	1	Fully Supporting					34
Lower Sevier River	UT16030004-011_00	San Pitch-4	Silver Creek and tributaries from confluence with San Pitch to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2014	43
Lower Sevier River	UT16030004-012_00	Oak Creek Upper	Oak Creek and tributaries from confluence with San Pitch River to headwaters (near Fairview)	1	Fully Supporting					15
Lower Sevier River	UT16030004-013_00	Cottonwood Creek-SP	Cottonwood Creek and tributaries from confluence with San Pitch River to headwaters	1	Fully Supporting					16
Lower Sevier River	UT16030005-002_00	Cherry Creek	Cherry Creek and tributaries from mouth to headwaters	3	Insufficient Data					41
Lower Sevier River	UT16030005-003_00	Tanner Creek	Tanner Creek and tributaries from mouth to headwaters	3	Insufficient Data					90
Lower Sevier River	UT16030005-004_00	Oak Creek-1	Oak Creek tributaries from mouth to USFS boundary (near Oak City)	3	Insufficient Data					15
Lower Sevier River	UT16030005-005_00	Fool Creek-1	Fool Creek and tributaries from mouth to USFS boundary	3	Insufficient Data					4
Lower Sevier River	UT16030005-006_00	Fishlake National Forest-I15	Fishlake National Forest perennial streams located west of Interstate 15	3	Insufficient Data					76

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Lower Sevier River	UT16030005-007_00	Sevier River-21	Sevier River north side tributaries from DMAD Reservoir upstream to Sevier Bridge Reservoir (Yuba Dam) excluding Tanner Creek, Chicken Creek, their tributaries, and waters above USFS boundary	3	Insufficient Data					55
Lower Sevier River	UT16030005-008_00	Sevier River-27	Sevier River south side tributaries from DMAD Reservoir upstream to Yuba Dam, excluding all waters above USFS boundary	1	Fully Supporting					84
Lower Sevier River	UT16030005-011_00	Chicken Creek-3	Sevier River drainage streams south of Chicken Creek and above USFS boundary flowing towards Sevier River	3	Insufficient Data					21
Lower Sevier River	UT16030005-012_00	Ivie Creek	Ivie Creek and tributaries from Scipio Dam to headwaters	2	No Evidence of Impairment					33
Lower Sevier River	UT16030005-013_00	Goose Creek-1	Goose Creek and tributaries from mouth to USFS boundary	3	Insufficient Data					4
Lower Sevier River	UT16030005-014_00	Goose Creek-2	Goose Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					8
Lower Sevier River	UT16030005-015_00	Pioneer Creek-1	Pioneer Creek and tributaries from mouth to USFS boundary	3	Insufficient Data					13
Lower Sevier River	UT16030005-016_00	Pioneer Creek-2	Pioneer Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					6
Lower Sevier River	UT16030005-017_00	Sevier River-23	Sevier River south side tributaries from Gunnison bend reservoir upstream to DMAD Reservoir	3	Insufficient Data					23
Lower Sevier River	UT16030005-018_00	Chalk Creek-1	Chalk Creek and Pine Creek (Millard County) and tributaries from mouth to USFS boundary	3	Insufficient Data					39
Lower Sevier River	UT16030005-019_00	Chalk Creek2-Fillmore	Chalk Creek and Pine Creek (Millard County) and tributaries from USFS boundary to headwaters	1	Fully Supporting					53
Lower Sevier River	UT16030005-020_00	Chicken Creek-1	Chicken Creek and tributaries from Levan to headwaters	1	Fully Supporting					27
Lower Sevier River	UT16030005-021_00	Corn Creek	Corn Creek and tributaries from mouth to headwaters	1	Fully Supporting					84
Lower Sevier River	UT16030005-022_00	Chicken Creek-2	Chicken Creek and tributaries from confluence with Sevier River to Levan	5	Not Supporting	Total Dissolved Solids	4	Low	1998	57
						Max. Temperature	3A	Low	2016	57
Lower Sevier River	UT16030005-023_00	Meadow Creek	Meadow Creek and tributaries from mouth to headwaters (Juab County)	2	No Evidence of Impairment					15
Lower Sevier River	UT16030005-024_00	Round Valley Creek	Round Valley Creek from mouth upstream to Scipio Reservoir	3	Insufficient Data					16
Lower Sevier River	UT16030005-025_00	Sevier River-20	Sevier River from U-132 crossing at the northern most point of the Sevier River (near Dog Valley Wash confluence) upstream to Yuba Dam	5	Not Supporting	Macroinvertebrates	3B	Low	2008	4
Lower Sevier River	UT16030005-026_00	Sevier River-22	Sevier River from DMAD Reservoir upstream to U-132 crossing at the northern most point of the Sevier River (near Dog Valley Wash)	4A	Approved TMDL	Total Phosphorus as P	3B		1998	8
						Sediment	3C		1998	8
Lower Sevier River	UT16030005-027_00	Sevier River-24	Sevier River from Gunnison Bend Reservoir to DMAD Reservoir	5	Not Supporting	Total Dissolved Solids	4	Low	2016	1
					Approved TMDL	Total Phosphorus as P	3B		1998	1
						Sediment	3C		1998	1

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Lower Sevier River	UT16030005-028_00	Sevier River-25	Sevier River from Crafts Lake to Gunnison Bend Reservoir	1	Fully Supporting					29
Lower Sevier River	UT16030005-029_00	Sevier River-26	Sevier River north side tributaries from Gunnison Bend Reservoir to DMAD Reservoir	3	Insufficient Data					18

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Southeast Colorado Riv	UT14010005-001_00	Colorado River-6	Colorado River from HUC 14010005-14030001 boundary to Colorado State Line	4A	Approved TMDL	Selenium	3B		2004	18
Southeast Colorado Riv	UT14010005-002_00	Unknown tribs	Unknown tributaries from HUC boundary (14010005) to Utah-Colorado state line	3	Insufficient Data					46
Southeast Colorado Riv	UT14030001-001_00	Cottonwood Wash	Cottonwood Wash from Colorado River confluence to headwaters	5	Not Supporting	Max. Temperature	3B	Low	2014	515
						Total Dissolved Solids	4	Low	2020	515
Southeast Colorado Riv	UT14030001-002_00	Little Dolores River	Little Dolores River from confluence with Colorado River to Utah-Colorado state line	3	Insufficient Data					32
Southeast Colorado Riv	UT14030001-003_00	Westwater Creek	Westwater Creek and tributaries from confluence with Colorado River to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2012	703
						Max. Temperature	3B	Low	2012	703
Southeast Colorado Riv	UT14030001-004_00	Bitter Creek	Bitter Creek and tributaries from Colorado River to headwaters	3	Insufficient Data					443
Southeast Colorado Riv	UT14030001-005_00	Colorado River-5	Colorado River from Dolores River confluence to HUC 14010005 boundary	4A	Approved TMDL	Selenium	3B		2004	61
Southeast Colorado Riv	UT14030001-006_00	Nash Wash	Nash Wash and tributaries from the confluence with Pinto Wash to headwaters	2	No Evidence of Impairment					137
Southeast Colorado Riv	UT14030002-001_01	La Sal Creek-1	La Sal Creek and tributaries from Utah-Colorado state line to headwaters	1	Fully Supporting					182
Southeast Colorado Riv	UT14030002-001_02	La Sal Creek-2	La Sal Creek and tributaries from Utah-Colorado state line to headwaters	3	Insufficient Data					0
Southeast Colorado Riv	UT14030002-001_03	La Sal Creek-3	La Sal Creek and tributaries from Utah-Colorado state line to headwaters	3	Insufficient Data					0
Southeast Colorado Riv	UT14030004-001_00	Dolores River	Dolores River and tributaries (except Granite Creek) from confluence with Colorado River to headwaters or Utah-Colorado state line	5	Not Supporting	Max. Temperature	3C	Low	2014	547
						Macroinvertebrates	3C	Low	2020	547
Southeast Colorado Riv	UT14030004-002_00	Granite Creek - CRSE	Granite Creek and tributaries from confluence with Dolores River to Utah-Colorado state line	3	Insufficient Data					59
Southeast Colorado Riv	UT14030004-003_00	Roc Creek	Roc Creek and tributaries from Utah-Colorado state line to headwaters	3	Insufficient Data					166
Southeast Colorado Riv	UT14030005-001_00	Kane Spring Wash	Kane Spring Wash from confluence with Colorado River to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2014	1472
						Max. Temperature	3C	Low	2014	1472
Southeast Colorado Riv	UT14030005-002_00	Indian Creek-2	Indian Creek and tributaries from Newspaper Rock State Park north boundary to headwaters	1	Fully Supporting					94
Southeast Colorado Riv	UT14030005-003_00	Colorado River-3	Colorado River from Green River confluence to Moab	4A	Approved TMDL	Selenium	3B		2006	97
Southeast Colorado Riv	UT14030005-004_00	Colorado River-4	Colorado River from Moab to HUC unit (14030005) boundary	5	Not Supporting	E. coli	2A	Low	2020	71
					Approved TMDL	Selenium	3B		2006	71
Southeast Colorado Riv	UT14030005-005_00	Mill Creek1-Moab	Mill Creek and tributaries, except Pack Creek, from the confluence with Colorado River to USFS boundary	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2014	105
						E. coli	1C:2B	Low	2016	105
					Approved TMDL	Max. Temperature	3A		1998	105
Southeast Colorado Riv	UT14030005-006_00	Mill Creek2-Moab	Mill Creek and tributaries from USFS boundary to headwaters	1	Fully Supporting					154

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Southeast Colorado Riv	UT14030005-007_00	Salt Wash	Salt Wash and tributaries from confluence with Colorado River to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2016	324
Southeast Colorado Riv	UT14030005-008_00	Grandstaff Canyon	Grandstaff Canyon from confluence with Colorado River to headwaters	2	No Evidence of Impairment					46
Southeast Colorado Riv	UT14030005-009_00	Castle Creek-1	Castle Creek and tributaries from confluence with Colorado River to Seventh-Day Adventist diversion	5	Not Supporting	Macroinvertebrates	3B	Low	2008	134
						E. coli	1C;2A	Low	2020	134
Southeast Colorado Riv	UT14030005-010_00	Onion Creek Lower	Onion Creek and tributaries from confluence with Colorado River to road crossing above Stinking Springs	5	Not Supporting	Total Dissolved Solids	4	Low	2016	44
					Approved TMDL	Max. Temperature	3B		1998	44
Southeast Colorado Riv	UT14030005-011_00	Pack Creek	Pack Creek and tributaries from the confluence with Mill Creek to USFS boundary	5	Not Supporting	Total Dissolved Solids	4	Low	2006	80
						Max. Temperature	3A	Low	2006	80
						Selenium	3A	Low	2010	80
						E. coli	1C;2B	Low	2016	80
Southeast Colorado Riv	UT14030005-012_00	Castle Creek-2	Castle Creek and tributaries from Seventh Day Adventist diversion to headwaters	3	Insufficient Data					40
Southeast Colorado Riv	UT14030005-013_00	Onion Creek Upper	Onion Creek and tributaries from road crossing above Stinking Springs to headwaters	1	Fully Supporting					43
Southeast Colorado Riv	UT14030005-014_00	Indian Creek-1	Indian Creek from confluence with North Cottonwood Creek near Dugout Ranch to northern boundary of Newspaper Rock State Park	3	Insufficient Data					81
Southeast Colorado Riv	UT14030005-015_00	North Cottonwood Creek	North Cottowood Creek and tributaries from confluence with Indian Creek near Dugout Ranch to headwaters	5	Not Supporting	Macroinvertebrates	3B	Low	2014	362
Southeast Colorado Riv	UT14030005-016_00	Salt Creek-Canyonlands	Salt Creek and tributaries from confluence with Colorado River to headwaters	3	Insufficient Data					294
Southeast Colorado Riv	UT14030005-017_00	Courthouse Wash	Harts Draw and tributaries from confluence with Indina Creek to headwaters	5	Not Supporting	Macroinvertebrates	3B	Low	2020	323
Southeast Colorado Riv	UT14030005-018_00	Courthouse Wash	Courthouse Wash and tributaries from confluence with Colorado River to headwaters	3	Insufficient Data					355
Southeast Colorado Riv	UT14030005-019_00	Professor Creek	Professor Creek and tributaries from confluence with Colrado River to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2012	109
						Max. Temperature	3B	Low	2012	109
Southeast Colorado Riv	UT14070001-003_00	Colorado River-2	Colorado River from Dirty Devil confluence to Green River confluence	1	Fully Supporting					84
Southeast Colorado Riv	UT14070001-004_00	White Canyon	Bowns Canyon from confluence with Lake Powell to headwaters	3	Insufficient Data					680
Southeast Colorado Riv	UT14070006-007_01	Lake Powell Tributaries-4-1	Lake Powell south side tributaries from Utah-Arizona state line to HUC (14070006) boundary	3	Insufficient Data					187
Southeast Colorado Riv	UT14070006-007_02	Lake Powell Tributaries-4-2	Lake Powell south side tributaries from Utah-Arizona state line to HUC (14070006) boundary	3	Insufficient Data					6

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Southeast Colorado Riv	UT14070006-007_03	Lake Powell Tributaries-4-3	Lake Powell south side tributaries from Utah-Arizona state line to HUC (14070006) boundary	3	Insufficient Data					5
Southeast Colorado Riv	UT14070006-007_04	Lake Powell Tributaries-4-4	Lake Powell south side tributaries from Utah-Arizona state line to HUC (14070006) boundary	3	Insufficient Data					6
Southeast Colorado Riv	UT14080201-001_00	Butler Wash	Butler Wash and tributaries from confluence with San Juan River to headwaters	3	Insufficient Data					167
Southeast Colorado Riv	UT14080201-002_00	Cottonwood Wash-1	Cottonwood Wash and tributaries from confluence with San Juan River to Westwater Creek confluence	2	No Evidence of Impairment					267
Southeast Colorado Riv	UT14080201-003_00	Recapture Creek-2	Recapture Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					84
Southeast Colorado Riv	UT14080201-004_00	Johnson Creek	Johnson Creek and tributaries from confluence with Recapture Creek to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2010	89
						Minimum Dissolved Oxygen	3A	Low	2014	89
Southeast Colorado Riv	UT14080201-005_00	Recapture Creek-1	Recapture Creek and tributaries from confluence with San Juan River to USFS boundary within State Jurisdiction, except Johnson Creek	5	Not Supporting	Minimum Dissolved Oxygen	3B	Low	2020	610
Southeast Colorado Riv	UT14080201-006_00	Cottonwood Wash-2	Cottonwood Wash from Westwater confluence to USFS boundary	5	Not Supporting	Radium 226, 228 (Combined)	1C	Low	1998	422
						Minimum Dissolved Oxyge	3B	Low	2012	422
					Approved TMDL	Gross Alpha	1C		1998	422
Southeast Colorado Riv	UT14080201-007_00	Cottonwood Wash-3	Cottonwood Wash and tributaries within USFS boundary	5	Not Supporting	Radium 226, 228 (Combinec	1C;4	Low	2010	468
					Approved TMDL	Gross Alpha	1C;4		2010	468
Southeast Colorado Riv	UT14080201-008_00	Westwater Creek	Westwater Creek and tributaries from confluence with Cottonwood Wash to headwaters	5	Not Supporting	Selenium	3B	Low	2012	127
						Minimum Dissolved Oxygen	3B	Low	2012	127
Southeast Colorado Riv	UT14080201-009_00	San Juan River-2	San Juan River from the confluence with Chinle Creek to the Confluence with Montezuma Creek within State Jurisdiction	5	Not Supporting	Lead	3B	Low	2016	49
						Iron	3B	Low	2016	49
						Cadmium	3B	Low	2016	49
						Macroinvertebrates	3B	Low	2020	49
						E. coli	1C;2A	Low	2020	49
Southeast Colorado Riv	UT14080201-010_00	San Juan River-3	San Juan River from the confluence with Montezuma Creek to the Utah-Colorado border	3	Insufficient Data					54
Southeast Colorado Riv	UT14080201-011_00	Comb Wash	Comb Wash and tributaries from the confluence with San Juan River to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2014	788
						Selenium	3B	Low	2014	788
						Minimum Dissolved Oxygen	3B	Low	2014	788
						Max. Temperature	3B	Low	2014	788
						Macroinvertebrates	3B	Low	2020	788
Southeast Colorado Riv	UT14080202-001_00	McElmo Creek	McElmo Creek and tributaries from the confluence with San Juan River to Utah-Colorado state line within State Jurisdiction	3	Insufficient Data					202

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Southeast Colorado Riv	UT14080203-001_00	Verdure Creek-1	Verdure Creek and tributaries from confluence with Montezuma Creek to U.S.191	5	Not Supporting	Macroinvertebrates	3A	Low	2020	32
Southeast Colorado Riv	UT14080203-002_00	Verdure Creek-2	Verdure Creek and tributaries from U.S. 191 to headwaters	2	No Evidence of Impairment					66
Southeast Colorado Riv	UT14080203-003_00	Montezuma Creek-2	Montezuma Creek and tributaries from Verdure Creek confluence to U.S. 191	5	Not Supporting	Macroinvertebrates	3A	Low	2020	148
Southeast Colorado Riv	UT14080203-004_00	South Creek	South Creek and tributaries from confluence with Montezuma creek to headwaters	1	Fully Supporting					47
Southeast Colorado Riv	UT14080203-005_01	Montezuma Creek-1-1	Montezuma Creek and all other tributaries not defined, from U.S. 191 to headwaters	2	No Evidence of Impairment					58
Southeast Colorado Riv	UT14080203-005_02	Montezuma Creek-1-2	Montezuma Creek and all other tributaries not defined, from U.S. 191 to headwaters	2	No Evidence of Impairment					25
Southeast Colorado Riv	UT14080203-006_00	Spring Creek	Spring Creek and tributaries from confluence with Vega Creek to headwaters	3	Insufficient Data					68
Southeast Colorado Riv	UT14080203-007_00	Montezuma Creek-3	Montezuma Creek from San Juan River confluence to Verdure Creek confluence<U+00A0>within State Jurisdiction	5	Not Supporting	Selenium	3B	Low	2014	2025
Southeast Colorado Riv	UT14080203-008_00	North Creek	North Creek and tributaries from confluence with Montezuma Creek to headwaters	3	Insufficient Data					37
Southeast Colorado Riv	UT14080205-001_00	San Juan River-1	San Juan River from Lake Powell to confluence with Chinle Creek within State Jurisdiction	5	Not Supporting	Max.Temperature E. coli	3B 1C;2A	Low Low	2020 2020	97 97
Southeast Colorado Riv	UT14080205-002_00	Grand Gulch	Grand Gulch and tributaries from San Juan River confluence to headwaters	3	Insufficient Data					493
Southeast Colorado Riv	UT14080205-003_00	San Juan River-1 Triburaries	San Juan River north side tributaries from Lake Powell to confluence with Chinle Creek	5	Not Supporting	Total Dissolved Solids	4	Low	2012	573

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Uinta Basin	UT14040106-001_00	Dahlgreen Creek	Dahlgreen Creek and tributaries from Utah-Wyoming state line to headwaters	2	No Evidence of Impairment					48
Uinta Basin	UT14040106-002_00	Henrys Fork River	Henrys Fork River and tributaries from Utah-Wyoming state line to headwaters	3	Insufficient Data					122
Uinta Basin	UT14040106-003_00	West Fork Beaver Creek	West Fork Beaver Creek and tributaries from Utah-Wyoming state line to headwaters	5	Not Supporting	Aluminum	3A	Low	2014	51
Uinta Basin	UT14040106-004_00	Middle Fork Beaver Creek	Middle Fork Beaver Creek and tributaries from Utah-Wyoming state line to headwaters	5	Not Supporting	Aluminum	3A	Low	2014	84
Uinta Basin	UT14040106-005_00	Burnt Fork Creek	Burnt Fork Creek and tributaries from Utah-Wyoming state line to headwaters	1	Fully Supporting					100
Uinta Basin	UT14040106-006_00	Birch Creek-tribs	Birch Creek tributaries Utah-Wyoming state line to headwaters	3	Insufficient Data					133
Uinta Basin	UT14040106-007_00	Sheep Creek	Sheep Creek and tributaries from Flaming Gorge Reservoir to headwaters	3	Insufficient Data					264
Uinta Basin	UT14040106-008_01	Green River-1 Tribs-1	Green River perennial tributaries to Green River-1 (UT14040106-019) not specifially defined	1	Fully Supporting					82
Uinta Basin	UT14040106-008_02	Green River-1 Tribs-2	Green River perennial tributaries to Green River-1 (UT14040106-019) not specifially defined	1	Fully Supporting					29
Uinta Basin	UT14040106-008_03	Green River-1 Tribs-3	Green River perennial tributaries to Green River-1 (UT14040106-019) not specifially defined	1	Fully Supporting					75
Uinta Basin	UT14040106-008_04	Green River-1 Tribs-4	Green River perennial tributaries to Green River-1 (UT14040106-019) not specifially defined	1	Fully Supporting					7
Uinta Basin	UT14040106-008_05	Green River-1 Tribs-5	Green River perennial tributaries to Green River-1 (UT14040106-019) not specifially defined	1	Fully Supporting					8
Uinta Basin	UT14040106-009_00	Birch Spring Draw	Birch Spring Draw and tributaries from Flaming Gorge Reservoir to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2012	146
						Selenium	3C;4	Low	2012	146
Uinta Basin	UT14040106-010_00	Carter Creek	Carter Creek and tributaries from Flaming Gorge Reservoir to headwaters	5	Not Supporting	Aluminum	3A	Low	2014	199
Uinta Basin	UT14040106-011_00	Eagle Creek	Eagle Creek and tributaries from Flaming Gorge Reservoir to headwaters	1	Fully Supporting					25
Uinta Basin	UT14040106-012_01	Flaming Gorge Tributaries-1	Flaming Gorge Reservoir tributaries not defined separately	3	Insufficient Data					14
Uinta Basin	UT14040106-012_02	Flaming Gorge Tributaries-2	Flaming Gorge Reservoir tributaries not defined separately	3	Insufficient Data					34
Uinta Basin	UT14040106-012_03	Flaming Gorge Tributaries-3	Flaming Gorge Reservoir tributaries not defined separately	3	Insufficient Data					0
Uinta Basin	UT14040106-012_04	Flaming Gorge Tributaries-4	Flaming Gorge Reservoir tributaries not defined separately	2	No Evidence of Impairment					70
Uinta Basin	UT14040106-013_00	Spring Creek	Spring Creek and tributaries from Flaming Gorge Reservoir to Utah-Wyoming state line	3	Insufficient Data					59
Uinta Basin	UT14040106-014_00	Cart Creek	Cart Creek and tributaries from Flaming Gorge Reservoir to headwaters	5	Not Supporting	Aluminum	3A	Low	2014	52
						Minimum Dissolved Oxygen	3A	Low	2020	52

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Uinta Basin	UT14040106-015_00	Gorge Creek	Gorge Creek and tributaries from Green River confluence to headwaters	2	No Evidence of Impairment					16
Uinta Basin	UT14040106-016_00	Davenport Creek	Davenport Creek and tributaries from Green River confluence to headwaters	1	Fully Supporting					18
Uinta Basin	UT14040106-017_00	Goslin Creek	Goslin Creek and tributaries from Green River confluence to headwaters	1	Fully Supporting					15
Uinta Basin	UT14040106-018_00	Red Creek	Red Creek and tributaries from Green River confluence to headwaters	5	Not Supporting	Macroinvertebrates	3C	Low	2020	105
Uinta Basin	UT14040106-019_00	Green River-1	Green River from Utah-Colorado state line to Flaming Gorge Reservoir	1	Fully Supporting					60
Uinta Basin	UT14040106-020_00	Jackson Creek	Jackson Creek and tributaries from Green River confluence to headwaters	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2020	35
Uinta Basin	UT14040106-021_00	Pot Creek	Pot Creek and tributaries from Crouse reservoir to headwaters	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2014	105
						Iron	3A	Low	2014	105
						Aluminum	3A	Low	2014	105
						E. coli	2B	Low	2020	105
Uinta Basin	UT14040106-022_00	Sears Creek	Sears Creek and tributaries from Green River confluence to headwaters	1	Fully Supporting					21
Uinta Basin	UT14040106-023_00	Pot Creek Lower	Pot Creek from Utah-Colorado state line to Crouse Reservoir outlet	3	Insufficient Data					69
Uinta Basin	UT14040106-024_00	Willow Creek - Daggett	Willow Creek and tributaries from confluence with Green River to headwaters (Dagget Co.)	1	Fully Supporting					51
Uinta Basin	UT14040106-025_00	O-Wi-Yu-Kuts Creek	O-Wi-Yu-Kuts Creek and tributaries from Willow Creek confluence to Utah-Colorado state line	3	Insufficient Data					5
Uinta Basin	UT14040106-026_00	Tolivers Creek	Tolivers Creek from confluence with Green River to headwaters	2	No Evidence of Impairment					12
Uinta Basin	UT14040106-027_00	Beaver Creek	Beaver Creek and tributaries (east of Willow Creek near 3 corners) from Colorado-Utah state line to Utah-Colorado state line	2	No Evidence of Impairment					10
Uinta Basin	UT14040107-001_00	Blacks Fork	Blacks Fork River and tributaries from Utah-Wyoming state line at Meeks Cabin Reservoir to headwaters	5	Not Supporting	Aluminum	3A	Low	2014	229
Uinta Basin	UT14040107-002_00	Archie Creek	Archie Creek and tributaries from Utah-Wyoming state line to headwaters	2	No Evidence of Impairment					15
Uinta Basin	UT14040107-003_00	West Fork Smiths Fork	West Fork Smiths Fork and tributaries from Utah-Wyoming state line to headwaters	2	No Evidence of Impairment					29
Uinta Basin	UT14040107-004_00	Gilbert Creek	Gilbert Creek and tributaries from Utah-Wyoming state line to headwaters	3	Insufficient Data					30
Uinta Basin	UT14040107-005_00	East Fork Smiths Fork	East Fork Smiths Fork and tributaries from Utah-Wyoming state line to headwaters	5	Not Supporting	Zinc	3A	Low	2014	89
						Aluminum	3A	Low	2014	89
Uinta Basin	UT14040108-001_00	West Muddy Creek	West Muddy Creek and tributaries from Utah-Wyoming state line to headwaters	3	Insufficient Data					15
Uinta Basin	UT14050007-001_00	White River	White River from confluence with Green River to Utah-Colorado state line	3	Insufficient Data					2093

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Uinta Basin	UT14050007-002_00	Bitter Creek Lower	Bitter Creek and tributaries from White River confluence to start of perennial stream (excluding Sweetwater Creek)	5	Not Supporting	Total Dissolved Solids	4	Low	2014	245
						Selenium	3A	Low	2014	245
						Max. Temperature	3A	Low	2014	245
						Boron	4	Low	2014	245
						Minimum Dissolved Oxygen	3A	Low	2020	245
Uinta Basin	UT14050007-003_00	Evacuation Creek	Evacuation Creek and tributaries from the confluence with White River to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2008	336
						Selenium	3B	Low	2014	336
						Max. Temperature	3B	Low	2014	336
						Boron	4	Low	2014	336
Uinta Basin	UT14050007-004_00	Sweetwater Creek	Sweetwater Creek and tributaries from Bitter Creek confluence to headwaters	3	Insufficient Data					379
Uinta Basin	UT14050007-005_00	Bitter Creek Upper	Bitter Creek and tributaries from upper portion that is perennial	5	Not Supporting	Total Dissolved Solids	4	Low	2014	352
						Max. Temperature	3A	Low	2014	352
Uinta Basin	UT14060001-001_01	Green River-2 Tribs-1	Green River tributaries from Duchesne River confluence to Utah-Wyoming border, except Ashley, Brush, and Jones Hole Creeks	5	Not Supporting	E. coli	1C;2A	Low	2014	42
Uinta Basin	UT14060001-001_02	Green River-2 Tribs-2	Green River tributaries from Duchesne River confluence to Utah-Wyoming border, except Ashley, Brush, and Jones Hole Creeks	5	Not Supporting	E. coli	1C;2A	Low	2014	537
						E. coli	2B	Low	2020	537
Uinta Basin	UT14060001-001_03	Green River-2 Tribs-3	Green River tributaries from Duchesne River confluence to Utah-Wyoming border, except Ashley, Brush, and Jones Hole Creeks	5	Not Supporting	E. coli	1C;2A	Low	2014	225
Uinta Basin	UT14060001-001_04	Green River-2 Tribs-4	Green River tributaries from Duchesne River confluence to Utah-Wyoming border, except Ashley, Brush, and Jones Hole Creeks	5	Not Supporting	E. coli	1C;2A	Low	2014	867
Uinta Basin	UT14060001-002_00	Jones Hole Creek	Jones Hole Creek and tributaries from confluence with Green River to headwaters	1	Fully Supporting					34
Uinta Basin	UT14060001-003_00	Diamond Gulch	Diamond Gulch and tributaries from near Jones Hole Creek to headwaters	5	Not Supporting	Aluminum	3A	Low	2014	140
						E. coli	2B	Low	2020	140
Uinta Basin	UT14060001-004_00	Green River-2	Green River from Duchesne River confluence to Utah-Wyoming border	5	Not Supporting	Selenium	3B	Low	2014	99
Uinta Basin	UT14060002-001_00	Ashley Creek Lower	Ashley Creek and tributaries from Green River confluence to Vernal sewage lagoons	5	Not Supporting	Total Dissolved Solids	4	Low	1992	173
						Selenium	3B;4	Low	1992	173
Uinta Basin	UT14060002-002_00	Middle Ashley Creek	Ashley Creek and tributaries from Vernal sewage lagoons to Dry Fork confluence	5	Not Supporting	Total Dissolved Solids	4	Low	2008	413
						Selenium	3B	Low	2008	413
						Aluminum	3B	Low	2014	413
						E. coli	2B	Low	2020	413

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Uinta Basin	UT14060002-003_00	Brush Creek	Brush Creek and tributaries from confluence with Green River to Red Fleet Dam but excluding Little Brush Creek	5	Not Supporting	Selenium	3B	Low	2004	282
						E. coli	2B	Low	2014	282
Uinta Basin	UT14060002-004_00	Little Brush Creek Lower	Little Brush Creek and tributaries from Big Brush Creek confluence to mouth of Little Brush Creek Gorge	3	Insufficient Data					76
Uinta Basin	UT14060002-005_00	Little Brush Creek Upper	Little Brush Creek and tributaries from mouth of Little Brush Creek Gorge to headwaters	5	Not Supporting	Aluminum	3B	Low	2014	84
Uinta Basin	UT14060002-006_00	Big Brush Creek	Big Brush Creek and tributaries from Red Fleet Reservoir to headwaters	5	Not Supporting	Aluminum	3A	Low	2014	211
Uinta Basin	UT14060002-007_00	Ashley Creek Upper	Ashley Creek and tributaries from Dry Fork confluence to headwaters (exclude Dry Fork)	5	Not Supporting	Aluminum	3A	Low	2014	230
Uinta Basin	UT14060002-008_00	Dry Fork Creek Lower	Dry Fork and tributaries from confluence with Ashley Creek to USFS boundary	3	Insufficient Data					60
Uinta Basin	UT14060002-009_00	Dry Fork Creek Upper	Dry Fork and tributaries from U.S. Forest Service boundary to headwaters	2	No Evidence of Impairment					153
Uinta Basin	UT14060003-001_00	Duchesne River-1	Duchesne River and tributaries from Green River confluence to Uinta River confluence	5	Not Supporting	E. coli	2B	Low	2014	244
					Approved TMDL	Total Dissolved Solids	4		1998	244
Uinta Basin	UT14060003-002_00	Duchesne River-2	Duchesne River and tributaries from confluence with Uinta River to Myton	5	Not Supporting	E. coli	2B	Low	2014	248
						Boron	4	Low	2016	248
					Approved TMDL	Total Dissolved Solids	4		2016	248
Uinta Basin	UT14060003-003_00	Uinta River-1	Uinta River and tributaries from Duchesne River confluence upstream to Dry Gulch confluence	4A	Approved TMDL	Total Dissolved Solids	4		2016	36
Uinta Basin	UT14060003-004_00	Uinta River-2	Uinta River and tributaries from Dry Gulch confluence upstream to U.S. Highway 40	4A	Approved TMDL	Total Dissolved Solids	4		1998	104
Uinta Basin	UT14060003-005_00	Antelope Creek	Antelope Creek and tributaries from Duchesne River confluence to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	1998	509
						Boron	4	Low	2008	509
						Selenium	3A	Low	2014	509
						Arsenic	1C;HH1C	Low	2014	509
Uinta Basin	UT14060003-006_00	Duchesne River-3	Duchesne River from Myton to Strawberry River confluence	2	No Evidence of Impairment					381
Uinta Basin	UT14060003-007_00	Zimmerman Wash	Zimmerman Wash from confluence with Lake Fork River to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2020	147
Uinta Basin	UT14060003-008_00	Lake Fork-1	Lake Fork River and tributaries from Duchesne River confluence to Pigeon Water Creek confluence	5	Not Supporting	Max. Temperature	3A	Low	2000	163
						Aluminum	3A	Low	2014	163
						Minimum Dissolved Oxygen	3A	Low	2020	163
						Macroinvertebrates	3A	Low	2020	163
					Approved TMDL	Total Dissolved Solids	4		2004	163
Uinta Basin	UT14060003-009_00	Dry Gulch Creek	Dry Gulch Creek and tributaries from Duchesne River confluence to headwaters	5	Not Supporting	E. coli	2B	Low	2014	1344
					Approved TMDL	Total Dissolved Solids	4		1998	1344

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Uinta Basin	UT14060003-010_00	Uinta River-3	Uinta River and tributaries from U.S. Highway 40 to USFS boundary, excluding all of Whiterocks River and Farm, Pole, and Deep Creeks	3	Insufficient Data					590
Uinta Basin	UT14060003-011_00	Whiterocks River Lower	Whiterocks River and tributaries from confluence with Uintah River to Tridell Water Treatment Plant	2	No Evidence of Impairment					69
Uinta Basin	UT14060003-012_00	Deep Creek - Uinta	Deep Creek and tributaries from Uintah River confluence to headwaters	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2014	261
Uinta Basin	UT14060003-013_00	Whiterocks River Upper	Whiterocks River and tributaries from Tridell Water Treatment Plant to headwaters	3	Insufficient Data					143
Uinta Basin	UT14060003-014_00	Pole Creek	Pole and Farm Creeks and their tributaries from their Uinta River confluence to headwaters, and Cart Hollow above USFS boundary	3	Insufficient Data					155
Uinta Basin	UT14060003-015_00	Lake Fork-2	Lake Fork River and tributaries from Pigeon Water Creek confluence to Yellowstone River confluence (includes Pigeon Water Creek and Yellowstone River to USFS boundary)	1	Fully Supporting					396
Uinta Basin	UT14060003-016_00	Rock Creek Lower	Rock Creek and tributaries from confluence with Duchesne River to USFS boundary	3	Insufficient Data					192
Uinta Basin	UT14060003-017_00	Duchesne River-4	Duchesne River and tributaries from Strawberry River confluence to West Fork Duchesne River confluence, excluding Rock Creek	3	Insufficient Data					567
Uinta Basin	UT14060003-018_00	West Fork Duchesne	West Fork Duchesne River and tributaries from confluence with Duchesne River to headwaters	5	Not Supporting	pH	1C;2B;3A;4	Low	2020	183
Uinta Basin	UT14060003-019_00	North Fork Duchesne	North Fork Duchesne River and tributaries from Duchesne River confluence to headwaters	5	Not Supporting	Aluminum	3A	Low	2014	120
Uinta Basin	UT14060003-020_00	Rock Creek Upper	Rock Creek and tributaries from USFS boundary to headwaters	5	Not Supporting	Aluminum	3A	Low	2014	173
Uinta Basin	UT14060003-021_00	Moon Lake Tributaries	Moon Lake tributaries	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2014	161
Uinta Basin	UT14060003-022_00	Lake Fork-3	Lake Fork River and tributaries from Yellowstone River confluence to Moon Lake	3	Insufficient Data					92
Uinta Basin	UT14060003-023_00	Yellowstone Upper	Yellowstone River and tributaries from USFS boundary to headwaters	2	No Evidence of Impairment					167
Uinta Basin	UT14060003-024_00	Uinta River-4	Uinta River and tributaries from USFS boundary to headwaters	5	Not Supporting	Zinc	3A	Low	2014	165
						pH	2B;3A;4	Low	2014	165
						Aluminum	3A	Low	2014	165
Uinta Basin	UT14060004-001_00	Strawberry River-1	Strawberry River from confluence with Duchesne River to Starvation Dam	1	Fully Supporting					41
Uinta Basin	UT14060004-002_00	Indian Canyon Creek	Indian Canyon Creek and tributaries from Strawberry River confluence to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	1998	276
						Boron	4	Low	2008	276
						Arsenic	1C;HH1C	Low	2008	276
						Selenium	3A	Low	2014	276
Uinta Basin	UT14060004-003_01	Starvation Tributaries-1	Starvation Reservoir tributaries except Strawberry River	2	No Evidence of Impairment					69

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Uinta Basin	UT14060004-003_02	Starvation Tributaries-2	Starvation Reservoir tributaries except Strawberry River	5	Not Supporting	Total Dissolved Solids	4	Low	2020	248
						Max. Temperature	3A	Low	2020	248
Uinta Basin	UT14060004-004_00	Stawberry River-2	Strawberry River and tributaries from Starvation Reservoir to Avintaquin Creek confluence, excluding Red Creek and tributaries	5	Not Supporting	Arsenic	1C;HH1C	Low	2020	310
Uinta Basin	UT14060004-005_00	Avintaquin Creek	Avintaquin Creek and tributaries from Strawberry River confluence to headwaters	5	Not Supporting	Arsenic	1C;HH1C	Low	2008	308
Uinta Basin	UT14060004-006_00	Red Creek Lower	Red Creek and tributaries from Strawberry River confluence to Currant Creek Confluence	1	Fully Supporting					30
Uinta Basin	UT14060004-007_00	Red Creek Middle	Red Creek and tributaries from Current Creek confluence to Red Creek Reservoir	5	Not Supporting	Macroinvertebrates	3A	Low	2020	217
Uinta Basin	UT14060004-008_00	Red Creek Upper	Red Creek Reservoir tributaries	3	Insufficient Data					91
Uinta Basin	UT14060004-009_00	Currant Creek Lower	Current Creek and tributaries from Red Creek confluence to Current Creek Reservoir	3	Insufficient Data					280
Uinta Basin	UT14060004-010_00	Strawberry River-3	Strawberry River and tributaries, except Willow Creek and Timber Canyon, from Avintaquin Creek confluence to Strawberry Reservoir	5	Not Supporting	Macroinvertebrates	3A	Low	2014	182
Uinta Basin	UT14060004-011_00	Timber Canyon Creek	Timber Canyon Creek and tributaries from confluence with Strawberry River to headwaters	5	Not Supporting	Arsenic	1C;HH1C	Low	2014	123
Uinta Basin	UT14060004-012_00	Willow Creek - Wasatch	Willow Creek and tributaries from confluence with Strawberry River to headwaters	2	No Evidence of Impairment					83
Uinta Basin	UT14060004-013_00	Strawberry-4	Strawberry Reservoir tributaries other than Strawberry River	5	Not Supporting	pH	1C;2B;3A;4	Low	2014	281
						Minimum Dissolved Oxygen*	3A	Low	2014	281
Uinta Basin	UT14060004-014_00	Strawberry River Upper	Strawberry River and tributaries from Strawberry Reservoir to headwaters	3	Insufficient Data					144
Uinta Basin	UT14060004-015_00	Currant Creek Upper	Currant Creek Reservoir tributaries	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2014	107
Uinta Basin	UT14060005-001_01	Green River-3 Tribs-1	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined	3	Insufficient Data					110
Uinta Basin	UT14060005-001_02	Green River-3 Tribs-2	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined	3	Insufficient Data					4
Uinta Basin	UT14060005-001_03	Green River-3 Tribs-3	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined	3	Insufficient Data					503
Uinta Basin	UT14060005-001_04	Green River-3 Tribs-4	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined	3	Insufficient Data					954
Uinta Basin	UT14060005-001_05	Green River-3 Tribs-5	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined	3	Insufficient Data					369
Uinta Basin	UT14060005-001_06	Green River-3 Tribs-6	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined	3	Insufficient Data					148

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Uinta Basin	UT14060005-001_07	Green River-3 Tribs-7	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined	3	Insufficient Data					40
Uinta Basin	UT14060005-001_08	Green River-3 Tribs-8	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined	3	Insufficient Data					218
Uinta Basin	UT14060005-002_00	Pariette Draw Creek	Pariette Draw Creek and tributaries from Green River confluence to headwaters	5	Not Supporting	Max. Temperature	3B	Low	2014	1083
						Minimum Dissolved Oxygen	3B;3D	Low	2020	1083
					Approved TMDL	Total Dissolved Solids	4		1998	1083
						Selenium	3B;3D		1998	1083
						Boron	4		1998	1083
Uinta Basin	UT14060005-003_00	Ninemile	Ninemile Creek and tributaries from Green River confluence to headwaters	4A	Approved TMDL	Max. Temperature	3A		2020	1053
Uinta Basin	UT14060005-004_00	Range Creek Upper	Range Creek and tributaries from Range Creek Pumping Station to headwaters	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2016	23
Uinta Basin	UT14060005-005_00	Range Creek Middle	Range Creek and tributaries from ranch diversion to Range Creek Pumping Station	2	No Evidence of Impairment					213
Uinta Basin	UT14060005-006_00	Range Creek Lower	Range Creek and tributaries from confluence with Green River to ranch diversion	2	No Evidence of Impairment					116
Uinta Basin	UT14060005-007_00	Florence Creek	Florence Creek and tributaries from Green River confluence to headwaters	3	Insufficient Data					101
Uinta Basin	UT14060005-008_00	Rock Creek	Rock Creek from Green River confluence to headwaters	3	Insufficient Data					120
Uinta Basin	UT14060005-009_00	Green River-3	Green River from Price River confluence to Duchesne River confluence (Green River in HUC 14060005)	5	Not Supporting	pH	1C;2B;3B;4	Low	2020	221
Uinta Basin	UT14060006-001_00	Willow Creek	Willow Creek and tributaries from Geen River confluence to Meadow Creek confluence (excluding Hill Creek)	5	Not Supporting	Boron	4	Low	2014	1035
						Total Dissolved Solids	4	Low	2020	1035
Uinta Basin	UT14060006-002_00	Willow Creek Upper	Willow Creek and tributaries from, and including, Meadow Creek confluence to headwaters	2	No Evidence of Impairment					500
Uinta Basin	UT14060006-003_00	Hill Creek	Hill Creek and tributaries from Willow Creek confluence to headwaters	3	Insufficient Data					782
Uinta Basin	UT14060008-001_00	Green River-4	Green River from San Rafael confluence to Price River confluence	1	Fully Supporting					119
Uinta Basin	UT14060008-002_00	Green River-5	Green River from confluence with Colorado River to San Rafael confluence	3	Insufficient Data					148
Uinta Basin	UT14060008-003_00	Green River-5 Tributaries	Thompson Creek and tributaries from I-70 to headwaters	1	Fully Supporting					69
Uinta Basin	UT14060008-004_00	Floy Creek	Flow Wash and tributaries from confluence with Little Grand Wash to headwaters	2	No Evidence of Impairment					165

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Uinta Basin	UT14060008-005_00	Horse Canyon-Canyonlands	Horse Canyon and tributaries from confluence with Green River to headwaters	3	Insufficient Data					192
Uinta Basin	UT14060008-006_00	Barrier Creek	Barrier Creek and tributaries from confluence with Green River to headwaters	3	Insufficient Data					299
Uinta Basin	UT14060008-007_00	Ten Mile Canyon - Grand	Ten mile canyon and tribs from confluence with Green River to confluence with Thompson Wash	5	Not Supporting	Minimum Dissolved Oxygen	3B	Low	2014	153
						Max. Temperature	3B	Low	2014	153

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Upper Provo River	UT16020203-002_00	Provo River-2	Provo River from Murdock Diversion to Olmstead Diversion	3	Insufficient Data					4
Upper Provo River	UT16020203-003_00	Provo River-3	Provo River from Olmstead Diversion to Deer Creek Reservoir	5	Not Supporting	Macroinvertebrates	3A	Low	2020	2
Upper Provo River	UT16020203-004_00	Provo River-4	Provo River from Deer Creek Reservoir to Jordanelle Reservoir	5	Not Supporting	E. coli	1C;2B	High	2010	19
Upper Provo River	UT16020203-005_00	Provo River-5	Provo River from Jordanelle Reservoir to Woodland	5	Not Supporting	Aluminum	3A	Low	2016	10
Upper Provo River	UT16020203-006_01	Provo River-6-1	Provo River and tributaries from Woodland to headwaters, except Little South Fork and Upper South Fork	5	Not Supporting	Zinc	3A	Low	2014	35
						Aluminum	3A	Low	2014	35
Upper Provo River	UT16020203-006_02	Provo River-6-2	Provo River and tributaries from Woodland to headwaters, except Little South Fork and Upper South Fork	5	Not Supporting	Zinc	3A	Low	2014	39
						Aluminum	3A	Low	2014	39
Upper Provo River	UT16020203-006_03	Provo River-6-3	Provo River and tributaries from Woodland to headwaters, except Little South Fork and Upper South Fork	5	Not Supporting	Zinc	3A	Low	2014	42
						Aluminum	3A	Low	2014	42
						pH	1C;2B;3A;4	Low	2020	42
						Copper	3A	Low	2020	42
Upper Provo River	UT16020203-007_00	South Fork Provo River	Lower South Fork Provo River and tributaries from confluence with Provo River to headwaters	1	Fully Supporting					17
Upper Provo River	UT16020203-008_00	North Fork Provo River	North Fork Provo River and tributaries from confluence with Provo River to headwaters	3	Insufficient Data					10
Upper Provo River	UT16020203-009_00	Main Creek-1	Main Creek and tributaries from Deer Creek Reservoir to Round Valley	5	Not Supporting	E. coli	1C;2B	Low	2010	11
						Macroinvertebrates	3A	Low	2016	11
						Max. Temperature	3A	Low	2020	11
Upper Provo River	UT16020203-010_00	Main Creek-2	Main Creek and tributaries from Round Valley to headwaters	5	Not Supporting	E. coli	1C;2B	Low	2016	54
Upper Provo River	UT16020203-011_00	Daniels Creek-1	Daniels Creek and tributaries from confluence with Deer Creek Reservoir to Whiskey Springs	1	Fully Supporting					26
Upper Provo River	UT16020203-012_00	Daniels Creek-2	Daniels Creek and tributaries from Whiskey Springs to headwaters	2	No Evidence of Impairment					15
Upper Provo River	UT16020203-013_00	Provo Deer Creek	Provo Deer Creek and tributaries from confluence with Provo River to headwaters	5	Not Supporting	Macroinvertebrates	3A	Low	2008	27
Upper Provo River	UT16020203-014_00	Snake Creek-1	Snake Creek from confluence with Provo River to Wasatch Mountain State Park Golf Course	5	Not Supporting	Arsenic	1C;HH1C	High	2006	5
Upper Provo River	UT16020203-015_00	Snake Creek-2	Snake Creek and tributaries from Wasatch Mountain State Park to headwaters	5	Not Supporting	E. coli	1C;2B	Low	2020	24
Upper Provo River	UT16020203-016_00	McHenry Creek	McHenry Creek and tributaries from Jordanelle Reservoir to headwaters	5	Not Supporting	Cadmium	3A	Low	2014	1
Upper Provo River	UT16020203-017_00	Little South Fork Provo	Little South Fork Provo River and tributaries from confluence with Provo River to headwaters	2	No Evidence of Impairment					31
Upper Provo River	UT16020203-018_00	South Fork Provo	Upper South Fork Provo River and tributaries from confluence with Provo River to headwaters	3	Insufficient Data					34

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Upper Provo River	UT16020203-019_00	Lake Creek-2	Lake Creek and tributaries above Timber Creek confluence to headwaters	1	Fully Supporting					23
Upper Provo River	UT16020203-020_00	Lost Creek and tributaries from confluence with Provo River	HUC: 16020203 (across Provo Canyon from Bridal Veil Falls)	3	Insufficient Data					2
Upper Provo River	UT16020203-021_00	Upper Falls Drainage	Upper Falls above Bridal Veil Falls	3	Insufficient Data					0
Upper Provo River	UT16020203-022_00	Bridal Veil Falls	Bridal Veil Falls from falls to headwaters	3	Insufficient Data					0
Upper Provo River	UT16020203-023_00	Provo Lower Tributaries	HUC: 16020203	3	Insufficient Data					0
Upper Provo River	UT16020203-024_00	Rock Canyon	Rock Canyon and tributaries from mouth to headwaters	3	Insufficient Data					5
Upper Provo River	UT16020203-025_00	Provo Canyon	HUC: 16020203	3	Insufficient Data					0
Upper Provo River	UT16020203-026_00	Heber Valley	Provo River east side tributaries from Daniels Creek to Little South Fork except Lake Creek	5	Not Supporting	E. coli	1C;2B	Low	2020	83
Upper Provo River	UT16020203-027_00	Spring Creek-Heber	Spring Creek and tributaries from confluence with Provo River to headwaters	5	Not Supporting	E. coli	1C;2B	Low	2016	36
Upper Provo River	UT16020203-028_01	Provo Tributaries-Heber-1	Provo River west side tributaries from Deer Creek Dam to Jordanelle Dam except Snake Creek	3	Insufficient Data					14
Upper Provo River	UT16020203-028_02	Provo Tributaries-Heber-2	Provo River west side tributaries from Deer Creek Dam to Jordanelle Dam except Snake Creek	3	Insufficient Data					16

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Upper Sevier River	UT16030001-001_00	Piute West	Piute Reservoir west side tributaries (City Creek) above USFS boundary and south of HUC boundary 16030003	3	Insufficient Data					17
Upper Sevier River	UT16030001-002_00	Sevier River-4	Sevier River and tributaries from Piute Reservoir to Circleville Irrigation Diversion, excluding East Fork Sevier River and tributaries	3	Insufficient Data					77
Upper Sevier River	UT16030001-004_00	Bear Creek	Bear Creek and tributaries from confluence with Sevier River to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2014	27
						Copper	3A;4	Low	2014	27
						E. coli	2B	Low	2020	27
Upper Sevier River	UT16030001-005_00	Sevier River-3	Sevier River and tributaries from Circleville Irrigation Diversion to Horse Valley Diversion	4A	Approved TMDL	Total Phosphorus as P	3A		1998	72
						Sediment	3C		1998	72
Upper Sevier River	UT16030001-006_00	Panguitch Creek-2	Panguitch Creek and tributaries from confluence with Sevier River to Panguitch Reservoir	5	Not Supporting	E. coli	2B	Low	2020	60
Upper Sevier River	UT16030001-007_00	Sevier River-2	Sevier River and east side tributaries from Horse Valley Bridge Diversion upstream to Long Canal	5	Not Supporting	Macroinvertebrates	3A	Low	2014	134
						Max. Temperature	3A	Low	2020	134
					Approved TMDL	Total Phosphorus as P	3A		2002	134
						Sediment	3C		2002	134
Upper Sevier River	UT16030001-008_00	Panguitch Creek-1	Panguitch Creek and tributaries and all other tributaries to Panguitch Reservoir to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2014	32
Upper Sevier River	UT16030001-009_00	Mammoth Creek Lower	Mammoth Creek and tributaries from confluence with Sevier River to Mammoth Spring confluence	4A	Approved TMDL	Total Phosphorus as P	3A		2004	33
Upper Sevier River	UT16030001-010_00	Duck Creek	Duck Creek and tributaries from mouth to headwaters	3	Insufficient Data					22
Upper Sevier River	UT16030001-011_00	Asay Creek	Asay Creek and tributaries from confluence with Sevier River to Headwaters	1	Fully Supporting					87
Upper Sevier River	UT16030001-012_00	Sevier River-1	Sevier River and tributaries from Long Canal to Mammoth Creek confluence	5	Not Supporting	Max. Temperature	3A	Low	2008	58
Upper Sevier River	UT16030001-013_00	Piute	Piute Reservoir tributaries below USFS boundary and excluding Sevier River inlet	3	Insufficient Data					13
Upper Sevier River	UT16030001-014_00	Threemile Creek	Threemile Creek and other Sevier River west side tributaries from Horse Valley Diversion upstream to Long Canal, excluding Panquitch and Bear Creeks	5	Not Supporting	Max. Temperature	3A	Low	2008	76
Upper Sevier River	UT16030001-015_00	Mammoth Creek Upper	Mammoth Creek and tributaries from confluence with Mammoth Spring to headwaters	3	Insufficient Data					32
Upper Sevier River	UT16030002-001_00	Otter Creek-4	Otter Creek and tributaries from Koosharem Reservoir to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2008	36
						E. coli	2B	Low	2016	36
Upper Sevier River	UT16030002-002_00	Otter Creek-1	Otter Creek and tributaries from Otter Creek Reservoir to Koosharem Reservoir, except Box and Greenwich Creeks	5	Not Supporting	Max. Temperature	3A	Low	2008	122
						Macroinvertebrates	3A	Low	2008	122

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Upper Sevier River	UT16030002-003_00	Otter Creek-3	Greenwich Creek and tributaries from confluence with Otter Creek to headwaters	4A	Approved TMDL	Total Phosphorus as P	3A		1998	32
						Sediment	3A		1998	32
Upper Sevier River	UT16030002-004_00	Otter Creek-2	Box Creek and tributaries from confluence with Otter Creek to headwaters	4A	Approved TMDL	Total Phosphorus as P	3A		1998	39
						Sediment	3A		1998	39
						Minimum Dissolved Oxyg	3A		2012	39
					Non-Pollutant	Habitat	3A		1998	39
Upper Sevier River	UT16030002-005_00	East Fork Sevier River-4	East Fork Sevier River and tributaries from confluence with Sevier River upstream to Antimony Creek confluence, excluding Otter Creek and tributaries	5	Not Supporting	Max. Temperature	3A	Low	2006	56
					Approved TMDL	Total Phosphorus as P	3A		2000	56
Upper Sevier River	UT16030002-006_00	East Fork Sevier-3	East Fork Sevier River and tributaries from Antimony Creek confluence to Deer Creek confluence	5	Not Supporting	Macroinvertebrates	3A	Low	2010	82
Upper Sevier River	UT16030002-007_00	Deer Creek	Deer Creek and tributaries from confluence with East Fork Sevier River to headwaters	3	Insufficient Data					29
Upper Sevier River	UT16030002-008_00	Antimony Creek	Antimony Creek and tributaries from confluence with Sevier River to headwaters	1	Fully Supporting					33
Upper Sevier River	UT16030002-009_00	East Fork Sevier-2	East Fork Sevier River and tributaries from Deer Creek confluence to Tropic Reservoir	5	Not Supporting	Macroinvertebrates	3A	Low	2014	323
Upper Sevier River	UT16030002-010_00	East Fork Sevier-1	East Fork Sevier River and tributaries from Tropic Reservoir to headwaters	3	Insufficient Data					77

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Utah Lake-Lower Provo	UT16020201-001_00	American Fork River-1	American Fork River and tributaries from Diversion at mouth of Canyon to Tibble Fork Reservoir	1	Fully Supporting					13
Utah Lake-Lower Provo	UT16020201-003_00	Currant Creek	Current Creek from mouth of Goshen Canyon to Mona Reservoir	5	Not Supporting	Max. Temperature	3A	Low	2002	5
Utah Lake-Lower Provo	UT16020201-004_00	Salt Creek-1	Salt Creek from mouth of Canyon to USFS boundary	3	Insufficient Data					7
Utah Lake-Lower Provo	UT16020201-005_00	Salt Creek-2	Salt Creek and tributaries from USFS boundary to headwaters	5	Not Supporting	pH	2B;3A;4	Low	2014	32
Utah Lake-Lower Provo	UT16020201-006_00	Hop Creek	Hop Creek and tributaries from confluence with Salt Creek to headwaters	1	Fully Supporting					18
Utah Lake-Lower Provo	UT16020201-007_00	Summit Creek-Santaquin	Summit Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					8
Utah Lake-Lower Provo	UT16020201-009_00	Spring Creek-Lehi	Spring Creek and tributaries from Utah Lake near Lehi to headwaters	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2020	18
Utah Lake-Lower Provo	UT16020201-010_00	Powell Slough	Powell Slough state waterfowl management area	5	Not Supporting	Minimum Dissolved Oxygen	3D	Low	2014	1
Utah Lake-Lower Provo	UT16020201-011_00	Lindon Hollow	Lindon Hollow and tributaries from Utah Lake to Interstate 15	3	Insufficient Data					10
Utah Lake-Lower Provo	UT16020201-012_00	Mill Race Creek-1	Mill Race Creek and tributaries from HUC boundary (16020203) to headwaters	5	Not Supporting	Macroinvertebrates E. coli	3B 2B	Low Low	2016 2020	1 1
Utah Lake-Lower Provo	UT16020201-013_00	Ironton Canal Lower	Ironton Canal from Utah Lake (Provo Bay) to the east boundary of the Denver Rio Grande Western Railroad right-of-way	2	No Evidence of Impairment					1
Utah Lake-Lower Provo	UT16020201-014_00	Currant Creek-Juab Valley	Currant Creek and tributaries from Mona Reservoir to headwaters, except Salt Creek	5	Not Supporting	Max. Temperature	3A	Low	2016	68
Utah Lake-Lower Provo	UT16020201-016_00	American Fork	American Fork and tributaries from Utah Lake to diversion at mouth of American Fork Canyon	1	Fully Supporting					22
Utah Lake-Lower Provo	UT16020201-017_00	Currant Creek-Goshen	Current Creek and tributaries from Utah Lake to mouth of Goshen Canyon	1	Fully Supporting					46
Utah Lake-Lower Provo	UT16020202-001_00	Spanish Fork River-1	Spanish Fork River from Utah Lake to Moark Diversion	5	Not Supporting	E. coli*	2B	Low	2020	35
Utah Lake-Lower Provo	UT16020202-002_00	Spanish Fork River-2	Spanish Fork River from Moark Diversion to Thistle Creek confluence	1	Fully Supporting					7
Utah Lake-Lower Provo	UT16020202-003_00	Hobble Creek-1	Hobble Creek from Utah Lake to confluence of Left Fork Hobble Creek and Right Fork Hobble Creek	5	Not Supporting	pH	2B;3A;4	Low	2016	12
Utah Lake-Lower Provo	UT16020202-004_00	Hobble Creek-2	Left Fork Hobble Creek and tributaries from confluence with Right Fork to headwaters	3	Insufficient Data					27
Utah Lake-Lower Provo	UT16020202-005_00	Hobble Creek-3	Right Fork Hobble Creek and tributaries from confluence with Left Fork to headwaters	3	Insufficient Data					32
Utah Lake-Lower Provo	UT16020202-006_00	Diamond Fork-1	Diamond Fork Creek and tributaries from confluence with Spanish Fork River to Sixth Water confluence	3	Insufficient Data					28
Utah Lake-Lower Provo	UT16020202-007_00	Diamond Fork-2	Diamond Fork Creek and tributaries from Sixth Water Creek confluence to Hawthorne Campground	3	Insufficient Data					5

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Utah Lake-Lower Provo	UT16020202-008_00	Diamond Fork-3	Diamond Fork Creek and tributaries from Hawthorne Campground to headwaters	3	Insufficient Data					30
Utah Lake-Lower Provo	UT16020202-009_00	Sixth Water Creek	Sixth Water Creek and tributaries except Fifth Water and First Water Creeks and tributaries from confluence with Diamond Fork Creek to headwaters	5	Not Supporting	Selenium	3A	Low	2020	25
						Minimum Dissolved Oxygen	3A	Low	2020	25
Utah Lake-Lower Provo	UT16020202-010_00	Third Water Creek	Third Water Creek and tributaries from confluence with Sixth Water Creek to headwaters	3	Insufficient Data					32
Utah Lake-Lower Provo	UT16020202-011_00	Cottonwood Creek	Cottonwood Creek and tributaries from confluence with Sixth Water Creek to headwaters	3	Insufficient Data					15
Utah Lake-Lower Provo	UT16020202-012_00	Soldier Creek-1	Soldier Creek from confluence with Thistle Creek to confluence of Starvation Creek	5	Not Supporting	Max. Temperature	3A	Low	2014	28
					Approved TMDL	Total Phosphorus as P	3A		1998	28
						Sediment	3A		1998	28
Utah Lake-Lower Provo	UT16020202-013_00	Soldier Creek-2	Soldier Creek and tributaries from Starvation Creek confluence to headwaters	1	Fully Supporting					8
Utah Lake-Lower Provo	UT16020202-014_00	Sheep Creek	Sheep Creek and tributaries from confluence with Soldier Creek to headwaters	3	Insufficient Data					6
Utah Lake-Lower Provo	UT16020202-015_00	Tie Fork	Tie Fork and tributaries from confluence with Soldier Creek to headwaters	3	Insufficient Data					15
Utah Lake-Lower Provo	UT16020202-016_00	Lake Fork	Lake Fork and tributaries from USFS Boundary to headwaters	3	Insufficient Data					36
Utah Lake-Lower Provo	UT16020202-017_00	Dairy Fork	Dairy Fork and tributaries from confluence with Soldier Creek to headwaters	2	No Evidence of Impairment					10
Utah Lake-Lower Provo	UT16020202-018_00	Mill Fork	Mill Fork and tributaries from confluence with Soldier Creek to headwaters	3	Insufficient Data					14
Utah Lake-Lower Provo	UT16020202-019_00	Clear Creek-Tucker	Clear Creek and tributaries from confluence with Soldier Creek to headwaters	5	Not Supporting	Macroinvertebrates	3A	Low	2008	14
Utah Lake-Lower Provo	UT16020202-020_00	Starvation Creek	Starvation Creek and tributaries from confluence with Soldier Creek to headwaters	1	Fully Supporting					22
Utah Lake-Lower Provo	UT16020202-021_00	Indian Creek	Indian Creek and tributaries from confluence with Soldier Creek to headwaters	3	Insufficient Data					5
Utah Lake-Lower Provo	UT16020202-022_00	Thistle Creek-1	Thistle Creek from confluence with Soldier Creek to confluence with Little Clear Creek	4A	Approved TMDL	Sediment	3A		2008	27
Utah Lake-Lower Provo	UT16020202-023_00	Thistle Creek-2	Thistle Creek and tributaries from confluence with Little Clear Creek to headwaters	2	No Evidence of Impairment					22
Utah Lake-Lower Provo	UT16020202-024_00	Bennie Creek	Bennie Creek and tributaries from confluence with Thistle Creek to headwaters	3	Insufficient Data					14
Utah Lake-Lower Provo	UT16020202-025_00	Nebo Creek	Nebo Creek and tributaries from confluence with Thistle Creek to headwaters	2	No Evidence of Impairment					53

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Utah Lake-Lower Provo	UT16020202-026_00	Spring Creek-Payson	Spring Creek and tributaries from confluence with Beer Creek to headwaters	3	Insufficient Data					36
Utah Lake-Lower Provo	UT16020202-027_00	Beer Creek	Beer Creek and tributaries from confluence with Spring Creek to headwaters	5	Not Supporting	Macroinvertebrates	3C	Low	2014	47
						Total Ammonia as N	3C	Low	2016	47
						pH	2B;3C;4	Low	2020	47
						E. coli	2B	Low	2020	47
Utah Lake-Lower Provo	UT16020202-028_00	Peteetneet Creek	Peteetneet Creek and tributaries from Maple Dell Campground to headwaters	3	Insufficient Data					28
Utah Lake-Lower Provo	UT16020202-030_00	Benjamin Slough	Benjamin Slough from confluence with Utah Lake to Beer Creek confluence	5	Not Supporting	Total Ammonia as N	3B	Low	2016	8
Utah Lake-Lower Provo	UT16020202-031_00	Moark	Spanish Fork River east side tributaries from Moark Diversion to Diamond Fork confluence	3	Insufficient Data					0
Utah Lake-Lower Provo	UT16020202-032_00	Thistle Creek-5	Thistle Creek tributaries between Bennie Creek and Nebo Creek confluences	3	Insufficient Data					1
Utah Lake-Lower Provo	UT16020202-033_00	Soldier Creek-3	Soldier Creek north side perennial tributaries between Tie Fork and Sheep Creek confluence	3	Insufficient Data					0
Utah Lake-Lower Provo	UT16020202-034_00	Soldier Creek-4	Soldier Creek south side tributaries from confluence with Thistle Creek to Dairy Fork confluence, excluding Lake Fork above USFS boundary	3	Insufficient Data					3
Utah Lake-Lower Provo	UT16020202-035_00	Dry Creek-1	Dry Creek and tributaries from Utah Lake (Provo Bay) to Interstate 15	5	Not Supporting	pH	2B;4	Low	2020	12
						E. coli	2B	Low	2020	12
Utah Lake-Lower Provo	UT16020202-036_00	Dry Creek-2	Dry Creek and tributaries from Interstate 15 to headwaters	3	Insufficient Data					25
Utah Lake-Lower Provo	UT16020202-037_00	Thistle Creek-3	Thistle Creek east side tributaries from confluence with Soldier Creek upstream to confluence with Little Clear Creek	3	Insufficient Data					14
Utah Lake-Lower Provo	UT16020202-038_00	Thistle Creek-4	Thistle Creek west and south side tributaries from Nebo Creek to Little Clear Creek	3	Insufficient Data					7
Utah Lake-Lower Provo	UT16020202-039_00	Soldier Creek-5	Soldier Creek south side tributaries between Mill Fork confluence and Clear Creek confluence	3	Insufficient Data					0
Utah Lake-Lower Provo	UT16020202-042_00	Spring Creek-Springville	Spring Creek from wetlands at I-15 to headwaters	5	Not Supporting	Total Ammonia as N	3B;3D	Low	2014	3
Utah Lake-Lower Provo	UT16020203-001_00	Provo River-1	Provo River from Utah Lake to Murdock Diversion	5	Not Supporting	Macroinvertebrates	3A	Low	2008	25

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Weber River	UT16020101-001_00	Lost Creek1-Croydon	Lost Creek and tributaries from confluence with Weber River to Lost Creek Reservoir	3	Insufficient Data					48
Weber River	UT16020101-002_00	Francis Creek	Francis Creek and tributaries from Lost Creek Reservoir to headwaters	3	Insufficient Data					15
Weber River	UT16020101-003_00	Lost Creek2-Croydon	Lost Creek and tributaries from Lost Creek Reservoir to headwaters	3	Insufficient Data					72
Weber River	UT16020101-004_00	Weber River-7	Weber River segment between confluence of Lost Creek and Echo Reservoir	5	Not Supporting	Total Phosphorus as P	3A	Low	2008	3
						Macroinvertebrates	3A	Low	2008	3
Weber River	UT16020101-005_00	Main Canyon	Main Canyon Creek and other tributaries to Weber River	2	No Evidence of Impairment					21
Weber River	UT16020101-006_00	Weber Upper Tributaries-1	Weber River east side tributaries from Lost Creek confluence to Echo Creek	3	Insufficient Data					6
Weber River	UT16020101-007_00	Echo Creek	Echo Creek and tributaries from confluence with Weber River to headwaters, excluding Sawmill Creek	5	Not Supporting	Total Dissolved Solids	4	Low	2014	91
					Approved TMDL	Sediment	3A		1998	91
Weber River	UT16020101-008_00	Carruth Creek	Carruth and Lewis Canyon Creeks and tributaries from confluence with Echo Reservoir to headwaters	5	Not Supporting	E. coli	1C;2B	Low	2020	9
Weber River	UT16020101-009_00	Grass Creek	Grass Creek and tributaries from confluence with Echo Reservoir to headwaters	3	Insufficient Data					12
Weber River	UT16020101-010_00	Chalk Creek1-Coalville	Chalk Creek and tributaries from confluence with Weber River to South Fork confluence	5	Not Supporting	Macroinvertebrates	3A	Low	2008	18
Weber River	UT16020101-011_00	South Fork Chalk Creek	South Fork Chalk Creek and tributaries from confluence with Chalk Creek to headwaters	5	Not Supporting	E. coli	1C;2B	Low	2020	65
					Approved TMDL	Total Phosphorus as P	3A		1998	65
						Sediment	3A		1998	65
Weber River	UT16020101-012_00	Chalk Creek-2	Chalk Creek and tributaries from South Fork confluence to Huff Creek confluence	5	Not Supporting	E. coli	1C;2B	Low	2020	8
Weber River	UT16020101-013_00	Huff Creek	Huff Creek and tributaries from confluence with Chalk Creek to headwaters	4A	Approved TMDL	Total Phosphorus as P	3A		1998	22
						Sediment	3A		1998	22
Weber River	UT16020101-014_00	Chalk Creek3-Coalville	Chalk Creek and tributaries from Huff Creek confluence to East Fork confluence	4A	Approved TMDL	Total Phosphorus as P	3A		1998	26
						Sediment	3A		1998	26
					Non-Pollutant	Habitat	3A		1998	26
Weber River	UT16020101-015_00	East Fork Chalk Creek	East Fork Chalk Creek and tributaries from confluence with Chalk Creek to headwaters	3	Insufficient Data					38
Weber River	UT16020101-016_00	Chalk Creek-4	Chalk Creek and tributaries from East Fork Chalk Creek confluence to headwaters	4A	Approved TMDL	Total Phosphorus as P	3A		1998	65
						Sediment	3A		1998	65
						Minimum Dissolved Oxygen	3A		2020	65
Weber River	UT16020101-017_00	Weber River-8	Weber River from Echo Reservoir to Rockport Reservoir	3	Insufficient Data					9

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Weber River	UT16020101-018_00	Weber Upper Tributaries-2	Weber River west side tributaries between Echo Reservoir and Silver Creek confluence	3	Insufficient Data					14
Weber River	UT16020101-019_00	Weber Upper Tributaries-3	Weber River east side tributaries between Echo Reservoir and Fort Creek confluence	3	Insufficient Data					46
Weber River	UT16020101-020_00	Silver Creek	Silver Creek and tributaries from confluence with Weber River to headwaters	5	Not Supporting	Arsenic	1C;HH1C	Low	2006	51
						Macroinvertebrates	3A	Low	2008	51
						Total Dissolved Solids	4	Low	2010	51
						Nitrates as N	1C	Low	2014	51
						E. coli	1C;2B	Low	2020	51
					Approved TMDL	Zinc	3A		1998	51
						Cadmium	1C;3A;4		1998	51
Weber River	UT16020101-021_00	Weber Upper Tributaries-4	Weber River west side tributaries between Silver Creek confluence and Beaver Creek confluence	2	No Evidence of Impairment					17
Weber River	UT16020101-022_00	Fort Creek	Fort Creek and tributaries from confluence with Weber River to headwaters	3	Insufficient Data					21
Weber River	UT16020101-023_00	Weber River-9	Weber River from Rockport Reservoir to Weber-Provo Canal	3	Insufficient Data					22
Weber River	UT16020101-024_00	Weber River-10	Weber River and tributaries from Provo Canal Diversion to Smith-Morehouse confluence	3	Insufficient Data					52
Weber River	UT16020101-025_00	Weber River-11	Weber River and tributaries from Smith Morehouse confluence to Holiday Park	3	Insufficient Data					48
Weber River	UT16020101-026_00	Smith Morehouse River-1	Smith Morehouse River from confluence with Weber River to Smith Morehouse Reservoir	3	Insufficient Data					14
Weber River	UT16020101-027_00	Smith Morehouse River-2	Smith Morehouse River and tributaries from Smith Morehouse Reservoir to headwaters	3	Insufficient Data					20
Weber River	UT16020101-028_00	Weber River-12	Weber River and tributaries from Holiday Park to headwaters	3	Insufficient Data					28
Weber River	UT16020101-029_00	Beaver Creek-1	Beaver Creek and tributaries from confluence with Weber River to Kamas	3	Insufficient Data					66
Weber River	UT16020101-030_00	Beaver Creek2-Kamas	Beaver Creek and tributaries from Kamas to headwaters	5	Not Supporting	Aluminum	3A	Low	2020	34
Weber River	UT16020101-031_00	Sawmill Creek	Sawmill Creek and tributaries from confluence with Echo Creek to headwaters	3	Insufficient Data					4
Weber River	UT16020102-001_00	Weber River-1	Weber River and tributaries from Great Salt Lake to Slaterville Diversion	5	Not Supporting	Macroinvertebrates	3C;3D	Low	2008	163
Weber River	UT16020102-002_00	Weber River-3	Weber River from Ogden River confluence to Cottonwood Creek confluence	5	Not Supporting	Macroinvertebrates	3A	Low	2008	21
Weber River	UT16020102-003_00	Four Mile Creek	Fourmile Creek and tributaries from confluence with Weber River to headwaters	2	No Evidence of Impairment					30
Weber River	UT16020102-004_00	Burch Creek-2	Burch Creek and tributaries from Harrison Blvd to headwaters	3	Insufficient Data					8
Weber River	UT16020102-005_00	Ogden River-1	Ogden River from confluence with Weber River to Pineview Reservoir	3	Insufficient Data					12
Weber River	UT16020102-006_00	North Fork Ogden River	North Fork Ogden River and tributaries from Pineview Reservoir to headwaters	2	No Evidence of Impairment					83

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Weber River	UT16020102-007_00	Weber River-2	Weber River from Slaterville Diversion to Ogden River confluence	2	No Evidence of Impairment					0
Weber River	UT16020102-008_00	Wheeler Creek	Wheeler Creek and tributaries from confluence with Ogden River to headwaters	3	Insufficient Data					14
Weber River	UT16020102-009_00	Middle Fork Ogden River	Middle Fork Ogden River and tributaries from Pineview Reservoir to headwaters	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2014	69
Weber River	UT16020102-010_00	South Fork Ogden River-1	South Fork Ogden River and tributaries from Pineview Reservoir to Causey Reservoir	3	Insufficient Data					57
Weber River	UT16020102-011_00	Beaver Creek-Weber	Beaver Creek and tributaries from South Fork Ogden River confluence to headwaters	3	Insufficient Data					36
Weber River	UT16020102-012_00	South Fork Ogden River	South Fork Ogden River and tributaries from Causey Reservoir to headwaters	1	Fully Supporting					41
Weber River	UT16020102-013_00	Strong Canyons Creek	Strongs Canyon Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					2
Weber River	UT16020102-014_00	Burch Creek-1	Burch Creek and tributaries from confluence with Weber River to Harrison Blvd	3	Insufficient Data					7
Weber River	UT16020102-015_00	Spring Creek	Spring Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					3
Weber River	UT16020102-016_00	Weber Lower Tributaries-2	Weber River south side tributaries from mouth of Weber Canyon to Cottonwood Creek	3	Insufficient Data					10
Weber River	UT16020102-017_01	Weber Lower Tributaries-1-1	Weber River north side tributaries from Ogden River confluence to Cottonwood Creek confluence, excluding defined tributaries	5	Not Supporting	Max. Temperature	3A	Low	2020	5
Weber River	UT16020102-017_02	Weber Lower Tributaries-1-2	Weber River north side tributaries from Ogden River confluence to Cottonwood Creek confluence, excluding defined tributaries	3	Insufficient Data					48
Weber River	UT16020102-018_00	Cottonwood Creek	Cottonwood Creek and tributaries from confluence with Weber River to headwaters	3	Insufficient Data					39
Weber River	UT16020102-019_00	Weber Lower Tributaries-4	Weber River east side tributaries from Cottonwood Creek to Stoddard Diversion	3	Insufficient Data					5
Weber River	UT16020102-020_00	Weber River-4	Weber River from Cottonwood Creek confluence to Stoddard Diversion	3	Insufficient Data					6
Weber River	UT16020102-021_00	Weber Lower Tributaries-3	Weber River west side tributaries from Cottonwood Creek to Stoddard Diversion	3	Insufficient Data					37
Weber River	UT16020102-022_00	Weber River-6	Weber River between East Canyon Creek confluence and Lost Creek confluence	5	Not Supporting	Macroinvertebrates	3A	Low	2008	5
Weber River	UT16020102-023_00	Hardscrabble Creek	Hardscrabble Creek and tributaries from confluence with East Canyon Creek to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2012	33
Weber River	UT16020102-024_00	East Canyon Creek-1	East Canyon Creek from confluence with Weber River to East Canyon Dam	3	Insufficient Data					48
Weber River	UT16020102-025_00	East Canyon Creek-3	East Canyon Reservoir tributaries other than East Canyon Creek	3	Insufficient Data					11

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Weber River	UT16020102-026_01	East Canyon Creek-2	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters	5	Not Supporting	Macroinvertebrates	3A	Low	2008	55
						Total Dissolved Solids	4	Low	2014	55
						Max. Temperature	3A	Low	2014	55
					Approved TMDL	Total Phosphorus as P	3A		1992	55
Weber River	UT16020102-026_02	Murnin Creek	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters	5	Not Supporting	Macroinvertebrates	3A	Low	2008	9
						Total Dissolved Solids	4	Low	2014	9
						Max. Temperature	3A	Low	2014	9
					Approved TMDL	Total Phosphorus as P	3A		1992	9
Weber River	UT16020102-026_03	Toll Canyon	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters	5	Not Supporting	Macroinvertebrates	3A	Low	2008	1
						Total Dissolved Solids	4	Low	2014	1
						Max. Temperature	3A	Low	2014	1
					Approved TMDL	Total Phosphorus as P	3A		1992	1
Weber River	UT16020102-027_00	Kimball Creek	Kimball Creek and tributaries from East Canyon Creek confluence to headwaters, including McLeod Creek	5	Not Supporting	Macroinvertebrates	3A	Low	2008	19
						Arsenic	1C;HH1C	Low	2014	19
Weber River	UT16020102-028_00	Weber Lower Tributaries-7	Weber River north side tributaries between East Canyon Creek and Lost Creek	3	Insufficient Data					25
Weber River	UT16020102-029_00	Weber Lower Tributaries-8	Weber River south side tributaries between East Canyon Creek and Lost Creek	3	Insufficient Data					0
Weber River	UT16020102-030_00	North Fork Kays Creek	North Fork Kays Creek and tributaries from USFS boundary to headwaters	2	No Evidence of Impairment					3
Weber River	UT16020102-031_00	Kays Creek	Kays Creek and tributaries from Farmington Bay to USFS boundary	5	Not Supporting	E. coli	2B	Low	2014	24
						Copper	3B	Low	2016	24
Weber River	UT16020102-032_01	South Fork Kays Creek	Kays Creek South Fork and Middle Fork and their tributaries from USFS Boundary to headwaters	5	Not Supporting	Copper	3A	Low	2014	3
Weber River	UT16020102-032_02	Middle Fork Kays Creek	Kays Creek South Fork and Middle Fork and their tributaries from USFS Boundary to headwaters	5	Not Supporting	Copper	3A	Low	2014	3
Weber River	UT16020102-033_00	Snow Creek	Snow Creek and tributaries	5	Not Supporting	E. coli	2B	Low	2020	5
Weber River	UT16020102-034_00	Holmes Creek-2	Holmes Creek and tributaries from USFS boundary to headwaters	2	No Evidence of Impairment					8
Weber River	UT16020102-035_00	Holmes Creek-1	Holmes Creek and tributaries from Farmington Bay to USFS boundary	5	Not Supporting	E. coli	2B	Low	2014	14
						Copper	3B	Low	2014	14
Weber River	UT16020102-036_00	Baer Creek-3	Baer Creek and tributaries from US 89 to headwaters	1	Fully Supporting					8
Weber River	UT16020102-037_00	Shepard Creek	Sheppard Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					3
Weber River	UT16020102-038_00	Farmington Creek-2	Farmington Creek and tributaries from USFS boundary to headwaters	5	Not Supporting	Copper	3A	Low	2014	22
						Aluminum	3A	Low	2016	22
Weber River	UT16020102-039_00	Farmington Creek-1	Farmington Creek and tributaries from Farmington Bay to USFS boundary	5	Not Supporting	E. coli	2B	Low	2014	5
						Copper	3B	Low	2014	5
						pH	2B;3B;4	Low	2020	5
						Aluminum	3B	Low	2020	5
Weber River	UT16020102-040_00	Steed Creek	Steed Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					5

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Weber River	UT16020102-041_00	Davis Creek	Davis and Lone Pine Creeks and tributaries from US 89 to headwaters	1	Fully Supporting					3
Weber River	UT16020102-042_00	Ricks Creek	Ricks Creek and tributaries from Interstate 15 to headwaters	1	Fully Supporting					5
Weber River	UT16020102-043_00	Barnard Creek	Barnard Creek and tributaries from US 89 to headwaters	5	Not Supporting	Copper	3A	Low	2014	4
						E. coli	2B	Low	2016	4
Weber River	UT16020102-044_01	Parrish Creek	Parrish and Duel Creeks and their tributaries from Davis Aqueduct to headwaters	1	Fully Supporting					4
Weber River	UT16020102-044_02	Centerville Canyon	Parrish and Duel Creeks and their tributaries from Davis Aqueduct to headwaters	5	Not Supporting	Copper	3A	Low	2014	5
Weber River	UT16020102-045_00	Stone Creek-2	Stone Creek and tributaries from USFS boundary to headwaters	3	Insufficient Data					6
Weber River	UT16020102-046_00	Stone Creek-1	Stone Creek from Great Salt Lake to USFS boundary	5	Not Supporting	Max. Temperature	3A	Low	2014	4
						Copper	3A	Low	2014	4
						pH	2B;3A;4	Low	2016	4
						E. coli	2B	Low	2016	4
Weber River	UT16020102-047_00	Barton Creek	Barton Creek and tributaries from USFS boundary to headwaters	1	Fully Supporting					5
Weber River	UT16020102-048_00	Weber River-5	Weber River from Stoddard Diversion to East Canyon Creek confluence	3	Insufficient Data					2
Weber River	UT16020102-049_00	Mill Creek2-Davis	Mill Creek and tributaries from Mueller Park at USFS boundary to headwaters	5	Not Supporting	Copper	3A	Low	2014	12
Weber River	UT16020102-050_00	Mill Creek1-Davis	Mill Creek from Great Salt Lake to Mueller Park at USFS boundary	5	Not Supporting	Total Dissolved Solids	4	Low	2014	5
						Copper	3B	Low	2014	5
						E. coli	2B	Low	2020	5
Weber River	UT16020102-051_00	Baer Creek-2	Baer Creek and tributaries from Interstate 15 to US 89	3	Insufficient Data					4
Weber River	UT16020102-052_00	Rudd Creek	Rudd Creek and tributaries from Davis Aqueduct to headwaters	1	Fully Supporting					2
Weber River	UT16020102-053_00	Baer Creek-1	Baer Creek and tributaries from Farmington Bay to Interstate 15	5	Not Supporting	E. coli	2B	Low	2020	4
Weber River	UT16020102-054_00	Weber Lower Tributaries-6	Weber River east side tributaries from Stoddard Diversion to East Canyon Creek	3	Insufficient Data					6
Weber River	UT16020102-055_00	Weber Lower Tributaries-5	Weber River west side tributaries from Stoddard Diversion to East Canyon Creek	5	Not Supporting	E. coli	1C;2B	Low	2020	42
Weber River	UT16020102-056_00	Corbett Creek	Corbett Creek and tributaries from U.S. Highway 89 to headwaters	3	Insufficient Data					3
Weber River	UT16020102-057_00	Unknown	Unknown	3	Insufficient Data					24

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West Desert	UT16020301-001_00	Lake Creek-Millard Co	Lake Creek and tributaries from Garrison to Nevada state line	5	Not Supporting	Macroinvertebrates	3A	Low	2020	60
West Desert	UT16020301-002_00	Hamlin Valley Wash	Hamlin Valley Wash and tributaries from Nevada state line to headwaters	2	No Evidence of Impairment					89
West Desert	UT16020304-001_00	Vernon Creek	Vernon Creek and tributaries, Tooele County	5	Not Supporting	pH	2B;3A;4	Low	2014	48
West Desert	UT16020304-002_00	Faust Creek	Faust Creek and tributaries, Tooele County	5	Not Supporting	Max. Temperature	3A	Low	2016	55
West Desert	UT16020304-003_00	North Willow Creek	North Willow Creek and tributaries, Tooele County	3	Insufficient Data					20
West Desert	UT16020304-004_00	Ophir Creek	Ophir Creek and tributaries, Tooele County	3	Insufficient Data					11
West Desert	UT16020304-005_00	Soldier Creek	Soldier Creek and tributaries from the Drinking Water Treatment Facility to headwaters, Tooele County	3	Insufficient Data					10
West Desert	UT16020304-006_00	Settlement Canyon Creek	Settlement Canyon Creek and tributaries, Tooele County	3	Insufficient Data					2
West Desert	UT16020304-007_00	Middle Canyon	Middle Canyon Creek and tributaries, Tooele County	3	Insufficient Data					13
West Desert	UT16020304-008_00	South Willow Creek	South Willow Creek and tributaries from Grantville Reervoir diversion? to headwaters	3	Insufficient Data					14
West Desert	UT16020304-009_00	Clover Creek	Clover Creek and tributaries from Clover to headwaters	3	Insufficient Data					8
West Desert	UT16020306-001_00	Trout Creek	Trout Creek and tributaries, Juab County	3	Insufficient Data					21
West Desert	UT16020306-002_00	Granite Creek	Granite Creek and tributaries, Juab County	3	Insufficient Data					40
West Desert	UT16020306-003_00	Thomas Creek	Thomas Creek and tributaries, Juab County	3	Insufficient Data					28
West Desert	UT16020306-004_00	Basin Creek	Basin Creek and tributaries, Juab and Tooele Counties	3	Insufficient Data					16
West Desert	UT16020306-005_00	Deep Creek - 1 WD/C	Deep Creek and tributaries from Rock Spring Creek to headwaters, Juab and Tooele Counties	2	No Evidence of Impairment					95
West Desert	UT16020308-001_00	Donner Creek	Donner Creek and tributaries from irrigation diversion to Utah-Nevada state line	3	Insufficient Data					4
West Desert	UT16020308-002_00	Bettridge Creek	Bettridge Creek and tributaries from irrigation diversion to Utah-Nevada state line	3	Insufficient Data					6
West Desert	UT16020308-003_00	Red Butte Creek	Red Butte Creek and tributaries from confluence with Grouse Creek to headwaters	2	No Evidence of Impairment					18
West Desert	UT16020308-004_00	Pine Creek	Pine Creek and tributaries, Box Elder County	3	Insufficient Data					21
West Desert	UT16020308-005_00	Warm Creek	Warm Creek from confluence with Etna Ditch to Headwaters	2	No Evidence of Impairment					25
West Desert	UT16020308-006_00	Straight Fork Creek	Straight Fork Creek and tributaries from Etna Reservoir to headwaters	2	No Evidence of Impairment					9
West Desert	UT16020308-007_00	Grouse Creek	Grouse Creek and tributaries from Red Butte confluence to headwaters, except Pine Creek and tributaries	2	No Evidence of Impairment					59
West Desert	UT16020308-008_00	Birch Creek	Birch Creek and tributaries from mouth to headwaters, Box Elder County	3	Insufficient Data					10
West Desert	UT16020308-009_00	Cottonwood Creek	Cottonwood Creek and tributaries from mouth to headwaters, Box Elder County	3	Insufficient Data					6

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West Desert	UT16020308-010_00	Muddy Creek	Muddy Creek and tributaries from mouth to headwaters, Box Elder County	3	Insufficient Data					39
West Desert	UT16020309-001_00	Deep Creek	Deep Creek and tributaries from Utah-Idaho state line to Rose Ranch Reservoir, Box Elder County	3	Insufficient Data					27
West Desert	UT16020309-002_00	Blue Creek	Blue Creek and tributaries from Great Salt Lake to Blue Creek Reservoir	5	Not Supporting	Total Dissolved Solids	4	Low	2012	49
						Selenium	3D	Low	2012	49
						pH	2B;3D;4	Low	2012	49
						E. coli	2B	Low	2020	49
						Boron	4	Low	2020	49
West Desert	UT16030005-001_00	Judd Creek	Judd Creek and tributaries from mouth to headwaters	3	Insufficient Data					20
West Desert	UT17040210-001_00	Raft River	Raft River and tributaries from Utah-Idaho state line to confluence of Junction Creek and South Junction Creek	2	No Evidence of Impairment					126
West Desert	UT17040210-002_00	Junction Creek	Junction Creek and tributaries from confluence with South Junction Creek to headwaters	3	Insufficient Data					61
West Desert	UT17040210-003_00	South Junction Creek	South Junction Creek and tributaries from confluence with Junction Creek to headwaters	2	No Evidence of Impairment					158
West Desert	UT17040210-004_00	Johnson Creek - WD/C	Johnson Creek and tributaries from Utah-Idaho state line to headwaters	3	Insufficient Data					43
West Desert	UT17040210-005_00	Holt Creek	Holt Creek from Utah-Idaho state line to headwaters	3	Insufficient Data					9
West Desert	UT17040210-006_00	Clear Creek-Sawtooth NF	Clear Creek and tributaries from Idaho state line to headwaters	3	Insufficient Data					42
West Desert	UT17040211-001_01	Goose Creek-1	Goose Creek and tributaries from Utah-Idaho state line to headwaters	3	Insufficient Data					81
West Desert	UT17040211-001_02	Goose Creek-2	Goose Creek and tributaries from Utah-Idaho state line to headwaters	3	Insufficient Data					11
West Desert	UT17040211-002_00	Pole Creek	Pole Creek and tributaries from Utah-Idaho state line to headwaters	2	No Evidence of Impairment					43
West Desert	UT17040211-003_00	Birch Creek - WD/C	Birch Creek and tributaries from Utah-Idaho state line to headwaters	2	No Evidence of Impairment					19

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Flowing Surface Waters of the State and Canal Miles
Western Colorado River	UT14060007-001_00	White River-Colton	White River from confluence with Price River to headwaters	1	Fully Supporting					213
Western Colorado River	UT14060007-002_00	Scofield Tributaries	Scofield Reservoir tributaries	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2016	260
Western Colorado River	UT14060007-003_00	Price River-1	Price River and tributaries from Price City Water Treatment intake to Scofield Reservoir	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2014	232
						Macroinvertebrates	3A	Low	2014	232
Western Colorado River	UT14060007-004_00	Willow Creek - Carbon	Willow Creek and tributaries from confluence with Price River to headwaters	3	Insufficient Data					172
Western Colorado River	UT14060007-005_00	Price River-2	Price River and tributaries from Carbon Canal Diversion to Price City Water Treatment intake	3	Insufficient Data					173
Western Colorado River	UT14060007-006_00	Gordon Creek	Gordon Creek and tributaries below 7500 feet elevation	5	Not Supporting	Macroinvertebrates	3C	Low	2020	217
					Approved TMDL	Total Dissolved Solids	4		2014	217
Western Colorado River	UT14060007-007_00	Price River-3	Price River and tributaries (excluding Gordon Creeka nd Pinnacle Wash) from Coal Creek confluence to Carbon Canal Diversion	5	Not Supporting	Total Ammonia as N	3C	Low	2014	332
						Selenium	3C;4	Low	2014	332
						Boron	4	Low	2014	332
					Approved TMDL	Total Dissolved Solids	4		2014	332
Western Colorado River	UT14060007-008_00	Coal Creek	Coal Creek and tributaries from confluence with Price River to headwaters	5	Not Supporting	Macroinvertebrates	3C	Low	2014	211
Western Colorado River	UT14060007-009_00	Soldier Creek	Soldier Creek and tributaries from confluence with Price River to headwaters	2	No Evidence of Impairment					161
Western Colorado River	UT14060007-010_00	Miller Creek	Miller Creek and tributaries below 7500 feet elevation	5	Not Supporting	Total Dissolved Solids	4	Low	2020	273
Western Colorado River	UT14060007-011_00	Desert Seep Wash	Desert Seep Wash from confluence with Price River to headwaters	5	Not Supporting	Macroinvertebrates	3C	Low	2020	521
Western Colorado River	UT14060007-012_00	Grassy Trail Creek Lower	Grassy Trail Creek and tributaries from Price River confluence to Grassy Trail Creek Reservoir	3	Insufficient Data					913
Western Colorado River	UT14060007-013_00	Grassy Trail Creek Upper	Grassy Trail Reservoir tributaries	5	Not Supporting	Max. Temperature	3A	Low	2014	38
Western Colorado River	UT14060007-014_00	Price River-4	Price River and tributaries (except Desert Seep Wash, Miller Creek, and Grassy Trail Creek) from Woodside to Soldier Creek confluence	3	Insufficient Data					977
Western Colorado River	UT14060007-015_00	Price River-5	Price River and tributaries from confluence with Green River to Woodside	4A	Approved TMDL	Total Dissolved Solids	4		2016	378
Western Colorado River	UT14060007-017_00	Pinnacle Wash	Pinnacle Wash and tributaries from confluence with Price River to headwaters	5	Not Supporting	Selenium	3C	Low	2016	71
					Approved TMDL	Total Dissolved Solids	4		2016	71
Western Colorado River	UT14060009-001_00	Electric Lake Tributaries	Electric Lake tributaries	2	No Evidence of Impairment					43
Western Colorado River	UT14060009-002_00	LF Huntington Creek	Left Fork Huntington Creek and tributaries from confluence with Huntington Creek to headwaters	3	Insufficient Data					78
Western Colorado River	UT14060009-003_01	Huntington Creek-3-1	Huntington Creek and tributaries from USFS boundary to headwaters	5	Not Supporting	pH	1C;2B;3A;4	Low	2014	148
						Minimum Dissolved Oxygen	3A	Low	2014	148
						Max. Temperature	3A	Low	2014	148
					Approved TMDL	Total Dissolved Solids	4		2016	148

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Flowing Surface Waters of the State and Canal Miles
Western Colorado River	UT14060009-003_02	Huntington Creek-3-2	Huntington Creek and tributaries from USFS boundary to headwaters	5	Not Supporting	pH	1C;2B;3A;4	Low	2014	36
						Minimum Dissolved Oxygen	3A	Low	2014	36
						Max. Temperature	3A	Low	2014	36
					Approved TMDL	Total Dissolved Solids	4		2016	36
Western Colorado River	UT14060009-003_03	Rilda Canyon	Huntington Creek and tributaries from USFS boundary to headwaters	5	Not Supporting	pH	1C;2B;3A;4	Low	2014	12
						Minimum Dissolved Oxygen	3A	Low	2014	12
						Max. Temperature	3A	Low	2014	12
					Approved TMDL	Total Dissolved Solids	4		2016	12
Western Colorado River	UT14060009-003_04	Bear Canyon-2	Huntington Creek and tributaries from USFS boundary to headwaters	5	Not Supporting	pH	1C;2B;3A;4	Low	2014	3
						Minimum Dissolved Oxygen	3A	Low	2014	3
						Max. Temperature	3A	Low	2014	3
					Approved TMDL	Total Dissolved Solids	4		2016	3
Western Colorado River	UT14060009-004_01	Huntington Creek-2	Huntington Creek and tributaries from Highway 10 crossing to USFS boundary	5	Not Supporting	pH	1C;2B;3A;4	Low	2014	310
						Minimum Dissolved Oxygen	3A	Low	2014	310
					Approved TMDL	Total Dissolved Solids	4		2014	310
Western Colorado River	UT14060009-004_02	Bear Canyon-1	Huntington Creek and tributaries from Highway 10 crossing to USFS boundary	5	Not Supporting	pH	1C;2B;3A;4	Low	2014	3
						Minimum Dissolved Oxygen	3A	Low	2014	3
					Approved TMDL	Total Dissolved Solids	4		2014	3
Western Colorado River	UT14060009-005_00	Lowery Water	Lowery Water and tributaries from Joes Valley Reservoir to headwaters	2	No Evidence of Impairment					116
Western Colorado River	UT14060009-006_00	Joes Valley	Joes Valley Reservoir tributaries except Lowry Creek	2	No Evidence of Impairment					128
Western Colorado River	UT14060009-007_00	Cottonwood Creek Upper	Cottonwood Creek and tributaries from USFS boundary to headwaters and Joes Valley Reservoir	5	Not Supporting	Total Dissolved Solids	4	Low	2014	111
						pH	1C;2B;3A;4	Low	2014	111
						Max. Temperature	3A	Low	2014	111
Western Colorado River	UT14060009-009_00	Ferron Creek Upper	Ferron Creek and tributaries from Millsite Reservoir to headwaters	3	Insufficient Data					274
Western Colorado River	UT14060009-010_00	Huntington Creek-1	Huntington Creek and tributaries from confluence with Cottonwood Creek to Highway 10	5	Not Supporting	Selenium	3C	Low	2006	202
						Max. Temperature	3A	Low	2014	202
Western Colorado River	UT14060009-011_00	Cottonwood Creek Lower	Cottonwood Creek and tributaries from confluence with Huntington Creek to Highway 57	5	Not Supporting	pH	2B;3C;4	Low	2014	389
					Approved TMDL	Total Dissolved Solids	4		2014	389
Western Colorado River	UT14060009-012_00	Ferron Creek Lower	Ferron Creek and tributaries from confluence with San Rafael River to Millsite Reservoir	1	Fully Supporting					310
Western Colorado River	UT14060009-013_00	San Rafael Upper	San Rafael River from Buckhorn Crossing to confluence of Huntington and Cottonwood Creeks	5	Not Supporting	Macroinvertebrates	3C	Low	2008	50
Western Colorado River	UT14060009-014_00	San Rafael Lower	San Rafael River from confluence with Green River to Buckhorn Crossing	5	Not Supporting	Macroinvertebrates	3C	Low	2010	121
					Approved TMDL	Total Dissolved Solids	4		2016	121
Western Colorado River	UT14070001-001_00	Halls Creek	Halls Creek and tributaries from Lake Powell to headwaters	5	Not Supporting	Max. Temperature	3B	Low	2020	354
Western Colorado River	UT14070001-002_00	Bullfrog Creek	Bullfrog Creek and tributaries from Lake Powell to headwaters	3	Insufficient Data					665
Western Colorado River	UT14070001-005_00	Lake Canyon	Bowns Canyon from confluence with Lake Powell to headwaters	3	Insufficient Data					8

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Flowing Surface Waters of the State and Canal Miles
Western Colorado River	UT14070001-006_00	Navajo Long Creek	Navajo Long Canyon and tributaries from Lake Powell to headwaters	3	Insufficient Data					20
Western Colorado River	UT14070001-093_00	North Wash	North Wash from Lake Powell to headwaters	1	Fully Supporting					284
Western Colorado River	UT14070001-094_00	Trachyte Creek	Trachyte Creek and tributaries from Lake Powell to headwaters	1	Fully Supporting					454
Western Colorado River	UT14070002-001_00	Muddy Creek Upper	Muddy Creek from U-10 crossing to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2014	261
						Minimum Dissolved Oxygen	3A	Low	2014	261
						Macroinvertebrates	3A	Low	2014	261
						Max. Temperature	3A	Low	2016	261
Western Colorado River	UT14070002-002_00	Quitchipah Creek Upper	Quitchipah Creek from U-10 to headwaters	5	Not Supporting	Macroinvertebrates	3A	Low	2010	198
						Minimum Dissolved Oxygen	3A	Low	2014	198
						Max. Temperature	3A	Low	2014	198
Western Colorado River	UT14070002-003_00	Saleratus Creek - Emery	Saleratus Creek and tributaries from U-10 crossing to headwaters	5	Not Supporting	Macroinvertebrates	3A	Low	2020	58
Western Colorado River	UT14070002-004_01	Ivie Creek Upper-1	Ivie Creek and some tributaries from U-10 crossing to headwaters	3	Insufficient Data					5
Western Colorado River	UT14070002-004_02	Ivie Creek Upper-2	Ivie Creek and some tributaries from U-10 crossing to headwaters	1	Fully Supporting					130
Western Colorado River	UT14070002-005_00	Last Chance Creek	Last Chance Creek and tributaries from Ivie Creek confluence to headwaters	3	Insufficient Data					72
Western Colorado River	UT14070002-006_00	Muddy Creek Middle	Muddy Creek and tributaries from Ivie Creek confluence to U-10 crossing	3	Insufficient Data					108
Western Colorado River	UT14070002-007_00	Quitchipah Creek Lower	Quitchipah Creek and tributaries from confluence with Ivie Creek to U-10 crossing	5	Not Supporting	Macroinvertebrates	3C	Low	2010	62
					Approved TMDL	Total Dissolved Solids	4		2014	62
Western Colorado River	UT14070002-008_00	Ivie Creek Lower	Ivie Creek and tributaries from confluence with Muddy River to U-10 highway crossing	5	Not Supporting	Boron	4	Low	2014	68
						Max. Temperature	3A	Low	2016	68
					Approved TMDL	Total Dissolved Solids	4		2014	68
Western Colorado River	UT14070002-009_00	Muddy Creek Lower	Muddy Creek from confluence with Freemont River to Ivie Creek confluence	5	Not Supporting	Macroinvertebrates	3C	Low	2020	189
Western Colorado River	UT14070003-001_00	Johnson Valley	Johnson Valley Reservoir tributaries	5	Not Supporting	E. coli	1C;2A	Low	2020	32
Western Colorado River	UT14070003-002_00	UM Creek	UM Creek and other tributaries to Forsyth Reservoir	5	Not Supporting	Zinc	3A	Low	2012	92
						E. coli	1C;2A	Low	2020	92
Western Colorado River	UT14070003-003_00	UM Creek Lower	UM Creek and tributaries from Mill Meadow to Forsythe Reservoir	1	Fully Supporting					14
Western Colorado River	UT14070003-004_00	Fremont River-1	Fremont River and tributaries from Mill Meadow Reservoir to Johnson Valley Reservoir	1	Fully Supporting					52
Western Colorado River	UT14070003-005_00	Fremont River-2	Fremont River and tributaries from Bicknell to Mill Meadow Reservoir near USFS boundary	5	Not Supporting	pH	1C;2A;3A;4	Low	2014	908
						Max. Temperature	3A	Low	2014	908
						E. coli	1C;2A	Low	2020	908
					Approved TMDL	Total Phosphorus as P	3A		1998	908
Western Colorado River	UT14070003-006_00	Pine Creek (Wayne Co)	Pine Creek and tributaries from confluence with Fremont River to headwaters	3	Insufficient Data					222

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Flowing Surface Waters of the State and Canal Miles
Western Colorado River	UT14070003-007_00	Donkey Creek	Donkey Creek and other tributaries between Pine Creek and Pleasant Creek and above USFS boundary	1	Fully Supporting					164
Western Colorado River	UT14070003-008_00	Fremont River-3	Fremont River and tributaries from east boundary of Capitol Reef National Park to Bicknell	5	Not Supporting	Total Dissolved Solids	4	Low	2014	1109
						Max. Temperature	3A	Low	2014	1109
						E. coli	1C;2A	High	2014	1109
Western Colorado River	UT14070003-009_00	Pleasant Creek-1	Pleasant Creek and tributaries from east boundary of Capitol Reef National Park to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2016	322
Western Colorado River	UT14070003-010_00	Pleasant Creek-2	Pleasant Creek and tributaries from confluence with Fremont River to east boundary of Capitol Reef National Park	3	Insufficient Data					52
Western Colorado River	UT14070003-011_00	Oak Creek	Oak Creek and tributaries from east boundary of Capitol Reef National Park to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2014	311
Western Colorado River	UT14070003-012_00	Sandy Creek	Sandy Creek and tributaries from confluence with Fremont River to east boundary of Capitol Reef National Park	2	No Evidence of Impairment					377
Western Colorado River	UT14070003-013_00	Henry Mountains	Henry Mountain streams in Garfield County whicih flow west and north as Fremont River tributaries	3	Insufficient Data					391
Western Colorado River	UT14070003-014_00	Fremont River-4	Fremont River and tributaries from confluence with Dirty Devil to east boundary of Capitol Reef National Park, except Pleasant and Sandy Creeks	4A	Approved TMDL	Total Dissolved Solids	4		1998	1123
Western Colorado River	UT14070003-015_00	Fish Lake Tributaries	Fish Lake tributaries	3	Insufficient Data					8
Western Colorado River	UT14070004-001_00	Dirty Devil River	Dirty Devil from confluence with Colorado River to Fremont River	5	Not Supporting	Total Dissolved Solids	4	Low	2016	125
Western Colorado River	UT14070004-002_00	Dirty Devil west side tributaries	Dirty Devil River west side tirubtaries from Lake Powell to Fremont River	1	Fully Supporting					660
Western Colorado River	UT14070005-001_00	Upper Valley Creek	Upper Valley Creek and tributaries from confluence with Birch Creek to headwaters	3	Insufficient Data					132
Western Colorado River	UT14070005-002_00	Birch Creek	Birch Creek and tributaries from confluence with Escalante River to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2014	102
Western Colorado River	UT14070005-003_00	North Creek-Escalante	North Creek and tributaries from confluence with Escalante River to headwaters	5	Not Supporting	Minimum Dissolved Oxygen	3A	Low	2014	176
						Max. Temperature	3A	Low	2014	176
Western Colorado River	UT14070005-004_00	Pine Creek	Pine Creek and tributaries from confluence with Escalante River to headwaters	2	No Evidence of Impairment					162
Western Colorado River	UT14070005-005_00	Mamie Creek	Mamie Creek and tributaries from confluence with Escalante River to headwaters	3	Insufficient Data					119
Western Colorado River	UT14070005-006_00	Sand Creek	Sand Creek and tributaries from confluence with Escalante River to headwaters	2	No Evidence of Impairment					163
Western Colorado River	UT14070005-007_00	Calf Creek	Calf Creek and tributaries from confluence with Escalante River to headwaters	5	Not Supporting	Max. Temperature	3A	Low	2008	32
Western Colorado River	UT14070005-008_00	Deer Creek (Garfield Co.)	Deer Creek and tributaries from confluence with Escalante River to headwaters	3	Insufficient Data					182

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Flowing Surface Waters of the State and Canal Miles
Western Colorado River	UT14070005-010_00	The Gulch	The Gulch from confluence with Escalante River to headwaters	5	Not Supporting	Macroinvertebrates	3B	Low	2020	205
Western Colorado River	UT14070005-011_00	Escalante River Lower	Escalante River from Lake Powell to Boulder Creek confluence	3	Insufficient Data					108
Western Colorado River	UT14070005-012_00	Escalante River Upper	Escalante River from Boulder Creek confluence to Birch Creek confluence	5	Not Supporting	Macroinvertebrates	3B	Low	2008	66
						Total Dissolved Solids	4	Low	2016	66
Western Colorado River	UT14070005-013_01	Escalante Tributaries-1	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek	3	Insufficient Data					1
Western Colorado River	UT14070005-013_02	Escalante Tributaries-2	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek	3	Insufficient Data					4
Western Colorado River	UT14070005-013_03	Escalante Tributaries-3	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek	3	Insufficient Data					6
Western Colorado River	UT14070005-013_04	Escalante Tributaries-4	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek	3	Insufficient Data					7
Western Colorado River	UT14070005-013_05	Escalante Tributaries-5	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek	3	Insufficient Data					17
Western Colorado River	UT14070005-013_06	Escalante Tributaries-6	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek	3	Insufficient Data					48
Western Colorado River	UT14070005-013_07	Escalante Tributaries-7	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek	3	Insufficient Data					5
Western Colorado River	UT14070005-013_08	Escalante Tributaries-8	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek	3	Insufficient Data					27
Western Colorado River	UT14070005-014_00	Alvey Wash Upper	Alvey Wash and tributaries from Tenmile Spring to headwaters	3	Insufficient Data					441
Western Colorado River	UT14070005-015_00	Alvey Wash Lower	Harris Wash and tributaries from confluence with Escalante River to Tenmile Spring	3	Insufficient Data					200
Western Colorado River	UT14070005-016_00	Wolverine Creek	Wolverine Creek and tributaries from confluence with Escalante River to headwaters	3	Insufficient Data					309
Western Colorado River	UT14070005-017_00	Coyote Gulch	Coyote Gulch and tributaries from confluence with Escalante River to headwaters	3	Insufficient Data					313
Western Colorado River	UT14070005-018_00	Boulder Creek	Boulder Creek and tributaries from confluence with Escalante River to headwaters	3	Insufficient Data					153
Western Colorado River	UT14070005-019_00	Lower Escalante River trbiutaries	Cow Canyon and tributaries from Lake Powell to headwaters	3	Insufficient Data					19
Western Colorado River	UT14070006-001_00	Wahweap Creek	Wahweap Creek and tributaries from Lake Powell to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2014	980
						Max. Temperature	3B	Low	2014	980
Western Colorado River	UT14070006-002_00	Warm Creek	Warm Creek and tributaries from Lake Powell to headwaters	3	Insufficient Data					344
Western Colorado River	UT14070006-003_00	Lake Powell Tribs-1	Lake Powell north side tributaries between Wahweap and Warm Creek	3	Insufficient Data					100
Western Colorado River	UT14070006-004_00	Last Chance Creek	Chance Creek and tributaries from Lake Powell to headwaters	5	Not Supporting	Macroinvertebrates	3B	Low	2008	606
						Total Dissolved Solids	4	Low	2014	606

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessment Unit Category	Category Description	Impaired Parameter	Impaired Beneficial Uses	Total Maximun Daily Load Development Priority	IR Cycle First Listed	Flowing Surface Waters of the State and Canal Miles
Western Colorado River	UT14070006-005_00	Croton	Croton Canyon and tributaries from Lake Powell to headwaters	3	Insufficient Data					408
Western Colorado River	UT14070006-006_01	Lake Powell Tribs-3-1	Lake Powell tributaries from Croton Canyon to HUC boundary	3	Insufficient Data					2
Western Colorado River	UT14070006-006_02	Lake Powell Tribs-3-2	Lake Powell tributaries from Croton Canyon to HUC boundary	3	Insufficient Data					407
Western Colorado River	UT14070006-008_00	Lake Powell Tribs-2	Lake Powell north side tributaries between Warm and Chance Creeks	3	Insufficient Data					119
Western Colorado River	UT14070007-001_00	Paria River-1	Paria River from start of Paria River Gorge to headwaters	5	Not Supporting	Total Dissolved Solids	4	Low	2000	701
						Max. Temperature	3C	Low	2008	701
						Macroinvertebrates	3C	Low	2020	701
Western Colorado River	UT14070007-002_00	Paria River-2	Paria River from Cottonwood Creek confluence to start of Paria Gorge	5	Not Supporting	Total Dissolved Solids	4	Low	2014	574
						Max. Temperature	3C	Low	2014	574
Western Colorado River	UT14070007-003_00	Buckskin Gulch	Buckskin Gulch and tributaries from Paria River confluence to headwaters	1	Fully Supporting					651
Western Colorado River	UT14070007-004_00	Cottonwood Creek	Cottonwood Creek and tributaries from confluence with Paria River to headwaters	5	Not Supporting	Minimum Dissolved Oxygen	3C	Low	2014	308
Western Colorado River	UT14070007-005_00	Paria River-3	Paria River and tributaries from Arizona-Utah state line to Cottonwood Creek confluence	5	Not Supporting	Macroinvertebrates	3C	Low	2008	378
						Total Dissolved Solids	4	Low	2014	378

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Draft Combined 2018/2020 Integrated Report: Resegmented Assessment Units for Flowing Surface Waters of the State and Canals				
Watershed Management Unit	**Original Assessment Unit ID**	**New Assessment Unit ID**	**New Assessment Unit Name**	**New Assessment Unit Description**
Bear River	UT16010101-019_00	UT16010101-019_01	Yellow Creek Tributaries-1	Yellow Creek tributaries (e.g. Thief, Chicken, Spring Creeks) above Barker Reservoir and Yellow Creek below Barker Reservoir
Bear River	UT16010101-019_00	UT16010101-019_02	Yellow Creek Tributaries-2	Yellow Creek tributaries (e.g. Thief, Chicken, Spring Creeks) above Barker Reservoir and Yellow Creek below Barker Reservoir
Bear River	UT16010204-007_00	UT16010204-007_01	Middle Bear East-1	Bear River east side tributaries from Malad River confluence north to HUC boundary
Bear River	UT16010204-007_00	UT16010204-007_02	Middle Bear East-2	Bear River east side tributaries from Malad River confluence north to HUC boundary
Bear River	UT16010204-008_00	UT16010204-008_01	Bear River-2-1	Bear River from Malad River confluence to Cutler Reservoir
Bear River	UT16010204-008_00	UT16010204-008_02	Bear River-2-2	Bear River from Malad River confluence to Cutler Reservoir
Bear River	UT16010204-010_00	UT16010204-010_01	Malad River-2-1	Malad River tributaries
Bear River	UT16010204-010_00	UT16010204-010_02	Malad River-2-2	Malad River tributaries
Bear River	UT16010204-011_00	UT16010204-011_01	Mantua Reservoir Tributaries-1	Big Creek from confluence with Box Elder Creek to Mantua Reservoir
Bear River	UT16010204-011_00	UT16010204-011_02	Mantua Reservoir Tributaries-2	Big Creek from confluence with Box Elder Creek to Mantua Reservoir
Jordan River	UT16020201-002_00	UT16020201-002_01	American Fork River-2	American Fork River and tributaries from Tibble Fork Reservoir to headwaters
Jordan River	UT16020201-002_00	UT16020201-002_02	Mary Ellen Gulch	American Fork River and tributaries from Tibble Fork Reservoir to headwaters
Jordan River	UT16020204-001_00	UT16020204-001_01	Jordan River-1	Jordan River from Farmington Bay upstream contiguous with the Davis County line
Jordan River	UT16020204-001_00	UT16020204-001_02	North Canyon Creek	Jordan River from Farmington Bay upstream contiguous with the Davis County line
Jordan River	UT16020204-006_00	UT16020204-006_01	Jordan River-6	Jordan River from 7800 South to Bluffdale at 14600 South
Jordan River	UT16020204-006_00	UT16020204-006_02	Big Willow Creek	Jordan River from 7800 South to Bluffdale at 14600 South
Jordan River	UT16020204-006_00	UT16020204-006_03	Dry Creek	Jordan River from 7800 South to Bluffdale at 14600 South
Jordan River	UT16020204-024_00	UT16020204-024_01	Midas Creek	Butterfield Creek and tributaries from confluence with Jordan River to headwaters
Jordan River	UT16020204-024_00	UT16020204-024_02	Butterfield Creek	Butterfield Creek and tributaries from confluence with Jordan River to headwaters
Lower Sevier River	UT16030003-004_00	UT16030003-004_01	Sevier River-16-1	Sevier River east and west side tributaries from Salina Creek confluence to Rocky Ford Reservoir (excludes Lost Creek)
Lower Sevier River	UT16030003-004_00	UT16030003-004_02	Sevier River-16-2	Sevier River east and west side tributaries from Salina Creek confluence to Rocky Ford Reservoir (excludes Lost Creek)
Lower Sevier River	UT16030003-004_00	UT16030003-004_03	Sevier River-16-3	Sevier River east and west side tributaries from Salina Creek confluence to Rocky Ford Reservoir (excludes Lost Creek)
Lower Sevier River	UT16030004-005_00	UT16030004-005_01	San Pitch-3-1	San Pitch River and tributaries from Gunnison Reservoir to U132 crossing and below USFS boundary
Lower Sevier River	UT16030004-005_00	UT16030004-005_02	San Pitch-3-2	San Pitch River and tributaries from Gunnison Reservoir to U132 crossing and below USFS boundary
Lower Sevier River	UT16030004-007_00	UT16030004-007_01	Upper Willow Creek	Ephraim Creek and tributaries from USFS boundary to headwaters
Lower Sevier River	UT16030004-007_00	UT16030004-007_02	Ephraim Creek	Ephraim Creek and tributaries from USFS boundary to headwaters

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Watershed Management Unit	**Original Assessment Unit ID**	**New Assessment Unit ID**	**New Assessment Unit Name**	**New Assessment Unit Description**
Southeast Colorado River	UT14030002-001_00	UT14030002-001_01	La Sal Creek-1	La Sal Creek and tributaries from Utah-Colorado state line to headwaters
Southeast Colorado River	UT14030002-001_00	UT14030002-001_02	La Sal Creek-2	La Sal Creek and tributaries from Utah-Colorado state line to headwaters
Southeast Colorado River	UT14030002-001_00	UT14030002-001_03	La Sal Creek-3	La Sal Creek and tributaries from Utah-Colorado state line to headwaters
Southeast Colorado River	UT14070006-007_00	UT14070006-007_01	Lake Powell Tributaries-4-1	Lake Powell south side tributaries from Utah-Arizona state line to HUC (14070006) boundary
Southeast Colorado River	UT14070006-007_00	UT14070006-007_02	Lake Powell Tributaries-4-2	Lake Powell south side tributaries from Utah-Arizona state line to HUC (14070006) boundary
Southeast Colorado River	UT14070006-007_00	UT14070006-007_03	Lake Powell Tributaries-4-3	Lake Powell south side tributaries from Utah-Arizona state line to HUC (14070006) boundary
Southeast Colorado River	UT14070006-007_00	UT14070006-007_04	Lake Powell Tributaries-4-4	Lake Powell south side tributaries from Utah-Arizona state line to HUC (14070006) boundary
Southeast Colorado River	UT14080203-005_00	UT14080203-005_01	Montezuma Creek-1-1	Montezuma Creek and all other tributaries not defined, from U.S. 191 to headwaters
Southeast Colorado River	UT14080203-005_00	UT14080203-005_02	Montezuma Creek-1-2	Montezuma Creek and all other tributaries not defined, from U.S. 191 to headwaters
Uinta Basin	UT14040106-008_00	UT14040106-008_01	Green River-1 Tribs-1	Green River perennial tributaries to Green River-1 (UT14040106-019) not specifially defined
Uinta Basin	UT14040106-008_00	UT14040106-008_02	Green River-1 Tribs-2	Green River perennial tributaries to Green River-1 (UT14040106-019) not specifially defined
Uinta Basin	UT14040106-008_00	UT14040106-008_03	Green River-1 Tribs-3	Green River perennial tributaries to Green River-1 (UT14040106-019) not specifially defined
Uinta Basin	UT14040106-008_00	UT14040106-008_04	Green River-1 Tribs-4	Green River perennial tributaries to Green River-1 (UT14040106-019) not specifially defined
Uinta Basin	UT14040106-008_00	UT14040106-008_05	Green River-1 Tribs-5	Green River perennial tributaries to Green River-1 (UT14040106-019) not specifially defined
Uinta Basin	UT14040106-012_00	UT14040106-012_01	Flaming Gorge Tributaries-1	Flaming Gorge Reservoir tributaries not defined separately
Uinta Basin	UT14040106-012_00	UT14040106-012_02	Flaming Gorge Tributaries-2	Flaming Gorge Reservoir tributaries not defined separately
Uinta Basin	UT14040106-012_00	UT14040106-012_03	Flaming Gorge Tributaries-3	Flaming Gorge Reservoir tributaries not defined separately
Uinta Basin	UT14040106-012_00	UT14040106-012_04	Flaming Gorge Tributaries-4	Flaming Gorge Reservoir tributaries not defined separately
Uinta Basin	UT14060001-001_00	UT14060001-001_01	Green River-2 Tribs-1	Green River tributaries from Duchesne River confluence to Utah-Wyoming border, except Ashley, Brush, and Jones Hole Creeks
Uinta Basin	UT14060001-001_00	UT14060001-001_02	Green River-2 Tribs-2	Green River tributaries from Duchesne River confluence to Utah-Wyoming border, except Ashley, Brush, and Jones Hole Creeks
Uinta Basin	UT14060001-001_00	UT14060001-001_03	Green River-2 Tribs-3	Green River tributaries from Duchesne River confluence to Utah-Wyoming border, except Ashley, Brush, and Jones Hole Creeks
Uinta Basin	UT14060001-001_00	UT14060001-001_04	Green River-2 Tribs-4	Green River tributaries from Duchesne River confluence to Utah-Wyoming border, except Ashley, Brush, and Jones Hole Creeks
Uinta Basin	UT14060004-003_00	UT14060004-003_01	Starvation Tributaries-1	Starvation Reservoir tributaries except Strawberry River
Uinta Basin	UT14060004-003_00	UT14060004-003_02	Starvation Tributaries-2	Starvation Reservoir tributaries except Strawberry River

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Watershed Management Unit	**Original Assessment Unit ID**	**New Assessment Unit ID**	**New Assessment Unit Name**	**New Assessment Unit Description**
Uinta Basin	UT14060005-001_00	UT14060005-001_01	Green River-3 Tribs-1	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined
Uinta Basin	UT14060005-001_00	UT14060005-001_02	Green River-3 Tribs-2	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined
Uinta Basin	UT14060005-001_00	UT14060005-001_03	Green River-3 Tribs-3	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined
Uinta Basin	UT14060005-001_00	UT14060005-001_04	Green River-3 Tribs-4	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined
Uinta Basin	UT14060005-001_00	UT14060005-001_05	Green River-3 Tribs-5	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined
Uinta Basin	UT14060005-001_00	UT14060005-001_06	Green River-3 Tribs-6	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined
Uinta Basin	UT14060005-001_00	UT14060005-001_07	Green River-3 Tribs-7	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined
Uinta Basin	UT14060005-001_00	UT14060005-001_08	Green River-3 Tribs-8	Green River tributaries from Price River to Duchesne River (HUC 14060005) not spefically defined
Upper Provo River	UT16020203-006_00	UT16020203-006_01	Provo River-6-1	Provo River and tributaries from Woodland to headwaters, except Little South Fork and Upper South Fork
Upper Provo River	UT16020203-006_00	UT16020203-006_02	Provo River-6-2	Provo River and tributaries from Woodland to headwaters, except Little South Fork and Upper South Fork
Upper Provo River	UT16020203-006_00	UT16020203-006_03	Provo River-6-3	Provo River and tributaries from Woodland to headwaters, except Little South Fork and Upper South Fork
Upper Provo River	UT16020203-028_00	UT16020203-028_01	Provo Tributaries-Heber-1	Provo River west side tributaries from Deer Creek Dam to Jordanelle Dam except Snake Creek
Upper Provo River	UT16020203-028_00	UT16020203-028_02	Provo Tributaries-Heber-2	Provo River west side tributaries from Deer Creek Dam to Jordanelle Dam except Snake Creek
Weber River	UT16020102-017_00	UT16020102-017_01	Weber Lower Tributaries-1-1	Weber River north side tributaries from Ogden River confluence to Cottonwood Creek confluence, excluding defined tributaries
Weber River	UT16020102-017_00	UT16020102-017_02	Weber Lower Tributaries-1-2	Weber River north side tributaries from Ogden River confluence to Cottonwood Creek confluence, excluding defined tributaries
Weber River	UT16020102-026_00	UT16020102-026_01	East Canyon Creek-2	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters
Weber River	UT16020102-026_00	UT16020102-026_02	Murnin Creek	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters
Weber River	UT16020102-026_00	UT16020102-026_03	Toll Canyon	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters
Weber River	UT16020102-032_00	UT16020102-032_01	South Fork Kays Creek	Kays Creek South Fork and Middle Fork and their tributaries from USFS Boundary to headwaters
Weber River	UT16020102-032_00	UT16020102-032_02	Middle Fork Kays Creek	Kays Creek South Fork and Middle Fork and their tributaries from USFS Boundary to headwaters
Weber River	UT16020102-044_00	UT16020102-044_01	Parrish Creek	Parrish and Duel Creeks and their tributaries from Davis Aqueduct to headwaters
Weber River	UT16020102-044_00	UT16020102-044_02	Centerville Canyon	Parrish and Duel Creeks and their tributaries from Davis Aqueduct to headwaters
West Desert	UT17040211-001_00	UT17040211-001_01	Goose Creek-1	Goose Creek and tributaries from Utah-Idaho state line to headwaters
West Desert	UT17040211-001_00	UT17040211-001_02	Goose Creek-2	Goose Creek and tributaries from Utah-Idaho state line to headwaters

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Watershed Management Unit	**Original Assessment Unit ID**	**New Assessment Unit ID**	**New Assessment Unit Name**	**New Assessment Unit Description**
Western Colorado River	UT14060009-003_00	UT14060009-003_01	Huntington Creek-3-1	Huntington Creek and tributaries from USFS boundary to headwaters
Western Colorado River	UT14060009-003_00	UT14060009-003_02	Huntington Creek-3-2	Huntington Creek and tributaries from USFS boundary to headwaters
Western Colorado River	UT14060009-003_00	UT14060009-003_03	Rilda Canyon	Huntington Creek and tributaries from USFS boundary to headwaters
Western Colorado River	UT14060009-003_00	UT14060009-003_04	Bear Canyon-2	Huntington Creek and tributaries from USFS boundary to headwaters
Western Colorado River	UT14060009-004_00	UT14060009-004_01	Huntington Creek-2	Huntington Creek and tributaries from Highway 10 crossing to USFS boundary
Western Colorado River	UT14060009-004_00	UT14060009-004_02	Bear Canyon-1	Huntington Creek and tributaries from Highway 10 crossing to USFS boundary
Western Colorado River	UT14070002-004_00	UT14070002-004_01	Ivie Creek Upper-1	Ivie Creek and some tributaries from U-10 crossing to headwaters
Western Colorado River	UT14070002-004_00	UT14070002-004_02	Ivie Creek Upper-2	Ivie Creek and some tributaries from U-10 crossing to headwaters
Western Colorado River	UT14070005-013_00	UT14070005-013_01	Escalante Tributaries-1	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek
Western Colorado River	UT14070005-013_00	UT14070005-013_02	Escalante Tributaries-2	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek
Western Colorado River	UT14070005-013_00	UT14070005-013_03	Escalante Tributaries-3	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek
Western Colorado River	UT14070005-013_00	UT14070005-013_04	Escalante Tributaries-4	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek
Western Colorado River	UT14070005-013_00	UT14070005-013_05	Escalante Tributaries-5	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek
Western Colorado River	UT14070005-013_00	UT14070005-013_06	Escalante Tributaries-6	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek
Western Colorado River	UT14070005-013_00	UT14070005-013_07	Escalante Tributaries-7	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek
Western Colorado River	UT14070005-013_00	UT14070005-013_08	Escalante Tributaries-8	Escalante River tributaries not previously defined from Boulder Creek to Birch Creek
Western Colorado River	UT14070006-006_00	UT14070006-006_01	Lake Powell Tribs-3-1	Lake Powell tributaries from Croton Canyon to HUC boundary
Western Colorado River	UT14070006-006_00	UT14070006-006_02	Lake Powell Tribs-3-2	Lake Powell tributaries from Croton Canyon to HUC boundary

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Watershed Management Unit	**Assessment Unit ID**	**Assessment Unit Name**	**Assessment Unit Description**	**Assessed Parameter**	**Cycle Delisted**	**EPA Justification**	**DWQ Delisting Comment**
Bear River	UT16010101-007_00	Big Creek	Big Creek and tributaries from Bear River to headwaters	Max. Temperature	2018/2020	Attaining WQS with new data	Pre 2012: 4908180 impaired for temperature with data from 1/1/99-12/31/08. 2014 IR: 4908180 still impaired for temperature. 4908190 IDWE for temperature. 2016 IR: 4908140 and 4908190 impaired for temperature. 4908180 IDNE for temperature. 2020 IR: 4908140 for 10/1/14-9/30/18 only 1/23 exceed so fully supporting. 4908180 for 10/1/14-9/30/18 only 1/11 exceed so fully supporting. 4908190 10/1/14-9/30/18 0/28 exceed so fully supporting for temperature.
Bear River	UT16010101-007_00	Big Creek	Big Creek and tributaries from Bear River to headwaters	Total Dissolved Solids	2018/2020	Attaining WQS with new data	2012/2014 IR: 4908180 was not supporting. 2018/2020 IR: 4908180 has sufficient new data since cycle first listed and is supporting.
Bear River	UT16010201-002_00	Laketown	Laketown and Big Creek and other tributaries from Bear Lake to headwaters	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data due to restoration activity.	2012/2014 IR: 4907100 was not supporting. 2018/2020 IR: 4907100 has sufficient new data since cycle first listed and is supporting.
Bear River	UT16010201-004_00	North Eden	North Eden Creek and tributaries from Bear Lake to headwaters	Max. Temperature	2018/2020	Attaining WQS with new data	2014 IR: 4907120 impaired for temperature. 2016 IR: 4907120 IDNE for temperature. 2020 IR: 4907120 has only 1 exceedance of 11 samples with data from 10/1/14-9/21/15 for full support for temperature.
Bear River	UT16010203-008_00	Spring Creek-Hyrum	Spring Creek and tributaries from confluence with Little Bear River to headwaters	Macroinvertebrates	2018/2020	Attaining WQS with new data due to restoration activity.	Attaining WQS with new data
Bear River	UT16010203-009_00	Little Bear River-1	Little Bear River from Cutler Reservoir to Hyrum Reservoir	Minimum Dissolved Oxygen	2018/2020	Original 303(d) listing rationale was in error and due to restoration activity.	2012/2014 IR: 4904800 and 4905000 were not supporting. 2018/2020 IR: 4905000 has sufficient new data since cycle first listed and is supporting. 4904800 is a Blind Duplicate of 4905000 (and should not have been assessed in 2012/2014). QAQC monitoring location ID.
Bear River	UT16010203-020_00	Blacksmith Fork-1	Blacksmiths Fork and tributaries from confluence with Logan River to Left Hand Fork Blacksmiths Fork	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data due to restoration activity.	2012/2014 IR: 4905400 was not supporting; 4908735 was insuffic data with exceedances. 2018/2020 IR: 4905400 and 4908735 have sufficient new data since cycle first listed and are supporting.
Bear River	UT16010204-002_00	Bear River Lower-East	Bear River east side tributaries from Malad confluence south	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data due to restoration activity.	2012/2014 IR: 4901180 was not supporting. 2018/2020 IR: 4901180 has sufficient new data since cycle first listed and is supporting.
Bear River	UT16010204-003_00	Bear River-1	Bear River from Great Salt Lake to Malad River confluence	Minimum Dissolved Oxygen	2018/2020	Original 303(d) listing rationale was in error and due to restoration activity.	2012-2016 IR: 4901100 was not supporting. 2018/2020 IR: 4901100 was wrongly assessed in 2012-2016. The site is in a different AU (UT16010204-008). Delist wrong AU (UT16010204-003) and list UT16010204-008.
Bear River	UT16010204-003_00	Bear River-1	Bear River from Great Salt Lake to Malad River confluence	Minimum Dissolved Oxygen	2018/2020	Original 303(d) listing rationale was in error.	Previous not supporting site(s) were assessed in wrong AU in older IRs. 2012/2014 IR: 4901100 was not supporting for DO. 2018/2020 IR: 4901100 is in different AU (UT16010204-008_00). List correct AU for DO.
Bear River	UT16010204-008_01	Bear River-2-1	Bear River from Malad River confluence to Cutler Reservoir	Max. Temperature	2018/2020	Attaining WQS with new data	2012/2014 IR: 4901700 was not supporting. 2018/2020 IR: 4901700 has sufficient new data since cycle first listed and is supporting.
Bear River	UT16010204-008_02	Bear River-2-2	Bear River from Malad River confluence to Cutler Reservoir	Max. Temperature	2018/2020	Attaining WQS with new data	2012/2014 IR: 4901700 was not supporting. 2018/2020 IR: 4901700 has sufficient new data since cycle first listed and is supporting.
Colorado River West	UT14070006-001_00	Wahweap Creek	Wahweap Creek and tributaries from Lake Powell to headwaters	Selenium	2018/2020	Attaining WQS with new data	2014 IR: 5994530 impaired for selenium. 2016 IR: 5994530 still impaired for selenium. 2018/20 IR: 5994530 had 2 exceedances from 2011 (March and May) driving impairment. Kanab BLM sampled the site after it was listed. Most recent 11 samples, including several from the months of March and May, show full support. If DWQ only considers the 2020 IR period of record from 10/1/12-9/30/18 there would be no exceedances and full support.

Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessed Parameter	Cycle Delisted	EPA Justification	DWQ Delisting Comment
Jordan River	UT16020204-002_00	Jordan River-2	Jordan River from Davis County line upstream to North Temple Street	Total Dissolved Solids	2018/2020	Attaining WQS with new data	2016 IR: 4991900 was not supporting. 2018/2020 IR: 4991900 has sufficient new data since cycle first listed and is supporting.
Jordan River	UT16020204-006_01	Jordan River-6	Jordan River from 7800 South to Bluffdale at 14600 South	Selenium	2018/2020	Attaining WQS with new data	2012-2016 IR: 4994170 was not supporting. 2018/2020 IR: 4994170 has sufficient new data since cycle first listed and is supporting.
Jordan River	UT16020204-006_02	Big Willow Creek	Jordan River from 7800 South to Bluffdale at 14600 South	Selenium	2018/2020	Attaining WQS with new data	2012-2016 IR: 4994170 was not supporting. 2018/2020 IR: 4994170 has sufficient new data since cycle first listed and is supporting.
Jordan River	UT16020204-006_03	Dry Creek	Jordan River from 7800 South to Bluffdale at 14600 South	Selenium	2018/2020	Attaining WQS with new data	2012-2016 IR: 4994170 was not supporting. 2018/2020 IR: 4994170 has sufficient new data since cycle first listed and is supporting.
Lower Colorado River	UT15010003-002_00	Kanab Creek-1	Kanab Creek and tributaries from state line to the confluence with Fourmile Hollow near the White Cliffs	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data	2012-2016 IR: 4951800 was not supporting. 2018/2020 IR: 4951800 has sufficient new data since cycle first listed and is supporting.
Lower Colorado River	UT15010008-004_00	Virgin River-2	Virgin River and tributaries from Santa Clara River confluence to Quail Creek diversion, excluding Quail, Ash, and La Verkin Creeks	Max. Temperature	2018/2020	Attaining WQS with new data	Pre 2012: Unsure of what MLID was driving the original impairment. Robust data sets for 4950200 (n=35) and 4950320 (n=58) show full support with data from 1/1/1997-12/31/2007. 2020 IR: 4950200 had 0 exceedances of 12 samples between 10/22/12 and 9/16/13 for full support. 4950320 had 1 exceedance of 12 samples between 10/22/12-9/16/13 for full support.

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Watershed Management Unit	**Assessment Unit ID**	**Assessment Unit Name**	**Assessment Unit Description**	**Assessed Parameter**	**Cycle Delisted**	**EPA Justification**	**DWQ Delisting Comment**
Southeast Colorado River	UT14030004-001_00	Dolores River	Dolores River and tributaries (except Granite Creek) from confluence with Colorado River to headwaters or Utah-Colorado state line	Total Dissolved Solids	2018/2020	Attaining WQS with new data	Pre 2012: 4958600 impaired for TDS from 1/1/1997-12/31/2007 with 10 of 57 samples excceding. 4958780 IDNE. 2014 IR: 49558600 still impaired for TDS. 2016 IR: Both 4958600 and 4958780 IDNE. 2020 IR: 4958600 fully supporting from 10/1/2014-9/30/2018 with only 1 sample of 11 exceeding. 4958780 IDNE from 10/1/14-9/30/2018 with 0/8 exceeding.
Southeast Colorado River	UT14030005-010_00	Onion Creek Lower	Onion Creek and tributaries from confluence with Colorado River to road crossing above Stinking Springs	Selenium	2018/2020	Attaining WQS with new data due to restoration activity.	2012/2014 IR: 4958280 was not supporting and 4958285 was insufficient data with exceedances. 2016 IR: 4958280 was on a UDWQ targeted run in the 2016 IR. Only 9 samples were new to dataset (2 were from the beginning of the targeted run and in the 2012/2014 data set). Also note that all data from the targeted run except the 2 repeated data points were rejected in the 2018/2020 secondary review. AU should be cat 3 because of previous data assessment from site 4958285. (This site had no data in the 2018/2020 IR). 2018/2020 IR: 4958280 has insufficient data with NO exceedances.
Southeast Colorado River	UT14080201-009_00	San Juan River-2	San Juan River from the confluence with Chinle Creek to the Confluence with Montezuma Creek within State Jurisdiction	Aluminum	2018/2020	Attaining WQS with new data	2016 IR: 4953250 was not supporting. 2018/2020 IR: 4953250 has sufficient new data since cycle first listed and is supporting.
Southeast Colorado River	UT14080205-001_00	San Juan River-1	San Juan River from Lake Powell to confluence with Chinle Creek within State Jurisdiction	Aluminum	2018/2020	Attaining WQS with new data	2016 IR: 4953000 was not supporting. 2018/2020 IR: 4953000 has sufficient new data since cycle first listed and is supporting.
Southeast Colorado River	UT14080205-001_00	San Juan River-1	San Juan River from Lake Powell to confluence with Chinle Creek within State Jurisdiction	Copper	2018/2020	Attaining WQS with new data	2016 IR: 4953000 was not supporting. 2018/2020 IR: 4953000 has sufficient new data since cycle first listed and is supporting.
Southeast Colorado River	UT14080205-001_00	San Juan River-1	San Juan River from Lake Powell to confluence with Chinle Creek within State Jurisdiction	Iron	2018/2020	Attaining WQS with new data	2016 IR: 4953000 was not supporting. 2018/2020 IR: 4953000 has sufficient new data since cycle first listed and is supporting.
Southeast Colorado River	UT14080205-001_00	San Juan River-1	San Juan River from Lake Powell to confluence with Chinle Creek within State Jurisdiction	Mercury	2018/2020	Attaining WQS with new data	2016 IR: 4953000 was not supporting. 2018/2020 IR: 4953000 has sufficient new data since cycle first listed and is supporting.
Southeast Colorado River	UT14080205-001_00	San Juan River-1	San Juan River from Lake Powell to confluence with Chinle Creek within State Jurisdiction	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data	2012/2014 IR: 4952940 was not supporting. 2018/2020 IR: 4952940 has sufficient new data since cycle first listed and is supporting.

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Watershed Management Unit	**Assessment Unit ID**	**Assessment Unit Name**	**Assessment Unit Description**	**Assessed Parameter**	**Cycle Delisted**	**EPA Justification**	**DWQ Delisting Comment**
Uinta Basin	UT14040106-014_00	Cart Creek	Cart Creek and tributaries from Flaming Gorge Reservoir to headwaters	Max. Temperature	2018/2020	Attaining WQS with new data	2016 IR: 4938700 was not supporting. 2018/2020 IR: 4938700 has sufficient new data since cycle first listed and is supporting.
Uinta Basin	UT14040106-021_00	Pot Creek	Pot Creek and tributaries from Crouse reservoir to headwaters	Max. Temperature	2018/2020	Attaining WQS with new data	2012/2014 IR: 5937880 was not supporting. 2018/2020 IR: 5937880 has sufficient new data since cycle first listed and is supporting.
Uinta Basin	UT14040107-001_00	Blacks Fork	Blacks Fork River and tributaries from Utah-Wyoming state line at Meeks Cabin Reservoir to headwaters	pH	2018/2020	Attaining WQS with new data	2012/2014 IR: 4939550 was not supporting. 2016 IR: 4939116 had insuffic data with exceedances. 2018/2020 IR: 4939550 has sufficient new data since cycle first listed and is supporting. 4939116 has insufficient data with NO exceedances.
Uinta Basin	UT14060003-011_00	Whiterocks River Lower	Whiterocks River and tributaries from confluence with Uintah River to Tridell Water Treatment Plant	Aluminum	2018/2020	Original 303(d) listing rationale was in error.	2012-2016 IR: 4935070 was not supporting. 2018/2020 IR: 4935070 is identified as not within the state's jurisdiction. Other data in AU shows no exceedances.
Uinta Basin	UT14060003-015_00	Lake Fork-2	Lake Fork River and tributaries from Pigeon Water Creek confluence to Yellowstone River confluence (includes Pigeon Water Creek and Yellowstone River to USFS boundary)	Zinc	2018/2020	Original 303(d) listing rationale was in error.	2012-2016 IR: 4935110 was not supporting. 2018/2020 IR: 4935110 is not an IR waterbody type site. Wrongly assessed in 2012-2016 IRs.
Uinta Basin	UT14060004-001_00	Strawberry River-1	Strawberry River from confluence with Duchesne River to Starvation Dam	pH	2018/2020	Attaining WQS with new data	2016 IR: 4934510 was not supporting. 2018/2020 IR: 4934510 has sufficient new data since cycle first listed and is supporting.
Uinta Basin	UT14060004-010_00	Strawberry River-3	Strawberry River and tributaries, except Willow Creek and Timber Canyon, from Avintaquin Creek confluence to Strawberry Reservoir	Macroinvertebrates	2018/2020	Attaining WQS with new data	Attaining WQS with new data

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessed Parameter	Cycle Delisted	EPA Justification	DWQ Delisting Comment
Upper Provo River	UT16020203-016_00	McHenry Creek	McHenry Creek and tributaries from Jordanelle Reservoir to headwaters	Zinc	2018/2020	Attaining WQS with new data	2012-2016 IR: 4997675 was not supporting. 2018/2020 IR: 4997675 has sufficient new data since cycle first listed and is supporting.
Upper Provo River	UT16020203-026_00	Heber Valley	Provo River east side tributaries from Daniels Creek to Little South Fork except Lake Creek	Max. Temperature	2018/2020	Attaining WQS with new data	2012/2014 IR: 5911120 was not supporting. 2018/2020 IR: 5911120 has sufficient new data since cycle first listed and is supporting.
Upper Sevier River	UT16030002-002_00	Otter Creek-1	Otter Creek and tributaries from Otter Creek Reservoir to Koosharem Reservoir, except Box and Greenwich Creeks	pH	2018/2020	Attaining WQS with new data due to restoration activity.	2012/2014: 4948870 and 4949070 were not supporting. 2018/2020 IR: 4948870 and 4949070 have sufficient new data since cycle first listed and are supporting.
Upper Sevier River	UT16030002-006_00	East Fork Sevier-3	East Fork Sevier River and tributaries from Antimony Creek confluence to Deer Creek confluence	Macroinvertebrates	2018/2020	Attaining WQS with new data due to restoration activity.	Attaining WQS with new data
Utah Lake-Lower Provo River	UT16020201-009_00	Spring Creek-Lehi	Spring Creek and tributaries from Utah Lake near Lehi to headwaters	Cadmium	2018/2020	Attaining WQS with new data	2012-2016 IR: 4994950 was not supporting. 2018/2020 IR: 4994950 has sufficient new data since cycle first listed and is supporting.
Utah Lake-Lower Provo River	UT16020202-019_00	Clear Creek-Tucker	Clear Creek and tributaries from confluence with Soldier Creek to headwaters	Macroinvertebrates	2018/2020	Attaining WQS with new data	Attaining WQS with new data
Utah Lake-Lower Provo River	UT16020202-042_00	Spring Creek-Springville	Spring Creek from wetlands at I-15 to headwaters	Max. Temperature	2018/2020	Original 303(d) listing rationale was in error and due to restoration activity.	2012/2014 IR: 4996290 was not supporting. 2018/2020 IR: 4996290 is in an undefined AU. Should not have been assessed 2012/2014 for AU UT16020202-042.

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessed Parameter	Cycle Delisted	EPA Justification	DWQ Delisting Comment
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Weber River	UT16020101-010_00	Chalk Creek1-Coalville	Chalk Creek and tributaries from confluence with Weber River to South Fork confluence	Macroinvertebrates	2018/2020	Attaining WQS with new data due to restoration activity.	Attaining WQS with new data
Weber River	UT16020101-014_00	Chalk Creek3-Coalville	Chalk Creek and tributaries from Huff Creek confluence to East Fork confluence	pH	2018/2020	Attaining WQS with new data due to restoration activity.	2012/2014 IR: 4926390 was not supporting. 2018/2020 IR: 4926390 has sufficient new data since cycle first listed and is supporting.
Weber River	UT16020101-015_00	East Fork Chalk Creek	East Fork Chalk Creek and tributaries from confluence with Chalk Creek to headwaters	pH	2018/2020	Attaining WQS with new data due to restoration activity.	2012/2014 IR: 4926370 was not supporting. 2018/2020 IR: 4926370 has sufficient new data since cycle first listed and is supporting.
Weber River	UT16020101-017_00	Weber River-8	Weber River from Echo Reservoir to Rockport Reservoir	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data due to restoration activity.	2012/2014 IR: 4927010 was not supporting. 2018/2020 IR: 4927010 has sufficient new data since cycle first listed and is supporting.
Weber River	UT16020101-020_00	Silver Creek	Silver Creek and tributaries from confluence with Weber River to headwaters	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data	2012/2014 IR: 4926850 was not supporting. 2016 IR: 4926850, 4922698, and 4926791 had insuffic data with exceedances. 2018/2020 IR: 4926850 has sufficient new data since cycle first listed and is supporting. 4926791 and 4922698 (was merged with 4926794) are insuffic data with NO exceedances.
Weber River	UT16020101-020_00	Silver Creek	Silver Creek and tributaries from confluence with Weber River to headwaters	pH	2018/2020	Attaining WQS with new data	2012/2014 IR: 4926750 was not supporting. 2016 IR: 4926850 had insufficient data with exceedances. 2018/2020 IR: 4926750 has sufficient new data since cycle first listed and is supporting. 4926850 is also supporting.
Weber River	UT16020102-001_00	Weber River-1	Weber River and tributaries from Great Salt Lake to Slaterville Diversion	Total Ammonia as N	2018/2020	Attaining WQS with new data	2012-2016 IR: 4920050 was not supporting. 2018/2020 IR: 4920050 and USGS-10141000 were merged and are now called USGS-10141000. USGS-10141000 has sufficient new data since cycle first listed and is supporting.
Weber River	UT16020102-002_00	Weber River-3	Weber River from Ogden River confluence to Cottonwood Creek confluence	Macroinvertebrates	2018/2020	Attaining WQS with new data	Attaining WQS with new data
Weber River	UT16020102-026_01	East Canyon Creek-2	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters	Macroinvertebrates	2018/2020	Attaining WQS with new data due to restoration activity.	Attaining WQS with new data
Weber River	UT16020102-026_02	Murnin Creek	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters	Macroinvertebrates	2018/2020	Attaining WQS with new data due to restoration activity.	Attaining WQS with new data
Weber River	UT16020102-026_03	Toll Canyon	East Canyon Creek and tributaries from East Canyon Reservoir to headwaters	Macroinvertebrates	2018/2020	Attaining WQS with new data due to restoration activity.	Attaining WQS with new data
Weber River	UT16020102-027_00	Kimball Creek	Kimball Creek and tributaries from East Canyon Creek confluence to headwaters, including McLeod Creek	Macroinvertebrates	2018/2020	Attaining WQS with new data due to restoration activity.	Attaining WQS with new data
Weber River	UT16020102-034_00	Holmes Creek-2	Holmes Creek and tributaries from USFS boundary to headwaters	Copper	2018/2020	Original 303(d) listing rationale was in error.	Previous not supporting site(s) were assessed in wrong AU in older IRs. 2016 IR: 4990220 was not supporting for Copper. 2018/2020 IR: 4990220 is in different AU (UT16020102-035_00). Correct Au already not supporting for copper.
Weber River	UT16020102-043_00	Barnard Creek	Barnard Creek and tributaries from US 89 to headwaters	Minimum Dissolved Oxygen	2018/2020	Attaining WQS with new data	2012/2014 IR: 4990390 was not supporting. 2018/2020 IR: 4990390 has sufficient new data since cycle first listed and is supporting.

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Watershed Management Unit	**Assessment Unit ID**	**Assessment Unit Name**	**Assessment Unit Description**	**Assessed Parameter**	**Cycle Delisted**	**EPA Justification**	**DWQ Delisting Comment**
Weber River	UT16020102-044_01	Parrish Creek	Parrish and Duel Creeks and their tributaries from Davis Aqueduct to headwaters	Copper	2018/2020	Original 303(d) listing rationale was in error.	2012-2016 IR: 4990360 was not supporting. 2018/2020 IR: 4990360 is located in different AU (UT16020102-044_02) and was wrongly assessed in 2012-2016. UT16020102-044_02 should be listed for Cu.
Weber River	UT16020102-044_02	Centerville Canyon	Parrish and Duel Creeks and their tributaries from Davis Aqueduct to headwaters	Copper	2018/2020	Original 303(d) listing rationale was in error.	2012-2016 IR: 4990360 was not supporting. 2018/2020 IR: 4990360 is located in different AU (UT16020102-044_02) and was wrongly assessed in 2012-2016. UT16020102-044_02 should be listed for Cu.
Weber River	UT16020102-045_00	Stone Creek-2	Stone Creek and tributaries from USFS boundary to headwaters	Copper	2018/2020	Original 303(d) listing rationale was in error.	Previous not supporting site(s) were assessed in wrong AU in older IRs. 2012-2016 IR: 4990620 was not supporting for Copper. 2018/2020 IR: 4990620 is in different AU (UT16020102-046_00). Correct Au already not supporting for copper.
West Desert	UT16020309-002_00	Blue Creek	Blue Creek and tributaries from Great Salt Lake to Blue Creek Reservoir	Aluminum	2018/2020	Attaining WQS with new data	2012-2016 IR: 4960760 was not supporting. 2018/2020 IR: 4960760 has sufficient new data since cycle first listed and is supporting.
Western Colorado River	UT14060007-003_00	Price River-1	Price River and tributaries from Price City Water Treatment intake to Scofield Reservoir	Macroinvertebrates	2018/2020	Attaining WQS with new data	Attaining WQS with new data
Western Colorado River	UT14060009-004_01	Huntington Creek-2	Huntington Creek and tributaries from Highway 10 crossing to USFS boundary	Max. Temperature	2018/2020	Original 303(d) listing rationale was in error.	Previous not supporting site(s) were assessed in wrong AU in older IRs. 2012/2014 IR: 4930524 was not supporting for temperature. 2018/2020 IR: 4930524 is in different AU (UT14060009-010_00). List correct AU for Temp.
Western Colorado River	UT14060009-004_02	Bear Canyon-1	Huntington Creek and tributaries from Highway 10 crossing to USFS boundary	Max. Temperature	2018/2020	Original 303(d) listing rationale was in error.	Previous not supporting site(s) were assessed in wrong AU in older IRs. 2012/2014 IR: 4930524 was not supporting for temperature. 2018/2020 IR: 4930524 is in different AU (UT14060009-010_00). List correct AU for Temp.

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Watershed Management Unit	Assessment Unit ID	Assessment Unit Name	Assessment Unit Description	Assessed Parameter	Cycle Delisted	EPA Justification	DWQ Delisting Comment
Western Colorado River	UT14060009-013_00	San Rafael Upper	San Rafael River from Buckhorn Crossing to confluence of Huntington and Cottonwood Creeks	Macroinvertebrates	2018/2020	Attaining WQS with new data due to restoration activity.	Attaining WQS with new data
Western Colorado River	UT14070002-003_00	Saleratus Creek - Emery	Saleratus Creek and tributaries from U-10 crossing to headwaters	Boron	2018/2020	Original 303(d) listing rationale was in error.	Previous not supporting site(s) were assessed in wrong AU in older IRs. 2012/2014 IR: 4955460 was not supporting for Boron and TDS. 2016 IR: 4955460 was not supporting for Temperature. 2018/2020 IR: 4955460 is in different AU (UT14070002-008_00). List correct AU for Boron and temperature (correct AU is already not supporting for TDS).
Western Colorado River	UT14070002-003_00	Saleratus Creek - Emery	Saleratus Creek and tributaries from U-10 crossing to headwaters	Max. Temperature	2018/2020	Original 303(d) listing rationale was in error.	Previous not supporting site(s) were assessed in wrong AU in older IRs. 2012/2014 IR: 4955460 was not supporting for Boron and TDS. 2016 IR: 4955460 was not supporting for Temperature. 2018/2020 IR: 4955460 is in different AU (UT14070002-008_00). List correct AU for Boron and temperature (correct AU is already not supporting for TDS).
Western Colorado River	UT14070002-003_00	Saleratus Creek - Emery	Saleratus Creek and tributaries from U-10 crossing to headwaters	Total Dissolved Solids	2018/2020	Original 303(d) listing rationale was in error.	2012-2016 IR: 4955460 was not supporting. 2018/2020 IR: 4955460 is located in different AU (UT14070002-008_00) and was wrongly assessed in 2012-2016. Correct AU is already impaired for TDS.
Western Colorado River	UT14070002-004_01	Ivie Creek Upper-1	Ivie Creek and some tributaries from U-10 crossing to headwaters	Total Dissolved Solids	2018/2020	Original 303(d) listing rationale was in error.	2012/2014 IR: 4955450 was not supporting. 2018/2020 IR: 4955450 is located in a different AU (UT14070002-008_00) and was wrongly assessed in 2012-2016. Correct AU is already impaired for TDS.
Western Colorado River	UT14070002-004_01	Ivie Creek Upper-1	Ivie Creek and some tributaries from U-10 crossing to headwaters	Total Dissolved Solids	2018/2020	Original 303(d) listing rationale was in error.	Previous not supporting site(s) were assessed in wrong AU in older IRs. 2012/2014 IR: 4955450 was not supporting for TDS 2018/2020 IR: 4955450 is in different AU (UT14070002-008_00). Correct Au already not supporting for TDS
Western Colorado River	UT14070002-004_02	Ivie Creek Upper-2	Ivie Creek and some tributaries from U-10 crossing to headwaters	Total Dissolved Solids	2018/2020	Original 303(d) listing rationale was in error.	2012/2014 IR: 4955450 was not supporting. 2018/2020 IR: 4955450 is located in a different AU (UT14070002-008_00) and was wrongly assessed in 2012-2016. Correct AU is already impaired for TDS.
Western Colorado River	UT14070002-004_02	Ivie Creek Upper-2	Ivie Creek and some tributaries from U-10 crossing to headwaters	Total Dissolved Solids	2018/2020	Original 303(d) listing rationale was in error.	Previous not supporting site(s) were assessed in wrong AU in older IRs. 2012/2014 IR: 4955450 was not supporting for TDS 2018/2020 IR: 4955450 is in different AU (UT14070002-008_00). Correct Au already not supporting for TDS

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Appendix 1

PRIORITY PARAMETERS

DWQ Parameter Name	DWQ Parameter Fraction	Recommended CAS Number	Parameters impacted by New/ Revised Assessment Methodology	DWQ Parameters Routinely Measured for Assessment Purposes	Required Additional Parameter Submissions for Complete Assessment Purposes	Additional Submission Considerations for QAQC
Fish Mercury		n/a				
Flow	n/a	Field Measurement		X		
pH	n/a	Field Measurement		X		
Secchi Depth	n/a	Field Measurement		X	for Lake Samples only	
Temperature, Air	n/a	Field Measurement			Accompanying Fluoride, Dissolved for Fluoride Assessment	
Temperature, Water	n/a	Field Measurement		X		
Total Dissolved Gases	Total	Field Measurement				
Bromate	Total	15541-45-4				
Chlorine (Total Residual)	Total	Field Measurement				
Chlorite	Total	14998-27-7				
Cyanide	Dissolved	57-12-5				(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Cyanide	Total	57-12-5				
Fluoride	Total	16984-48-8			Accompanying Air Temperature measurement	
Hardness	Dissolved	Calculated		X		
Hydrogen Sulfide	Total	7783-06-4			Accompanying Field pH Measurement	
Sulfate	Total	14808-79-8			Accompanying Total Dissolved Solids measurements for Site-specific locations located on Ivie Creek and its tributaries from the confluence with Muddy Creek to the confluence with Quitchupah Creek, and Quitchupah Creek from confluence with Ivie Creek to U-10	
Total Dissolved Solids	Total	n/a		X		
BOD	Total	n/a				
Chlorophyll a	Total	n/a		X	for Lake Samples only; Accompanying Secchi Depth	
Chlorophyll a, uncorrected for pheophytin	Total	n/a		X	for Lake Samples only; Accompanying Secchi Depth	
Dissolved Oxygen (% Sat)	n/a	Field Measurement				Recommend submitting Water Temperature
Dissolved Oxygen (Concentration)	n/a	Field Measurement	X - High frequency data assessments	X	Please refer to the credible data requirements and DWQ's Call for Data Website.	Please refer to the credible data requirements and DWQ's Call for Data Website.
Aluminum	Dissolved	7429-90-5		X	Accompanying Field pH Measurement AND Hardness or Calcium, Dissolved AND Magnesium, Dissolved Measurement	(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Antimony	Total	7440-36-0				
Arsenic	Dissolved	7440-38-2		X		Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Arsenic (Trivalent)	Dissolved	7440-38-2		O - DWQ unable to routinely measure this parameter due to analytical constraints		(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Asbestos	Total	1332-21-4				
Barium	Dissolved	7440-39-3		X		Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Beryllium	Dissolved	7440-41-7		X		Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Boron	Total	7440-42-8		X		
Cadmium	Dissolved	7440-43-9		X	Accompanying Hardness or Calcium, Dissolved AND Magnesium, Dissolved Measurement	(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Calcium	Dissolved	7440-70-2		X	Accompanying Magnesium, Dissolved for Hardness calculation	Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Chromium	Dissolved	7440-47-3		X		Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Chromium (Hexavalent)	Dissolved	18540-29-9		O - DWQ unable to routinely measure this parameter due to analytical constraints		(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Chromium Trivalent	Dissolved	16065-83-1		O - DWQ unable to routinely measure this parameter due to analytical constraints	Accompanying Hardness or Calcium, Dissolved AND Magnesium, Dissolved Measurement	(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Copper	Dissolved	7440-50-8		X	Accompanying Hardness or Calcium, Dissolved AND Magnesium, Dissolved Measurement	(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Iron	Dissolved	7439-89-6		X		(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Lead	Dissolved	7439-92-1		X	Accompanying Hardness or Calcium, Dissolved AND Magnesium, Dissolved Measurement	(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Magnesium	Dissolved	7439-95-4		X	Accompanying Calcium, Dissolved for Hardness calculation	Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Mercury	Dissolved	7439-97-6		X		(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Nickel	Dissolved	7440-02-0		X	Accompanying Hardness or Calcium, Dissolved AND Magnesium, Dissolved Measurement	(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Selenium	Dissolved	7782-49-2		X		(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.

DWQ Parameter Name	DWQ Parameter Fraction	Recommended CAS Number	Parameters impacted by New/ Revised Assessment Methodology	DWQ Parameters Routinely Measured for Assessment Purposes	Required Additional Parameter Submissions for Complete Assessment Purposes	Additional Submission Considerations for QAQC
Silver	Dissolved	7440-22-4		X	Accompanying Hardness or Calcium, Dissolved AND Magnesium, Dissolved Measurement	(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
Thallium	Total	7440-28-0				
Uranium	Total	7440-61-1				
Zinc	Dissolved	7440-66-6		X	Accompanying Hardness or Calcium, Dissolved AND Magnesium, Dissolved Measurement	(1) The dissolved metals method involves filtration of the sample in the field, acidification of the sample in the field, no digestion process in the laboratory, and analysis by EPA approved laboratory methods for the required detection levels. (2) Recommended that the **Total** fraction result value is also submitted in the data package for QAQC purposes.
E. coli	n/a	n/a		X		
Beach Closures		n/a				
Drinking Water Closures		n/a				
Fish Kills		n/a				
Harmful Algal Blooms: Cyanobacteria cell density		n/a		X	for Lake Samples only	
Harmful Algal Blooms: Cyanobacteria taxanomic composition (i.e., phytoplankton)		n/a		X		
Harmful Algal Blooms: Cyanobacteria toxin concentrations		n/a		X		
Nitrate as N	Total and/ or Dissolved	14797-55-8		X		
Total Ammonia as N	Total	7664-41-7		X	Accompanying Field pH AND Field Water Temperature Measurement	
Total Phosphorus as P	Total	7723-14-0		X		
1,1,1-Trichloroethane	Total	71-55-6				
1,1,2,2-Tetrachloroethane	Total	79-34-5				
1,1,2-Trichloroethane	Total	79-00-5				
1,1-Dichloroethane	Total	75-34-3				
1,1-Dichloroethylene	Total	75-35-4				
1,2 -Trans-Dichloroethylene	Total	156-60-5				
1,2,4-Trichlorobenzene	Total	120-82-1				
1,2-Dichlorobenzene	Total	95-50-1				
1,2-Dichloroethane	Total	107-06-2				
1,2-Dichloropropane	Total	78-87-5				
1,2-Diphenylhydrazine	Total	122-66-7				
1,3-Dichlorobenzene	Total	541-73-1				
1,3-Dichloropropene	Total	542-75-6				
1,4-Dichlorobenzene	Total	106-46-7				
2,4,5-TP	Total	93-72-1				
2,4,6-Trichlorophenol	Total	88-06-2				
2,4-D	Total	94-75-7				
2,4-Dichlorophenol	Total	120-83-2				
2,4-Dimethylphenol	Total	105-67-9				
2,4-Dinitrophenol	Total	51-28-5				
2,4-Dinitrotoluene	Total	121-14-2				
2,6-Dinitrotoluene	Total	606-20-2				
2-Chloroethyl vinyl Ether	Total	110-75-8				
2-Chloronaphthalene	Total	91-58-7				
2-Chlorophenol	Total	95-57-8				
2-Methyl-4,6-Dinitrophenol	Total	534-52-1				
2-Nitrophenol	Total	88-75-5				
3,3'-Dichlorobenzidine	Total	91-94-1				
3-Methyl-4-Chlorophenol	Total	59-50-7				
4,4-DDD	Total	72-54-8				
4,4-DDE	Total	72-55-9				
4,4'-DDT	Total	50-29-3				
4-Bromophenyl Phenyl Ether	Total	101-55-3				
4-Chlorophenyl Phenyl Ether	Total	7005-72-3				
4-Nitrophenol	Total	100-02-7				
Acenaphthene	Total	83-32-9				
Acenaphthylene	Total	208-96-8				
Acrolein	Total	107-02-8				
Acrylonitrile	Total	107-13-1				
Alachlor	Total	15972-60-8				
Aldrin	Total	309-00-2				
alpha-BHC	Total	319-84-6				
alpha-Endosulfan	Total	959-98-8				
Anthracene	Total	120-12-7				
Atrazine	Total	1912-24-9				
Benzene	Total	71-43-2				
Benzidine	Total	92-87-5				
Benzo(a)Anthracene	Total	56-55-3				
Benzo(a)Pyrene	Total	50-32-8				
Benzo(b)Fluoranthene	Total	205-99-2				
Benzo(ghi)Perylene	Total	191-24-2				

DWQ Parameter Name	DWQ Parameter Fraction	Recommended CAS Number	Parameters impacted by New/ Revised Assessment Methodology	DWQ Parameters Routinely Measured for Assessment Purposes	Required Additional Parameter Submissions for Complete Assessment Purposes	Additional Submission Considerations for QAQC
Benzo(k)Fluoranthene	Total	207-08-9				
beta-BHC	Total	319-85-7				
beta-Endosulfan	Total	33213-65-9				
Bis(2-Chloroethoxy)Methane	Total	111-91-1				
Bis(2-Chloroethyl)Ether	Total	111-44-4				
Bis(2-Chloroisopropyl)Ether	Total	39638-32-9				
Bis(2-Ethylhexyl)Phthalate	Total	117-81-7				
Bromoform	Total	75-25-2				
Butylbenzyl Phthalate	Total	85-68-7				
Carbofuran	Total	1563-66-2				
Carbon Tetrachloride	Total	56-23-5				
Chlordane	Total	57-74-9				
Chlorobenzene	Total	108-90-7				
Chlorodibromomethane	Total	124-48-1				
Chloroethane	Total	75-00-3				
Chloroform	Total	67-66-3				
Chlorpyrifos	Total	2921-88-2				
Chrysene	Total	218-01-9				
Dalapon	Total	75-99-0				
Di(2-ethylhexl)adipate	Total	103-23-1				
Diazinon	Total	333-41-5				
Dibenzo(a,h)Anthracene	Total	53-70-3				
Dibromochloropropane	Total	96-12-8				
Dichlorobromomethane	Total	75-27-4				
Dichloroethylene (cis-1,2)	Total	156-59-2				
Dieldrin	Total	60-57-1				
Diethyl Phthalate	Total	84-66-2				
Dimethyl Phthalate	Total	131-11-3				
Di-n-Butyl Phthalate	Total	84-74-2				
Di-n-Octyl Phthalate	Total	117-84-0				
Dinoseb	Total	88-85-7				
Dioxin	Total	1746-01-6				
Diquat	Total	85-00-7				
Endosulfan Sulfate	Total	1031-07-8				
Endothall	Total	145-73-3				
Endrin	Total	72-20-8				
Endrin Aldehyde	Total	7421-93-4				
Ethylbenzene	Total	100-41-4				
Ethylene Dibromide	Total	106-93-4				
Fluoranthene	Total	206-44-0				
Fluorene	Total	86-73-7				
gamma-BHC (Lindane)	Total	58-89-9				
Glyphosate	Total	1071-83-6				
Haloacetic acids	Total	n/a				
Heptachlor	Total	76-44-8				
Heptachlor epoxide	Total	1024-57-3				
Hexachlorobenzene	Total	118-74-1				
Hexachlorobutadine	Total	87-68-3				
Hexachlorocyclohexane (Lindane)	Total	58-89-9				
Hexachlorocyclopentadiene	Total	77-47-4				
Hexachloroethane	Total	67-72-1				
Ideno 1,2,3-cdPyrene	Total	193-39-5				
Isophorone	Total	78-59-1				
Methoxychlor	Total	72-43-5				
Methyl Bromide	Total	74-83-9				
Methyl Chloride	Total	74-87-3				
Methylene Chloride	Total	75-09-2				
Mirex	Total	2385-85-5				
Naphthalene	Total	91-20-3				
Nitrobenzene	Total	98-95-3				
N-Nitrosodimethylamine	Total	62-75-9				
N-Nitrosodi-n-Propylamine	Total	621-64-7				
N-Nitrosodiphenylamine	Total	86-30-6				
Nonylphenol	Total	84852-15-3				
Oxamyl (vydate)	Total	23135-22-0				
Parathion	Total	56-38-2				
PCB's	Total	1336-36-3				
Pentachlorophenol	Total	87-86-5			Accompanying Field pH Measurement	
Phenanthrene	Total	85-01-8				
Phenol	Total	108-95-2				
Picloram	Total	1918-02-1				
Polychlorinated Biphenyls	Total	1336-36-3				
Pyrene	Total	129-00-0				

DWQ Parameter Name	DWQ Parameter Fraction	Recommended CAS Number	Parameters impacted by New/ Revised Assessment Methodology	DWQ Parameters Routinely Measured for Assessment Purposes	Required Additional Parameter Submissions for Complete Assessment Purposes	Additional Submission Considerations for QAQC
Simazine	Total	122-34-9				
Styrene	Total	100-42-5				
Tetrachloroethylene	Total	127-18-4				
Toluene	Total	108-88-3				
Toxaphene	Total	8001-35-2				
Trichloroethylene	Total	79-01-6				
Vinyl Chloride	Total	75-01-4				
Xylenes	Total	1330-20-7				
Tributyltin	Dissolved	n/a				Please refer to appropriate method for QC requirements and to ensure that method sensitivity is sufficient to accurately quantify constituent concentration from natural waters
Gross Alpha	Total	12587-46-1				
Gross Beta (Combined)	Total	12587-47-2				
Radium 226	Total	13982-63-3				
Radium 228	Total	15262-20-1				
Strontium 90	Total	10098-97-2				
Tritium	Total	10028-17-8				

NOTE: This list and accompanying information may not be complete. Please check UAC R317-2 for the most current list of parameters and the 303(d) Methods for additional information on what parameters are assessed, readily available, and credible.

Appendix 2

DATA QUALITY GUIDELINE EXAMPLES

DWQ Sampling Analysis Plan Requirements

Revision 1.1 July 6, 2016

Utah Division of Water Quality

Checklist of Essential Elements for Sampling and Analysis Plans (SAPs)

Monitoring Project/Program:____

Preparer(s):____

Reviewer(s):____

Date Submitted for Review:____

Date of Review:____

Parent QAPP or Equivalent Document:_____________________________________

Instructions for Preparers:

As required by DWQ's Quality Assurance Program Plan for Monitoring Programs (DWQ QAPP), ***any monitoring activity*** conducted or overseen by DWQ ***must*** have a SAP, excluding one-time response actions (such as a spill) or compliance sampling. The SAP must be reviewed and revised for each field season/monitoring year. SAPs are approved and kept on file by the Monitoring Section QA Staff and must be distributed to everyone involved with a monitoring project. Use the template and checklist below to help create your SAP. The SAP should contain or reference all the elements in this checklist but need not have the same format. Rather than extensive text, include as much information as possible in the form of tables, which are easier to refer to in the field.

The SAP should be a usable, stand-alone document that can be taken into the field by Monitors. Therefore, if you choose to use an element directly from the DWQ QAPP that needs to be viewable when reading the SAP, copy and paste it into the SAP rather than just referencing the QAPP so that Monitors do not have to read through both documents while in the field. The Monitoring- and Data and Information-Section's QA Staff are available to assist you in preparing your SAP and you may view other DWQ SAP examples on the Monitoring Council Webpage at http://www.waterquality.utah.gov/Monitoring/Council.

Definitions and Acronyms:

DPM - Designated Project Manager. As defined by DEQ's Quality Management Plan (QMP), the DPM is the staff member responsible for a specific project and has immediate managerial or technical control of that project. The DPM is responsible for specifying the quality of the data required for each project and initiating corrective actions when quality control is not being met. The DPM may also be a program manager. The DPM is responsible for designing monitoring strategies, setting project-specific data quality objectives (DQOs), and developing project-specific SAPs. DPMs are responsible for making sure all personnel involved with the project are briefed and/or trained on the procedures to be used. Roles of DPMs are further discussed throughout the DWQ QAPP.

IR – Integrated Report

Introduction and Background Information (This can be brief if it references some previous documentation or the IR or SMP, etc.)

- Site history
- Regulatory framework
- Summary of previous investigations
- Location/characteristics of any known pollution sources at the site or in the area
- Site location map showing area at a broad scale

Objectives and Design of the Investigation (This should be very specific to the project and should be a result of discussions between DPM, data users, stakeholders, science panel, etc.)

- Specific objectives of this study (describe how they support broader program goals/objectives or regulatory framework)
- Provide the study design (i.e. spatial/temporal limits, sample characteristics, the smallest population, area, volume, or time frame for which decisions will be made).
- Discuss representative sampling conditions and instructions for field personnel if they encounter non-representative sampling conditions
- Describe parameters of concern (narrative – must conform to list(s) in sections 4 and 6)
- Number, location, and frequency of samples and quality control samples
- Sampling site locations
- Rationale for site selection
- Site map(s) showing sampling locations and ‑control‖ sites and any other pertinent features such as land use, etc. within the sampling area

Special Precautions and Safety Plan

- Detailed itemization of any specific safety concerns
- Reference to an applicable safety plan
- Any additional safety training required for project
- Documentation that field personnel comply with your Invasive Species Plan and SOPs to prevent spread of invasive species

Field Sampling Methods and Documentation

- Any special training needed beyond those discussed in DWQ QAPP and where training documentation will be kept
- A table listing each field instrument to be used (equipment, describe operation or indicate where operation manual is kept for field event, include calibration procedures, if any)
- A table listing each sampling method to be used (sampling equipment if needed, cite method in SAP, attach applicable SOPs)
- For any sampling equipment used, describe operation or indicate where operation manual is kept for field event, include decontamination procedures, if any, attach applicable SOPs
- If not found in SOPs, include equipment lists, sampling trip organizing checklists,
- List corrective actions for problems that may occur in the field
- Discuss what field documentation is required, and how field records shall be generated and stored

Laboratory Sample Handling Procedures

- Describe sample containers, preservatives, holding times
- Describe field documentation (COC) and sample labeling procedures
- Describe shipping plan for sample transport to laboratory

Analytical Methods and Laboratory Documentation

- Chemical – list parameter, cite preparation method and analytical method, list required sensitivity or detection limits
- Biological – cite method or desired taxonomic level and organism target count, etc.
- Required reporting procedures (e.g. hardcopy, electronic deliverables) and turnaround times
- Be sure DWQ has obtained QA documentation for each laboratory used (check with Monitoring Section QA Staff), reference this information and any new/research analytical methods being used (obtain these protocols if available from lab)
- List the required data package contents from the analyzing laboratories [or reference a service contract or Memorandum of Understanding (MOU)]

Project Quality Control Requirements

- Table of QC limits for field instruments (operation range, accuracy, and precision)
- Table listing each Data Quality Indicator (precision, accuracy, bias, etc.), how it will be measured, and the performance criteria against which it will be evaluated (use the table in the DWQ QAPP and adapt it to this project if needed): (1) analytical (internal to lab) QC limits for chemical analyses (acceptable precision, accuracy, and negative control – lab method blank, (2) field sample QC limits for chemical analyses [Acceptable precision (field duplicates) and negative control (field or trip blanks)], and (3) QC limits for biological analysis [Acceptable precision (% diff in enumeration, five taxonomic difference)]
- QC limits, schedule, and descriptions of planned field/lab audits/assessments
- Data quality assurance review procedures: (1) describe system of data qualification, (2) describe measure of completeness relative to planned design, and (3) corrective actions for non-conformance

Data Analysis, Record Keeping, and Reporting Requirements

- Data interpretation approach (include means to temper decision-making if limited completeness of design occurs)
- Describe project record-keeping procedures and archive (hardcopies, electronic data)
- Describe how and when DPM wishes to be notified of available laboratory/field results
- Describe expected content and format of final project report and who will receive original/copies.

Schedule and Budget

- Table or figure showing project schedule with key project milestones
- List funding sources for project and include anticipated equipment, consumables, personnel purchases/costs
- Sample costs/lab resources per fee schedule

Project Team and Responsibilities

- Identify project team responsibilities and personnel
- Identify sampling personnel
- Identify subcontractors (e.g., chemical and biological labs)

References (Include references to DWQ-prepared documents)

Appendices and Attachments (Include SOPs, Chain of Custody Forms, Field Forms, Sample Labels, etc.)

Example Field Observation Form for Grab Samples

UTAH DEPARTMENT of ENVIRONMENTAL QUALITY

Version 2.0
Monitoring Location ID: ______________________
Monitoring Location Name: ______________________
Monitoring Location Description: ______________________

Sample Date: ______________________
Sample Time: ______________________

Check the water color desciption that best fits the sampling location:
□ Brown/Gray (turbid) □ Black □ Clear □ Stained (tea-look) □ Green □ Other (describe) ______________________

Indicate the level of coverage of *Didymosphenia geminata* (didymo) in reach
□ Absent (0%) □ Sparse (<10%) □ Moderate (10-75%) □ Heavy (>75%)

<-- Example of didymo.
Photo fromhttp://www.wvdnr.gov/fishing/didymo.shtm

Indicate the level of coverage of Filmentous algae in reach
□ Absent (0%) □ Sparse (<10%) □ Moderate (10-75%) □ Heavy (>75%)

<-- Example of filamentous algae
Photo from http://www.dep.wv.gov/WWE/Programs/
/wqs/Pages/FilamentousAlgaeinWestVirginia.aspx

(Lake sampling) Is there blue green algae? □ Y □ N

<-- Example of blue green algae
Photo courtesy of Utah County Health Dept

Is there an Algal Mat? ☐ Y ☐ N Fish kill?: ☐ Y ☐ N Number of Fish Observed: ________ Type of Fish: ______________________
Does the underside of the rock look black AND have a straong sulfur/ rotten eggs smell? ☐ Y ☐ N Sheen present?: ☐ Y ☐ N Odor at the site?: ☐ Y ☐ N
Anthropogenic disturbances present at site that may affect sample results? ☐ Y ☐ N

If yes to any above, explain here: ______________________

Were any photos take from the site visit? ☐ Y ☐ N

Circle all weather codes that apply
1 Windy
2 Dust
3 Rain in the last 24/48 hrs
4 Rain (presently
5 Runoff (indicate if you are sampling/ trying to capture runoff)

Circle all flow codes that apply
1 Standing Water (no flow <u>BUT</u> measurement/ sample taken
2 Measurement/ sample taken from backwater
3 Swift and deep
4 Shallow/trickle
5 Ice Present: evidence of flow beneath surface
6 Ice Present: unsure if flowing beneath surface

Circle all field condition codes that apply
1 Fire (evidence of)
2 Landslide/ Mudslide (evidence of)
3 Flooding (evidence of)
4 Presently Flooding/ Water Rising
5 Livestock (present)
6 Livestock (not present but evidence of)
7 Beaver Dam (sample taken upstream)
8 Beaver Dam (sample taken downstream)
9 Dam (sample taken downstream of resevoir tailrace)

FIELD COMMENTS: ______________________

Other comments/concerns/issues: ______________________

Appendix 3

APPLICATION OF SECONDARY REVIEW PROCESS

Data Concern	Secondary Review Process	Data Application
Temporal variation within a dataset	Insufficient sampling frequency within an assessment period of record.	Individual data records.
Bias in sampling design	(1) Event monitoring (review flow, weather, and spill/response/incident data; narrative criteria; field observations and photographs; satellite imagery; other data types collected in same (and around the) period of concern, etc.), (2) sample time of day (literature review to determine if parameter is impacted by the time of day sample is collected), (3) sampling a specific season (unless approved by DWQ in a SAP or is data-type specific (e.g., E. coli sampling during the recreation season)], and (4) locational bias.	Individual data records.
Data quality	(1) Quality Assurance Program Plan for Environmental Data Operations, (2) field calibration documentation, (3) laboratory methods, (4) standard operating procedures, (5) demonstration of capability (if applicable to data type), and (6) discussion with sample collector.	Individual data records, and/or, parameter(s) in period of record, and/or monitoring location.
Wrongly monitored	(1) Measured point source (vs. main water body), review imagery of area, flow, etc., (2) waterbody type DWQ does not assess, (3) grab sample vs. composite, (4) flow conditions (too low or not flowing), and (5) field observation that impacts quality of data.	Individual data records and/or monitoring location.
Outlier	(1) Need more than a statistical test. Should be based on scientific or QA basis, (2) QA/QC field sampling blanks, duplicates/replicate, (3) laboratory Analytical Batch QC, (4) value is nonsensical (e.g., cannot be measured with field/laboratory method), and (5) refer to data quality (above).	Individual data records
Magnitude of exceedance	(1) Significant figures and (2) review narrative criteria	Individual data records
QA/QC concerns	(1) Holding time, (2) laboratory comment, (3) dilutions, spikes, and (4) other laboratory QC Performance Checks	Individual data records
Assessment unit grouping/spatial variation	(1) Multiple locations not grouped correctly (either should or should not have been grouped), (2) AUs where water quality criterion exceedances are clearly isolated to a relatively small, hydrologically distinct portion of the larger AU and may need to be re-segmented to more accurately reflect that variation in water quality (please refer to 303(d) Assessment Methods section on ―Assessment Unit Re-segmentation‖ for more information on the process), and (3) a surface water (e.g., a spring or seep) was sampled in the AU and was assessed but additional information indicates that the surface water may not have been flowing or did not connect, contribute, or influence downstream water quality.	Monitoring location.

Data Concern	Secondary Review Process	Data Application
Credible data	(1) Data type applied incorrectly and (2) data type not considered. (Data type must meet credible and representative data requirements in 303(d) Assessment Methods and if included in the assessment analysis would result in a change in the categorization of the waterbody and parameter.	Individual data records and/or parameter(s) in period of record, monitoring location.
Other	(1) Parameters wrongly grouped (by CAS, fraction, or methods), (2) data type is laboratory measurement (when the data assessment requires a field measurement), (3) IR QA/QC flagged data, and (4) errors in standards.	Individual data records. Entire parameter assessments.
Conflicting DO assessments between grab and high frequency data	Scenario: Two types of data available at the site(s) (i.e., grab or high frequency data) do not have the same preliminary assessment result. Reviews to consider: (1) sampling period captured, (2) duration of conditions below criterion, (3) frequency of recurrent low DO events, (4) magnitude of exceedance, (5) spatial extent of low DO, and (6) diel flux of DO.	Individual data records. Entire parameter assessments.
Representativeness and Environmental Factors*	Examples of extreme events include the following: (1) accidental spills of toxic chemicals, (2) scouring storm flows that lead to diminished aquatic-life beneficial uses, and (3) 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. Examples of such a review may include reviewing flow, weather, spill data, narrative criteria, field observations and photographs, satellite imagery, other data types collected in the same (and around the) period of concern, etc..	Individual data records
Pollution Indicators	Secondary reviewers will incorporate indicator data into assessment category determinations, relying on multiple lines of evidence including pollution indicator thresholds, the presence or absence of other indicator-associated water quality issues, potential pollutant sources, and other site or watershed specific knowledge to determine whether listing or delisting on a pollution indicator parameter is appropriate or whether to prioritize waterbodies for additional monitoring.	(1) Pollution indicator evaluations will be posted with the report(s (e.g., exceedance counts and frequencies) so DWQ programs and stakeholders can consider the results when planning for future monitoring, studies, evaluations, etc., (2) pollution Indicator evaluations may be included in a narrative assessment/standard not supporting or supporting assessment decision, (3) pollution indicators may be reported by the IR as a cause of pollution impairment, and (4) pollution indicators may be reported by the IR as the source of an impairment.

Data Concern	Secondary Review Process	Data Application
*Footnote: 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. Category 1: Supporting: If analyses with and without the extreme events are supporting (Category 1). Category 2: No evidence of impairment: If analyses with the extreme events are supporting (Category 1), but the analyses without the extreme events show no evidence of impairment (Category 2). Category 2: No evidence of impairment: If analyses with and without the extreme events do not indicate evidence of impairment (Category 2). Category 2: No evidence of impairment: If analyses with the extreme events are evidence of impairment (Category 3 with exceedances), but the analyses without the extreme events show no evidence of impairment (Category 2). Category 2: No evidence of impairment: If analyses with the extreme events are not supporting (Category 5), but the analyses without the extreme events show no evidence of impairment (Category 2). Category 3: Insufficient Data, Exceedances: If analyses with and without the extreme events show evidence of impairment (Category 3). Category 3: Insufficient Data, Exceedances: If analyses with the extreme events are not supporting (Category 5), but the analyses without the extreme events are supporting (Category 1). Category 5: Not supporting: If analyses with the extreme events are evidence of impairment (Category 3), but the analyses without the extreme events are not supporting (Category 5). Category 5: Not supporting: If analyses with the extreme events are not supporting (Category 5), but the analyses without the extreme events show evidence of impairment (Category 3). Category 5: Not supporting: If analyses with and without the extreme events are not supporting (Category 5).		

Appendix 4

SUMMARIZING ASSESSMENTS FROM SITE TO ASSESSMENT UNIT LEVEL

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

IR Analysis Action: 3: (Insufficient Data with Exceedances)

- 1, 2, or 3 exceedances (with no data rejected for a use). ParamCat: 3 insufficient data with exceedances → ParamEPACat: 3
- 1, 2, or 3 exceedances (with some data rejected for a use). ParamCat: 3 insufficient data with exceedances → ParamEPACat: 3
- 0 exceedances (with no data rejected for a use). ParamCat: 3 insufficient data with no exceedances → ParamEPACat: 3
- 0 exceedances (with some data rejected for a use). ParamCat: 3 insufficient data with no exceedances → ParamEPACat: 3
- All data removed for every use. ParamCat: 3 insufficient data because not assessed → ParamEPACat: 3

IR Analysis Action: Not Assessed

- All data removed for every use. ParamCat: 3 insufficient data because not assessed → ParamEPACat: 3

IR Analysis Action: Not Assessed

- IR Analysis Comment: ―Non-Rejected data available for MLID/AU, but data available for individual use assessment was all rejected.‖ ParamCat: 3 insufficient data because not assessed →ParamEPACat: 3

IR Analysis Action: Not Assessed

- IR Analysis Comment: ―No uses assigned to site.‖ ParamCat: 3 insufficient data because not assessed →ParamEPACat: 3

IR Analysis Action: Assessed by Use

- FS Only →ParamEPACat: 1
- FS Only + some data rejected by use →ParamEPACat: 2
- Contains an NS →ParamEPACat: 5
- Only combo: All data was rejected for a use →ParamEPACat: 3, insufficient data because not assessed
- FS Only + exceedances by use + some data rejected by use →ParamCat: 3 insufficient data with exceedances →ParamEPACat: 3
- FS Only + no exceedances by use + some data rejected by use →ParamEPACat: 2
- FS Only + exceedances by use + NO data rejected by use →ParamCat: 3 insufficient data with exceedances →ParamEPACat: 3
- FS Only + no exceedances by use + NO data rejected by use →ParamEPACat: 2
- Exceedances by use + some data rejected by use →3 insufficient data with exceedances →ParamEPACat: 3
- No exceedances by use + some data rejected by use →3 insufficient data with no exceedances →ParamEPACat: 3
- Exceedances by use + NO data rejected by use →3 insufficient data with exceedances →ParamEPACat: 3

- No exceedances by use (NO exceedances) + NO data rejected by use →3 insufficient data with no exceedances →ParamEPACat: 3
- BOD, TP**, and Nitrate (for non-1C uses) →ParameterCat: MLIDCat =3 Further Investigations →ParamEPACat: 3

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

Going from many parameter categories within an MLID to one category for the MLID: Take MLID Param Cats and group them by MLID.then assign the MLID category by the following logic:

- **ParameterCat = 5 →MLIDCat = 5 AND MLIDEPACat = 5
- ParameterCat = 3 with exceedances →MLIDCat =3 with exceedances AND MLIDEPACat = 3
- ParameterCat = 1 → (Cat1 Matrix Check is a match) →MLIDCat =1 AND MLIDEPACat = 1
- ParameterCat = 1 → (Cat1 Matrix Check is a NOT a match) → MLIDCat =2 AND MLIDEPACat = 2
- ParameterCat = 2 →MLIDCat =2 AND MLIDEPACat = 2
- ParameterCat = 3 further investigations needed →MLIDCat =3 further Investigations Needed AND MLIDCat = 3
- ParameterCat = 3 no exceedances →MLIDCat =3 no exceedance AND MLIDEPACat = 3
- ParameterCat = 3 not assessed →MLIDCat =3 no assessed 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 one category for the AU: Take MLID Cats and group them by AUID then assign the AUID category by the following logic:

- **MLIDCat = 5 →AUIDCat = 5 AND AUIDEPACat = 5
- AUIDCat = 5 (and TMDL in Place) →AUIDCat = 5 AND AUIDEPACat = 4a
- AUIDCat = 5 (and non-TMDL in Place) →AUIDCat = 5 AND AUIDCat = 4b
- **MLIDCat = 5 → (and TMDL is in place & only parameter assessed for that AUID is being considered) →AUIDCat = 4a AND AUIDEPACat = 4a
- AUIDCat = 5 (and non-TMDL in place) →AUIDCat = 4a AND AUIDEPACat = 4b
- **MLIDCat = 5 → (and non-TMDL is in place and only parameter assessed for that AUID is being considered) →AUIDCat = 4b AND AUIDCat = 4b
- MLIDCat = 3 with exceedances →AUIDCat =3 with exceedances AND AUIDEPACat = 3
- MLIDCat = 2 →AUIDCat =2 AND AUIDEPACat = 2
- MLIDCat = 1 →AUIDCat =1 AND AUIDEPACat = 1
- MLIDCat = 3 further investigations needed →AUIDCat =3 further investigations needed AND AUIDCat = 3
- MLIDCat = 3 no exceedances →AUIDCat =3 no exceedances AND AUIDCat = 3
- MLIDCat = 3 not assessed →AUIDCat =3 not assessed AND AUIDCat = 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 rollup process described in this document. *One* example is only if a biological assessment is performed for an AU and the AU is Category 1 (should be changed to a Category 2).

Appendix 5

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 the Comprehensive Environmental Response, Compensation, and Liability Act) and their associated regulations. A Category 4B demonstration can be used for segments impaired by point sources and/or nonpoint sources. Both 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 permits, etc.); 2) existing commitments bythe 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:

A Statement of the Problem Causing the Impairment

A description of:

- The pollution controls to be used
- How these pollution controls will achieve attainment with all applicable water quality standards
- Requirements under which those pollution controls will be implemented.

An estimate of the time needed to meet all applicable water quality standards

A schedule for implementation of the necessary pollution controls

A schedule for tracking progress, including a description of milestones

A commitment from the demonstration plan proponent to revise the implementation strategy and pollution controls if progress toward 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 DWQ by *July 1 of even numbered years* in order for DWQ to submit the plan to EPA by *September 1 of even numbered years*. Parties are encouraged to work with DWQ before this date as states are the entity required to submit these plans to EPA.
- Acceptance from EPA must be obtained by *October 31 of even numbered years*; otherwise, DWQ will *continue* to propose that the segment in question is included on the *current cycle's* 303(d) List.
- If EPA and DWQ accept the Category 4B plan, DWQ will notify the Utah Water Quality Board andthe 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" and "Information Concerning 2008 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions."

Appendix 6

GUIDELINES

Does the AU/AU-parameter combination warrant further investigation? (See 303(d) Assessment Methods for more details.)

What was the AU originally impaired for?

What IR assessment cycle was the AU and parameter first listed?

- What datasets were used for that listing (e.g., the agency/sample collector)?
- What was the period of record? (If unknown, use the longer period of record.)
- What MLIDs are in the AU?

For impairments listed in the previous assessment cycle, compile the data. (Query data for all MLIDs in the AU. Ignore waterbody types.)

- What MLID has > = 1 exceedances?
- For MLIDs with impairments/exceedances and not assessed in the current IR cycle: why did DWQ (or someone else) not resample? (Provide documentation as to why resampling was not done and why (by not re-sampling) the site should meet water quality standards. Please refer to the good cause descriptions in the 303(d) methods. Check for good cause. If it is a reason other than good cause, the documentation will need to be EPA-approved).
- Where all MLIDs with exceedances are assessed in the current IR cycle: (1) For MLIDs with impairments/exceedances and the current parameter assessment for the MLID is not 1, 2, or 3 no exceedances –> no delisting or (2) is the current parameter Category 1, 2, or 3 no exceedances? Was there a secondary review applied to this parameter (e.g., an assessment category overwrite for the whole?). If so:

  a. Parameter? If the secondary review created a Category 1, 2, or 3 no exceedances, the secondary review justification will need to be EPA-approved if it is considered to be a delisting. Check for good cause.
  b. MLID? If the secondary review created a Category 1, 2, or 3 no exceedances, the secondary review justification will need to be EPA-approved if it is considered to be a delisting. Check for good cause.
  c. AU? If the secondary review created a Category 1, 2, or 3 no exceedances, the secondary review justification will need to be EPA-approved if it is considered to be a delisting. Check for good cause.

- (3) Is the current parameter Category 1, 2, or 3 no exceedances? (No secondary review applied to this parameter) → Check for good cause.)

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

Double check before delisting:

- If the current Parameter Category 1, 2, or 3 no exceedances – what is the oldest date in that period of record for that MLID/Parameter combo in the current Assessment cycle?
- For every MLID in the AU (ignore waterbody 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.

- What MLID has > = 1 exceedances
- For MLIDs with impairments/exceedances and not assessed in the current IR cycle: why did DWQ (or someone else) not resample? (Provide documentation as to why resampling was not done and why (by not re-sampling) the site should meet water quality standards. Please refer to the good cause descriptions in the 303(d) methods. If it is a reason other than good cause, the documentation will need to be EPA-approved.) Check for good cause.
- Where all MLIDs with exceedances are assessed in the current IR cycle: (1) for MLIDs with impairments/exceedances and the current parameter assessment for the MLID is not 1, 2, or 3 no exceedances –> no delisting or (2) is the current parameter Category 1, 2, or 3 no exceedances. Was there a secondary review applied to this parameter (e.g., an assessment category overwrite for the whole?) If so:

  d. Parameter? If the secondary review created a Category 1, 2, or 3 no exceedances, the secondary review justification will need to be EPA-approved if it is considered to be a delisting. Check for good cause.
  e. MLID? If the secondary review created a Category 1, 2, or 3 no exceedances, the secondary review justification will need to be EPA-approved if it is considered to be a delisting. Check for good cause.
  f. AU? If the secondary review created a Category 1, 2, or 3 no exceedances, the secondary review justification will need to be EPA-approved if it is considered to be a delisting. Check for good cause.

- (3) Is the current parameter Category 1, 2, or 3 no exceedances? (No secondary review applied to this parameter) →Check for good cause

Note: Need to confirm that if no new data are collected, the new assessment analysis is not a Category 1,2, or 3 no exceedances because the exceedances are out of the period of record for assessment analysis.

EPA DELISTING CODES

Delisting Reason Code	Comment
TMDL Approved or established by EPA (4A)	Not meeting water quality standards (WQS) but removed from 303(d) List
Other pollution control requirements (4B)	Not meeting water quality standards (WQS) but removed from 303(d) List
Not caused by a pollutant (4C)	Not meeting water quality standards (WQS) but removed from 303(d) List
Data and/or information lacking to determine WQ status; original basis for listing was incorrect	Delisting
WQS no longer applicable	Delisting
Listed water not in state's jurisdiction	Delisting
Water determined to not be a water of the state	Delisting
Applicable WQS attained according to new assessment method	WQS Attainment
Applicable WQS attained due to change in WQS	WQS Attainment
Applicable WQS attained due to restoration activities	WQS Attainment
Applicable WQS attained; original basis for listing was incorrect	WQS Attainment
Applicable WQS attained; reason for recovery unspecified	WQS Attainment
Applicable WQS attained; threatened water no longer threatened	WQS Attainment
Applicable WQS attained based on new data	WQS Attainment
Refinement of terminology of listing cause	Refinement

Appendix 7

TMDL PRIORITIZATION PROCESS

The Clean Water Act (CWA) requires total maximum daily loads (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 CWA also requires states to prioritize where they will dedicate resources toward TMDL development. 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.

As described in the Division of Water Quality's (DWQ) 303(d) vision document, DWQ 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 considered in setting TMDL priorities include programmatic needs such as permitting and addressing watershed-wide water quality issues.

DWQ'S RESPONSE TO COMMENTS AND PUBLIC COMMENTS RECEIVED: 303(D) ASSESSMENT METHODS

Public Commenter : First Name	Public Commenter : Last Name	Public Comment Document ID	NEW FORM SORT ID	ATTACHMENT SORT ID	Public Comment to Respond To (UDWQ sometimes splits the original public comments to make sure each comment within a larger comment submission is addressed).	Action	DWQ's Response
Dan	Potts	DPotts_12102018.pdf	1		Because "beneficial use" data may not be parametric in nature, non-parametric data (e.g. excellent, good, average, bad, extremely bad should also qualify as legitimate measures, even though they may not be necessarily numeric.	None.	DWQ evaluates qualitative data and other non-numeric types of information in the assessment process, provided they meet other aspects of data credibility and availability, as identified in tables 3, 5-9, and 10 of the assessment methods. These types of information are included in the assessment review process described in table 3 and the "Aggregation of Site-Specific Assessments to Assessment Unit Categories", "Secondary Review", and "Appendix 3" sections of the assessment methods.
Dan	Potts	DPotts_12102018.pdf	2		Evaluation of HAB-produced off-flavor in fish (=poor taste, texture and odor), most commonly the result of cyano-produced geosmyn should be considered in ANY evaluation of "beneficial use" by the public, especially anglers who might be consuming those fish. The decades old channel catfish industry has used techniques to evaluate whether they can/should harvest commercially raised fish for the market from which water quality can (and should) utilize to help evaluate beneficial use (food fish) for the waters of Utah. Just because other states and the Fed have not yet successfully moved in this direction is no reason that Utah could not be the first to utilize an approach to truly assess beneficial use in this mostly non-parametric assessment way. If anglers simply cannot, or will not consume the fish they catch because of a problem of off-flavor then that water certainly cannot be deemed beneficial.	None.	Thank you for your suggestion. Objectionable tastes in edible aquatic organisms is a part of Utah's Narrative Standard and information regarding objectionable tastes may be submitted for consideration by DWQ under the assessment secondary review process (page 80) during the Integrated Report Call for Data. DWQ may consider the addition of methods specific to this type of assessment in the future.
Dan	Potts	DPotts_12102018.pdf	5		Parametric "numerical" data are not likely to pick up this off-flavor compound regardless of DWQ's various assessment methods to evaluate HABs! Utah Lake provides an excellent example of this condition, where recurring HABs may be occurring in isolated areas protected from the wind (e.g. marinas and shallow protected areas of Provo Bay), however, fish lake wide continue to NOT suffer from any cyano-causing off-flavors that compromise their beneficial use as both sport and food fish! Let's get ahead of the crowd.	None.	Although DWQ's current HAB methods do not include aspects of fish taste, DWQ does consider qualitative data and other non-numeric types of information in the assessment process, provided they meet other aspects of data credibility and availability, as identified in Table 10 of the assessment methods document. These types of information are included in the assessment secondary review process described starting on page 80. DWQ may consider the addition of methods specific to this type of assessment in the future.

Public Commenter : First Name	Public Commenter : Last Name	Public Comment Document ID	NEW FORM SORT ID	ATTACHMENT SORT ID	Public Comment to Respond To (UDWQ sometimes splits the original public comments to make sure each comment within a larger comment submission is addressed).	Action	DWQ's Response
David	Richards	DRichards_12042018.pdf	6	35	NARRATIVE STANDARDS: BIOLOGICAL ASSESSMENTS. Page 46. Comment: Based on the following paragraphs in the draft, I am not sure why macroinvertebrate O/E assessments are considered narrative. O/E is one number similar to a temperature or DO value. Perhaps O/E should be considered numerical criteria not narrative.	None.	DWQ is authorized by R317-2-7.3.c. to use quantitative biological assessment methods which are -documented methods that have been subject to technical review and produce consistent, objective and repeatable results that account for methodological uncertainty and natural environmental variability.‖ Narrative criteria are intended to capture threats to designated uses for which numeric criteria are not applicable. O/E in this context is a numeric translator that is used to assess narrative criteria objectives.
David	Richards	DRichards_12152018_v1.pdf	7	36	Page 46. Last sentence. Comment: I would change wording to read ―… DWQ uses an empirically based model‘ not ‗empirical model‘.	Clarified Methods text.	Thank you for this comment. The text was edited to reflect the commenter's suggestion.
David	Richards	DRichards_12152018_v1.pdf	8	37	Page 47. Last sentence, first paragraph. Comment: Most importantly, macroinvertebrates are the designated beneficial use, "aquatic life in the food chain" and consequently need to be explicitly protected. Macroinvertebrates are secondarily a useful measure of conditions.	None.	Thank you for the comment. This is one important reason why DWQ chose to create an assessment method that directly measures aquatic life rather than an indirect measure such as chemical criteria.

Public Commenter : First Name	Public Commenter : Last Name	Public Comment Document ID	NEW FORM SORT ID	ATTACHMENT SORT ID	Public Comment to Respond To (UDWQ sometimes splits the original public comments to make sure each comment within a larger comment submission is addressed).	Action	DWQ's Response
David	Richards	DRichards_12152018_v1.pdf	9	38	Biological integrity is not a measurable attribute but an abstract idea (latent variable), similar to ―human health‖. Bioassessments do not quantify integrity, they are only an indicator.	None.	DWQ agrees with the commenter that O/E (or any biological assessment) is not biological integrity, but it is an important aspect of it. Indicators are needed to measure biological integrity because all aspects of this conceptual construct are impossible to quantify completely, particularly for statewide assessments conducted biannually. This does not, however, negate the utility of these indicators to accurately identify sites where biological degradation has occurred. A low O/E score is an indication biological degradation has occurred, inferring the stream is not meeting its biological integrity objectives, and needs to be further evaluated and restored. O/E may not measure all aspects of biological integrity, but the fact that the measure is incomplete does not negate the fact that problems revealed through this metric should be ignored.
David	Richards	DRichards_12152018_v1.pdf	10	39	Page 47. 4th sentence, second paragraph…. ‗absence of human-caused disturbance'. Comment: Obviously, there are no waterbodies in UT that are absent of human-caused disturbance. Suggest rewording to read, ‗least impaired sites that could be limited or affected by the types of impairment not being evaluated or compared with'.	Clarified Methods text.	Thank you for this comment. DWQ agrees that there are no locations in Utah that are absent of human-caused disturbance. The phrase was used conceptually to describe the goal of the model. DWQ removed this phrase from the text and made changes to the section to better describe reference sites..
David	Richards	DRichards_12152018_v1.pdf	11	40	Page 47. 4th sentence, third paragraph Comment: There apparently are no direct, real world, reference site(s) to compare with the Jordan River, Green River, Colorado Rivers, or Utah Lake (and others). Only generalized, regionwide, summary, and averaged hypothetical reference sites. This absence of benchmarks makes O/E models highly questionable. For example, the Jordan River's source is Utah Lake, a shallow remnant of Lake Bonneville, and its terminus is the Great Salt Lake. Historically the Jordan River had wide, meandering or sometimes braided channels that migrated across its valley. These conditions make the Jordan River a truly unique river and I assume there is no real-world reference river in the state, only reference conditions based on averaged watershed values.	None.	Each stream and river segment is unique; not just those the commenter identifies. RIVPACS uses real reference site data to estimate the most probable set of taxa that would occur at a given stream. In this sense, the model is heavily weighting reference sites that are physically/chemically similar to the assessed site when estimating the taxa that should occur (E). E is more than a general, hypothetical community that applies everywhere (unless a null model is used). Larger rivers offer more of a challenge to assess because they are more regional rather than isolated to a state. DWQ's model incorporates reference river locations from the intermountain west rather than being limited to Utah-based locations. In addition, DWQ runs a chi-square test to ensure that each assessed site fits within the bounds of the model. Sites that fail this test are not used in the assessment. For example, the Jordan River sites passed that test and were appropriate for this model and assessment.

Public Commenter : First Name	Public Commenter : Last Name	Public Comment Document ID	NEW FORM SORT ID	ATTACHMENT SORT ID	Public Comment to Respond To (UDWQ sometimes splits the original public comments to make sure each comment within a larger comment submission is addressed).	Action	DWQ's Response
David	Richards	DRichards_12152018_v1.pdf	13	42	The Green River downstream of Flaming Gorge Reservoir should not be considered a reference site if UDWQ has chosen to do so. The Green River is a highly regulated river and does not resemble its condition prior to construction of the dam.	None.	Larger rivers offer more of a challenge to assess because they are more regional rather than isolated to a state. There are also fewer large river reference sites, which further complicates model predictions. Therefore, DWQ's model incorporates reference river locations from the intermountain west rather than being limited to Utah-based locations to tackle these challenges. There are only a handful of undammed rivers in the intermountain west, but when reference sites on dammed rivers are used, such as this instance mentioned by the commenter, they are hundreds of miles downstream on well-regulated rivers. Again, ‑reference‖ in this sense, means least-impacted. It is well known that dams cause impacts to aquatic life and DWQ avoids sample collection, even for test sites, immediately below dams.
David	Richards	DRichards_12152018_v1.pdf	14	43	Of course, the Colorado River does not have any other river(s) to compare with in Utah and no hypothetical reference rivers and ‑E‖ scores should be used on such a national treasure.	None.	Each stream and river segment is unique; not just the Colorado River. DWQ's model incorporates reference river locations from across the intermountain west and captures the range of watershed predicator variables sufficient to assess Colorado River samples collected thus far.

Public Commenter : First Name	Public Commenter : Last Name	Public Comment Document ID	NEW FORM SORT ID	ATTACHMENT SORT ID	Public Comment to Respond To (UDWQ sometimes splits the original public comments to make sure each comment within a larger comment submission is addressed).	Action	DWQ's Response
David	Richards	DRichards_12042018.pdf	15	44	River Invertebrate Prediction and Classification System Models Entire section. Comment: There is no reason to justify using a single measure to describe highly complex biological integrity and report as one numeric index just to summarize into a single, easily interpretable number. Biological integrity/beneficial use is one of the main reasons DWQ conducts biological assessments, determines criteria, and sets regulations. UDWQ is mandated to protect beneficial uses, including aquatic life. To simplify biological integrity into one number just because it is easily interpretable (by who? DWQ trained biologists? Citizens of UT?) is a disservice to citizens of UT and is not the best protection criterion of our waterbodies. I do not know of any other state, federal, tribal, or county agency that relies solely on one biological assessment metric. Utah DWQ is the only one that does this, as far as I know.	None.	O/E is more than richness. It is sensitive to shifts in composition. Based on substantial stakeholder input, DWQ believes it is important that indices be easily interpretable. Ecological interactions can be complex, but assessment tools need not try to expose all of the complexity. From an aquatic life use support context, DWQ assesses whether aquatic life has been impaired. O/E is not biological integrity but an important aspect of it. Other measures such as indices based on tolerances are not measures of overall biotic integrity either. Most invertebrate-based indices are strongly correlated with one another, so they tend to capture the same signals (e.g., please review: Hawkins 2006 and Hawkins et al. 2010). Most importantly, when multi-metric indices are used for assessment purposes they are generally collapsed into one summary metric to simplify impairment determinations. It may be important to point out that O/E, MMI, etc., are indices of an ecological endpoint (biological integrity) that is otherwise very difficult to measure in full. To conduct detailed, full evaluations of ecological structure and function everywhere is unrealistic for a biannual, state-wide assessment process. However, once degraded waters are identified, it is possible to more thoroughly investigate those changes that have occurred to better understand alteration to biological assemblages and likely stressors contributing to the degradation. DWQ, in collaboration with many local entities, has identified the RIVPACS O/E index approach as the most scientifically defensible method for performing bioassessments for assessment purposes for Utah. The rationale for this decision is that RIVPACS models tend to be more precise and often more responsive to known stressors than other indices (e.g., please review Hawkins 2006, Hawkins et al 2010). Many states and countries have made a similar determination with respect to assessment decisions and principally use additional metrics for further exploration of impairments identified by O/E.

Public Commenter : First Name	Public Commenter : Last Name	Public Comment Document ID	NEW FORM SORT ID	ATTACHMENT SORT ID	Public Comment to Respond To (UDWQ sometimes splits the original public comments to make sure each comment within a larger comment submission is addressed).	Action	DWQ's Response
David	Richards	DRichards_12042018.pdf	16	45	This eight-page section River Invertebrate Prediction and Classification System Models€• in the draft appears to be written primarily to justify the use of RIVPACS models by UDWQ. The draft states that Recently, many western states have adopted the RIVPACS model such as Colorado, Montana, and Wyoming. These States indeed use O/E models but the O/E metric is just one of many in a multimetric assessment program (see Table 1). To claim that these states also use O/E models leads the public to believe that UDWQ's use of O/E as a stand-alone metric is valid, which it is not. Table 1. Some metrics used by other states Bioassessment metrics used by Montana (MDEQ 2016) Ephemeroptera taxa Plecoptera taxa % EPT % Non-insect % Predator Burrower taxa % Hilsenhoff Biotic Index % EPT excluding Hydropsychidae and Baetidae % Chironomidae % Crustacea and Mollusca Shredder Taxa % Predator EPT taxa % Tanypodinae % Orthocladiinae of Chironomidae Predator taxa % Filterers and Collectors O/E Bioassessment metrics used by Wyoming (Hargett 2011) Richness and Diversity Metrics % Chironomidae Taxa of Total Taxa % Diptera Taxa of Total TaxaX % Ephemeroptera Taxa of EPT Taxa % Ephemeroptera Taxa of Total Taxa No. Ephemeroptera Taxa No. EPT No. EPT Taxa (less Arctopsychidae and Hydropychidae) No. EPT Taxa (less Baetidae, Arctopsychidae, Hydropychidae and Tricorythodes) No. EPT Taxa (less Baetidae and Tricorythodes) Shannon Diversity (E) Composition Metrics % Ephemeroptera (less Baetidae and Tricorythodes) % EPT (less Arctopsychidae and Hydropsychidae) % EPT (less Baetidae and Tricorythodes) % Tricorythodes of Ephemeroptera Life History Metrics [reponse continued below]	None.	The justification is that RIVPACS models tend to be more precise and often more responsive to known stressors than other indices (e.g., please review Hawkins 2006, Hawkins et al 2010). Further, only one of the states the commenter identifies, Montana, uses additional metrics in support of O/E, but that process is used to assess sediment pollution specifically. DWQ's use of O/E is applied more broadly to the full suite of anthropogenic stress.

Public Commenter : First Name	Public Commenter : Last Name	Public Comment Document ID	NEW FORM SORT ID	ATTACHMENT SORT ID	Public Comment to Respond To (UDWQ sometimes splits the original public comments to make sure each comment within a larger comment submission is addressed).	Action	DWQ's Response
David	Richards	DRichards_12042018.pdf	16	45	Ratio of Multivoltine Taxa to Unvoltine Taxa +Semivoltine Taxa Functional Feeding Group/Habitat Metrics % Clinger % Collector-gatherer % Filterer Taxa of Total Taxa % Scraper % Scraper Taxa of Total Taxa No. Burrower Taxa No. Predator Taxa No. Scraper Taxa Tolerance Metrics BCICTQa HBI No. Semivoltine Taxa No. Univoltine Taxa Bioassessment metrics used by Idaho (IDEQ 2011). % Chironomidae % clingers % Ephemeroptera % Ephemeroptera and Plecoptera % filterers % EPT % EPT, excl. Hydropsychidae % filterers (adjusted) % Multivoltine % non-insects % Predators % Scrapers % Tolerant % tolerant (adjusted) Becks Biotic index Clinger taxa (adjusted) EPT Taxa EPT taxa (adjusted) HBI (adjusted) Insect Taxa Non-insect % of taxa Non-insect % of taxa (adjusted) Scraper taxa Semi-voltine taxa Simpsons index Sprawler taxa Sprawler taxa (adjusted) Swimmer & Climber Taxa Tolerant taxa O/E	None.	[see row above for response]

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David	Richards	DRichards_12042018.pdf	17	46	I don't agree that using a single taxon richness-based metric, RIVPACS O/E would constitute a robust index of biological integrity. It is only one metric that does not address anything other than richness and apparently does not do an adequate job of that (Richards 2016).	None.	O/E is more than richness. It is sensitive to shifts in composition. Based on substantial stakeholder input, DWQ believes it is important that indices be easily interpretable. Ecological interactions can be complex, but assessment tools need not try to expose all of the complexity. From an aquatic life use support context, DWQ assesses whether aquatic life has been impaired. O/E is not biological integrity but an important aspect of it. Other measures such as indices based on tolerances are not measures of overall biotic integrity either. Most invertebrate-based indices are strongly correlated with one another, so they do tend to capture the same signals (e.g., please review: Hawkins 2006 and Hawkins et al. 2010). Further, O/E, MMI, etc., are indices of an ecological endpoint (biological integrity) that is otherwise very difficult to measure in full. To conduct detailed, full evaluations of ecological structure and function everywhere is unrealistic for a biannual state-wide assessment process.
David	Richards	DRichards_12042018.pdf	18	47	There is also no reason to make a ‚robust IBI' easily interpretable. Ecological interactions between dozens of organisms and their responses to human caused impairment are anything but easily interpretable. RIVPACS O/E models themselves are not easily interpretable. The data and algorithms used in these models are extremely difficult to obtain and often not available, thus not transparent. Other metrics used by other agencies, such as taxa richness, functional feeding group, etc. are very transparent and easily calculable.	None.	Ecological interactions can be complex, but assessment tools need not try to expose all of the complexity. From an aquatic life use support context, DWQ assesses whether aquatic life has been impaired. O/E is not biological integrity but an important aspect of it. Other measures such as indices based on tolerances are not measures of overall biotic integrity either. Most invertebrate-based indices are strongly correlated with one another, so they do tend to capture the same signals (e.g., please review: Hawkins 2006 and Hawkins et al. 2010). Further, O/E, MMI, etc., are indices of an ecological endpoint (biological integrity) that is otherwise very difficult to measure in full. To conduct detailed, full evaluations of ecological structure and function everywhere is unrealistic for a biannual state-wide assessment process.
David	Richards	DRichards_12042018.pdf	19		Arbitrary cut- off points, no statistical justification for choices in Decision Tree (Figure 7) or Use Determination (Table 13). Apparently mostly a best guess.	None.	Thresholds are derived based on an understanding of model error (which is based on actual field measures) and the specific values represent an attempt to balance type I (false positive) and type II (false negative) errors. This is a common dilemma for any regulatory agency in general and perhaps more so with those using biological data. DWQ has stated in the chapter the cost-benefit of ensuring that type I and II errors are appropriately balanced and not arbitrarily set.

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David	Richards	DRichards_12042018.pdf	20	68	Methods are lacking in the draft to evaluate biological integrity/aquatic beneficial uses. There are no zooplankton, benthic macroinvertebrate, or fish numeric or narrative metrics. Without such metrics, there likely is no possibility of evaluating whether biological beneficial uses are supported or not supported. A program needs to be started by UDWQ to develop robust multimetric biological assessments for lentic waters.	None.	O/E is not biological integrity but an important aspect of it. DWQ agrees that the development of biological assessment tools for additional assemblages would be useful and has taken preliminary steps to accomplish this task. Nevertheless, the use of O/E, which has been repeatedly demonstrated to be a robust indicator of biological degradation, provides a useful way to identify whether a site is biologically degraded. More nuanced evaluations of the nature and extent of this degradation can always be evaluated once biologically degraded sites are identified. To conduct detailed, full evaluations of ecological structure and function everywhere is unrealistic for a biannual state-wide assessment process. With respect to biological assessments of lentic ecosystems, DWQ has developed a MMI for impounded wetlands. In addition, many of the metrics used for the assessment of lakes and reservoirs are biological indicators of the condition of these ecosystems. Nevertheless, DWQ is open to expanding these approaches as resources permit. DWQ has participated in the national assessment of lakes and reservoirs and these data could potentially be used to expand the number of indicators used to assess lentic ecosystems.
David	Richards	DRichards_12042018.pdf	21	69	In many instances UDWQ refers to cold-water vs. warm-water uses. Temperatures that exceed 20O C do not necessary mean impaired. It is possible that the water body is naturally a warm water fishery and may have been misclassified or that increased temperatures due to climate change have affected temperatures. This is a problem with stream assessments as well (e.g. Jordan River).	None.	As explained in UTAH'S NUMERIC CRITERIA AND BENEFICIAL USES section in the Assessment Methods, current data are compared to current water quality criteria in the IR process. If the current temperature criterion is 20º C in R317-2 , Standards of Quality for Waters of the State, and the data exceed 20º C, the water quality is impaired for temperature. An identified impairment is typically followed by more intense monitoring. One potential outcome of these investigations is that the beneficial use for a waterbody may be misclassified which can be corrected by a Water Quality Standards change. Standards changes are beyond the scope of the IR. Recommendations for use classification changes should be made to DWQ's water quality standards program (https://deq.utah.gov/water-quality/water-quality-standards).
David	Richards	DRichards_12042018.pdf	22	70	There is also no reason for UDWQ to infer that a cold-water fishery is superior to a warm water fishery by stating that cold water uses are a higher use than warm water use. For example, UDWQ states their goal is to meet the highest attainable use. We need to get away from the idea that cold-water mountain streams and lakes have some greater innate value than lower elevation warm-water bodies. Global climate change may insure this, eventually.	None.	DWQ does not infer differences in value among aquatic life use classes. It appears that this is a general comment regarding beneficial use classifications which are out of scope for the IR. Water quality criteria to protect aquatic life uses may be more or less stringent from use class to use class depending on the sensitivity of organisms occurring in those use classes to various pollutants, but this does not imply higher or lower intrinsic value of various types of ecosystems. Recommended beneficial use or water quality standards changes should be directed towards DWQ's Standards program (https://deq.utah.gov/water-quality/water-quality-standards).

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David	Richards	DRichards_12042018.pdf	23	71	My overall conclusion is that the UDWQ 2018 Draft reflects a concerted effort by UDWQ to manage Utah's waters that are protective of biological integrity (and other uses) and is to be commended.	None.	DWQ appreciates your encouragement and feedback regarding the Integrated Report and the 303(d) assessment methods.
David	Richards	DRichards_12042018.pdf	24	72	However, the draft is heavy on numeric -criteria based- measures such as DO and weak on how these metrics actually relate to biological integrity, the real measure of water quality as mandated by the Clean Water Act.	None.	The Clean Water Act (CWA) aims to prevent, reduce, and eliminate pollution in the nation's waters in order to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters"(emphasis added), as described in CWA section 101(a). In practice, the protection of chemical integrity involves regular assessments to determine whether or not numeric chemical criteria are violated. Some of these numeric criteria were established to protect aquatic life uses, so an evaluation of these criteria provides an indirect evaluation of biological integrity objectives. Sites that meet these criteria infer supporting aquatic life uses. Similarly, biological assessments are intended as another indicator of biological integrity objectives. As the commenter notes elsewhere, biological integrity is an abstract idea that cannot be measured directly or completely, so DWQ and other regulatory agencies depend on indicators that quantify important components of this CWA objective.
David	Richards	DRichards_12042018.pdf	25	73	Finally, there seems to be no clear scientific or otherwise causal link between the numeric based metrics and the beneficial uses particularly biological, that UDWQ is evaluating.	None.	The biological assessment process is based on Utah's Narrative Water Quality standard. Applicability of the narrative standard is not wholly dependent on the specific beneficial uses ascribed to an individual waterbody. Nevertheless, from an aquatic life use support context, DWQ assesses whether aquatic life has been impaired. O/E is not biological integrity but an important aspect of it. Numerous studies have demonstrated that O/E can quantify biological degradation to a wide range of human-caused stressors, which provides confidence the metric as a robust measure of condition. More nuanced investigations of the nature and extent of the degradation that has occurred and the stressors that caused the degradation to occur can be evaluated once impairments are identified.
David	Richards	DRichards_12042018.pdf	26	74	A few Recommendations and Suggestions 1. UDWQ needs to provide user-friendly public access to RIVPAC O/E and PRISM models. Transparency (repeatability) is a key component of scientifically validity.	None.	RIVPACS O/E scores have been, and will continue to be, made available with publication of the Integrated Report. The underlying models require additional information and some instruction to be used properly, so have traditionally been provided to interested stakeholders upon request. PRISM data are not proprietary and are freely available. They have been independently tested and validated. They are used by a very large community of scientists across a wide range of disciplines and are continually updated and corrected. Please contact DWQ's Standard and Technical Services Section manager for public access to the RIVPAC O/E and PRISM models.

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David	Richards	DRichards_12042018.pdf	27	75	2. Macroinvertebrates are the corner stone of biological integrity. As such, UDWQ should put much more effort into developing useful macroinvertebrate metrics in a multimetric assessment program that could include an O/E metric.	None.	At this time, DWQ has identified the RIVPACS O/E index approach as the most scientifically defensible method for performing bioassessment for purposes of identifying sites that experienced biological degradation. This does not preclude the use of other indicators of biological integrity or to provide insights into the nature and extent of any biologically degraded sites that are identified. Both multiple metric indices (MMIs) and O/E indices have potential strengths and weaknesses. Alternative biological assessment methods would require the same level of technical review and documentation that has been completed for the currently employed RIVPACS approach if they are to be used for assessment purposes.

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David	Richards	DRichards_12042018.pdf	28	76	3. There is a need to include references or links in the draft to UDWQ field macroinvertebrate sampling protocols or add one or two sentences in the draft that include methods used such as riffle/run habitats, 8 composite samples, 600 organism subsample including large and rare, taxonomic resolution used, etc. Literature Cited and Suggested Readings Hargett, E. G. 2011. The Wyoming stream integrity index (WSII) multimetric indices for assessment of wadeable streams and large rivers in Wyoming. Wyoming Department of Environmental Quality. Cheyenne, WY. Idaho Department of Environmental Quality. 2011. Biological assessment frameworks and index development for rivers and streams in Idaho. IDEQ. Boise, Idaho. Jessup, B. Recalibration of the macroinvertebrate multi-metric index for Colorado. Colorado Department of Public Health and Environment. Water Quality Control Division. Denver, CO. Jones, J. and J. Woods 2007 to 2010. A statewide assessment of Arizona's streams. Arizona Department of Environmental Quality. Leitao, R. P. et al. 2016. Rare species contribute disproportionately to the functional structure of species assemblages. Proceedings of the Royal Society B: Biological Sciences. Vol. 283. Issue 1828. Montana Department of Environmental Quality. 2008. An assessment of the ecological conditions of the streams and rivers of Montana using environmental monitoring and assessment program (EMAP) method. Montana Department of Environmental Quality. Helena MT. New Mexico Environmental Department. 2006. Benthic macroinvertebrate stream condition indices for New Mexico wadeable streams. New Mexico Environmental Department. Santa Fe, New Mexico. Nijboer, R. C. and A. Schmidt-Kloiber. 2004. The effect of excluding taxa with low abundances or taxa with small distribution ranges on ecological assessment. Hydrobiologia. Vol. 515 1:347-363. Pimm, S. L. et al. 2014. The biodiversity of species and their rates of extinction, distribution, and protection. Science. Vol. 344. Issue 6187. Review. Richards, D. C. 2016. Real and Perceived Macroinvertebrate Assemblage Variability in the Jordan River, Utah can Affect Water Quality Assessments. Draft Technical Report. Submitted to the Jordan River/Farmington Bay Water Quality Council. Salt Lake City, UT. Oreohelix Consulting, Vineyard, UT. [response continued below]	None.	The online location of the benthic macroinvertebrate collection Standard Operating Procedure (SOP), along with all IR relevant SOPs, is identified In the Data Quality section on page 30 in the IR methods. Also, thank you for providing the literature references. These were helpful when reviewing your comments on the assessment methods.

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David	Richards	DRichards_12042018.pdf	28	76	Richards, D. C. 2016. Does Phylogeny Predict Sensitivity to Ammonia in Freshwater Animals using USEPA Ammonia Criteria Data? Submitted to the Wasatch Front Water Quality Council. Salt Lake City, UT. Oreohelix Consulting, Vineyard, UT. Richards, D. C. 2016. Is Reliance on a Single Bioassessment Metric for Assessing Water Quality in Utah's Rivers and Streams Prudent? Draft Technical Report to Wasatch Front Water Quality Council. Salt Lake City, UT. Oreohelix Consulting, Vineyard, UT. Stout III, Ben M. "River Continuum Concept as an Analytical Template for Assessing Watershed Health" Wheeling Jesuit University. 2003. Thorp J.H., Delong M.D.: The Riverine Productivity Model: An Heuristic View of Carbon Sources and organic processing in large river ecosystems• . In: Oikos 70 (2) :305-308. Blackwell, Oxford 70 .1994. Turak, E. and K. Koop. 2003. Use of rare macroinvertebrate taxa and multiple-year data to detect low-level impacts in rivers. Aquatic ecosystem health and management. 167-175. UDWQ et al. 2017. Utah and Colorado Water Survey for Mussels and Snails. Final Report. Original Draft-July 1, 2017. Revised Draft-. Vannote R.L., G. W. Minshall, K. W. Cummins,Can. J. River Continuum Concept• Fish. Aquatic Science. March 2005. Vannote R.L., G.W. MINSHALL, K.W. Cummins, J.R. Sedell, C.E. Cushing: The River Continuum Concept• . Canadian Journal of Fisheries and Aquatic Sciences. 37.1980,1 Ottawa, 130-137. Ward J.V., J.A. Stanford: The Serial Discontinuity Concept of River Ecosystems. T.D. Fontaine, S.M. Bartell: Dynamics of Lotic Ecosystems. Science Publications, Ann Arbor Mich 29-42. 1983.	None.	[see row above for response]
David	Richards	DRichards_12152018_v1.pdf	30		I entered my responses in the electronic format by copying and pasting from Word document but it appears that the formats for headings, literature cited did not transcribe. Therefore, I am also submitting my comments as additional comments in the native Word format. Thanks!	Requested improvement on form functionality.	DWQ appreciates your feedback regarding the form's formatting issues and thanks you for using the electronic public comment submission form. Your notes regarding the form's formatting issues have been communicated to DEQ's Office of Planning and Public Affairs Web Manager and Specialists who are looking into whether or not special formatting can be accommodated in the form's text box properties. These comments are helpful for enhancing our forms for the next public comment period.

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Marian	Rice	MRice_12072018.pdf	101		This letter transmits comments from Salt Lake City Department of Public Utilities (SLCDPU) in response to the DRAFT 2018/2020 303(d) Assessment Methods. Salt Lake City (City) supports the Utah Division of Water Quality (DWQ) efforts to monitor assess, and protect the surface and ground waters of the state. Thus, we appreciate the opportunity to provide feedback and comment on the DRAFT 2018/2020 303(d) Assessment Methods.	None.	DWQ appreciates your encouragement and feedback regarding the Integrated Report and the 303(d) assessment methods.
Mark	Allen	MAllen_11272018.pdf	111		In meetings with DWQ it has been stated that there are not any standards for heavy metals bonded with sediments that flow in high water years, into irrigation systems. There are standards for dissolved heavy metals in the water column, but we all know that the heavy metals that are not dissolved can end up in backyards via the irrigation system and then rain that is acidic can release these heavy metals. American Fork Canyon is particularly prone to this problem. Please create a standard to protect the public health from this known problem.	Out of scope.	Thank you for your comment. Sediment assessments are currently beyond the scope of the IR, although the Division continues to investigate potential sediment standards for heavy metal laden waters. DWQ continues to work with the Utah Department of Health to ensure human health is protected with regards to potentially contaminated sediment in American Fork Canyon (see https://deq.utah.gov/destinations/updates-tibble-fork-reservoir-sediment-release-august-2016). DWQ is also coordinating with the EPA to support the ongoing American Fork Canyon CERCLA Preliminary Assessment. Recommendations from PA are expected in 2019.
Mark	Allen	MAllen_11272018.pdf	112		Please put in place measures to dredge the heavy metals that are still in Tibble Fork Reservoir.	Out of scope.	DWQ appreciates the comment and underlying concern; however, this comment is not within the scope of the IR. DWQ continues to work with the Utah Department of Health to ensure human health is protected with regards to potentially contaminated sediment in American Fork Canyon (see https://deq.utah.gov/destinations/updates-tibble-fork-reservoir-sediment-release-august-2016). DWQ is also coordinating with the EPA to support the ongoing American Fork Canyon CERCLA Preliminary Assessment. Recommendations from Preliminary Assessment are expected in 2019.
Mark	Allen	MAllen_11272018.pdf	113		Please put the discharge permit that was promised 2 years ago to the outflows of the Yankee Mine and address the problems with the Globe Mine complex at the headwaters of American Fork River.	Out of scope.	DWQ appreciates the comment and underlying concern; however, this comment is not within the scope of the IR. Please contact the DWQ Surface Water Utah Pollutant Discharge Elimination System Section Manager for more information at https://deq.utah.gov/legacy/permits/water-quality/utah-pollutant-discharge-elimination-system/index.htm).

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Shera	Reems	EPA_Region8_12072018.pdf	114		EPA recommends that UDEQ include a link to the State's Vision Document.	Clarified Methods table.	DWQ appreciates the feedback and added a hyperlink to the "Assessment Category Description" for the 5-alt EPA assessment category in Table 1 of the assessment methods. DWQ did not include a section in the assessment methods document on Utah's prioritization of the 303(d) list as this was out of scope for the IR. For more information on the Prioritizing Utah's 303(d) List, please see https://deq.utah.gov/legacy/programs/water-quality/watersheds/docs/2016/303d-list-for%20tmdl-development.pdf

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Shera	Reems	EPA_Region8_12072018.pdf	115		The list of required data elements under 305(b) Summary and 303(d) Assessment Results is not consistent with EPA guidance document. EPA recommends deleting the lists and pointing the public to the ATTAINS website.	Revised Methods text.	DWQ appreciates the comment and suggestion to simplify the "Developing the Components of the Draft Integrated Report and 303(d) List" section of the assessment methods. For this reporting cycle, DWQ decided to keep the bulleted list for the current assessment methods and will review whether to simplify this section in a future assessment method document. To ensure the current language does not conflict with the 2018 guidance document (https://www.epa.gov/tmdl/integrated-reporting-guidance-under-cwa-sections-303d-305b-and-314) and 40 CFR 130.7 (b)(6), DWQ added the following language to the "Developing the Components of the Draft Integrated Report and 303(d) List" section: 305(b) Summary At a minimum, this summary will address the following elements for current assessments (and previous assessments where new data and information did not result in an EPA-defined categorical change): 303(d) Assessment Results At a minimum, the following information will be provided for current assessments (and previous assessments where new data and information did not result in an EPA-defined categorical change): 305(b) and 303(d) Assessment Data and Information To support DWQ's decision to list or not list waters, DWQ will provided (at a minimum) the following supporting information and documentation as referenced in CFR 130.7 (b)(6): • A description of (or access to) the data records and information used in the IR's current period of record, • A rational for (and access to) any data and information that was obtained or submitted to DWQ during the call for data but did not meet DWQ's readily available or credible data requirements and was not used for 305(b) and 303(d) assessments, and • A rational for (and access to) any rejected data records and information

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Shera	Reems	EPA_Region8_12072018.pdf	116		Table 6. Does UDEQ have validation criteria for high frequency datasets other than dissolved oxygen?	Issue added to the Methods Current Review Topics Tracking Workplan list for future IRs.	For the 2018/2020 IR, DWQ is focusing only on assessing high frequency data for dissolved oxygen. This decision is based on: (1) the foundation that was laid out in Chapter 7 of the 2016 IR, and (2) our commitment made in the 2016 IR response to public comment process to scale the Chapter 7 pilot study for assessing high frequency data on the Jordan River to all assessed waterbodies of the State in the 2018/2020 303(d) Assessment Methods and IR. Currently, DWQ has not yet developed assessment methods for other parameters with high frequency data. DWQ welcomes EPA (and others) to provide any studies or examples from other states that assess high frequency data.
Shera	Reems	EPA_Region8_12072018.pdf	117		Table 8. Has UDEQ considered expanding this table for macroinvertebrate data to include the list of requirements to parallel the list of requirements for toxics and other conventional parameters? For example, include in this table the following information: number of organisms counted and level of taxonomic resolution.	Clarified Methods table.	DWQ appreciates EPA's suggestions to clarify what the credible data requirements are for 305(b) and 303(d) assessment purposes. To be consistent with the SOP submission requirements communicated in the "Standard Operating Procedures Guidelines and Examples" section of the methods, DWQ added a QAPP column to Tables 5-8. The QAPP discusses subsample organism counts and taxonomic resolution. Also, we added an essential metadata element across all data types including macroinvertebrates to further ensure consistency. DWQ will continue to seek ideas to align requirements in the next IR cycle without causing unintentional and unnecessary burden to organizations submitting data.
Shera	Reems	EPA_Region8_12072018.pdf	118		Please clarify what is meant by water years?	Clarified Methods text.	DWQ uses the same definition as the U.S. Geologic Survey (https://water.usgs.gov/nwc/explain_data.html) and defines the water year as the 12-month period between October 1 and September 30 of the following year. As an example, a 2018 water year begins on October 1, 2017 and ends on September 30, 2018. This clarification has been added to the Period of Record section of the methods.
Shera	Reems	EPA_Region8_12072018.pdf	119		EPA recommends including the actual water quality criteria in the table.	Clarified Methods table.	To reduce errors and avoid inconsistencies in information between multiple documents and files, DWQ is working towards minimizing the duplication of data and information in the division's files. Beginning with the 2016 IR, DWQ started using hyperlinks to direct readers to the primary document or source of information to ensure that users were referring to the most current and accurate information. DWQ has continued this practice in the 2018/2020 303(d) Assessment Methods. To better assist users of the assessment methods, DWQ added hyperlinks to the numeric criteria in UAC R317-2 in Table 2 of the 303(d) Assessment Methods .

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Shera	Reems	EPA_Region8_12072018.pdf	120		Has UDEQ considered assessing the 30-day average with high frequency dissolved oxygen data?	None.	For high frequency dissolved oxygen (DO) data, DWQ assesses three dissolved oxygen criteria independently of each other (i.e., the minimum, 7-day average, and 30-day average). The 30-day average minimum DO assessment for high frequency data is outlined in Figure 5 of the Assessment Process section of the assessment methods and is described in more detail under Figure 4's caption.
Shera	Reems	EPA_Region8_12072018.pdf	121		Does UDEQ have a process to assess turbidity data?	Issue added to the Methods Current Review Topics Tracking Workplan list for future IRs.	Currently, DWQ does not have an assessment method process for assessing Utah's water quality standard for turbidity. The criteria is expressed as a change in turbidity. The difficulty in establishing an assessment methodology lies with the inability to establish an appropriate baseline from which to evaluate the change in turbidity. DWQ implements the turbidity standard in Section 401 water quality certifications by limiting turbidity increases in receiving waters caused by activities covered under those permits to 10-15 NTU's. As briefly noted in Table 6 of the assessment methods, DWQ is working towards developing methods for high frequency data, including temperature and pH. As DWQ moves forward with the development of high frequency data assessment methods and research studies specific to temperature and pH, DWQ will review turbidity as well.
Shera	Reems	EPA_Region8_12072018.pdf	122		Figure 2. EPA recommends UDEQ delete this figure. When assessing all designated uses more than just conventional pollutants should be considered.	None.	When evaluating the impacts of measured pollutant concentrations on environmental and human health for 305(b) and 303(d) assessment purposes, DWQ assesses and reports every beneficial use with numeric criteria that has credible and readily available data. DWQ does not assess just the most environmentally protective criterion and/or use for a parameter and IR waterbody type. For more information on how DWQ assesses non-conventional pollutants, please refer to the following sections in the assessment methods: "Narrative Standards: Biological Assessments", "Assessments Specific to Lake, Reservoirs, and Ponds", "Toxics Parameter Assessment for All Waters", "Escherichia Coli Assessment for All Waters", "Pollution Indicator Assessments of All Waters", and "Narrative Standards for All Waters".

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Shera	Reems	EPA_Region8_12072018.pdf	123		Data Sufficiency. EPA recommends that UDEQ reconsider greater than or equal to 39 complete days of contiguous data. This approach is a significant data requirement and DO could be assessed against the daily minimum criterion or 7-day average which require less data.	None.	DWQ appreciates the feedback and concerns regarding the method's "High Frequency Assessments for Dissolved Oxygen" section and Figures 3-5. The original intent of requiring ≥39 complete days of contiguous data within the period of record was to ensure that the 30-day, 7-day, and daily minimum criteria could all be fully assessed. However, after review of the publicly submitted comments, DWQ understands how this may have been miscommunicated as a significant or restrictive data requirement and prevent data submissions for further evaluation in 305(b) and 303(d) assessments. DWQ agrees with the commenter that 39 contiguous days of high frequency dissolved oxygen (DO) data are not needed to fully assess the 7-day average minimum DO criteria. DWQ reviewed the original language and removed the ≥39 day requirement from the "Data Sufficiency" section. The section now reads, "To ensure that daily minima are captured and that daily averages can be accurately calculated, high frequency data must capture complete days. DWQ defines a complete day as a calendar day (i.e. 12:00 am – 11:59 pm) in which at least one measurement is made in each hour. Incomplete days will not be included in the high frequency DO assessment." DWQ also removed the ≥39 day requirements in Figures 3 and 4. Instead, data are considered sufficient for assessment if at least ten daily minima or 7 or 30 day averages can be calculated over the period of record.
Shera	Reems	EPA_Region8_12072018.pdf	124		Figure 3. In the box that starts with, calculate the daily, EPA recommends that UDEQ consider specifying that either the 7-day or 30-day averages could be calculated with continuous data.	None.	DWQ appreciates the comment and suggestion to help further clarify the high frequency dissolved oxygen (DO) assessment process and figure. However, after further review DWQ decided to keep the Assessment Process figure as is. For 305(b) and 303(d) reporting purposes, DWQ assesses each minimum DO criterion independently of one another. To help communicate that decision clearly to reviewers and users of the assessment methods, DWQ prefers not to reference the other high frequency DO criterion or assessment processes in Figure 3.

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Shera	Reems	EPA_Region8_12072018.pdf	125		Figure 4. Has UDEQ considered completing the assessment outlined with fewer days using continuous dissolved oxygen data? See comment submitted for Page 43.	None.	DWQ appreciates the feedback and concerns regarding the method's "High Frequency Assessments for Dissolved Oxygen" section and Figures 3-5. The original intent of requiring ≥39 complete days of contiguous data within the period of record was to ensure that the 30-day, 7-day, and daily minimum criteria could all be fully assessed. However, after review of the publicly submitted comments, DWQ understands how this may have been miscommunicated as a significant or restrictive data requirement and prevent data submissions for further evaluation in 305(b) and 303(d) assessments. DWQ agrees with the commenter that 39 contiguous days of high frequency dissolved oxygen (DO) data are not needed to fully assess the 7-day average minimum DO criteria. DWQ reviewed the original language and removed the ≥39 day requirement from the "Data Sufficiency" section. The section now reads, "To ensure that daily minima are captured and that daily averages can be accurately calculated, high frequency data must capture complete days. DWQ defines a complete day as a calendar day (i.e. 12:00 am – 11:59 pm) in which at least one measurement is made in each hour. Incomplete days will not be included in the high frequency DO assessment." Instead, data are considered sufficient for assessment if at least ten daily minima or 7 or 30 day averages can be calculated over the period of record.

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Shera	Reems	EPA_Region8_12072018.pdf	126		Does UDEQ give additional weight to continuous dissolved oxygen data compared to grab samples?	None.	DWQ recognizes the importance of diurnal variation in water quality parameters, particularly dissolved oxygen, and is actively expanding its capacity to collect and analyze high frequency data with sonde deployments in waterbodies throughout the state. However, this effort is resource intensive, and it is not currently feasible to deploy high frequency sondes at all monitoring locations. As such, DWQ assesses all available data for this parameter, including instantaneous measures. As discussed in the "Analyzing Multiple DO Datasets at a Site" section of the 303(d) assessment methods, DWQ assesses instantaneous and high frequency measurements independently of each other and follows the aggregation and secondary review process described in "Determinations of Impairment: All Assessment Units" and "Appendix 3". The same level of secondary review is applied when reviewing delistings. If during the secondary review, DWQ applies additional weight to instantaneous or high frequency dissolved oxygen data, a secondary review rationale with supporting documentation is provided during the draft IR public comment period and submission to EPA for final review.
Shera	Reems	EPA_Region8_12072018.pdf	127		Does the RIVPACS model apply to larger non-wadeable streams?	None.	Larger rivers offer more of a challenge to assess because they are more regional rather than isolated to a state. DWQ's model incorporates reference river locations from the intermountain west rather than being limited to Utah-based locations to ensure that the model is applicable to as many non-wadeable streams as possible. In addition, DWQ runs a chi-square test to ensure that each assessed site fits within the bounds of the model. If a larger river is sufficiently dissimilar from these larger river reference sites then chi-squared test would fail and assessments would not be conducted.
Shera	Reems	EPA_Region8_12072018.pdf	128		Has UDEQ updated the RIVPACS model since 2002?	None.	DWQ periodically updates the model once a sufficient number of reference sites have been sampled to increase the likelihood that the model can better differentiate between different types of streams located throughout Utah. The most recent update occurred in 2012.
Shera	Reems	EPA_Region8_12072018.pdf	129		Figure 7. The line from the top left diamond has a Yes going to Beneficial Use Not Supported. Should this line indicate No and point to the diamond that says Do at least 2 O/E samples score <0.69. The line between the top two diamonds should indicate Yes, and the arrow should point to is the average O/E score >.76• .	None.	This figure is as intended and correct as applied.

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Shera	Reems	EPA_Region8_12072018.pdf	130		Table 13. Figure 7 and Table 13 do not appear to align. EPA recommends modifying the scenarios in the table to align with Figure 7. The scenario in the third row of the table should read insufficient data. Please clarify the last scenario in this Table.	Clarified Methods table.	Figure 7 and Table 13 do align correctly. However, the row that identified a scenario when < 3 samples with a mean O/E score ≥ 0.76 as fully supporting is redundant and potentially confusing, so it was removed.
Shera	Reems	EPA_Region8_12072018.pdf	131		Page 56 indicates that if 10% of the DO measurements are below the criterion, the standard is exceeded. Shouldn't the left column also apply to dissolved oxygen instead of the >50% water column exceedence?	Corrected error.	Thank you for identifying the error in Figure 8. The figure has been updated to 10%.
Shera	Reems	EPA_Region8_12072018.pdf	132		Recommend moving Figure 14 up to follow Figure 8.	None.	Figure 14 describes the tier II lakes assessment process and follows the text and figures that describe the tier I assessment processes. As readers may find it confusing to jump to the tier II assessment process without going through the tier I assessment process, DWQ is maintaining the current position of the figure.
Shera	Reems	EPA_Region8_12072018.pdf	133		pH. Is the outlined process the same for both lakes and streams? If so, should these indicators be referenced in the stream section?	None.	The processes for pH assessment for lakes and streams are separate processes. pH assessments in streams are conducted following the streams 'Conventional Parameter Assessments' process described on page 40. Lake pH assessments follow the profile assessment process described on pages 54-55.
Shera	Reems	EPA_Region8_12072018.pdf	134		EPA suggests removing Figures 9 and 10 and simply indicate that pH, temperature, and dissolved oxygen are assessed using profile data.	None.	DWQ believes that these figures provide useful examples of what profile data are and how they are used in the assessment process and is retaining them for this IR cycle. DWQ will consider improvements or clarifications to these figures in future cycles.
Shera	Reems	EPA_Region8_12072018.pdf	135		Streams and Lakes and Reservoirs. * Should this section only reference Lakes and Reservoirs.	None.	DWQ is unclear what section the commenter is referring to. The "Assessments Specific to Lakes, Reservoirs, and Ponds" section does not include any methods which are applied to rivers or streams.
Shera	Reems	EPA_Region8_12072018.pdf	136		* Assuming the only difference between the assessment process for mixed vs. stratified systems is the approach to dissolved oxygen, EPA suggests revising this section as follows: 1) describe the process for interpreting pH, 2) describe the process for analyzing dissolved oxygen and temperature for mixed lakes, 3) describe the process for analyzing dissolved oxygen and temperature for stratified lakes, 4) discuss Tier 2 analysis.	Clarified Methods text.	DWQ agrees with the order of information suggested in the comment. The process is generally described in the order recommended. However, the section headers are somewhat confusing. The pH assessment process applies to both stratified and non-stratified profile assessments. The difference between the assessment process for stratified and non-stratified profiles is the use of a joint assessment of temperature and dissolved oxygen in the stratified profiles. The headers were reorganized to clarify the process.

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Shera	Reems	EPA_Region8_12072018.pdf	137		Figure 11. Does this figure refer to at least 3 continuous meters meeting the dissolved oxygen criterion?	Clarified Methods figure.	The text, "Is an adequate habitable zone for aquatic life present?" in Figure 11 refers to the presence of at least 3 continuous meters in the water column meeting both dissolved oxygen and temperature criteria. The text in the figure has been updated to better correspond to the text and clarify the assessment process.
Shera	Reems	EPA_Region8_12072018.pdf	138		Figure 11. Recommend explaining the process separately for evaluating dissolved oxygen and temperature data.	None.	Figure 11 describes the process for jointly assessing dissolved oxygen and temperature under stratified lake conditions. The separate evaluations for dissolved oxygen and temperature conducted under mixed conditions are described in the preceding section under the headers 'Mixed Lake and Reservoirs': 'Temperature' and 'Dissolved Oxygen'.
Shera	Reems	EPA_Region8_12072018.pdf	139		Figure 12 explanation. EPA recommends clarifying this explanation to more clearly communicate that Panel B is not meeting the designated use because of temperature and not dissolved oxygen. Without knowledge of the state's assessment process a reader may not understand as written.	Clarified Methods figure.	Panel B in Figure 12 is not meeting aquatic life uses because: although there are regions in the water column where dissolved oxygen and temperature criteria are met separately, the region of overlap in the water column where both temperature and dissolved oxygen criteria (approximately 8 meters depth) is less than 3 meters thick. This has been clarified in the figure caption.
Shera	Reems	EPA_Region8_12072018.pdf	140		Figure 13. Please explain UDEQ's rationale for requiring a two-sample requirement for TDS as a minimum dataset compared to other parameters that require 10 samples?	None.	DWQ's minimum data requirements for TDS assessments in lakes reflect the frequency of sampling typically conducted under DWQ's lake monitoring program. Sampling frequencies tend to be higher for stream monitoring, so a higher minimum data requirement of 10 samples is applied to streams conventional assessments.
Shera	Reems	EPA_Region8_12072018.pdf	141		Figure 14. Under the first diamond, should the line have a no?	Corrected error.	Yes. The arrow directly under the first diamond should be labeled "No". This label has been added to the figure.
Shera	Reems	EPA_Region8_12072018.pdf	142		Figure 14. How did UDEQ decide on a TSI > 50 as a decision point?	None.	A TSI of 50 is a commonly used benchmark in lake management to categorize a waterbody as eutrophic and potentially indicative of cultural eutrophication. DWQ recognizes that trophic states occur on a continuum, but a general benchmark is useful for performing tier II assessments of lakes.
Shera	Reems	EPA_Region8_12072018.pdf	143		EPA recommends removing the TSI-SDD and TSI-TP discussion because UDEQ is not using TSI-SDD or TSI-TP for assessment. This level of detail should be included as an appendix. The location of this information in the document gives the reader the impression that TSI for chl-a, TP and SDD are calculated for the assessment.	Revised Methods text.	DWQ agrees with the commenter. Secchi disk and total phosphorus based TSIs are not currently used in the lake assessment methods. This section has been removed from the assessment methods. Rather than including them in an appendix here, these types of methods will be included in other documents when they are used by other programs.

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Shera	Reems	EPA_Region8_12072018.pdf	144, 145, 146		Does UDEQ intend to assess the Great Salt Lake using the narrative standard? How will UDEQ consider all readily available data and/or information for the Great Salt Lake? The EPA regulations at 40 C.F.R. Â§130.7(b)(6) require States to include, as part of their submissions to the EPA, documentation to support decisions for using or excluding data and/or information and decisions to list or not list waters.	None.	The Narrative Standard applies to all waters of the State, including Great Salt Lake, and DWQ will consider all readily available and credible data, including data from Great Salt Lake, in the assessment process. However, current Narrative Standard based assessment methods (e.g. harmful algal blooms, and macroinvertebrate O/E) are not applicable to Great Salt Lake's beneficial uses. DWQ's goal is to evaluate whether these types of methods are applicable to GSL and develop GSL-specific methods in the future. DWQ is in the process of developing Water Quality Standards and Assessment Methods for Great Salt Lake as outlined in the Great Salt Lake Water Quality Strategy Document (https://documents.deq.utah.gov/water-quality/standards-technical-services/gsl-website-docs/gsl-wq-strategy/DWQ-2019-000535.pdf) Once the standards or methods are fully developed, they will be incorporated in the assessment methods for future Integrated Report cycles.
Shera	Reems	EPA_Region8_12072018.pdf	147		UDEQ indicates that a single sample is sufficient for assessment; however, at the bottom of the page, UDEQ indicates that 4 samples is the minimum sample size? Please explain.	None.	In the toxic parameter assessments section of the methods, DWQ requires at least four samples for the sample site's dataset to be sufficient in size. If the location has ≥ 4 samples, the site has sufficient data and will be assessed as not supporting (i.e., ≥ 2 samples exceeds the criterion) or supporting (i.e., <2 samples exceed the criterion). If a sample location has < 4 samples, the site does not have sufficient data to assess and will be reported as insufficient data with exceedances if one of the measurements exceeds the criterion. If none of the measurements in the smaller dataset exceed the criterion, the site will be reported as insufficient data without exceedances. Following this procedure, while one sample is sufficient to conduct an assessment, ≥ 4 samples is required to report either supporting or non-supporting.
Shera	Reems	EPA_Region8_12072018.pdf	148		Figure 16. Please clarify how Insufficient Data: Exceedances are implemented and whether they result in some waters being a higher priority for additional monitoring?	Out of scope.	DWQ agrees with the commenter on the importance of following up on assessments that are reported as Category 3 due to insufficient data and information to determine if the waters were supporting or not supporting their designated beneficial uses. However, determining the strategy and process for following up on Category 3 (or Category 5 - impaired) waters is outside of the scope of the IR. Follow up monitoring due to insufficient data and information or to identify causes, sources, or develop remediation strategies are addressed through individual project plans that focus on TMDLs, watershed plans, BMPs, NPSs, delisting opportunities, etc. For more information on DWQ's monitoring strategies, please contact the Monitoring Section manager. Link to Strategic Monitoring Plan: https://deq.utah.gov/water-quality/strategic-monitoring-plan-water-quality

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Shera	Reems	EPA_Region8_12072018.pdf	149		UDEQ only included a Data Preparation section for E. coli but not the other parameters discussed. Would this type of information be helpful for other parameters as well or presented more generally?	Issue added to the Methods Current Review Topics Tracking Workplan list for future IRs.	In previous assessment methods, the flowing surface waters and lake, reservoir, and ponds sections had separate data preparation sections resulting in duplicated text. To reduce redundancy in the 2018/2020 assessment methods, DWQ created one section that discusses the Data Preparation for Conventional and Toxic Assessments for All Waters. DWQ maintained separate data preparation sections for high frequency dissolved oxygen and E. coli assessments because the data collection and sampling frequency is much different from conventional and toxic data collection and assessment processes. As DWQ continues to better clarify and streamline future assessment methods, DWQ will review and further define the data preparation steps for applicable narrative and lake specific assessments.
Shera	Reems	EPA_Region8_12072018.pdf	150		Figure 20. EPA suggests that the left pathway of the flow diagram in Figure 20. conclude with the following decision ovals: Insufficient Data with Exceedances• and Insufficient Data without Exceedances. This allows for an equivalent minimum sample size when determining full support and non-support in Scenario C.	Issue added to the Methods Current Review Topics Tracking Workplan list for future IRs.	DWQ agrees with the commenter that the left side of Figure 20 (Scenario C: A seasonal geometric mean assessment of E. coli) should be reviewed and edited in a future assessment method document. DWQ is working to conduct analysis and research on how to edit the left side of Figure 20, so that DWQ can better quantify and address potential E. coli concerns. During the next internal methods workshop, DWQ will evaluate and strongly consider EPA's suggestion.

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Shera	Reems	EPA_Region8_12072018.pdf	151		Table 16. EPA requests details on how UDEQ will assess for Gross alpha and Gross beta.	Clarified Methods text.	For the Class 1C designated use, gross alpha and gross beta are evaluated as a toxicant using comparisons to the numeric criteria in UAC R317-2-14, Table 2.14.1. For the Class 3 aquatic life designated uses, gross alpha and gross beta are evaluated as an indicator in accordance with UAC R317-2-14, Table 2.14.2, and footnote 10 that states: "Investigation[s] should be conducted to develop more information where these levels are exceeded". To capture this footnote in the assessment process, DWQ will review the preliminary pollution indicator assessment during the secondary review process to determine whether or not gross-alpha, -beta, and other pollution indicators demonstrate clear and convincing evidence of supporting or not supporting the beneficial uses assigned to the waterbody in UAC R317-2. Secondary reviews will incorporate indicator data into assessment category determinations, relying on multiple lines of evidence including pollution indicator thresholds, the presence or absence of other indicator-associated water quality issues, potential pollutant sources, and other site or watershed specific knowledge to determine whether listing or delisting on a pollution indicator parameter is appropriate or whether to prioritize waterbodies for additional monitoring. As noted in in the Secondary Review and Appendix 3 sections of the assessment methods document and CFR 140 130.7 (b)(6)(ii) and (iii), DWQ will provide a rationale and documentation for any decision to report pollution indicators as supporting or not supporting the beneficial uses in UAC R317-2-14, Tables 2.14.1 and 2.14.2. To better capture this process, DWQ removed table 16 from the assessment methods document and added the pollution indicator evaluation process described above to Appendix 3, Application of Secondary Review Process.

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Shera	Reems	EPA_Region8_12072018.pdf	152		Table 16. Total Phosphorus. All categorical assessments for aquatic life uses (Class 3) will be overwritten to Category 3.• Does UDEQ intend to provide delisting rationales for these waters? The EPA regulations at 40 C.F.R. Â§130.7(b)(6) require States to include, as part of their submissions to the EPA, documentation to support decisions for using or excluding data and/or information and decisions to list or not list waters. Such documentation needs to include, at a minimum, the following information: (1) a description of the methodology used to develop the list; (2) a description of the data and/or information used to identify waters; (3) a rationale for any decision not to use any existing and readily available data and/or information 40 C.F.R. Â§ 130.7(b)(5), and (4) any other reasonable information requested by the Region.	None.	When good cause can be demonstrated, DWQ will delist Total Phosphorus as P and provide the necessary documentation as described in the Delisting and Appendix 6 sections of the assessment methods document. Any delisting documentation and justifications will be available for review during the public comment process of the draft IR. To clarify, any Total Phosphorus as P assessments that are delisted or removed from the 303(d) list will undergo the same level of review and documentation as any other parameter DWQ removes from the 303(d) list. Examples of previous delisting documentation are available on the last four pages of Chapter 3 of the Final 2016 IR (https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/docs/2016/chapter-3-river-and-stream-assessments-final2016ir-v2-1.pdf).
Shera	Reems	EPA_Region8_12072018.pdf	153		Figure 21. Please clarify the rationale for determining if the bottom diamond arrow is no, the determination is Insufficient Data with Exceedances?	Clarified Methods figure.	As noted in the figure caption, Figure 21 in DWQ's assessment methods is based off of EPA's Consolidated Assessment and Listing Methods (CALM) guidance that was published in 2002 (https://www.epa.gov/sites/production/files/2015-09/documents/consolidated_assessment_and_listing_methodology_calm.pdf). In EPA's CALM guidance document, Figure 3-2 describes a scenario where there are two or more types of data that do not indicate consistent attainment status, and the differences in attainment status are not artifacts of data quality issues. Under this scenario, EPA's recommendation is to document and submit examples to them of where these situations occur. In Figure 21 of DWQ's assessment methods, DWQ expands on EPA's guidance by notifying EPA of the example(s), documenting the conflicting assessment(s), and following the secondary review process outlined in DWQ's assessment methods. DWQ will edit Figure 21 to reflect that the next step is to highlight the preliminary assessment for secondary review and not move directly to an insufficient data category (i.e., Category 3).

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Shera	Reems	EPA_Region8_12072018.pdf	154		Figure 22. Bottom right box. Please clarify the implications for these subcategories in terms of follow-up actions (e.g., monitoring, future assessments).	Out of scope.	DWQ agrees with the commenter on the importance of following up on assessments that are reported as Category 3 because there was insufficient data and information to determine if the waters were supporting or not supporting their designated beneficial uses. However, determining the strategy and process for following up on Category 3 (or Category 5 -impaired) waters is outside of the scope of the IR. Follow up monitoring due to insufficient data and information or to identify causes, sources, or develop remediation strategies are addressed through individual project plans that focus on TMDLs, watershed plans, BMPs, NPSs, delisting opportunities, etc. For more information on follow up monitoring, please contact the Monitoring Section manager. Link to Strategic Monitoring Plan: https://deq.utah.gov/water-quality/strategic-monitoring-plan-water-quality
Shera	Reems	EPA_Region8_12072018.pdf	155		Please elaborate on the types of information that UDEQ considers for a secondary data review.	None.	As part of DWQ's assessment and secondary review process, DWQ reviews and considers any quantitative and qualitative data (as described in greater detail in "Type of Data to Submit" and Table 10 of the assessment methods) that is readily available and credible. Appendix 3 provides some examples of the kind of information that may be considered during the secondary review. An example of the type of information submitted for secondary review, is documented in comment ID #343 from the 2016 IR. During the public comment process of the 2016 IR a commenter provided information that the data exceeding criteria was collected under flow conditions that were rare and not representative of normal operating conditions. DWQ agreed with the commenter that the data in question did not meet several data concerns as outlined in Appendix 3. For tracking and transparency to the public, DWQ documented the original category assignment, provided a brief justification for implementing the secondary review, and the final category assignment with the data in question removed. Examples of this secondary review and others from the 2016 IR are located here: https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/docs/2016/dwq-response-to-public-comments-final2016ir-v2-1.pdf

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Shera	Reems	EPA_Region8_12072018.pdf	156		Does UDEQ complete a secondary review on all assessments?	None.	DWQ performs a secondary review on all 305(b) and 303(d) assessments. However, not supporting and supporting assessments that result in a delisting are prioritized for multiple levels of review prior to releasing the report for public comment. Assessments where a secondary review recommendation is applied and overwrites a preliminary supporting or not supporting site or assessment unit decision also undergoes multiple levels of review prior to releasing the draft report.
Shera	Reems	EPA_Region8_12072018.pdf	157		Appendix 7 doesn't include information about Vision priorities. Has the UDEQ assessment and listing staff coordinated with the TMDL staff?	Clarified Methods text.	DWQ did not include a section in the assessment methods document on Utah's prioritization of the 303(d) list as this was out of scope for the IR. However, DWQ decided to reference and add a hyperlink to DWQ's 303(d) Vision document in Appendix 7 of the assessment methods. The first sentence of the second paragraph of the appendix now reads, "As described in the Division of Water Quality's (DWQ) 303(d) vision document <insert hyperlink to https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/docs/2016/303d-list-for-tmdl-development-final2016ir.pdf., DWQ prioritizes impairments to human and ecological health." The rest of the paragraph discusses additional considerations DWQ may include when prioritizing TMDL development.
Shera	Reems	EPA_Region8_12072018.pdf	158		UDEQ should reference here and Appendix 7 the state Vision prioritization document and/or revise the current description to reflect that process & results. See: https://deq.utah.gov/legacy/programs/water-quality/watersheds/docs/2016/303d-list-for%20tmdl-development.pdf	Clarified Methods text.	DWQ did not include a section in the assessment methods document on Utah's prioritization of the 303(d) list as this was out of scope for the IR. However, DWQ decided to reference and add a hyperlink to DWQ's 303(d) Vision document in Appendix 7 of the assessment methods. The first sentence of the second paragraph of the appendix now reads, "As described in the Division of Water Quality's (DWQ) 303(d) vision document <insert hyperlink to https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/docs/2016/303d-list-for-tmdl-development-final2016ir.pdf., DWQ prioritizes impairments to human and ecological health." The rest of the paragraph discusses additional considerations DWQ may include when prioritizing TMDL development.

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Theron	Miller	TMiller_12202018.pdf	166		Page 40, Table 11. Conventional parameters. Numerous recurrence intervals are listed. 30-day averages are used for assessments based on grab samples. 30- and 7-day averages and minimums are used for assessments based on high frequency data, and early life stages are assumed present for the 7-day and minimum high frequency assessments. Some site-specific standards have been generated, which are used for assessment purposes.• Comment: Need to clarify the phrase: Numerous recurrence intervals are listed.	Clarified Methods text.	Thank you for the comment. To avoid confusion DWQ removed the sentence in question and now only lists when specific dissolved oxygen minimums, 7-, and 30-day averaging periods are used based on the DO data type being assessed.
Theron	Miller	TMiller_12202018.pdf	167		Also, the sentence, 30-day averages are used for assessments based on grab samples is also unclear. It appears that grab samples are used for calculating 30-day averages. Yet, the figures presented describe the instantaneous minimum, 7-day and 30-day criteria, which appear to incorporate the use of high-frequency data. Hence, either the description needs to be re-written or the figures need to be re-drawn. If, however, the use of high-frequency data has been incorporated into the assessment methodology for the 7-day and 30-day dissolved oxygen (DO) criteria, this is a welcome change, which I applaud.	Clarified Methods table.	DWQ appreciates the commenter's encouragement regarding the addition of high frequency dissolved oxygen (DO) minimum, 7-day, and 30-day assessments into the methods. As noted in Table 11 and the Conventional Parameter Assessments section of the methods, DWQ assesses instantaneous/ DO grab samples and DO high frequency datasets under separate assessment methods. To help clarify that two different sample collection methods will be used to assess DO, DWQ added assessment notes to Table 11. The information in the table now reads: "DO measurements collected by instantaneous/ grab samples are assessed against the 30-day averages in UAC R317-2 and follow the assessment process in Figure 2 and the "Assessments Specific to Lakes, Reservoirs, and Ponds" section of the methods. DO measurements that are collected by high frequency data probes are assessed against the 30- and 7-day averages and minimums in UAC R317-2 and follow the assessment process in Figures 3-5. Note: for high frequency DO assessments, DWQ assumes early life stages are present for the 7-day and minimum. Some site-specific standards have been generated, which are used for assessment purposes."

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Theron	Miller	TMiller_12202018.pdf	168		P. 40, Table 11. Some site-specific standards have been generated, which are used for assessment purposes.• Comment: The only waterbody with site-specific DO criteria is the Jordan River. The only documentation I can find supporting this determination is from a report submitted to Central Valley Water Reclamation Facility by Bio-West (Hugie 1987), where it was believed (absent any actual data) that DO in the Jordan River influences the DO concentrations in downstream wetlands. This was thought to be a potentially critical issue in the prevention of avian botulism outbreaks. The reasoning for this decision was that Clostridium botulinum is an obligate anaerobic bacterium and producer of the botulinum toxin, whose spores and mature cells reside in anaerobic sediments. Apparently, it was thought that higher DO in the river would help prevent avian botulism outbreaks in the wetlands. Yet, sixteen years of subsequent monitoring in the impounded wetlands of Farmington Bay by monitoring and research staff of both the Wasatch Front Water Quality Council and DWQ, have found NO connection between Jordan River DO and DO in downstream impounded wetlands (Miller et al. 2013, additional unpublished data). In fact, DO in the water column of healthy wetlands typically ranges from near or at 0.0 mg/L in the morning to > 20 mg/L in the afternoon (DWQ DO and pH UAA, GSL wetlands). This is the case regardless of season, hydraulic residence time, or whether source water is the Surplus Canal or the Jordan River/State Canal. The referenced use attainability analysis resulted in DWQ issuing new water quality criteria for the impounded wetlands and removing numerical DO and pH criteria from these waterbodies. Furthermore, after decades of monitoring botulism outbreaks, the only demonstrated relationship between inflows and botulism was that outbreaks were likely to occur during years of elevated winter/spring runoff or the rare elevated summer flows. In turn, these were thought to cause fluctuations in water level in impoundments or flooding of mudflats (Barras and Kadlec 2000, Kadlec, 2002). In a review of dozens botulism outbreaks across the globe, Rocke and Bolinger (2007) summarized the potential causes with two general hypotheses: (1) large quantities of decaying organic matter leads to a depletion of oxygen, which allows germination of botulinum spores and toxin production; and temperature, pH, and dissolved salts in the water were considered important corollary factors; and (2) C. botulinum type C germinates and produces toxin in small, discrete, particulate substances (invertebrate carcasses) that are independent of the ambient environment. [reponse continued below]	Out of Scope	This comment is out of scope for the IR and should instead be directed towards DWQ's Standards Coordinator to discuss the potential for conducting a Use Attainability Analysis (UAA) to revise the site-specific DO criteria on the Jordan River.

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Theron	Miller	TMiller_12202018.pdf	168		After decades of observations of GSL outbreaks, Kadlec (2002), offers different hypotheses. The historical record of avian botulism at the Bear River Refuge strongly suggests that major out-breaks are more likely in years of high spring and summer rainfall and high flows in the Bear River entering the Refuge (Barras and Kadlec 2000). Thus, hot, dry years, low flows, and deteriorating water quality associated with those conditions appear not to be involved in causing major outbreaks. (emphasis added). Sampling of invertebrates (J. A. Kadlec, unpublished data) does not lend support to the hypothesis that invertebrate mortality is involved in causing outbreaks.• Rather, Kadlec (2002) suggested that the abundant midge and other wetland benthic invertebrates ingest the C. botulinum directly during foraging, followed by ingestion of these invertebrates by the waterfowl or shorebirds; hence there is an element of bioaccumulation. These hypotheses suggest that abundant living invertebrates may be more important, as Dodge (1972) speculated. Certainly, these more recent hypotheses need further investigation. But these multiple lines of evidence make it clear that DO in the Jordan River has nothing to do with avian botulism outbreaks. Therefore, DWQ should perform a use attainability analysis for the purpose of removing the more stringent site-specific DO criterion for the Lower Jordan.	Out of Scope	[see response above]
Theron	Miller	TMiller_12202018.pdf	169		Page 43. Data sufficiency to ensure that daily minima are captured and that daily averages can be accurately calculated, high frequency data must capture complete days. DWQ defines a complete day as a calendar day (i.e. 12:00 am â€- 11:59 pm) in which at least one measurement is made in each hour. For 303(d) assessment purposes DWQ considers a high frequency dataset of sufficient size for assessment when there are â‰¥39 complete days of contiguous data within the period of record. This ensures measurements are adequately spaced and representative of DO concentrations over the course of a day and that the 30-day, 7-day, and daily minimum criteria can all be fully assessed. If both of these conditions are not met, the data will be flagged as insufficient in size and not included in the current IR cycle.• Comment: This intensive sampling routine appears obviously focused on the Jordan River DO problem. No other stream in Utah receives such attention.	None.	DWQ installs high frequency probes on many of Utah's waters, and the length of deployments can vary based on the objectives of sampling analysis plans. Examples of waterbodies with longer high frequency probe deployments include: Jordan River, Jordanelle Reservoir, Utah Lake, and Scofield Reservoir. For this IR, DWQ's high frequency data assessment is limited to assessing Dissolved Oxygen in rivers and streams. DWQ also leverages high frequency data collected by U.S. Geologic Survey (https://nrtwq.usgs.gov/ut) and other agencies and groups who submit data during the Integrated Report's Call for Data.

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Theron	Miller	TMiller_12202018.pdf	170		While it is necessary to measure an appropriate number of days to assess the 7-day and 30-day criteria, there is no inherent mathematical or EPA requirement to measure 39 contiguous days to determine whether DO violates the minimum DO standard.	Revised Methods text.	DWQ appreciates the feedback and concerns regarding the method's "High Frequency Assessments for Dissolved Oxygen" section and figures 3-5. The original intent of requiring ≥39 complete days of contiguous data within the period of record was to ensure that the 30-day, 7-day, and daily minimum criteria could all be fully assessed. However, after review of the publicly submitted comments, DWQ understands how this may be a significant or restrictive data requirement and prevent data submissions for assessment. DWQ agrees with the commenter that 39 contiguous days of high frequency dissolved oxygen (DO) data are not needed to fully assess the 7-day average minimum DO criteria. DWQ reviewed the original language and removed the ≥39 day requirement from the "Data Sufficiency" section. The section now reads, "To ensure that daily minima are captured and that daily averages can be accurately calculated, high frequency data must capture complete days. DWQ defines a complete day as a calendar day (i.e. 12:00 am – 11:59 pm) in which at least one measurement is made in each hour." DWQ also removed the ≥39 day requirements in Figures 3 and 4. Instead, data are considered sufficient for assessment if at least ten daily minima or 7 or 30 day averages can be calculated over the period of record.
Theron	Miller	TMiller_12202018.pdf	171		Rather, it is likely that such contiguous recordings will only capture a single high-flow runoff event and if there are 39 contiguous days of data, only 4 days of values below the 1-day minimal are necessary to claim impairment. This hardly assures that measurements are adequately spaced.• The high-frequency data recording sondes have revealed that the great majority of low DO events are associated with high-flow storm events. In each of these events, the DO drops precipitously, as the methane and hydrogen sulfide-rich anaerobic sediments are mobilized. This is followed by a 2- to 4-day recovery where morning DO concentrations may drop below the minimum DO standard. The DO minimum standard could therefore be violated in 10 percent of measurements during a single high-flow event, which is contrary to the goal of being adequately spaced.•	Clarified Methods text.	The phrase, "adequately spaced," in this context refers to the spacing of dissolved oxygen readings throughout the course of any given day, not the spacing of days on which exceedances are observed. This ensures that all samples are not collected during one particular part of the day and that accurate daily minima and means can be calculated for each day. This has been clarified in the assessment methods.

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Theron	Miller	TMiller_12202018.pdf	172		More important, such violations during high-flow events would not occur if the Jordan River was not suffering from human-caused severe channel alterations and significant flow diversions that leave the river dewatered and accruing enormous amounts of decomposing organic matter through sediment deposition. As EPA has instructed, such severe hydrologic modification can be the cause of nonattainment of beneficial uses (40 CFR 131.10(g) factors 3, 4 and 5 — related to degraded habitat and dewatering)causing unnatural sedimentation of sand, silt and copious amounts of decomposing organic matter, that by themselves require dredging every few years (depending on frequency and severity of high-flow events). After 18 years of more intensive monitoring and countless meetings, there is neither the political or regulatory teeth, nor the financial resources to control the organic matter loads originating from this urban watershed. Therefore, at a minimum, DWQ should develop a use attainability analysis for the purpose of removing the more stringent site-specific DO criterion for the Lower Jordan.	Out of Scope.	DWQ agrees with the commenter on the importance of evaluating impairments that are caused by pollution. However, determining sources of pollution and site specific Use Attainability Analysis are outside the scope of the Integrated Report. Sources are determined as part of the TMDL or related source assessment studies. (See section Unknown Sources in the assessment methods for more information on how sources are identified and tracked in the assessment process). Concerns relating to water quality standards are addressed through the Triennial Review process. Information on the Triennial Review can be found at the following web address: http://www.deq.utah.gov/ProgramsServices/programs/water/wqmanagement/standards/triennialrev.htm. For source concerns specifically related to the Jordan River, the commenter should refer to the ongoing development of a dissolved oxygen TMDL for the Jordan River (https://deq.utah.gov/water-quality/watershed-monitoring-program/jordan-river-dissolved-oxygen-tmdl-watershed-management-program)
Theron	Miller	TMiller_12202018.pdf	173		Additional evidence now exists describing the consequences of severe habitat destruction (channelizing and frequent dredging) and severe hydrologic diversions (leaving the lower JR dewatered and consequently, one long depositional zone). These three factors, are present and clearly dominate the physical and biological conditions of the river.	Out of scope.	The purpose of the Integrated Report assessment is to identify whether or not waters are exceeding numeric criteria and supporting their designated beneficial uses(s). Identification of sources and causes of pollution are not part of the Integrated Report process and are addressed as part of the TMDL or related source studies and assessments (https://deq.utah.gov/water-quality/watershed-monitoring-program/jordan-river-dissolved-oxygen-tmdl-watershed-management-program). For source concerns specifically related to the Jordan River, the commenter should refer to the ongoing development of a dissolved oxygen TMDL for the Jordan River (https://deq.utah.gov/water-quality/watershed-monitoring-program/jordan-river-dissolved-oxygen-tmdl-watershed-management-program).
Theron	Miller	TMiller_12202018.pdf	174		No feasible BMPs are currently available, even if there were political and financial will to attempt to mitigate this loading and settling of organic matter. Yet this is causing the extremely high sediment oxygen demand values that cause the DO impairment particularly the unmitigable remobilization of oxygen-demanding methane and hydrogen sulfide and even fresh• debris such as grass clippings (known to drop the DO to 0.0 mg/L), when occasional thunderstorms rush through the watershed.	Out of Scope.	Determining the causes and sources of impairments are outside the scope of the Integrated Report and are addressed as part of the TMDL or related source studies and assessments. For source concerns specifically related to the Jordan River, the commenter should refer to the ongoing development of the dissolved oxygen TMDL for the Jordan River (https://deq.utah.gov/water-quality/watershed-monitoring-program/jordan-river-dissolved-oxygen-tmdl-watershed-management-program).

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Theron	Miller	TMiller_12202018.pdf	175		Page 47. 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).â€• Comment: This is only true if physical conditions are comparable between reference sites and between reference sites and target sites. In the case of the Jordan River, we know that it is extremely habitat limited and there are no reference sites for the JR. DWQ needs to justify how O/E is used when there are no reference sites.	None.	Each stream and river segment is unique; not just the Jordan River. RIVPACS uses real reference site data to estimate the most probable set of taxa that would occur at a given stream. In this sense, the model is heavily weighting reference sites that are physically/chemically similar to the assessed site when estimating the taxa that should occur (E). E is more than some general, hypothetical community that applies everywhere (unless a null model is used). Larger rivers offer more of a challenge to assess because they are more regional rather than isolated to a state. DWQ's model incorporates reference river locations from the intermountain west rather than being limited to Utah-based locations. In addition, DWQ runs a chi-square test to ensure that each assessed site fits within the bounds of the model. Sites that fail this test are not used in the assessment. For example, the Jordan River sites passed that test and were appropriate for this model and assessment.
Theron	Miller	TMiller_12202018.pdf	176		Page 47. The biological integrity of sites can be evaluated by comparing the biological composition observed at a site against a subset of ecologically 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 waterbodies with similar ecological, 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.• Comment: Unfortunately, DWQ acknowledged that for several valley stream sites, particularly in the Jordan River, there are no river sites across the state that quality as reference condition for the Jordan River. This has been discussed with Dr. Chuck Hawkins, who admitted that the RIVPACS model does not work well when there are no usable reference sites with which to determine macroinvertebrate reference condition (David Richards personal communication based on discussions with Dr. Hawkins at a recent EPA Pacific Northwest Bioassessment Workshop held in Astoria, WA). This important factor should be acknowledged by DWQ and should prompt DWQ to choose a different biological assessment approach.	None.	RIVPACS uses real reference site data to estimate the most probable set of taxa that would occur at a given stream. In this sense, the model is heavily weighting reference sites that are physically/chemically similar to the assessed site when estimating the taxa that should occur (E). E is more than some general, hypothetical community that applies everywhere (unless a null model is used). Larger rivers offer more of a challenge to assess because they are more regional rather than isolated to a state. To address this limitation, DWQ's model incorporates reference river locations from the intermountain west rather than being limited to Utah-based locations. DWQ uses a RIVPACS model that incorporates a chi-squared test to determine if any site of interest has comparable reference sites, if this test is failed then O/E scores are not calculated. With respect to the selection of alternative methods, it is worth noting that unless historical data are available all biological assessments are dependent on comparisons to similar reference sites, so these limitations are not limited to RIVPACS approaches. RIVPACS approaches address this better than most other biological assessment methods because O/E predictions are site-specific. In contrast, other methods, like MMIs, frequently use broad, a priori classifications (e.g., all streams within an ecoregion) to establish what reference streams are comparable to a stream of interest.

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Theron	Miller	TMiller_12202018.pdf	177		Page 47. 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 on a site-specific scale. This is particularly important for Utah, where streams vary considerably from high-altitude mountain environments to the arid desert regions. 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.• Comment: It is not an asset that O/E's derivation and interpretation do not require knowledge of stressors in the region.• Rather, O/E's inability to inform is one of the limitations of the single O/E metric. I believe that any supplemental watershed or stream condition information, including evidence of human disturbance, that explains observed biological characteristics is valuable. Virtually all states that use biological assessments, including DWQ's wetland assessment protocol, use a multiple of metrics in the assessment process. As I comment further below, focusing only on O/E ignores additional valuable information which can be obtained through knowledge of habitat requirements of sentinel species and environmental tolerances that are available for most Utah resident species. Another example is intermittent streams, which have reduced and/or substantially different macroinvertebrate assemblages than perennial streams and require different bioassessment approaches. (Richards 2010, Richards 2013) Many of the streams that DWQ considers perennial may very well be intermittent.	None.	In the context of identifying biologically degraded sites, it is an asset that O/E does not need knowledge of stressors. DWQ is charged with assessing streams statewide and a tool that allows the identification of problems efficiently is necessary to meet this obligation. Once impairments are identified, both biological and habitat data can be examined more closely, on a site-specific basis, to better understand the relative importance of different sources of stress. Using the specific example provided by the commenter, these investigations may reveal that water withdrawals are significant contributors to the problem. It is also possible that they reveal that other stressors, either natural (e.g., droughts) or human-caused (e.g., riparian degradation), contribute to the observed degradation. Thorough site-specific evaluations of existing and new data sources are a necessary step in the development of effective remediation plans. The fact that DWQ relies on O/E for assessment purposes does not preclude the use of biological alternative indicators for other purposes.
Theron	Miller	TMiller_12202018.pdf	178		Page 48. Despite the mathematical complexities of model development, O/E is easily interpreted because it simply represents the extent to which taxa are missing as a result of human activities. For example, an O/E ratio of 0.40 implies that, on average, 60% of the taxa are missing as a result of human-caused alterations to the stream.• Comment: Apparently DWQ assumes that the use of broad geographical variables avoids the biases of differences due to human disturbance, but there is no evidence that this is true.	None.	All biological assessment methods are inevitably more sensitive to some types of stressors than others and RIVPACS is not an exception. Nevertheless, O/E has been demonstrated to be sensitive to a breadth of different stressors and is generally considered to be among the more sensitive measures of biological degradation. One reason for this is that the geographic predictors allow the models to make site-specific predictions of expected taxa (E). However, this does not avoid biases resulting from the relative sensitivity of different resident taxa to different types of human-caused stressors.

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Theron	Miller	TMiller_12202018.pdf	179		Alternatively, actual site-specific-scale habitat measures, including those that will assess the degree of human disturbance (rather than being based on probabilities), need to be part of the assessment to determine the value of this assumption.	None.	O/E intrinsically quantifies the magnitude of biological degradation that has occurred at a stream. Whether or not a loss of taxa scales with a specific type of human-caused stress (e.g., habitat degradation) is a separate question. The advantage of O/E measuring the magnitude of biological degradation without consideration of human-caused stress is that it allows DWQ to identify problems so that follow-up investigations, such as those suggested by the commenter, can be conducted to evaluate the combination of stressors that have caused the degradation to occur. Given the scale of statewide assessments that DWQ is required to conduct, such thorough evaluations cannot be routinely conducted everywhere and the identification of biologically degraded sites allows DWQ to focus these efforts where they are most needed.
Theron	Miller	TMiller_12202018.pdf	180		For example, what if a flash flood occurred 30 days prior to the sampling?	None.	DWQ does make note of recent flooding activity and has chosen to not assess sites using O/E due to signs of recent flooding activity. However, there may be circumstances where recent flash floods were undetected by field staff, which could potentially result in atypically low O/E scores. This is one of the reasons why DWQ requires the collection of several unique samples, from different field seasons, prior to concluding that a site is impaired based on O/E. The assumption is that the likelihood that DWQ would happen to visit a site where recent events created undetectable sources of bias over several different years is small.
Theron	Miller	TMiller_12202018.pdf	181		Another example is East Canyon Creek, which a few times in recent years has been severely dewatered from drought and excess diversions. A third example is Silver Creek, upstream from the Silver Creek POTW, which is left a trickle every drought summer. These are examples where prior knowledge of the habitat or flow characteristics can account for a low O/E score and inform the assessment process as well as steer restoration efforts.	None.	In some cases, DWQ will not collect biological assessment data in a stream that has been severely dewatered, particularly if this condition is natural, but not typical (e.g., extreme drought). If samples are collected under extreme, low flow conditions, over several different field seasons, and if the site is determined to be impaired, then the role of flow diversions would manifest in subsequent investigations into the cause of the impairment.
Theron	Miller	TMiller_12202018.pdf	182		Moreover, the 303(d) reporting process to EPA requires that causes and sources be identified for each impaired waterbody. O/E does not provide this necessary information. DWQ should re-think this assessment strategy because it ignores available site-specific information obtained from site visits which should inform actual causes and sources of potential impairment.	Out of scope.	DWQ agrees that identifying the causes and sources of impairments benefits from site-specific information obtained through additional site monitoring, visits, and additional analyses. For these reasons identifying causes and sources of impairments are not part of the Integrated Report process and are addressed through either a TMDL, pollution prevention plan, or other related source and cause assessments. Once identified through these processes, cause and source information for impairments are updated and populated in ATTAINS.

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Theron	Miller	TMiller_12202018.pdf	183		As another example of erroneous application of data, the 2014 IR reported excess P as the cause of the low O/E score for the Jordan River. Clearly, this was just a guess. After further study, nutrients were found not even to be a cause of low DO events. Moreover, severe habitat loss has been identified earlier by Miller (2012, 2014), and more recently by Richards (2016).	Out of scope.	In the 2014 IR for the Jordan River-3 Assessment Unit, O/E and TP were list as separate parameters that were not meeting beneficial uses. Both were originally listed as impaired in the 2008 IR and both were independently listed as separate impairments. There was no connection made between them in the 2014 and 2016 IRs as well. Comments on the 305(b) and 303(d) assessments results (from both current and historical reports) can be submitted during the public comment period of the Draft 2018/2020 Integrated Report.
Theron	Miller	TMiller_12202018.pdf	184		Further, as described in the introduction, trained field biologists perform independent assessments of candidate reference sites and I assume that this assessment includes the use of UCASE/EMAP protocols to quantify and assess important habitat characteristics. Therefore, data hypothetically exists to compare taxa lists, including sensitive species (e.g. EPT taxa) and guild diversity (e.g. functional feeding groups) to habitat availability and complexity. Developing predictive models based on modeled average watershed characteristics and reduction of taxa lists to simple presence/absence for the purposes of expediency ignores the principles of river continuum theory. Using a single number/metric that is used to describe biological and physical integrity is nothing short of a large step backward in utilizing stream ecological knowledge and principles.	None.	Site-specific, GIS-based predictor variables are used to develop RIVPACS models rather than regional watershed means. The spatial resolution for these predictor variables is 800 m which makes the assessment at reach segment scale rather than watershed. The text was changed to better explain the nature of RIVPACS predictor variables after the same comment was made during the last Integrated Report cycle. River continuum theory does not speak to habitat complexity, but instead is a conceptual model that describes functional and structural ecological characteristic changes naturally from headwaters to larger rivers downstream. The specific predictor variables used in model construction align closely with this theory because many could be used to place a specific site in its position along this continuum.
Theron	Miller	TMiller_12202018.pdf	185		It is highly presumptive, if not outright inaccurate, to assert that a meaningful measure of species richness and ecological capital• can be based on a probability of > 50% capture. Where are the scientific underpinnings for such an assumption? Indeed, rare species that occupy limited or specialized niches or diverse functional feeding groups are much more valuable in assessing the quality of habitat and degree of biological integrity and resilience â€— as these taxa are most often those that disappear first in the presence of stress (Richards 2017). Moreover, the relaxation of taxonomic accuracy further reduces the ability to detect subtle indicators of stress.	None.	Considerable research has demonstrated that RIVPACS models tend to be more precise and often more responsive to known stressors than other indices (e.g., please review Hawkins 2006, Hawkins et al 2010) when a Pc >0.5 is used as opposed to a Pc >0. Similarly, a relatively large amount of literature empirically shows that the use of coarse (family) taxa can often provide similar assessment scores as fine level taxonomic resolution in O/E models. There are many states that use just family level data. There are tradeoffs in use of fine versus coarse taxonomic resolution data. Coarse data are easier to model (more precise) but use of fine resolution data may produce more responsive indices. Please review Hawkins 2006 to understand a few good examples of these tradeoffs.

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Theron	Miller	TMiller_12202018.pdf	186		Page 49. Table 12. Final predictor variables used in model construction. Comment: While the use of predictor variables at the watershed level is an improvement over regional scales, the use of PRISM model results for the various geographical variables introduces additional uncertainty in determining meaningful environmental tolerances. For example, many macroinvertebrate taxa have known temperature tolerance ranges that have been used to establish temperature criteria (e.g. Richards et al. 2018). Also, actual daily measures of extraordinary stream temperature or watershed air temperature can vary enormously from mean stream temperatures or mean annual air watershed temperatures and sufficiently to cause the loss of local species â€- and which may take months or years to recover.	None.	This comment reflects a misunderstanding of how appropriate predictor variables are used in the construction of RIVPACS models. Conceptually, the purpose of physical predictor variables is to identify the proximity, in multivariate space, of a site of interest to all reference sites. This is best accomplished using predictors that are reflective of general, naturally occurring, long-term differences in different types of streams. Variables that change naturally over short time scales are not good candidates. Another critical assumption is that the predictor variables cannot be strongly affected by human-caused activities, because doing so would make E a prediction of degraded conditions. The variables that were empirically selected for Utah's RIVPACS models allow sites to be differentiated based on major environmental gradients (e.g., wet vs. dry conditions) and position along a longitudinal continuum.
Theron	Miller	TMiller_12202018.pdf	187		Page 62. Phytoplankton Community: DWQ routinely collects phytoplankton to evaluate the composition and relative abundance of algae and cyanobacteria. These data are used to identify waterbodies potentially undergoing cultural eutrophication that may negatively impact beneficial uses.• Comment: Natural eutrophication has been occurring for a much longer period than cultural eutrophication and many lakes have already naturally exceeded the tipping point• of regime change. Supporting data indicating domination by cyanobacteria historically and prehistorically has been reported numerous times in the literature using paleolimnological techniques, including the recent report on Great Salt Lake by Levitt et al. (2013). Paleolimnological techniques should be a standard procedure when contemplating any restoration effort, as paleo data can date the age of sediments that contain cyanobacteria and other sentinel species of diatoms and thereby help identify the degree of restoration that is reasonably possible and thereby appropriate objectives - including the condition the lake was in during 1975. This is critically important when contemplating massive and expensive remedial practices that more and more are reported in the literature as failures, particularly for shallow lakes (e.g. Sondergaard et al. 2007, Jeppesen et al. 2007). These authors have identified several causes of restoration failures as well as other challenges that require understanding of particularly shallow lake ecology. It is not merely as simple as determining cell counts and relative abundance of cyanobacteria.	None.	Restoration and restoration goals are beyond the scope of the IR because decisions regarding restoration are not part of the assessment process. Restoration is typically addressed during the TMDL process. With regards to paleolimnological data, Utah's assessment methods do not include methods for assessing this type of data nor are they being considered. As documented in the PERIOD OF RECORD section of the methods, the assessment is of current water quality and the data assessed cannot be more than 10 years old. Paleolimnological data are intended to be representative of historical conditions by definition and are not intended to be representative of current conditions.

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Theron	Miller	TMiller_12202018.pdf	188		Page 64. DWQ targets dissolved metals sample collection to 1 meter above the bottom at the deepest site of the waterbody, as this location is the most likely to identify dissolved metal exceedances if they exist in a lake.• Comment: The reason why metal concentrations are often elevated at the sediment surface is a result of relatively low pH and/or redox chemistry where anaerobic/anoxic conditions reduce the oxidation state of redox-sensitive metals or induce the methylation of some metals such Hg and Se. While concentrations may be elevated at 1 m above the sediment surface, this is only due to the physics of diffusion away from the source. More importantly, the required anaerobic/anoxic conditions, for their dissolution, themselves preclude the presence of most aquatic life. Listing a lake for metal toxicity based on this sampling approach is misleading and overly protective and actually describes a phenomenon that cannot be remedied without expensive intervention such as aeration or chemical treatment. Rather, a more appropriate and accurate approach would be to measure metal concentrations at the bottom of the metalimnion or where the DO concentration falls below the instantaneous criterion. In other words, available habitat will dictate whether aquatic organisms are exposed to metals.	None.	Recommended changes to sampling protocols are out of scope for the IR and should be addressed towards DWQ's monitoring program. Aquatic organisms may be exposed to toxic metals through multiple pathways. As described by the commenter, diffusion from anoxic sediments to the water column is one potential pathway. DWQ's routine metal sampling methods for lakes are intended to capture the potential for toxic metals to enter the water column or food web and negatively impact aquatic life uses. However, where additional metals data are available at other depths, they are also assessed following the toxic parameter assessment methods. Although in some cases, an anoxic layer exceeding 1 meter in thickness at the bottom of a lake may exclude certain organisms, particularly fish, other organisms are still likely present and potentially exposed. The cost or practicality of any potential pollutant remediation is out of scope for the IR. These considerations are incorporated into other programs including TMDLs or standards development (e.g. site-specific standards, use attainability analyses, or water quality variances) and recommendations regarding those processes should be addressed to those programs.

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Theron	Miller	TMiller_12202018.pdf	190		Page 74. HABs and Cell Counts Comments: Lake closures and particularly 303(d) listings should not be based merely on cell counts. Existing evidence indicates that these actions are based on weak, anecdotal and incomplete data as described by EPA documentation (EPA 2016, Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin). Notably, EPA has rejected recommending cell counts or chlorophyll a because they are not scientifically justified. Indeed, there are many more peer-reviewed studies that denounce the linkage between cell counts and allergic or gastrointestinal symptoms than those that support these metrics. In fact, all reports of these allergic responses, including those reported for Utah Lake, are merely anecdotal and/or require removal of a portion of the sample volunteers (e.g. Pilotto, 1997) to establish some level of significance. This suggests that merely announcing the warnings, or briefing volunteer participants prior to data collection (the power of suggestion), may invite hypersensitivity (hypochondria) and lead to unsupported reports of symptoms. Reports may also fail to record the level or type of exposure â€- such as swimming, wading, waterskiing, fishing, or even walking through or near the hyper-allergenic phragmites which surrounds most of Utah Lake. Therefore, retaining these criteria in state regulations, without the underlying EPA criteria recommendations, is inappropriate and should not be used as a basis for regulatory or assessment decisions by DWQ. Following this line of reasoning, DWQ and UDPH should initiate a program to eradicate all grasses, including phragmites, as well as ragweed, cottonwood trees, mold and many other common allergens â€- because they cause similar symptoms. We owe it to the people of Utah to base such decisions on more rigorous, conclusive data.	None.	The issuance of recreational advisories or closures is a separate process from water quality assessment. Suggestions regarding the health advisory process should be addressed to the Water Quality and Health Advisory Panel (https://deq.utah.gov/legacy/divisions/water-quality/health-advisory/index.htm). DWQ's HAB assessment methods directly reflect Utah's Narrative Standard which stipulates that the presence of scums, nuisances such as color, odor, or taste, or water quality conditions that may cause undesirable human effects are a violation of the state's water quality rules. EPA's development of draft criteria for any particular cyanotoxin does not constitute a rejection of other forms of assessment and does not preclude DWQ's use of other indicators of impairment that are reflective of Utah's Narrative Standard. EPA's draft recommended criterion document for microcystin specifically identifies cyanobacteria cell densities as indicators of the ecological health of a waterbody and includes substantial discussion of the available eco-epidemiological evidence associating cyanobacteria exposure and human health symptoms. Based on DWQ's review of this evidence, and discussions with the authors of EPA's draft microcystin and cylindrospermopsin criteria, DWQ has determined that a HAB assessment approach that does not include cyanobacteria cell densities would not be protective of recreational uses. The use of cell counts in DWQ's assessment process was a point of substantial discussion during the 2016 IR. Please see DWQ's 2016 IR response to comments, appendix A, responses 2, 3, and 9 for additional information (https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/docs/2016/dwq-response-to-public-comments-final2016ir-v2-1.pdf).

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Theron	Miller	TMiller_12202018.pdf	191		Backer et al. (2009) reported: The second important component of environmental epidemiologic studies is an accurate measure of the health outcome. Based on anecdotal reports and earlier studies (Pilotto et al., 1997; Stewart et al., 2006a), we hypothesized in this and our previous study (Backer et al., 2008) that exposure to aerosolized MC during recreational activities in lakes with M. aeruginosa blooms would result in increased frequencies of self-reported acute dermal or respiratory symptoms over baseline (emphasis added). Some study participants reported throat and skin irritation after being in the bloom-affected waters. However, these are common symptoms with myriad causes and only a few participants reported such symptoms. Thus, we were not able to demonstrate differences in symptom reporting between exposed and unexposed participants, nor were we able to examine associations between reported symptoms and environmental measurements (cyanobacterial cell concentrations, water and air MC concentrations, or other water quality parameters).â€• Again, the important point here is that while the EPA carefully chose NOT to recommend criteria based on cell counts, UDWQ and UDPH are implementing cell counts in the assessment criteria for lake and beach/marina closures, as well as for listing on the 303(d) list, as is the case for Utah Lake. During the WQHAP meeting on January 12, the EPA representative stated that while there was useful data suggesting that cell counts are linked to dermal or respiratory distress, data were not quantitative and were absent of any dose-response relationship necessary to recommend criteria values for cyanobacterial cell counts. Even so, the representative mentioned that he would not be opposed to the use of cell counts if states choose to do so. It is inconsistent for EPA to officially not recommend the use of cell counts in its document, but yet still say to the group and regulatory agencies that cell counts and allergic responses could still be used. Clearly, the greater wisdom of EPA's upper management team that wrote the recommendation dictated that there is indeed insufficient information to include cell counts. Part of this decision appears to be the fact that dermal or respiratory or digestive symptoms are simply not toxicological responses in the tradition of describing lethal or sublethal effects of chemicals or metals on a dose-response basis. At least part of EPA's decision is based on the fact that researchers have attempted to link [response continued below]	None.	Thank you for your providing this paper excerpt. DWQ recognizes the inherent difficulty in attributing causation for human health systems in eco-epidemiological studies. Recommended health advisory procedures are developed in conjunction with state and local health departments and stakeholders through DWQ's Water Quality and Health Advisory Panel (https://deq.utah.gov/legacy/divisions/water-quality/health-advisory/index.htm). Recommendations for the health advisory process can be made to that program. The inclusion of cell counts as an indicator in DWQ's HAB assessment methods directly reflects Utah's Narrative Standard which stipulates that the presence of scums, nuisances such as color, odor, or taste, or water quality conditions that may cause undesirable human effects are a violation of the state's water quality rules. EPA's development of draft criteria for any particular cyanotoxin does not constitute a rejection of other forms of assessment and does not preclude DWQ's use of other indicators of impairment that are reflective of Utah's narrative water quality standard. EPA's draft recommended criterion document for microcystin specifically identifies cyanobacteria cell densities as indicators of the ecological health of a waterbody and includes substantial discussion of the available eco-epidemiological evidence associating cyanobacteria exposure and human health symptoms. Based on DWQ's review of this evidence, and discussions with the authors of EPA's draft microcystin and cylindrospermopsin criteria, DWQ has determined that a HAB assessment approach that does not include cyanobacteria cell densities would not be protective of recreational uses. The use of cell counts in DWQ's assessment process was a point of substantial discussion during the 2016 IR. Please see DWQ's 2016 IR response to comments, appendix A, responses 2, 3, and 9 for additional information (https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/docs/2016/dwq-response-to-public-comments-final2016ir-v2-1.pdf).

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Theron	Miller	TMiller_12202018.pdf	191		the allergic respiratory or dermal symptoms to lipopolysaccharides (LPS; molecules that are rooted in the cell membrane of mostly gram-negative heterotrophic bacteria such as E. coli or Salmonella). For example, these well-studied structures have been found to be responsible for the adverse inflammatory cascading responses of our immune system (sore throat, congestion, itchy eyes, mucus secretion, etc.). In most ways these responses have been reported to be akin to typical inflammatory responses to everyday allergens such as pollen, dust or mold. Clearly, EPA has chosen to not try to establish assessment criteria based on cell counts, because there is virtual ly no quantitative data that links a threshold of cell counts to an allergic or gastrointestinal response. Moreover, LPS, of themselves, are not toxic, but actually require specific host proteins (such as within our mucus membranes) for LPS to display full agonist potency. Most notable, the link between cyanobacterial LPS and allergic responses is indeed a very weak one. Stewart et al. (2006), also cited in the EPA document, provides perhaps the most thorough review of the literature that might describe such a link. [Response continued below in the "Mercury Assessment Process" box]	None.	[see response above]

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Theron	Miller	TMiller_12202018.pdf	192		Here are some excerpts of the Stewart et al. review: Several authors note that the health implications of cyanobacterial LPS are poorly understood and the topic requires more research [6, 7, 8, 9, 10, 11, 12, 13, 14, 15]. Carmichael [16] suggests that the relationship between ingested LPS and illness in an immunologically competent population is debatable, there being little evidence that people with a normal LPS-containing gut flora would be affected by LPS from water supplies. (emphasis added) The reason that cyanobacterial LPS has not been discussed here is simply that the required research has not been done as yet (emphasis added). No cyanobacterial lipid A structures have been published, therefore no inferences can be deduced as to their likely endotoxic potential, or lack of it. But with the knowledge that endotoxic potential can vary in the most fundamental way across Gram-negative bacteria, from agonistic to weakly active to inactive to antagonistic, it should be incumbent on the cyanobacteria research community to cease attributing biological activity and clinical symptoms to cyanobacterial LPS without specific research evidence. (emphasis added). Cyanobacteria may not be typical Gram-negative organisms because of their unusual cell wall architecture, and cyanobacteria will have experienced very different selection pressures to gut-dwelling Gram-negative bacteria, which may be reflected in different lipid A structures. Some observations on the behaviour of Gram-negative bacterial LPS in the gut serve to cast doubt on the suspicions that cyanobacterial LPS alone is responsible for initiating acute gastro-intestinal illness in humans by the oral route: Commensal gut flora: The human intestinal tract houses an enormous population of bacteria, many of which are Gram-negative. The Enterobacteriaceae are found in normal faecal flora at some 108â€—109 per gram [130]. The number of microbes in the gut lumen exceeds the number of eukaryotic cells in the human body by an order of magnitude [49, 131], an observation that may lead some to unkindly suggest that the principal reason for human existence is to serve as bags for the housing and transport of bacteria. Nanthakumar et al [132] note that mature enterocytes are 100 to 1,000 times less sensitive to LPS than neutrophils and hepatocytes, which is not surprising since they are exposed to Gram-negative bacteria and their endotoxins since birth when the gut is colonised. [response continued below]	None.	Thank you for providing these excerpts. DWQ is familiar with the Stewart et al. 2006 study which provides a review of the available evidence in the scientific literature associated with one proposed pathway through which cyanobacteria may elicit negative human health effects, cyanobacterial lipopolysaccharides. DWQ agrees with the authors that additional research regarding causes of human health effects apparently associated with cyanobacteria or cyanotoxin exposure is well warranted.

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Theron	Miller	TMiller_12202018.pdf	192		Non-virulent strains: Most Gram-negative organisms are non-pathogenic. Pathogenicity involves a complex interaction between host-related and specific microbial virulence factors â€- the latter including pili, fimbriae and heat shock proteins [133, 134]. Infectious, i.e. colonising, microbes are the most common cause of diarrhoea worldwide; pathogenic strains commonly cause disease by the action of enterotoxins [135]. That virulence factors other than lipid A structures of LPS are responsible for gastro-intestinal disease is seen in the protective effects of attenuated or mutant Gram-negative bacteria when used as live oral vaccines against pathogenic strains [133, 136, 137, 138]. Some E. coli strains are used as probiotics for the treatment of gastrointestinal disease and infection prophylaxis in neonates [139]. Anecdotal reports of consumption of non-hazardous cyanobacteria: Heaney [39] reports observations of cattle seen drinking from two Irish lakes affected by thick scums of Anabaena flos-aquae and Aphanizomenon flos-aquae without ill effect. Author IS can add a similar observation: during recruitment for an epidemiology study [140] at Lake Coolmunda in southern Queensland, a frank Microcystis aeruginosa bloom was in attendance. A group of six or seven dogs were seen playing vigorously in the water, and three dogs were observed drinking from it. The owners of the animals were questioned the following day; all denied observing any adverse effects. The consumption of Spirulina and other cyanobacteria provides further evidence that cyanobacterial LPS cannot all be harmful.•	None.	[see response above]

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Theron	Miller	TMiller_12202018.pdf	193		Based on this information it is clear that DWQ's and DPH's decision to push for retaining cell counts as assessment, closure, and listing criteria is not founded in solid science, but rather on incomplete, anecdotal epidemiological reports that are largely non-quantitative in terms of linking cell counts to the presence of cyanotoxins. The reported allergenic and nontoxic response that DWQ and DPH are so adamant to report lacks the necessary scientific underpinnings that link LPS to any of the reported allergenic or gastrointestinal pathogenic symptoms such as diarrhea.	None.	The issuance of recreational advisories or closures is a separate process from water quality assessment as part of the IR. Suggestions regarding the health advisory process should be addressed to the Water Quality and Health Advisory Panel (https://deq.utah.gov/legacy/divisions/water-quality/health-advisory/index.htm). The inclusion of cell counts as an indicator in DWQ's HAB assessment methods directly reflect Utah's narrative water quality standard which stipulates that the presence of scums, nuisances such as color, odor, or taste, or water quality conditions that may cause undesirable human effects are a violation of the state's water quality rules. Based on DWQ's review of HAB related eco-epidemiological evidence and other HAB related literature DWQ has determined that a HAB assessment approach that does not include cyanobacteria cell densities would not be protective of recreational uses. The use of cell counts in DWQ's assessment process was a point of substantial discussion during the 2016 IR. Please see DWQ's 2016 IR response to comments, appendix A, responses 2, 3, and 9 for additional information (https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/docs/2016/dwq-response-to-public-comments-final2016ir-v2-1.pdf). Cyanobacteria lipopolysaccharides are one potential pathway proposed by some authors in the scientific literature through which exposure to cyanobacteria blooms may result in undesirable human health effects. Multiple potential causes of human health symptoms associated with cyanobacteria bloom exposure have been proposed. DWQ has not attempted link human health symptoms to any specific property of cyanobacteria cells. Instead, based on a review of the available eco-epidemiological evidence and other HAB related literature DWQ has determined that a HAB assessment approach that does not include cyanobacteria cell densities would not be protective of recreational uses.

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Theron	Miller	TMiller_12202018.pdf	195		[Response continued below in the "General Comments on Narrative Standards for All Waters" box]	Requested improvement on form functionality.	Thank you for using the public comment form and indicating that your response was continued in another text box in the form. DWQ will review text box character limits for the next IR public comment forms.

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Theron	Miller	TMiller_12202018.pdf	196		What are the implications of such an unsupported decision? Here are the facts: 1. The open water of Utah Lake was sampled about 48 times in 2016 and 2017 for microcystins. Of these, only three samples contained measurable microcystins (toxins in the great majority of samples were below detection limits) and all three of these samples contained less than 4 ug/L microcystin. Yet, due to an abundance of precaution• and elevated cell counts, the entire lake was closed for about four weeks. In turn, this was used as support for DWQ's decision to add Utah Lake on the 303(d) list based on 2014 data cell count data. 2. This listing ignored the EPA initial recommended criteria of 20 ug/L microcystin â€- and NOT cell counts. This EPA decision to not use cell counts for assessments was due to a lack of quantitative and appropriate basic research that needs to be performed. The discussion outlined above explains a lot of EPA's reasoning. Therefore, the decision to retain cell counts as assessment criteria is simply not scientifically supported, and hence, not supported by a major policy decision by EPA. Moreover, Utah Lake blooms are most often dominated by Aphanezomenon flos aquae, a very weak to non-toxin producer (it has been identified as a weak microcystin producer; although whether this species was completely isolated from other microcystin producers is questionable), for which there are not sufficient scientific underpinnings to demonstrate toxicity, or an LPS/allergenic reaction. In fact, quantification of our early zooplankton data found 5 out of the 6 most common species doubled or tripled their populations during the peak of the 2016 bloom. Perhaps most notably, the data indicates that even if appropriate linkages to allergenic responses were to be established, these symptoms are not pathologic and constitute nothing more than a nuisance allergic response that is no more serious than hay fever. Just for comparison, this is akin to the notion that perhaps we need to put out a public policy to destroy the grasses and weeds in our open spaces and even in our yards because they produce pollen, or the cottonwood trees because, darn it, this hay fever is a nuisance. Just how much government regulation do we need to control nontoxic allergens? Perhaps it is these types of decisions, whether to close a beach or a lake, in the interest of public health protection and recreation interests, that the charge of DWQ and DPH appear to converge. But it should remain clear that their responsibilities are indeed different. I can somewhat understand why local county health departments, in the spirit of zeal, may endeavor to close a beach or harbor based on cell counts. But DWQ has much greater responsibility under EPA-delegated state authority, to implement and enforce EPA recommended water quality criteria. Moreover, this should particularly apply in situations of performing beneficial use assessments that have always strictly adhered to EPA recommended criteria. This then begs the question: should DWQ and DPH be given the latitude to impose a regulatory value to be used for lake closures and even the ability to list the lake as 303(d)-impaired using a parameter that has no EPA-recommended criteria, but is rather based solely on the possibility that nontoxic nuisance allergic responses MIGHT occur from recreating in the lake, or maybe even just walking or driving next to the lake? [see response below]	None.	The inclusion of cell counts as an indicator in DWQ's HAB assessment methods directly reflect Utah's narrative water quality standard which stipulates that the presence of scums, nuisances such as color, odor, or taste, or water quality conditions that may cause undesirable human effects are a violation of the state's water quality rules. EPA's development of draft criteria for any particular cyanotoxin does not constitute a rejection of other forms of assessment and does not preclude DWQ's use of other indicators of impairment that are reflective of Utah's narrative water quality standard. The use of cell counts in DWQ's assessment process was a point of substantial discussion during the 2016 IR. Please see DWQ's 2016 IR response to comments, appendix A, responses 2, 3, and 9 for additional information (https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/docs/2016/dwq-response-to-public-comments-final2016ir-v2-1.pdf). In their review and comments on the 2016 Integrated Report, EPA approved and supported the recreational use impairment determination for Utah Lake for harmful algal blooms stating, "Based on a comparison to the HABS methodology and information from the multiple lines of evidence considered in the state's assessment, EPA agrees that Utah Lake is impaired". The issuance of recreational advisories or closures is a separate process from water quality assessment. Suggestions regarding the health advisory process should be addressed to the Water Quality and Health Advisory Panel (https://deq.utah.gov/legacy/divisions/water-quality/health-advisory/index.htm). Water quality based recreational advisories or closures of waterbodies protected for recreational uses are direct indicators that recreational uses are not being attained.

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Theron	Miller	TMiller_12202018.pdf	196		The other concern that I have with this type of action (listing an entire lake on cell counts alone), is consideration of where this has led - that DWQ has moved forward to establish water quality criteria that are based only on cell count data and the weak, anecdotal linkage that these cells MIGHT induce some allergenic responses. Not only is this unnecessary, with the type of bloom that occurs on Utah Lake and many others, but it imbues in the court of public opinion the undeserved reputation that particularly Utah lake is toxic and people should not recreate there - which is just simply not the case. This type of publicity is more about raising fear and support for unfounded closures that further support DWQ's nutrient-removal agenda at any cost. Warnings and closures should be based on sound science â€- rather than the common species in recent blooms that are not strong toxin producers. This leads to my biggest concern site-specific criteria are being developed using only cell counts, which, in the case of Utah Lake has thus far included dominant species that are benign toxin producers, rather than EPA-recommended cyanotoxin concentrations. This will lead to a TMDL that will require cell counts to be < 100,000 or even < 20,000 - even if the bloom is benign. Moreover, the current literature on nutrient thresholds of cyanobacterial blooms suggests that reaching this goal would require the most remote possibility of achieving total P concentrations in the range of 20 to 30 ug/L or lower, and this will unquestionably be the conclusion of the Science Panel final report. Initial calculations suggest that this would require total P loadings of < about 20 tons per year. While this seems like a lot, preliminary estimates from monitoring and research on the sources of P to Utah Lake indicate that even if POTW loadings were reduced to zero, the unregulated nonpoint sources (urban and rural), or the potential high rates of P recycling from sediments would preclude achieving such low nutrient concentrations. Moreover, and truly surprising, the initial estimates from the last 24 months of weekly monitoring atmospheric P deposition, alone range from 50 to 170 tons per year â€— resulting in 40 to 150 ug/L in the water column from this source alone. Indeed, the whole of these potential loads suggests that reaching 20 to 30 ug/L will be impossible. Moreover, as these additional sources become further understood and quantified, this raises the question of whether the narrative criteria (i.e. It is illegal for any human to discharge or place any waste in such a way that it may become offensive) even applies. Rather, the dominant loadings appear thus far to be from unregulated urban and rural sources as well and airborne atmospheric sources that likely originate from the west desert. We need to document where Utah Lake lies with regard to regime shift and alternative stable state. This should be a major consideration with regard to the ability, degree and strategies for restoration success as well as carefully quantifying what is to blame or who is to blame for various nutrient loads before making such drastic and very expensive speculations.	None.	[see response above]

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Theron	Miller	TMiller_12202018.pdf	197		Literature Cited Backer, L. C. S. V. McNeel, T. Barber, B. Kirkpatrick, C. Williams, M. Irvin, Y. Zhou, T. B. Johnson, K. Nierenberg, M. Aubel, R. LePrell, A. Chapman, A. Foss, S. Corum, V. R. Hill, S. M. Kieszak and Y. Cheng. 2009. Recreational exposure to microcystins during algal blooms in two California lakes. Toxicon: 2009: 1â€—13 Barras, S.C. and J. A. Kadlec. 2000. Abiotic predictors of avian botulism outbreaks in Utah. Wildlife Society Bulletin (1973-2006) Vol. 28, No. 3 (Autumn, 2000), pp. 724-729 Jeppesen, E. Ã† M. Meerhoff Ã† B. A. Jacobsen Ã† R. S. Hansen Ã† M. SÃ¸ndergaard Ã† J. P. Jensen Ã† T. L. Lauridsen Ã† N. Mazzeo Ã† C. W. C. Branco. 2007. Restoration of shallow lakes by nutrient control and biomanipulationâ€‖the successful strategy varies with lake size and climate. Hydrobiologia 581:269â€—285. Kadlec, J.A. 2002. Avian Botulism in Great Salt Lake Marshes: Perspectives and Possible Mechanisms. Wildlife Society Bulletin (1973-2006) Vol. 30, No. 3 (Autumn, 2002), pp. 983-989. Miller, T. G. 2012. Research Compendium. A summary of 2009 to 2011 Studies on Jordan River and Farmington Bay wetlands. Report to Jordan River/Farmington Bay Water Quality Council. Miller T.G. 2014. A Physical, Chemical and Biological Assessment of the Jordan River: 2009-2013 Report to Wasatch Front Water Quality Council. Pilotto, L.S., R. M. Douglas, M. D. Burch, S. Cameron, M. Beers, G. J. Rouch, P. Robinson, M. Kirk, C.T. Cowie, S. Hardiman, C. Moore and R. G. Attewell. 1997. Health effects of exposure to cyanobacteria (blue-green algae) during recreational water-related activities. Aust N Z J Public Health 1997; 21: 562-6) Richards, D. C. 2010. Characterization of temperature, dissolved oxygen, and macroinvertebrate communities of targeted intermittent streams. Report to Idaho Department of Environmental Quality, Boise, Idaho. 189 pp. [see response below]	None.	Thank you for providing the literature references that you cited and used to support of your comments. These were reviewed when responding to your comments.

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Theron	Miller	TMiller_12202018.pdf	197		Richards, D. C. 2013. Arizona Intermittent Streams Macroinvertebrate Index of Biological Integrity. Developed for the Arizona/New Mexico Mountain Ecoregion. Final Report. Biocriteria Program Monitoring Unit, Water Quality Division, Arizona Department of Environmental Quality, Phoenix AZ. 59 pp. Richards, D. C. 2016. Real and Perceived Macroinvertebrate Assemblage Variability in the Jordan River, Utah can Affect Water Quality Assessments. Draft Technical Report. Submitted to the Jordan River/Farmington Bay Water Quality Council. Salt Lake City, UT. Oreohelix Consulting, Vineyard, UT. Richards, D. C. 2017. Native Unionoida Surveys, Distribution, and Metapopulation Dynamics in the Jordan River-Utah Lake Drainage, UT. Report to: Wasatch Front Water Quality Council. Salt Lake City, UT. OreoHelix Consulting, Vineyard, UT. Version 1.5 May, 26, 2017. Richards, D. C. 2016. Is Reliance on a Single Bioassessment Metric for Assessing Water Quality in Utahs Rivers and Streams Prudent? Draft Technical Report to Wasatch Front Water Quality Council. Salt Lake City, UT. Oreohelix Consulting, Vineyard, UT. Richards, D. C., Lester, G., Pfeiffer, J. and J. Pappani. 2018. Temperature Threshold Models for Benthic Macroinvertebrates in Idaho Wadeable Streams and Neighboring Ecoregions. Environmental Monitoring and Assessment. 190: 120. https://doi.org/10.1007/s10661-018-6478-9. Rocke, T.K. and T. K. Bollinger. 2007. Avian Botulism. PP 377-417. In: N.J. Thomas, D. B. Hunter and C. T. Atkinson (Eds.) Infections diseases of wild birds. Blackwell Publishing. Sondergaard, M. E. Jeppesen, T.L. Lauridsen, C. Skov, E.H. Van Ness R. Roujackers, E Lammensand R. Portielje. 2007. Lake restoration: successes, failures and long-term effects. J. Appl. Ecol.44 (6): 1095-1105. Stewart, I, P J Schluter and G R Shaw. 2006. Cyanobacterial lipopolysaccharides and human health â€- a review. Environmental Health. 2006. 5:7	None.	[see response above]
David	Richards	DRichards_12152018_v1.pdf		31	I would like to thank Utah Division of Water Quality (UDWQ) for providing citizens with the opportunity to comment on their 2018/2020 303(d) Assessment Methods draft. UDWQ has done a tremendous job in trying to evaluate and protect Utah's valuable water resources and it is reflected in this draft. UDWQ should be commended for its efforts.	None.	DWQ appreciates your encouragement regarding the improvements made to the water quality assessment program and the Draft 2018/2020 303(d) Assessment Methods. Thank you for providing comments on the methods, so we can better assess and report on Utah's surface waters.

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David	Richards	DRichards_12152018_v1.pdf		32	However, I do have some comments that may prove helpful in the next revision of the draft and in particular on how biological evaluations are presently being conducted. Hopefully UDWQ is in the process of revising its biological assessment program to better reflect the state of science and in particular, to address the pitfalls of over reliance on RIVPAC O/E models.	None.	DWQ appreciates the time and effort spent in making recommendations for improvements to Utah's biological assessment method. Improvements to all programs can always be made and it is important to seek advice from others when making a change to any water quality program. However, DWQ and the primary scientific literature disagree with your opinion about the effectiveness of using O/E models for evaluating stressor disturbance (e.g., please review: Hawkins, C.P. 2006. Quantifying biological integrity by taxonomic completeness: it's utility in regional and global assessments. Ecological Applications 16(4): 1277-1294). The fact that O/E is a scientifically defensible and a well-established method for assessing biological degradation does not mean that other methods are invalid. All biological assessment approaches have strengths and weaknesses. DWQ is open to expanding on the existing biological assessment methods in the future, provided that resources can be deflected from other water quality priorities to do so.
David	Richards	DRichards_12152018_v1.pdf		33	Introduction Table 1. U.S. Environmental Protection Agency categorization of assessed surface waterbodies for integrated report purposes. EPA Assessment Category 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 Categories 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 Categories 4A, 4B, and 5. Therefore, an AU with a pollution control… Comment: Many waterbodies in Utah likely fall under this category, which will affect all other assessment criteria. For example, the Jordan River has undergone severe habitat degradation and hydraulic modification. The river has been channelized, dewatered, and not allowed to flush out sediments, including organic matter, that were typically flushed in the past during high water events. In addition, the Jordan River naturally flows through unconsolidated fine sediments including silts, clays, sands, and small gravels. These factors, human caused and natural, directly affect all other types of ‚pollution,' resulting in increased temperatures, reduced dissolved oxygen (DO) levels, lower O/E scores, etc. Therefore, in many instances, impairments to lotic systems are not caused by a pollutant but rather by ‚pollution' as defined by EPA. More emphasis by UDWQ should be placed on these types of impairments when evaluating ‚supporting' or ‚not supporting' beneficial uses.	None.	DWQ agrees with the commenter on the importance of evaluating impairments that are caused by pollution. However, identifying sources of pollution is not part of the Assessment Methods of the IR. Instead sources are determined as part of the TMDL or related source assessments. (See section Unknown Sources in the assessment methods for more information on how sources are identified and tracked in the assessment process). DWQ is in the process of drafting implementation guidance for Category 4C and 5-alt. For more information, contact DWQ's Watershed Protection Section Manager. For source concerns specifically related to the Jordan River, the commenter should refer to the ongoing development of a dissolved oxygen TMDL for the Jordan River (https://deq.utah.gov/water-quality/watershed-monitoring-program/jordan-river-dissolved-oxygen-tmdl-watershed-management-program).

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David	Richards	DRichards_12152018_v1.pdf		34	Assessments Specific to Flowing Surface Waters of the State and Canals CONVENTIONAL PARAMETER ASSESSMENTS Page 40. Table 11. Conventional parameters and associated designated uses as identified for assessment purposes. Total dissolved solids (TDS) Comment: TDS are also known to negatively affect aquatic life. Recommend adding Aquatic Life to Designated Use.	Out of Scope.	DWQ is committed to protecting aquatic life uses of Utah's waterbodies. Utah does not currently have aquatic life use numeric TDS criteria and the development of standards are outside the scope of the Integrated Report. Utah water quality standards are reviewed every 3 years (see https://deq.utah.gov/water-quality/triennial-review-water-quality) and as of the last review, USEPA had not published Clean Water Act Section 304(A) recommendations for TDS aquatic life criteria. The development of standards are outside the scope of the Integrated Report. Information on the Triennial Review can be found at the following web address: https://deq.utah.gov/water-quality/triennial-review-water-quality.
David	Richards	DRichards_12152018_v1.pdf		48	Although O/E may have an intuitive biological meaning, there are so many assumptions, generalizations, and errors associated with derivation of results that its accuracy in assessing loss of taxa and impairment is highly questionable.	None.	DWQ and the primary scientific literature disagree with your opinion about the effectiveness of using O/E models for evaluating stressor disturbance (e.g., please review: Hawkins, C.P. 2006. Quantifying biological integrity by taxonomic completeness: it's utility in regional and global assessments. Ecological Applications 16(4): 1277-1294). All biological assessment methods have intrinsic assumptions and errors. Well over 100 peer-reviewed studies, many of which have been cited in the biological assessment chapter associated with the Integrated Report, have evaluated the assumptions and errors associated with RIVPACS methods and have found the approach to be on par or superior to other methods for purposes of accurately identifying sites that have experienced biological degradation.

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David	Richards	DRichards_12152018_v1.pdf		49	There are several other diversity metrics in use throughout the world that are much simpler to derive and interpret than RIVPACS O/E (Table 1 for example and see Literature Cited). These metrics can easily substitute for O/E or at least supplement it. For example, richness and evenness are better indicators than O/E for several reasons, 1) they are not confounded with other models (e.g. PRISM, a costly and proprietary model that is not transparent except for those who can afford to pay for its use), 2) they are independently verifiable, and 3) they allow assessment of change at local-scale due to point source impacts.	None.	Diversity measures were abandoned long ago by the ecological assessment community because they are strongly influenced by natural setting and are not easily interpretable when used in this context. In that sense, they are not at all substitutable for O/E, which attempts to parse out natural signals from stressor signals. Please review Hawkins and Carlisle 2001 for an example that shows how O/E is preferable to plain taxa richness. As the commenter suggests, other metrics may provide additional information about the nature of biological degradation and clues to the types of stressors causing the disturbance. However, these are often highly correlated, which complicates combining the scores for purposes of making an impairment determination. Additionally, 1) PRISM data are not proprietary and are freely available. They have been independently tested and validated. They are used by a very large community of scientists across a wide range of disciplines and are continually updated and corrected, 2) any O/E model is independently verifiable, 3) O/E can be used for point source assessments and sometimes must be used to avoid pseudoreplication issues when BACI designs cannot be implemented.
David	Richards	DRichards_12152018_v1.pdf		50	As I have emphasized to UDWQ on numerous occasions, RIVPACS O/E models do not quantify loss of predicted taxa. In the case of UDWQ assessments, O/E quantifies only those taxa that were identified from a single (N = 1) composite sample collected from several types of habitats (including riffles and runs) that can exhibit much variability between the macroinvertebrate assemblages. Samples were also identified in the laboratory using a subsample (typically 600 organisms, with large and rare counts). O/E simply quantifies what was observed in a sample, nothing more. Taxa not identified may have or may not have been lost from the waterbody; UDWQ can only conclude that they simply weren't observed.	Clarified Methods text.	The commenter is correct with the assertion that the ―loss‖ of a taxon from a waterbody is strictly an inference made from model results. DWQ removed the text from the Narrative Standards: Biological Assessment section . O/E does not simply quantify what was observed in a sample; it quantifies those taxa that were observed in a sample that were predicted to occur in the absence of human disturbance.

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David	Richards	DRichards_12152018_v1.pdf		51	Probability of Capture > 50% Again, as I have discussed on numerous occasions, probability of captures (Pc's) >50% preclude those very macroinvertebrate taxa that constitute biological integrity in a water body. As an example, waters in the Bonneville Basin and in some other parts of UT have unique mollusk assemblages found nowhere else in the world. Most of Utah's mollusks, including native mussels, clams, and non pulmonate snails do not occur in UT waters at Pc rates > 50%. By relying on RIVPACS O/E > 50% Pc, UDWQ failed to protect the unique mollusk assemblages in UT and apparently was completely unaware of their declines during the time period when continued molluscan viability may have been protected/ensured. This reliance on a single metric with > 50% Pc to assess biological integrity also likely is not protecting other rare and uncommon macroinvertebrates (< 50% Pc) that are again, by definition, biological integrity.	None.	In short, the use of a Pc >0.5 helps more accurately identify sites that have been biologically degraded. With a few exceptions, O/E based on Pc >0.5 is more sensitive and precise than O/E based on all possible taxa (Pc >0). The reason is that common/core taxa that are characteristic of a given stream are typically the ones that are most sensitive to anthropogenic alteration at that site. Due to these scientific facts supported in peer-reviewed, scientific literature, most States and countries use Pc >0.5. A suite of research citations that evaluated different Pc thresholds in different contexts is provided. It is true that these O/E calculations may result in a failure to consider rare taxa. Rare taxa are often relatively low in abundance, in which case their presence or absence at a site is strongly influenced by sampling error. This is likely why the use of Pc >0.5 is more sensitive to degradation and precise than the use of Pc >0. In other cases, rare taxa are limited to a small number of locations, which all biological assessment methods cannot easily incorporate because they are dependent on comparisons against regional reference composition. Rare species are important, but their identification and protection is beyond the scope and intent of biological assessments conducted for purposes of the Integrated Report. The protection of rare and endangered species is an important concern, addressed through the Endangered Species Act, not the Clean Water Act. To our knowledge, the disappearance of rare mollusks occurred long before DWQ conducted biological assessments. The Division of Wildlife Resources, who works with the US Fish and Wildlife Service on Endangered Species Act concerns, has that regulatory authority. It is aware of the loss of mollusks and working on this problem.
David	Richards	DRichards_12152018_v1.pdf		52	Calculating ‗E' using a probability of capture (Pc) of >50% is extremely problematic and results in a poor assessment of biological integrity. Taxa with Pcs < 50% are likely the most sensitive taxa and the very taxa that respond to impairment more that those with Pc > 50%. The statement that ―Using a Pc limit set at greater than 50% typically results in models that are more sensitive and precise, which results in a better ability to detect biological stress‖ is based on two relatively limited studies that evaluated precision using their own methods, i.e. circular reasoning and these were hardly typical. UDWQ is setting a precedent by using Pc > 50% based on results that are not solidly supported in the literature and not established scientific fact but based on a vague, ill-defined term in the two studies: ‗sensitivity'.	None.	DWQ is not setting precedent by using a Pc >0.5. The methods include eight peer reviewed articles on the topic that provide these results and also include extensive discussion about why this is the case. In the early stages of RIVPACS approaches, models were routinely constructed using both a Pc >0 and Pc >0.5; however, most biological assessment programs throughout Europe, Australia, New Zealand, and the United States that use RIVPACS methods have settled on a Pc >0.5 because they are almost always more accurate, precise and sensitive to anthropogenic degradation than lower Pc values.

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David	Richards	DRichards_12152018_v1.pdf		53	From the lengthy discussion in the draft, it appears that UDWQ is more interested in the continued reliance on a single metric (O/E) that had good statistical properties (e.g. more sensitive and precise) than incorporating other metrics or using a < 50% Pc that may prevent loss of rare, uncommon, and unique taxa and provide greater insights into the types of impairments that Utah waterbodies experience.	None.	At this time, DWQ has identified the RIVPACS O/E index approach as the most scientifically defensible method for performing bioassessments for making impairment determinations. Other methods can be used to better understand the nature of biological degradation for any impairments that are identified using O/E. Alternative biological assessment methods would require the same level of technical review and documentation that has been completed for the currently employed methods.
David	Richards	DRichards_12152018_v1.pdf		54	It is my opinion that O/E models may be able to detect large levels of biological stress, but not biological integrity.	None.	O/E is not biological integrity but an important aspect of it.
David	Richards	DRichards_12152018_v1.pdf		55	RIVPACS O/E precision and predictive ability The new O/E model in the draft is claimed to be a less precise predictive model than the previous one used by UDWQ. A loss of precision in the updated model should be critically reevaluated.	None.	The new model incorporated a wider range of reference sites, including larger rivers and has an expanded index period. This is the most likely explanation for the slight decrease in model accuracy and precision. However, the accuracy and precision of the current model are at a level considered acceptable for conducting biological assessments by regulatory agencies worldwide. It is also important to note that the most important reason for expanding the breadth of conditions applicable to the model has led to considerable savings in public resources. DWQ is now able to better partner with state and federal agencies to leverage our resources, saving well over $100,000/year in sample collection and processing costs.
David	Richards	DRichards_12152018_v1.pdf		56	Was this updated model selected because in saves time and money?	None.	While it is true that the model has saved DWQ and natural resource agency partners' considerable time and money by enabling us to more effectively collaborate sample collection and results in a consistent manner, this was not the principal impetus for the update. DWQ routinely updates the model whenever sufficient data from new reference sites suggests that work to construct a new model is warranted.
David	Richards	DRichards_12152018_v1.pdf		57	Several problems in simplifying the model are as follows: Incorporation of 1st order and 8th plus order streams and rivers. There is a big difference in macroinvertebrate assemblages in typical 1st order vs. 2nd to 5th order streams and between 8th plus rivers and 2nd to 5th order streams (please review the River Continuum Concept by Vannote et al.).	None.	DWQ is aware of naturally-occurring longitudinal changes in biological composition in stream ecosystems and the seminal article on this topic cited by the commenter. Several predictor variables in the RIVPACS model were included (e.g., watershed area, mean watershed elevation) so the model predictions could account for such differences. This means that the models predictions for the taxa expected at a site (E) explicitly account for stream size.

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David	Richards	DRichards_12152018_v1.pdf		58	Taxonomic resolution. A coarser taxonomic resolution results in a major loss of valuable information provided by individual taxa when 'rolled up' to higher taxonomic level. It also means that some unique or ecologically valuable taxa may be unaccounted for and lost from the AU without knowledge by UDWQ. For example: combining all species of caddisflies in the genus Rhyacophila at least 5 species or more could be lost without UDWQs knowledge. Or by combining all species of the mayfly genus Baetis, several of the more sensitive species may have been lost. UDWQ is well aware that taxonomic (phylogenetic) similarity has very little predictive power for sensitivity to different types of impairment (Richards 2016, UDWQ 2017).	None.	O/E is an effective indicator of biological condition. The primary goal of this tool for water quality management is to discover whether the aquatic life use is supported. A relatively large amount of literature empirically shows that the use of coarse (family) taxa can often provide similar assessment scores as fine level taxonomic resolution in O/E models. There are many states that use just family level data. There are tradeoffs in the use of fine versus coarse taxonomic resolution data. Coarse data are easier to model (more precise) but use of fine resolution data may produce more responsive indices. Please review Hawkins 2006 to understand a few good examples of these tradeoffs. DWQ's model is perhaps less sensitive, but more precise while also providing the cost effectiveness of incorporating water quality partner collected invertebrate data; creating critical efficiency of DWQ's resources.
David	Richards	DRichards_12152018_v1.pdf		60	Seasonality effects Seasonality also affects macroinvertebrate assemblages. Summer season has fewer taxa in larval stages that are needed for taxonomic identification and O/E derivation. Comparing summer collected vs. late autumn to early spring samples increases variability and thus O/E results (e.g. summer samples likely will have fewer taxa and lower O). Because of these pitfalls, I caution UDWQ not to try to accommodate broader spatial and temporal data into O/E models simply to cut costs. This will result in loss of predictive power in ability to detect impairment. Remember that all assessments and monitoring efforts will eventually have to be measured at the watershed or site-specific level and a macroinvertebrate assessment program that reduces variability at the onset will be more cost effective in the long run.	None.	The RIVPACS model was constructed from reference sites with repeat visits across seasons. Therefore, the temporal range of variability across seasons is implicit in the model.
David	Richards	DRichards_12152018_v1.pdf		61	UDWQ is in an ideal situation to vastly improve macroinvertebrate biological assessments. UDWQ has a strong working relationship with the USU Bug lab, including the leading developers of RIVPACS models at USU and other entities. It should take full advantage of this opportunity to develop a robust biological assessment program comparable to other federal, state, tribal, and county agencies in the region.	None.	At this time, DWQ, in collaboration with many of the entities recommended by the commenter, has identified the RIVPACS O/E index approach as the most scientifically defensible method for performing bioassessments for assessment purposes. The rationale for this decision is that RIVPACS models tend to be more precise and often more responsive to known stressors than other indices (e.g., please review Hawkins 2006, Hawkins et al 2010). Many states and countries have made a similar determination with respect to assessment decisions and principally use additional metrics for further exploration of impairments identified by O/E.

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David	Richards	DRichards_12152018_v1.pdf		62	It appears to me that many millions of dollars have been spent developing RIVPACs O/E regional models when it would have been much more prudent to train UDWQ staff to recognize the macroinvertebrate taxa that occur in UT and become proficient in understanding their ecology, natural and life history, in order to examine sample results and easily evaluate which taxa were missing and why at the watershed level.	None.	DWQ has not spent millions of dollars developing regional O/E models. Much of the data that was used to develop models was collected from EPA-funded projects that used the information for other purposes. DWQ has partnered with the US Forest Service, BLM, EPA, and Salt Lake County—who all use O/E—to offset costs and ensure that biological data meet the needs of multiple agencies. Model construction was conducted by DWQ staff working in collaboration with national experts. The types of heuristic evaluations that the commenter recommends are not well suited to making assessment decisions because they are difficult to conduct consistently and objectively. Instead they are better positioned to assist with further evaluations of impairments identified through empirically derived indices such as O/E.
David	Richards	DRichards_12152018_v1.pdf		63	Model Construction and Performance Page 49. Table 12. Comment: These predictor models and variables are mostly watershed based. It is commendable that UDWQ is now assessing biological integrity at the watershed level rather than at the region wide level, as it has done in the past.	None.	Site-specific, GIS-based predictor variables are used to develop RIVPACS models rather than regional watershed means. The spatial resolution for these predictor variables is 800 m which makes the assessment at reach segment scale rather than watershed. DWQ has conducted biological assessments since the 2008 IR using the same site-specific approach. It is true that DWQ has extrapolated site-specific assessment results to better understand the extent of degradation that has occurred regionally, but these analyses have never been used to formally assess specific waterbodies. Instead, these regional results have been used to better understand broad patterns of biological degradation for planning purposes.
David	Richards	DRichards_12152018_v1.pdf		64	By assessing biological integrity at the watershed level, more accurate and precise conclusions will be made. However, watershed averages are just that: averages. Macroinvertebrate assemblages can easily change from the top of a watershed to the bottom, and an average value likely will not capture those responses.	None.	Site-specific, GIS-based predictor variables are used to develop RIVPACS models rather than regional watershed means. The spatial resolution for these predictor variables is 800 m which makes the assessment at reach segment scale rather than watershed. Many of the empirically derived predictor variables that are used in Utah's RIVPACS model were likely selected because they help ensure that E is calculated based, in part, on the site position along a river continuum.

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David	Richards	DRichards_12152018_v1.pdf		65	As discussed in earlier comment letters, PRISM models are proprietary (black box) and as such are not independently verifiable and thus scientifically invalid. The scientific method requires the possibility of independent validations. PRISM models are not reproducible or transparent, which is what we are all striving for. PRISM models rely on historic data (e.g. most of the climate data metrics in Table 12). As an example, ‐Watershed maximum of mean 1961-1990 annual number of wet days' was 28-year-old data. Conditions likely have changed substantially in 28 years. The past has absolutely nothing to do with the macroinvertebrates collected next year. Similarly, the average of multiple years has nothing to do with invertebrate assemblages that are mostly multivoltine or univoltine. Their lives are shaped only by the conditions in the years during which they lived… not over multiyear averages. Variables in Table 12 had nothing to do with environmental conditions during the time when the sampled invertebrates lived. This introduces an unmeasurable and significant error to every Pc calculated and prevents the use of field data, which would be site specific. It may have been useful in developing regional models… but it has no place in continued assessment/monitoring and should never be used as such. Only field measurements should be used when possible.	None.	While the model building methodology is explained in the methods, including why GIS-based predictor variables are used rather than in-stream physical data, it is worth reiterating. While the model predictions are site-specific, the overarching objective is to use the watershed descriptors to determine the suite of reference sites that are most comparable to the site of interest. Variables such as ‐Watershed maximum of mean 1961-1990 annual number of wet days‖ was likely statistically significant because it helped distinguish between wetter and dryer areas of the state, a distinction that the commenter would likely agree to be important when accounting for natural variation in macroinvertebrate composition statewide. It is true that this has likely changed in the past 29 years, but this would only matter with respect to model predictions if they changed disproportionately. In other words, if areas of Utah that were once dry are now among the wetter areas of the state. Similar reasoning also explains why averaging over a longer period of record is preferable to contemporary data. Weather patterns vary from year-to-year, in any given year it is often true that some areas of the state receive above average precipitation while other areas receive below average precipitation. As a result, averaging over several years provides a better indication of climatic difference from one place in the state to another. PRISM data are not proprietary and are freely available. They have been independently tested and validated. They are used by a very large community of scientists across a wide range of disciplines and are continually updated and corrected
Jonathan	Ratner	JRatner_12062018.pdf		77	Thank you for the opportunity to comment on the proposed 2018 Listing Methodology. Our comments and requests for clarification are rather limited as the document is solid and well thought through. Below are the issues we see.	None.	DWQ appreciates your encouragement and feedback regarding the 303(d) assessment methods.
Jonathan	Ratner	JRatner_12062018.pdf		79	Table 10, likewise, does not provide the needed clarification. For instance, what is ‐Landscape Analysis‖?	Clarified Methods table.	40 CFR section 130.7(b)(5) requires that ‐Each State shall assemble and evaluate all existing and readily available water quality related data and information to develop the list.‖ In EPA's July 29, 2005, guidance (https://www.epa.gov/sites/production/files/2015-10/documents/2006irg-report.pdf), EPA recommended that states solicit data and information from several different data types, including results from relevant landscape analyses. However, EPA didn't define types of "landscape analysis" data, so DWQ removed landscape analysis from Table 10. Thank you for the comment.

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Jonathan	Ratner	JRatner_12062018.pdf		80	Is Multiple Indicators Monitoring (MIM) suitable for listing under habitat degradation? If so, what are the criteria or triggers for departure that would result in listing.	None.	The first step in the assessment process is to determine whether the waterbody is meeting water quality standards (both numeric and narrative), regardless of surrounding land uses. If the waterbody is considered not meeting any of the uses, it will be identified on the 303(d) list for further evaluation such as the cause(s), source(s), and magnitude of potential pollutants. The physical data the commenter is referring are not currently used in conducting water quality assessments. All are potential candidates for evaluating the extent to which habitat degradation is contributing to biological degradation; however, DWQ has not developed definitive methods quantifying habitat degradation. DWQ agrees that habitat methods would be useful, but the integration of available tools would require the same level of technical review and documentation that has been completed for the biological assessment program. If the commenter has a specific proposal for how these approaches could be integrated into an integrative habitat assessment, DWQ would be interested in seeing these details.
Jonathan	Ratner	JRatner_12062018.pdf		81	Is Proper Functioning Condition (PFC) data useful for listing determinations?	None.	DWQ is currently developing water quality standards and assessment methods specific to wetlands. Until the standards and methods are vetted internally and have undergone a public comment or DWQ stakeholder review process, DWQ will not assess Proper Functioning Condition (PFC) data that is traditionally used to characterize and assess the physical functioning of riparian-wetland areas. If, however, there are PFC data that (1) meet DWQ's readily available and credible data requirements, (2) are associated with waterbodies that are assessed by the IR, and (3) have beneficial uses and numeric criteria associated with them in UAC R317-2, DWQ would encourage the commenter to submit the data during the IR's Call for Data.
Jonathan	Ratner	JRatner_12062018.pdf		82	Is Aquatic AIM, the BLM's method of riparian condition assessment and inventory suitable for listing determinations? This issue needs much more elaboration in order to be useful.	None.	Thank you for this recommendation. DWQ works closely with the US BLM's AIM Program to ensure our field and lab protocols and quality control are consistent. Therefore, we routinely incorporate the BLM AIM Program benthic macroinvertebrate results into this assessment. It is a shared goal of our programs to formalize riparian condition assessment methods. However, this project continues and is not yet available for implementation into the IR.

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Jonathan	Ratner	JRatner_12062018.pdf		83	At 19, the ability to reject data based on undefined -resource limitations‖ does not meet the CWA's -existing and readily available data‖ standard.. We understand resource limitations but the process needs to be designed to accept and use all -existing and readily available data‖. If dates or deadlines need to be adjusted then the process needs to do that as opposed to simply rejecting data that is -existing and readily available‖ simply because of, for instance, budget cuts or staffing issues. Table 3 contains the same issues as discussed above.	Revised Methods text.	DWQ appreciates the feedback and concerns regarding the method's "Existing and Readily Available Data Defined" section and Table 3. The original intent of the section and table was to demonstrate the tools and processes DWQ developed since the previous IR to accommodate the many different forms and types of data and information that are submitted during the IR's Call for Data. However, after review of the publicly submitted comments, DWQ understands how this may have been miscommunicated in the methods. DWQ reviewed the original language and removed the text that discussed resource limitations and the "partially available" and "unavailable" rows from Table 3. Thank you for the feedback.
Jonathan	Ratner	JRatner_12062018.pdf		85	In addition, it is unclear what -Data are collected at pre-determined locations‖ means. We collect data under an SAP that allows for locations to be selected based on observed conditions. As such, specific locations are not defined in the SAP. From the language, it appears DEQ could reject data based on this current wording. We suggest the phrase be removed.	Clarified Methods text.	DWQ agrees with the commenter that this phrase is too general. This phrase has been removed from the document.
Jonathan	Ratner	JRatner_12062018.pdf		86	In Table 3, we are concerned that existing and readily available data could be rejected based on database issues. For instance, habitat degradation or narrative standards data may not fit into structured databases such as dozens or hundreds of photos or field sheets from habitat assessment methodologies. This would clearly be -existing and readily available data‖	Revised Methods text.	DWQ agrees with the commenter and added a footnote to Table 3 that "DWQ data submission templates and processes are designed to allow for data and information that may not fit the data structure of EPA's Water Quality Exchange System or may be used to support a credible data review (Tables 5-8) or perform a narrative or high frequency data assessments". For further clarification, DWQ also added to the "Existing and Readily Available Data Defined" section of the assessment methods that existing and readily available data for the IR may include: "Data collected for narrative assessments (see Narrative Assessment: Biological Assessments and Narrative Standards for All Waters)", "Data obtained through EPA's Water Quality Portal (WQP), "Data and information obtained through the IR's public Call for Data", "Data and information submitted to EPA's Water Quality Exchange System or DWQ's Call for Data to support a credible data submission (e.g., Tables 5-8)", and "Data included in the Data Types Matrix in Table 10.". At this time, DWQ does not have methods for assessing physical habitat data or field photos. However, DWQ can evaluate qualitative data and other non-numeric types of information in the assessment process, provided they meet other aspects of data credibility and availability, as identified in tables 3, 5-9, and 10 of the assessment methods. These types of information are included in the assessment review process described in table 3 and the "Aggregation of Site-Specific Assessments to Assessment Unit Categories", "Secondary Review", and "Appendix 3" sections of the assessment methods. DWQ appreciates the feedback.

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Jonathan	Ratner	JRatner_12062018.pdf		87	In the -partially available‖ section we see -may have been collected for the purposes of answering specific questions or addressing specific issues.‖ Nearly all data could fall under this description. Certainly the data we collect is to answer the specific question of what are e coli levels at this stream reach. This criteria needs to be removed as a trigger for putting data into this category.	Revised Methods text.	DWQ agrees with the commenter and removed the "partially available" row from Table 3. The table now focuses on how DWQ incorporates readily available information and datasets that are obtained or submitted to DWQ during the IR's Call for Data. DWQ would also like to add that should DWQ not include data and information that is obtained by or submitted to DWQ during the IR's Call for Data, DWQ will clearly document which information and dataset (or datasets) were not included and why. DWQ does this for transparency purposes to reviewers and to meet the requirements of CFR 130.7 (b)(6)(iii). Any concerns with data and information rejections (or data and information gaps), can be reviewed and publically commented on during the Draft IR's public comment period.

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Jonathan	Ratner	JRatner_12062018.pdf		88	Again, data collected for narrative standards or habitat degradation may require data formats that do not fit in the normal EPA database setup. This data is still existing and readily available.	Revised Methods text.	DWQ appreciates the feedback and concerns regarding the method's Table 3 and "Existing and Readily Available Data Defined" section. The original intent of the table and section was to demonstrate the tools and processes DWQ developed since the previous IR to accommodate the many different forms and types of data and information that are submitted during the IR's Call for Data. However, after review of the publicly submitted comments, DWQ understands how this may have been miscommunicated and made several edits to the table and section described below. DWQ can evaluate qualitative data and other non-numeric types of information in the assessment process, provided they meet other aspects of data credibility and availability, as identified in tables 3, 5-9, and 10 of the assessment methods. These types of information are included in the assessment review process described in table 3 and the "Aggregation of Site-Specific Assessments to Assessment Unit Categories", "Secondary Review", and "Appendix 3" sections of the assessment methods. DWQ removed the "unavailable" and "partially available" rows from Table 3 and added a footnote explaining that for readily available data, "DWQ data submission templates and processes are designed to allow for data and information that may not fit the data structure of EPA's Water Quality Exchange System or may be used to support a credible data review (Tables 5-8) or perform a narrative or high frequency data assessments". DWQ also added to the "Existing and Readily Available Data Defined" section of the assessment methods that existing and readily available data for the IR may include: "Data collected for narrative assessments (see Narrative Assessment: Biological Assessments and Narrative Standards for All Waters)", "Data obtained through EPA's Water Quality Portal (WQP), "Data and information obtained through the IR's public Call for Data", "Data and information submitted to EPA's Water Quality Exchange System or DWQ's Call for Data to support a credible data submission (e.g., Tables 5-8)", and "Data included in the Data Types Matrix in Table 10."

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Jonathan	Ratner	JRatner_12062018.pdf		89	In the ―unavailable‖ category, PDF's, such as field sheets or photos, are cited as unavailable. Again, we are concerned that limits beyond what the CWA intended are being applied.	Revised Methods text.	DWQ appreciates the feedback and concerns regarding the method's Table 3 and "Existing and Readily Available Data Defined" section. The original intent of the table and section was to demonstrate the tools and processes DWQ developed since the previous IR to accommodate the many different forms and types of data and information that are submitted in the IR's Call for Data. However, after review of the publicly submitted comments, DWQ understands how this may have been miscommunicated in the methods and made several edits to the table and section described below. DWQ can evaluate qualitative data and other non-numeric types of information in the assessment process, provided they meet other aspects of data credibility and availability, as identified in tables 3, 5-9, and 10 of the assessment methods. These types of information are included in the assessment review process described in table 3 and the "Aggregation of Site-Specific Assessments to Assessment Unit Categories", "Secondary Review", and "Appendix 3" sections of the assessment methods. DWQ removed the "unavailable" row from Table 3 and added a footnote explaining that for readily available data, "DWQ data submission templates and processes are designed to allow for data and information that may not fit the data structure of EPA's Water Quality Exchange System or may be used to support a credible data review (Tables 5-8) or perform a narrative or high frequency data assessments". DWQ also added to the "Existing and Readily Available Data Defined" section of the assessment methods that existing and readily available data for the IR may include: "Data collected for narrative assessments (see Narrative Assessment: Biological Assessments and Narrative Standards for All Waters)", "Data obtained through EPA's Water Quality Portal (WQP), "Data and information obtained through the IR's public Call for Data", "Data and information submitted to EPA's Water Quality Exchange System or DWQ's Call for Data to support a credible data submission (e.g., Tables 5-8)", and "Data included in the Data Types Matrix in Table 10."

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Jonathan	Ratner	JRatner_12062018.pdf		90	Page 30: Since starting data collection in Utah many years ago, we have tried to move our approved Wyoming SAP over to Utah and get it officially approved and signed by Utah DEQ but have not gotten feedback as to what Utah DEQ sees as needed changes. Staff have told us that the Wyoming SAP is sufficient for their immediate purposes of reviewing our data but the process to get a fully approved Utah SAP has not happened. We would appreciate clarification as to what updates are needed in order to get Utah DEQ approval.	None.	DWQ appreciates the feedback and apologizes that the commenter has not received a response on the SAP that was previously submitted for DWQ approval. Please contact Jodi Gardberg, the Watershed Protection Manager, who will process the SAP. DWQ would like to clarify that the commenter does not need a DWQ approved QAPP, SAP, SOPs, etc. DWQ requests this information during the IR's Call for Data to ensure results from disparate data sources are repeatable and scientifically defensible. For examples of the types of content EPA and DWQ require for their data quality documents, please refer to the "Components for Credible Data" section of the assessment methods.
Jonathan	Ratner	JRatner_12062018.pdf		91	Also our SAP incorporates the elements of a QAPP. It appears from pages 29 and 30 that we need to separate out these two aspects of the SAP into two separate documents. Is that correct?	None.	QAPPs, SAPs, and SOPs that are submitted to DWQ during the Integrated Report's Call for Data may be submitted electronically as either one or several smaller documents.
Jonathan	Ratner	JRatner_12062018.pdf		92	In Table 5, we see that flow data has been made mandatory for all Grade A data. Is this necessary for all grab sample parameters?	None.	In Table 5, flow data is not required for Grade A data. However, if during the secondary review process, DWQ or public commenters have any data concerns (as defined in the Conflicting Assessments of Water Quality Standards and Appendix 3 sections of the assessment methods), DWQ may request flow or any other Grade A or B credible data documentation. DWQ requests and requires this information when data concerns are raised, so that DWQ can further evaluate the extent to which data is representative and demonstrates clear and convincing evidence of supporting or not supporting the beneficial uses assigned to the waterbody in UAC R317-2. If the requested information was not preemptively submitted during the Call for Data or provided upon DWQ request, the data of concern may be rejected and removed from assessments.
Jonathan	Ratner	JRatner_12062018.pdf		93	In Table 9, we see that, under QA/QC is -incubation‖. It should be clarified as to what aspect of -incubation‖ information is required. Is it time in and time out, temp in and out, both or other information.	Revised Methods text.	In Table 9 "incubation" refers to data and information that is recorded on DWQ's E. coli bench sheets and relates to time and temperature (i.e., time samples were placed in and taken out of the incubator and the temperature of the incubator when samples were placed in and taken out of it). For an example of how DWQ records this information, please refer to Appendix 3 of DWQ's Standard Operating Procedure for Escherichia coli (E. coli) and Total Coliform Quantification Using the IDEXX QUANTI-TRAY/2000 System (https://deq.utah.gov/legacy/monitoring/water-quality/docs/2014/05May/SOP_EcoliSampleAnalysis_5.1.14_Rev%201.2.pdf). DWQ added a footnote to table 9 with this clarification.

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Jonathan	Ratner	JRatner_12062018.pdf		94	At 41, discussing minimum number of grab samples for determining exceedances, is there a minimum time between samples or has this not been defined in the regulations?	None.	DWQ does not define a minimum time between samples for conventional grab sample assessments. However, if there are multiple grab sample measurements in a single day, DWQ will only assess a single daily value (i.e., 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). For assessments with sample temporal requirements, the commenter should refer to the "High Frequency Assessments for Dissolved Oxygen" and "Escherichia Coli Assessment for All Waters" sections of the assessment methods.
Jonathan	Ratner	JRatner_12062018.pdf		95	Figure 2 – Assuming 10 samples are collected and 2 exceed the standard by, for example, 100%, and 2 samples are collected and both exceed by 100%. It is not clear what the rationale is for rejecting latter dataset as insufficient, given they both show the exact same exceedances.	Issue added to the Methods Current Review Topics Tracking Workplan list for future IRs.	DWQ agrees with the commenter that with conventional assessments based on grab sample data there may be an exceedance frequency threshold where it may be appropriate to list a waterbody as impaired using an insufficiently sized dataset. DWQ is working to conduct analysis and research on what that threshold may be, so that DWQ can better quantify and address not supporting water quality concerns. DWQ welcomes Western Watersheds and others to provide studies and data that could be used in evaluating what that threshold may be, balanced against an appropriate minimum sample size.
Jonathan	Ratner	JRatner_12062018.pdf		96	At 13 and elsewhere, there is a much greater need to define acceptable data types and methods for determining listing and impairment under the categories of hydrologic modification and habitat degradation. These issues are widespread throughout Utah, but there is little to no guidance in acceptable data documenting these conditions. The proposed listing methodology document needs to go much further in clarifying this currently murky issue.	None	DWQ agrees with the commenter on the importance of evaluating impairments that are caused by pollution. However, identifying sources of pollution is not part of the Assessment Methods of the IR. Instead sources are determined as part of a TMDL or related source assessments process. (See section Unknown Sources in the assessment methods for more information on how sources are identified and tracked in the assessment process). DWQ is in the process of drafting implementation guidance for Category 4C and 5-alt. For more information, contact DWQ's Watershed Protection Section Manager.
Jonathan	Ratner	JRatner_12062018.pdf		97	Assuming there is a need for more than one sample to exceed in order to list it makes no difference whatsoever if more than the minimum number of samples are collected.	Issue added to the Methods Current Review Topics Tracking Workplan list for future IRs.	DWQ agrees with the commenter that with conventional assessments based on grab sample data there may be a threshold where an insufficiently sized dataset may be impaired regardless of how much additional data is collected in an IR period of record. DWQ is working to conduct analysis and research on what that threshold may be, so that DWQ can better quantify and address not supporting water quality concerns. DWQ welcomes Western Watersheds and others to provide studies and data that could be used in evaluating what that threshold may be.

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Jonathan	Ratner	JRatner_12062018.pdf		98	At 42, the document states ―For readily available and credible data within the period of record, DWQ will correct or remove all questionable data points (i.e., sensor drift, calibration shift, strange anomalous points, and battery issues) before data analysis and interpretation begins‖ These issues would have been flagged as ‗qualified' or ‗invalid' during the submitter's QC processes. Without being determined ‗qualified' or ‗invalid' by the sampler and QC officer it would be nearly impossible for the DEQ to determine what should be ‗qualified' or ‗invalid' (described as ―questionable‖ above. We are concern that valid data could be rejected based on this undefined ―questionable‖ determination.	Clarified Methods text.	DWQ agrees with the comment that any necessary corrections or removal of data points in high frequency data should be performed and identified by the data collector or submitter. In these cases, DWQ will use the corrected dataset and ensure that data identified for removal are not included in the assessment. DWQ has clarified this text to state that, "For assessments, DWQ will use corrected high frequency data as documented by the data submitter. If during the assessment DWQ determines that additional corrections may be required, DWQ will contact the data submitter for clarification and additional information." As described in Table 6, submitters of high frequency dissolved oxygen data should submit documentation of the QA/QC procedures performed on raw data for their submitted data to be included in the assessment.
Jonathan	Ratner	JRatner_12062018.pdf		99	If the DEQ thinks some data are ―questionable‖ and they are not flagged by the submitted as ‗qualified' or ‗invalid', the DEQ needs to question the submitter to investigate the cause.	Out of scope.	Following up with submitters whose data record(s) have been rejected by the submitter is outside the scope of the IR. However, DWQ agrees with the commenter that collectors and data submitters should be aware of problems with data that was rejected for 305(b) and 303(d) assessment purposes. To assist with this and help communicate concerns with data, DWQ publishes all data from the IR period of record that was used for the current assessment cycle. In the published datasets, DWQ populates "IR Flag" and "IR Comment" columns, where reviewers can see if a data record was rejected and why. Trainings hosted by DWQ's Monitoring Section should help reduce these issues in the future.
Jonathan	Ratner	JRatner_12062018.pdf		100	Page 84: Reasonable time period is way too vague. This needs to be more fully defined.	Out of Scope.	Developing a pollution control plan for category 4B assessments is outside the scope of the IR. Pollution control plans go through a robust internal and external review process, including a presentation to DWQ's Water Quality Board for approval and a submission to EPA for final approval. Concerns regarding the time frame specified in plans for pollution-control requirements to bring impaired waters back into attainment should be raised to DWQ's Watershed Protection Section manager when a plan is being developed. For more information about the development and approval of a pollution control plan, please refer to EPA's Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and314 of the Clean Water Act and Information Concerning 2008 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions.

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Marian	Rice	MRice_12072018.pdf		102	After review of the DRAFT 2018/2020 303(d) Assessment Methods document we would like to provide the following comments: Existing and Readily Available Data Defined • Salt Lake City supports use of Citizen Scientist's efforts and data collected to help provide education and capacity building to the public. Also, we support use of the data collected to qualitatively identify a potential issue. However, as the data and collection methods could be inconsistent and thus questionable, we do not support use of the data to determine if the waterbody is supporting or not supporting the assigned beneficial use and numeric criteria. Furthermore, any data utilized must be credible, and needs to be thoroughly reviewed by DWQ prior to use.	None.	DWQ appreciates the comment and concern about assessing readily available and credible data. As mandated in 40 CFR 130.7(b)(5)(i), (iii), and (iv) DWQ must assemble and evaluate all existing and readily available data in determining whether a waterbody is supporting or not supporting the assigned beneficial uses and numeric criteria in UAC R317-2. During the IR Call for Data process DWQ can receive data from citizen groups, government agencies, private companies, etc.. To ensure that the data used for 305(b) and 303(d) assessments purposes are of high quality, consistent across various sampling techniques from disparate data sources, representative of ambient conditions, and appropriately documented, DWQ goes through a thorough credible data requirements review as outlined in the Data Quality section of the methods. Following DWQ's review, any readily available data that are of Grade A or B quality are then used for 305(b) and 303(d) assessments regardless of who collects and submits data.
Marian	Rice	MRice_12072018.pdf		103	• Data collected needs to follow appropriate methodologies and adhere to appropriate QA and QC procedures.	None.	DWQ agrees with the commenter on the importance of demonstrating that data collected and used for 305(b) and 303(d) assessment purposes follows established protocols, procedures, and methods. In the Data Quality section of the assessment methods DWQ requires that collectors and data submitters provide documentation identified in the assessment methods' credible data matrices when any concerns are raised surrounding the quality of that data. (In previous reporting cycles, this request usually occurred during DWQ's secondary reviews prior to publishing the draft report or when responding to public comments on the draft 305(b) and 303(d) lists). If documentation is missing or does not demonstrate that the data is of known quality or defensible, DWQ assigns a lower grade to the data record(s) in question. For more information on how DWQ and DWQ Cooperators collect, process, and calibrate equipment for data collection, please contact DWQ's Monitoring Section manager. If there are concerns or suggestions on DWQ's quality process, please contact DWQ's Quality Assurance Officer and Laboratory Coordinator in the Information and Data Services section.

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Marian	Rice	MRice_12072018.pdf		104	Conventional Parameter Assessments • High Frequency Assessments – SLCDPU supports the use of high frequency data collection for parameters such as DO, ph, Temperature, etc. We request the water quality sondes are calibrated on a regular schedule as well as if there is an event that requires additional calibration.	None.	DWQ agrees with the commenter on the importance of regular and proper calibration and requires that any field sample data used for 305(b) and 303(d) assessment purposes follows established protocols, procedures, and methods. DWQ also specifies in the Data Quality section of the assessment methods document that to support and demonstrate that data is of high quality, collectors and data submitters must provide documentation identified in the assessment methods' credible data matrices when any concerns are raised surrounding the quality of that data. If documentation is missing or does not demonstrate that the data is of known quality or defensible, DWQ assigns a lower grade to the data record(s) in question (as outlined in the method's credible data matrices). For more information or any concerns on how DWQ and DWQ Cooperators calibrate instantaneous and high frequency data probes, please contact DWQ's Monitoring Section manager.
Marian	Rice	MRice_12072018.pdf		105	We request that outlier and questionable data points be assessed and removed as applicable. If correction occurs, that data corrected needs annotation stating the correction.	None.	As part of DWQ's secondary review process, one of the potential data concerns DWQ evaluates is the presence of outliers in a sample location's dataset. However, as noted in Appendix 3, DWQ does not rely solely on a statistical test to identify a potential outlier; instead, the identification of an outlier is based on a scientific or a quality assurance basis, such as: QA/QC field sampling blanks, duplicates/replicates, laboratory analytical batch QC, or the value is nonsensical (e.g., cannot be measured with field/laboratory methods or there are concerns with the data quality). If during the secondary review process, a record is identified as an outlier, the record will be rejected and a DWQ comment will be populated, so during the public comment period of the Draft IR, reviewers will be aware of the secondary review decision. Examples of this type of documentation are available in the 2016 IR dissolved oxygen river and stream excel data file. The commenter should refer to the "draft2016ir_do_datareport" worksheet table and the "Flag_Comment" column (https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/2016-integrated-report-data.htm).

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Marian	Rice	MRice_12072018.pdf		106	Components for Credible Data • Monitoring locations – As DWQ assesses data from partners and performs their own Basin-specific data collection efforts, SLCDPU wants to ensure the monitoring locations are representative of the Basin as well as the specific Assessment Unit (AU). A single monitoring location per AU is not sufficient to determine if an AU and waterbody is supporting the assigned beneficial use and numeric criteria. Thus, we request there are multiple sampling locations per AU to provide a better and more holistic picture of the health of the waterbody.	Issue added to the Methods Current Review Topics Tracking Workplan list for future IRs.	DWQ agrees with the commenter that it is important that assessment sites be representative of the waters in the AU. DWQ's AU's were delineated into discrete units with the intent of grouping waters likely to share similar characteristics. As a result, AU's across the state range in size from first order tributaries to segments of larger river basins. Likewise, the number of sites that inform listing decisions in each of those AU's range from one to many sites. As described in the section "Determinations of Impairment: All Assessment Units" of the assessment methods, DWQ assesses each individual beneficial use and parameter for a single site (regardless of the site's location in an assessment unit (AU) or drainage area). As a first step towards better addressing the representativeness of a site to an AU, DWQ expanded on the secondary review section in the 2018/2020 methods by adding the section ―Assessment Unit Re-segmentation‖. This section allows DWQ to reevaluate the delineation of AU's in relation to assessment sites to more accurately characterize the extent of water quality assessments in an AU (especially when there is conflicting assessment results at the site level). DWQ will further consider the commenter's recommendation to expand on the secondary review and AU re-segmentation sections of the assessment methods by considering sample site density and distribution within an AU in future IRs.
Marian	Rice	MRice_12072018.pdf		107	• Data collection during or recently after a precipitation event (rain, snow) needs to be identified and assessed as such. Ideally, the data collected should be dry weather monitoring.	None.	To ensure that data used for 305(b) and 303(d) assessment decisions are of high quality, representative of ambient conditions, and appropriately documented, DWQ requires that data collectors and submitters must provide documentation identified in the assessment methods' credible data matrices when any concerns are raised surrounding the quality of that data. This includes field documentation of sampling conditions, flow data, and sampling analysis plans. With this information DWQ is able to better evaluate during the secondary review if sample conditions have a bias in their sampling design or are not representative due to environmental factors, such as extreme events. DWQ's process for this is located in the secondary review section and Appendix 3 of the assessment methods document.

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Marian	Rice	MRice_12072018.pdf		108	• Data Outliers-We ask for specific information on how outliers are identified and resolved in datasets.	None.	As part of DWQ's secondary review process, one of the potential data concerns DWQ evaluates for is the presence of outliers in a sample location's dataset. However, as noted in Appendix 3, DWQ does not rely solely on a statistical test to identify a potential outlier; instead, the identification of an outlier is based on a scientific or a quality assurance basis, such as: QA/QC field sampling blanks, duplicates/replicates, laboratory analytical batch QC, or the value is nonsensical (e.g., cannot be measured with field/laboratory methods or there are concerns with the data quality). If during the secondary review process, a record is identified as an outlier, the record will be rejected and a DWQ comment will be populated, so during the public comment period of the Draft IR, reviewers will be aware of the secondary review decision.
Marian	Rice	MRice_12072018.pdf		109	Harmful Algal Blooms (HAB) • DWQ states the goal of the HAB assessment method is to identify waterbodies that experience HAB events that impair Class 2 recreational uses. In addition, we request the goal of the HAB assessment method is to also identify waterbodies that experience HAB events that impair Class 4 agricultural uses. We encourage coordination with the Utah Department of Agriculture and Food (UDAF) to identify methods associated with agriculture.	None.	DWQ agrees with the commenter that HABs have the potential to negatively impact agricultural uses. DWQ continues to coordinate with the Utah Department of Agriculture and Food regarding potential benchmarks for agricultural use advisories or use assessments. However, at this time, DWQ has not identified sufficient information to recommend agricultural use assessment benchmarks for HABs and as such agricultural uses are not currently assessed under the HAB assessment methods. DWQ encourages the commenter to participate in broader discussions with DWQ, local health departments, and UDAF regarding this issue.
Marian	Rice	MRice_12072018.pdf		110	• Cell Counts- We do not believe cell counts alone should be utilized to drive an Advisory of a waterbody. We request there is a review and possible revision of recreational guidance criteria.	None.	The issuance of recreational advisories or closures is a separate process from water quality assessment as part of the IR. Recommended health advisory procedures are developed in conjunction with state and local health departments and stakeholders through DWQ's Water Quality and Health Advisory Panel (https://deq.utah.gov/legacy/divisions/water-quality/health-advisory/index.htm). Recommendations for the health advisory process can be made to that program. The inclusion of cell counts as an indicator in DWQ's HAB assessment methods directly reflects Utah's Narrative Standard which stipulates that the presence of scums, nuisances such as color, odor, or taste, or water quality conditions that may cause undesirable human effects are a violation of the state's water quality rules.

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Shera	Reems	EPA_Region8_12072018.pdf		159	The EPA commends the work of the Department of Environmental Quality on implementing outcomes from the continuous improvement process that has been underway for a few years. We want to thank you for providing the EPA the opportunity to review and provide comments on the Draft 2018/2020 303(d) Assessment Methods. This letter highlights a few of our more important comments that we would like to bring to your attention. We have provided additional comments and suggestions via the on-line submission tool located at https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/draft-2020-methodology-for-integrated-report.htm.	None.	DWQ appreciates your encouragement regarding the improvements made to the water quality assessment program and the Draft 2018/2020 303(d) Assessment Methods. Thank you for using the public comment submission form and for providing feedback on the draft 303(d) assessment methods.
Shera	Reems	EPA_Region8_12072018.pdf		160	Data Sufficiency In interpreting macroinvertebrate RIVPACs results, the state proposes to apply different minimum sample size requirements to make a fully supporting use decision vs. non-supporting use decision. Table 13 (page 52) indicates that a minimum of one sample is required to make a fully supporting use determination, whereas a minimum of three samples is required to make a non-supporting use decision. The EPA recommends that UDEQ apply the same minimum sample size to make fully supporting and non-supporting use decisions when interpreting data for macroinvertebrates or pollutants.	None.	DWQ made the decision to use different sample size requirements based on reasonable assumptions with respect to the interpretation of biological data. An O/E score closer to 1 indicates that a stream is indistinguishable from reference condition and fully supporting the biological uses. There are not obvious sources of bias that could lead to an alternative conclusion. In contrast, it is possible that a single low O/E score is strongly influenced by atypical environmental conditions (e.g., undetected flash flood, extreme drought). The decision to make impairment decisions based on data collected over several samples avoids making erroneous impairment conclusions based on samples collected in atypical, naturally occurring conditions.

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Shera	Reems	EPA_Region8_12072018.pdf		161	Dissolved Oxygen The EPA recognizes the inherent challenges with assessing dissolved oxygen (DO) in Utah's lakes and reservoirs. Based on the assessment methods, it is unclear whether the state's proposed approach for assessing for DO impairments in lakes and reservoirs is consistent with the state's DO water quality standards. The EPA recommends that UDEQ provide additional clarification on this assessment method and its harmonization with the DO water quality standards. Additionally, for high frequency assessments (assessment of continuous data loggers), the EPA requests that UDEQ provide additional information explaining the selection of a 39 contiguous-day minimum dataset to make an assessment determination. This approach appears to represent a significant da\ta/workload requirement and does not provide the flexibility to consider DO averaging periods that could be assessed using less data collected over shorter timeframes (e.g., daily minimum value, 7-day average).	Issue added to the Methods Current Review Topics Tracking Workplan list for future IRs.	DWQ agrees with the comment that there is inconsistency in the way DO criteria have been interpreted under the DO assessment approaches between lakes & reservoirs and rivers & streams. However, the comment does not identify a specific point of confusion and does not make specific method change recommendations. DWQ has added this issue to the methods review topics tracking system for future IR methods and will continue to work to improve DO assessment methods during future IR cycles, collaborating with stakeholders and EPA. DWQ agrees with the commenter that 39 contiguous days of high frequency dissolved oxygen (DO) data are not needed to fully assess the 7-day average minimum DO criteria. DWQ reviewed the original language and removed the ≥39 day requirement from the "Data Sufficiency" section. The section now reads, "To ensure that daily minima are captured and that daily averages can be accurately calculated, high frequency data must capture complete days. DWQ defines a complete day as a calendar day (i.e. 12:00 am – 11:59 pm) in which at least one measurement is made in each hour." DWQ also removed the ≥39 day requirements in Figures 3 and 4. Instead, data are considered sufficient for assessment if at least ten daily minima or 7 or 30 day averages can be calculated over the period of record.
Shera	Reems	EPA_Region8_12072018.pdf		162	Assessment of Wetlands The EPA applauds the work that UDEQ has undertaken to compile the information collected over the past several years for the wetlands surrounding the Great Salt Lake and to develop an approach to assess these wetlands. EPA found the presentation, -What Should the Water Quality Goals for Great Salt Lake Wetlands Be?‖ from the Watershed Symposium on November 15, 2018, to be very informative. Based on the information presented and the work conducted to date, EPA recommends including a section that discusses UDEQ's approach to assessing the wetlands surrounding the Great Salt Lake and other wetland ecosystems in the 2018/2020 Assessment Methods document.	Out of scope.	DWQ appreciates your encouragement regarding the improvements made to developing an approach for assessing wetlands. However, for the 2018/2020 Assessment Methods DWQ is not reporting on assessments methods that are still under development. DWQ's assessment methods reflect methods and processes that are heavily vetted internally and have undergone a public comment or DWQ stakeholder review process. DWQ encourages the commenter and other stakeholders to follow the research and assessment method development process for wetlands by visiting DWQ's Wetlands Program website (https://deq.utah.gov/water-quality/wetlands-program/wetlands-program).

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Shera	Reems	EPA_Region8_12072018.pdf		163	Great Salt Lake / Farmington Bay UDEQ's draft assessment methodology does not specify whether UDEQ intends to complete an assessment of the Great Salt Lake based on an interpretation of the narrative standard. The EPA requests an update on the state's plan to develop assessment methods for parameters other than Selenium including Harmful Algal Blooms in Great Salt Lake/Farmington Bay.	None.	DWQ is in the process of developing Water Quality Standards and Assessment Methods for Great Salt Lake as outlined in the Great Salt Lake Water Quality Strategy Document (https://documents.deq.utah.gov/water-quality/standards-technical-services/gsl-website-docs/gsl-wq-strategy/DWQ-2019-000535.pdf) Once the standards or methods are fully developed and vetted by stakeholders and the Water Quality Board, they will be incorporated in the assessment methods for a future Integrated Report.
Shera	Reems	EPA_Region8_12072018.pdf		164	Delisting of Waters In Table 16 (page 73), UDEQ noted that for Nitrate as N and Total Phosphorus as P, -…all categorical assessments for aquatic life uses (Class 3) will be overwritten to Category 3.‖ Consistent with 40 C.F.R. § 130.7(b)(5) and the 2006 Integrated Reporting Guidance and subsequent clarification memos, the EPA encourages states to demonstrate good cause (e.g., data and/or information) for not including individual segments (including previously listed segments) on the 303(d) list. We request that UDEQ provide additional information documenting the state's rationale to delist waters based on a review of the site-specific data.	None.	When good cause can be demonstrated, DWQ will delist Total Phosphorus as P and provide the necessary documentation as described in the Delisting and Appendix 6 sections of the assessment methods document. Any delisting documentation and justifications will be available for review during the public comment process of the draft IR. To clarify, any Total Phosphorus as P assessments that are delisted or removed from the 303(d) list will undergo the same level of review and documentation as any other parameter DWQ removes from the 303(d) list. Examples of previous delisting documentation are available on the last four pages of Chapter 3 of the Final 2016 IR (https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/docs/2016/chapter-3-river-and-stream-assessments-final2016ir-v2-1.pdf).
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		198	Because of the way we drafted our comments, it's hard to re-engineer them to fit into all the various boxes. For that reason, we thought we'd just attach a complete letter here. (In other words, all our comments are included in the attached.) Thank you.	Requested improvement on form functionality.	Thank you for using the electronic public comment submission form and the form's attachment section. For future assessment method and Integrated Report public comment forms, DWQ will review the form's structure, function, and text box character limits.
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		204	Second, while we appreciate the opportunity to submit comments electronically, electronic submission requires the use of set fields with word limits, which makes it difficult for the public to take a crafted set of comments like this and then shoehorn those comments into a set of word-limited fields that may or may not track the document's organizational structure.	Requested improvement on form functionality.	DWQ appreciates your feedback regarding the form's structure and text box limits and thanks you for using the electronic public comment submission form. To help commenter's identify the methods section(s) they were commenting on, DWQ's comment form followed the same structure as the assessment methods Table of Contents. In addition, DWQ provided an "Additional Comments on the Draft 303(d) Assessment Methods" comment box, as well as a section for submitters to attach documents. DWQ will also re-evaluate whether the text box limit set at two pages of text per section was adequate and not limiting. For future IR public comment forms, DWQ will review the form's structure, function, and text box character limits.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		205	In some ways, that challenge reflects our broader concern with the Draft Assessment Methods. Just as there is more than one way to collect scientifically valid data, there is more than one valid way to organize comments in response to a call for public comment. In both cases, artificially limiting the way information is submitted can undermine e the broader goals behind asking for information in the first place.	Requested improvement on form functionality.	DWQ agrees with the commenter that there is more than one way to collect scientifically valid data. DWQ's credible data requirements, which includes submitting SAPs, SOPs, etc., are required when requested by DWQ, so that the Division can ensure results from disparate data sources are repeatable and scientifically defensible. DWQ believes that this level of review is necessary for instilling confidence in the 305(b) and 303(d) lists. See also response to Comment 204.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		206	Comments and Concerns Regarding the Substance of the Draft Assessment Methods (1) Application of the Draft Assessment Methods may exclude robust and legitimate data sets that inform the question of whether GSL is healthy or should be listed as impaired under Section 303(d). In designing our data collection protocols, the Cooperative made a conscious decision to prioritize greater sample quantity and breadth. For example, the nutrient , temperature, oxygen, and chlorophyll-a measures the Cooperative has collected on Gilbert Bay span nine sites over multiple years, which allows us to better assess temporal and spatial trends and ecologically relevant correlations and relationships. While we follow careful and defensible protocols in collecting samples, we lack the resources to collect that same depth and breadth of samples using the elaborate Standard Operating Procedures ("SOP") and protocol requirements of the EPA. For example, we do not use EPA Clean Hands/Dirty Hands for obtaining lake water samples. Instead, we take care to avoid touching or allowing external contaminants to come in contact with the interior surfaces of the water sampler, the sample itself, and sample collection bottles. Similarly, we purchase and use new aseptic sampling bottles for nutrient sampling and acid wash containers in-house for heavy metal sampling rather than use acid washed containers supplied by the lab that performs the analysis. In each case, our protocols cost considerably less than the EPA protocols, but still yield scientifically defensible and valid results. More to the point: adopting the more stringent EPA protocols in the context of our GSL sampling would not likely change the dataset. The EPA protocol is designed to prevent contamination of samples, which is a concern when moving between dissimilar water bodies, or in oligotrophic, nutrient poor waters in which a small amount of contamination will have a large proportional effect on the sample. In a t terminal , saline lake like GSL, however, nutrient and chlorophyll levels are generally much higher than in freshwater bodies located higher in a watershed, greatly reducing the effect of between-sample contamination. That assumption is validated by comparisons between the Cooperative's measured ammonia levels, which correlate strongly with measurements by the United States Geological Survey ("USGS") that were collected using more rigid protocols. Similarly, we frequently record chlorophyll-a levels below our outside laboratory's detection limit during key summer months, suggesting contamination is not a large concern in our sampling program.1 Additionally we have split samples between certified research labs and derived similar results. Given that, we believe our sampling protocols are scientifically defensible and the resulting data sets would qualify for inclusion in a peer-reviewed scientific journal. In most cases, however, those same data sets would not meet the strict availability and credibility standards laid out in the Draft Assessment Methods.	Revised and clarified language in credible data section and Tables 5 - 9.	As described in the "Data Quality" section of the assessment methods document, data collected under a repeatable and scientifically defensible QAPP and SAP are considered high quality and incorporated in the assessment process for further evaluation. Submitters are not obligated to collect data under the specifications of any of EPA's or DWQ's established monitoring protocols. The QAPP, SAP, and SOP guidelines and examples in the assessment methods document are intended to provide stakeholders with an example that can be used as a template for establishing scientifically defensible QAPPs and SAPs. This has been further clarified in the methods. DWQ encourages the commenter to submit data and information (as outlined by the processes in the assessment methods) to DWQ during the IR's Call for Data, so that DWQ can evaluate the data for the assessment. DWQ can provide a general review of the commenter's credible data documents outside of the IR's Call for Data process if this feedback would be helpful. (Please contact DWQ's Watershed Protection Section manager for more details).

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		207	The Cooperative is willing to work with DWQ to do a side-by-side comparison of testing protocols to see whether the more rigorous protocols make a meaningful difference in the results. We strongly suspect they would not.	Out of Scope.	DWQ thanks you for the offer to collaborate on comparisons among sampling protocols. DWQ recommends that the commenters contact DWQ's Great Salt Lake (GSL) program coordinator (Jake Vander Laan, jvander@utah.gov) if they are interested in further pursuing comparisons of GSL datasets. Testing protocols is out of scope for the IR. As described in the response to Comment 206, DWQ does not require a specific testing protocol to consider data to be credible.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		208	Readily Available Data. DWQ allows data submitted by outside entities, but is more likely to consider data in 303(d) assessments if it is submitted in a format that fits the EPA Water Quality Portal ("WQP"). The Draft Assessment Methods (see Table 3, at p. 20) rank datasets in descending order of "fit." Ideal datasets are uploaded into the WQP, and those are eligible for full consideration. Three inferior categories exist below this ideal, with the bottom category of " unavailable" being ineligible for consideration. Our initial evaluation suggests that GSL datasets would likely fall into this category as currently defined.	Table 3 modified.	DWQ appreciates the feedback and concerns regarding the method's "Existing and Readily Available Data Defined" section and Table 3. The readily available data section aims to balance consideration of all data with reasonable expenditure of resources to accommodate disparate data formats. Recognizing the ambiguity in the table, DWQ has revised the table to clarify how various types of data will be used in the Integrated Report and has removed the ―partially available‖ and ―unavailable‖ rows. DWQ, however, did not remove the "Readily available, additional processing required" row because this is still considered readily available data, pending further evaluation from DWQ. To clarify how DWQ may integrate this type of data for 305(b) and 303(d) assessments, DWQ added to the assessment uses column of Table 3 that DWQ, "fully incorporates this data into IR assessment tools if interface tools have been developed. If interface tools are still in the development phase, DWQ will (1) screen data for exceedances for the waterbodies described in 40 CFR 130.7(b)(5)(i), (iii), and (iv), or (2) manually assess data for specific sites, dates, and parameters at the request of stakeholders or data submitters for waterbodies described in 40 CFR 130.7(b)(5)(i), (iii), and (iv). Results are fully incorporated into DWQ's Conflicting Assessments of Water Quality Standards and Secondary Reviews. DWQ would like to further clarify that should DWQ not include any data and information that is obtained by or submitted to DWQ during the IR's Call for Data, DWQ will clearly document which information and dataset (or datasets) were not included and why. DWQ does this for transparency purposes to reviewers and to meet the requirements of CFR 130.7 (b)(6)(iii). Any concerns with data and information rejections (or data and information gaps), can be reviewed and publically commented on during the Draft IR's public comment period.
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		209	While the Draft Assessment Methods contemplate a "partially available" category of data that DWQ might consider if it could be reformatted by DWQ staff "as time and resources allow," inclusion of otherwise scientifically defensible data is now subject to procedural rather than substantive objection, and even the procedural objections remain highly subjective and potentially arbitrary.	Revised Table 3.	DWQ appreciates the feedback and concerns regarding the method's "Existing and Readily Available Data Defined" section and Table 3. DWQ reviewed the original language and removed the "partially available" category from Table 3. Thank you for the feedback. Please see the revised category ―Readily available (additional processing may be required by DWQ)‖.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		210	Data Credibility. Under the Draft Assessment Methods, DWQ will assess data credibility based on adherence to the DWQ's Quality Assurance Project Plan ("QAPP") which is in turn based on EPA's QAPP. Seep. 29. Conforming our future data collection to meet those QAPP standards would impose significant costs-likely as much as three times current costs-and it would be impossible to fix retroactively our existing datasets.	Revised and clarified language in credible data section and Tables 5 - 9.	As described in the 'Data Quality' section of the methods document, data collected under a scientifically defensible QAPP and SAP and submitted to DWQ are considered of high quality and incorporated in the assessment process. Submitters are not obligated to collect data under the specifications of any of DWQ's established monitoring protocols. The QAPP and SAP guidelines and examples provided in the "Components for Credible Data" sections of the assessment methods are intended to provide stakeholders with an example that can be used as a template for establishing scientifically defensible QAPPs and SAPs. This has been further clarified in the methods.
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		211	Tables 5 and 7 on page 32 of the Draft Assessment Methods summarize DWQ's methodology, ranking data quality for water grab samples, which the Cooperative's nutrient, temperature, oxygen, chlorophyll-a, and salinity data would fall under. Based on a preliminary assessment, Cooperative data would likely rank as a "C," owing largely to our data not meeting an "approved" or "equivalent" QAPP and our inconsistent recording of instrument calibration readings, which the Draft Assessment Method suggests would fall outside the data eligible for consideration under 303(d}. We do use a professional lab for the analysis of nutrient s and chlorophyll-a, so we would likely rank highly in those lab-determined factors. Even so, it difficult to know, without more, how DWQ weighs these factors when assigning the A-D quality grade.	Revised and clarified language in credible data section and Tables 5 and 7.	As described in the "Data Quality" section of the methods document, data collected under a repeatable and scientifically defensible QAPP are considered high quality and incorporated in the assessment process for further evaluation. Submitters are not obligated to collect data under the specifications of any of DWQ's or EPA's established quality assurance protocols. The QAPP and SAP guidelines and examples in the assessment methods are intended to provide stakeholders with an example that can be used as a template and suggestions for the documentation for establishing scientifically defensible QAPPs and SAPs. This has been further clarified in the methods. As noted by the commenter, DWQ relies on the availability of documentation from data submitters to demonstrate that the field collection processes associated with the data are well documented, followed established protocols and methods, and are scientifically defensible and repeatable. As outlined in the credible data matrices this may include information such as QAPPs, calibration reports, information on the accuracy and ranges of properly calibrated probes, descriptions of method collections, laboratory protocols, and essential metadata elements for different data types.
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		212	The trouble begins with water chemistry sampling protocols, which affect our nutrient, chlorophyll-a, and any contaminant sampling. These Standard Operating Procedures ("SOPs") call for very specific and time-consuming equipment cleaning and QA/QC processes to avoid contamination. Based on our research needs and the unique conditions of GSL, we do not follow the referenced Clean Hands/Dirty Hands sampling method, the water sampler cleaning between sites, or the use of field blanks and equipment blanks. We also do not preserve our nutrient samples with H2SO4 because our laboratory' s methods do not require it. Given that, DWQ could readily dismiss our large nutrient and chlorophyll databases in making a Section 303(d) determination.	Revised and clarified language in credible data section and Tables 5 - 9.Clarified assessment methods.	The QAPP, SAP, and SOP guidelines and examples presented in the IR methods document are intended to provide stakeholders with an example that can be used as a template for establishing scientifically defensible QAPPs and SAPs. As described in the 'Data Quality' section of the methods document, data collected under a scientifically defensible QAPP and SAP and submitted to DWQ are considered of high quality and incorporated in the assessment process for further evaluation. Submitters are not obligated to collect data under the specifications of any of DWQ's or EPA's established monitoring protocols. This has been further clarified in the methods.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		213	In the aforementioned QAPP, DWQ references two SOPs for the collection of water chemistry samples, and they are not consistent on Clean Hands/Dirty Hands. For example, the SOP for GSL-specific " Total and Dissolved Water Sampling" (https://deq.utah.gov/legacy/destinations/g/great-salt-lake/monitoring-research/index.htm) calls for the Clean Hands/ Dirty Hands protocol and laboratory blanks. Ironically, the non-GSL lake sampling SOP "Collection of Lake Water Samples" (https: // deq.utah.gov/ legacy/monitoring/ water-quality/quality -assurance e-quality control.htm) appears less stringent than the GSL-specific protocol as it does not call for Clean Hand s/Dirty Hands. That SOP specifies a simple triple-rinse in lake water at the sample site, which the Cooperative does use in its GSL sampling.	Clarified assessment methods	Because data quality objectives may vary from project to project, sampling planners and collectors may develop and use different SOPs. Similarly, stakeholders and data submitters are free to determine appropriate sampling protocols that satisfy their data quality objectives. The commenter has identified an example of different SOPs, both of which are acceptable, for purposes of collecting data that could be used for assessment purposes. The SOP for the Great Salt Lake water chemistry samples was originally developed by USGS to collect mercury samples for which Clean Hands/ Dirty Hands protocol is appropriate. DWQ is evaluating whether a broader SOP may be appropriate for collection of other Great Salt Lake samples. We welcome the Brine Shrimp Cooperative's participation in this review effort.
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		214	The temperature, pH, dissolved oxygen, and conductivity data that we routinely collect at multiple depths and multiple sites would also fail to meet DWQ's QAPP standards. DWQ requires frequent calibration of the water quality probe with documentation to verify. While we do calibrate our instruments prior to each sampling program, our data still would not meet the QAP standards. Why isn't our calibration more stringent? Because we are more interested in trends and patterns than the precise absolute values.	None.	DWQ's Integrated Report focuses on evaluating whether or not surface waters are supporting or not supporting the currently defined beneficial uses and numeric criteria in UAC R317-2. Though DWQ agrees with the commenter that there are other uses of water quality data, including evaluation of trends and patterns, especially when evaluating the cause and sources of impairments, these analyses are addressed by other programs (e.g., TMDL, Nonpoint Source etc.). The purpose of the assessment is to evaluate whether a water body exceeds water quality standards and therefore relies on confidence in the absolute value of data included in the analysis. Please see response to Comment 206 regarding credible data.
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		215	The methods that we employ follow guidelines outlined by a certified water quality laboratory and through discussions with their chief scientist. In short, they meet all reasonable guidelines necessary to preserve accuracy and quality of samples.	Revised and clarified language in credible data section and Tables 5 - 9.	DWQ relies on the availability of documentation from data submitters to demonstrate that the field collection processes associated with the data are well documented, followed established protocols and methods, and are scientifically defensible and repeatable. As outlined in the credible data matrices this may include information such as QAPPs, calibration reports, information on the accuracy and ranges of properly calibrated probes, descriptions of method collections, laboratory protocols, and essential metadata elements for different data types.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		216	(2) Complying with DWQ's QA/QC requirements would impose unreasonable costs on the Cooperative's data collection and/or force us to greatly reduce the scope of our sampling, which would impair the ability to assess important determinants of GSL's health. We estimate that complying with DWQ's QA/QC requirements for sampling would at least triple the cost of our current sampling efforts, forcing us to either shoulder those order-of-magnitude increased costs and/or curtail the scope of our sampling. Again, in a nutrient rich water body like GSL, our protocols reflect the need to use a large number of sample sites so as to better assess temporal and spatial trends and ecologically relevant correlations and relationships-in short, to better understand nutrient cycling and ecosystem health, which should be the foremost goal of any regulatory regime that purports to assess the health of a waterbody. As a result of those efforts to broaden the scope and scale of our sampling, the Cooperative's database on nutrient, chlorophyll, temperature, salinity, and dissolved oxygen-all of which could be subject to dismissal under the Draft Assessment Methods--contains a spatio-temporal scale that other available datasets simply cannot match. It strikes us as arbitrary for DWQ to categorically exclude such information from its 303(d) assessments.	Revised and clarified language in credible data section and Tables 5 - 9.	Regarding DWQ's QA/QC requirements, please see response to comment 206. DWQ welcomes the opportunity to collaborate with the Brine Shrimp Cooperative to leverage our collective resources for data collection, recognizing the multiple uses of data for evaluation of the health of Great Salt Lake. DWQ is in the process of developing Water Quality Standards and Assessment Methods for Great Salt Lake as outlined in the Great Salt Lake Water Quality Strategy Document (https://documents.deq.utah.gov/water-quality/standards-technical-services/gsl-website-docs/gsl-wq-strategy/DWQ-2019-000535.pdf). Standards specific to Great Salt Lake will be developed in collaboration with stakeholders and will require Water Quality Board approval. Once standards or methods are fully developed, they will be incorporated in the assessment methods for future Integrated Report cycles. DWQ does not intend to assess Great Salt Lake during the current IR cycle.
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		217	(3) Other categorical restrictions on data may undermine DWQ's ability to make full and fair determinations under Section 303(d). On page 37 of the Draft Assessment Methods, DWQ specifies a "period of record" of eight years and states further that "DWQ will not consider data and other information older than the period of record" in making 303(d) determinations. While an eight-year period seems generally reasonable, the question arises whether older data could in fact inform a current assessment. We think it could. Take, for example, evaluations of Harmful Algal Blooms (HABs) in areas of GSL like Farmington Bay. If older data such as core samples showed HABs occurred routinely in Farmington Bay before settlement, that data would certainly inform the question of whether HABs occurring today represent a true "impairment" of the ecosystem.	None.	The focus of the Integrated Report is to evaluate whether the currently defined uses of a waterbody have been attained during the recent period of record. DWQ agrees with the commenter that older data or paleolimnological techniques are important for characterizing historic conditions, determining the cause and sources for impairments, or reviewing appropriate use classifications. However, these analyses are outside the scope of the IR and are addressed by other programs (e.g., TMDL, Nonpoint Source, Standards, etc.). Regarding HAB assessments in Great Salt Lake (GSL), the current Narrative Standard based assessment method is not directly applicable to Great Salt Lake's beneficial uses. DWQ is in the process of developing Water Quality Standards and Assessment Methods for Great Salt Lake as outlined in the Great Salt Lake Water Quality Strategy Document (https://documents.deq.utah.gov/water-quality/standards-technical-services/gsl-website-docs/gsl-wq-strategy/DWQ-2019-000535.pdf).. GSL specific assessment methods will be incorporated into future Integrated Report cycles. DWQ does not intend to assess Great Salt Lake during the current IR cycle.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		218	Another concern regarding an arbitrary and one-size-fits-all time frame for data acceptance is that there are well established, cyclical, biological and climatic patterns that exert a tremendous influence on water quality, biological responses, nutrient levels, and population dynamics within the GSL ecosystem. To impose an arbitrary time frame for information to be considered is to disregard biological factors that are well known to exert a significant influence on water quality.	Revision to ‗Period of Record‘ section.	The focus of the Integrated Report is to evaluate whether the currently defined uses of a waterbody have been attained during the recent period of record. That does not preclude DWQ from using older data, including the data types described by the commenter, to characterize historic conditions, determine restoration goals, evaluate the appropriateness of and potentially reclassify beneficial uses, or develop or update water quality standards for Utah's waters as a part of TMDL, standards, or other DWQ programs. This has been further clarified in the methods. However, these processes are out of scope for the assessment process. Recommendations regarding these techniques and their uses should be made to specific TMDL or standards development processes.
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		219	Again, the problem is not with setting a general period of record, but rather in establishing a categorical limit on information that could otherwise be relevant to a scientific determination, particularly as those limits may limit the ability of DWQ to understand or craft appropriate regulations relative to water quality in GSL and its ecosystem.	Revision to ‗Period of Record‘ section.	The development or alteration of water quality standards, permits, waste load allocations, or other regulatory processes are outside the scope of the IR. The IR's period of record and data credibility and availability requirements do not limit DWQ's ability to use older or other types of data in developing or updating water quality standards or goals. DWQ can consider older or other data and information as part of a secondary review of an impairment determination. This has been clarified in the revised document.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		220	(4) The cyanotoxin thresholds for recreational use assessments do not comport well with best available science. At pages 75-76 of the Draft Assessment Methods, DWQ states that, with regard to HABs, a beneficial use is fully supported only if, over the entire period of record, (a) cyanobacterial cell counts "have not exceeded 20,000 cells/ml AND (b) cyanotoxin concentrations have not been identified above recreational use thresholds, AND (c) a warning, danger, or closure has not been issued for recreational access to a waterbody." (Emphasis added.) Is, then, the single occurrence of a warning or closure over the course of an eight year period, even if that warning or closure is arbitrary and/or not tied to specific measurements, sufficient to remove a waterbody from the category of " Beneficial Use Supported"?	None.	As described in the HAB assessment methods, DWQ will identify a waterbody as impaired if a HAB-related recreational warning, danger, or closure notice lasting two or more weeks is issued for that waterbody in two or more years. Waterbodies with a warning, danger, or closure notice lasting less than two weeks or occurring in only one year will be identified as insufficient data with exceedances. Therefore, yes, a single warning, danger, or closure may result in a waterbody not being considered fully supporting its recreational uses due to HAB occurrence. However, if clear and convincing evidence were available to demonstrate that a warning or closure were issued in error or based on incorrect data, that assessment could be modified under the secondary review process to reflect that evidence (please see the ‗Secondary Review' section of the Assessment Methods for more information). DWQ continues to work with stakeholders and partner agencies to collect HAB related data throughout Utah and adapt and adjust HAB assessment methods as new data and information become available. Specific recommendations for method updates can be made during the next IR assessment methods public comment period.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		221	Beyond that, we question whether the use of undifferentiated "cyanobacterial cell counts" at 20,000 cells/ml (for Beneficial Use Supported) and 100,000 cells/ml (for Beneficial Use Not Supported) represent scientifically defensible and reasonable standards. As many researchers have observed, arbitrarily adopting WHO initial standards or otherwise using an alert framework based solely on total cyanobacterial cells/ml is not advisable . See, e.g., David C. Szlag et al., "Cyanobacteria and Cyanotoxins Occurrence and Removal from Five High-Risk Conventional Treatment Drinking Water Plant s," Toxins (Basel), 12 June 2015 ("The original WHO Alert Level framework ... provides a useful starting point but should not be arbitrarily adopted The Water Safety Plan approach should be considered as a tool to modify the WHO ALF for local conditions including Alert levels based on cell concentrations of locally pre sent toxin producing genera.") (available at: https:/ / www .ncbi.nlm.nih.gov/ pmc/ art icles/PM C4488698 /) . We note that other states have done just that. To cite one example, Oregon previously adopted a Health Advisory system that uses 100,000 cells/ml of "all toxigenic species" or "40,000 cells/ml" of two specific, locally occurring and toxin producing species. See Oregon Health Authority {OHA), " Public Health Advisory Guidelines: Harmful Algal Blooms in Freshwater Bodies, January 2018, at 6 (available at: https:/ / www.oregon.gov/oha/ph/healthyenvironments/recreation/harmfulalgaeblooms/document s/ habpublichealthadvisoryguidelines.pdf). OHA specifically evaluated the efficacy of using algal cell counts alone as the guideline for issuing advisories for waterbodies contaminated with cyanobacteria, and, after extensive study, concluded that toxin based advisories (TBA) represented a superior and more scientifically defensible means of assessing the risks to the public from cyanotoxins (see David Farrar et al., "Health-Based Cyanotoxin Guideline Values Allow for Cyanotoxin-Based Monitoring and Efficient Public Health Response to Cyanobacterial Bloom s," 5 February 2015; available at: https:/ / www.mdp i.com/ 2072- 6651/7/2/457/htm). That study opined that the pre-existing, cell-based approach was economically harmful and resulted in inefficient use of resources, unnecessary advisories, and increased the risk of "advisory fatigue" among the general population, in which the public ceases to heed to advisories due to the frequency and duration of such advisories. In their closing comments the researchers observed: Toxin data allow OHA to communicate with the public about actual risks, as opposed to the potential risk represented by cell count data alone. Toxin data give great credibility to health advisories when they are issued and decrease the likelihood that an advisory would be issued unnecessarily. See id. Many environmental factors serve to regulate the production of toxins by cyanobacteria. The amount of toxin produced depends on the species of cyanobacteria present as well as the presence of other cyanobacteria. Genetic and epigenetic factors are also at play, and a host of nutritional and enzymatic factors influence cyanotoxin production. While it may make sense to use cell counts to trigger further studies of actual cyanotoxin levels in a given waterbody (i.e., as a trigger for further investigation}, it can be inaccurate, misleading, and incorrect to assess risk based on cell counts alone.	None.	Thank you for identifying these studies and recreational health advisory policies from other states. The issuance of recreational advisories or closures is a separate process from water quality assessment. Suggestions regarding the health advisory process should be addressed to the Water Quality and Health Advisory Panel (https://deq.utah.gov/legacy/divisions/water-quality/health-advisory/index.htm). In developing recreational use assessment methods for HABs, DWQ reviewed indicators used by states throughout the country for water quality assessment or health advisory issuance (see https://www.epa.gov/sites/production/files/2016-12/documents/draft-hh-rec-ambient-water-swimming-document.pdf, appendix B for details). States use a wide variety of indicators including cyanobacteria cell counts (total and lists of pre-determined potentially toxigenic taxa), cyanobacteria relative abundances, cyanotoxin concentrations, and assessments of the presence of cyanobacteria scum layers.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		222	For all these reasons, we question whether the use of undifferentiated "cyanobacterial cell counts" at 20,000 cells/ml(for Beneficial Use Supported} and 100,000 cells/ml (for Beneficial Use Not Supported) represent scientifically defensible and reasonable standards.	None.	DWQ's HAB assessment methods directly reflect Utah's Narrative Standard which stipulates that the presence of scums, nuisances such as color, odor, or taste, or water quality conditions that may cause undesirable human effects are a violation of the state's water quality rules. Due to the numerous potential toxins and congeners associated with cyanobacteria and the recombinant nature of cyanobacteria resulting in the potential for gene transfer between toxic and non-toxic strains, differentiating between toxic and non-toxic strains or taxa of cyanobacteria is problematic, and limiting cell counts to specific taxa may be not be protective of recreational uses. DWQ has therefore based assessment methods on total cell counts. The use of cell counts in DWQ's assessment process was a point of substantial discussion during the 2016 IR. Please see DWQ's 2016 IR response to comments, appendix A, responses 2, 3, and 9 for additional information (https://deq.utah.gov/legacy/programs/water-quality/monitoring-reporting/assessment/docs/2016/dwq-response-to-public-comments-final2016ir-v2-1.pdf).
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		223	Conclusion Our over-arching concern about the processes and limitations outlined in the Draft Assessment Methods is that the proposed methodology will categorically exclude highly valuable information that has been collected systematically and according to standard scientific methods over long periods of time information that could help DWQ better understand the complex biological and ecological processes that exist in the GSI ecosystem and that directly informs the question of whether GSI should be listed as impaired under Section 303(d). DWQ and other GSI stakeholders have often expressed concern that little is known about GSI and more research is needed.4 Given that, we are concerned about proposed methods for categorizing data and incorporating (or not incorporating) it into 303(d) determinations that could effectively eliminate from consideration most of the extant scientific data on GSL.	None.	DWQ appreciates the interest in the assessment process and has clarified our methods to ensure that high quality data is available to the assessment process. DWQ welcomes the opportunity to collaborate with GSL stakeholders in further developing water quality goals and plans for the lake.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		224	4 To address that knowledge gap, the U.S. Geological Service (USGS) recently put out a call for data on GSL. That call said, to paraphrase, "please send us any quality data you have on GSL, and make sure you include information on where and how the data was collected." That strikes us as a far more sensible approach to receiving and evaluate in g data than trying to shoehorn it into predetermined categories that may or may not be considered, a strategy that sounds good in theory but risks excluding quality data from regulatory decision-making.	None.	DWQ is aware of and commends USGS' effort to compile GSL related datasets and studies that are not currently publically available elsewhere through the USGS ScienceBase program. The USGS ScienceBase is a data and research catalog and has different data quality objectives from the IR. As suggested in EPA's 2005 Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act, EPA suggests in the "Data Quality Considerations" section to develop scientifically sound data evaluation procedures that include, but are not limited to, QAPPs, descriptions of method collections, laboratory protocols, and required metadata elements for different data types. (https://www.epa.gov/sites/production/files/2015-10/documents/2006irg-report.pdf)
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		225	We appreciate DWQ' s unique role in protecting Utah's waters, the good working relationship the Cooperative has with DWQ, and our shared goal of preserving the ecologic value and integrity of GSl and its ecosystem. If there is any other information we could provide that would help inform DWQ's 303(d} listing process, please let us know.	None.	Thank you for this comment. DWQ values our collaborative partnerships with stakeholders to protect water quality in Great Salt Lake and statewide. DWQ does not intend to assess Great Salt Lake during this IR cycle because water quality standards and assessment methods have not yet been developed for this unique water body.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		200	The Great Salt Lake Brine Shrimp Cooperative (the "Cooperative") hereby submits comments regarding the Draft 2018/2020 303(d) Assessment Methods (the "Draft Assessment Methods"). The Cooperative is concerned that the Draft Assessment Methods unduly restrict the types of data that the Division of Water Quality ("DWQ") will use to assess water quality in the Great Salt Lake ("GSL"), including the likely exclusion of robust data sets on various water quality parameters that directly inform the question of whether GSL is healthy or should be listed as impaired under Section 303(d). While we understand the desire to achieve greater consistency in water quality data, we urge DWQ to resist the temptation to categorically exclude data from consideration. According to the EPA, "States may use any number of ways to determine whether or not a water body meets the water quality standard. However, federal regulations say states must evaluate 'all existing and readily available information' in developing their 303{d) lists (40 C.F.R. §130.7(b) (5)). This means that states cannot select what data/information they use and purposely disregard other." EPA, Overview of Listing Impaired Waters under CWA Section 303{d) at 1 (available at: https: // www.epa.gov/ t mdl/ overview- listing impaired-waters-under -cwa-section-303d) (emphasis added.) Consistent with that EPA guidance, we want to make sure that DWQ has more information rather than less information available to it to make informed decisions affecting the lake and its future.	None.	DWQ appreciates your feedback regarding the 303(d) assessment methods and would like to clarify that DWQ's credible data requirements, which includes submitting SAPs, SOPs, etc., are required when requested by DWQ, so that the division can ensure results from disparate data sources are repeatable and scientifically defensible. For 305(b) and 303(d) reporting purposes, the available and credible data requirements and documentation outlined in the assessment methods are designed to ensure results from disparate data sources are repeatable and scientifically defensible and instill confidence in the 305(b) and 303(d) lists that DWQ publishes. The requirements and review protocols in the "Data Quality" section and tables 5-9 reflect legitimate data quality concerns when determining whether or not a waterbody is supporting or not supporting the beneficial uses and criteria in UAC R317-2. Should any data and information not be included in the assessment process, DWQ will clearly document which dataset (or datasets) were not included and why (as described and required in 40 CFR 130.7(b)(6)(iii)). This documentation, as well as other data and information described in section "Developing the Components of the Draft Integrated Report and 303(d) List" of the assessment methods, will be tracked and made available for review during the draft IR public comment process. Please also see response to comment 206.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		201	Beyond that, we strongly encourage DWQ to consider specific measurements in the context of overall ecosystem health, which is precisely the kind of question our sampling efforts are designed to answer. A hyper focus on any one parameter and excluding scientifically valid data undermines that goal and risks losing the forest for the trees.	None.	DWQ's Integrated Report focuses on evaluating whether or not surface waters are supporting or not supporting the currently defined beneficial uses and criteria in UAC R317-2. The identification of the causes and sources of pollution or understanding the overall ecosystem health of surface waters are outside the scope of the IR and are addressed through other DWQ programs including TMDLs, Nonpoint Source, Standards etc. However, as noted in the "Individual Assessment of Water Quality Standards" section of the assessment methods, DWQ initially assesses each use and parameter for a waterbody at the site level as this provides a more direct measure of supporting or not supporting water quality standards. DWQ recognizes that conflicting assessment results can exist at the individual site or broader assessment unit level. To evaluate the potential conflicting results among different data types and to better quantify the extent of surface waters supporting or not supporting their beneficial uses, DWQ employs several levels of reviews including, but not limited to: (1) independent applicability, (2) secondary reviews, and (3) assessment unit re-segmentation. These reviews are discussed in more detail in the "Conflicting Assessment of Water Quality Standards" and "Appendix 3" sections of the assessment methods.
Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		202	The Cooperative recognizes the need to apply reasonable standards to the data that DWQ will consider in making determinations under Section 303(d). Those standards must, however, take into account the context in which the data was collected, including the purposes and methodology behind the data collection, and, in some cases, the unique characteristics of the water body where the data is collected. In the case of GSL, protocols that may make sense in the context of a pristine headwater stream may make little sense in a terminal lake like GSL that is nutrient rich and where reasonable criteria for assessing the health of the waterbody may be entirely different.	None.	DWQ strives to ensure that all data used for 303(d) water quality assessments are of high quality, representative of ambient conditions, and appropriately documented. The IR's credible data requirements do not preclude DWQ from incorporating qualitative information including expert opinions, reviewer comments, available external research, or other forms of site-specific knowledge into the secondary review portion of the assessment or potentially modifying the initial assessment if clear and convincing evidence indicate it appropriate to do so. Please see the section, 'Secondary Review,' starting on page 80 of the methods document for additional detail. The IR's credible data requirements also do not preclude DWQ from using these types of information in other programs.

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Thomas **Timothy**	Bosteels Hawkes	TBosteels_12202018.pdf THawkes_12202018.pdf		203	Comments and Concerns Regarding the Process Before addressing the substance of the Draft Methods, we would like to express a couple of concerns about the process: First, the cover email from Jodi Gardberg, Manager of the Technical and Standard Services Section at DWQ, contains the following statement: Call for Data: Right after the public comment period closes for the 303{d) assessment methods, DWQ will issue a formal call for water quality data to be used in DWQ's assessment for the combined 2018/2020 IR. The data must meet the readily available and credible data requirements outlined in the 303(d) assessment methods. (Emphasis added.) Our concern is this: if DWQ plans to issue a formal call for water quality data "right after" the public comment period closes, and that data "must meet the readily available and credible data requirements outlined in the [Draft Assessment Methods]," how can DWQ reasonably evaluate public comment relative to those Assessment Methods? In short, the schedule seems to presume the validity of the Assessment Methods and does not seem to provide an effective way for DWQ to take into account public comment before applying those Assessment Methods.	IR project timeline adjusted.	DWQ appreciates the feedback from the commenter and as a result, delayed the IR Call for Data until the DWQ Response to comments and the revisions to the 2018/2020 IR Assessment Methods document were released. DWQ received multiple public comments asking for clarification of the definitions and requirements for readily available and credible data. DWQ has addressed these concerns and has made changes to the data submission and review process in the final version of the Assessment Methods document.