Date	Commenter	Organization (if provided)	Comment	Response	Action (page # affected in methods)
2/16/2021	Mark Allen		**POLLUTANTS:** Heavy Metals bonded to sediment, not dissolved metals.	Assessments are based on existing water quality criteria (UAC R317-2) that do not include standards for sediment. Additional criteria for sediment bound metals would require water quality standards changes which are beyond the scope of the Integrated Report. Recommendations or comments on water quality standards can be provided to DWQ's Water Quality Standards Workgroup.	Out of Scope
2/16/2021	Mark Allen		**POLLUTION:** There needs to be a standard for heavy metals bonded to sediment which end up in Tibble Fork. Also, there should be signage of the heavy metals which are in Tibble Fork so the public can be alerted to wash off. Perhaps a wash station would be appropriate.	Assessments are based on existing water quality criteria (UAC R317-2) that do not include standards for sediment. Additional criteria for sediment bound metals would require water quality standards changes which are beyond the scope of the Integrated Report (IR). Recommendations or comments on water quality standards can be provided to DWQ's Water Quality Standards Workgroup. Recommendations for public health measures such as signage or wash stations are also beyond the scope of the IR. These recommendations should be referred to the appropriate local health agency.	Out of Scope
2/16/2021	Mark Allen		**UNKNOWN SOURCES:** Upper Mary Ellen Gulch, Yankee and Globe Mine Complexes need more remediation per EPA studies and recommendations.	DWQ appreciates the comment and underlying concern; however, this comment is not within the scope of the Integrated Report. There are two abandoned mine remediation activities under way in Mary Ellen Gulch. The first is a voluntary effort led by Snowbird resort focused on slope stabililzation practices. Please contact Snowbirds Director of Sustainability, Hilary Arens (harens@snowbird.com) for up to date information. The second effort resulted from the the EPA Mary Ellen Gulch Preliminary Assessment (PA). Following the completion of the PA, Mary Ellen Gulch was referred to EPA's Removal Program for evaluation. The EPA Removal program is currently reviewing PA results and working with Snowbird and the Utah Department of Environmental Quality's Division of Environmental Response and Remediation to find a path forward. DWQ is unaware of the current status of this effort.	Out of Scope
2/16/2021	Mark Allen		**NATURAL CONDITIONS:** Tibble Fork is filling up with microloading of heavy metals. What is the clean up plan? Who has the responsibility for the clean up and what is the schedule for such?	DWQ appreciates the comment and underlying concern; however, this comment is not within the scope of the Integrated Report. There is currently no active plan for sediment metal remediation in Tibble Fork Reservoir. The Utah Department of Health is finalizing a Health Consultation to evaluate risks associated with sediment metals in Tibble Fork Reservoir. Once completed DWQ will coordinate with the appropriate state and federal agencies to determine the appropriate next steps.	Out of Scope
2/25/2021	David Richards		**A few specific comments upfront concerning RIVPACs models development.** What was the unit area used to develop models? There are three conflicting units in the draft: From Page 53. “Predictions of expected “E” taxa are obtained empirically from reference site collections made throughout Utah. Reference sites represent the reference conditions in different biogeographical settings throughout the state. “ From Page 52. “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.” From page 53. “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”. From Page 55. “Utah currently assesses watersheds based on established AUs.” DWQ states the use of different biogeographical settings, region, watershed, and AUs for model development. It can’t possibly be all four. Which unit was it? These differences will have major consequences on how the model is applied to streams, particularly E, the expected number of taxa the sole denominator and half of the equation in the so called easy to interpret model.	Biological assessments are conducted at the watershed scale using site-specific watershed characteristics. Watershed are delineated from each specific sample location upstream. Sites are then characterized using GIS-based characteristics that describe the specific sample location (e. g., elevation) or the range of conditions from the sample specific sample location upstream to the headwaters. The first two quotes are general statements about the need for reference sites to encompass the range of conditions and geographic settings. For biological assessments to be as broadly applicable as possible, the suite of all reference sites needs to capture natural variation in biological composition (first quote from p. 53) and the physical and chemical stream attributes that cause resident biota to differ among streams (second quote from p. 52). When models are constructed, site-specific, GIS-based watershed descriptors are used to quantify important watershed attributes (quote 3 from p. 53). Those attributes best able to differentiate among groups (clusters) of reference sites with similar biological composition are included in the final model. When the models are used to assess a new site, a chi-square test is conducted to ensure that it falls within the range of watershed attributes among all of the reference sites used for model construction. Biological assessments are ultimately conducted at the spatial scale of an Assessment Unit (AU). Occasionally, this involves the interpretation of multiples sample sites within AU watersheds, in which case any impairment within the AU results in an impairment decision. This “one out, all out” impairment determination process is consistent with how among site discrepancies are handled for all water quality parameters in the IR.	No Action

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2/25/2021	David Richards		**E, expected number of taxa is irrelevant.** Choice of area is especially important for derivation of E, expected number of taxa. For example, whichever unit was used in DWQ models, the expected number of taxa, E would be the same within that unit. That is how the model is designed. E, is therefore a constant within any area unit be it region, watershed, AU, biogeographical setting, and dividing by that constant for all sample location benthic invertebrate results within that unit would be meaningless unnecessary confusing irrational and nonsensical. Division by a constant E would only result in O, the observed number of taxa in a sample, or as every aquatic ecologist is familiar with, the taxa richness metric.	E is not irrelevant, it is a site-specific prediction of the specific taxa expected in the absence of human-caused stress. O/E is more than richness. It is sensitive to shifts in composition. Many studies have been published in peer reviewed, scientific literature that demonstrate that O/E provides more precise and sensitive measure of stream condition that richness. Predictions of E are site-specific, so it is not true that E would be the same for all sites in, for instance, an AU. Watershed are delineated from the sample location upstream. The watershed predictors used to make E predictions either describe conditions at the collection site (e.g., latitude, minimum elevation) or the average conditions from the specific sample site upstream (e.g., watershed average of predicted mean monthly air temperature). For E to be the same for different sites all 15 predictor variables would need to be identical, which is highly unlikely. O is not the observed number of taxa; it quantifies the number of taxa observed that were predicted to occur based on composition observed among comparable reference site. This distinction is important because human-caused stress sometimes creates conditions that are favorable for taxa that would not naturally occur at the location. For instance, riparian degradation could increase stream temperature creating conditions favorable to warm water taxa. If the models are sufficiently accurate, these taxa would not be included in the calculation of O, which is one of the reasons why O/E is a more sensitive measure of human-caused stress than taxa richness.	No Action
2/25/2021	David Richards		**Website links useless** I also went to the links provided on page 52. The WCMAFE website had no information on how Utah DWQ models were made. Hence, there is no available mechanism to understand the model components and assumptions. For example, I have no way of knowing what reference condition expected taxa were for the Jordan River. As I have stated many, many, times to DWQ there is no reference condition for the Jordan River and no valid E can be used to evaluate. Also, the link to the EPA website was invalid.	Thank you for pointing out the dated website links. DWQ has updated the appropriate links in the methods and is working with the entities to ensure their links are updated. Each stream and river segment is unique; not just those along 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 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. As DWQ stated to the commenter previously, models require additional information and some instruction to be used properly, so they 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 visit EPA's StreamCAT website to access spatial base files used to develop RIVPACs models. StreamCAT includes PRISM data used in these models.	Methods Clarified (p. 49)

Date	Commenter	Organization (if provided)	Comment	Response	Action (page # affected in methods)
2/25/2021	David Richards		**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. This 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, DWQ: see original comment letter PDF to view table). 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. 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). 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. 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. 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. 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.	Ecological interactions can be complex, but assessment tools need not try to expose all of the complexity. As previously stated, DWQ does not claim that O/E is biological integrity, but it is an important aspect of it. Other measures such as indices based on tolerances are not measures of overall biotic integrity either. All biological assessment methods have intrinsic assumptions and errors. From an aquatic life use support context, DWQ simply uses O/E to assess whether aquatic life has been impaired. DWQ and the primary scientific literature disagree with your opinion about the effectiveness of using O/E models for impairment determination purposes (e.g., please review: Hawkins, C.P. 2006. Quantifying biological integrity by taxonomic completeness: its utility in regional and global assessments. Ecological Applications 16(4): 1277-1294). 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. Based on the results of these investigations it is reasonable to conclude that other metrics, such as those recommended by the author could be reported, but doing so would not improve on DWQ's principle use of macroinvertebrate data, which is identifying biologically degraded streams. DWQ also disagrees that richness and evenness would be a suitable substitute for O/E. Diversity measures were abandoned long ago by the ecological assessment community because they are strongly influenced by natural settings 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. Finally, DWQ did not intend to mislead the public by providing examples of other states that use O/E. Given the widespread use of O/E worldwide, pointing out specific examples is not really needed. This text has been removed from the methods.	Methods Clarified (p. 48)

Date	Commenter	Organization (if provided)	Comment	Response	Action (page # affected in methods)
2/25/2021	David Richards		**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. 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'. 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. It is my opinion that O/E models may be able to detect large levels of biological stress, but not biological integrity.	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. 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. This is why the US Fish and Wildlife Service is working with Utah's Division Wildlife Resources to address the loss of mussels; a problem that predates DWQ conducting any biological assessments.	No Action
	David Richards		**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. 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. They 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. 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, examine sample results and easily evaluate which taxa were missing and why at the watershed level.	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. 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.	No Action

Date	Commenter	Organization (if provided)	Comment	Response	Action (page # affected in methods)
2/25/2021	David Richards		**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 used by UDWQ. A loss of precision in the updated model should be critically reevaluated. Was this updated model selected because in saves time and money? Several problems in simplifying the model are as follows: Incorporation of 1rst order and 8th plus order streams and rivers. All aquatic ecologists know that there is a big difference in macroinvertebrate assemblages in typical 1rst order vs. 2nd to 5th streams and between 8th plus rivers and 2nd to 5th order stream (please review the River Continuum Concept by Vannote et al.). 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).	The new model incorporates 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. Cost was not the driver for model revision, DWQ was simply updating the model to incorporate new data and information. 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 model's predictions for the taxa expected at a site (E) explicitly account for stream size. Utah's model uses the finest level of taxonomic resolution that was possible given the information reported by the taxonomists and agency programmatic requirements. 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 agency resources.	No Action
2/25/2021	David Richards		**Model Construction and Performance** Page 49. Table 12. Comment: These predictor models and variables are mostly watershed based. It is highly commendable that UDWQ is now assessing biological integrity at the watershed level rather than at the region wide level, which it has done in the past. 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. As discussed in earlier comment letters; PRISM models are proprietary black box and as such are not independently verifiable and thus are scientifically invalid. The scientific method requires the possibility of independent validations. PRISM models are not reproducible or transparent, which as we all agree, 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 past data. Conditions likely have changed substantially in 28 years. Clearly 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. PRISM data errors are also spatially derived mostly from misuse of regional models to monitor local scale changes. These models will complicate every O/E assessment conducted anywhere that there are natural gradients, introducing error in every local assessment. PRISM data often are not precise, and values can change substantially between small changes in elevation within a watershed and sometimes within a few hundred meters. In addition, PRISM values are model predicted values and subject to error.	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. Please visit EPA's StreamCAT website to access spatial base files used to develop RIVPACs models. StreamCAT includes PRISM data used in these models. Other predictor variables help address other types of natural variation. As mentioned in other responses, watersheds are delineated from the sample site upstream to the headwaters. As a result, "Minimum watershed elevation" is the site elevation and especially when combined with some of the PRISM temperature information allows the model to account for things like temperature. Similarly, watershed area is a measure of stream size, which means that the model doesn't consider all stream orders equivalent.	No Action

Date	Commenter	Organization (if provided)	Comment	Response	Action (page # affected in methods)
2/25/2021	David Richards		**Assessments Specific to Lakes, Reservoirs, and Ponds** Starting on page 53 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. In many instances UDWQ refers to cold-water vs. warm water uses. Temperatures that exceed 20 dC do not necessarily 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). 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.	DWQ agrees that the development of biological assessment tools for additional assemblages would be useful and has taken preliminary steps to accomplish this task. It would also be useful to expand biological assessments in lentic ecosystems. DWQ has participated in the national assessment of lakes and reservoirs. Some of the biological indicators that EPA and academic partners have developed nationally could potentially be incorporated into lake assessments, resources permitting. 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 Integrated Report (IR) process. If the current temperature criterion is 20° C in R317-2, Standards of Quality for Waters of the State, and the data exceed 20° C, the waterbody 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. DWQ does not infer differences in value among aquatic life use classes. 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.	No Action
2/25/2021	David Richards		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. 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. 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. The State of Utah Department of Water Quality (UDWQ) is responsible for assessing, monitoring, and protecting the 'physical, chemical, and biological integrity' of its waters based on the Clean Water Act (CWA) and by UDWQ's designated 'beneficial uses' under state law. Biological integrity is the cornerstone upon which the health of a river or stream is measured, and biological assessments are one of the most important and useful management tools available for restoring and maintaining biological integrity. Bioassessments have been developed for many years and are widely used by management agencies for wadeable waters throughout the world, however, Utah is the only state in the western USA that entrusts its river and stream bioassessments entirely to a single taxa richness based metric, "River Invertebrate Prediction and Classification System" (RIVPACS O/E). All other western state water quality programs in the region integrate multimetric methods. O/E models are complex and are based on many assumptions and generalizations; some of which lead to a poor evaluation of biological integrity. An impaired listing based on O/E can have significant economic penalties on water users. Consequently, the reliance on any single metric such as O/E in a bioassessment program may not be prudent.	The Clean Water Act 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", as described in Clean Water Act 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. 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 in 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 (i.e., 303(d) list). All biological assessment methods have their strengths and weaknesses. Scientists have argued about whether MMIs or RIVPACS methods are superior for over 20-years. Many empirical tests have been conducted and generally find that O/E are slightly better or roughly equivalent. To our knowledge, no study has suggested that O/E was not a defensible measure of biological condition. DWQ could ultimately incorporate MMI methods into biological assessment procedures, but this would require extensive resources that are now directed towards more urgent initiatives. In the interim, the lack of an MMI does not mean that current assessments are not scientifically defensible measures of biological degradation.	No Action

Date	Commenter	Organization (if provided)	Comment	Response	Action (page # affected in methods)
2/25/2021	David Richards		For this comment letter, I include statistical analyses I conducted several years ago. A statistical evaluation of O/E as it relates to evenness and other metrics and the effects of subsampling on these metrics was conducted. A discussion of the consequences of a > 50% probability of capture criterion in O/E models and their ability to actually monitor biological integrity is also discussed, as well as some other concerns including a comparison between bioassessment programs in UT and surrounding states. Macroinvertebrate datasets were obtained from the Bureau of Land Management/Utah State University Buglab database and the Utah Department of Water Quality data that were used in their 2016 draft Integrated Report. Compatible data were merged and filtered to reduce spatial variability. Several metrics reported by the Buglab were examined; O/E score, Taxa Richness, % Labsplit, Abundance, Shannon Diversity, Simpson Diversity and Evenness. Pairwise correlations, linear and quadratic Ordinary Least Squares (OLS) regressions, simultaneous quantile regressions at the 25th, 50th, and 75th quantiles and Path Diagrams and Structural Equation Models (SEM) were developed. Evenness and taxa richness were the most important metrics directly and indirectly effecting O/E scores. SEM results suggest that a 1 standard deviation change in evenness (0.14) equaled a 0.96 standard deviation change in O/E scores = 0.22 (0.18 to 0.26, 95% CIs). As little of a change in evenness of approximately 5% can lead to a change from an O/E score of 0.76 (fully supporting) to 0.69 (not supporting) and unrelated to impairment. A hypothetical but realistic example of the effects of evenness and subsampling on taxa richness resulted in a detection of all taxa in the completely even sample compared to a detection of < 50% of the taxa in an uneven sample when in fact all the same taxa occurred in the original uneven and even samples. Thus, natural fluctuations in evenness in a river or stream without a loss or extinction event resulting from human caused impairment could trigger an unjustified management response from 'fully supporting' to 'not supporting'. A realworld example is the Jordan River, listed as impaired by UDWQ. Analysis showed that O/E scores should have been rated higher if the effects of subsampling and evenness were considered. Reliance on a complicated, computationally expensive, generalized, non-site-specific metric such as that produced by a RIVPACS O/E model may not be prudent. Replacing the O/E metric with one or several of the other correlated metrics should be considered. At the minimum, these metrics should also be included in a bioassessment program. The decision to use a probability of capture > 50% in an O/E model has very strong negative consequences for assessing the biological integrity of Utah's river or streams. Uncommon and rare taxa should always be included in ecological assessments. Detection of impacts will be enhanced by including these taxa because they are often the first to become extinct due to human disturbance. Uncommon and rare taxa have also been shown to disproportionally contribute to ecosystem function and integrity. Their unmeasured loss could fail to warn of an impending ecological shift. Many RIVPAC O/E users continue to insist that a reduction in O/E scores reflects the extent to which taxa have become locally extinct due to human activities. This is clearly not the case. In many instances, taxa weren't lost; they just weren't found. To continue to assume that native taxa have become locally extinct because O/E scores have decreased reflects a gross misinterpretation of RIVPACS O/E models. There is also no shortage of additional informative metrics used by other state water quality management agencies, including those with fewer resources and human populations than Utah. Utah should follow suit, otherwise it will lag far behind. Even though a RIVPACS O/E model has the potential to be a useful summary metric: its use as a stand-alone metric is not recommended. O/E relies on too many assumptions, constraints, and inherent errors that necessitates its inclusion into a more comprehensive macroinvertebrate multimetric program. Fewer incorrect assessments of impairment will be made by incorporating the O/E metric into a multimetric program than if used alone. Unfortunately, all metrics are affected by the evenness of a sample and subsampling. This phenomenon needs to be considered in any bioassessment program. The O/E probability of capture < 50% constraint results in a poor evaluation of macroinvertebrate assemblages and thus fails to measure true biological integrity. With Utah's booming economy and exponentially growing population, UDWQ now has the opportunity to build a bioassessment program worthy of its unique rivers and streams.	There have been numerous, peer reviewed, scientific investigations into the statistical properties of O/E in relation to ecological diversity metrics, which these analyses do not acknowledge. Many studies have also been conducted that compare O/E and Multimetric Indices (MMIs) biological assessments, but such comparisons are not trivial (see Cao and Hawkins, 2011, The comparability of bioassessments: a review of conceptual and methodological issue, Journal of Freshwater Science: 30(3)).The central challenge is that these methods, indeed all biological composition measures, are altered by systematic differences in data structure and analytical methods (see Figure 1 of Cao and Hawkins 2011). Despite these challenges, almost all of the studies have concluded that O/E performed similarly or better than MMIs. Also, most authors conclude that both methods are capable of quantifying biological degradation. The use of one method does not preclude the use of another, but this does not mean that the use of both is required to quantify biological degradation, which is the principle objective of IR assessments. It is not surprising that richness and diversity show a positive, linear relationship to O/E. Various measures of richness and evenness are frequently combined to measure biological diversity. It would be more concerning if O/E did not increase as biological diversity increases because losing functional and structural diversity is integral to biological degradation. Numerous peer reviewed, scientific studies have been published showing a positive relationship between O/E and MMIs. The commenter's analysis also demonstrates several other DWQ responses. The range of richness values demonstrates that O/E is not simply a measure of richness as the commenter claims. For example, at a richness of 10, O/E values may vary from ~0.4 to 1.1. Richness varies naturally while the site-specific O/E predictions are able to account for this natural variation; meaning that sites would not be automatically determined to be biologically degraded at streams that are naturally lower in taxonomic richness. This would not be the case if DWQ used the richness metric, as the commenter suggests; creating costly false-positive errors. Similarly, the paucity of low O/E scores at the most diverse streams demonstrates that O/E is unlikely to lead to an impairment determination at streams where biological degradation is most unlikely to have occurred. Similar patterns can also be observed with evenness. DWQ uses a Pc >0.5 because we evaluated Pc >0 (use of all taxa) early in the model development process and found that the latter models were less precise. As DWQ has pointed out to the commenter previously, many studies have been published in scientific, peer reviewed literature that have evaluated different Pc values and these have almost universally concluded that Pc >0.5 is more precise and sensitive to anthropogenic degradation. This is why biological assessment programs that use O/E in Europe, Australia, New Zealand, and the United States use a Pc >0.5 when calculating O/E. Citations for these investigations have been provided to the commenter (including eight in the assessment methods). 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 true for O/E and the constituent metrics in an MMI. 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. 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 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.	No Action
2/25/2021	David Richards		**ADDITIONAL COMMENTS:** My comments are in the pdf attached. I spend hours preparing my comments to help DWQ protect Utah's waters and I find it a waste of my time to go through DWQ's submission steps process and always use a pdf	DWQ thanks you for the time you spent preparing your responses. Using the form entry fields saves DWQ a significant amount of time and resources in sorting and assigning comments to appropriate staff for response. This improves the timeliness and quality of our responses to public comments. DWQ will continue to offer the option to upload a comment letter file for commenters who wish to provide a PDF instead. We are always open to alternatives that improve public comment period efficiency and effectiveness.	No Action

Date	Commenter	Organization (if provided)	Comment	Response	Action (page # affected in methods)
2/26/2021	Shera Reems	EPA Region 8	**GRAB SAMPLE ASSESSMENTS:** Table 11 on Page 41 states that, DO measurements collected by instantaneous/grab samples are assessed against the 30-day averages in UAC R317-2-14. UDWQ does not specify in the assessment method how grab samples are compared against the 7-day average criteria or instantaneous minima. All three sets of DO criteria apply simultaneously and should be compared to all data sets containing sufficient data for a given 30-day, 7-day or instantaneous duration. See Table 2.14.2 Numeric Criteria for Aquatic Wildlife (8) available at https://rules.utah.gov/publicat/code/r317/r317-002.htm#/T16. The approach outlined in the Draft 2022 303(d) Assessment Methods may miss exceedances, especially for Class 3A and 3C waters, that may otherwise result in identifying the waterbody as impaired and placed on the 303(d) list for DO. Minimum Dissolved Oxygen Recreated from Table 2.14.2 Parameter (mg/L) (2)(2a) Aquatic Wildlife Use Class 3A 3B 3C 3D 30 Day Average 6.5 5.5 5.0 5.0 7 Day Average 9.5/5.0 6.0/4.0 Minimum 8.0/4.0 5.0/3.0 3.0 3.0 Where two values are shown: 1st number is protective of Early Life Stages (ELS) present; 2nd number for ELS absent.	In response to this comment, DWQ revised the assessments methods for dissolved oxygen (DO) grab samples. The DO criteria in R317-2 table 2.14.2 apply to all waterbodies with those assigned uses. However, not all datasets provide sufficient information to evaluate all criteria. DO grab samples do not provide sufficient data to evaluate whether the 7 or 30 day average criteria are met. DWQ has revised the assessment methods to specify that DO grab samples are assessed using the instantaneous minimum criteria for aquatic life uses, assuming the presence of early lifestages for class 3A and 3B streams. Datasets meeting the data requirements specified in the high frequency DO assessment methods will be assessed against all applicable DO criteria as stated in that section, including 7 and 30 day averages as appropriate.	Methods Changed (p. 38)
2/26/2021	Shera Reems	EPA Region 8	**HIGH FREQUENCY DO ASSESSMENTS:** While the application of the DO assessment methods to high elevation streams is not discussed, there may be situations where, because of the barometric pressure at higher altitudes, DO concentrations may be naturally lower. In these situations, the EPA-approved criteria found in the Utah Administrative Code R317-2-14 apply and should be used to make assessment decisions that follow the states DO assessment method described from pages 40 to 45. If there are concerns with the applicable water quality standards for high elevation streams, UDWQ may consider revising those criteria through the water quality standards triennial review process. Additionally, according to 40 CFR §130.7(b)(5), Each State shall assemble and evaluate all existing and readily available water quality-related data and information to develop the list required by §130.7(b)(1) and 130.7(b)(2). (see §130.7 Total maximum daily loads (TMDL) and individual water quality-based effluent limitations). To ensure UDWQ is meeting this requirement, EPA expects UDWQ to consider high frequency data in the development of the 2022 303(d) list.	As specified in the methods and consistent with the commenter's recommendations, DWQ assesses available high frequency dissolved oxygen datasets against all dissolved oxygen criteria for which there are sufficient data. DWQ will consider secondary reviews and draft IR comments when making a final assessment decision. Changes to water quality standards are beyond the scope of the IR. Recommended changes to dissolved oxygen criteria can be provided to DWQ's Water Quality Standards Workgroup.	No Action

Date	Commenter	Organization (if provided)	Comment	Response	Action (page # affected in methods)
2/26/2021	Shera Reems	EPA Region 8	**HEADWATER NUTRIENT CRITERIA:** On page 46, under the nutrient numeric criteria the growing season is defined, as the period of algal growth through senescence. For assessment purposes, UDWQ assumes that the growing season includes the months of June through September, although this may be lengthened where additional information demonstrates that a longer period of growth is warranted. EPA recommends that UDWQ extend the end of the timeframe from September to November be considered as part of the assessment period to ensure senescence conditions that may affect respiration are represented. To clearly communicate the decision framework for applying Utah's Numeric Nutrient Criteria (NNC) EPA recommends that UDWQ review the Assessment section in the Proposed Nutrient Criteria and EPA's Action Letter , and update figures and tables in the assessment methods document as follows: - delete Figure 6, - move up Table 12 to the beginning of this section, and - add Table 8 (provided below [DWQ: see original comment letter for Table 8]). Lower Nutrient Enrichment Level: Page 47 states, Any site where the growing season average of both TP and TN falls below the lower NNC thresholds (lowest enrichment tier) is considered to be supporting aquatic life uses with respect to nutrient enrichment (Figure 6). The assessment methodology should be updated to indicate that: the waterbody will be considered as not assessed in situations where no ecological response data are available (see Table 8); a full support (Category 1 or 2) attainment decision requires collection of all three ecological response metrics with supporting data (see Table 8); and if any ecological response threshold is exceeded, the waterbody is placed on the 303(d) list as impaired on the basis of a biological assessment, and the cause will be listed as unknown pending follow-up investigations (see Table 12 on page 50 and Table 8 above). Upper Nutrient Enrichment Level: Page 47 states, At the other end of the enrichment gradient, any site where the average TN or TP concentration exceeds the upper NNC threshold (high enrichment tier) is categorized as threatened unless degradation is confirmed by an ecological response, in which case it is considered impaired (not supporting aquatic life uses). Threatened AUs are designated as category 5 due to highly enriched conditions, but the Division commits to more thoroughly evaluate the AU for adverse nutrient-related responses. If no adverse responses are identified within the AU watershed or downstream, the site will be considered to be supporting aquatic life uses and reclassified accordingly in subsequent IR reports. The last sentence contradicts Table 8 provided above, which communicates that in all cases an exceedance of the upper threshold is clear evidence of an impairment and results in the waterbody being considered threatened or impaired. In its approval of the upper thresholds, EPA noted, The upper thresholds, reflective of the upper tail of the distribution of nutrient enrichment observed in Utah streams, are at levels where it is reasonable to conclude impairment and that confirmation with response indicators is not necessary. [underline added] Based on this information, EPA recommends UDWQ delete the following sentence on page 47 in the assessment methods document, "If no adverse responses are identified within the AU watershed or downstream, the site will be considered to be supporting aquatic life uses and reclassified accordingly in subsequent IR reports." Moderate Nutrient Enrichment Level: In Figure 6, Page 48, UDWQ indicates that a waterbody will be considered as "fully supporting" its aquatic life uses when the TN and TP values fall within the "moderate" range and when one of the ecological response indicators is meeting its associated threshold. This approach does not align with EPA's CWA-approval of the moderate range as a "combined criterion". The EPA views the data and analysis [UDWQ] submitted as supporting the construction of the combined criterion that includes the threshold for filamentous algae cover as a component of the full suite of all three response variables to determine that a stream fully supports its aquatic life uses. [underline added] Therefore, for moderate enriched streams, EPA recommends UDWQ revise the assessment methodology to align with the EPA action that requires a demonstration that all three ecological response indicators meet their associated thresholds for a stream to be considered as "fully supporting" its aquatic life uses.	DWQ thanks the commenter for their input. The methods have been revised as suggested to clarrify assessment nuances that more closely align with the intent of the newly adopted headwater nutireint criteria.	Methods Clarified (p. 44-46)

Date	Commenter	Organization (if provided)	Comment	Response	Action (page # affected in methods)
2/26/2021	Shera Reems	EPA Region 8	**HARMFUL ALGAL BLOOMS:** UDWQ stated that, For this IR cycle, harmful algal bloom (HAB) assessments are currently on hold while UDWQ develops and reviews implementation guidance and assessment methods based on recent EPA recommendations for water quality criteria for cyanotoxins (see Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsins). In future IR cycles, UDWQ expects to continue assessing recreational uses for the occurrence of HABs. EPA recommends that UDWQ update the assessment method that was used for the 2018 / 2020 303(d) Cycle (see Final 2018 / 2020 303(d) Assessment Methods) to include EPA's recommended criteria for microcystins and cylindrospermopsins and apply this method for the 2022 303(d) Cycle. According to 40 CFR §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 required by §130.7(b)(1) and 130.7(b)(2)." (see §130.7 Total maximum daily loads (TMDL) and individual water quality-based effluent limitations). To ensure UDWQ is meeting this requirement, EPA expects UDWQ to consider all available cyanotoxin and cyanobacteria cell count data in the development of the 2022 303(d) list.	For the 2022 IR cycle, DWQ has put the harmful algal bloom (HAB) assessments on hold in order to develop appropriate assessment methods using EPA's recommended water quality criteria for cyanotoxins and the draft implementation guidance. During this time, DWQ is working towards adopting the cyanotoxin criteria into our Water Quality Standards. DWQ will be working with EPA and stakeholders to evaluate and establish HAB assessment methodologies that are appropriate for assessment in the Integrated Report context.	No Action
2/26/2021	THOMAS BOSTEELS	Great Salt Lake Brine Shrimp Cooperative, Inc.	**Specific Comment Regarding Nutrient Assessments Specific to Headwater Streams** The Cooperative recognizes the extensive effort that was involved in the process of defining nutrient assessments specific to headwater streams and that the DWQ served a pivotal role in meeting with involved stakeholders, receiving and processing input, and defining outcomes. The Division of Water Quality was able to develop an innovative approach to nutrient criteria by combining numeric nutrient criteria and associated ecological responses. The cooperative is fully supportive of the process and the outcome of this effort.	DWQ appreciates the many hours that stakeholders, including Cooperative scientists, spent advising DWQ throughout standards development. Development of these criteria had many technical challenges and the final rules were more scientifically robust. Thanks to your input.	No Action
2/26/2021	THOMAS BOSTEELS	Great Salt Lake Brine Shrimp Cooperative, Inc.	**Specific Comment and Concerns Regarding Data Acceptance Process** The Draft 2018/2020 Document placed arbitrary restrictions on the acceptability of datasets which did not conform to the format of the EPA Water Quality Portal. Our concern was that valid data could be rejected if DWQ staff did not have the time to reformat it. We appreciate the fact that this appears to have been addressed in the 2022 document and that the details for submitting data are found in the "call for data" presented by DWQ. We are aware of the fact that the acceptance of data may require the development of "interface tools" by DWQ to allow the data to be imported in the correct format. If those tools have not been developed at time of data submission, they cannot be fully incorporated into DWQ's assessment tools and they will be placed in the DWQ Conflicting Assessments of Water Quality Standards and Secondary Review rather than rejected outright. Based on this understanding we want to ensure that stakeholders can request that DWQ manually screen and assess the data for specific parameters, sites, or dates if necessary and that a reasonable effort is made by DWQ to accommodate data. Whereas, the current Draft 2022 Document reveals a willingness of DWQ to work with outside entities in formatting their data for inclusion in the 303(d) process, it still leaves a substantial grey area. DWQ states that it wants "to balance consideration of all data with reasonable expenditure of resources", yet this does not obligate DWQ to accept all data if they judge the expenditure of resources to be unreasonable. The criteria for making this judgment is not given, and thus outside entities must assume acceptance of data decisions are made in good faith and that they support a positive working relationship between stakeholders and DWQ.	DWQ appreciates submissions by stakeholders during the Call for Data and considers all submissions for use in the 305(b)/303(d) assessment. Data that do not pass credible data requirements are still available for use during the secondary review process. In the publicly available data export files, DWQ publishes the reasons for not considering particular data records in assessment. The Draft Integrated Report (IR) public comment period serves as a time for data submitters to ensure their data were used as intended and raise questions about the process. Questions will be investigated and addressed by DWQ. Furthermore, as an iterative process, the IR provides multiple opportunities to consider data from stakeholder submissions. If the data do not meet credible data requirements or interface incorrectly with assessment tools at the time of EPA approval, stakeholders are encouraged to resubmit their reformatted data for consideration in the subsequent IR cycle. At any time, stakeholders are welcome to open a dialogue with DWQ staff on the appropriateness of their data for assessment in preparation for consideration during the next Call for Data/IR assessment.	No Action
2/26/2021	THOMAS BOSTEELS	Great Salt Lake Brine Shrimp Cooperative, Inc.	In our comments on the Draft 2018/2020 Document we expressed concern about the exclusion of historic data for interpretation of current limnological and ecological conditions of bays of GSL. We remain of the opinion that historic data have merit and that inclusion in the process of interpretation of current results remains valid and necessary.	The main focus of the Integrated Report (IR) is to evaluate data collected during the period of record against existing criteria to determine the attainment status of waterbodies. DWQ agrees with the commenter that data outside of the period of record may be important for characterizing historic conditions, determining the sources and causes of impairments, or designating standards for a waterbody. These types of analyses are outside the scope of the IR and are typically addressed by other programs (e.g., TMDL, Nonpoint Source, Standards, etc.). However, this type of waterbody specific knowledge can be considered as part of the IR's secondary review process.	No Action

Date	Commenter	Organization (if provided)	Comment	Response	Action (page # affected in methods)
2/26/2021	THOMAS BOSTEELS	Great Salt Lake Brine Shrimp Cooperative, Inc.	**Specific Comment and Concerns Regarding Data Credibility** The Draft 2018/2020 Document contained a fairly restrictive set of categories for data considered "credible" and sufficient to be included in 303(d) assessments. The Draft 2022 Document has modified these criteria in a way that seems to be more permissive of datasets without such onerous adherence to DWQ QAPP procedures. According to our interpretation of the Draft 2022 Document credible data from external entities is now defined, on page 30, as being under no obligation to follow precisely the DWQ or EPA quality assurance protocols. However, the data collection and QA process must still be evaluated by DWQ to ensure credibility. This means that outside entities will need to develop a QAPP, SAPs, and SOPs, collect their data under its guidance, and the documents will need to be furnished to the DWQ at their request. DWQ will then make a judgement about whether the QAPP is sufficient for the data to be considered in 303(d) decisions. This is required in order for the data to receive a Quality Grade of A or B and be considered in 303(d). The lack of QAPP, SAP, and SOP for DWQ review will result in a C grade, and exclusion from 303(d) consideration. We want to ensure that DWQ will dedicate the time to review submitted QAPP, SAP, and SOP documents from participating stakeholders and that there is an open and interactive process that supports a stakeholder's ability to collect and submit data that meets the definition of "credible". In this process of working with DWQ to develop and implement QAPP, SAPs, and SOPs stakeholders want to ensure that such guidance from DWQ combines the goal of ensuring the reliable acquisition and documentation of data with a realistic understanding of the constraints that time, personnel and money can impose on the collection of data. Ultimately we strongly encourage the DWQ to proceed in an unbiased and open-minded manner when considering the merits of an outside entity's QAPP.	DWQ appreciates the review of credible data requirements. Indeed, DWQ does not require data submitters to follow DWQ-specific QAPPs, SAPs, and SOPs; these are offered in the document as guidance. DWQ does require data submitters to have credible data documentation that may be reviewed should the data records be questioned at any point in the Integrated I26R assessment process. Credible data documents should confirm that data fit into the Grade A or B categories defined by the credible data matrices. DWQ will ask for clarification when needed and work with the data submitter to understand and solve any discrepancies between credible data documentation and credible data requirements.	No Action
2/26/2021	THOMAS BOSTEELS	Great Salt Lake Brine Shrimp Cooperative, Inc.	Regarding the temperature and dissolved oxygen, we have concerns about the instrument calibration requirements for accuracy and range in Tables 5 and 6. First, we believe the term "range" should be changed to "resolution" in the table footnotes, as the units provided for R in the tables suggests that resolution is being specified. Second, the calibration accuracy requirement for dissolved oxygen exceeds the manufacturer's instrument specifications for the YSI 556 sonde we currently use, which is a standard hand held device routinely used in limnological studies. YSI 556 oxygen sensors are rated for an accuracy of 0.2 mg/L. The minimum criteria for dissolved oxygen accuracy is 0.1 mg/L for Quality Grade B, which would downgrade data collected by a YSI 556 to Quality Grade C, excluding it from consideration in 303(d) assessments. We believe this would be a mistake, because the YSI 556 service life extended throughout the 2015-2020 period of record DWQ is considering and therefore any data collected with this common instrument by other entities would also be at risk of dismissal. While the YSI 556 has recently been discontinued, the contemporary YSI ProPlus replacing it has the same dissolved oxygen accuracy and resolution specifications as the YSI 556, yet is approved by the EPA for wastewater and drinking water analysis (https://www.ysi.com/File%20Library /Documents/News%20Briefs/N B13-0116- 01-EPA-Approved-Methods. pdf). Similarly, the DWQ water temperature minimum resolution of 0.05 degrees Celsius excludes data from the YSI 556 and the contemporary ProPlus and ProDSS, which are rated to 0.1 degree Celsius resolution. We recommend the dissolved oxygen accuracy requirement for Data Quality Grade B be raised to 0.2 mg/Land temperature resolution to 0.1 degree Celsius to accommodate valid data collected from commonly used water quality sondes over the period of record. To be clear, these comments pertain to GSL and the various subclassifications therein, and we are not trying to recommend alternative instrument standards for fresh water streams, rivers or lakes. The other requirements-metadata, flow data, field documentation, laboratory comments, detection limits, and lab certifications-appear reasonable. With respect to lab certification we expect that labs outside the State of Utah that have specific national or state level certificates meet the requirements of DWQ.	DWQ agrees with the commenter that the term "range" is inappropriate in this table and has removed this specification from the data matrix. DWQ also agrees with the commenter's suggestions regarding the required accuracy of dissolved oxygen and temperature calibrations. Based on this comment, DWQ has reviewed field sonde calibration documentation for several widely used professional water quality sonde makes and models and updated the accuracy requirements to better reflect those documents. These changes include updating the temperature and DO credible data matrix requirements for Grades A and B to include the specifications typical of YSI 556 and YSI ProPlus sondes.	Methods Changed (p. 30)
2/26/2021	THOMAS BOSTEELS	Great Salt Lake Brine Shrimp Cooperative, Inc.	In the Draft 2018 Document, it was somewhat unclear how data that does not fully meet the criteria for inclusion into the Integrated Report program for EPA 303(d) actions might be used for state DWQ Watershed Plans, TMDLs, and development of water quality standards. However, in the Draft 2022 Document it is evident that data which are not sufficiently credible according to acceptance criteria may still have merit and can be used in a capacity outside of the specific 303(d) assessment. We feel that at least this level of inclusion is an important process. DWQ's statement that they will no longer require outside entities to conform specifically to their QA/QC reduces the risk of highly restrictive practices such as the "clean hands/dirty hands" nutrient sampling protocol and instrument washing that are applicable under certain circumstances and data quality objectives yet are excessive or not specifically warranted for other sample types or alternative data quality objectives.	DWQ thanks you for this comment. In addition to potential usage in TMDLs, standards, and other non-Integrated Report (IR) DWQ programs, data and information that do not meet the primary credible data requirements can also still be considered as part of the secondary review process of the IR which allows for the consideration of additional waterbody specific knowledge in making final assessment determinations.	No Action

Date	Commenter	Organization (if provided)	Comment	Response	Action (page # affected in methods)
2/26/2021	THOMAS BOSTEELS	Great Salt Lake Brine Shrimp Cooperative, Inc.	**Specific Comment and Concerns Regarding Beneficial Use Subclassification and Bays of GSL** Subclassifications 5A through 5E are all GSL-specific, recognizing the individual bays as separate water bodies with unique characteristics and unique criteria. Whereas the recognition of GSL as a unique waterbody continues to be a positive and scientifically defensible designation the Cooperative strongly urges DWQ to include the interconnection of bays of GSL within the framework of assessing beneficial uses. It is abundantly clear from years of research on the bays of GSL that there is substantial biological and limnological connectivity between the GSL subclassifications such that changes in one bay can have significant and long-lasting impacts on other bays. Regulatory solutions designed to alleviate nonsupport of beneficial uses of a particular GSL bay must take into account potential impacts on beneficial uses in other bays before being implemented.	With the exception of a selenium bird-egg tissue criterion for Gilbert Bay, DWQ has yet to develop criteria for the individual bays of Great Salt Lake. DWQ agrees that the connectivity of the individual bays is a complex and important consideration when evaluating water quality and management decisions and while this comment is outside the scope of the Integrated Report methods, we encourage the Cooperative to provide data and expertise during the standards development process.	Out of Scope
2/26/2021	THOMAS BOSTEELS	Great Salt Lake Brine Shrimp Cooperative, Inc.	**Specific Comment and Concerns Regarding Potential Conflicts Generated Among Beneficial Uses** One of the concerns we have is that the implementation of regulatory measures to mitigate or resolve perceived impairment of a particular beneficial use may then create harm to other beneficial uses for a particular waterbody. Based on this concern we examined the Draft 2022 Document for the procedural process to remedy conflicts that arise between beneficial uses of a particular waterbody. Specifically we are most concerned with those conflicts that develop out of implementation of measures to correct impairment of one of the beneficial uses yet causes demonstrable or highly probable harm to other beneficial uses. As it is unclear how such conflicts are resolved we urge DWQ to inform stakeholders if such potential conflicts are anticipated and if so, then what is the process to resolve such conflicts. As it may result in setting priorities of one beneficial use over another, then how are the beneficial uses prioritized?	Potential actions to resolve an identified impairment are beyond the scope of the Integrated Report (IR). Therefore, a description of the implementation processes is not included in the IR methods. Resolution of an impairment may include point source controls, non-point source reduction projects, water quality standards changes, or other actions. For further information on these processes, please contact the DWQ staff overseeing your watersheds or waterbodies of concern as identified on DWQ's Watershed Management Program page. Defining, altering, or prioritizing beneficial use classifications is beyond the scope of the IR. Beneficial uses are part of Utah's water quality standards. Criteria to protect the uses must protect the most sensitive use (40 CFR §131.11(a)(1)). Specific recommendations or comments to modify the existing beneficial use classifications and criteria can be provided to DWQ's Water Quality Standards Workgroup.	Out of Scope
2/26/2021	THOMAS BOSTEELS	Great Salt Lake Brine Shrimp Cooperative, Inc.	**Specific Comment and Concerns Regarding Sampling Bias** The Draft 2022 Document does include recognition that there can be both spatial and temporal bias in sampling and that this could influence the interpretation of water quality within an AU. DWQ has presented details on the possibility to "split" or "re-segment" an AU given information on the spatial specifics and how this influences the perceived compliance and support of beneficial uses. However, with respect to the bays of GSL it is unclear how the potential for a temporal bias may influence the interpretation of attainment or impairment. It has been thoroughly documented that there are demonstrable temporal differences in algal and aquatic invertebrate community structure and population dynamics in the various bays of GSL. Sampling at a particular time versus another time for the same location can lead to nearly opposite conclusions regarding water quality. For example, chlorophyll-a assessments in Gilbert Bay in January vs July can lead to conclusions of highly eutrophic (i.e., a high Carlson's TSI) vs oligotrophic (i.e., low Carlson's TSI). Yet both conditions are a "normal" situation for Gilbert Bay and constitute a healthy system. Similarly, in Farmington Bay there typically is both a profound temporal and spatial pattern of algal and aquatic invertebrate community structure and population size throughout the year. Sampling must take into account these spatial and temporal differences and understand whether or not it represents "healthy" ecological dynamics or risk and impairment to the system. In short, the Cooperative would like to see more details in the final version of the Draft 2022 Document that more clearly addresses the potential for spatial and temporal bias and how such biases are managed.	DWQ agrees that timing of data collection for assessment can play a significant role in determining attainment of beneficial uses. However, since criteria have yet to be developed for the areas and constituents you cite, the comments are not within the scope of the Integrated Report methods. It would be premature to discuss specific issues of spacial and temporal bias in determining attainment without criteria or a complete assessment framework developed for the bays of Great Salt Lake (GSL). As DWQ further develops criteria for GSL, we encourage the Cooperative to provide their expertise and input.	Out of Scope

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2/26/2021	THOMAS BOSTEELS	Great Salt Lake Brine Shrimp Cooperative, Inc.	**Specific Comment and Concerns Regarding use of the term Harmful Algal Bloom (HAB)** We support the conclusion by DWQ that "For this IR cycle, harmful algal bloom (HAB) assessments are currently on hold while DWQ develops and review implementation guidance and assessment methods based on recent EPA recommendations for water quality criteria for cyanotoxins". The Cooperative believes that cyanobacteria cell counts alone are not sufficient to define an algal bloom as harmful, or a waterbody as impaired, or as an impact on beneficial use without further assessments of impact. There needs to be more specific accounting of the species of cyanobacteria, the type and concentration of toxin produced, and the impact on other aquatic biota, community structure or the ecosystem that a cyanobacteria bloom has on the bays of GSL. In particular the Cooperative opines that nitrogen fixation by cyanobacteria is an essential and typical event that captures nitrogen and introduces it into the GSL ecosystem and therefore has value. Repeated studies have demonstrated that GSL is predominantly a nitrogen limited system and that sufficient nitrogen is essential to maintain the massive demand on energy, nutrients, and carbon transfer required for the aquatic and aquatic-dependent biota of GSL. It is yet unclear the full extent of the role that nitrogen fixation has on the nutrient balance of the GSL ecosystem, but there is accumulating evidence that it plays and important and beneficial role.	Thank you for your comment. For the 2022 Integrated Report cycle, DWQ has put the harmful algal bloom (HAB) assessments on hold in order to develop appropriate assessment methods using EPA's recommended water quality criteria for cyanotoxins and the draft implementation guidance. During this time, DWQ is working towards adopting the cyanotoxin criteria into our Water Quality Standards. DWQ will be working with EPA and stakeholders to evaluate and establish HAB assessment methodologies that are appropriate for assessment in the Integrated Report context.	No Action
2/26/2021	THOMAS BOSTEELS	Great Salt Lake Brine Shrimp Cooperative, Inc.	**Conclusion** The Cooperative remains concerned about the inclusion of valuable data from stakeholders that can inform DWQ and that offers an historical perspective as well as insight into complex ecological, toxicological, biological and hydrochemical conditions or interactions that influence the integrity of the GSL ecosystem. While we understand the guidelines and steps required to meet data credibility standards we still urge the DWQ to recognize the realistic constraints on data acquisition and the limitations of time, personnel and money that constrain the scope and frequency of sample collection and analysis. We understand the designation of the bays of GSL as separate beneficial use subclassifications, yet we still adhere to the opinion that the GSL is an integrated system and that all bays interact, contribute to, and influence water quality and biotic composition of other bays. We therefore urge consideration of impacts on other bays if, and when, management decisions are made for a particular bay. We support the on-going effort to truly understand the role that nitrogen-fixing cyanobacteria have on nutrient loading and balance in GSL and the need to understand when an algal bloom becomes problematic rather than beneficial. We worry about potential conflicts between beneficial uses and we would prefer to see more definitive information on how such conflicts are resolved. Overall, we applaud the effort DWQ has made to listen to stakeholders and to incorporate their valid contributions to the process of completing the Draft 2022 Document. We strongly believe such cooperation and interaction helps to propel the document in a manner that enhances the likelihood of positive outcomes for waterbodies in Utah and especially for the GSL ecosystem. If there is further information, clarification, or services that we can provide for the DWQ's 303(d) listing process, please let us know and we will respond.	We appreciate the thoughtful input provided by the Cooperative and look forward to continued cooperation with our valued partners as we further develop standards for Great Salt Lake. The concerns summarized here are largely out of scope with regards to the Integrated Report assessment methods; however, we agree that historic data may be valuable to the efforts of criteria development as well as the importance of considering the connectivity of bays to standards and future assessment method development.	Out of Scope