UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
www.epa.gov/region8

August 18, 2021

Ref: 8WP-CWB

Galen Steffens, Water Quality Planning Bureau Chief
Montana Department of Environmental Quality
1520 East 6th Avenue
Helena, MT 59620-0901

Re: EPA Comments on Montana's Proposed Response Variables and Associated Thresholds

Dear Ms. Steffens:

This letter provides the U.S. Environmental Protection Agency (EPA) Region 8 Water Quality Section's comments on Montana Department of Environmental Quality (MDEQ)'s proposed response variables and associated thresholds discussed during the August nutrient workgroup technical subcommittee meetings. The EPA's regulation (40 C.F.R. § 131.11(a)) requires that "criteria must be based on sound scientific rationale and must contain sufficient parameters to protect the designated use." Additionally, States are required to submit to EPA "methods used and analyses conducted to support water quality standards revisions" (40 C.F.R. § 131.6 (b)), as well as "general information which will aid the Agency in determining the adequacy of the scientific basis of the standards which do not include the uses specified in section 101(a)(2) of the Act as well as information on general policies applicable to State standards which may affect their application and implementation" (40 C.F.R. § 131.6 (f)). As such, the EPA is offering comments to assist MDEQ in ensuring that Montana's proposed approach to interpret the narrative water quality standard and supporting documentation comply with these WQS requirements. Please note that our comments are preliminary in nature and should not be interpreted as a final EPA decision under Clean Water Act (CWA) § 303(c).

Additionally, the following information is intended to clarify how EPA will assess revisions to Montana's WQS that result from Montana removing its numeric nutrient criteria (NNC) from Department Circular DEQ 12-A per legislative direction. The record accompanying MDEQ's 2014 adoption of the NNC and EPA's 2015 CWA section 303(c) approval indicates the NNC are scientifically defensible and protective of designated uses, and that both total nitrogen (TN) and total phosphorus (TP) need to be addressed and limited to protect the applicable designated uses. EPA will review MDEQ's replacement rule consistent with EPA's regulatory requirements, including 40 CFR § 131.11(a)(1) which specifies that criteria must contain sufficient parameters or constituents to protect the designated uses.

Because MDEQ is removing numeric criteria that are still scientifically defensible and protective, EPA expects an adequate level of assurance that MDEQ can identify protective levels of both TN and TP for implementation in CWA programs. One way to provide such assurance would be to adopt a numeric translator for the narrative criterion in rule or to incorporate a numeric translator by reference. For example, MDEQ could adopt protective thresholds for response variables that are scientifically defensible and protective of the applicable designated uses in rule, and incorporate by reference the technical documents that provide a reliable process for deriving TN and TP levels associated with those response variable thresholds.

If MDEQ chooses another approach, it should include a procedure that establishes a transparent, reliable, and consistent mechanism for assessing waters, developing TMDLs, evaluating discharges for reasonable potential to cause or contribute to exceedances of translated nutrient levels, and developing water-quality based effluent limitations for those permits where they're needed to protect the designated use. EPA also recommends that MDEQ review EPA's 2013 *Guiding Principles on an Optional Approach for Developing and Implementing a Numeric Nutrient Criterion that Integrates Causal and Response Parameters* (https://www.epa.gov/sites/default/files/2013-09/documents/guiding-principles.pdf). This document offers specific information that may be helpful in development of a narrative criterion translator approach.

Because Montana's proposed approach gives additional weight to ecological response indicators, the sensitivity of the response indicators and derivation of their thresholds is important to ensure protection of aquatic life uses.[1] EPA's technical review of this proposed approach identified a number of questions and concerns related to the proposed response indicators and associated thresholds that are discussed in detail in Attachment A. The bullets below highlight some of the main questions/concerns:

- MDEQ is proposing to apply a single benthic chlorophyll-a threshold for multiple designated uses. EPA's regulation 40 CFR 131.11(a)(1) requires that "[f]or waters with multiple use designations, the criteria shall support the most sensitive use." EPA recommends MDEQ independently analyze the thresholds required to protect each use and demonstrate that the final proposed threshold protects the most sensitive use or identifies unique thresholds for different designated uses.
- For each response indicator, EPA expects MDEQ to provide a scientifically defensible rationale for the response variable threshold selected and specify the link to nitrogen and phosphorus concentrations.
- EPA requests the state provide the available data used to derive the thresholds proposed for all response indicators (i.e., benthic chlorophyll-a, percent bottom cover; dissolved oxygen delta) and associated TN and TP thresholds.
- EPA recommends MDEQ validate the calculations and assumptions used in MDEQ's 2014 memo to demonstrate that the state's proposed threshold of benthic chlorophyll threshold of 125 mg/m^2 is protective of aquatic life uses in western Montana streams.
- EPA is concerned that the proposed benthic chlorophyll-a threshold would not apply to the majority of western MT streams.

[1] See EPA's guidance: Guiding Principles on an Optional Approach for Developing and Implementing a Numeric Nutrient Criterion that Integrates Causal and Response Parameters. 2013. EPA-820-F-13-039. https://www.epa.gov/sites/production/files/2013-09/documents/guiding-principles.pdf.

- EPA recommends MDEQ use available percent bottom cover data collected on western Montana streams to demonstrate that the proposed value will protect aquatic life uses.
- EPA requests additional analyses and information to demonstrate that MDEQ's proposed dissolved oxygen (DO) delta will protect aquatic life uses.
- The existing documentation does not provide information on how proposed thresholds would ensure that water quality standards of downstream waters will be maintained and protected (see 40 CFR 131.10(b)).[2]
- The existing documentation does not include causal variables (TN and TP) or a process for how proposed thresholds would be used to derive TN and TP criteria for the purposes of assessing waters, developing TMDLs, evaluating discharges for reasonable potential to cause or contribute to exceedances of translated nutrient levels, and developing water-quality based effluent limitations for those permits where they're needed to protect the designated use.

In its detailed comments in Appendix A, the EPA has offered suggestions for additional rationale, analyses and/or data collection that could be used to address these concerns before a final technical rationale is submitted to the EPA for review and approval under the Clean Water Act § 303(c).

We hope our comments are helpful to MDEQ. We appreciate MDEQ's efforts to ensure that Montana's revisions to its water quality standards resulting from removal of the NNC comply with the EPA's water quality standards requirements at 40 C.F.R. Part 131. If there are questions concerning our comments, please contact Tina Laidlaw (406-457-5016). We look forward to working with the parties to address these issues.

Sincerely,

ANDREW TODD

Digitally signed by ANDREW TODD
Date: 2021.08.18 12:04:41 -06'00'

Andrew Todd, Ph.D.
Chief, Water Quality Section

Attachment

cc: Tina Laidlaw, EPA
Mike Suplee, MDEQ
Myla Kelly, MDEQ

[2] 40 CFR 131.10(b): In designating uses of a water body and the appropriate criteria for those uses, the State shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters.

ATTACHMENT A - Detailed Comments on Montana's Proposed Response Variables and Associated Thresholds

The EPA's regulation (40 C.F.R. § 131.11(a)) requires that "criteria must be based on sound scientific rationale and must contain sufficient parameters to protect the designated use." Additionally, States are required to submit to EPA "methods used and analyses conducted to support water quality standards revisions" (40 C.F.R. § 131.6 (b)), as well as "general information which will aid the Agency in determining the adequacy of the scientific basis of the standards which do not include the uses specified in section 101(a)(2) of the Act as well as information on general policies applicable to State standards which may affect their application and implementation" (40 C.F.R. § 131.6 (f)). The EPA is offering comments to assist MDEQ in ensuring that MDEQ's revisions to Montana's WQS that result from removing its numeric nutrient criteria comply with these WQS requirements.

General Comments:

1. **Criteria Protect the Most Sensitive Use:** 40 CFR 131.11(a)(1) requires state to adopt criteria that protect the designated use and are scientifically defensible. 40 CFR 131.11(a)(1) requires that "[f]or waters with multiple use designations, the criteria shall support the most sensitive use." It appears that the thresholds MDEQ is contemplating may serve as criteria or as the principal translators of criteria. MDEQ's current approach to establishing thresholds for each response variables blends thresholds across multiple designated uses (e.g., recreation versus aquatic life use) without a demonstration that the proposed threshold will protect the most sensitive use. EPA recommends MDEQ independently analyze the thresholds required to protect each designated use and demonstrate that the final proposed threshold protects the most sensitive use. Additionally, EPA recommends MDEQ clearly connect, in rule, the proposed thresholds with the beneficial uses for Montana's waters they are intended to protect.

2. **Linkage to Nutrients Needed**: EPA's document entitled "Guiding Principles on an Optional Approach for Developing and Implementing a Numeric Nutrient Criterion that Integrates Causal and Response Parameters" recommends that a combined criterion "should demonstrate the sensitivity of the response indicator(s) to increased nutrient concentrations and quantify how these nutrient-response linkages will achieve the goal of protecting and maintaining aquatic communities."[3]

   In Montana's case, while the state is not adopting a combined nutrient criterion, the record accompanying MDEQ's 2014 adoption of the NNC and EPA's 2015 CWA section 303(c) approval indicates that both total nitrogen (TN) and total phosphorus (TP) need to be addressed and limited to protect the applicable designated uses. Therefore, for each response indicator selected by MDEQ, EPA expects MDEQ to provide documentation that demonstrates the relationship between the response indicator and TN and TP for the waters to which the response indicator is being applied, a scientifically defensible rationale for the response variable threshold selected, and the link to nitrogen and phosphorus concentrations. In the attached cover letter, EPA identifies several recommendations for how the state can meet EPA's expectations, either in rule or incorporated by reference.

[3] Guiding Principles on an Optional Approach for Developing and Implementing a Numeric Nutrient Criterion that Integrates Causal and Response Parameters. 2013. EPA-820-F-13-039. https://www.epa.gov/sites/production/files/2013-09/documents/guiding-principles.pdf.

The existing documentation does not include causal variables (TN and TP) or identify a process for how proposed thresholds would be used to derive TN and TP criteria for the purposes of assessing waters, developing TMDLs, evaluating discharges for reasonable potential to cause or contribute to exceedances of translated nutrient levels, and developing water-quality based effluent limitations for those permits where they're needed to protect the designated use. EPA recommends MDEQ include a process for deriving TN and TP concentrations associated with meeting the response variable thresholds.

3. **Data:** EPA requests that MDEQ provide a database to all interested stakeholders that contains the available information including, but not limited to, benthic chlorophyll-a, total nitrogen, and total phosphorus data collected throughout the state and considered in the development of Montana's proposed response variables and thresholds. This information provides an opportunity for stakeholders to examine and complete their own analyses using the state's data.

   Additionally, EPA would appreciate MDEQ providing the underlying the data collected at the 78 prairie streams between 2013 to 2017 and used to support the 2021 memo that documents that a dissolved oxygen (DO) delta ≥5.3 mg/L is adequate to protect aquatic life uses in prairie streams.

4. **Western vs. Eastern Streams compared to Ecoregional Approach**: In Montana's 2013 technical support document,[4] MDEQ used ecoregions as the basis for establishing numeric nutrient criteria based on classification analyses completed in 2005.[5] MDEQ's current approach divides wadeable streams into western and eastern systems without describing the basis for that decision. EPA requests that MDEQ please explain how this decision was reached and is supported. Information provided to Montana's nutrient workgroup by MDEQ suggests that stream gradient influences the effect of nutrient concentrations on Montana's wadeable streams. Instead of selecting response variables based on a division between western versus eastern Montana, did MDEQ consider stream gradient (e.g., low vs. high gradient) as a possible classification approach?

5. **ESA Consultation:** EPA's CWA section 303(c) action on Montana's removal of the state's numeric nutrient criteria and its replacement with the narrative standard may be subject to the consultation requirement of Section 7(a)(2) of the Endangered Species Act (ESA). Under Section 7(a)(2) of the ESA, 16 U.S.C. § 1536, EPA has the obligation to ensure that its actions on Montana's WQS revisions will not jeopardize the continued existence of threatened and endangered species and their critical habitat in Montana.

6. **Additional Indicators:** EPA encourages MDEQ to consider the use of diatoms as a possible response indicator that could be used as an independent response variable or provide corroborating evidence for other response variables. EPA welcomes the opportunity to work with MDEQ to explore the use of diatoms as an indicator of nutrient enrichment for the state.

[4] Suplee, M.W1., and V. Watson2, 2013. Scientific and Technical Basis of the Numeric Nutrient Criteria for Montana's Wadeable Streams and Rivers—Update 1. Helena, MT: Montana Dept. of Environmental Quality.
[5] Varghese, Arun and Joshua Cleland. 2005. Seasonally Stratified Water Quality Analysis for Montana Rivers and Streams: Final Report. Fairfax, VA: ICF Consulting.

Indicators for Western Montana Wadeable Streams

7. **Benthic chlorophyll-a of 125 mg/m^2 for Recreational Use Support:** EPA supports the benthic chlorophyll-a and AFDM criteria proposed by MDEQ as protective of recreational uses and has approved similar criteria in Utah and Colorado. The underlying user perception survey identified thresholds for excess algal growth (using chlorophyll-a and AFDM as surrogate metrics) above which recreational users are averse to recreating in a river or stream. The survey asked citizens to review photographs of streams with varying quantities of algae growth and to evaluate whether or not the conditions represented "desirable" or "undesirable" recreational conditions. The premise of this approach is that when algal abundance becomes excessive, the visual appearance of the stream (i.e., its color or "greenness") discourages recreation and impairs recreation designated uses. EPA agrees with the state's rationale that a threshold of 125 mg/m^2 benthic chlorophyll-a is protective of recreational uses.

8. **Benthic chlorophyll-a of 125 mg/m^2 for Aquatic Life Use Support:** Montana's primary basis for selection of a benthic chlorophyll-a threshold of 125 mg/m^2 for aquatic life appears to be the MDEQ 2014 technical memo: "Benthic algae biomass levels protective of fish and aquatic life in western Montana streams."[6] EPA has reviewed that document and has the following comments and recommendations.
    - EPA recommends validating the calculations described in the 2014 memo using data from western MT wadeable streams to which the benthic chlorophyll threshold of 125 mg/m^2 would apply. For example, the equation relies on velocity, stream temperature, and elevation. It is important to ensure these parameters are not estimated and are based on empirical data. EPA requests that MDEQ indicate whether it has validated these assumptions and calculations using data from western MT streams and requests that those results be provided to EPA.
    - MDEQ has indicated that they are not proposing to use DO as a response indicator for western streams because reaeration in many western streams makes DO unresponsive to increases in nutrient concentrations. However, MDEQ linked the proposed benthic chlorophyll-a indicator and associated threshold on impacts to Montana's DO standards. EPA has the following technical concerns:
        i. Please demonstrate that the benthic chlorophyll-a concentration of 125 mg/m^2 relates to meeting a DO minimum concentration of 8 mg/L using data from western Montana streams.
        ii. In addition to the daily DO minimum of 8 mg/L, MDEQ has a numeric 7-day average DO criterion of 9.5 mg/L that would apply to western MT streams and could be calculated because the state deployed continuous data sondes. Please describe whether MDEQ evaluated whether the proposed benthic chlorophyll-a threshold would achieve the 7-day average DO criterion.
        iii. A number of western MT stream segments are designated as "A-closed" waters where the applicable Montana DO standard is: "No change from the naturally occurring dissolved oxygen levels is allowed" (ARM 17.30.621(3)(b)). Please describe how MDEQ's proposed benthic chlorophyll-a threshold that was derived based on meeting

[6] Suplee, Mike and K. Flynn. 2014. Memo to the Montana Board of Environmental Review regarding "Benthic algae biomass levels protective of fish and aquatic life in western Montana streams."

a daily DO minimum criterion of 8 mg/L applies to A-closed waters and would protect A-closed waters.

- EPA is concerned that the proposed benthic chlorophyll-a threshold would not apply to the majority of western MT streams based on the state's analysis which showed the following:
    i. The memo states that the threshold applies to Rosgen C and F channels but not Rosgen A, B, D, E and G channels. Based on this information, please document the percentage of western MT streams that the proposed benthic chlorophyll-a response variable would apply to? Further, EPA is interested in knowing whether the data exist to evaluate the percentage of streams to which this indicator would apply?
    ii. Rosgen E5 streams tend to have lower velocities and lower gradients and may be more responsive to increases in nutrient concentrations. However, MDEQ's proposed approach suggests that benthic chlorophyll-a would <u>not</u> be used as a response variable for these stream types. If benthic chlorophyll-a is not applicable to the most responsive western MT stream types, please explain how this approach will protect aquatic life uses in all western MT wadeable streams.
    iii. Results for three Rosgen channel types are presented. EPA requests that MDEQ share the results of analyses conducted for the other stream types.
    iv. If these models represent low-flow conditions, the flow conditions could be overestimated for western MT. Have these values been validated?
    v. Please explain the basis for using 7 degrees Celsius as a representative of summer temperature for western MT streams. Based on EPA's understanding of average temperatures in western MT streams, this value may be too low which would change the dissolved oxygen (DO) results. Did MDEQ calculate DO saturation at other temperatures?
    vi. The model assumed that low DO would be observed in western Montana streams and drop to 0 mg/L DO. Has this underlying assumption been validated? If so, what data was used in this validation? Please describe that analysis and share those data.
    vii. The memo states (pdf page 5) that: "Thus the equation is applicable to small shallow streams where the oxygen generation and consumption processes are primarily reaeration and SAOD [senesced algae oxygen demand]. It should be noted that reaeration is temperature adjusted using the Arrhenius equation with a theta (θ) of 1.024 (Chapra, 1997). Also, since we have omitted respiration and photosynthesis from our equation, the results are probably only appropriate for night-time conditions only."
        1. EPA assumes that respiration would be an important factor to consider in changes in DO concentrations associated with elevated benthic chlorophyll-a concentrations. Please explain why respiration is not considered in the calculations. If respiration is included, what do the results look like?
    viii. The memo also notes that "the SAOD we calculated is far higher [90 g)2/m2/day] than sediment oxygen demand (SOD) reported in the literature (highest SOD located was 21.4 g O2/m2/day; Ling et al., 2009)." MDEQ justifies the SAOD rates as "reasonable" but higher than reported in the literature. How did MDEQ validate that the SAOD is accurate and applicable to Western MT? Would it be more appropriate to run the calculations using more typical SOD rates?
- Has MDEQ analyzed potential downstream impacts to the Clark Fork River and demonstrated that allowing upstream systems to meet a benthic chlorophyll-a threshold of 125 mg/m^2 will ensure protection of the downstream use and comply with the numeric criterion of 100 mg/m^2 as a summertime average and a maximum concentration of 150

mg/m^2 benthic chlorophyll-a? If the state has not run these analyses, please explain the state's plan to evaluate potential DS impacts.

- Did MDEQ prepare a modeling report that provides additional detail on the assumptions used for the calculations and more detailed results? If so, please share with EPA. If not, EPA encourages the state to provide more detailed documentation on the underlying assumptions and demonstrate the calculations were validated using data from western MT streams.
- Lastly, the New Zealand value cited by MDEQ would allow "periodic short-duration nuisance blooms reflecting moderate nutrient enrichment."[7] EPA does not consider a threshold associated with conditions that support nuisance blooms as protective of aquatic life or as meeting the intent of MDEQ's narrative standard that prohibits substances in concentrations that "produce odors, colors, or other conditions as to which create a nuisance or render undesirable tastes to fish flesh or make fish inedible" or "create conditions which produce undesirable aquatic life." (ARM 17.30.637(d) and (e)). EPA recommends that MDEQ use western Montana data to demonstrate that the values cited in the New Zealand document are protective of aquatic life uses in Montana.

9. **Ash Free Dry Mass (AFDM) of 35 g AFDW/m^2 for Aquatic Life:** MDEQ's proposed threshold for AFDM appears to be based on the following rationale documented in MDEQ's 2016 nutrient assessment method.[8]

> "In Suplee et al. (2009), the threshold Chl a level of 150 mg/m^2 corresponds to 36 g AFDW/m^2. In New Zealand, extensive analysis of algal AFDW resulted in a recommendation of 35 g AFDW/m^2 as the maximum level for gravel/cobble streams, to protect recreation use (Biggs, 2000). Note in Table B1-1 above that the late season AFDW corresponding to 127 mg Chl a/m^2 (the Chl a level linked to the late-season DO problems) is 33 g/m^2. Long -term monitoring in the Clark Fork River (1998-2009) shows that the average summer AFDW at sites that do not develop nuisance algae (i.e., they are consistently <150 mg Chl a/m^2) ranged from 17 to 48 g AFDW/m^2 (mean: 27 g AFDW/m^2). Given the values presented, we recommend that site average AFDW (i.e., mean of the 11 replicates collected at a site, replicates being only templates or hoops) should be no greater than 35 g AFDW/m^2. This value should be protective of both fish and aquatic life and recreation uses."

As documented in Comment #7 above, EPA has identified a number of concerns with the proposed benthic chlorophyll-a threshold of 125mg/m^2 as protective of aquatic life uses. Absent a more robust analysis of the available AFDM data that demonstrates the proposed threshold is protective of aquatic life uses, EPA is concerned that MDEQ's proposed AFDM threshold may not protect aquatic life uses.

10. **<u>% Bottom cover threshold of 30%:</u>** MDEQ's proposed 30% threshold for percent bottom cover currently lacks a clear scientific rationale that demonstrates the proposed threshold will ensure protection of aquatic life uses in western Montana streams. MDEQ did not empirically derive the proposed threshold using available Montana data. EPA recommends MDEQ use data collected from waters where percent bottom cover will be used as a response indicator and demonstrate that the proposed value will protect aquatic life uses. Given the uncertainty with the proposed percent bottom

[7] New Zealand National Policy Statement for Freshwater Management 2014: Updated August 2017. Page 33.
[8] Suplee, M.W., and R. Sada, 2016. Section B.1.3. page B-5. Assessment Methodology for Determining Wadeable Stream Impairment Due to Excess Nitrogen and Phosphorus Levels. Helena, MT: Montana Dept. of Environmental Quality.

cover threshold, EPA recommends MDEQ use percent bottom cover as a secondary indicator of excess primary production *in conjunction with* other measures of adverse effects. Having a robust suite of response indicators is critical to determine that a stream fully supports its aquatic life uses.

Additionally, several of the references cited by the state refer to thresholds associated with protection of recreational use support. EPA recommends MDEQ independently evaluate the effect of the bottom cover threshold may have on aquatic life to ensure that the final proposed threshold is protective of the most sensitive use.

Indicators for Eastern Montana Wadeable Streams

11. **Application to all Eastern Montana Streams:** The 2016 Montana nutrient assessment method mentions that the 5.3 mg/L delta DO threshold was derived using data from both intermittent and perennial streams. Additionally, the 2021 Memo[9] indicates that data were collected at perennial, intermittent and wetland-like streams. Based on this information, EPA assumes that any response variables and associated TN and TP thresholds would be applicable to **all** eastern MT streams (i.e., perennial, intermittent and wetland-like) and used to implement CWA programs for these systems. Please clarify.

12. **Relevance of DO delta as nutrient response indicator/appropriate translator for nutrient criteria**: The preliminary results of Montana's 2013-17 delta DO study[10] lists watershed disturbance, precipitation, conductivity, nutrient levels, drainage area, and water temperature as important predictors of DO delta. Based on the study results, EPA recommends MDEQ document the extent to which DO delta responds to increasing nutrient concentrations and, therefore, serves as a reliable nutrient response variable. The 2021 memo suggests that delta DO may respond primarily to other non-nutrient related factors. If that is the case, please demonstrate whether MDEQ still considers delta DO as an appropriate nutrient response indicator for use in eastern Montana streams.

13. **Rationale for the proposed DO delta threshold:** EPA requests MDEQ share the data and analyses (i.e. 2016 nutrient assessment and the 2013-17 project) used to derive and/or support the proposed DO delta threshold of 5.3 mg/L. According to MDEQ's 2016 nutrient assessment method, the proposed 5.3 mg/L DO delta: (1) corresponds to the 90th percentile of the reference distribution of DO deltas for data collected from two reference sites during 2009-2010; (2) balances the probability of alpha and beta errors during assessment; and (3) is close to the lower bound of the 90% confidence interval of the 6.0 mg/L threshold calculated using change-point analyses. However, the currently available technical documents do not contain the data or analyses.
    - EPA recommends MDEQ revise the changepoint analysis to use readily available nutrient concentrations (TN or TP) as the predictor variable, instead of categorical nutrient ratings, for the change point analysis.
    - EPA requests that MDEQ share the results and present the changepoint analyses graphs for EPA to review the information in more detail. Another option would be for MDEQ to provide the raw data to EPA and EPA could complete its own analyses.

[9] Sada de Suplee, Rosie and M. Suplee M, 2021. Memo to the Nutrient Work Group Technical Subcommittee regarding "Dissolved Oxygen Delta Summary Findings in Prairie Streams."
[10] *Ibid.*

- EPA recommends MDEQ use the 2013-17 dataset (which is far more extensive than the 2009-2010 data used in threshold development) to evaluate and refine, as needed, the basis for the DO delta threshold selection.
- Please clarify whether the delta DO threshold would be applied as a daily or weekly measurement. The 2021 memo suggests that weekly averages are the "more adequate timeframe for assessing DO"; however, the state's current rationale for the proposed delta DO threshold is based on daily delta DO values.

14. **Protectiveness of the proposed DO delta threshold**: Based on a review of the articles provided by MDEQ to support the rationale for a delta DO threshold of 5.3 mg/L, EPA is concerned that a delta DO of 5.3 mg/L may not adequately protect aquatic life uses. For example,

    - The Suplee 2019 JAWRA article documents that: "Heiskary and Bouchard (2015) showed that the percent of tolerant fish increases sharply in a step fashion when DO delta (daily DO maximum–daily DO minimum) of Minnesota's warm-water rivers is above 3.5 mg/L; this undesirable change in the fishery can occur even when daily DO minima have not been found to drop below acceptable concentrations (Heiskary et al. 2013)."
    - MCPA adopted DO delta criteria that range from 3.0 to 4.5 mg/L, depending on geographic zone.[11] MPCA's analyses showed a decline of sensitive fish accompanied by a substantial increase in tolerant fish when DO delta values exceeded 4.5 mg/L.[12]
    - In Tennessee, the maximum DO delta reported was 4 mg/L at reference sites whereas about 45% of impacted streams assessed have measured DO deltas greater than 4.0 mg/L.[13]
    - Most importantly, Suplee at al. 2019 stated that "episodic and spatially discontinuous DO problems can occur at an average DO delta of 3.1 mg/L in a low gradient prairie stream."[14]

    This information and the data presented suggests a lower DO delta threshold may be warranted.

15. **Applicability and protectiveness of BOD as a response indicator:** MDEQ's 2019 study showed that BOD did not respond to increasing nutrient concentrations and therefore, would not be recommended as a nutrient response variable; specifically "there was no significant difference in stream water biochemical oxygen demand (BOD5) between the Before and After periods in either the Low or High Dose Reach." [15] Additionally, MDEQ's proposed threshold of 8 mg/L BOD does not appear to be protective of aquatic life uses. The proposed threshold was identified based on the widely accepted BOD categories for BOD and is associated with BOD concentrations that would allow "Many bacteria, much biodegradable matter."[16]

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[11] Heiskary, S.A., and R.W. Bouchard, Jr. 2015. Development of Eutrophication Criteria for Minnesota Streams and Rivers Using Multiple Lines of Evidence. Freshwater Science 34: 574–92. https://doi.org/10.1086/680662.
[12] *Ibid.*
[13] Arnwine, D. H. and K. J. Sparks. 2003. Comparison of Nutrient Levels, Periphyton Densities and Diurnal Dissolved Oxygen Patterns in Impaired and Reference Quality Streams in Tennessee. Nashville, Tennessee: Tennessee Department of Environment and Conservation, Division of Water Pollution Control.
[14] Suplee, M.W., R. Sada, and D.L. Feldman. 2019. Page 716. Aquatic Plant and Dissolved Oxygen Changes in a Reference-Condition Prairie Stream Subjected to Experimental Nutrient Enrichments. Journal of the American Water Resources Association 55 (3): 700–719. https://doi. org/10.1111/1752-1688.12736.
[15] *Ibid.* Page 707.
[16] Suplee, M.W., and R. Sada, 2016. Section C. 3.0. Assessment Methodology for Determining Wadeable Stream Impairment Due to Excess Nitrogen and Phosphorus Levels. Helena, MT: Montana Dept. of Environmental Quality.

Indicators for Nonwadeable Streams

For medium and large rivers, MDEQ has indicated that they plan to use water quality models to derive the TN and TP thresholds required to meet the selected response indicators. To date, the state has adopted (and EPA approved) numeric TN and TP criteria for individual segments of the Yellowstone River. It is EPA's understanding that the state is removing the applicable TN and TP criteria for those segments of the Yellowstone and plans to apply the general prohibitions narrative standard to all medium and nonwadeable rivers. Because the modeling approach would be applied to waters not previously covered by the NNC, it is EPA's understanding that MDEQ plans to adopt both new and revised WQS for nonwadeable systems.

MDEQ has not provided details that outline what the criteria will be or what detailed guidance dischargers will need to follow to derive model-based TN and TP thresholds. Absent detailed guidance and documentation from MDEQ that specifies the methodologies, models, minimum data requirements, QA/QC requirements, parameters and decision criteria that will be used to derive TN and TP thresholds, any nutrient values derived from the models will need to be submitted to EPA for review and approval prior to implementing the response variable or resulting total nitrogen or total phosphorus concentrations in Clean Water Act programs.