State of Minnesota

Minnesota Pollution Control Agency

In the Matter of Proposed Amendment to Minnesota Rules Chapters 7050 and 7053, Relating to Minnesota Rules 7050.0130, 7050.0220, 7050.0224, 7050.0470, 7050.0471, 7053.0135, 7053.0205, and 7053.0406,	MPCA Rebuttal Response to Public Comments
OAH Docket # 80-9003-34519	
Revisor ID 4324	December 1, 2017

MPCA Rebuttal Response to Public Comments Submitted During the Post-Hearing Public Comment Period.

I. Introduction

This document supplements information provided in the Minnesota Pollution Control Agency's (MPCA or Agency) Response to Comments Submitted during the Pre-Hearing Public Comment Period and at the Public Hearings, dated November 22, 2017 (Response to Comments).

This document contains the MPCA's detailed responses to public comments submitted during the post-hearing comment period following the final public hearing on November 2, 2017. The MPCA reviewed those comments and is addressing them in this Rebuttal Response to Public Comments Submitted During the Post-Hearing Public Comment Period (Rebuttal Response). The subjects of many of the public comments received were addressed previously in the MPCA's November 22, 2017 Response to Comments so that in this Rebuttal Response the MPCA will only respond in detail to those comments not previously addressed or that require a more complete response than was previously provided.[1]

The MPCA's Rebuttal Response consists of this document and a spreadsheet (Attachment 1) that identifies the comments received and the MPCA's response.

The next section of this document explains and discusses areas where the MPCA is proposing to rule language changes. The following section offers a response to comments. To the extent possible, the MPCA responds to some comments with short responses directly in the Attachment 1 spreadsheet in the column titled "MPCA Response." Where a more detailed response is necessary, the discussion is provided in this document.

The comment topics addressed in detail in Part III of this document are:

A. Scope of the Propose Rulemaking

B. Beneficial Use Comments

C. Waterbody Identification Numbers (WIDs)

D. Future Identification of Additional Class 4D Wild Rice Waters

[1] To meet the deadline for submitting post-hearing comments, MPCA focused on responding to comments available for review through November 17, 2017.

E. Application of Wild Rice Sulfate Standard to Streams

F. Comments on Specific Waters Proposed or Not Proposed as Wild Rice Waters

G. Comments on Developing the Magnitude of the Standard

H. Comments on the Duration, Flow Rate, Frequency, and Seasonality

I. Comments on NPDES Permitting

J. Sampling and Analytical Methods

K. Procedural Concerns

II. Proposed and Planned Rule Changes

Some commenters identified specific changes to the proposed rule language. In some cases, the MPCA agrees that the rule should be revised and has provided proposed revised language below. In other cases, the MPCA agrees that the rule language should be revised but is not ready at this point to provide specific language.

Rule Part: 7050.0130, Subp. 2b.

The MPCA plans to remove proposed rule language 7050.0130, Subp. 2b. (lines 1.11 to 1.12), the definition of cultivated wild rice water. EPA provided a comment stating, "Minn. R. § 7050.0130, Subpart 2b. Cultivated Waters. EPA's understanding is that the surface waters to which the proposed rules apply are those waters identified specifically in the proposed rules at Minn. R. § 7050.0471 and that none of the waters identified as wild rice waters at Minn. R. § 7050.0471 include sub areas that meet the definition of "cultivated waters." Unless otherwise specified in rule, EPA considers the Class 4D wild rice use (wild rice use) and criteria to be applicable to all waters identified in Minn. R. § 7050.0471." The MPCA agrees with EPA's interpretation and comment and has not (and will not in future) identify cultivated wild rice areas as Class 4D wild rice waters, because such waters do not need a sulfate standard. Therefore, we plan to remove the proposed definition.

Rule Part 7050.0220, Subpart 1, B (1 – 4) ; 7050.0220, Subpart 3a.

In several locations (line 2.19, line 2.22, line 3.2, line 3.8, and line 5.14), the MPCA added rule language to clarify that certain kinds of waters may hold multiple use classes and that the sulfate standard would apply to those waters if they were also specifically listed as Class 4D waters. The proposed rule language here was "4D when applicable to a wild rice water listed in part 7050.0471". EPA provided a comment that "4D is always applicable to water bodies listed in Minn. R. § 7050.0471 and so the phrase 'when applicable to a wild rice water listed in part 7050.0471' is superfluous. To avoid confusion as to whether there might be instances when 4D would not be applicable to a wild rice water listed in Minn. R. § 7050.0471, EPA recommended that the language be revised to simply say '4D for water bodies listed in part 7050.0471.'" The MPCA agrees with this comment and will make the recommended change.

Rule Part 7050.0220, Subpart 3a, A

In several locations (line 3.11, line 3.18, line 4.5, line 4.13, line 5.2, and line 5.16), the rule language contains tables that include columns listing use classes; the columns are then filled in with the related standards for each use class. Because the wild rice sulfate standard was originally listed within (as a subset of) Class 4A, it was

delineated within these lists with the words "wild rice present". The MPCA proposed to retain the structure of the tables and replace the language "Sulfates, wild rice present, mg/L" with "sulfate in a wild rice water" and the 10 mg/L standard with a reference to the equation. EPA provided a comment that the rule language should have a column heading for the 4D use class. The MPCA agrees that this structure would be clearer and will work with the Revisor to determine the feasibility of making such a change.

Rule Part 7050.0220, Subp. 6c

As earlier mentioned, the MPCA proposes to delete the definition of "Cultivated wild rice water." With the deletion of that definition, there is no need to reference the term in the definition of "Wild rice waters", particularly since wild rice waters are defined to be those water bodies identified in part 7050.0471. Therefore, the MPCA plans to delete the sentence at lines 2.3-2.4 that reads, "Wild rice waters do not include cultivated wild rice waters."

Rule Part 7050.0224, Subp. 5, B.

A comment from EPA recommended that the first sentence (lines 7.22-7.24) be revised to clarify that the annual average concentration of sulfate is that in the surface water. The MPCA agrees and is proposing to change the rule language to read:

> 7.22 B. The annual average concentration of sulfate in the surface water of a wild rice water must not exceed
> 7.23 the concentration established as the calculated sulfate standard under subitem (1) or alternate
> 7.24 sulfate standard under subitem (2) more than one year out of every ten years.

Rule Part 7050.0224, Subp. 5., B, (1)

This rule part contains the equation that is the primary option used to derive the numeric sulfate standard. EPA commented that "it is not possible to say with certainty that the relationships between sediment pore water sulfide and total organic carbon and total extractable iron used to calculate protective water column sulfate concentrations remain valid outside the range of the data used to develop the criterion." Comments from Nathan Johnson also raise this issue, stating "I would like to encourage the MPCA to carefully consider the range over which their empirical equation that relates the quantity of sulfide realized as a function of sediment iron, sediment carbon, and surface water sulfate…It is possible that a limitation on the model predictions could be imposed on this basis which would not allow high sulfate concentrations to be calculated by the model if the statistical strength of the model's predictive abilities towards the edge of the domains is limited.

Using the proposed equation to extrapolate to very high surface water sulfate concentrations (higher than those observed commonly in the observational dataset) represents a potential instance of applying the model beyond an appropriate domain of applicability. The same could be said for sediment carbon and iron."

The MPCA understands the concerns raised – namely that the equation is of unknown validity outside of the range of data used to develop it. "EPA recommends that potential input parameter values be constrained to reflect the range of concentrations observed in the studies upon which the criterion is based." The MPCA believes it is appropriate to respond to this concern by setting constraints on the implementation of the equation that would ensure that the equation is protective. The MPCA is proposing that input values of carbon cannot be lower than the minimum value in the range of data used to develop the equation, because carbon enhances sulfide production. The MPCA is proposing that input values of iron cannot be higher than the maximum value in the range of data used to develop the equation because iron removes sulfide from porewater.

The MPCA is proposing that output values of sulfate cannot be higher than the maximum value in the range of data used to develop the equation, 838 mg/L.

The constraint on sulfate is appropriate because observed sulfate levels were an input to the development of the equation, and the equation is of unknown validity outside the range used to develop it.

Such an approach will help assuage commenter concerns about exceedingly high sulfate levels that may result from the equation. The MPCA understands that this limitation will may raise more concerns for other commenters. The MPCA notes that this limitation only applies to one of three possible mechanisms to develop the numeric sulfate standard – the equation. While the equation is the primary mechanism for setting a sulfate standard, the alternate standard and a site-specific standard approach will also be available for appropriate conditions and could result in numeric standards that are higher or lower than calculated by the equation.

The MPCA is considering where and how to make such rule language changes (likely either here or in Subp. 5. B. (1)(d)) needed to implement this change.

Rule Part 7050.0224, Subp. 5., B, (1),(a – c)

These rule parts describe how sediment samples are to be collected and analyzed, based on the Sampling and Analytical Methods that are incorporated by reference. EPA provided comments that by adopting the methods by reference, "Minnesota may hamper its ability to respond to unforeseen technical issues that may arise as new sites are visited and for which application of the methods as written may lead to results that do not adequately protect the wild rice use as it occurs in a given water." EPA suggested various rule changes in pages 10 – 11 of its comment letter; the suggestions place more language directly in the rule but then do not incorporate the methods by reference.

Additionally, commenter Norman Miranda noted that "The dilemma I see for utility managers regardless of whatever protective limit is adopted is to convince their respective City Council and rate payers that a very limited number of samples and sample locations yielded adequate and conclusive data to justify a significant capital investment…I believe MPCA is on the right track offering a consistent sampling regiment of a fixed number of samples at a prescribed location array…I believe at least two sampling events conducted in appropriate but separate locations need to be conducted by the MPCA. I realize the MPCA has limited financial resources to conduct extensive sampling and analysis in multiple locations for every discharger. However, to offer some flexibility, I think the Rule should include a provision that municipalities/permitted facilities be given the opportunity to conduct additional sampling/testing beyond two events that would be required under the Rule. The ground rules for this additional sampling could include:

1. Regulated party must submit a plan for MPCA approval showing proposed alternative sample locations.
2. Sampling must follow MPCA "Sampling and Analytical Methods" and be conducted by approved lab/consultant.
3. Sampling/testing to be done before or concurrent with MPCA sampling as not to delay MPCA's schedule.
4. Cost of additional sampling events to be the responsibility of the Regulated Party.

In return I believe there should be language where the MPCA will give the Regulated Party's data set the same weight if all conditions are followed."

The MPCA does agree that some flexibility may be needed as more sampling occurs, and appreciates that many permittees want to do more sampling (and perhaps sooner) than the MPCA plans to undertake. While the MPCA

has planned to do most sampling with our own resources, we have always planned to allow the use of data submitted by other parties (whether regulated/permitted parties or others) if it meets our requirements.

A primary goal of incorporating the sampling methodology into the rule was to provide clarity so that others can conduct sampling and to ensure that the sampling, which is foundational to the developing of a numeric sulfate standard, is completed consistently and accurately. The MPCA believes this is an important goal and will continue to incorporate the methods by reference. Changes to the methods will need to be made through rulemaking.

However, MPCA is proposing a rule language change at lines 8.6, 8.11, and 8.13 to require that analysis and sampling happen consistent with the methods, rather than requiring exact adherence to the methods. This will allow some flexibility if, for example, an analytical method is slightly updated. The MPCA is also proposing to add language that the sediment samples are collected in areas where wild rice is growing or may grow within the wild rice water.

The proposed rule language would then read:

> Where:
> 8.5 (a) organic carbon is the amount of organic matter in dry sediment. The
> 8.6 concentration is expressed as percentage of carbon, as determined ~~using~~ consistent with the method for
> 8.7 organic carbon analysis in Sampling and Analytical Methods for Wild Rice Waters, which
> 8.8 is incorporated by reference in item E;
> 8.9 (b) iron is the amount of extractable iron in dry sediment. The
> 8.10 concentration is expressed as micrograms of iron per gram of dry sediment, as determined
> 8.11 ~~using~~ consistent with the method for extractable iron in Sampling and Analytical Methods for Wild Rice
> 8.12 Waters;
> 8.13 (c) sediment samples are collected ~~using~~ consistent with the procedures established in
> 8.14 Sampling and Analytical Methods for Wild Rice Waters; and

The MPCA is then proposing additional related changes, likely to be codified as rule part 7050.0224, Subp. 5., E. which would read as follows:

> For each wild rice water identified in 7050.0471, the methods for selecting sediment sampling sites and for collecting, processing and analyzing sediment samples must be documented, including all QA/QC. Where methods are used that are consistent with but different from those specified in Sampling and Analytical Methods for Wild Rice Waters, the intended methods and how they will be used to calculate the numeric sulfate standard must be submitted to and approved by the Commissioner prior to sample collection.

The incorporation by reference would then be moved to Subp. 5., F.

The MPCA believes this change will allow flexibility when other parties wish to undertake sampling of wild rice waters needed to calculate a protective sulfate value, while ensuring the necessary consistency. The MPCA believes sampling by others could occur at any time; if MPCA sampling has already occurred, the intended methods should describe how both the MPCA gathered data and any additional data will be used in concert. Regardless of the method employed, it is intended that all sampling be documented as required by this rule language. The MPCA will make the final determination about the numeric sulfate standard for any given water body.

Rule Part 7050.0224, Subp. 5., B (2)

The MPCA proposes to change the phrase "ambient sulfate concentration" found in this rule part at lines 8.19 and 8.23 to "surface water sulfate concentration" to be consistent with the rule language change suggested by EPA for line 7.22.

The MPCA received several comments about the alternate standard. This section responds to many of those comments by describing how MPCA envisions that the alternate standard procedure would work and setting forth some proposed rule changes.

This alternate standard procedure develops a replicable approach to developing an alternate standard for areas where the equation does not fit – where there is high sulfate but low porewater sulfide. Some commenters (e.g., Mining Minnesota) have stated that the alternate standard procedure is unclear and creates confusion. They have said that the "Sampling Methods do not include a clear description of the purpose of the porewater sampling", and that the language "create[s] substantial confusion as to what water quality standards [will] actually be applied by the MPCA in any given circumstance."

The MPCA envisions that the alternate standard would be used in places where sediment and surface water sampling has been completed, the equation indicates that the calculated numeric standard is being exceeded in the surface water of the wild rice water, but there are indications that porewater sulfide may not be above the 120 µg/L protective threshold. These indications may be, for example, information about groundwater upwelling or evidence of thriving wild rice (see p. 67 of the TSD). In these situations, if MPCA has done the sediment sampling the MPCA may choose to go back to do porewater sulfide sampling; MPCA also envisions that a permittee may do porewater sulfide sampling and request that the alternate standard approach be used to develop the numeric sulfate standard.

One of MPCA's goals for this rule language was to set out a procedure that is sufficiently defined in rule to be approved by EPA as an alternate methodology to the equation for specifying a numeric sulfate standard. This would obviate the need for each individual sulfate standard developed via the alternate method to be submitted to EPA as a site-specific standard for their approval. In their comment letter, EPA noted that "The only situation where states would not need to submit any new or revised water quality criteria to EPA for review and approval would be where states have adopted and EPA has approved a 'performance-based' standard that relies on regulatory adoption of a process (i.e., a criterion derivation methodology) rather than a specific outcome (i.e., a concentration limit for a pollutant) . . . when such a performance-based approach is binding; sufficiently detailed; and contains suitable safeguards to ensure predictable, repeatable outcomes, EPA's approval of such an approach can also serve as approval of the outcomes as well. If a state's approach is not sufficiently detailed or lacks appropriate safeguards to produce predictable outcomes, EPA review of a specific outcome remains necessary." EPA's comments indicate that they do not find the current rule language to have sufficient specificity to meet this threshold, and suggest that MPCA could add sufficient detail to satisfy the requirements.

Other commenters (USS, Mining Minnesota, etc.) also felt that the alternate standard was vaguely described. The MPCA intends to provide more clarity and meet EPA's requirements for a performance-based rule by revising the rule language. As stated in the TSD on page 70, "it is likely that the maximum increase in porewater sulfide concentrations as a result of increased sulfate would be proportional to the increase in sulfate…With this understanding, a conservative alternate standard would be an increase in the observed ambient sulfate that is proportional to the degree that 120 µg/L is greater than the observed maximum porewater sulfide concentration. For instance, if the observed porewater sulfide was 80 µg/L and the observed surface water sulfate was 110 mg/L, a conservative sulfide standard would be 165 mg/L sulfate (120/80 * 110 mg/L)."

The MPCA plans to revise the rule language. The rule language currently reads (line 8.18 to 8.25):

(2) The commissioner may establish an alternate sulfate standard for a wild rice water when the ambient sulfate concentration is above the calculated sulfate standard and data demonstrates that sulfide concentrations in pore water are 120 micrograms per liter or less. Data must be gathered using the procedures specified in Sampling and Analytical Methods for Wild Rice Waters, which is incorporated by reference in item E. The alternate sulfate standard established must be either the annual average sulfate concentration in the ambient water or a level of sulfate the commissioner has determined will maintain the sulfide concentrations in pore water at or below 120 micrograms per liter.

The MPCA's planned revision, subject to review by the Revisor, would be

(2) The commissioner may establish an alternate sulfate standard for a wild rice water when the ~~ambient~~ surface water sulfate concentration is above the calculated sulfate standard and data demonstrates that sulfide concentrations in pore water are 120 micrograms per liter or less. Data must be gathered ~~using~~ consistent with the procedures specified in Sampling and Analytical Methods for Wild Rice Waters, which is incorporated by reference in item E. The alternate sulfate standard ~~established must be either the annual average sulfate concentration in the ambient water or a level of sulfate the commissioner has determined will maintain the sulfide concentrations in pore water at or below 120 micrograms per liter.~~ is determined by calculating the ratio of measured sulfide, in micrograms per liter, to 120 micrograms per liter and applying that ratio to the surface water sulfate as follows $\frac{120}{porewater\ sulfide} * surface\ water\ sulfate.$

The EPA notes that MPCA must also have supporting documentation specifying how much sulfate and sulfide data is sufficient to describe the empirical relationship between the two in the specific wild rice water. This information is contained in the methods incorporated by reference.

The MPCA believes this revision ensures the process is sufficiently repeatable and detailed to qualify as a performance based standard that does not require individual EPA review. If EPA does not agree, the rule language provides helpful additional clarity but MPCA will submit alternate standards through the EPA's site-specific standards process; MPCA does not find that language about that process is needed in the rule either in this section or in the section about the site-specific standard.

Rule Part 7050.0224, Subp. 5., E.

This rule part contains the incorporation of Sampling and Analytical Methods for Wild Rice Waters by reference. It is important to note that documents incorporated by reference have the standing of rule and should not be viewed as guidance. They are fully enforceable. EPA provided many detailed comments on the Sampling and Analytical methods. Additional detailed comments were provided by other commenters such as Mining Minnesota.

MPCA intends to review those carefully and may make changes to the methods. Some of these changes are likely needed to reflect the prior rule language change that sediment and porewater sampling and analysis must be completed in a manner "consistent with" the methods document. MPCA will be reviewing to see where the methods document can contain broader language – such as by not specifying exactly how samples are to be dried and pulverized if that is not intrinsic to the resulting calculation – to respond to comments about the methods being overly specific.

However, the MPCA believes that in many cases the level of detail that is requested by EPA or other commenters is inappropriate to include as binding language in rule, and many commenters seem to believe that parts of the methods document are already overly restrictive. EPA seems to have intended these comments to apply to a "technical guidance" document not incorporated by reference and purported to have the same

standing as rule language. However, technical guidance would not have the same standing unless expressly incorporated by reference. The MPCA will also consider the need for a Standard Operating Procedure and additional detail as a useful guide for sampling, but such a detailed document would not be incorporated in rule. It would be available to others who wish to do sampling in order to help them develop their alternative sampling method or protocol as needed for approval by the MPCA.

Rule Part 7050.0471, Subp. 2.

This rule part sets out that MPCA will solicit information to identify new Class 4D wild rice waters in the Triennial Standards Review, and provides an illustrative example of the types of evidence that should be provided. EPA suggests that MPCA should provide additional details about how this review would be accomplished and the type of information that would be needed. MPCA agrees that additional details would be helpful, but will best be included in the public notice process for each triennial review.

Other commenters raise concerns that the types of evidence that MPCA lists is overly restrictive. A response to these comments can be found in the response to the topic "Listing of Waters". However, in re-reading the rule language, the MPCA notes that the statement that the evidence "must demonstrate the wild rice beneficial use exists" is somewhat restrictive. It is the MPCA's responsibility to demonstrate, based on available information, that the wild rice beneficial use exists or has existed. Furthermore. The MPCA does not intend to limit the evidence that commenters provide as part of the triennial review process, but instead to clearly lay out the demonstration that the MPCA will need to make as part of any rulemaking process to add Class 4D wild rice waters. In order to clarify this, the MPCA is proposing the following rule change:

11.18 Subp. 2. Triennial review and future identification of wild rice waters. As part of each triennial review of water-quality standards
11.19 conducted under Code of Federal Regulations, title 40, section 131.20, the commissioner
11.20 must solicit evidence that supports identifying additional wild rice waters in rule. Identifying additional waters in rule must be based on ~~The~~
11.21 evidence ~~must demonstrate~~ that supports a demonstration that the wild rice beneficial use exists or has existed on or after
11.22 November 28, 1975, in the water body, such as by showing a history of human harvest or
11.23 use of the grain as food for wildlife or by showing that a cumulative total of at least two
11.24 acres of wild rice are present. Acceptable types of evidence include:
12.1 A. written or oral histories that meet the criteria of validity, reliability, and
12.2 consistency;
12.3 B. written records, such as harvest records;
12.4 C. photographs, aerial surveys, or field surveys; or
12.5 D. other quantitative or qualitative information that provides a reasonable basis
12.6 to conclude that the wild rice beneficial use exists.

Rule Part 7050.0471 – List of Waters

The MPCA is proposing three changes to the proposed list of Class 4D wild rice waters. The reasons for these changes are addressed in the section of this document about specific wild rice waters. The MPCA is proposing to remove the following waters from the list of wild rice waters in Subp. 3., C.

Line 16.21 (42) Mud Lake St. Louis 69-0652-00

Line 17.1 (49) Round Lake St. Louis 69-0649-00

In addition, MPCA is proposing to split the Embarrass River WID 04010201-577 into two separate WIDs – one from Embarrass Lake through Esquagama Lake and the other from Esquagama Lake to the St. Louis River. Both stretches will receive new WID numbers to identify them. The MPCA proposes to list the WID from Embarrass Lake through Esquagama Lake as a Class 4D wild rice water. The MPCA does not have sufficient information to list the segment from Esquagama Lake to the St. Louis River as a Class 4D wild rice water and will therefore track it as an insufficient information water.

III. Detailed Rebuttal Responses

A. Scope of the Proposed Rulemaking

Many commenters have expressed concerns about the scope of the proposed rulemaking, asserting that it is too narrowly focused and therefore somehow fundamentally flawed. MPCA has responded to specific and general comments about scope in the 11/22/17 Response to Comments and elsewhere in this Rebuttal Response. It may be useful to also note here, however, that the number and volume of comments received prior to, during and after the Administrative Hearings for this rulemaking speaks to the reasonableness of the MPCA's decision to focus the scope of this rulemaking as it has. Given the complexity of the science of sulfate, sulfide and wild rice; the extensive interest in both wild rice and in the activities that may result in sulfate discharges; and the immediate need to address the difficulties in interpreting and implementing the existing wild rice sulfate standard it was reasonable for the MPCA to focus the scope of this rulemaking as it has.

Aquatic Life Standard

Some commenters (MCEA) also stated that "the SONAR generally proceeds on the assumption that if a water body or discharge does not need limits on the discharge of sulfate to protect wild rice, it does not need any limit on sulfate discharges at all. In other words, it is presumed that if there is no wild rice to be protected, that any amount of sulfate may be allowed because any amount of sulfate is presumed to be harmless to fish and other aquatic life. However, at high concentrations, sulfate is harmful to a number of aquatic uses. While probably in most cases the 10 mg/L sulfate standard is more stringent than necessary to protect uses other than wild rice, Minnesota should not throw out its only numeric sulfate standard without establishing standards to protect other uses. Doing so would have the effect of weakening protections for aquatic life from sulfate pollution."

MPCA has never made an assertion that it is not necessary to consider sulfate impacts on other beneficial uses. Rather, MPCA has explained its reasonable decision to limit the scope of this rulemaking to the effects of sulfate on the wild rice beneficial use (see Cover memorandum to the MPCA's 11/22/17 response to Comments). In fact, a sulfate standard to protect aquatic life is on the MPCA's list of potential future water quality standards development and rulemaking efforts (see https://www.pca.state.mn.us/water/mpca%E2%80%99s-proposed-water-quality-standards-work-plan-2018-2020). The SONAR does not speak to other uses because the purpose of this rulemaking was to revise and clarify the sulfate standard related to wild rice.

B. Beneficial Use Comments

Several commenters had detailed comments concerning the beneficial use and how the MPCA has designated waters. Many of the comments are addressed here, but they also overlap with comment addressed in the section discussing water body identification numbers (WIDs).

Background

Discussions related to the Clean Water Act often use three terms that include the word "use." These are – beneficial use, designated use, and existing use. It is helpful to understand these terms in order to better understand our response to comments which follow.

Beneficial use and designated use are generally used interchangeably. The MPCA refers to the wild rice "beneficial use," while EPA and other commenters might refer to the same concept as the "designated use."

According to EPA, designated uses "specify goals and expectations for how each water body is used. Typical designated uses include:

1. Protection and propagation of fish, shellfish and wildlife
2. Recreation
3. Public drinking water supply
4. Agricultural, industrial, navigational and other purposes."[2]

The terms "designated use" and "beneficial use" both refer to the goals and expectations that Minnesota has set for the use of a water body. Minnesota has identified 7 beneficial use classes which are listed in Minnesota Rules 7050.0140.

A critical goal of the CWA, as stated in section 101(a)(2) of the Act, is to ensure that all waters are fishable and swimmable. "The national goal in CWA section 101(a)(2) is water quality that provides for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water where attainable" (80 Fed. Reg. 51024, Aug.21, 2015). Thus, these fishable, swimmable goals are known as the "101(a)(2)" beneficial uses. In Minnesota, CWA section 101(a)(2) beneficial uses are protected in Class 2 of the beneficial use classes in Minnesota Rules Chapter 7050.

States may also identify beneficial uses other than 101(a)(2) beneficial uses. These other beneficial uses often include protecting water quality for drinking water, industrial use, or agriculture. Minnesota has identified 7 beneficial use classes in Minnesota Rules 7050.0140. The wild rice beneficial use of "use of the grain as food for humans and wildlife" is one of these other beneficial uses and is found in Class 4 (Minn. R. 7050.0224), which protects waters supporting agriculture and wildlife uses.

Some beneficial uses (such as Class 2) are designated to apply to all water bodies in Minnesota, while other beneficial uses are designated to apply to specific water bodies (such as the Class 1 use for drinking water, which only applies to a subset of Minnesota waters).

A single waterbody may be designated as having more than one beneficial use. For example, a single waterbody may be designated as having both Class 2 and Class 4 beneficial uses.

In 1973, the Class 4 wild rice beneficial use was initially designated to apply to "water used for production of wild rice." In a 1998 rulemaking, the MPCA specifically identified a list of 24 selected wild rice waters to which the use and the narrative standard of specifically applied. See Minn. R. 7050.0470. However, other specific waters to which this category applied were never identified. Therefore, up to this point designating the specific waters to which this beneficial use applies has been a case-by-case determination. With this rulemaking the MPCA is specifically identifying, by WID, those waters that have been designated as having the wild rice beneficial use.

[2] https://www.epa.gov/standards-water-body-health/what-are-water-quality-standards#designated

Under the CWA, the term "existing use" means that a designated beneficial use actually existed (was attained) in a water body at any time on or after November 28, 1975 (the date on which the CWA became effective). The concept of existing use is somewhat confusing because to establish an "existing use" you must consider a time period that starts in 1975 and continues to the present. If at any point in time from November 28, 1975, to the present a designated beneficial use existed in a water body, that beneficial use is an "existing use."

Beneficial Use, Designated Use, Existing Use

Some commenters suggested that MPCA confused the idea of a designated use and an existing use. The Fond du Lac band stated "The CWA protects both "designated" and "existing" uses of water bodies…

"Designated uses" are "those uses specified in water quality standards for each water body or segment whether or not they are being attained." 40 C.F.R. § 131.3(f). Designated uses are not dependent on whether or not conditions currently support the use."

The MPCA has not confused the concepts of "designated use" and "existing use." The MPCA used the existing use concept to identify waters where the Class 4D wild rice waters beneficial use would be designated (the beneficial use was previously "waters used for production of wild rice" and is now "Class 4D wild rice waters"). As stated above, the term "existing use" means that the designated beneficial use actually existed in the water on or after November 28, 1975. The MPCA is designating 1300 waters by WID as Class 4D wild rice waters where the beneficial use of wild rice has existed in the water on or after November 28, 1975. The two concepts are tied together, but are not used inappropriately by the MPCA.

When the wild rice sulfate standard was originally adopted, it was clearly intended to apply to a subset of Minnesota waters – those *used* for wild rice production -- not all Minnesota waters (SONAR, p. 20). A plain language reading of the original beneficial use description, which references use for wild rice production, supports the MPCA's reasonable reliance on this concept in specifying the Class 4D wild rice waters. It is also reasonable for the MPCA to identify waters where the Class 4D wild rice waters beneficial use applies as those waters where the wild rice beneficial use has existed in the water on or after November 28, 1975.

Class 2 Use vs Class 4 Use

Many commenters indicated that the wild rice beneficial use was inappropriately placed in the Class 4 Agriculture and Wildlife Use Class in 1973; and should be reclassified as a Class 2 aquatic life beneficial use because they assert it is a 101(a)(2) use under the CWA. For example:

- The Fond du Lac Band of Lake Superior Chippewa commented that the MPCA should have considered tribal recommendations to "elevate the unique qualities and characteristics beyond simply 'food.'"
- The Minnesota Center for Environmental Advocacy asserted that the wild rice beneficial use is a 101(a)(2) use because wild rice is properly seen as a form of wildlife, wild rice is closely related to propagation of wildlife, and because the collection of wild rice can be considered a form of "recreation on the water."
- Water Legacy commented that when a "designated use" pertains to fish, shellfish, recreation or wildlife, the use has special protection under Section 101(a)(2) of the Clean Water Act.

The MPCA has repeatedly asserted and provided an affirmative demonstration in the SONAR and the Response to Comments dated November 22, 2017, that the wild rice beneficial use is appropriately retained as a Class 4 use, related to agriculture and wildlife uses; it is not a Class 2 use. The MPCA established this beneficial use

through rulemaking in 1973 and rule amendments in 1997. When the Class 4A wild rice beneficial use was adopted in 1973 it clearly did not apply to all waters, which is evidence of the fact that this beneficial use is not and should not be interpreted as a CWA section 101(a)(2) use. As noted on pp. 33-35 of the SONAR, in this rulemaking the MPCA is clarifying the existing Class 4 beneficial use; the MPCA is not removing the existing Class 4 beneficial use, nor designating a new wild rice beneficial use. This effort is focused on protecting the specific wild rice beneficial use of use of the grain as a food source for humans and wildlife, not aquatic life more generally as do CWA 101(a)(2) uses. Furthermore, while wild rice is a food source for wildlife, it is not the only food source and it is therefore not reasonable to conclude that the Class 4D wild rice beneficial use is "necessary for protection and propagation of fish, shellfish and wildlife." (Fond du Lac Band, p. 24)

Identifying Waters

The MPCA also received comments that the agency was removing a designated use or existing use as part of this rulemaking when it failed to identify certain waters as wild rice waters. The comments referred to all waters listed in Appendix B of MDNR's 2008 *Natural Wild Rice in Minnesota* report and the I854 Treaty Authority's 2016 and 2017 lists of wild rice waters. The Friends of the Boundary Waters comment letter asserts that "MPCA is removing an "existing use" because MPCA has proposed a list of wild rice waters that omits many waters despite evidence that wild rice grows or has grown in them." The Fond du Lac Band's comment letter argues that the MPCA is removing a designated use when it did not include all of the waters included in Appendix B of the MDNR's 2008 report *Natural Wild Rice in Minnesota*. The Band commented that "the more than 900 excluded water bodies have the 'designated use' of wild rice waters because that use was 'specified in water quality standards' for those waters, when the state designated all surface waters in the state as Class 4A waters used for the production of wild rice." Commenters also disputed the MPCA's statement in the SONAR that the MDNR inventory in Appendix B was not developed for regulatory use. The Fond du Lac Band commented that the MPCA actually used the list for regulation of water quality when it used the list to review water discharge permits to evaluate if they discharged to wild rice waters.

The MPCA does not agree that all surface waters in the state are class 4A waters used for production of wild rice. The existing Class 4A rule has a sulfate standard that is only "applicable to water used for production of wild rice." This language is a modifier that serves to limit the scope of the waters to which the standard applies- not all Class 4A waters, but just those waters that are "used for production of wild rice." This modifier establishes a new sub-class of Class 4A, clearly demonstrating that not all Class 4A waters are wild rice waters.

The MPCA also does not agree that the presence (or evidence of past presence) of any amount of wild rice is indicative that the Class 4D wild rice beneficial use is an existing use in that water body. This topic is covered in depth in Section 6D of the SONAR and in the MPCA's Response to Comments dated November 22, 2017.

Finally, the MPCA does not agree that presence of a waterbody in the inventory found in Appendix B of MDNR's 2008 *Natural Wild Rice in Minnesota—A Wild Rice Report Study Report to the Legislature* is sufficient to demonstrate the beneficial use of the grain as a food source for wildlife and humans. The MDNR report was not developed for regulatory purposes and the MDNR is not a regulatory agency under the Clean Water Act. Although the MDNR report is the most comprehensive statewide inventory available, it has some limitations with respect to the MPCA's need to identify Class 4D wild rice waters subject to the wild rice sulfate standard. For example, the report does not consider density or acreage estimates for all the wild rice stands and it contains only limited information on streams. (see discussion in SONAR pp.42-51 and Response Exhibit N.28 e-mail from Ray Norrgard about DNR inventories). MPCA's evaluation of 1854 Treaty Authority Waters was discussed in MPCA's November 22, 2017 response to comments in Attachment 1.

The discussion cited by a commenter detailing how the MPCA conducted the permit review process to determine if waters were "water used for production of wild rice" shows that the MPCA did NOT treat the 2008 MDNR list as definitive or presumptively valid. As noted there, the MPCA reviewed multiple wild rice records and databases maintained by the MDNR (as was done to establish the list of Class 4D wild rice waters for this rulemaking), and in many cases, required permit applicants to conduct a survey of wild rice in the receiving waters. If the MDNR 2008 list was definitive, then additional surveys would not have been needed.

Other commenters (Mining Minnesota, etc.) have stated that "MPCA has elected to over-designate waters", and that "MPCA does not have statutory authority to designate waters that contain no wild rice as 'wild rice waters' subject to the requirements of Minn. R. ch. 7050." As described here, the MPCA has identified those waters where wild rice is an existing use as wild rice waters. Some of those waters may not have wild rice today, but under the CWA must be protected if the use has existed since November 28, 1975.

C. Waterbody Identification Numbers (WIDs)

Mining Minnesota commented that the application of the standard to the entire WID is inappropriate because it does not require wild rice presence within the WID, and because application of the standard to an entire WID is overly broad.

The comment letter suggests that the identification of a wild rice water should require the actual presence of rice in the waters over a defined period (4-6 years) and that an opportunity for public comment should be required before identifying wild rice waters.

The MPCA does not agree that actual presence of rice is required for identification of a Class 4D wild rice water. Class 4D wild rice waters identified in the proposed rule are the lakes, reservoirs, streams and wetlands where the MPCA has concluded that the beneficial use has existed since November 28, 1975. (November 28, 1975, is a key date in the Clean Water Act. Any beneficial use that a water body actually attained on or since that date is an existing use, and water quality should be such as to ensure that existing use is maintained.) The MPCA agrees that the public should have an opportunity for public comment when wild rice waters are identified. The current public comment period provides this opportunity for the MPCA's proposed Class 4D wild rice waters, and rulemaking is required for any future listing of wild rice waters. Rulemaking always includes an opportunity for public comment.

The commenter also raised concerns that the use of WIDs gives the agency "virtually unfettered discretion to identify and regulate 'wild rice waters' after the rulemaking process has been completed. There are no objective criteria included in the Proposed Rules for determining WIDs, and there is no public process by which interested parties can provide MPCA with information as to how to determine WIDS or their boundaries other than in the cumbersome rulemaking process."

WIDs are unique numeric identifiers assigned to surface waters that are used throughout the MPCA's permitting, water assessment and monitoring programs. This use of unique identifiers for lakes and stream reaches is well established in Minnesota. The MPCA has been using this system of unique lake and stream identifiers since 2001 for its water quality assessments and the MDNR has assigned the DOW numbers (the same as lake WIDs) for lakes since at least 1968. See SONAR Part 1D pp.39-41 for background on the reasonable scientific and hydrological bases for decisions on how WIDs are assigned. Unique numeric identifiers for lakes and stream reaches are essential in Minnesota where there may be many waters in the state with identical names.

The MPCA disagrees that the use of WIDs provides the agency with undue discretion to change where the wild rice standard applies. WIDs are an important component of the MPCA's water programs. For example, they are used to identify impaired waters for public review and reporting to EPA. (Note that for the impaired waters list they are known as assessment unit IDs or AUIDs. The MPCA is moving towards the WID nomenclature in all contexts. The AUID and WID numbers are the same.) The MPCA is committed to documenting WIDs with numeric sulfate standards on the Agency's website, and plans to provide map layers or other tools to make the geographic boundaries of WIDs more accessible. As noted in the EPA comments "EPA emphasizes that modifications to a WID number are only permissible as long as the designation of the WID as a wild rice water is not removed for the entirety of a WID or any subpart of a WID previously approved as a wild rice water". Otherwise, the modifications require rulemaking. The MPCA agrees with EPA's statement that rulemaking is required for any WID modification that may result in removal of a wild rice water from any part or subpart of a WID. Although it may be perceived by the commenter as cumbersome, this rulemaking process will provide the public process by which interested parties can provide comments.

The MPCA will address the comments about application of the standard to the entire WID in three parts: first, applicability of the standard to WIDs in lakes, wetlands and reservoirs; secondly, applicability of the standard to stream and river WIDS; and thirdly, the MPCA's plan for exceptions to the proposed approach.

1. The MPCA's decision to apply the standard to the entire WID for lakes, wetlands and reservoirs was straightforward and is reasonable because in most cases water moves and mixes throughout the entire waterbody. Therefore, discharge to any part of the WID will affect sulfide production in every other part. There are some limited cases where one part of a lake, such as a bay, may be hydrologically isolated, and will not mix with the rest of the waters of the lake. In these cases, the state has a mechanism to assign more than one WID to a lake or reservoir; and each hydrologically separate part of the water body is assigned a unique WID. In these limited cases, the MPCA will make a separate determination of whether each part of the waterbody is a wild rice water. See SONAR Part F. p.93 for further discussion and an example.

2. MPCA's decision to apply the standard to an entire WID for streams and rivers was more complex, and the MPCA considered many alternatives before deciding to apply the standard based on documented presence of the wild rice beneficial use at some point in the WID and to have the standard applicable to the entire WID. Briefly, the alternatives MPCA considered were:

    a. Applying the standard within a distance range from where the beneficial use is present or had been previously documented (MPCA at one time considered 800 meters upstream and downstream of where the rice was located). However, this proved unworkable because further investigation of sources used to identify wild rice waters showed a lack of evidence detailing the exact location of the rice. In some cases, this was due to how information was collected, but it is also because wild rice is known to move around within a water from year to year.

    b. Basing the identification of where the standard applies on the presence of suitable conditions in the wild rice water that would support wild rice. This idea was rejected as it would be very difficult to implement because of the variability of conditions for wild rice growth or the presence of other factors that could limit the growth of wild rice (e.g., wild rice will not grow where water levels vary too widely.)

    c. Establishing wild rice waters at a level smaller than a WID. This would require either subdividing existing WIDs into smaller units or establishing a wholly separate system of WIDs for wild rice

waters. While it would be possible to request WID splits to better identify where wild rice might be present within an existing stream WID, it would not be reasonable to do so in every case. The WID is used by the MPCA as the main administrative designation used to assess whether a stream reach may be impaired for a variety of parameters such as dissolved oxygen, sulfate, nutrients and various toxic substances. While a series of smaller WIDs might better represent the location of wild rice, smaller WIDs would like make it more difficult for the MPCA and others to collect representative samples to characterize conditions for other parameters and would also create additional administrative and monitoring burdens. See SONAR Part 6F pp. 93-96 for further discussion.

After considering alternatives, the MPCA decided to establish wild rice waters at the WID level. This choice was reasonable because, as discussed in the SONAR at 39-41, the existing WID nomenclature provides a consistent, accessible, and reliable system to identify specific portions of streams and rivers as wild rice waters.

3. The MPCA recognizes that there may cases where the presence of wild rice within a large or very diverse WID does not justify the application of the standard to the entire WID. The MPCA had originally suggested a proposed amendment for Minn. R. Chapter 7053, which allowed the commissioner to determine that an effluent limit is not necessary under certain circumstances. These circumstances generally relate to the location of a discharge within the wild rice water; e.g., discharge from a facility only affects part of a wild rice water where there is no wild rice. Or there may be specific hydraulic or substrate conditions in the part of the WID that dischargers affects that would prevent growth of wild rice regardless of sulfate levels. Some commenters objected to this provision in the rule, and the EPA also suggested the removal of this provision. In Part IV of the Cover Memorandum to the November 22, 2017 response, MPCA proposed to remove this proposed provision from part 7053.0406, subpart 1. Even with the removal of the proposed amendment to Minn. R. Chapter 7053, there is an approach for situations where rice is not and cannot grow within part of a WID. In these situations, the MPCA can split the WID and conduct a use and value determination (see response to topic area 1.6 in Attachment 1 in MPCA's November 22, 2017 Response to Comments) to remove the wild rice beneficial use from the WID that does not support the beneficial use.

D. Future Identification of Additional Class 4D Wild Rice Waters and Triennial Standards Review

The proposed rule specifies that the sulfate standard applies only to Class 4D wild rice waters, and that those waters must be specified in rule. MPCA has proposed rule language requiring the Commissioner to solicit information about wild rice waters as part of the triennial standards review process that is mandated by the Clean Water Act. The MPCA would then, as a separate process, undertake rulemaking to add any waters to the list of Class 4D wild rice waters to which the standard applies.

Several commenters have raised concerns about the proposed rule language regarding soliciting future evidence for listing waters as Class 4D wild rice waters.

First, one commenter (Fond du Lac Band) stated that "the State admits that its methodology for identifying existing uses may fail, because it provides a process for parties to add water bodies to its list in the future by proving that a water has been used for wild rice in the past". The MPCA's acknowledgement that the list of Class 4D wild rice waters is likely to be incomplete and need to be updated does not mean that the methodology is a failure. The Clean Water Act has a rebuttable presumption that 101(a)(2) uses apply "unless states and authorized tribes show those uses are unattainable" (Water Quality Standards Regulatory Revisions, 80 Fed.

Reg. 51020 (Aug. 21, 2015).) There is no such presumption for non-101(a)(2) uses, such as wild rice, so it is not unreasonable or unexpected for states to designate such beneficial uses as they are found.

One commenter, WaterLegacy, stated that the Minn. R. 7050.041 Subp. 2 "proposed rule section requiring that the commissioner must solicit evidence that supports identifying additional wild rice waters as part of triennial review is, at best, superfluous." The MPCA agrees that we could solicit information about water bodies to add to the list of Class 4D wild rice waters without the proposed language. However, particularly given concern by Tribes and stakeholders about the lack of additions to the list of [WR] waters since their initial promulgation in 1998, the MPCA felt it was important to make our intent clear. Namely, that we are interested in gathering more information about waters that are not presently identified as proposed Class 4D wild rice waters due to a lack of information and will be specifically asking for the public to provide information for consideration in future rulemaking.

Other comments (Cleveland-Cliffs) found that the "MPCA's guidelines in proposed part 7050.0471 for how to demonstrate that the beneficial use exists in a water provide no further clarity. The proposed rule simply lists non-mandatory types of evidence that can be used to establish the beneficial use."

In this proposed rule language, the MPCA felt that it was important to give those people who wish to provide information to support future listing of waters some kind of goal or target for the information that they should be providing; therefore, the proposed rule language describes what the evidence must show in order for it to be used in development of a SONAR for a future rulemaking. The criteria and types of evidence listed mirror the process the MPCA went through to develop the proposed list of waters in this rulemaking. In developing the list of proposed wild rice waters the MPCA used not only a history of human harvest, but other evidence that rice was present in sufficient amounts (acreage, density) to support the beneficial use. The MPCA did not rely solely on human harvest history as one commenter (MCEA) implies.

Other commenters (e.g. Cleveland-Cliffs) are concerned that the criteria are insufficient because they do not require showing a history of harvest and density and acreage, which the commenter believes the legislative language requires. The MPCA responded to that concern in our November 22, 2017 Response, noting that Laws of Minn. 2011, 1st Special Session, ch. 2, article 4, section 32 states: The criteria shall include, but not be limited to, history of wild rice harvests, minimum acreage, and wild rice density. The MPCA has correctly interpreted the legislative directive to mean that all of these criteria can be considered in evaluating whether a water is a wild rice water to which the standard applies, but that the determination of a waterbody being a wild rice water does not require that the waterbody show a history of harvest and a certain acreage of rice and a certain density of rice. The usual statutory construction of the term "include" is that an illustrative example follows.

Commenters (WaterLegacy) stated that "the proposed rule adds no requirements that would increase the likelihood that additional wild rice waters would be listed in rulemaking. It would provide no benefit to citizen stakeholders or tribal rights holders who seek to protect wild rice." The MPCA believes the proposed rule does provide such benefit by providing an illustrative example of the types of evidence that parties interested in adding a water to the Class 4D wild rice waters list should be gathering.The MPCA believes the proposed rule language strikes a reasonable balance by articulating the criteria that the MPCA used to develop the list of wild rice waters proposed in this rule and setting that forth so that all interested parties know what kind of information they should be gathering to support a listing, without being overly restrictive about acceptable evidence.

Some commenters are concerned that additional Class 4D wild rice waters can only be added through rulemaking. WaterLegacy states that the MPCA's proposal of this provision "underscore[s] that – irrespective of

evidence – it will not add any wild rice water prior to additional rulemaking" and implies that this is a flaw in the rulemaking.

Another commenter, Cleveland-Cliffs, states that "under the plain language of the proposed rule, a water could be regulated as a wild rice water simply on the basis of a person telling the MPCA that he or she observed a single animal (i.e., wildlife) eating some wild rice (i.e., using the grain as food). The result of MPCA's "criteria" would be either (a) that effectively *all* waters containing any amount of wild rice would be listed (because it seems likely that any water with even the smallest amount of wild rice has experienced at least one instance of an animal or human eating wild rice at some point since 1975), or (b) MPCA staff will exercise "best professional judgment" to draw the line between those waters that are "in" and those waters that are "out" of the Rule's reach, creating an inherent risk of arbitrary application of the rule."

The opposing nature of these comments demonstrates why it is reasonable, as the MPCA has proposed in the rule, to add Class 4D waters only through rulemaking. A rulemaking process, including a SONAR and public comment, will allow a full discussion of the evidence for identifying a water as a Class 4D wild rice water. The MPCA staff will exercise best professional judgement about what waters to propose as Class 4D waters, but that judgement will be subject to public review and comment, thereby preventing arbitrary application of the rule or a sulfate standard.

Some commenters are concerned about the types of evidence that the MPCA described as being needed to support the future listing of waters. Commenters were especially concerned about the two acre threshold mentioned. The MPCA believes that two acres of wild rice is sufficient, without additional corroborating evidence, to show that the beneficial use exists in the waterbody. If the MPCA is provided evidence that two acres of rice exist, or has existed since November 28, 1975, we would propose to add the waterbody to the Class 4D wild rice waters. However, if there is no evidence of two acres of wild rice, we would want to look at multiple lines of evidence to see if the beneficial use exists or has existed. A demonstration of two acres of wild rice is not required to identify a water as a Class 4D wild rice water.

Other commenters (1854 Treaty Authority) raised concerns that the list of criteria show that "[a]ny additions will undergo a more burdensome and scrutinous process than waters currently being proposed. To add waters, evidence could include meeting the minimum level of two acres of wild rice in a water, past or current human harvest, or other evidence of wild rice presence (oral histories, written records, photographs, field surveys, etc.)" The MPCA does not believe this is the case; the intent was for future criteria or evidence to be the same as the evidence that the MPCA used to propose Class 4D wild rice waters in this rulemaking. (See SONAR, pg 58 – 64).

Specific to the criteria about oral histories, WaterLegacy mentioned that "Oral histories of wild rice harvest are particularly salient to protection of tribal Treaty resources and are often referenced in tribal comments. Although the SONAR and MPCA's hearing presentations may suggest that MPCA 'recognizes the validity of written or oral histories about wild rice,' the proposed rule text belies this assertion. Written or oral histories about wild rice are only 'acceptable' as evidence if they 'meet the criteria of validity, reliability, and consistency.' No other form of evidence must meet these criteria to be considered 'acceptable.'" As stated in the SONAR (pg 62 and Exhibit 33), the MPCA drew these criteria from the way in which oral evidence was presented in the court case Zuni Tribe of New Mexico vs. United States. This strikes a reasonable balance that allows MPCA to accept important information from oral history and tradition while mitigating the potential for an erroneous listing based on hearsay.

E. Application of Wild Rice Sulfate Standard to Streams

MPCA received several comments asserting that the proposed equation should not apply to streams. The rationale stated was that sulfate does not convert to sulfide as readily in a stream as it does in a lake, because streams typically have more oxygen present in comparison to lakes (MESERB and Hall memorandum). The commenters are assuming that the greater oxygen that may occur in the surface water of streams penetrates the sediment and produces low porewater sulfide concentrations that do not conform to predictions. MPCA did investigate this question while developing the structural equation model (SEM) that was published as Pollman et al. (2017, Response Exhibit N.4). To test to see if there is a difference between the variables that control sulfide in streams and lakes, the residuals of the predictions were examined. Residuals are the difference between the observed sulfide and the predicted sulfide concentration. Residuals for both groups (lakes and streams) were normally distributed. Using a t-test to evaluate whether the mean differences between the two groups is significantly different from zero yielded a non-significant probability of $p = 0.63$. Therefore, the ability of SEM to predict sulfide was similar for lakes and streams, and there is no evidence that another variable not included in the model, such as oxygen, was influencing sulfide in stream sediment porewater differently between the two waterbody types.

If elevated oxygen were efficiently oxidizing sulfide in stream sediment, one would expect sulfide to have been consumed and not measureable. However, sulfide was measureable at all stream sites sampled during the MPCA-sponsored field work. Out of 232 sulfide measurements at lakes and streams, only three were below the lab's reporting limit of 11 micrograms per liter (i.e., near zero), and those occurred in two lakes, Carlos Avery (one measurement) and Height of Land (2 measurements, separated by a year). These low sulfide concentrations were probably the result of low availability of sulfate in the overlying water, as all sulfate concentrations from these lakes were below the lab's reporting limit of 0.5 mg/L sulfate.

Overall, these results are consistent with the premise that wild rice tends to grow at sites in waterbodies that accumulate organic matter in the sediment. Bacteria that colonize the accumulated organic matter consume all available oxygen, which allows the accumulation of sulfide.

Another commenter asserted that the "agency's field data is vastly skewed toward still water (27 streams compared to 81 lakes), and that the data has been molded into a mathematical expression that does not account for the differences between lakes and streams." (Mesabi Nugget). The assertion is immaterial, considering that the MPCA analysis (first paragraph above) found that the mathematical expression is not affected differently by lakes and streams.

Mesabi Nugget also suggested the MPCA should have collected data on water movement, and cited the repeated presence of healthy rice in Second Creek as evidence that the MPCA's equation is flawed. MPCA staff disagree with his conclusion that the equation is flawed. A detailed discussion of an alternative numeric standard approach that can apply to unique situations, such as Second Creek, can be found in the MPCA Technical Support Document (TSD) beginning on page 67.

F. Comments on Specific Waters Proposed or Not Proposed as Class 4D Wild Rice Waters

Representatives from three mining operations in northeastern Minnesota (ArcelorMittal Minorca Mine Inc. (ArcelorMittal), Cleveland-Cliffs, Inc. (Cliffs), and U. S. Steel – Minnesota Ore Operations (U.S. Steel)) submitted specific comments on individual waters proposed for inclusion in Minnesota Rules 7050.0471 as a Class 4D wild rice water. Comments on individual waters were also submitted on behalf of Northeastern Minnesotans for Wilderness and WaterLegacy. The specific proposals and MPCA's responses are summarized below.

<u>ArcelorMittal</u>

In its November 22, 2017 comment letter, ArcelorMittal provided information and recommendations on White Lake (69-0571-00) and the lower portion of the Embarrass River. ArcelorMittal requests that the MPCA:

- Remove White Lake, WID 69-0571-00 from the Proposed Rule, (Minn. R. 7050.0471, Subp. 3.C. (74)); and

- Remove the Lower Embarrass River from WID 04010201-577 (Minn. R. 7050.0471, Subp. 3.C. (17), thereby redefining the WID to only include Embarrass Lake to Esquagama Lake.

White Lake. White Lake (69-0571-00) was proposed as a wild rice water based on the initial listing of this lake in the March 24, 2016 version of the 1854 Treaty Authority's list of wild rice waters (SONAR Exhibit 24). In retrospect, the MPCA should also have included "Permittee" as a reference source applicable to this water based on the results from the December 29, 2011 wild rice survey conducted by Barr Engineering for ArcelorMittal and Figures 2 through 6 attached to the November 22, 2017 comment letter.

The background imagery of Figures 2 through 6 is of particular interest. Figure 2 background imagery is attributed to a 2010 aerial photograph from the U.S. Department of Agriculture's Farm Service Agency (FSA). In this photograph, along the northwest shore of White Lake just above the site label "60 sqft", there is a land extension that juts out into the lake. (This land extension is even more evident in another aerial photograph in the online historical aerial photographs collection from the University of Minnesota's John R. Borchert Map Library at: http://maps.dnr.state.mn.us/landview/historical_airphotos/projects/stl/y1981/stl_014_199.jpg). These two aerial photos show a more or less continuous extension of land jutting out into the lake. Comparing it to the background imagery in Figures 3 – 5 (2013) and Figure 6 (2016), one can see that the land jut becomes an island in the lake. The cause for this apparent difference is likely due to an increase in the water level of the lake. MPCA contends that the sparse number of wild rice plants observed during these surveys may have been associated with the elevated water levels that are reflected in these aerial photographs. Another possible contributing factor affecting the in-lake wild rice may have been elevated lake sulfate concentrations (two lake samples collected on August 18, 2011, each with 123 mg/L sulfate). MPCA staff do not agree with ArcelorMittal's request to remove White Lake from the proposed Class 4D wild rice waters list.

Embarrass River. The Embarrass River WID 04010201-577 is approximately 14.5 miles long with about 70 percent of its length being between Esquagama Lake and the St. Louis River. Based on the September 2017 Barr Engineering Embarrass River survey characterizing the sediment within this reach, MPCA agrees that redefining (splitting) WID 04010201-577 would be appropriate. MPCA will split this WID into two separate WIDs – one from Embarrass Lake through Esquagama Lake and the other from Esquagama Lake to the St. Louis River. The former will continue to be proposed as a Class 4D water and the latter will be added to the MPCA wild rice database as an Insufficient Information water.

Cleveland-Cliffs

Cliffs' November 22, 2017 comment letter (pages 19 – 22) questions the reasonableness of listing six individual waters as proposed Class 4D wild rice waters. A seventh waterbody noted, Dunka River, is considered an Insufficient Information water and is not being proposed as a Class 4D water. The specific concern with this water relates to the Dunka River entry in SONAR Attachment 5 that lists it as a proposed wild rice water. MPCA staff acknowledge this discrepancy and would like the hearing record reflect this acknowledgment.

MPCA's responses to the proposed Class 4D issues raised by Cliffs are summarized as follows.

Day Brook. The wild rice beneficial use of Day Brook (WID 07010103-542 in St. Louis and Itasca Counties) is discussed in MPCA's November 22, 2017 Post Hearing Response, Attachment 1 at page 17. The Permittee reference source of wild rice information came from the Barr Engineering technical memorandum with the subject heading *2011 Wild Rice Survey for Hibbing Taconite Company* dated December 22, 2011.

Mud Lake (69-0652-00) and Round Lake (69-0649-00). The primary reference source cited by the MPCA for both of these lakes is a November 9, 2011 Barr Engineering technical memorandum with the subject heading *Wild Rice Field Survey for United Taconite LLC*. Both lakes were surveyed once on August 19, 2011. The other reference source cited by MPCA for these lakes is the 1854 Treaty Authority wild rice waters list (SONAR Exhibit 24) although the 2011 Barr survey results were the primary reason these two lakes were added to the 1854 list.

At the time of the survey, a limited number of wild rice plants was observed. Field estimates of the cumulative total of wild rice plants were 65 and 95 for Mud Lake and Round Lake, respectively. The sulfate concentration in Mud Lake based on three samples averaged about 19.6 mg/L. Round Lake had sulfate concentrations less than 1 mg/L in all four of the samples that were collected.

Generally speaking, the 2011 wild rice production levels in northeast Minnesota lakes was characterized by the 1854 Treaty Authority as being "fair". The amount of wild rice on Mud and Round Lakes observed in 2011 fall way short of what would be considered as being "fair."

The nearest lake with 2011 water level records is Stone Lake (69-0686-00) which is about one-half mile south of Round Lake. For calendar year 2011, the water level in Stone Lake ranged from 0.4 to 1.1 feet below the lake's ordinary high water mark, with the lowest water levels occurring in June of that year. If lake water levels were below the ordinary high water marks for Mud and Round Lakes, water levels do not seem to be a factor influencing the limited amount of wild rice observed in these two lakes. That is not to say that 2011 was not a poor growing year in the natural wild rice cycle for these two lakes; it is difficult to say based on the one-time survey results.

Based on the above considerations, MPCA staff plan to remove Mud Lake (69-0652-00) and Round Lake (69-0649-00) from the list of proposed Class 4D waters and will maintain them in the MPCA wild rice database as insufficient Information waters pending the collection of additional wild rice information.

Perch Lake (69-0688-00). MDNR files in the St. Paul office contain a fisheries survey for Perch Lake (69-0688-00) from August 28 – 29, 1968. Wild rice density was assigned a density rating of "2". The emergent vegetation density rating scale in use at this time assigned the following numeric ratings: 4 for lush; 3 for moderate; 2 for scattered, and 1 for sparse. In addition, the survey noted "wild rice was concentrated in two areas on the northwest shoreline". The MDNR 2008 report (SONAR Exhibit 21) estimated wild rice coverage to be 32 acres. While the September 2017 Northeast Technical Services survey referenced provides useful information building upon the "wild rice story" specific to this waterbody, it does not alter MPCA's position on Perch Lake. MPCA maintains that Perch Lake (69-0688-00) should be proposed as a Class 4D water.

St. Louis River Segments. Cliffs identifies two separate entries for the St. Louis River – rule as proposed line number 58, St. Louis River WID 04010201-644 and line number 59, St. Louis River WID 04010201-631 and one entry for the St. Louis River/Estuary WID 04010201-532.

St. Louis River WID 04010201-631 is already in Minn. R. 7050.0471, subp. 1 as a wild rice water. This is the headwaters reach of the St. Louis River downstream of Seven Beaver Lake to the west side of Section 36, Twp.58, R.13. The next downstream WID, 04010201- 644, extends from the east line of Section 35, Twp. 58,

R.13 to the Partridge River. There are four separate locations within this reach with wild rice identified by the 1854 Treaty Authority.

St. Louis River/Estuary WID 04010201-532 is the river reach from Mission Creek to the Oliver Bridge. In 2013 the UofM/MPCA wild rice field study had a sampling station within this reach that reported mid-summer wild rice stem counts averaging between 11.8 and 31.2 stems per square meter. Permittee wild rice surveys in this WID reach also reported wild rice. Barr Engineering conducted these permittee-sponsored surveys at the request of PolyMet Mining. These surveys were conducted in 2009, 2010, 2014, and 2016. Wild rice densities encountered within WID 04010201-532 during these surveys ranged from 1 to 5 at numerous sample site locations (see wild rice density classification description table below).

Wild Rice Density Classification	**Description**
1	<10% Wild Rice Coverage
2	10 – 25 % Wild Rive Coverage
3	25 – 50 % Wild Rice Coverage
4	50 – 75% Wild Rice Coverage
5	>75% Wild Rice Coverage

MPCA maintains the proposed Class 4D classification for these reaches of the St. Louis River and Estuary, as well a proposed Class 4D WID reach of the St. Louis Estuary (2) WID 04010201-533 (Oliver Bridge to Pokegama River).

Embarrass River. Cliffs questioned the reasonableness of proposing two Embarrass River WIDs as Class 4D waters: WID 04010201-577 (Embarrass Lake to the St. Louis River) and WID 04010201-579 (Headwaters to Embarrass Lake). [See also the discussion above regarding WID 04010201-577.]

There were a series of permittee sponsored wild rice and water quality monitoring surveys conducted by Barr Engineering for PolyMet Mining Inc. over the period 2009 – 2016 (SONAR Exhibit 30). These reports were evaluated by MPCA and the survey findings provided additional evidence supporting the Class 4D classification proposal for these two WID reaches of the Embarrass River.

Cliffs questioned whether one wild rice harvester trip on the Embarrass River was sufficient information to list the river as a wild rice water (see SONAR Exhibit 22). MPCA views one harvester trip to be more than adequate in support of the proposed Class 4D listing.

U.S. Steel.

Little Sandy Lake (69-0729-00) and Sandy Lake (69-0730-00). MPCA has provided Post Hearing response and additional exhibits concerning these two lakes (see MPCA November 22, 2017 Post Hearing Response – Attachment 1 at page 16 and MPCA Post Hearing response exhibits N. 28, N.35 – 37, and N. 39).

Little Sandy Lake and Sandy Lake are prime examples of waters where significant wild rice was present post November 28, 1975 but currently are experiencing a greatly diminished wild rice population. Since available information documents this existing use after the 1975 date, it is reasonable to propose that these two lakes be classified as Class 4D wild rice waters.

Northeastern Minnesotans for Wilderness.

The November 22, 2017 comment letter submitted by Northeastern Minnesotans for Wilderness offered support for inclusion of White Iron Lake (69-0004-00) as a wild rice water. MPCA staff acknowledge the statement of support and appreciate the comments.

WaterLegacy

Dark Lake (69-0790-00). Dark Lake is currently being maintained as an Insufficient Information water in the MPCA wild rice database. Dark Lake was not listed in MDNR's 2008 inventory of wild rice waters (SONAR Exhibit 21) but was included by the MDNR in response to the 2013 Call for Data (SONAR Exhibit 29). Dark Lake was among the waterbodies surveyed and sampled by University of Minnesota as part of the MPCA sponsored wild rice field survey.

In their comment letter, WaterLegacy provided comments on Dark Lake (page 37). MPCA's November 22, 2017 Response to Comments – Attachment 1 at page 15 discusses the reasons why Dark Lake (and Dark River) are not being proposed by the MPCA for Class 4D use classification during this rulemaking.

Upper Partridge River. WaterLegacy (at page 38) states that the portion of the Partridge River east of Colby Lake is not being proposed as a wild rice water. This is not the case. MPCA is proposing Partridge River WID 04010201-552 (Headwaters to St. Louis River) as a Class 4D wild rice water. The portion of the Partridge River east of Colby Lake is included in this WID.

G. Comments on Developing the Magnitude of the Standard

The MPCA continued to receive detailed comments relating to the development of the protective sulfide level and the resulting equation for calculating the numeric sulfate standard. Some of these comments included information on new studies, or more information on ongoing studies, while others related to data analysis and statistical approaches. Many of these comments were submitted by multiple commenters or referenced across comment letters.

1. Hydroponics Studies

   MPCA received multiple comments concerning the use of hydroponic studies in developing the proposed standard. In particularly, many commenters submitted results of a new hydroponics study conducted by Fort Environmental Laboratories in November 2017. The main discussion of this study is provided in the executive summary of the expert comments on behalf of the Iron Mining Association attached to comments submitted by a coalition of mining companies and Minnesota Power. The comments state:

   "Fort Environmental Laboratories conducted another hydroponics study in November 2017 (unpublished) in response to the MPCA speculations that the water depth was not deep enough in the previous Fort hydroponics study. The study design is substantially the same as that used in the published Fort et al 2017 study, but the water depth was increased from 1 cm to 6 cm. The study was conducted from November 3, 2017 to November 13, 2017. The study was conducted using Good Laboratory Practices, addressed all of the recommendations of the Peer Review Committee, and met all acceptability criteria. Results from the most recent study, as well as previous Fort et al studies confirmed:

   - That sulfide was not toxic to wild rice at concentrations observed in Minnesota wild rice waters;
   - That adequate oxygen was not present at sufficient levels in the test media to support detoxification based on the hypoxic environment, as speculated by the MPCA in their rejection of the 2017 Fort et al study.

- Rather complexation with Fe is the primary mitigating factor in terms of sulfide toxicity. Thus, the results suggest that detoxification of sulfide in the Fort et al. were also the result of Fe complexation rather than detoxification by the plant itself.
- The November 2017 study provides even more evidence that MPCA unreasonably rejected the published 2017 Fort et al study and should have given much more weight to its results."

The study design for the new, unpublished study, was not substantially the same as that used in the published Fort et al. 2017 study, as claimed. The study was 10 days instead of 21, was conducted in the dark, and did not include some biological endpoints such as mesocotyl (stem) length. The study does not have any bearing on whether the wild rice seedlings in Fort et al. (2017) were able to detoxify sulfide because the young seedlings in Fort et al. (2017) were afforded access to the elevated oxygen of the atmosphere. Rather, the new study repeated a similar exposure reported in Pastor et al. (2017). Both of these studies germinated seeds for 10 or 11 days in anoxic, dark conditions against a range of sulfide concentrations. Both studies showed that germination is not a growth stage that is very sensitive to elevated sulfide. The fact that the new Fort study showed that adding iron reduces the toxicity of sulfide has no bearing, despite assertions, on the reduced toxicity of sulfide when seedlings have access to the atmosphere. The new study did not even report the same biological endpoints, such as mesocotyl length, but rather just reported germination rate.

Furthermore, MPCA did not "reject" the 2017 Fort et al study. In fact, MPCA reviewed that study and included the results in the TSD (pp. 33-34, 37-38). The fact that the MPCA put less weight on that study in establishing the proposed protective sulfide concentration is not evidence that the Fort et al study was rejected or ignored. Notably, MPCA also gave less weight to some of the MPCA-sponsored studies TSD pp. 33-34, 38-39).

2. Mesocosm Studies (Dr. Pastor)

Multiple commenters (Water Legacy, Fond du Lac) stated that the MPCA's proposed equation would not result in defensible levels of sulfate because the equation treats iron as protective. These comments refer to research done using outdoor mesocosms by Dr. John Pastor at the University of Minnesota, Duluth; Dr. Pastor himself submitted comments and his research is discussed here based on his comments.

First, Dr. Pastor stated that "Our recent research at the University of Minnesota Duluth demonstrates that sulfide, not sulfate, is toxic to seedlings of wild rice. The MPCA proposes that iron can protect wild rice by precipitating with the sulfide. However, the addition of iron to mesocosms with high sulfate concentrations did not entirely mitigate the toxic effects of sulfide to seedlings. Our research also demonstrates that precipitation of iron sulfide on wild rice roots can inhibit nutrient uptake needed to ripen seeds, so iron sulfide can have negative effects on wild rice sustainability. Setting sulfate limits based on the level of sediment iron is premature and is not reasonable. (p. 2)…The net effect of sulfate additions to wild rice populations is to drive the populations to extinction within 4 or 5 years at high concentrations of sulfate (300 mg/l), even when iron was added to the sediments."

First, the MPCA wants to emphasize the first part of Dr. Pastor's comment. While other comments (Hansel attachment to Expert Comments) state that MPCA does not prove its hypothesis, in that there is no causal determination that sulfide in the porewater (e.g. the rooting zone) impacts the presence and density of wild rice, the hypothesis that porewater sulfide impacts the presence and density of wild rice is supported by the mesocosm results published in Pastor et al. (2017), as Dr. Pastor mentions above,

and by the field data published by Myrbo et al. (2017), and the presentation of Myrbo's data on pages 51-52 of the TSD.

Turning to iron plaque formation, the only information the MPCA has on this issue is a four-page non-peer reviewed progress report (Pastor, 2017, N.34) that indicates that exposing sediment from Rice Portage Lake, which would have an equation-calculated numeric sulfate standard of about 34 mg/L (TSD, page 92). The only evidence presented by Pastor (2017) that iron plaque can inhibit nutrient uptake was performed at a treatment concentration of 300 mg/L, which is over eight times greater than the average sulfate concentration calculated for that mesocosm exposure using the equation under the proposed standard (34 mg/L). Thus, it may be true that deleterious forms of iron sulfide can form when sulfate concentrations occur that are much higher than would be allowed using the MPCA's proposed equation. Regarding the ineffectiveness of added iron: First, it is not clear how to calculate, or whether it is possible to calculate, what the equation-based standard would be after the addition of iron (the iron additions are of unstated quantity and form, and there are many chemical forms of iron). Therefore, it is unknown whether the failure of iron addition to protect wild rice is consistent or inconsistent with the equation.

Secondly, Dr. Pastor noted that "In addition, the MPCA's model assumes that concentrations of sulfide, sulfate, reactive iron and organic matter are in a steady state. This is not a reasonable assumption, especially once sulfate loading increases from various sources of pollution." (p. 2) He also commented that "the amount of reactive iron in a localized area will decline with increased sulfate loading, just as a checkbook balance declines when withdrawals increase without a matching increase in deposits. MPCA's model does not demonstrate that natural inputs of iron would replenish the reactive iron in the sediment commensurate with sulfate discharge. The model assumes, without evidence, that iron input will remain at a rate sufficient to ameliorate sulfide toxicity from the additional sulfate without creating additional adverse consequences for wild rice survival." (p.6)

This comment expresses a misunderstanding of the assumption of steady state and how an increase in sulfate in a given wild rice water will affect the prediction of the new sulfide concentration, once the water body reaches a new steady state. First, it is common and reasonable for scientists to assume that porewater sulfide is in a steady state with the controlling variables of sulfate, TOC, and iron (TSD p. 43 and Pollman et al. (Response Exhibit N.4). Because the MPCA's equation was fit to real observations in natural systems at steady state, the equation describing those relationships predicts the effect of an increase in sulfate at a particular combination of TOC and iron as modeled by waters in a steady state with similar TOC and iron, but higher sulfate. The assumption that the waters in the calibration data set are in steady state includes the assumption that there is a continuous supply of iron to the waterbody from its watershed, so that it can be assumed, contrary to Dr. Pastor's comment, that iron input will remain at a rate sufficient to ameliorate sulfide toxicity.

Finally, Dr. Pastor commented that "Both historic field data and the recent field surveys performed by the University of Minnesota as part of the Wild Rice Sulfate Standards Study demonstrate that concentrations of sulfate in surface water above 10 mg/L proposed in the MPCA's flexible standard may not adequately protect wild rice." (p. 2)

The evidence cited by Dr. Pastor for this assertion are two: (1) that most lakes with wild rice currently have low sulfate, and (2) that Sandy Lake has lost most of its wild rice even though its current sulfate concentration (cited as 95 mg/L, but actually 125 mg/L when MPCA study site Sandy-1, influenced by an

incoming low-sulfate stream is not included) is only slightly higher than the average calculated standard (from 10 MPCA samplings), which is 79 mg/L.

Regarding (1), the correlation of wild rice with low sulfate does not indicate cause and effect between sulfate and wild rice, which is what the 10 mg/L standard was based on. The MPCA-sponsored research clearly demonstrated, in peer-reviewed publications, that the true cause and effect is more complicated, and that the production of porewater sulfide is primarily responsible for the presence and absence of wild rice in Minnesota (Myrbo et al. 2017, Response Exhibit N.2). As documented in Myrbo et al. there is no statistically significant relationship between sulfate concentration and wild rice occurrence, whereas there is a highly significant relationship with porewater sulfide.

Regarding (2), first, MPCA is proposing to use the lowest calculated standard, not the average. Second, sulfate concentrations declined significantly in recent years due to sulfate mitigation efforts by nearby Minntac. The wild rice was mainly lost by 2004 (according to a draft EIS titled Minntac Water Inventory Reduction) when sulfate concentrations were much higher than observed by the MPCA in 2013. The draft EIS cites a pre-Minntac sulfate concentration of 7.6 mg/L. Thus, the loss of wild rice in Sandy Lake is consistent with exceedances of equation-calculated standards, and the observations do not support Dr. Pastor's comment.

3. Field Surveys and Data

Many commenters raised concerns about the MPCA's use of field survey data. For example, one commenter (Hansel attachment to Expert Comments), stated that "Unlike the state-of-the-art controlled hydroponic studies, the field surveys are entirely uncontrolled. The wild rice growing in the wild rice waters (and non-wild rice waters) surveyed were subject to weather and all of the other stressors which can affect the presence and density of wild rice. MPCA acknowledges that several of these other stressors are "statistically significant", yet does nothing to separate their effects from the effects of sulfide. Instead, MPCA ascribes all ill effects on wild rice to sulfide and sulfide alone…MPCA ignores other stressors of wild rice, several of which the MPCA determined were statistically significant, in determining the sulfide and sulfide alone impacts the growth and density of wild rice."

The MPCA did not ascribe all ill effects on wild rice to sulfide and sulfide alone. On page 23 of the TSD, MPCA summarizes its investigation into the multiple factors that control wild rice:
"Performing *multiple* BLR with more than one variable demonstrated that porewater sulfide is one of three primary independent variables correlated with wild rice occurrence (Myrbo et al., in press-1): porewater sulfide, water transparency, and water temperature. The statistical analysis strongly supports the conclusion that sulfide independently affects wild rice presence and absence (p=0.001; Table 1-3), which implies that limiting sulfate availability has the potential to protect wild rice from elevated sulfide." As MPCA noted in the 11/22/17 Response to Comments (p. 3) "the fact that other factors than sulfate…also affect wild rice does not by itself negate the need for or reasonableness of a revised sulfate standard to protect wild rice from *sulfate* impacts."

This commenter continues to note that "MPCA does not resolve the inconsistencies between the results of the hydroponic studies (where only sulfide or sulfate are stressing the wild rice) and the field surveys, where multiple stressors are operating on the wild rice." MPCA finds that the data are remarkably consistent, except for the results of Fort et al. (2017), as presented on pages 33-34 of the TSD.

Some commenters were specifically concerned about the field data and the related analysis to develop the protective sulfide concentration. Comments from the Great Lakes Indian Fish and Wildlife

Commission (GLIFWC) discussed the MPCA's visual examination of the proportion of waterbodies with wild rice present, noting that "The graphical method used to identify 120 ug/L of pore water sulfide as the 'protective concentration' is conceptually flawed and cannot be used to identify a change in response of rice to sulfide concentration. The 'dip' at 120 ug/L of sulfide, identified in Figure 1-5 of the FTSD and Figure A7-3 of Appendix 7 of the FTSD, is an artifact of the number of samples with a concentration near 120 ug/L. The dip does not represent a response of rice to sulfide." (p. 3)

This commenter also stated that "The field-data based methods used to identify 120 ug/L of pore-water sulfide as the 'protective' level are either faulty (the visual examination of graphical representation) or generate highly variable results and are data-set dependent (EC10 on logistic regression and change-point analysis). The field survey data sets were not collected in a statistically rigorous manner and are not adequate to identify any particular 'protective' level of sulfide using these methods." (p. 7)

It may be true that the graphical method is conceptually flawed. Regardless, it is still a useful analysis. The MPCA relied on multiple lines of evidence from quantitative analyses of the MPCA-sponsored hydroponic, mesocosm, and field data, the central tendencies of which tend to cluster near 120 µg/l, albeit with relatively large 95% uncertainty ranges (TSD Table 1-8, page 33).

The commenter asserts that the field survey data sets were not collected in a statistically rigorous manner, without actually stating an actual problem with the data set. The easiest and most common conformance to a "statistically rigorous" dataset would be to sample sites randomly, so as to be probability-based. This issue was addressed in the MPCA June 2014 report that was peer reviewed. The MPCA wrote (p. 21):

Statisticians recommend that surveys be probability-based when the point of the survey is to characterize the population being sampled. Probability-based surveys allow survey results to be extrapolated back to a larger population. The 2012-2013 Field Survey was purposefully not probability based, in that the point was not to characterize the population of wild rice production waters, but rather to explore the effect of elevated sulfate on the chemistry of the porewater of actual and potential wild rice habitat. If wild rice habitats had been sampled probabilistically, most of the sites would have had very low sulfate concentrations and little would have been learned about the effect of elevated sulfate. To ensure that the Study included samples from waters with elevated sulfate concentrations, the survey sites were intentionally not chosen in a random manner.

After presentation and interpretation of several databases, MPCA concluded (p. 23):

In summary, the 2012-2013 Field Survey of lakes has a sulfate frequency distribution that is intermediate between the probability-based USEPA survey and the 513 sulfate values that were available for the 1,290 wild rice lakes identified by the DNR (2008). The intermediate position means that the Field Survey sampled more high-sulfate lakes than would be expected if only known wild rice lakes were sampled, but fewer than would be expected if all lakes in the state were sampled probabilistically. Given that wild rice does not occur naturally in all lakes of the state, and that a major goal of the Field Survey was to assess the effect of elevated sulfate on wild rice, the site selection approach used for the Field Survey could be just right. The intent of the sampling was to find variation in sulfate while maintaining all other parameters suitable for wild rice growth (water transparency, water depth, pH, alkalinity, hardness, etc.). If this was

accomplished, then the Field Survey could be interpreted as functioning as a sampling of a natural experiment that can be used to evaluate the effect of sulfate on wild rice.

Therefore, the MPCA sampled a range of lakes that was appropriate to answering the question of the effect of sulfate (and consequently sulfide) on wild rice. The MPCA data were analyzed by Myrbo et al. 2017 (Response Exhibit N.2), in which logistic regressions were presented and used to support the conclusion that porewater sulfide is a primary controller of wild rice presence and absence. During the journal's peer review process, the representativeness of the dataset was not raised as a concern by the reviewers. It is therefore not reasonable for GLIFWC to claim that an EC10 derived from the same logistic regression is not valid. Similarly, there is no reason that change-point in wild rice density should not be analyzed on the same dataset.

Another commenter (Bock attachment to Expert Comments) raised concerns about the MPCA's use and analysis of the field data. First, this commenter stated that "An examination of the field data shows that there are a great many waterbodies in the MPCA dataset that exhibit porewater sulfide concentrations that exceed the MPCA threshold (>120 μg/l) and also possess healthy stands of wild rice. This finding calls into question the validity of MPCA threshold and suggests problems in how MPCA used the field data to derive a threshold." Dr. Bock asserts that there are many waterbodies that exceed the protective sulfide level of 120 μg /L that possess healthy stands of wild rice. The only information on the health of the stands is the density, which the MPCA has shown continuously declines above 120 μg /L (TSD, pp 50-52).

This commenter goes on to state that "the results of these analysis show that the single change point identified by MPCA is not unique and in fact does not represent a change point that can be associated with a change in wild rice density." However, Change-point analysis, when restricted to identifying the single largest reduction in wild rice density, finds a significant reduction in wild rice density at 112 micrograms per liter, from an average of 68 stems per square meter below 112, to 34 stems per square meter above 112. This analysis was independently confirmed (presented in the GLIFWC comments).

Third, this commenter says that "although MPCA does fit the field data to a dose-response curve, the data do not fit the assumptions of the statistical model and therefore any sulfide threshold derived using this method should not be used." MPCA notes that toxicologists fit dose-response data to a variety of curves, so it is incorrect to say that the data do not fit the assumptions of the statistical model.

This commenter also analyzed the field data and finds "no evidence that increasing the sulfide threshold to values 2-3 times the MPCA value would lead to a discernible decrease in the health of wild rice. There is insufficient data to reliably evaluate higher thresholds. MPCA unreasonably excludes the alternative threshold of 300 μg/l in TSD Appendix 9."The only metric available to assess the "health" of wild rice is the density of the rice in the waterbody. The MPCA demonstrated in TSD Appendix 9 that the density of rice decreases significantly above 120, so 300 μg/L would not be protective of the health of wild rice. Therefore, MPCA reasonably excluded the alternative threshold of 300 μg/L as demonstrated in TSD Appendix 9.

Finally, commenters continued to question the MPCA's use of field data from waters that are not being proposed as Class 4D wild rice waters in order to determine protective levels of sulfide and sulfide. The MPCA used procedures commonly used by conservation biologists to identify

habitat requirements for species, which require the sampling of habitat that does not support the species of interest (page 8 of the TSD):

> "Binary logistic regression (BLR) is the classic method for scientists to identify environmental variables that control the suitability of habitat for a particular species of interest (Hosmer and Lemeshow, 1989; Peeters and Gardeniers, 1998; van der Heide et al., 2009). BLR is "binary" in the sense that it classifies field sites as having, or not having, the species of interest—in this approach, the density of the species is irrelevant to the classification. Conservation biologists use binary information (presence/absence) in the analysis of habitat suitability; density is rarely used because representative density data are difficult to obtain and density can be a function of factors unrelated to the long-term suitability of the habitat."

See also Attachment 1 of the MPCA's 11/22/17 Response to Comments.

4. Effect Concentration

Some commenters raised specific questions about the effect concentration chosen by the MPCA.

NCASI states that "It is unclear from the TSD why MPCA first selected the EC20 for the wild rice response effect level of interest, and later decided to use the EC10." (p. 1). This issue was discussed in detail in the TSD (pages 31-32). The choice of EC10 was a risk management decision by the MPCA.

Others (Richard, attachment to expert comments) stated that "The peer-reviewed article does not contain an EC10 so it should be noted that any EC10 based on these data were not evaluated during the peer-review process for publication. In a meta-analysis performed for MPCA, Pastor calculated an EC10 of 299 µg/L." The MPCA is not aware that Pastor calculated an EC10.

Several commenters (USFS, Fond du Lac Band, Tuominen) suggested that the MPCA should have considered using an EC5 or NOEC concentration rather than an EC10 concentration in establishing the protective sulfide level. Other commenters (NCASI) suggested that the use of an EC10 approach was overly conservative and an EC20 should have been used. The reasonableness of the EC10 approach compared to a higher EC (EC20-EC50) is discussed in detail in the TSD (pp. 31-32). This section focuses on the reasonableness of MPCA's use of EC10 concentrations rather than an EC5 or NOEC calculation.

The effect concentration concept in general is explained on pp. 31-32 of the TSD, as well as the history of MPCA's analyses of effect concentration (EC). The proposed protective sulfide concentration of 120 µ/L is based on a visual observation of the field data with corroborating evidence provided by change-point analysis of the field data and EC10 calculations from the hydroponic, mesocosm and field data.

Commenters stated that MPCA did not adequately discuss its choice to rely on an EC10 in the development of the protective sulfide level rather than EC5 calculations. The Fond du Lac band suggested an EC5 and compared it to the "extirpation coefficient" of five used by EPA in developing a benchmark conductivity standard. Fond du Lac suggests that "the EC5 or even the 'no effect' concentration (NOEC) is the reasonable protective concentration, when holistically considering the ecology of wild rice, its vastly diminished geographic range, its natural annual variability in production, and the adverse effects of other well-known stressors such as hydrologic alterations, invasive species, and climate change."

MPCA's use of EC10 calculations in the development of the protective sulfide concentration is reasonable because in a toxicological study, the tail ends of the dose-response curve are not as reliably estimated as the center of the curve (such as an EC50). The closer to the tail end of the curve (such as towards an EC0) you get, the less certain you are in the estimation. A no effect concentration is often represented as an EC5 or EC10, and these protective values were considered. The EC10 was chosen because it could be estimated more reliably than an EC5, but still represent a concentration that would elicit minimal effect.

5. Sulfate/Sulfide Model

Comments were received on the MPCA's model of the interactions surrounding sulfate and sulfide formation.

One commenter (Hansel) stated that "MPCA, though alerted by their own peer review panel, misconceptualized the hydrogeological conditions under which sulfate is delivered to sediment beds. This flawed conceptual model led to the following issues which pervade their analysis:

- Unreasonably assuming that chemical diffusion of sulfate from an overlying water column to the sediment porewater is a process favored in these environments; and

- Unreasonably excluding important controlling variables, such as the concentrations of iron and sulfate in groundwater, from field survey data collection."

MPCA's conceptualization of the hydrogeologic conditions is an accepted scientific approach. Diffusion of sulfate in surface water into the sediment porewater has been demonstrated in the peer-reviewed literature by the few sulfate addition experiments (both purposeful and natural) that have been made, where it has been noted that sulfide increases in the underlying sediment (Little Rock Lake, Wisconsin (Response Exhibit N.42)), a lake in the Experimental Lakes Area, north of International Falls, Minnesota (Response Exhibit N.41), and two lakes and a wetland receiving sulfate drainage from the iron range in Minnesota (Response Exhibits N.43 and N.44).

It would have not been reasonable to collect local groundwater samples from field survey sites, since installing wells is time-consuming and expensive. It was a major expense for the MPCA to install wells adjacent to Second Creek for the intensive study conducted by Ng et al. (2017). Rather than collecting empirical data, MPCA relied on the peer-reviewed scientific literature to inform its conceptual model, as noted above and in the TSD (Section 1D).

Another commenter, NCASI, found MPCA's model generally reasonable but noted that other models could be used, stating: "Finally, with respect to MPCA's reliance on the empirical sulfate model, we note that representation of the basic concepts of H2S formation (i.e. dependent upon available carbon and sulfide) in the model appears reasonable. Nonetheless, some widely used water quality computer simulation models (e.g., Water Quality Analysis Simulation Program, or WASP) predict H2S in porewaters using an approach that incorporates the underlying mechanisms that control sulfur chemistry, rather than relying on purely statistical relationships. Such a mechanistic approach could improve upon MPCA's empirical model, especially for predictions at locations not represented in the derivation of the empirical model."

The MPCA considered using a mechanistic model and determined that an empirical model would meet the needs of the state better (TSD, p. 41-43). In addition, the peer review panel recommended use of empirical modeling, in particular structural equation modeling.

6. Equation Development

Some commenters (Roberts) raised specific concerns about how the MPCA developed the probabilistic equation with the MBLR. This includes comments that "The reasons for changing from a deterministic equation to a probabilistic one are not fully explained in the TSD. The main reason given in the TSD is that it is supposed to avoid a phenomenon called re-transformation bias, sometimes also called back-transformation bias. This phenomenon occurs when a linear equation is fitted to logarithmically transformed data…The TSD provides no explanation of how the MBLR approach overcomes this bias. In fact, the claim that the MBLR approach overcomes the re-transformation bias actually is subject to serious doubt, because the derivation of the MBLR equation starts from a regression formula applied to log-transformed data. (That regression formula is presented in subsection (c) below.)" (pg 6)

The reasons for the change in equation approach are noted in the TSD as the commenter asserts, and explained in more detail in supporting information to the TSD, particularly the Pollman et. al. journal article (2017, Response Exhibit N.4). Transformation bias becomes an issue when the dependent variable is initially transformed to better fit the underlying assumption of linearity inherent in linear regression modeling. The bias is imposed on the back-transformation of predicted dependent variable values to their original (un-transformed) form because the back-transformation typically does not explicitly account for the effect of model residuals (model error) on the predicted and subsequently back-transformed value.

With MBLR, the transformation of the dependent variable is categorical and binary, with the two categories delineated by a threshold value of the original dependent variable. The MBLR model predicts the likelihood or probability that a given set of values for the independent variables will exceed the threshold value; it does not predict the threshold value. The threshold value is determined separately and external to the MBLR, and there is thus no back-transformation and associated bias relevant to the MBLR modeling.

In addition, the MBLR-calculated sulfate concentrations are more accurate than SEM-calculated numbers (16% misclassification rate for MBLR vs. 26% for SEM; TSD page 49), consistent with the elimination of back-transformation bias. Also, note that the peer-reviewed article by Pollman et al. (2017, Response Exhibit N.4) recommends the use of MBLR over SEM for predictions to avoid the back-transformation bias.

The commenter also stated that "Whether or not the decision to set p = 0.5 is protective of wild rice is much more debatable, however. Accepting it would mean that we were settling for a 50% chance of wild rice being protected at the EC10 level that was recommended by the peer review panel. This seems inadequate for protecting wild rice. Therefore a lower probability would be needed to be protective of wild rice. The TSD provides no discussion or citation to support the assumption that a 50% chance of protecting wild rice would be sufficiently protective. Absent a compelling rationale to the contrary, simple logic suggests that a lower probability would be needed to be protective of wild rice." (pg 7) The discussion that addresses the degree of

protection set by p=0.5 is discussed in the TSD (p. 46) and more extensively in Appendix 8 of the TSD (pp. 123-126).

7. Error Rate

Some commenters raised questions about the error rate – particularly in how it was described and discussed. One commenter (NCASI) stated that "MPCA's error rate analysis focuses on the relationship between pore water sulfide concentration and water column sulfate concentration, rather than the relationship between sulfate (the target of criteria and management) and the wild rice response. Therefore, the error rates presented are likely underestimates of the overall false positive and false negative error rates" (p. 2)

Although it might be a worthy goal to calculate error rates that extend from sulfide to the presence or density of wild rice, it is not practical, and therefore not a reasonable goal. It is not practical because wild rice does not appear in a waterbody just because sulfide is low. Because of environmental variables that have not been studied rigorously, and therefore are poorly understood, there are many waterbodies with low porewater sulfide but no wild rice population. Beyond presence and absence, wild rice is infamous for having wild swings in density from year to year even in a well-established wild rice water. Because there are other variables aside from sulfide that control wild rice presence and density, it is not possible to calculate error rates that relate the variables that control sulfide (sulfate, TOC, and iron) to wild rice.

This commenter also notes that "As an additional consequence, the comparison made to the error rates estimated by the state of Vermont in their nutrient criteria development document, which include the relationships between nutrient concentration and biological responses (see TSD at pp. 62-63), does not seem to be an "apples-to-apples" comparison." (p. 3) Similarly, another commenter (Richards) states that "MPCA neglected to explain the Vermont process and highlight how the process was very different from the MPCA approach for the MBLR sulfate equation. In particular, specific to the implementation of the Vermont nutrient criteria, an integrated approach to implementation is also presented by Vermont. The integrated approach used by Vermont allows for compliance with nutrient criteria to be evaluated by either comparison to nutrient criteria or by comparison to nutrient response variables (e.g., macroinvertebrate community health). This integrated approach is used because of the misclassification rates of 20 to 40%. An integrated approach that might be considered is the presence and health of the wild rice in the wild rice water body and if the wild rice were present and healthy, then compliance is demonstrated. Given the amount of MPCA MBLR sulfate misclassification rate, an integrated approach is warranted."

MPCA never claimed that the Vermont approach was the same as ours, only that it was an approach used (which we then used to help evaluate our approach). The Vermont approach for lakes relates phosphorus to phytoplankton density. Vermont is able to do this because all waterbodies have phytoplankton, which will grow to greater density when more phosphorus is available. The fact that MPCA's approach to developing a standard was different than Vermont's does not mean that the use of error rate analysis as a tool to help evaluate MPCA's proposed standard is inappropriate. It is appropriate for Vermont to take an integrated approach, which allows for compliance with, say, phosphorus standards combined with the biological response, which would be the invertebrate community in a stream. If monitoring the

invertebrate community shows that phosphorus is too high, the community will presumably recover fairly rapidly after phosphorus is decreased. However, it would be inappropriate to try to detect a decline in health of a wild rice population by monitoring, given the naturally chaotic fluctuations in wild rice density. By the time that wild rice is definitely harmed by elevated porewater sulfide, the sediment reactive iron would have been overwhelmed by sulfide, and recovery would take many years. Facilitating the recovery of wetlands with sulfidic sediment is problematic, and has rarely been studied (TSD, p. 100).

8. Effect of Sulfide on Wild Rice

Many comments received express general skepticism that sulfate (because of its relationship to sulfide) is an important controller of the presence of wild rice.

One commenter (Tedrow attachment to Expert comments) focuses extensively on the idea that competing vegetation in waters (particularly water lilies) and water depth control are an important factor for wild rice growth, implying that these are more important factors than sulfide. These comments seemed to be based on a misconception regarding the goal of the current rulemaking. The goal is not to manipulate the environment to encourage wild rice growth. Rather, the goal is to develop a sulfate standard so that the wild rice beneficial use is not impaired by porewater sulfide, regardless of any other factor that might be affecting wild rice. The MPCA acknowledged in the TSD that many other factors affect the success of wild rice in shallow aquatic systems (TSD, pp 23-31), and has also addressed comments related to this topic in its 11/22/17 Response to Comments. Also, regarding the commenters reference to water lilies and competition with wild rice, MPCA agrees that abundant water lilies can exclude wild rice from habitat that would otherwise be suitable for wild rice. Nevertheless, the presence of waterlilies can also be used as a sign that a site has a high probability of being suitable habitat for wild rice in the absence of water lilies.

Another commenter (Hansel) states that "the MPCA has not and cannot provide any studies, literature or other evidence that reducing sulfate in discharges to surface waters will effectively reduce sulfide in the porewater in wild rice waters. Indeed, Berndt et al. reach an entirely opposite conclusion…MPCA has not and cannot provide any studies, literature or other evidence that reducing sulfate in the water column will reduce sulfide in the porewater. This was simply not tested in any of the studies, nor in any of the literature cited by the MPCA. Yet the proposed rule explicitly says that this is what needs to happen to comply with the rule."

The reference to Berndt et al. is misleading, in that it concerns the St. Louis River, which has no wild rice habitat in the section studied. The experiments that added sulfate and showed increases in sulfide imply to the observer that decreases in the sulfate load would cause a decrease in sulfide: sulfate increases caused sulfide increases in the underlying sediment (Little Rock Lake, Wisconsin (Response Exhibit N.42)), a lake in the Experimental Lakes Area, north of International Falls, Minnesota (Response Exhibit N.41), and two lakes and a wetland receiving sulfate drainage from the iron range in Minnesota (Response Exhibits N.43 and N.44). It is highly likely that decreasing sulfate loading will decrease sulfide production. Be that as it may, the primary benefit of water quality standards is to protect waters from excessive increases.

9. Use of Conservative Assumptions

Several commenters asserted that the MPCA's standard is based on a number of overly conservative assumptions (Alexandria Lakes Sanitary District, MESERB) without providing specific detail about the assumptions. The implications are that these conservative assumptions compound through the rulemaking, resulting in a sulfate standard that will be overly stringent.

Cleveland Cliffs provided the following specific comment on MPCA assumptions associated with the standard; the substance of this comment is also largely echoed by USS.

"Furthermore, the protocol unreasonably proposes to apply the lowest sulfate standard to be the water body's sulfate standard. This introduces an additional level of conservatism for two reasons:

> 1. MPCA has not specified that only areas of the water body capable of supporting wild rice based on criteria such as water depth and sediment type be sampled. Therefore, the water body specific sulfate standard could be designed to control pore water sulfide in areas incapable of supporting wild rice and therefore wild rice would not benefit from implementation of the standard.
>
> 2. Statistically, the lowest sulfate standard approximates the 20th percentile of the distribution of possible sulfate standards. In brief, 4/5 samples, or 80% will have higher standards. We can combine the probabilities associated with the EC10 and the 20th percentile by multiplication as such: 10% x 20% is 2 %. That means that 2 % of the potential population of wild rice could be affected while 98% are predicted to be unaffected. This is much more conservative that limiting the effects to a 10% level specified by the EC10. This pattern is repeated because additional conservative inputs have been added, such as the currently recommended sulfide threshold of 120 µg/L, which is a factor of 10 lower than the NOEC from both the Fort et al. (2017) as well as the newly conducted Fort November of 2017 results. The final probability is the product of the individual probabilities. For example, if we take that 95% confidence level of the Ec10 and apply that to the 20th percentile sulfate standard for a sulfide standard that is over a factor of 100 too low. The true level of conservatism is 5% x 10% x 20% x 10% or in other words 0.01%.
>
> Conclusions: Conservatism on the order of one one-hundredth of a percent or more is not reasonable, and therefore the use of the lowest calculated protective sulfate value for a water body is not reasonable. We recommend using some type of averaging of the results. (p. 12-13)"

This comment claims that the MPCA makes three conservative (i.e., overprotective) choices and that these three choices in combination compounds the conservatism into a standard that is exceedingly overprotective. These three choices are:

1) the choice of the EC10 (as opposed to a less protective level such as the EC20);

2) the requirement that the protective sulfate standard for a waterbody will be based on the lowest calculated protective sulfate value from five samples from the waterbody; and

3) the fact that a 120 µg/L protective threshold for sulfide concentration is too low when compared to the NOEC from the Fort et al study.

The MPCA maintains that none of these three choices is overly conservative and thus there is no compounding of conservatism when these choices are made in combination. Defenses of each of these three choices as reasonable and appropriate (and not overly-conservative) – the EC10, the five sample requirement, and the 120 µg/L protective sulfide threshold – are each addressed elsewhere in these comments and in other rulemaking support documents. MPCA's choice of EC10 over EC 20 is discussed in detail in the Technical Support Document pp. 31-32. The use of the lowest calculated protective sulfate value is discussed in detail in the SONAR (p. 88) and the reasonableness of 120 µg/L is discussed in the SONAR (pp. 66-72). One other point that the commenter seems to make is that the conservatism is further compounded by using the lower bound of the 95% confidence interval around the EC10 point estimate. This, however, is not what the MPCA did. The MPCA used the EC10 point estimate itself, not the lower bound of the confidence interval around that estimate.

The MPCA has adequately demonstrated through the SONAR, TSD, and multiple responses to comment that sulfide is a factor that impacts wild rice and that the proposed rule is reasonable to protect the wild rice beneficial use from that adverse impact.

H. Duration and Related Flow Rate; Seasonality; Frequency of the Proposed Standard

Several commenters raised concerns about the duration of the standard – proposed as an annual average – and the flow rate that the MPCA proposed as the critical flow condition to evaluate in effluent limit reviews. Comments also were received about a seasonal component to the rules and the proposed one-in-ten year frequency of the standard. Most of these comments involved questions and concerns about how these elements of the rule proposal would affect the effluent limit review process and how they would allow (or not allow) higher levels of sulfate discharge from permitted facilities.

<u>Duration of the standard and related flow rate</u>

Duration: Several commenters raised concerns that the MPCA's proposed standard, by including an annual average duration and a related 365Q10 flow rate for effluent limit review, asserting that this approach would allow for high sulfate discharges that could harm wild rice. (MCEA, USFS, 1854 Treaty Authority)

Some of these comments seem to confuse a water quality standard and an effluent limit. As noted on page 96 of the SONAR and MPCA Hearing Exhibit L7, a standard applies in a water body to protect a specified beneficial use; an effluent limit applies to the discharge of a permitted facility and are an important tool in ensuring that a water quality standard is met in the receiving water(s) to which the facility discharges.

As noted on pages 15 and 79 of the SONAR, the duration and frequency of a standard are important components of understanding how a standard will be applied.

Commenters have also raised concerns that the annual average would allow some time periods of quite high sulfate discharge. For example:

- Water Legacy stated: "In practice, the MPCA would allow every sulfate discharger to use year-round dilution based on averaging of snow melt and other highest water flow conditions even if the discharge

were taking place during the driest week of the year, when far less flow would be available to dilute sulfate pollution. MPCA's proposed rule would relax pollution limits based on annual average flow even in shallow streams, common natural habitats for wild rice, which may have little or no flow available to dilute pollution."

- The 1854 Treaty Authority, also raised concerns that "dischargers could potentially 'flush' their systems and release high concentrations of sulfate during certain times of the year, and attempt to reduce or stop discharges during other times" and stated that this kind of discharge regime would be a problem.

- The Fond du Lac Band expressed concern that the annual average allows high levels of sulfate to be discharged to wild rice waters while the mesocosm experiments "suggests that there actually may be a discrete time in the growing season when wild rice plants are exceptionally vulnerable to the effect of sulfate loading and reduction to sulfide." The Nature Conservancy expressed a similar concern.

Fond du Lac Band and the Nature Conservancy assertion that wild rice has periods in its life cycle during which it is exceptionally vulnerable does not change the reasonableness of the proposed annual average duration. Myrbo et al. (Exhibit 18 of rulemaking) showed that there is no significant seasonal trend in porewater sulfide over the wild rice growing season. Since porewater sulfide does not vary significantly over the growing season, then protecting for sulfide during all periods of the year is also protective of sulfide over any single period. Consequently, protecting for sulfide over an annual average period is protective of all periods of the wild rice life cycle including any period during which the wild rice may be most sensitive. This further demonstrates the reasonableness of the proposed annual duration.

Water Legacy also stated that "MPCA attempts to justify use of an annual average since sulfate is not a direct toxicant upon wild rice. However, other pollutants controlled by water quality standards are not direct toxicants. Discharge limits for mercury, for example, are set to prevent the methylation of mercury and the bioaccumulation of mercury in the aquatic food chain. Mercury monitoring and effluent limits are generally based on a daily maximum and a calculated monthly average."

MPCA does routinely interpret the duration of mercury surface water quality standard as a 30 day average during NPDES permitting in order to protect for bio-geochemical processes with multi-year effects such as mercury bioaccumulation in the aquatic food chain. An annual average standard does not imply that effluent limits will always be set on an annual basis. Water Legacy appears to be confusing effluent limits and water quality standards in this instance.

Pages 79-81 of the SONAR and 91-94 of the TSD provide extensive discussions of MPCA's conclusion that proposing an annual average duration for the wild rice sulfate standard is reasonable. Expressing the standard as an annual average does mean that at times the concentration of sulfate in the waterbody might be higher than the calculated sulfate standard, so long as the average over the year is at or below the standard. As described in the SONAR and TSD, a longer averaging time is appropriate for the wild rice sulfate standard because sulfate is not a direct toxicant, and the negative impact of elevated sulfate occurs over time, not in a matter of days or weeks. As noted in the TSD, page 94, "temporary high sulfate concentrations are not the direct cause of negative effects on wild rice". Specific to the concerns raised about elevated sulfate discharges during dry periods of the year, the TSD specifically explains how the scientific evidence supports MPCA's conclusion that short-duration increases in sulfate concentration will not impact the wild rice beneficial use, so long as the annual average is maintained.

The reasonableness of MPCA's proposed annual average frequency is bolstered by the 11/22/2017 comment letter from EPA, which states on page 5 "Based on the information provided by Minnesota as part of the public notice for these rules, the proposed criterion appears to be scientifically defensible and protective of the wild rice use."

Flow rate: The proposed rule language regarding the applicable flow rate for evaluating the need for effluent limits to ensure discharges are protective of the standard is found in two places: 7050.0224, Subp. 5D and 7053.0205, Subp. 7E, with a definition of 365Q10 at 7050.0130, Subp. 2a. The language states that "discharges of sulfate in sewage, industrial waste, or other wastes affecting class 4D waters must be controlled so that the numeric sulfate standard for wild rice is maintained at stream flows that are equal to or greater than 365Q10." This proposed rule language mirrors language elsewhere in Minnesota Rules that specify other flow rates applicable to the evaluation of potential impacts to other standards (see 7Q10 language at Minn. R. 7050.0210, Subp. 7 and 30Q10 language at 7053.0135, subp. 4 and 7053.0205, subp. 7B. Similar concepts related to 122Q10 are at 7050.0150 supp. 4A and 4BB and 7053.0255 Subp. 1A and 1G).

MPCA is proposing to use the 365Q10 flow as that protective stream flow rate to use in the effluent limit review and development. 365Q10 means the lowest average 365-day flow with a once in ten-year interval. This flow rate is calculated specific to the receiving water of concern. Built into the choice of using the 365Q10 protective flow is the assumption that high flow rates after snow melt will average out low flow rates during late summer and thus protect wild rice from sulfate over a 365 day period.

The 365Q10 flow rate is a proposed variable in the mass balance formula used to calculate effluent limits. The mass balance formula allows the MPCA to reasonably calculate the assimilative capacity of the receiving water to receive the pollutant load from the discharger and thus determine the need for effluent limits for the discharger. Pages 98 through 102 of the SONAR address the mass-balance approach and the reasonableness of the proposed 365Q10 flow rate.

EPA provided comments stating that "it is unclear whether Minnesota intends for water quality-based effluent limits (WQBELs) to apply when receiving waters flows are less than 365Q10" and recommends that proposed 7050.0224, subp. 5D be clarified. MPCA absolutely intends that once established a water quality-based effluent limit will apply to the permitted discharge as specified by the effluent limit, regardless of the receiving water flow rate at a given time. Given that this proposed rule language identically mirrors other rule parts in Chapters 7050 and 7053 regarding, MPCA will address these recommendations for enhanced clarity in a future rulemaking when the other similar rule parts can also be addressed.

Commenters also expressed concern that the use of a 365Q10 flow in setting effluent limits would not be protective of the beneficial use, and MPCA should instead use the 7Q10 analysis used to evaluate toxic pollutants. This comment is analogous to concerns expressed about the annual average duration proposed for the standard. In both cases, as explained above the MPCA's proposed approach is scientifically defensible for the wild rice sulfate standard because sulfate is not a direct toxicant. For direct toxicants, concentration at low receiving water flows is a concern because point source have the greatest impact on stream composition at those flows and short-duration exposures to direct toxicants can impact the beneficial use. This same concern is not present for sulfate and wild rice, where the impact occurs over a longer timeframe.

<u>Seasonality</u>

The concept of "seasonality" is a further consideration of the duration of the water quality standard. As noted on page 20 of the SONAR, implementation of the existing wild rice sulfate standard has at times included an interpretation of the "period when rice may be susceptible to high sulfate levels" as being the growing season.

MPCA recognized the need to examine this interpretation in light of new scientific information, and included in the SONAR a specific discussion of the seasonality concept (pp. 81-82). The 2011 legislature also referenced seasonality in their specific rulemaking charge to MPCA.

Given that sulfide can form from elevated sulfate alt any time of the year, MPCA is proposing an annual average duration for the standard rather than a duration limited to a specific season. In other words, MPCA is proposing that the standard apply in all seasons. In general, most commenters supported the MPCA's proposal to have a standard that applies year-round.

Mesabi Nugget provided the following comments about the annual duration of the standard and introducing the concept of seasonality and/or temperature dependence to the equation.

"The equation fails to account for seasonal trends in porewater sulfide…Minnesota has never had a year-round sulfate limit for the protection of wild rice. This reflects the reality that wild rice is not a perennial and only grows for less than half of the calendar year. Accordingly, it does not make sense to remove the existing seasonality language and apply the sulfate standard year-round…MPCA is claiming that wild rice is equally susceptible to sulfate at all times of the year…MPCA arbitrarily discounted the only research on this topic and proceeded as though its data supported nothing but a year-round standard, with the calculated effects of a summer discharge being treated just like a sulfate discharge in the dead of winter. In 2013 DeRocher and Johnson provided research to MPCA showing significant temperature-dependent differences in the rate of sulfide creation in sediment. Their sediment incubation study indicates that in cold water, additions of sulfate take several weeks to show any increased porewater sulfide, and then it takes only a few weeks to go back to previous sulfide levels once the sulfate additions have ended."

As noted above, the SONAR provides a discussion on the reasonableness of the annual duration and the concept of seasonality beginning on page 81; pp. 91 – 94 also address these topics. The MPCA did not discount the 2013 DeRocher and Johnson study and in fact cites this work when discussing the reasonableness of the annual duration of the standard. MPCA has acknowledged that sulfate conversion to sulfide is slower in cold temperatures. However, MPCA explained that is does not have sufficient scientific information to quantify this difference in a way that could be incorporated into a proposed water quality standard. Specifically, the SONAR (excerpted below) provides the following justification of the reasonableness of not incorporating temperature dependence into the proposed equation.

"…the MPCA lacks sufficient scientific information to quantify the lower winter diffusion rates and thereby develop a ratio or other numeric approach to allow higher sulfate levels in the winter. The MPCA also does not know if an approach that allowed higher sulfate levels in the winter would be protective over the long term. Because of this, is it reasonable to have a standard that applies all year, not just seasonally."

John Hall also provided comments interpreting the Pastor et al. 2017 study that asserted:

"These data clearly indicate that a single season exposure does not cause adverse effects, even at the highest concentrations. These results show that the duration must be greater than one year to show an effect…The criteria duration necessary to protect wild rice is at least two years."

Other commenters are clearly concerned that even an annual duration is too long, because there may be effects at shorter duration.

The SONAR provides a reasonable justification for the annual duration using data from the Pastor et al. 2017 beginning on page 79:

"In this case, it was not until the third year of the experiment that wild rice growth and reproduction was significantly affected by the 100 mg/L treatment (Pastor et al., 2017). This mesocosm experiment conducted by Pastor et al. (2017) demonstrated that porewater sulfide is directly proportional to the long-term (annual) average sulfate concentration (Myrbo et al. Exhibit 36)."

Although statistically significant effects were not observed until year 3, it is not reasonable to assume that a 3-year average would be protective, for the following reason: The mesocosm experiment was not designed to evaluate the frequency or duration of exceedances. Rather, the mesocosms evaluated the cumulative impact of sudden increases to new elevated concentrations, from a base exposure that was very low—the sediment was taken from a wild rice lake with an average sulfate concentration of less than 3 mg/L. An experiment designed to address this issue might have first exposed the sediment to a sulfate concentration closer to the calculated standard of 34, and then observed the effect of an increase above the standard. Accordingly, the MPCA made a judgements of protective frequency and duration values, partly informed by the mesocosms experiment.

Given the available data, an annual average for a standard that applies at all times, (not just seasonally), is a reasonable choice.

Frequency of the standard

The proposed sulfate water quality criterion to protect wild rice waters has an exceedance frequency of once in ten years. This means that a water body would not be considered impaired until the numeric sulfate standard is exceeded in a second year out of ten.

Some commenters (Hall) found this frequency to be excessively conservative, stating that the mesocosm experiment: "results show that wild rice has the ability to recover even when plant growth was virtually eradicated after multiple years of exposure to extremely high levels of sulfate. If wild rice can begin recovery from this extreme condition, it should be apparent that recovery would be complete within two years after an exposure that only causes slight effects…These observations support a return frequency of once in three years."

Other commenters (Fond du Lac Band) expressed concern that the proposed frequency is not protective, stating that: "Dr. Pastor's experiments were not designed to determine what that frequency might be…MPCA cannot assume that this natural resilience of wild rice will be realized if an anthropogenic disturbance such as excessive pollutant loading occurs. The only existing data that is relevant to that issue are the latest mesocosm results (Pastor progress report, June 2017), where only about half of the high sulfate treatment mesocosms rebounded when the sulfate loadings ceased."

Still others (WaterLegacy) stated that: "even if sulfate was elevated over an entire year, the proposed rules would only consider this an "exceedance" of the standard if the discharger violated the wild rice sulfate standard for more than one year out of ten."

The MPCA believes that a shorter standard frequency (one to three years) is not protective. The MPCA agrees that the objective of the mesocosm study was not to determine a protective frequency in which to express the proposed standard; however, this does not mean the MPCA's evaluation of the data from the mesocosms and other lines of evidence is not scientifically defensible. Additionally, with regards to Mr. Hall's claim that wild rice did "recover", there was a notable decrease in wild rice density after five years of elevated sulfate concentrations followed by two years of reduced exposure. This finding suggests that multiple consecutive years of increased exposure reduced the potential of the wild rice to produce viable seed heads for future plant establishment. There is not sufficient information indicating a one in three-year frequency is protective for the use and propagation of wild rice. The reasonableness of applying a one in ten year frequency is available on

page 82 of the SONAR. Again, the MPCA's choice is a reasonable balance and the one in ten year frequency is reasonable and protective.

I. Comments Related to NPDES Permitting

Many commenters felt that the MPCA has not provided enough detail in the implementation sections of the proposed rule and supporting documents. For example, EPA suggests the inclusion or development of specific procedures. And, operators of permitted facilities provided comment that the lack of detail prevents them from fully understanding their future effluent limits and thus the cost implications of the rule. This is perhaps best illustrated by the comment from the Minnesota Chamber of Commerce, which states "The technical support document (TSD) and the Statement of Need and Reasonableness (SONAR) both have economic and socioeconomic impacts, but do not include all the factors that would be assembled in a complete cost analysis of the proposed rule. The MPCA estimates that, at a minimum, 130 permitted facilities will be evaluated for the possibility of requiring additional permit limits to protect wild rice under the new rule. Without an understanding of the feasibility and cost of meeting these new limits, it is difficult for these 130 facilities to plan for future development and commit capital investment into their facilities."

More general comments about the Agency's obligations around cost analyses are provided in the section of this Rebuttal Response related to procedural issues. This response section addresses the MPCA's effluent limit permitting process and why it is reasonable for the MPCA to not have specific details about effluent limits available at this time.

As noted in the November 22, 2017 Response to Comments, the MPCA understands that dischargers want clarity about how the standard will affect them, and we are sensitive to comments that the MPCA should strive to fully understand and articulate the implementation details of a rule prior to adopting the rule. In the case of water quality standards, the impact on permitted facilities comes through development of an effluent limit specific to a facility that ensures the permitted facility will not cause or contribute to a violation of the water quality standard. Effluent limit setting requires evaluating multiple factors as described beginning on page 96 of the SONAR.

There are approximately 1000 facilities in Minnesota that hold water discharge permits. Site-specific data is required to evaluate the need for an effluent limit at each facility, and these issues are addressed in an individualized permitting process. This data is not immediately available for all facilities and it takes time to gather this data.

This time and data need is inherent to the difference between water quality standards and effluent limits, and is not unique to the proposed revisions to the wild rice sulfate standard. As explained in Part 6G, pp. 96-99 of the SONAR, evaluating the need for and (as needed) determining a water quality based effluent limit requires data specific to the discharge being evaluated and the receiving water(s) being discharged to. Data needs unique to the proposed rule revisions are the sediment iron and carbon (or porewater sulfide) data.

Collecting all the data necessary to calculate all effluent limits statewide would take at least ten to fifteen years, even if the sediment data were not needed. Necessary steps such as gathering five years of effluent data to evaluate and set effluent limits combined with the 10-year surface water monitoring schedule to gather surface water data cumulatively add up to the necessary data not being available for some permitted discharges until at least ten to fifteen years after rule promulgation. The MPCA does plan to prioritize data collection based on factors such as those mentioned in the EPA comments, Appendix 2 – the likelihood of sulfate impacts (because of type and location of dischargers) and permitting schedules.

It is unreasonable to delay this rulemaking for ten to fifteen years to provide total certainty regarding future effluent limits for specific facility discharges and the exact future costs. In addition, every facility is unique and detailed engineering is needed to estimate the costs of installing any treatment system.

This is why the MPCA provided general effluent limit considerations and the range of costs detailed in the SONAR. A delay such as would be necessary to gather data and estimate the cost for all potentially affected facilities is particularly unreasonable given that while the rulemaking would be delayed the existing sulfate standard would remain in place and need to be addressed as required by the Clean Water Act and federal regulations.

NDPES Effluent Limit Expression

Commenters also raised questions about how the MPCA plans to express effluent limits, and several asked that this information to be placed in rules. For example, Mesabi Nugget made the following comment: "It appears MPCA may have committed a drafting error when preparing the rule language for public notice. The agency says that water quality-based effluent limitations (WQBELs) for sulfate will typically be expressed as a 12-month moving total mass. MPCA SONAR (July 2017), p. 105. However, the corresponding rule language does not appear to reflect this policy decision made by MPCA. The rule language should be updated to properly reflect the mass limit approach."

MPCA has not committed a drafting error. There are two general ways to express an effluent limit: as a mass limit or a concentration limit. The choice to express a limit as a mass limit or concentration is a decision that is made at the time that an effluent limit is developed for a specific discharge. The MPCA intends to fulfill its statutory responsibility to protect water quality standards and designated uses through requiring the most appropriate and protective effluent limits. At this time, based on our knowledge, the MPCA would prefer that effluent limits be expressed as 12 month moving mass totals. However, the MPCA may use other approaches as necessary to ensure protection of the water quality standard. MPCA expressly noted this intent in the sentence that follows the sentence quoted in the comment above, which reads "Concentration-based limits will also be included in the permit if need is demonstrated" (SONAR, p. 105).

More generally, it is not needed or reasonable to specify in rule the exact manner in which effluent limits must be expressed for every permitted discharge that may need a limit to protect the beneficial use. Data that the MPCA does not currently have for every facility, such as sulfate concentrations in the discharge and the receiving water(s), are key to informing the MPCA's decision on which approach is needed to protect the beneficial use in the receiving water(s).

There is extensive EPA guidance and MPCA past practices for effluent limit setting that will be evaluated and used as appropriate. This flexibility is important for setting individual facility limits, and is part of why the MPCA is not providing more detail in the rule such as the suggestion by EPA to specify a flow rate for the relatively rare situation of isolated waterbodies. MPCA may take the approach suggested by EPA, but putting detail for such a specific situation in rule is unnecessary.

It is reasonable for the agency to define key variables such as the 365Q10 in the rule and indicate the general limit-setting approach in the SONAR. It is unreasonable for the agency to know with total certainty the exact limit-setting approach for all wastewater plants, which would be needed to put exact limit-setting approaches into rule.

Sulfate Fate and Transport

Joe Mayasich provided comments on the limit-setting approach outlined in the SONAR specifically related to sulfate fate and transport in the environment. The comments criticized a lack of a discussion of specific sulfate fate decay rates in the SONAR, and provided the specific comment below on sulfate transport.

"The proposed Rules erroneously assume that 100% of the sulfate load/concentration discharged from permitted facilities' outfalls reach wild rice habitat via surface water transport, and then erroneously assert, with a simplistic equation, that the 'protective' level of biogeochemically produced Sulfide (i.e. 120 µg/L) can be achieved by reducing just the load/concentration of just the point-source-discharged, surface-water-transported Sulfate."

The MPCA has not assumed that 100% of the sulfate discharged from a facility will reach the wild rice habitat in downstream wild rice water(s). As noted in Part 6G of the SONAR, the first step in conducting an effluent limit review is determining if a discharge will cause, have the reasonable potential to cause, or contribute to an exceedance of a water quality standard (SONAR p. 97, also 40 CFR 122.44). This step is often referred to as the "reasonable potential" analysis. The MPCA effluent limit reviews of sulfate discharges from permitted facilities will consider factors such as flow dilution, water body type, water flow path, and site-specific sulfate decay rates in this "reasonable potential" analysis. Sulfate fate and transport is a complex environmental phenomenon and it is not possible to simplify sulfate fate in the environment to a singular half-life decay rate applicable statewide. The MPCA expects to treat sulfate transport in the environment conservatively during limit setting to be suitably protective and simplify the limit setting process. If quality evidence suggests sulfate is not transported conservatively then the MPCA is willing to consider that evidence in the limit setting process.

Regarding the second part of this comment, MPCA has not asserted that the protective sulfide level can only be achieved by controlling point source discharges of sulfate to surface waters. This comment again confuses key differences between water quality standards and permit effluent limits. Standards apply in the water body to protect the beneficial use. The need for and details of an effluent limit is established by first determining if a discharge has "reasonable potential" to cause or contribute to an exceedance of a standard applicable in the receiving water(s). If the discharge does have reasonable potential, the effluent limit must then be set at a level that controls the pollutant so that the facility does not cause or contribute to an exceedance. This requirement of the Clean Water Act does not assume that controlling the discharge will by itself ensure the water quality standard will be achieved, and MPCA has not made such an assertion.

Singular conservative assumptions in the implementation strategy will cumulatively result in excessive over-protection and unnecessarily low effluent limits

John Hall and other commenters provided comments on the limit-setting approach outlined in the SONAR, specifically the concept of individual conservative effluent limit setting assumptions compounding into excessively conservative assumptions when considered cumulatively. These commenters did not rigorously distinguish between the concept of compounding conservative assumptions in the science underlying the standard development and the concept of compounding conservative assumptions in the implementation of the standard. The MPCA addresses the concept of compounding conservative assumption in the science behind the standard development elsewhere in this document (Section K) and will address the concept of compounding conservative assumptions in the implementation of the standard below.

We maintain that none of the individual assumptions in the implementation section of the SONAR is overly conservative and thus there is no compounding of conservatism when these choices are made in combination. For example, the choice of the 365Q10 as the receiving water flow rate during the limit setting process is

reasonable and not overly conservative. We did not choose an unnecessarily conservative receiving water flow rate such as the 7Q10 (defined in Minn. Rule 7053.0135) because choosing that extremely low receiving water flow rate would have been overprotective of the duration and frequency of the proposed standard. Since every individual implementation assumption is not overly conservative, there can be no compounding of individual conservative assumption and thus there is no cumulative compounding of conservation assumption in the implementation of the standard. We maintain that the proposed implementation strategy is reasonable, is appropriately protective of the water quality standard and will not result in unnecessarily low effluent limits.

Implementation Timeline

Commenters (Friends of the Boundary Waters) also raised concerns that high levels of sulfate would be allowed until the MPCA gathers data and sets a numeric sulfate standard – essentially leaving waters without a standard. As noted in our Response to Comments, data gathering will be needed regardless of whether MPCA moves forward with the proposed equation based rule or chose to implement a single standard. In either case, data is needed on sulfate in effluent and sulfate in surface waters in order to implement discharge limits. The addition of the need to collect sediment data to implement the equation based standard does not substantially change the timeline.

Other commenters had concerns that an increase in sulfate loading could occur prior to the setting of a numeric sulfate standard. As raised by MCEA: "MPCA has rejected the alternatives of keeping the 10 mg/L standard in place while data are collected and also the alternative of specifying that there shall be no net increase in sulfate discharges until a numeric standard is developed that can be used to set protective effluent limits…sulfate loadings cannot be relied on to stay constant until new permit limits are calculated. Dischargers are not generally discharging the full amount of pollutants that their NPDES permits allow them to discharge and, thus, there is frequently room for increasing the flow or discharges of particular pollutants without obtaining a new permit."

The commenter is correct that most dischargers do not discharge at the full levels authorized by their NPDES permit; in MPCA's experience, most dischargers prefer to operate with a degree of buffer between their actual and permitted discharges. The MPCA felt that the concept of "no net increase" was not implementable primarily because of very limited existing data on sulfate effluent concentrations and on how much a permittee is operating below their maximum permitted levels and how sustainable that operation is.

Implementation of a "no net increase" provision would require defensible numerical methods for defining a baseline that correctly characterizes the concentration or load the facility is currently discharging. Several methods could be used, but nearly all would result in the same outcome: a disincentive to reduce loading below maximum authorized levels. For example, the current actual discharge baseline could be defined as the average effluent concentration recorded during the previous five years. A permit condition, or limit, would then be derived from this baseline. During the next permit cycle, the permittee would strive to operate below this baseline in order to remain in compliance with permit conditions. At the subsequent permit review, the new five years of data would be used to readjust the no net increase baseline lower to comply with the previously determined no net increase baseline. In this hypothetical scenario, it would be nearly impossible to not reduce discharge during every reissuance, and as a result, permittees would be tacitly encouraged to always discharge at maximum authorized levels. Another potential result of this scenario is that effluent limits for affected facilities could ultimately be reduced to a level where violations would be frequent and unavoidable.

J. Sampling and Analytical Methods

Multiple commenters provided input on the sampling and analytical methods incorporated by reference into the rule. The goal is to set forth methods that are sufficiently clear as to result in a consistent development of a numeric sulfate standard via the equation or alternate standard, while not constraining flexibility that may be needed to adapt to the differing conditions of a given wild rice water and different lab abilities and does not affect the ultimate result.

The MPCA chose to incorporate methods by reference because the sediment or porewater sampling and analysis are fundamental to the development of a numeric sulfate standard (through either the equation or the alternate standard) and we anticipate that permittees or other parties may want to conduct sediment or porewater sampling themselves. Some commenters (MCEA) raised concerns that parties other than the MPCA should not be allowed "to do sampling that determines the applicable water quality standard under state law." Others (Water Legacy) suggested that allowing such sampling is an "invitation to mischief".

Incorporating the sampling and analytical methods by reference makes them enforceable and ensures that the MPCA is able to accept only information with results that are consistent with the results that would be received if the MPCA itself conducted all sampling and analysis. To ensure quality data, the MPCA is also requiring outside parties to submit a sampling plan if they want to collect and analyze data in a way that is consistent with but does not exactly follow the incorporated methods. The MPCA will assess data quality before any use of the data occurs. MPCA will be responsible for documenting the final numeric sulfate standard for each water and will not document or enforce a result that arises from data that does not conform to the rule's methods.

Comments on the sampling methodology generally were in the areas of clarity and flexibility. For the methods on where and how to collect sediment and porewater within wild rice waters, commenters seemed to want more clarity; for the analytical methods, commenters tended to want more flexibility.

The MPCA is considering some rule changes based on these comments; more information is provided in the section on planned and proposed rule changes. The MPCA also plans to develop detailed guidance of best practices or standard procedures that can be used for sampling and analysis in order to provide a "recipe" for those who want such details.

<u>Sampling Methods are for Wild Rice Waters</u>

Some comments seemed to conflate the sampling methods – particularly discussion of where to sample within the wild rice water – with the identification of the wild rice water. For instance, one commenter (Cliffs) states that "the use of water lilies as indicators of suitable wild rice habitat is scientifically flawed." Another commenter (MESERB) stated that the "The list of areas within wild rice waters that must be sampled is overly broad. Wild rice propagates through seed. The Agency should look for more than the presence of waterlilies, other plants or areas with a certain water depth to demand testing. An upstream source of seed should also be required. Similarly, if conditions that preclude establishment of wild rice are present, such as waters that are not clear or that support a population of carp, sampling should not be required." It is important to note that the sampling methods are to be deployed in waters that the MPCA has already identified as Class 4D wild rice waters. Therefore, the waters are known to demonstrate or have demonstrated the wild rice beneficial use since November 28, 1975.

The sampling methods are about getting the best characterization of sediment iron and carbon or porewater sulfide in waters that have already been determined to be wild rice waters. EPA's comments in Appendix 2, particularly comment #3, raise concerns that requiring or allowing sampling to be constrained to areas of

obvious wild rice habitat within the wild rice water may bias the sampling. The MPCA will consider making changes to the method document to address this concern.

Sediment and Porewater Sampling Methods

Commenters (1854 Treaty Authority) rightly noted that "The design of this sampling would be crucial: where does sampling occur, how many samples are taken…it is also likely that sampling results in each water would give a range of sulfate values…under the proposed approach… However, guidelines could lead to inconsistent implementation." The goal of the methods document is to set out requirements for sampling, not guidelines, in order to have the most consistent implementation possible. As noted in the rule, the equation-based sulfate standard must be set at the lowest sulfate number obtained based on the sediment iron and carbon values found via sampling.

Similarly, commenters (MCEA) noted that "having a standard based on sampling of each site requires, at a minimum, a standard sampling protocol that rigorously controls for the spatial variability of iron and carbon in the sampled environment." Another commenter specifically mentioned the high spatial variability in iron and TOC in Twin Lakes. The TSD (Chapter 3) and Hearing Response to Comments discusses the variability of sediment TOC and iron, and the reasonableness of the methods proposed for sampling wild rice waters to collect data for use in calculating a standard for the waterbody.

The MPCA has adequately shown that the required 25 sediment samples is sufficient to characterize the spatial variability of iron and carbon, and the use of the lowest resulting sulfate value is sufficiently protective. Comments from EPA have suggested that MPCA consider providing more specificity about transects, specifically information like lengths and distances, and the MPCA will consider this and may make changes to the sampling methods. In particular, EPA Appendix 1 comments number 3, 4, 6, 11, and 13 suggest additional clarity that the MPCA will consider.

There was also some confusion among the commenters about the relationship between sampling for sediment iron and carbon, and porewater sulfide. Some stated that the sampling methods do not include a clear description of the purpose of the porewater sampling and others seemed to believe that all of these parameters would be collected at all times. To be clear (this is also discussed in the portion of this document on proposed and planned rule changes), the MPCA envisions that the vast majority of the sampling will be only for sediment iron and carbon. Porewater sulfide will only be collected if there is a reason to believe that using the alternate standard approach to developing a numeric sulfate standard would be appropriate. Other commenters (GLIFWC) noted that "The procedures do not make it clear how the porewater sampling effort can occur in conjunction with the sediment core sampling. The document states that the sediment sampling must be done before the porewater sampling. It then states that the porewater sampling must be done no later than 4 hours after the sediment cores are taken. Given that the sediment sampling is done first, how will the MPCA determine what is an undisturbed sediment for the purpose of porewater sampling?" The MPCA will review the methods document and add clarity as needed.

Commenters (Mining Minnesota) also stated that "[i]t is also unclear how to interpret porewater sulfide data. The MPCA Sampling Methods include direction that two porewater samples be collected at each of five transects used for the previous sediment sampling for a total of ten porewater samples per 'wild rice water.' It is unclear, however, which porewater sulfide value will be considered relevant for compliance. Is it the lowest of the ten values in the dataset, an average, or some other value? If sulfide values in the same location differ by hundreds of micrograms per liter or more, how will that data be evaluated and for what purpose? How will results be interpreted if they differ from the calculated sulfate standard based on sediment iron and total

organic carbon data?" Porewater sulfide data would only be used to establish a numeric sulfate standard via the alternate standard procedures. Once that numeric sulfate standard is set, that sulfate standard would be used to determine attainment of the standard and in effluent limit review. However, MPCA does agree that the rule and method do not adequately explain how to use the multiple porewater sample values to develop a sulfide level for use in the alternate standard. The MPCA will clarify.

Use of Sediment Data to Develop Sulfate Level

The rule language directs that "the calculated sulfate standard is the lowest sulfate value resulting from the application of the equation to each pair of organic carbon and iron values collected and analyzed" consistent with the methods document. Several commenters state that it is not appropriate to use the lowest calculated sulfate level rather than an average. The Technical Support Document discusses the detailed reasonableness of using the lowest calculated value of sulfate derived from the analysis of five composite sediment samples. (See page 87 of the TSD). Briefly, though each of the five values that are calculated from the five paired data sets of sediment TOC and iron is protective of wild rice, the lowest value represents the most sensitive condition for the wild rice in that waterbody. It is reasonable to protect for the beneficial use based on applying that lowest calculated sulfate value.

Analytical Methods

The document incorporated by reference also includes methods for analyzing the collected sediment to determine the iron and carbon levels and analyzing the collected porewater to determine the sulfide level. Commenters provided some very detailed and technical comments on the analytical methods in particular. These issues are more detailed than MPCA can fully investigate and respond to in the time allotted for the post-hearing comment and rebuttal periods. In addition, EPA posed some detailed questions concerning the analytical methods. MPCA is therefore responding broadly here. We will continue to consider the comments on the methods and the need for changes to the methods document prior to adoption of a final rule and will work to provide additional information to EPA and others as needed.

In general, comments about the analytical methods seemed to focus around the need for more flexibility – allowing for analytical methods that would provide comparable results while not requiring certain steps that are not consistently available at every analytical lab. The MPCA believes that the proposed rule language change to require analysis be conduct "consistent with" rather than "using" the specified methods will provide an appropriate level of flexibility and will be reviewing the analytical methods for similar types of revisions.

Many comments were received about the availability and need to follow specific procedures for drying sediment samples, sieving samples, method blanks and various other specifics of sediment sample preparation and analysis. The MPCA will review these comments and consider revisions to the methods as needed.

Comments (Mining Minnesota) were also received about the availability of the methods. "Because MPCA is specifying an analytical method that must be used under the Proposed Rule for porewater sampling, the MPCA should also consider whether commercial laboratories are willing to perform the specified method, and if laboratories become available, whether they are able to conduct the testing within the required detection limits and QA/QC standards."

Particular concerns were raised about the method for porewater sulfide analysis. Mining Minnesota noted that two methods have been used in the past; the two methods have a different distillation step; they state that "MPCA has incorporated Method E as the sole approved porewater sampling methodology without regard to its historical purpose or commercial availability… approximately 30 separate laboratories in the United States and

Canada were contacted, and none were able to conduct a Method E analysis." They note that most labs could analyze sulfide using a third method, which has higher reporting limits. Another commenter states that "MPCA does list acceptable analytical performance but neglects to identify the required MDL. My opinion is given MPCA's use of a porewater sulfide threshold of 120 µg/L, the MDL should be at least 3 to 5 µg/L and the RL 10 to 15 µg/L to have confidence in using the data to derive an enforceable sulfate standard." The MPCA will consider the need to specify a method detection limit in the incorporate document; the MPCA envisions that if a MDL is specified, multiple methods able to meet that limit could be used.

Ramboll also notes that they have "reached out to over 10 reputable certified (e.g., NELAC) commercial water testing laboratories and none of them either are set-up to run this method or routinely run this method to be confident in the quality of their results at a RL of 10 to 15 ug/L sulfide. One commercial lab who has been a leader in AVS and sulfide analytical method development, Alpha Analytical, noted that colorimetric methods have a high potential for false positives due to naturally colored water. It is concerning that dischargers have limited knowledge on the accuracy and precision of the state laboratory execution of Method 4500-S2- E Sulfide and has no information on what to expect for interlaboratory variability." In analyzing samples for the MPCA, the Minnesota Department Health (MDH) and the Science Museum of Minnesota labs both avoided the problem mentioned here--the potential for false positives due to naturally colored water--by separating the sulfide from the water sample prior to quantification. Standard Method 4500--S2-E, used by MDH, first separates the sulfide from the sample via gas dialysis, and only then quantifies the sulfide via colorimetric methods. The Standard Methods book states, "The automated methylene blue method (E) is similar to Method D. A gas dialysis technique separates the sulfide from the sample matrix. Gas dialysis eliminates most interferences, including turbidity and color." Standard Methods notes that this method can accurately quantify sulfide as low as 2 µg/L sulfide, lower than the MDH reporting limit of 11 µg/L sulfide.

K. Procedural Concerns

Several comment letters include assertions regarding purported failures of the MPCA to meet legal/procedural requirements of the Administrative procedures Act, SONAR content requirements, and Minnesota Statutes Section 116.07, subd. 6. The comments allege that MPCA failed to:

- Adequately cite its statutory authority to adopt rules
- Include economic information in the SONAR
- Give due consideration to economic factors
- Consider feasibility and practicability
- Properly assess alternatives

The following paragraphs address each comment in turn.

Statutory Authority: U.S. Steel has commented that the MPCA could have cited additional statutory provisions to demonstrate its authority for the present rulemaking. The agency appreciates that U.S. Steel acknowledges and identifies that the rulemaking is also authorized under other authorities in addition to those specifically cited in the SONAR. Minn. Stat. 14.131 establishes the requirement for a statement of need and reasonableness and delineates general content requirements. Additionally, Minn. R. 1400.2070 (not 1400.0270) presents additional content requirements, providing specifically that the statement must include:

D. a citation to the agency's grant of statutory authority to adopt the rule and, if the grant of authority was made after January 1, 1996, the effective date of the agency's statutory authority to adopt the rule;

Minn. R. 1400.2070, subp. 1.D. This is to assure that agencies have the necessary statutory authority to promulgate a rule and that the rule is lawful. Subpart 2.D. of the rule refers to information required by other law to be included in a SONAR. The agency complied with the requirements of both the statute and the rule. Neither requires an exhaustive listing of all agency rulemaking authorities nor is specific mention of the rule, Minn. R. 1400.2070, required SONAR content. The MPCA demonstrated that it has the necessary authority for the present rule amendment and cited sufficient statutory authority for the rulemaking.

Economic information included in the SONAR and used to inform development of the standard: In its November 22, 2017 Response to Comments the MPCA responds to the multiple comments about how and to what extent MPCA included economic information in the rule development and SONAR. This included whether the separate study MPCA has underway, funded by the Legislative Citizen Commission on Minnesota Resources, provided information to inform development of the standard.

Due consideration given to economic factors: A number of comments (USS, Cleveland-Cliffs, ArcelorMittal) suggest that the MPCA failed to consider cost and economic factors as required by 14.131 or that the analysis was insufficient. While it is true that MPCA did not title a section of the SONAR as "Consideration of Economic Factors," it is also true that the MPCA gave due consideration to economic factors as required by statute. In fact, the specific SONAR citations provided on page 9 of the USS comments demonstrate that cost considerations were part of MPCA's thinking in developing the proposed rule and SONAR.

USS on pp. 8-10 of its comments also cites recently completed examples of MPCA rulemaking as evidence that MPCA has recognized its obligation to consider economic impacts, and implies that these are in contrast to the rulemaking at hand. The SONAR's content readilyrefutes this assertion. The cost and enhanced economic analysis components of the SONAR for this rulemaking span pages 145-195 and 209-216; and the full regulatory Analysis section spans pages 143 - 218. Due to differences in economic impacts, formats and changes in statutory requirements direct comparisons of SONARs cannot provide a meaningful measure of whether costs were appropriately considered in any individual rulemaking. However, an examination of the SONARs mentioned by for the earlier rulemakings shows that:

- The Regulatory Analysis for the Tiered Aquatic Life Use rulemaking was 17 pages, and the "consideration of economic factors" spanned eight pages.
- The Regulatory Analysis for the Variance rulemaking was six pages, and the "consideration of economic factors" is three paragraphs.
- The "consideration of economic factors" section for the 1997-98 Great Lakes Initiative rulemaking was two pages.

The number of pages in SONAR for the present rule containing discussion of costs and economics exceeds the combined total of the above-identified SONARs. MPCA has fully met the requirements of Minn. Stat. § § 14.131 and 116.07, subd. 6. The fact that MPCA integrated its consideration of economic impacts throughout the Regulatory Analysis for this SONAR rather than limiting them to a section titled "consideration of economic factors" is not evidence that the requirement of due consideration was not met.

ArcelorMittal and USS also claim that MPCA has not met the statutory requirements under Minn. Stat. 14.131 and 115.43 to illustrate the benefits of implementing the proposed rules and that MPCA must directly compare

economic costs to benefits. Minn. Stat. 115.43 does require the agency to give due consideration to economic factors and take into account any taxes on municipalities. As demonstrated above, the MPCA has done this for this rulemaking. The APA does not require an explicit balancing of costs and benefits; in fact, Minn. Stat. 14.131 never explicitly mentions the idea of the benefits of a proposed rule (merely the costs of not implementing a rule). In addition, the Tribes in particular would note (as they have in consultation with the MPCA) that it is nearly impossible to quantify the benefits of wild rice and that this results in an uneven balance between easily monetized financial costs and difficult to monetize but very real benefits

Cliffs also claims that the CWA does not prohibit MPCA from evaluating the cost of compliance and references the agency's statements regarding the role of economics in determining water quality standards. The MPCA is on record as stating that the cost of compliance is not a determining factor in *setting* a water quality standard. The content of pages 143-218 of the SONAR demonstrate that the MPCA has considered costs as required by law. The MPCA cannot and should not act as many commenters suggested and simply determine the standard is unreasonable because it is expensive to implement.

A number of commenters have suggested that the MPCA can and should simply delete the existing wild rice standard, that the proposed rule amendment is solely a policy decision, and that the MPCA would be authorized to delete the existing standard without adopting a replacement. . Both the MPCA's response to Comments and the EPA's November 22, 2017 comment letter address this. EPA's comments directly contradicts assertions that MPCA can simply delete the existing wild rice sulfate standard without a replacement and meet its obligations under the CWA Section 303(c) and 40 CFR 131.11(a), and that the proposed revisions to the wild rice sulfate standard are in some way a "policy decision" and not a legal obligation.

Consideration of Feasibility and Practicality: USS asserts that MPCA has not given due consideration to the feasibility and practicability of the proposed rules, and references Section 404 of the Clean Water Act, Webster's Dictionary and the variance discussion in the SONAR as evidence of this lack of consideration. MPCA disagrees with these comments. Consideration of feasibility and practicality is about the proposed rule revisions, not the original adoption of a wild rice sulfate standard. As noted in the Response to Comments and above, MPCA cannot demonstrate that removing the existing wild rice sulfate standard, without a replacement approach, would be protective of the wild rice beneficial use. Therefore the consideration becomes the feasibility and practicality of the proposed revisions as compared to the existing rule.

In citing definitions of "practicable," the commenter references Section 404 of the Clean Water Act. This reference is misguided, since this proposed rulemaking involves the requirements and authorities of Section 303(c) of the Clean Water Act (see EPA comment letter); Section 404 is not relevant to this particular rulemaking.

Finally, the comments note that a condition for granting a variance is a finding "that attaining the designated use and criterion is not feasible" and suggests that MPCA's acknowledgment of the likely need for an applicability of variances therefore proves the rule is not feasible. This argument conflates two separate concepts: the feasibility and practicality of the rule revisions themselves and the feasibility of imposing specific permit conditions as needed to be protective of the adopted standard. These are not the same thing, as MPCA has repeatedly demonstrated throughout the SONAR and rulemaking record. In fact, the availability of variances as a tool to address economic impacts to permitted facilities is evidence that the proposed rule revisions are feasible and practical even though sulfate treatment technologies are currently limited and costly.

Minnesota Statutes 14.127: Mesabi Nugget's submittal includes a request for a statement from the MPCA acknowledging that Minn. Stat. 14.127 protections apply to them and that the Proposed Rule will not apply to

Mesabi Nugget until the rules are approved by law enacted after the agency determination or disapproval by the Administrative Law Judge. Such a statement is not required. The MPCA made the determination required by Minn. Stat. 14.127 in the SONAR as is noted in Mesabi Nugget's comment. The statute does not require the agency to make the requested acknowledgement and the statute speaks for itself as to its applicability and effect. Further, the statute requires that a business or city submit a statement claiming a temporary exemption from the rules before protections under 14.127 are triggered.