

Comments and Proposed Charge Questions for Peer Review of the Wild Rice Sulfate Standard Studies

WaterLegacy Proposed Charge Questions

The Wild Rice Sulfate Standard studies were funded by the Minnesota Legislature (Minn. Laws 2011, 1 Sp. c.2, art. 4, § 32(a)) and designed to evaluate questions related to potential rulemaking amendments to Minn. R. 7050.0224. Study objectives were to provide answers to these substantive questions:

- 1) whether Minnesota's existing water quality standard limiting sulfate to 10 milligrams per liter in waters used for the production of wild rice is appropriate to protect natural beds of wild rice; and
- 2) whether Minnesota's water quality standard limiting sulfate to protect natural beds of wild rice should or should not be limited to specific times of the year.

Based on these Study objectives and the multiple lines of research undertaken by scientists under contract with the MPCA, WaterLegacy believes the following charge questions are required in order to allow the independent peer reviewers to contribute their expertise to this process.

WaterLegacy Charge Question 1: Do the field data, mesocosm data and hydroponic data taken together support the existing 10 milligrams per liter (mg/L) sulfate standard to protect wild rice or some other standard? What is the best estimate of the degree to which the existing standard would be protective of natural beds of wild rice?

WaterLegacy Charge Question 2: Does the field, mesocosm and hydroponic data support a conclusion that sulfide in sediments is toxic to wild rice? Does the data allow determination of the threshold at which sulfide becomes toxic to wild rice? If so, what is the sulfide concentration where toxicity to wild rice is observed?

WaterLegacy Charge Question 3: Does the mesocosm study data support a conclusion that elevated concentrations of sulfate and sulfide have intergenerational adverse effects on wild rice seed weight and viability?

WaterLegacy Charge Question 4: Do study data related to sulfide toxicity and the data pertaining to conversion of sulfate to sulfide at various temperatures support any limits on the time of year during which the sulfate standard would apply to protect natural beds of wild rice? If so, what specific temporal limits?

WaterLegacy Charge Question 5: Are the wild rice sulfate studies on which the MPCA Analysis is based, in which neither sulfate or sulfide were manipulated in conjunction with iron, sufficient or insufficient to support the MPCA's conclusions about the ability to predict sulfide based on iron content in porewater?

WaterLegacy Charge Question 6: Are the wild rice sulfate studies on which the MPCA Analysis is based sufficient or insufficient to support MPCA's conclusion that high concentrations of iron in porewater prevent sulfate from diminishing wild rice abundance in the natural environment?

WaterLegacy Proposed Revisions of MPCA Charge Questions

MPCA's charge questions appear to be constrained by political factors, overstate the support for an

“iron mitigation” theory advanced by the mining industry, and do not provide the peer review committee with sufficient latitude to provide independent analysis of the issues before the MPCA for which the research was instituted and funded by the Minnesota Legislature, which are summarized above. The study objectives should have been clearly stated in the charge to the peer review committee and the charge questions should be modified as explained below to allow peer reviewers a more substantive and effective role in the process.

1) Various MPCA charge questions are inappropriately narrow and constrain the peer reviewers from contributing substantively to the scientific discussion:

MPCA Charge Questions 2 and 3 should be understood as part of Question 1.

MPCA Charge Question 5 is not meaningful and should be eliminated.

MPCA Charge Question 6 should provide peer reviewers greater latitude to respond to the issue.

2) Several charge questions inappropriately elevate an untested hypothesis advanced by the mining industry that anthropogenic iron would “mitigate” effects of sulfate discharge on wild rice and blur the distinction between correlations and experimental results.

MPCA Charge Question 4 should be substantially revised.

MPCA Charge Questions 7-8 assume that a correlation found in a targeted field sample establishes a causal relationship between sulfate, iron and sulfide. These questions should be eliminated.

MPCA Charge Questions 9 should be reframed to allow the peer review committee sufficient professional latitude to comment on the Agency’s “iron mitigation” hypothesis.

MPCA Charge Question 10 is redundant with Charge Question 9 and is not needed.

3) Once the Study objectives are clearly stated for the Peer Review Committee, WaterLegacy has no objection to MPCA Charge Questions 11, 12 and 13.

Amendments to the MPCA Charge Questions in Redline Format

MPCA Charge Question 1: Discuss the appropriateness of the sulfide seedling hydroponic test method and performance in evaluating the hypothesis that elevated sulfide in the sediment porewater can be toxic to wild rice. Among other issues, please comment on the reasonableness of uses of the initial exposure solutions as the operative exposure concentrations for the test and the MPCA’s use of regression analysis to determine effect levels.

Charge Question 2: Is it reasonable to use the initial exposure solutions as the operative exposure concentration for the test? Why or why not? If not, what approach do you suggest?

Charge Question 3: Is regression analysis to derive EC20 and EC50 values an appropriate way to analyze the sulfide seedling hydroponic data to identify effect levels? Why or why not? Is there an alternative approach to evaluate the data for effect levels that you would suggest the MPCA pursue?

MPCA Charge Question 4: Discuss whether the Analysis demonstrates that the lake and stream field survey data and results from selective sampling focused on water bodies that were high in sulfates where wild rice was present, including the following potential correlations: 1) elevated surface water sulfate and porewater sulfide; 2) elevated sulfate and iron and porewater concentrations of sulfide and iron. ~~are sufficiently representative of Minnesota lakes and streams with wild rice to 1) examine the chemical relationships between sulfate in surface water and acid-extractable iron, acid-volatile sulfide, and porewater concentrations of sulfide and iron, and 2) inform protection of wild rice from elevated sulfate.~~

~~Please note any specific questions or concerns.~~

~~Charge Question 5: Does the MPCA Analysis make appropriate use of the mesocosm experiment data? Please describe any suggestions you have about how the data could be further analyzed, or any cautions about the existing or potential use of these data.~~

MPCA Charge Question 6: Do you agree or disagree with the MPCA's assertion that the field survey and mesocosm experiment data further support the hypothesis that elevated sulfide in the sediment porewater above 300 µg/L can be toxic to wild rice? Explain why or why not and comment on the level at which the field data suggests sulfide can become toxic to wild rice.

~~Charge Question 7: Is the use of multiple quantile regression an appropriate tool for predicting porewater sulfide concentrations? Why or why not? If not, what other options for predicting porewater sulfide would be suitable?~~

~~Charge Question 8: In the multiple quantile regression, MPCA relied on the acid-extractable iron rather than the porewater iron to predict porewater sulfide concentrations based on surface water sulfate concentrations. Do you agree or disagree with this approach? Why or why not?~~

MPCA Charge Question 9: The MPCA Analysis focuses on sulfide in the porewater as the sulfur parameter impacting wild rice, and the role of sulfate and iron as key variables controlling sulfide concentrations in porewater. Was this focus appropriate to inform understanding of the effects of sulfate on wild rice? Why or why not? If not, what other variables do you suggest the MPCA explore?

~~Charge Question 10: Please identify any concerns you have about the Synthesis, particularly any key omissions or assumptions in the logic that should be further evaluated.~~

~~Charge Question 11: Please state your overall assessment of the five Study components. Did MPCA choose appropriate Study components to meet Study objectives (summarized above) and to support the Analysis? Why or why not?~~

~~Charge Question 12: Please provide any other comments you may have on the Study data collection and interpretation, or on the Analysis.~~

~~Charge Question 13: Please identify any other issues or critical data gaps for further research that should be considered when evaluating the relationship between wild rice and sulfate.~~

Respectfully submitted,

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