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Wild Rice Standard Framework Comments

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As a biologist with a B.A. in Biology, Winona State College, I contracted with US Environmental Protection Agency (EPA) as research biologist to collect underwater samples for Shagawa Lake Eutrophication Project and was employed to conduct chemical testing and additional sampling for three years. At the US Forest Service, I sampled and conducted laboratory tests on Superior National Forest waters, evaluated water quality data for Quality Assurance and Quality Control (QA/QC), and implemented an EPA grant to equip a lab and lead continued research on Shagawa Lake, for five years. For 21 years as superfund project manager, coordinating closely with the EPA, leading teams of scientists, I managed investigations, assimilated team specialists' products with my knowledge into documented decisions in compliance with regulations, and assured finances and cleanups to protect the public from dangers of hazardous waste sites. I set unexpected national precedent when I implemented the first Federal Facility Agreement to protect not only people but also ecological resources from Twin Cities Army Ammunition Plant contamination in soil and ground water and required a plan to address any newly identified wastes. I managed team cleanups of Perham Arsenic that actually poisoned people, Reserve Mining hazardous waste threatening Lake Superior, Northwoods Landfill closure construction near Ely, and many other MN waste sites. I own property near Ely and enjoy woods, water and cabin life, only 20 miles from proposed sulfide mining.
My review is based on 26 years of experience in environmental research and cleanup of Superfund hazardous waste sites in Minnesota, and another 10 years research and commenting on mining.

This set of comments is submitted in addition to my previous comments submitted 7/31/23. My previous comments addressed a number of concerns. I am trying not to repeat them here but these comments and those should probably be read together.

A Site-specific sulfate standard is absolutely not appropriate.

I am a biologist by training, MPCA proposes Site specific standard (SSS) as an alternative to the current standard of 10 ppm sulfate for wild rice. MPCA proposes to allow local sulfate concentrations at their existing level if some wild rice has survived it locally.

"Populations exposed to 300 mg L^{-1} sulfate concentrations produced fewer and smaller seeds and declined to extinction in 6 years or less." Result from Abstract.
From Sulfur Geochemistry Destabilizes Population Oscillations of Wild Rice (Zizania palustris)
Sophia LaFond-Hudson, Nathan W. Johnson, John Pastor, Brad Dewey
First published: 18 July 2022
https://doi.org/10.1029/2022JG006809

The above statement indicates that the endurance of wild rice populations cannot be assumed if wild rice is simply present at the time of a SSS. The populations local to a discharger may be in flux in

response to anthropogenic stressors as opposed to normal ecological stressors that also cause changes in population dynamics. MPCA does not have the capability to determine the viability of a population in the minimum of likely ten years it would take to differentiate between natural vs anthropogenic stressors. The above example was for "300 mg L-1 sulfate concentration". It would be logical that a population could take much longer than six years to decline at concentrations lower than 300, but it is reasonable to assume they would decline, based on the original reason for the 10 ppm standard that has been upheld in court.

Ground water studies would also be required to see whether the "surviving populations" are actually receiving dilution waters from ground water upwelling or natural connectivity to water table inputs, and not really surviving the upstream discharge concentrations of sulfate. If that is the case, the wild rice standard would still apply because the discharge is likely limiting wild rice growth where the additional water input is not available.

The 10 ppm standard should be enforced because allowing only the surviving wild rice to repopulate areas will also limit genetic variability, making the system less durable when only the wild rice that tolerates somewhat higher sulfate is able to survive. There are so many places that would want the MPCA's site-specific standard across the northern part of the state that the overall health of the wild rice as a species could be affected as it has in mid-Minnesota (Typo Lake overlying the Isanti-Anoka County border was a wild rice lake, and now has a TMDL with no real solution). Downstream waters will also be receptors of lower quality waters. Money spent on this multi-year SS standard study effort would be better spent in installing expensive technology, solving a problem instead of avoiding a solution.

MPCA needs to understand that genetic variability in sulfate tolerance may or may not be tied to other survival traits needed to deal with other crises. Until you have sufficiently studied the genetic connections in wild rice you do not have license to limit wild rice to only those strains that have survived higher sulfate concentrations. It is possible that these surviving populations are stressed enough and may not be able to tolerate other stresses, including those caused by coming climate change or other unregulated or uncontrolled pollutants, for example, like the now uncontrolled specific conductance that EPA recommended 300-320 uS/cm as protective for invertebrates in Ecoregion 50. It does not matter whether there is a standard or not in the rules, in NE MN the Minnesota Rule requiring 95% survival rate of invertebrates will be violated many times when the EPA recommendation for specific conductance is allowed by MPCA to be violated in their NPDES permits. A decreasing number of invertebrates mean the base of the food web is weakening and every living animal population that depends on the base will weaken also, and on up the ladder. When sulfate is allowed as a SSS, the resultant effects and the more-difficult-to-predict effects on water quality must also be considered. Increased specific conductance is one of those effects.

The wild rice is much more likely to have healthy populations with normal genetic variability when the current standard requires compliance. MPCA should not be proposing alternative compliance techniques without sound study to back up their proposals. Native Indian tribes have a right to biologically sound wild rice beds capable to respond to stresses in their normal growth patterns. The treaties did not say it is ok to pollute "some" of the rice beds. Sulfate is a symptom of worsening underlying pollution that may also be causing unidentified problems, as documented by the growing impaired water list.

MPCA, time to do your job and control the sulfate and the pollution that rides the sulfate train.

Businesses and people need to foot their bills to solve this problem, but we as a state will be healthier for it.

Sulfate removal technologies warrant a variance, not a SSS

Among many possible search results, I found the following sites about sulfate removal.

https://www.wateronline.com/doc/sulfate-removal-technologies-a-review-0001#:~:text=Physical processes for removing sulfate include: 1 Ion,GYP-CIX and Sulf-IX™ 2 Nanofiltration 3 Reverse osmosis

This 2015 website lists a number of ways to remove sulfate. The problems include that the removal processes leave other undesirable and polluting chemicals in the discharge, that the waste disposal is costly; and and/or that finding a disposal site to accept the removed waste may be difficult.

https://www.wateronline.com/doc/a-new-process-for-sulfate-removal-from-indust-0001
This is a newer APEX article on their work.

https://www.predest-ec.com/post/treatment-systems-for-sulfate-removal-in-water-and-wastewater

Other new ways to remove sulfate found on-line will likely each have their pros and cons; so dischargers should show that they have reviewed all of them and explain why each of them will not work and/or show their finances before they get a 5-year variance. At the variance fifth year, the assertions must again be reviewed and dischargers must again show why none of the newest and old alternatives will not work for them. MPCA must evaluate each as to whether the discharger is fully compliant with the variance requirements.

The waste from the reverse osmosis process is reject water or backflush, can be 40% of the discharge so it is voluminous, but also at least toxic and may be hazardous waste. Either way it may be expensive to properly dispose. We understand that the cost of reverse osmosis is the reason that Mesabi Nugget (near PolyMet's taconite processing plant) went down. Some of this is the cost of doing business.

It may be that industry and cities will have to install chloride- and sulfate-capable technologies to be responsible to downstream water users, or the state will be sued again in court to get that done, like Wisconsin did, that required the Metro treatment plant discharge to be fixed at big cost. Treaters' costs are legitimately reflected in higher prices that the public must pay if we want their services or products and if we want clean water.

The more appropriate approach is to give a variance, not a new SSS. The problem first must be solved in the discharge treatment by both public and private dischargers as part of their obligation to maintain clean water for future generations, and the public will wind up paying for it because we participated in the dirtying of the water in the first place by buying the products of dischargers and by discharging our own wastes to the land, water, sewer systems, and public sewer systems. The more costly it becomes, eventually dischargers may find other ways to provide for our needs and wants, but those are just ideas, and for now we are all responsible and must clean up our messes with our dollars.

The way that is fair to all businesses and all people is that everyone in wild rice territory has the same standard, that cannot be massaged by dischargers with manipulation talent and capabilities. Then it becomes political: those who can pull the most strings in management or the most wool over staff eyes are the ones who get the best SSS.

The MPCA equation

MPCA makes the following assertions:

The MPCA sponsored studies on how sulfate affects wild rice. Research projects – including a field survey, laboratory experiments, and mesocosm (pot) experiments – began in 2012 and were completed by December 2013, and produced several research papers. Based on these studies MPCA found:

Sulfate in water combined with bacteria creates sulfide, which is toxic to wild rice. High levels of organic carbon in sediment feed bacteria, which increases sulfide. However, high iron levels will neutralize the sulfide instead.
Iron in sediment binds to sulfide and neutralizes it, making it nontoxic to wild rice. Organic carbon in sediment is food for the bacteria, causing more sulfide to be produced. Sulfide is toxic to wild rice.
In the sediment in which wild rice is rooted, sulfate from the water above is converted to sulfide by bacteria.
Higher levels of sulfide in the sediment create an environment that is less hospitable to wild rice.
However, certain factors change the rate at which sulfate is converted to sulfide. Most significantly, it was stated higher levels of iron can lead to less sulfide, and higher levels of organic carbon can lead to more sulfide.

To take these variables into account, the MPCA developed an equation that can determine a sulfate level that will protect wild rice for a specific water body. The agency proposed to amend the 1973 water quality standard to include this new equation, and to specifically identify waters to which the standard should apply, based on information compiled into a database.

I recall this equation was much doubted by the scientific community. To use the equation for any purpose, ALL of the adverse comments must be refuted in writing in public to show the legitimacy of use of the equation.
MPCA must provide the per cent level of confidence in the accuracy of the equation, and the percent probability of error which will be most illustrative. The derivation of the equation must be clear and based on data with QAQC provided. If the data is questionable, the equation is also questionable.
MPCA must show that the above assertions are true, citing the sources used and refuting any applicable asserted contrary statements in other sources.

We are digging a hole, and every year it gets deeper. We should be solving the sulfate problem with our dollars, not delaying with studies and alternate standards.