Glacier Park Iron Ore Properties LLC (Matthew Walto)

Please see the attached letter.

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Submitted via MPCA's Online Comment Form

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Minnesota Pollution Control Agency
Stephanie Handeland – Industrial Division
Ian Babson – Environmental Analysis and Outcomes Division

Re: Variance Denials for U.S. Steel Keetac – Minnesota's 10 mg/L Sulfate Standard

Dear Ms. Handeland,
Dear Mr. Babson,

I am writing to provide comments regarding public notice of draft NPDES permits MN0031879 and MN0055948 for the United States Steel Keetac mining area and tailings basin, and to express serious concern regarding MPCA's reliance on the 10 mg/L sulfate standard as applied to wild rice waters, particularly in light of the variance denials recently contemplated for U.S. Steel's Keetac facility. While I respect the intent to protect Minnesota's natural resources, the underlying scientific foundation of this standard deserves careful scrutiny.

As a trained geologist with a strong background in the scientific method, I understand the importance of controlling for variables, ensuring reproducibility, and establishing causal mechanisms. Moyle's 1940s observations may have been pioneering for their time, but they do not meet the threshold of rigorous science required to set a statewide numeric water-quality criterion. Regulations with wide-ranging economic and social impacts must be based on transparent, peer-reviewed, and mechanistically sound evidence – not anecdotal correlations from more than 80 years ago.

1. Correlation, not causation

Moyle's conclusions were based on field correlations between sulfate concentrations and the distribution of wild rice. However, he did not account for the many other environmental variables that modern science recognizes as critical drivers of wild rice health and distribution. A rigorous, well-designed study would have controlled or measured at a minimum:

- **Water level fluctuations** – depth, timing, and interannual variability.
- **Water velocity/flow regime** – particularly in stream-borne rice beds, where current affects seedling establishment, sediment stability, nutrient delivery, and sulfide accumulation.
- **Water clarity and light penetration** – turbidity, Secchi depth.
- **Water temperature** – daily and seasonal variation.

- **pH and alkalinity.**
- **Suspended solids and sediment load.**
- **Sediment type and nutrient content** – organic matter, clay/sand balance, redox potential.
- **Dissolved oxygen** – especially in sediment pore water where sulfide toxicity develops.
- **Wildlife and aquatic disturbance** – muskrat grazing, waterfowl foraging, and beaver activity altering hydrology and sediment conditions.
- **Sediment and water geochemistry** – particularly iron, which binds sulfide and reduces its toxicity in sediments. Other ions such as calcium and magnesium buffer pH and influence carbonate balance, while sodium affects ionic strength. All of these factors shape the chemical environment in which wild rice grows, yet none were considered in Moyle's work.
- **Seasonal and interannual variability** – multi-year sampling to distinguish long-term trends from one-time observations.

Because none of these drivers were systematically addressed in Moyle's work, the observed correlations cannot be taken as evidence that sulfate itself was the causative factor determining wild rice stand size. The absence of such controls means the conclusions do not meet the standard of good scientific practice. Any of these other variables could have played an equal or greater role in the success or failure of the wild rice stands surveyed.

2. Lack of mechanism

Modern science has demonstrated that sulfate itself is not directly responsible for restricting wild rice stand size. Instead, the interaction of sulfate with sediment microbes and iron chemistry produces sulfide, which can inhibit root growth under certain conditions. Moyle could not and did not account for this mechanism, making the direct translation of his field correlations into a hard numeric standard scientifically unsound.

Indeed, the Minnesota Pollution Control Agency (2017) recognized this mechanism explicitly:

> "If sulfate is harmful to wild rice, the active agent would be a result of bacterial conversion of the sulfate to hydrogen sulfide (H_2S) in the sediment of root zones." (MPCA, 2017, p. 10)

In line with this, more recent research confirms that sulfate is not directly toxic to wild rice at concentrations far exceeding the 10 mg/L limit. Pastor et al. (2017) and Fort et al. (2014) found that sulfate concentrations up to 1,600 mg/L showed no direct toxicity to wild rice, a level well above concentrations observed in virtually all natural surface waters of the upper Midwest (Gorham et al., 1983). This makes clear that it is sulfide generation in sediments—not sulfate in the water column—that poses the actual risk to wild rice.

3. Internal inconsistency

Moyle (1944) indicated that large stands were "generally absent" above ~50 mg/L, but the 10 mg/L threshold has been treated by MPCA as an absolute limit. Moreover, historical records confirm that wild rice has been documented in waters with sulfate concentrations far exceeding 10 mg/L, contradicting the rigidity of the current rule.

4. Insufficient methods

Moyle's 1940s papers lack the fundamental components of reproducible science: no detailed methods, no consistent sampling design, and no lake-by-lake sulfate dataset to validate the conclusions. By modern standards of water-quality research, this record would not pass peer review as the basis for a statewide water-quality criterion.

5. The variance denial rests on an indefensible standard

MPCA's denial of Keetac's variance request is based on its determination that U.S. Steel failed to demonstrate that a site-specific standard would (a) protect wild rice in the targeted waterbody, (b) have a scientifically defensible basis, and (c) be more appropriate than the existing statewide standard. However, because the current 10 mg/L standard itself lacks scientific rigor (as described above), it is unreasonable to deny a variance based on a standard that cannot endure technical scrutiny.

Even MPCA (2017) acknowledged that sulfate itself is not the active agent, stating that if sulfate is harmful, it is because bacteria convert it to sulfide in sediments. Yet despite recognizing this distinction, MPCA continues to enforce a fixed sulfate standard rather than addressing the true causal mechanism. Denying variances without first reconciling this internal inconsistency amounts to placing regulatory procedure ahead of scientific integrity.

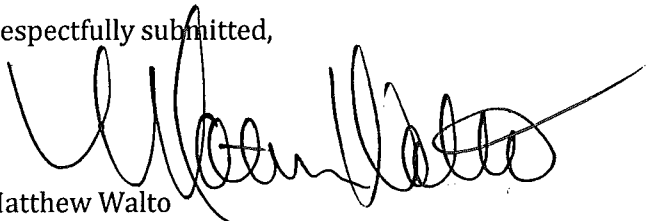
Moreover, this is not just an abstract matter of regulatory fairness. The denial is directly unfair to U.S. Steel, to its employees, to the contractors and consultants who depend on U.S. Steel for work, to the local governments and schools that rely on U.S. Steel's annual tax contributions, and to the broader communities across northern and central Minnesota that benefit from its operations. In short, the consequences extend well beyond United States Steel Corporation—they affect the livelihoods and stability of entire communities.

Conclusion

Without knowing the actual causal factors that determine wild rice stand size, the enforcement of a rigid 10 mg/L sulfate limit amounts to the application of an arbitrary number. We do not permit and regulate based on impressions or feelings; we do so based on science—solid, reproducible, and transparent science. Given the shortcomings of the Moyle data, it is difficult to understand how MPCA can continue to impose such sweeping regulatory burdens on Minnesota's mining and industrial facilities using a standard rooted in such weak evidence.

Until MPCA corrects the scientific foundation of the sulfate standard itself, denying variances based on that standard is premature, unfair, and unsupported by sound science. And because these denials ripple outward—to employees, contractors, consultants, taxpayers, and communities across Minnesota—the impacts are not only unfair but deeply harmful to the state's economic and social well-being.

Respectfully submitted,



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