TAMARACK WATER ALLIANCE

Tamarack Water Alliance Community Zoom Meeting
Wednesday, October 1, 2025 10am CT

TOPIC: Copper/Nickel Mining Hazards of Sulfates to Wild Rice and Mercury Methylation

PRESENTER: Craig Sterle, BS, Conservation Issues Chair for Izaak Walton League

Craig Sterle BS, MN Conservation Issues Chair for Izaak Walton League of America will address the pressing conservation issues of sulfate pollution in both taconite and copper-nickel mining drawing from his extensive conservation background as Cloquet forestry supervisor with the DNR, his experience fighting the Enbridge Pipeline to form the Carlton County Land Stewards, and serving with the MN Division Board of IWLA since 2018.

His career includes extensive experience with the DNR in state land management, including timber sales, forest development (planting/seeding, timber stand improvement, forest inventory, etc.), wildland fire management, private forest management assistance, forest planning, and personnel supervision. Sterle joined the Izaak Walton League in 2010. In August 2013, one year into retirement, he became embroiled in the Enbridge Sandpiper Pipeline project, when the company wanted to put the pipeline through his property. By November of 2013, Enbridge had settled on a new alignment for the proposed Right of Way, but he and his wife persisted until Enbridge abandoned the project in favor of purchasing a share of the Dakota Access Pipeline.

Over his time with IWLA, Sterle has served as the Duluth (W. J. McCabe) Chapter Conservation Issues Chair, a Chapter Board of Director, the Division VP, President, and Past President, and Division Conservation Issue Chair.

Register for the meeting and receive the Zoom link here (https://tamarackwateralliance.org/php/eventreg.php?eid=16).

NEW FACT SHEETS:

- **Difference Between High Sulfide Mining and Taconite Mining** (https://www.tamarackwateralliance.org/docs/HighSulifideVSTaconite.pdf)
- **Minnesota Has Listed Round Lake as Impaired** (https://www.tamarackwateralliance.org/docs/RoundLakeImpaired.pdf)
- **Talon Metals Dumping Toxic Drilling Waste** (https://www.tamarackwateralliance.org/docs/TalonToxicSumps.pdf)

NEW Tamarack Water Alliance Presentation Dangers of Sulfide Mining (https://tamarackwateralliance.org/docs/SulfideMining-details.pdf)

REQUEST PRESENTATION ON RISKS OF SULFIDE MINING for your group, Rotary Club, church or community club. Send us an email at waters@tamarackwateralliance.org.

DOWNLOAD Tamarack Water Alliance fact sheets/flyers **here** (https://tamarackwateralliance.org/resources.html#flyers).

DONATE to Tamarack Water Alliance: **here** (https://tamarackwateralliance.org/donate.html). Our current focus is on providing education about the risks of sulfide mining, narratives to counter the greenwashing and divisiveness that some mining companies promote, as well as forging connections to other communities concerned about sulfide mines in Minnesota, across the Midwest, and around the world.

Your donation goes to support our community educational activities which include tabling at community festivals and parades, participation in other community events, targeted speaking engagements with interested local organizations, monthly informational public zoom calls and an associated email newsletter, website and social media, letter writing campaigns and articles in local news outlets, interviews with media, and other community outreach and canvasing.

Sign-Up To Receive Updates from the DNR on Talon Metals Environmental Impact Statement here **here** (https://www.dnr.state.mn.us/input/environmentalreview/tamarack-nickel-project.html).

Too Risky: If you believe nickel-sulfide mining is too risky in Aitkin County, Tamarack Water Alliance has yard signs with this messaging available. Your $6 donation helps defray costs. Email waters@tamarackwateralliance.org to arrange pickup of your sign.

Volunteer with the Tamarack Water Alliance. Send us an email at waters@tamarackwateralliance.org.

Sign Up For This Newsletter: Encourage your friends, family and neighbors to sign up for the monthly Tamarack Water Alliance email newsletter at **tamarackwateralliance.org/php/articlereg.php**.

The Problem With Sulfates-Comments to MPCA-US Steel-Keetac- Wastewater Permit

by Craig Sterle, Conservation Issues Chair MN Division Izaak Walton League of America

For those wondering about the status of sulfates in Minnesota waters there are facts to consider. Sulfates by themselves are no problem. However, sulfates in water lacking oxygen are converted to hydrogen sulfide (that noticeable rotten egg smell.) These oxygen poor waters are abundant in wild rice lakes, and hydro-power reservoirs where water manipulation causes sulfate to sulfide conversion and methylation of mercury. In higher concentrations, sulfides can be toxic to many life-forms, humans included.

Wild Rice Impact & Numerical Limit on Sulfate

As part of his 1938 Ph.D. thesis, John Moyle (later with the MN Dept. of Conservation) studied aquatic plant growing conditions in 225 lakes across Minnesota. He concluded that “water chemistry appears to be the most important single factor influencing the general distribution of aquatic plants in Minnesota.”

Years later when contacted by the MPCA, he said wild rice exhibits the best growth in waters with less than 10 mg/L (milligrams per liter) of sulfate, and seldom persist when sulfates reach 50 mg/L or more.

Following Moyles findings, in 1973 the MPCA adopted MN Rule 7050.0224, establishing a limit of 10 mg/L for all waters used for the production of wild rice, during periods when wild rice may be susceptible to damage by high sulfate levels.

By 1975 Minnesota Power was the first to object to the use of the standard, because of sulfate discharge from its Boswell coal burning power plant. Subsequently, MPCA seldom enforced the standard. MPCA’s rationale was they lacked a list of “wild rice waters” where the rule could be enforced (MPCA failed to conduct research and rulemaking to identify which waters qualified as “wild rice waters” for almost 50 years.) MN DNR and the MN

Tribes had comprehensive lists of waters with wild rice, but MPCA would not adopt those into rule.

Eventually, pressure from tribes and environmental groups, and years later the US EPA, pushed for protection of wild rice, and enforcement of the standard.

Presently, MPCA is considering the Keetac Wastewater Permit which may be the first permit to ever have a numerical limit on sulfate in their discharge. Many mining operations as well as municipal wastewater dischargers are watching, because the result from Keetac might be applied to other permits in coming years.

Social Costs of Sulfate Pollution
We cannot look at sulfate and wild rice in a silo. Sulfate acts as a catalyst in the methylation of mercury. Methylmercury is the form that bioaccumulates up through the biotic food chain, causing high mercury levels in the fish humans (and wildlife) consume.

The impact of methylmercury is greatest on a fetus or young children, with women of child-bearing years being susceptible to passing on methylmercury to the fetus. A study by the MN Dept. of Health found that 10% of newborns in northeastern MN had elevated levels of mercury. Mercury is a powerful neuro-toxin that can lead to neurological problems, including developmental issues, behavioral issue, cognitive problems, and resulting reduced economic outcomes and increased social costs.

Mine Plans Do Not Consider Health and Environmental Risks
This is likely to lead to a lifetime of learning disabilities, behavioral problems, under-employment, and other personal and social costs. These life-long costs are never recognized, nor analyzed during the process of mine wastewater discharge permitting. We believe it's imperative that MPCA begin including such a social and economic analysis as part of this and all future wastewater discharge permits.

If MPCA limits sulfate discharge to the 10mg/L Wild Rice Sulfate Standard, mothers, infants and society may be spared this tragedy. But it also means the mercury level in mine discharges must also be addressed as part of the permit to eliminate, or at least greatly limit mercury input to our atmospheric and aquatic systems. Establishing a numeric permitted limit for mercury emissionand then enforcing this stricter mercury emission standard at this mining operation must be part of the new permit.

Allowing the company to pollute our waters is nothing more than socializing their costs while privatizing their profits. We demand better; we demand clear air and clean water. This is the social license cost Minnesota citizens are entitled to when industries operate in our State. We would like to see US Steel honor their social contract with Minnesota by protecting our clean water, wild rice beds, and the health of our people.

What Is To Be Done About These Polluted Waters?
In looking at the potential costs to remove sulfates from mine discharge waters, Barr Engineering reported that the cost for a reverse osmosis system at the Keetac mine could be $800M (ranging from $600M-$1.2B). ***The installation of a reverse osmosis treatment system is a viable option.***

Keetac has been given until April 30, 2030 to install wastewater treatment system(s) that meets the Wild Rice Sulfate Standard of 10mg/L. US Steel hired Barr Engineering to estimate the cost of installing a reverse osmosis (RO) system. Because of the many variables at play in developing this kind of wastewater treatment facility, the range of variability is large; Barr's estimate came in at around $800 million, which US Steel said is too expensive.

However, in checking recent financial reports for the company, we see that in 2024 they made $384 million dollars (a down year). Over the previous three years (2021-2023) the company made $7.593 billion dollars. Even with 2020 losses of $1.165 billion, the company

is certainly sufficiently profitable to afford to protect Minnesota's waters by installing an effective filtration system to deal with their industrial pollutants.

Utilizing MPCA's cost estimates during sulfate rulemaking, (see Report of the Chief Administrative Law Judge – OAH 80-9003-034519 - pg. 35 – 133), the estimated installation cost of a reverse osmosis system would be $20 million, with annual maintenance costs of $3 million (in 2012 dollars). This initial construction cost would amount to approximately 15% of the average yearly profit. Amortized over the life of the RO infrastructure, this is affordable for a company earning billions of dollars in profits.

Research Confirms 10/mg/L Still Sound Scientific Standard
Research at the Univ. of MN NRRI (Dr. John Pastor, et. al.) determined that the 10 mg/L standard was still a sound scientific standard for the protection of wild rice. Later, they determined that inputs of iron with sulfate formed iron-sulfide (FeS) plaques on the root of the wild rice, slowly starving the plant of nutrients. This resulted in small seeds with low reproductive viability, or no viable seed at all. Repetitive growing seasons under these conditions led to a loss of wild rice, and eventually, stands of wild rice disappearing.

Industry proponents continue to throw out red-herrings, stating that sulfate, in some combination of carbon and iron (to be determined on an individual basis for each waterbody) can allow wild rice to thrive. They do not point out that this has never been observed and documented in natural waterbodies, and is considered an artifact of a laboratory experiment completely detached from a repeatable natural environment ("…the equation does not sufficiently capture the dynamic biological, chemical, and hydrological relationships related to the effects of sulfate on wild rice."5).

This argument has largely been rebuffed by independent research findings, an Administrative Law Judge's (ALJ) findings and conclusions, and a subsequent ALJ review process, and Minnesota's courts.They also fail to cite from the Governor's Task Force report, pg. 34, para. 2, where it states "Ultimately, the MPCA found that high levels of sulfide in the porewater – the water in the sediment where the wild rice roots – has an adverse impact on wild rice.

Hydrogen Sulfide Also a Problem
Sulfate alone is not the problem, rather it is the microbial action that turns it to hydrogen sulfide (sulfide) that is most problematic. The anerobic conditions commonly found in sediment are likely to lead to the creation of hydrogen sulfide resulting in a decline in wild rice root health, and hence declining seed production and stand viability. Laboratory research that fails to emulate these anerobic conditions is not giving a real-world representation of the problem and must be dismissed.

Classification of Class 4 Wild Rice Waters A Mistake
In addition listing wild rice waters as Class 4 (Agriculture and wildlife use) was a mistake, and that the waterbodies should have been listed as a Class 2 (Aquatic life and recreation). The higher Class 2 listing better reflects the more pristine and exacting conditions necessary for sustaining the existence of wild rice stands. Today, too many of Minnesota's Class 4 waters that sustain agriculture and recreation are no longer healthy enough to sustain wild rice stands, and many are so polluted they may no longer be swimmable/fishable waters.

MPCA Must Consider Upstream Pollution And Year Round Limit
The MPCA in analyzing wastewater (pollution) discharge, including for sulfates and mercury, must understand the pollution impacts resulting from any and all other sources of these pollutants that are upstream of any and all listed wild rice waters. It is not enough to only look at the wastewater discharge from this Keetac facility. The permit must consider "the universe of affected dischargers." The Rule protecting wild rice only requires that there be a seasonal limit, while the wild rice is actively growing. But taken as a whole, with

sulfates enhancing the methylation of mercury, we believe a limit is needed year-round in order to further limit sulfate/sulfide reactions with mercury to form methylated mercury. A stated numeric limit for sulfate must be part of the permit. The same is true for mercury emissions. It is time to include a stated limit for mercury discharge in all waters, both surface and groundwaters, as part of the wastewater permit language.

Conclusion - Variance Should Be Denied

In conclusion, we believe that the variance should be denied, the proposed wastewater permit(s) must set numerical standards for both sulfate and mercury emissions, standards that meet Minnesota's statutory and Federal requirements. Past permits have only required that the company "monitor" sulfate and mercury pollutants. This is entirely insufficient to protect our waters and other natural resources. Terms in the permit must leave no ambiguity, and language must be enforceable, and enforced. Minnesota's citizens have endured over fifty-years of polluted waters, permittee stalling, legislative interference, and regulatory indifference. We demand that the statutes and permits be enforced, so our waters and wild rice are restored, and we can once again eat fish without the fear it may threatening our long-term health.

References

1. Ecological Applications - Dr. John Pastor, et.al., "Effects of sulfate and sulfide on the life cycle of Zizania palustris in hydroponic and mesocosm experiments" - Oct. 4, 2016;
2. Journal of Geophysical Research: Biogeosciences - "Increase in Nutrients, Mercury, and Methylmercury as a Consequence of Elevated Sulfate Reduction to Sulfide in Experimental Wetland Mesocosms" by A. Mybro, E. B. Swain, N. W. Johnson, D. R. Engstrom, J. Pastor, B. Dewey, P. Monson, J. Brenner, M. Dykhuizen Shore, and E. B. Peters;
3. Journal of Geophysical Research: Biogeosciences - "The Evolution of Sulfide in Shallow Aquatic Ecosystem Sediment: An Analysis of the Roles of Sulfate, Organic Carbon, and Iron and Feedback Constraints Using Structural Equation Modeling" by Curtis D. Pollman, Edward B. Swain, David Bael, Amy Mybro, Philip Monson, and Marta Dykhuizen Shore;
4. Journal of Geophysical Research: Biogeosciences - "Sulfide Generated by Sulfate Reductions Is a Primary Controller of the Occurrence of Wild Rice (Zizania palustris) in Shallow Aquatic Ecosystems" by A. Mybro, E.B. Swain, D. R. Engstrom, J. Coleman Wasik, J. Brenner, M. Dykhuizen Shore, E. B. Peters, G. Blaha;
5. Ecological Applications Vol. 27, Issue 1, Jan. 2017 pp. 321-336 - "Effects of sulfate and sulfide on the life cycle of Zizania palustris in hydroponic and mesocosm experiments" by John Pastor, Brad Dewey, Nathan Johnson, Edward B. Swain, Philip Monson, Emily B. Peters, and Amy Mybro;
6. Journal of Geophysical Research: Biogeosciences - "Modeling hydrologic controls on sulfur processes in sulfate-impacted wetland and stream sediments" by G.-H.C. Ng, A. R. Yourd, N.W. Johnson, and A.E. Mybro
7. Mercury Levels in Blood from Newborns in the Lake Superior Basin - GLNPO ID 2007-942 - Final Report - November 30, 2011
8. Duluth News Tribune - "Local View: Adopt modern wild rice sulfate standard based on science"
9. Report of the Chief Administrative Law Judge - OAH 80-9003-034519 - Revisor R-4324, pp. 19-20, 59 - a-d
10. Duluth News Tribune - "Local View: Adopt modern wild rice sulfate standard based on science"
11. Governor's Task Force on Wild Rice - 1/3/2019 How Sulfate Affects Wild Rice - pp. 6
12. The Effect of Sulfate Contamination of Water on Wild Rice Nutrient Composition - A THESIS SUBMITTED TO THE FACULTY OF THE UNIVERSITY OF MINNESOTA BY KATELYN JOHNSON - Feb. 2023 - pp. 25 - para. 1
13. Ibid - pg. 25, para. 2

14. Minn. Env't Quality Bd., Environmental Assessment Worksheet Form (Dec. 2022), https://www.eqb.state.mn.us/sites/eqb/files/December%202022%20EAW%20form_1.docx; see also Minn. R. 4410.3610, subp. 4 (AUAR); Minn. R. 4410.2300(H) (EIS); AUAR at 72.
15. The Effect of Sulfate Contamination of Water on Wild Rice Nutrient Composition - A THESIS SUBMITTED TO THE FACULTY OF THE UNIVERSITY OF MINNESOTA BY KATELYN JOHNSON - Feb. 2023 - pp. 27, Abstract

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Tell Governor Waltz: 500 years of pollution for 20 years of mining is not the legacy we want to leave. Did you know there has never been a copper-sulfide mine that hasn't caused pollution from acidified mining waste? That's why people have been fighting to protect Lake Superior from reckless mining proposals for decades. This kind of pollution could destroy years of work cleaning up Lake Superior, a national treasure that is home to wildlife, draws millions of people to its shores annually for recreation and tourism, and provides safe drinking water for thousands.

Sign the MCEA Petition to Protect Our Greatest Lake
https://www.mncenter.org/protect-our-greatest-lake?emci=f81f9011-cd94-f011-b484-6045bdeb7413&emdi=67246a5c-8095-f011-b484-6045bdeb7413&ceid=11370061

Friends of the Mississippi River New Video
Threats to Water and the Mississippi River
https://fmr.org/updates/land-use-planning/new-video-mines-risk-clean-mississippi?emci=a3771a01-ff8c-f011-b484-6045bdeb7413&emdi=ab674dae-0793-f011-b484-6045bdeb7413&ceid=6344066

From protecting Ojibwe maple sugar traditions to the tap water we drink, explore how clean water connects us all in this new video from Water Over Nickel and the Mille Lacs Band of Ojibwe.FMR is an official partner of Water Over Nickel, the Mille Lacs Band of Ojibwe's initiative to protect clean water, land and cultural resources from the negative impacts of a proposed nickel mine in Tamarack, Minnesota.

In nickel mining, metals and material waste are taken from the ground and exposed to water. This can create sulfuric acid, which has the same chemical composition as battery acid and may result in acid mine drainage that would affect not only surface and groundwater supplies, but also aquatic life, plant life, cultural sites and more.

No mine of this type in the U.S. or Canada has operated long-term without polluting its watershed. And the proposed mine would be located in the Mississippi and St. Croix watersheds, putting critical drinking water sources and habitats at risk.

Who We Are

Tamarack Water Alliance is a group of local residents and landowners working together with others from across Minnesota to protect water and community health from the dangers of sulfide mining near our beloved lakes and wild rice beds, at the headwaters of the Kettle River and in the Mississippi River watershed. Visit our website **here** (https://tamarackwateralliance.org/index.html).

A proposal by a foreign owned mining company, Talon Metals/Rio Tinto to mine nickel and other metals near Tamarack in Aitkin County threatens the health of our communities. This kind of sulfide mining, especially in water-rich environments, has never been done without severe impacts to water and the health of those downstream. Mining here is also a threat to environmental justice and the long-term economic security of nearby native and rural communities.

Review our **community slide presentation** (tamarackwateralliance.org/docs/TamarackMineConcerns-Consolidated.pdf) and download **informative flyers** (tamarackwateralliance.org/resources.html):

- Talon Mine Risks,
- Geology of Aitkin County,
- Talon Dumping Toxic Drilling Waste,
- Minnesota Declares Round Lake Impaired
- High Sulfide Mines Create Acid Mine Drainage,
- Nickel Not Needed for Future EV Batteries,
- Minnesota's Prime Wild Rice Lakes Under Threat,
- Difference Between High Sulfide Mining and Taconite Mining,
- Minnesota Regulators Poor Record In Protecting The Environment,
- Eagle Mine Environmental Report & Saving Our Meager Nickel Reserves
- Is There Really A Talon Tesla Supply Agreement? (no)
- Rio Tinto: A History of Corruption
- Green Bridge Metals -Canadian proposed sulfide mine near Duluth seeks to acquire battery rich mineral assets
- Copper and The Green Economy
- Prove It First!

We will send this monthly newsletter to keep you informed about this project, to share information and opportunities to act to protect clean water and community health.