



US Forest Service
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Forest Service Supervisor
ATT: Minerals Withdrawal
Superior National Forest
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February 19, 2018

Dear Supervisor Cummins and U.S. Forest Service (USFS),

We greatly appreciate not only your willingness to hear our comments during this public comment period for the Environmental Assessment (EA) being done for the Superior National Forest Mineral Withdrawal in the Rainy River watershed, but also for the opportunity we had to meet with members of your USFS Team including Paul Johnson, Deputy Director of the Minerals and Geology Management Division, on Feb. 6, 2018. We are a group of physicians representing the voices of thousands of health providers in Minnesota and would like to expand on the concerns and requests expressed to you in our letter dated May 8, 2017. We feel that the threats posed by sulfide-ore copper mining are unjustifiable in the water-rich environment at the headwaters of the Boundary Waters Canoe Area Wilderness (Boundary Waters). Many concerns, including concerns to human health, are posed by this form of mining in the Boundary Waters watershed. We would like to revisit the human health concerns, and then elaborate on our specific requests for the current EA.

The World Health Organization lists the ten environmental toxins with greatest concern to human health. We know that sulfide-ore copper mining releases six of these including mercury, lead, arsenic, particulate air pollution, asbestos, and cadmium. These toxins have known harmful effects to human health including cancer, lung disease, heart disease, and

neurodevelopmental disease. This type of mining also releases sulfates that fuel the sulfate-reducing bacteria in sediments to methylate mercury already present in the environment to its toxic form methylmercury, a known neurodevelopmental toxin. Given the geology and chemistry involved with sulfide-ore containing rock and the sulfide mineral oxidation that occurs as part of the mining process, we know that ongoing leaching of toxic metals from mine ore and waste rock will very likely continue for centuries and inevitably make its way into surrounding water, soil, fish, wildlife, and eventually humans.

As physicians we are concerned about the near certain likelihood of failure to prevent pollution to surface and ground water and acid mine drainage which will result in toxicity to human health. Kuipers et al (2006) studied 25 operating hardrock mines across the US and the EISs which had been submitted before operation commenced. All of the mines predicted compliance with water quality standards. However, pollution from 85% of the mines near surface water exceeded water quality standards and pollution from 93% of the mines near ground water exceeded water quality standards. Of the sites that developed acid mine drainage (AMD), 89% had inaccurately predicted that they would not create AMD. Most of these contaminants to surface or ground water included toxic heavy metals-mercury, lead, arsenic, cadmium, copper, nickel, zinc and sulfate.¹ Earthworks (2012) studied 14 currently operating copper mines representing 89% of US copper production in 2010. These mines had been operating for more than 5 years. 100% of the mines had had pipeline spills or other accidental releases. In 92% of the mines water collection and treatment systems failed to control contaminated mine seepage, resulting in significant water quality impact, including acid mine drainage. Many of these mines are located in the arid southwest, and the authors state that more significant impacts could be expected at mines in wetter climates.² Dr. Tom Myers (2014) studied the hydrology of surface and groundwater flow through the Rainy River headwaters watershed near the current sulfide-ore copper mining leases adjacent to the Boundary Waters. He stated: "If mineral deposits in the Rainy Headwaters are developed, it is not a question of whether, but when a leak will occur that will have major impacts on the water quality of the Boundary Waters Canoe Area Wilderness."³

Methylmercury, lead, arsenic, and other heavy metals (inevitable by-products of sulfide-ore copper mining), once in the environment, food, and water supply, have a strong affinity for nerve/brain tissue. This is the result of a simple chemical property shared by nerve/brain tissue, and by the species of fish (e.g., walleye pike, northern pike, lake trout, bass) most known to be repositories for methylmercury. Namely, the methylmercury has a high affinity for fatty substances, and these fish species, along with human nerve/brain tissue, have a high content of fat cells. The adverse health effects of heavy metals in human nerve/brain tissue can be outlined by stages of human development:

- I) Fetal stage: The child in-utero is at a triple-disadvantage in absorption of heavy metals (e.g. methylmercury, lead, arsenic) to which the mother is exposed:

- A) The placenta, which filters many compounds in the blood from reaching the fetus, is not able to filter heavy metals, and thus these compounds reach the child's circulation;
- B) The blood-brain barrier, which keeps older children and adults somewhat insulated from toxins in the bloodstream entering the brain tissue, is not fully formed until approximately age 2-3 years. Therefore, from the 9 months before birth to the first two years of life, the child's vulnerability to exposures is increased;
- C) Once heavy metals or other toxins reach nerve/brain tissue, the amount of damage done is proportional to the rate of growth and cell division of that same nerve/brain tissue. The brain doubles in size in the first year of life, and by age three it grows to approximately 80% of its adult volume. This makes the brains of young children extremely vulnerable to neurotoxins.

2) Pre-school and Early School ages: Neurodevelopmental Disorders, including Dyslexia and other Learning Disorders, Autism, Cerebral Palsy, Intellectual disability (low IQ), and ADHD (all known effects of methylmercury and other heavy metal exposure) are often diagnosed during this time period;

3) Late Adolescence/Early Adulthood: Proven outcomes from early life lead exposure include low academic achievement, high rates of educational/work disability, and increased rates of aggression and criminal behavior. In addition, each of the early childhood conditions noted above increases the risk for depression and anxiety disorders;

4) Older Adulthood: Early life lead and methylmercury exposure has been shown to cause higher rates of early cognitive decline/dementia and other neurodegenerative processes.

Other significant health risks of such activity would include the loss of what has become a critical therapeutic habitat for citizens receiving treatment for significant mental health disabilities. Programs treating veterans and other traumatized individuals suffering from Post-Traumatic Stress Disorder, and programs treating youth with emotional, behavioral, substance use, and developmental disorders, represent another important health-promoting presence in the Boundary Waters. These programs are run through national programs such as Voyageurs Outward Bound School, and by regional programs such as Camp Buckskin. Some programs work primarily with youth from the upper Midwest, while others guide and care for youth from around the nation. A threatened ecosystem would also threaten the critical effectiveness of these programs.

We know that toxic mercury and lead exposures are already a problem in Minnesota. The Minnesota Department of Health (MDH) released a study in 2011 which found that 10% of the newborns in the Minnesota portion of the Lake Superior basin had elevated blood mercury levels (higher than the EPA toxic level).⁴ The Journal of Pediatrics reported in 2016 that 10.3% of Minnesota children under 6 years of age had elevated blood lead levels. There is no safe blood lead level.⁵ This toxic burden will be increased by releases of these heavy metals into surface

and ground water and by the acid mine drainage which will occur with sulfide-ore copper mining.

Sulfide-ore copper mining releases the toxic heavy metal arsenic into surface and ground water. Arsenic can infiltrate into residential drinking water wells. Arsenic is taken up into aquatic plants (including wild rice) and can thereby be ingested by humans, causing arsenic poisoning. Long term exposure can cause cardiovascular disease, diabetes, and lung, bladder, and skin cancers. A 2016 FDA Risk Assessment for arsenic in rice showed an association between arsenic exposure and adverse pregnancy outcomes and neurologic effects in infancy and early childhood (decreased performance on developmental tests measuring learning). There is an FDA warning to parents to restrict feeding infants rice cereal, commonly the first solid food fed to infants.⁶

Arsenic is taken up by wild rice plants (*Zizania sp.*). Studies show that naturally growing wild rice has high nutritional value and is low in arsenic.⁷ Wild rice (Ma-no'-min) is regarded as a gift to the Ojibway people from the Creator. Prophecies led the early Ojibway people to migrate west on the Great Lakes to find "where the food grows on water".⁸ Land in Northern Minnesota including the Boundary Waters was ceded to the US Government by the Treaty of 1854. Wild rice is harvested from many of these waters. The Lake Superior Bands of Ojibway retain the usufructory rights (use and enjoyment) to hunt, fish, and gather on these lands. Many depend on hunting, fishing, and harvesting wild rice and other plants for subsistence living. They can be poisoned by the toxic heavy metals released from sulfide-ore copper mining. Additionally, sulfates released from this mining are converted to sulfides which are toxic to wild rice growth. Wild rice doesn't grow in waters with high levels of sulfate.⁹ Permanently damaging wild rice waters in the Rainy River watershed would be an abrogation of these treaty rights.

The health risks sulfide-ore copper mining poses for water will be accompanied by risks to air quality. Mining operations will create fine particulates that are difficult to contain and are known to cause lung and heart disease at low levels, even below EPA standards.^{10,11} Also, the ore body contains elongated mineral fibers that bear similarities to asbestos and are active in animal models for lung cancer.^{12,13} The Taconite Worker's Health Study¹⁴ showed increased risks for mesothelioma (over 200%), lung cancer (20%) and heart disease (11%) among miners. A study to detect airborne fibers in the region found that the highest levels occurred when winds were blowing towards Ely from the northeastern Iron Range (i.e., from the taconite mines), and the lowest levels occurred during a miners' strike.¹² Mining in the Superior National Forest adjacent to the Boundary Waters would be expected to cause degradation of the air quality in a large portion of the Boundary Waters, endangering the miners, and also members of nearby communities and visitors to the area. The harm would be insidious, potentially causing disease years after injury occurred. The Boundary Waters, designated a class 1 airspace, is already degraded by regional haze from coal-fired power generation and other industry,¹⁵ and the significant energy needs of a massive mining operation will add to this burden.

Because of the toxic reality of this industry, we have had an unprecedented voice of concern raised by health professionals and health advocates. The Minnesota Medical Association, Minnesota Academy of Family Physicians, Minnesota Nurses Association, Minnesota Public Health Organization, along with hundreds of individual providers and non-profit groups with ties to human health, all submitted letters in response to the one prior Environmental Impact Statement (EIS) done for sulfide-ore copper mining in Minnesota. The consensus by all of these groups representing over 30,000 healthcare professionals and health advocates, is that a comprehensive Health Risk Assessment (HRA) and a Health Impact Assessment (HIA) be mandated as part of an EIS necessary for decisions regarding sulfide-ore copper mining. In addition to this, the Minnesota Academy of Family Physician (the largest medical specialty organization in Minnesota) passed a resolution in 2016 which was brought to the Minnesota Environmental Quality Board (MNEQB) as a petition for rulemaking to require that an HIA be completed for all future nonferrous metallic minerals mining projects which would require an EIS or EAW in Minnesota. This petition is currently being considered by the MNEQB and is still pending a vote.

With this strong and unified voice of concern raised in response to sulfide-ore copper mining within our water-rich state, we ask that the current EA underway by the USFS regarding mineral lease withdrawal in the Rainy River Watershed be comprehensive and robust in regard to the risks to human health. In our collective opinion, this must include:

The risk of exposure to toxic heavy metal leachate into the Boundary Waters and surrounding waters. This must include modeling for “less than ideal” leaching similar to that seen in other sulfide-ore copper mines rather than limit modeling to the “best case scenario” often promised prospectively, but not accomplished retrospectively, by hard rock mines. This would include assessments of:

- All individuals who will utilize the Boundary Waters and surrounding wilderness, drinking unfiltered water straight out of the lakes downstream of these mining activities.
- Those who live in downstream communities including Stony River, Morse and Fall Lake Townships.
- Fetuses, infants, and children - those most vulnerable to the deleterious effects of methylmercury.
- Local Native Americans. Members of these tribal communities rely on hunting, fishing and gathering of wild rice and other plants for their subsistence and cultural well-being. Specific risks to this community from methylmercury and arsenic that will occur.

We also ask that you assess:

- Cumulative mercury risks, including hazard levels in bodies of water that may already be impaired for mercury in fish.
- Cancer and non-cancer risks to future on-site workers and others living regionally including risks due to airborne pollution and other emissions.

- Health risks resulting from fossil fuel combustion, including impacts of burning coal to meet energy demands.
- Cumulative risks of multiple chemicals.

It is also recognized by research that 60% of our health is determined by environmental and social conditions and behaviors, referred to in public health as the social determinants of health. Assessment of the risks and costs of disrupting this sensitive and unique region of our state is imperative for inclusion. These risks/costs would include but would not be limited to:

- The loss of wellness that will result if communities around the Boundary Waters were to transition from communities which serve as the gateway to pristine wilderness to communities which are a gateway to large industrial mine sites.
- The cost of erosion of the pristine wilderness that has sustained an outdoor recreation industry in Minnesota that contributes to a stable tax base, jobs in a range of sectors, and the retention and talent and wealth locally as well as in greater Minnesota.
- The cost of the erosion of the pristine wilderness that serves as a source of mental and spiritual health, healing, and rehabilitation not only for the local region, but for countless individuals across our state and nation who utilize this region.
- Noise pollution to surrounding wilderness and loss of serenity that this wilderness provides to utilizers as well as local residents.
- The cost for health care, special education, loss productivity resulting from potential human health impairments.
- The cost and capability of increasing mental health providers in this region to meet increasing needs, a region that currently has an inadequate number of mental health professionals and facilities to meet even its current needs.

It is critical that your assessment include not only the potential deleterious effects of sulfide-ore copper mines in this water-rich area, but also include an assessment of the inherent benefits of the region as it is and the risks/costs of what will be lost with the development of sulfide-ore copper mines at the headwaters of the Boundary Waters. It is our opinion that a robust EA that includes these components will clearly demonstrate that mineral withdrawal in the Rainy River watershed is necessary to protect the health and wellness of this sensitive and special region of our state.

We thank you for considering the concerns of Minnesota healthcare providers as you continue to evaluate this issue. We hope that you share our commitment to using careful assessment and rigorous science to understand potential health risks as well as the effects to the social determinants of health. We have included a reference list of articles from the medical literature that may be helpful to you in your evaluation. We urge you to do everything in your power to help protect the health of current and future generations throughout Minnesota.

Sincerely,

John Ipsen, MD, PhD
Jen Pearson, MD
Steve Sutherland, MD
Kris Wegerson, MD

References

1. Kuipers JR, Maest AS, MacHardy KA, Lawson G. 2006. Comparison of Predicted and Actual Water Quality at Hardrock Mines. The reliability of predictions in Environmental Impact Statements. Kuipers & Associates. Butte, MT.
2. Gestring B. 2012 (Revised). U.S. Copper Porphyry Mines Report: The track record of water quality impacts resulting from pipeline spills, tailings failures and water collection and treatment failures. Earthworks.
3. Myers T. 2014. Technical Memorandum. Twin Metals Mining and the Boundary Waters Canoe Area Wilderness, Risk Assessment for Underground Metals Mining. Reno, NV.
4. Minnesota Department of Health. 2011. Mercury in Newborns in the Lake Superior Basin. St. Paul, MN.
5. McClure LF, Niles JK, Kaufman HW. 2016. Lead Levels in Young Children: US, 2009-2015. *Journal of Pediatrics* 175:173-181.
6. U.S. Food and Drug Administration. 2016. Arsenic in Rice and Rice Products Risk Assessment Report. U.S. Department of Health and Human Services.
7. Brooke L, Polkinghorne CN, Saillard HJ, Markee TP. 2004. Metal Concentrations in Wild Rice Roots and Seeds, Mollusks, Crayfish, and Fish Collected from Various Wisconsin Water Bodies in Autumn of 2003. Lake Superior Research Institute, University of Wisconsin-Superior. Superior, WI.
8. Benton-Banai E. 2010. *The Mishomis Book. The Voice of the Ojibway*. University of Minnesota Press. Minneapolis, MN.
9. Myrbo A, Swain EB, Engstrom DR, Wasik JC, Brenner J, Shore MD, Peters EB, Blaha G. 2017. Sulfide Generation by Sulfate Reduction is a Primary Controller of the Occurrence of Wild Rice (*Zizania palustris*) in Shallow Water Ecosystems. *Journal of Geophysical Research: Biogeosciences* 122:2736-2753.
10. Shi L, Zanobetti A, Kloog I, Coull BA, Koutrakis P, Melly SJ, Schwartz JD. 2016. Low-concentration PM_{2.5} and mortality: estimating acute and chronic effects in a population-based study. *Environmental Health Perspectives* 124:46–52.

11. Franklin BA, Brook R, Pope CA. 2015. Air Pollution and Cardiovascular Disease. *Current Problems in Cardiology* 40:207–238.
12. Ring SJ. Expert Opinion of Steven J Ring. Roseville, MN.
13. Cook PM, Swintek J, Dawson TD, Chapman D, Etterson MA, Hoff D. 2016. Quantitative structure-mesothelioma potency model optimization for complex mixtures of elongated particles in rat pleura: A retrospective study. *Journal of Toxicology and Environmental Health, Part B*. 19:5-6, 266-288.
14. Taconite Workers Health Study: Final Report to the Minnesota Legislature. 2014. University of Minnesota School of Public Health. Minneapolis, MN.
15. Hemphill, Stephanie. 2012. State works to cut haze in northern Minn. wilderness areas. *MPR News*, St Paul, MN.