

# Sulfide-ore mining AND human health in Minnesota

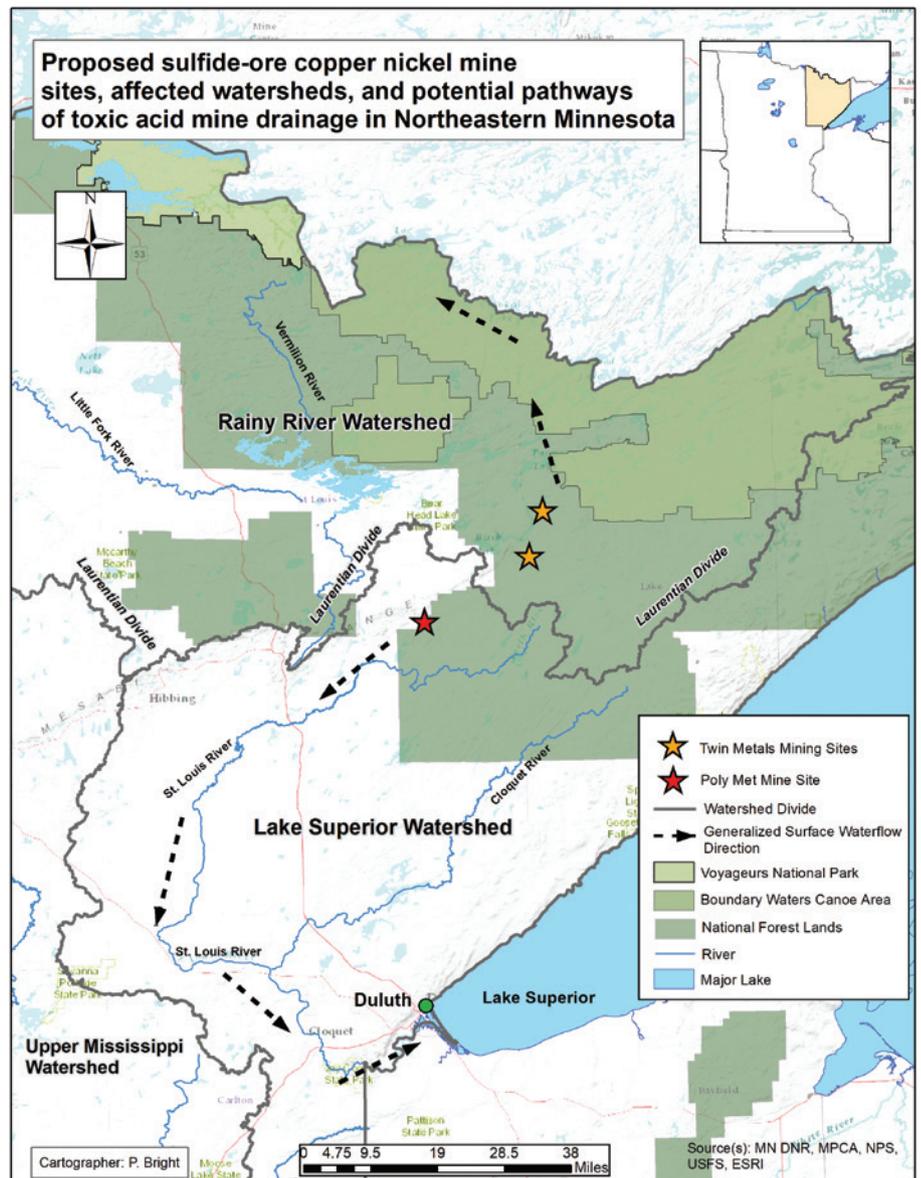
## WHERE ARE WE NOW?

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For many years, Minnesotans have been reading headlines regarding the prospecting, permitting and potential for sulfide-ore copper nickel (sulfide-ore) hardrock mining in Minnesota. Although the debate is not a new one, the landscape surrounding decisions regarding this type of mining within Minnesota’s borders is dynamic and constantly changing. As 2021 was ushered in, so were new legislative and legal efforts affecting sulfide-ore mining. Amid state and federal legislation and lawsuits, healthcare providers in Minnesota have continued to stay abreast and weigh in on the potential human health effects of these decisions. Given the shifting landscape, it is timely to understand where we are right now and why concerns for human health remain at the forefront of this issue.

### Background

The Duluth Complex, a geological formation in northeastern Minnesota, contains metals that are sought for many modern-day uses, including copper, nickel and platinum group metals. These metals are naturally bound to sulfides in the ore body and millions of tons of rock are excavated to obtain a fractional amount of the desired product. At both the mine site and in tailings and waste rock piles, exposure of this excavated ore to air and water triggers a chemical reaction that causes the sulfides to oxidize; this reaction creating sulfuric



acid, sulfate and toxic metals—acid mine drainage—that then leaches into surface and ground water.

Proponents of sulfide-ore mining argue that we need these metals in our lives and that they can be extracted safely within the state regulatory guidelines. Opponents of sulfide-ore question whether industry can extract these metals safely without irreversible harm to the surrounding ecosystem and beyond, particularly in water-rich environments. They argue that some places are too valuable to expose to the risks of sulfide-ore mining within the same watershed. Many advocate for recycling metals that have already been mined, which would consume less fossil fuel energy, have less climate impact and not put water resources at risk.

Given the inextricable connection between ecosystem health, animal health and human health articulated by the One Health movement, and the toxic track record of sulfide-ore mining elsewhere, concern for human health must be part of the public dialogue. The World Health Organization has concluded that environmental risks account for a large fraction of the global disease burden. Across the total population, 23% of all deaths worldwide are attributable to the environment, with greatest adverse effects to those younger than 5 years or older than 50. The WHO also lists 10 environmental toxins with the greatest concern to human health, and sulfide-ore mining has the potential to release six of these including mercury, lead, arsenic, cadmium, asbestos and particulate air pollution.

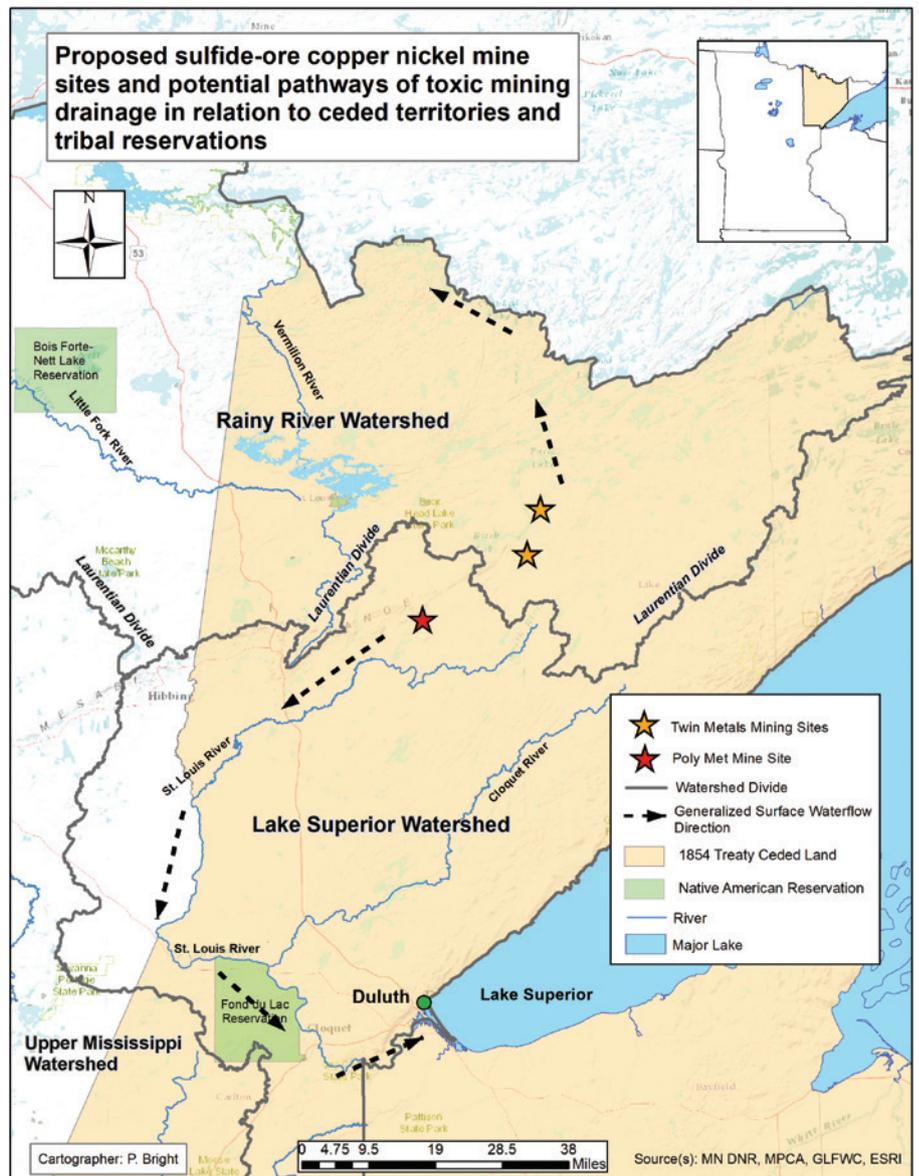
Sulfide-ore mining also releases sulfates that promote methylation of elemental mercury already present in wetlands and sediments. These sulfates interact with sulfate-reducing bacteria to produce the more bio-toxic form of mercury, methylmercury, a known neurodevelopmental toxin. Methylmercury and other released toxins (e.g., lead and arsenic) all have known harmful effects to human health, including neurodevelopmental disorders, cancers and heart and lung disease. Some of these toxins injure the developing brains of fetuses, infants and young

children and so contribute to the rise of neurodevelopmental disabilities including autism, attention-hyperactivity disorder dyslexia and other cognitive impairments that affect millions of children worldwide. The medical literature has produced expanding scientific evidence that connects environmental heavy-metal toxins with harmful human health effects.

These concerns add to problems that already exist in Minnesota; a 2011 Minnesota Department of Health study showed that 10% of newborns in the Minnesota portion of the Lake Superior basin had elevated blood-mercury levels, with some exceeding the EPA toxic level. The *Journal of Pediatrics* reported that 10.3% of Minnesota children under 6 years of age had

elevated blood lead levels, an alarming statistic given that there are no safe levels of lead. Many Minnesota physicians have voiced concern about adding to this existing toxic metal burden.

Given the geology and chemistry involved with sulfide ore and the sulfide mineral oxidation that occurs as part of the sulfide-ore mining process, leaching of sulfate and toxic metals from mine ore and waste rock will continue for centuries. Sulfate and toxic metals will inevitably make their way into surrounding water, soil, fish, birds and mammals, increasing the already existing toxic burden. Threats to fresh water from sulfide-ore mining could have devastating effects on our region. The example of Mount Polley’s



catastrophic tailings dam failure in British Columbia serves as a sobering example of that reality. The U.S. Government Accountability Office produced a report in March 2020 that found that the Forest Service, Bureau of Land Management, National Park Service, Environmental Protection Agency and Interior's office of Surface Mining Reclamation and Enforcement spent, on average, about \$287 million annually to address physical safety and environmental hazards at abandoned hardrock mines from fiscal years 2008 through 2017, for a total of about \$2.9 billion. Billions more are estimated for future costs of ongoing cleanup.

The environmental review process for sulfide-ore mining projects has been shown to fail repeatedly. The definitive study, "Comparisons of Predicted and Actual Water Quality at Hardrock Mines: The Reliability of Predictions in Environmental Impact Statements," looked at Environmental Impact Statements conducted on proposed mining projects and found they consistently failed to predict the groundwater and surface-water contamination created by the mines. The factor most closely associated with mine pollution failures is proximity to groundwater and to surface water. Earthworks studied 14 copper mines that had been in operation for more than five years, representing 89% of the United States copper production in 2010. Pipeline spills or other accidental releases were seen in 100% of these mines, with water collection and treatment system failures resulting in water impairment and acid mine drainage (AMD) occurring in 92%. The author concluded that these findings occurred within mines in the arid Southwest; significantly worse impacts can be expected at mines in wetter climates.

### **The voices of healthcare professionals**

Because of the likelihood of harmful effects to human health, many healthcare professionals have individually and collectively voiced concern in relation to sulfide-ore mining within Minnesota's water-rich borders. The Minnesota Medical Association, Minnesota Academy of Family

Physicians, Minnesota Nurses Association, Minnesota Public Health Organization along with dozens of individual providers, and non-profit groups with ties to human health all submitted letters in response to the Environmental Impact Statement prepared for Minnesota's first proposed sulfide-ore mine. The consensus of these groups representing tens of thousands of healthcare professionals was that a comprehensive Health Risk Assessment and Health Impact Assessment should be mandated as part of an Environmental Impact Statement necessary for decisions regarding sulfide-ore mining. The Minnesota Academy of Family Physicians (AAFP), the largest medical specialty organization in Minnesota, passed a resolution that was brought to the Minnesota Environmental Quality Board as a petition for rulemaking to require that a Health Impact Assessment be completed for all future sulfide-ore mining projects in Minnesota. This petition has not yet been voted on by the Minnesota Environmental Quality Board.

In 2019, the American Academy of Family Physicians adopted "Health in All Policies." This collaborative approach aimed to improve the health of all people by incorporating health considerations into decision-making across all sectors and policy areas. The AAFP supported the recommendation that Health in All Policies can be best accomplished by using Health Impact Assessments in the federal review of environmental impact statements and environmental assessments. For years now, Minnesota's collective medical voice, along with those of physicians from across the country, have been asking for a regulatory process that engages sound and independent scientific evaluation of a toxic industry such as sulfide-ore mining.

### **The Laurentian Divide: Recognizing risks on both sides**

The Laurentian divide runs through northern Minnesota and serves as a geographic boundary between surface watersheds. Simplistically, surface water north of the Laurentian eventually makes its way to Hudson Bay and water south of the Laurentian eventually flows into the

Gulf of Mexico or the Atlantic Ocean. This geographical feature divides the Rainy River watershed toward the north and the Lake Superior watershed toward the south, although groundwater does not always reflect surface flow. There are substantial risks and efforts to mitigate the potential toxic effects of sulfide-ore mining in watersheds on both sides of the Divide.

Northern Minnesota encompasses the federally designated Boundary Waters Canoe Area Wilderness (BWCAW), Voyageurs National Park, the Superior National Forest and shared border-waters with Canada. Because of this, there are several federal laws that pertain to the protection of this region. Current mining proposals for north of the Laurentian Divide are primarily to mine federal minerals that are governed by the Federal Land Policy and Management Act. In watersheds south of the Laurentian Divide, mining proposals primarily involve Minnesota state-owned minerals and surface lands that may be owned by the federal or state government or by private parties. Mining of state-owned minerals is governed by state regulatory provisions, and the primary constraint is the degree to which these state regulations are or are not protective or enforced.

Sulfide-ore mines proposed in either the Rainy River Basin and/or the Lake Superior Basin would be located in Tribal Ceded Territories. Under the Treaty of 1854, when the Lake Superior bands of Chippewa ceded lands to the United States government, they retained usufructuary rights to hunt, fish and gather plants throughout this land. Sulfide-ore mining likely would contaminate tribal food sources and so create potential abrogation of treaty rights.

### **North of the Laurentian Divide**

Twin Metals Mining Company, a wholly owned subsidiary of the large Chilean-based conglomerate Antofagasta, has prospected and developed a plan of operations for mining public lands and minerals in a portion of the Superior National Forest within the Rainy River Watershed and in the headwaters of the BWCAW.

Mining operations would cause acid mine drainage, toxic metal-rich runoff that would flow directly into the heart of the BWCAW and into the border waters between the United States and Canada. Tom Myers, PhD, an environmental hydrologist studying the surface and groundwater flow through the Rainy River watershed near the current proposed mining site 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.” This impact would also then flow north into Canadian waters.

The BWCAW is a national treasure. It is the most frequently visited wilderness in the United States and is a unique freshwater ecosystem. Along with the Superior National Forest, this region contains 20% of all the freshwater in the entire National Forest System. Wilderness experiences for users from all backgrounds provide an immeasurable source of physical, emotional and spiritual well-being. This region also provides critical habitat to wildlife as well as a local and regional economy that relies on the preservation of a pristine wilderness. Proponents of this mine argue that it will provide economic stimulus to the region. A 2020 analysis by Harvard University economists, however, concluded that “introducing mining in the Superior National Forest is very likely to have a negative effect on the regional economy.”

In response to the threat that opponents perceive sulfide-ore mining poses to this irreplaceable wilderness, several lawsuits and legislative efforts are underway. If successful, these efforts would ultimately aim to:

- Terminate two current federal mineral leases that were reinstated in 2018 and cover nearly 5,000 acres; the Biden administration announced cancellation of these leases in January 2022.
- Impose an administrative federal mineral withdrawal under the Federal Land Policy and Management Act.
- Pass permanent protection bills in Congress and in the Minnesota Legislature.

- Revise Minnesota’s nonferrous mining rules to ban sulfide-ore mining in the watershed of the BWCAW. In addition, efforts are being made to utilize sound science for scrutiny of a proposed mine plan.

In October 2021, the Biden Administration announced that it was re-starting a process that could lead to a 20-year ban on new mining activity. The United States Forest Service filed an application for mineral withdrawal of 225,378 acres of Superior National Forest lands and minerals with the Bureau of Land Management. A 90-day public comment period followed, with comments being considered in addition to further study by the Forest Service of the potential environmental and socio-economic impacts of sulfide-ore mining in the area. Once complete, Interior Secretary Deb Haaland could direct an administrative ban on sulfide-ore mining for up to 20 years.

In January 2020, Minnesota U.S. Congresswoman Betty McCollum introduced The Boundary Waters Wilderness Protection and Pollution Prevention Act, which permanently bans sulfide-ore mining on Superior National Forest lands located in the watershed of the Boundary Waters Canoe Area Wilderness. This bill was reintroduced in April 2021. If recently canceled federal mineral leases hold up against any litigative appeals by Twin Metals, an administrative mineral withdrawal under the Federal Land Policy and Management Act and passage of McCollum’s bill by Congress would protect all federal lands and minerals in the Boundary Waters watershed.

In 2021, the companion Boundary Waters Permanent Protection bills were introduced in the Minnesota Legislature; they would ban sulfide-ore on state-owned land in the watershed of the BWCAW and prohibit the issuance of mining permits throughout the watershed. As a result of a state lawsuit challenging the adequacy of Minnesota’s nonferrous mining rules to protect the BWCAW from sulfide-ore mining, the Minnesota Department of Natural Resources recently provided a 30-day comment period. The DNR’s decision

on the adequacy of the state mining rules will be delivered to the state district court overseeing the challenge by September 2022. If the rules are deemed inadequate, state rulemaking to amend the nonferrous mining rules will begin.

### **South of the Laurentian Divide**

In February 2005, the PolyMet company, now majority controlled by the Swiss mining giant Glencore, submitted a proposal to the DNR for Minnesota’s first proposed copper-nickel sulfide-ore mine; the NorthMet Project. The proposed mining operation would create an open pit sulfide-ore mine located between Babbitt and Hoyt Lakes in northeastern Minnesota, positioned at the headwaters of the St. Louis River, the largest United States tributary to Lake Superior. Acid mine drainage and pollution from mine pits and waste storage would eventually flow into Lake Superior, northern Minnesota’s Great Lake, holding 10% of the world’s surface fresh water. There is also potential for some flow north to the Rainy River watershed.

Proposed mining operations would blast and excavate more than 500 million tons of waste rock and ore from the earth over 20 years, the proposed mine operation duration. The waste tailings would be stored on top of an existing and unlined pile of old tailings from a shuttered iron mine. Tailings exposed to rain, snow and oxygen would trigger the geochemical process for acid mine drainage containing sulfuric acid along with heavy metal toxins. Drainage seeping into surface and ground water could flow through natural habitats and vital communities including the reservation lands of the Fond du Lac Band of Lake Superior Chippewa as well the City of Duluth and multiple adjacent communities.

The NorthMet Project environmental review process that began in 2005 was lengthy and controversial. Despite multiple comments from healthcare organizations and individuals requesting that a Health Risk Assessment and a Health Impact Assessment be mandated as part of this process, neither was included. Since November 2018, when the first Minnesota

Department of Natural Resources permit was granted, PolyMet has procured additional permits from the Minnesota Pollution Control Agency, and the U.S. Army Corps of Engineers. Many concerns for safety, process, compliance and validity of the permits have persisted, resulting in legal challenges that have embroiled the courts. Legal decisions to date have not upheld the NorthMet permits. The Environmental Protection Agency Office of Inspector General has found that the EPA failed to follow its standard procedures in oversight of the NorthMet water pollution permit. A district court also found that the MPCA's grant of the NorthMet water pollution permit was subject to "irregularities of procedure," including destruction of communications with the EPA. In April 2021, Minnesota's Supreme Court upheld the Court of Appeals' decision and reversed the critical permit to mine due to its indefinite term and the lack of substantial evidence supporting its plan to control acid mine drainage during closure. At the time of this writing, the NorthMet Project remains highly controversial and is still on hold as litigation continues.

The Fond du Lac Band of Lake Superior Chippewa (tribal lands shown on page 34) proceeded with its own Health Impact Assessment for the NorthMet Project in an effort to determine how the loss of lake-harvested wild rice (manoomin) would impact the mental, physical, spiritual and economic health of tribal members. Naturally occurring stands of manoomin are threatened by a host of environmental perturbations, including the sulfate-containing discharges from current and proposed mining operations. Such sulfate discharges are detrimental to the growth and vitality of wild rice. This first-of-its-kind Health Impact Assessment concluded that the persistent health disparities for tribal communities in Minnesota are directly related to the involuntary loss of traditional lands, subsequent disruption of traditional lifestyles and the loss of traditional, health-sustaining foods such as manoomin. Access to sustainable stands of wild rice is critical for tribal health.

In response to the mounting concerns about the risks of sulfide-ore mining in Minnesota, members of both the Minnesota House and Senate introduced "Prove It First" legislation in January 2021. If passed into law, it would require that the Minnesota Pollution Control Agency and the Minnesota Department of Natural Resources to affirm that a similar mine had successfully operated and closed without environmental contamination for 10 years

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before any sulfide-ore mining permit on Minnesota soil was granted. At the time of this writing, the legislation does not have bipartisan support. It does, however, reflect an expanding skepticism given the track record of environmental impact of sulfide-ore mines elsewhere and the serious concerns regarding human and ecological health.

### **Overall health concerns**

Given the toxic nature of sulfide-ore mining, and in an effort to include human health concerns within the broader regulatory and litigative debates, healthcare

providers have expressed the need for independent scientific scrutiny regarding:

- Direct toxic effects resulting from acid mine drainage to:
  - Those living in downstream communities.
  - Fetuses, infants and children most vulnerable to toxic methylmercury, lead and arsenic effects.
  - Low-income and tribal communities that rely on hunting, fishing and wild rice gathering for subsistence.
  - People experiencing the BWCAW and surrounding wilderness who drink unfiltered water straight out of the lakes.
- Additional health risks, including airborne and noise pollution resulting from mining activities that would affect the surrounding regions.
- Broader long-term impacts to the social determinants of health of the region, including:
  - Interference with the exercise of usufructuary rights for the Lake Superior Bands of Chippewa, guaranteed by the Treaty of 1854, with resulting adverse impacts of economic, social, cultural and spiritual well-being.
  - The overall climate impacts of these heavily fossil fuel-dependent mining operations and the destruction of thousands of acres of wetlands that sequester carbon.
  - The cost of potential loss of the pristine wilderness that serves as a source of mental and spiritual health for individuals from across our state and nation.
  - The cost of potential 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 of talent and wealth in Minnesota.
  - The cost of healthcare, special education and loss of productivity resulting from potential human health impairments from toxic acid mine drainage.
  - The cost of ecosystem damage to the St. Louis River headwaters, the St. Louis River and its estuary and the freshwater of Lake Superior.

- The cost and capability of increasing mental health providers to meet increasing needs in a region that currently has an inadequate number of mental health professionals and facilities to meet even the current needs.

Healthcare professionals concerned about potential harmful effects to human health from sulfide-ore mining on both sides of the Laurentian Divide have voiced ongoing need for:

- Upholding the mandate of the National Environmental Policy Act by ensuring that human health effects are addressed. This would be accomplished by completing broadly scoped and scientifically robust Health Risk Assessments and Health Impact Assessments for toxic industries such as sulfide-ore mining anywhere within our U.S. borders, so that science is used to scrutinize potential harmful effects to human health and the environment before irreversible damage is incurred.
- A Federal Land Policy and Management Act administrative mineral withdrawal of 225,378 acres of Superior National Forest lands from the federal mining program in the BWCAW watershed.
- Legislation pending in Congress that would permanently ban sulfide-ore mining on federal public lands in the watershed of the BWCAW.
- Legislation pending in the Minnesota Legislature that would permanently ban sulfide-ore mining on state public lands in the watershed of the BWCAW and would prohibit the issuance of mining permits in the BWCAW watershed.
- Revisions of Minnesota’s nonferrous mining rules to prohibit the siting of sulfide-ore mining in the watershed of the Boundary Waters.
- “Prove It First” legislation in the Minnesota House and Senate that would prevent sulfide-ore mining unless it can be proved that a similar mine operated and closed for 10 years without pollution.
- Opposition to mining that adversely impacts treaty rights and downstream communities, including reservations.
- Reverse of recent rollbacks to the Clean Water Act by reinstating protections

that allow state pollution regulators to help protect drinking water, people, rivers, streams and wildlife.

- Substantial financial support for programs that promote metal recycling and reuse rather than furthering the toxic sulfide-ore extractive industry in water-rich regions such as Minnesota.
- Needed economic stimulus to northern Minnesota in ways that are not primarily dependent on mining.

### What is needed now?

We recognize that the siloed thinking of past decades reveals an inexplicable connectedness between industry and ecological and human health, which must be addressed and reoriented. Minnesota contains and borders on a substantial portion of the world’s fresh water. This geographic reality, amid an expanding crisis for adequate fresh water in multiple places around the planet, requires that we scrutinize the long-term risks and costs of damaging this life-sustaining resource in an effort to extract sulfide-ore, especially given the potential to adversely affect human health. As healthcare professionals, we operate daily with a risk and benefit lens through which we care for patients. For many of us, weighing in on industry has not historically been part of our daily work. Yet, within our interconnected world, the broader public health impacts of certain types of toxic industry on our patients and broader communities, including our Indigenous communities, have become more and more apparent.

The challenge for healthcare professionals thus becomes: How do we effectively advocate for policies and a regulatory process that prioritize human health, and how do we support new alternatives to risky toxic industries, thereby strengthening economic security without trading this security for long term risks and costs to future generations? As healthcare professionals, we are drawn to serve our patients and communities by promoting their health and well-being. The ultimate challenge is to raise our collective voices beyond the various clinic and hospital walls within which we work to promote

human health in all policies and to fulfill our oath to “first, do no harm.” The health of future generations is at stake. **MM**

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