

# Arthur Baldwin

My name is Chris Baldwin, a native Minnesotan, a long-term and current resident of Hibbing and descendent of an Iron Range railroad pioneer grandfather. My father was executive VP and Director of Research for Cargill for 30 years. I am a retired hard rock underground mining engineer with relevant engineering and operating experience in twelve different open pit and underground salt, iron, uranium, and gold mines across the U.S. over the past forty five years. I wore various engineering and operating hats at Keewatin Taconite Mine 20 years, Chief Mine Engineer at Minorca Mine 3 years, and I was Technical Services Superintendent 7 years at the Haile Gold Mine in South Carolina prior to retiring and moving back to my roots in Hibbing. I have been honored with engineering accolades by the Duluth chapter of the Society of Mine Engineers for my work in introducing modern computer mine planning and design engineering in the Taconite mines and leading edge surveying and blasting practices. I have relevant experience in geology, hydrology, mine reclamation design, and sulfide mine design and operation.

My alarm signals are really going off as I research more into the long term

BIO-ACCUMULATION affects of the sulfide minerals that I personally witnessed and collected in the taconite ore the I helped mine for 23 years. As a professional engineer responsible to 'do no harm to the public and my fellow miners', I bear some responsibility to warn of an upcoming Bio Accumulation 'Bridge Collapse' I compare to the 35 W bridge collapse. Not only is the Methyl Mercury in the sport fish celebrated as Minnesota's best feature from the Land of Sky Blue Waters becoming so high that 3 game fish meals a week will give you a state record for high levels of Mercury Toxicity. The sulfides in the taconite ores are partly responsible for these elevated mercury levels seen as especially acute from Minntac's tailings basin flowing into Lake Vermillion, and the abandoned Dunka River Taconite mine sulfide overburden stockpile leaching into Birch Lake and into the BWCA, and Eire's tailings basin leaching into St Louis River.

The sulfides in the taconite ores are responsible for mobilizing the methyl mercury and poisoning the food chain that we humans rely on for sport fishing and subsistence fishing. And the threat to wild rice is increasing and is a direct threat to another Iconic feature of Minnesota Northland and subsistence food source for Native Americans.

## Trying (again) to tackle mercury in the St. Louis River

BY [STEPHANIE HEMPHILL](#) | FEBRUARY 28, 2023 |

### An Agate Original



An angler tries for a bite on the St. Louis River near Duluth. Photo: Stephanie Hemphill

"It's like Charlie Brown with Lucy and the football," says Andrew Slade, Great Lakes Program Director of the [Minnesota Environmental Partnership](#). "Our coalition is willing to participate, we're eager to come to the table. Whether it will be different this time, we'll see in the next year or year-and-a-half."

He's talking about the recently revived effort to put Northeastern Minnesota's St. Louis River on a mercury diet. Technically, it's a study called [Total Maximum Daily Load](#) (TMDL), and it's a calculation of how much mercury the watershed can handle and still meet established water quality standards. You could think of it as how many ice cream cones you can eat while maintaining a healthy weight.

Ten years ago the Minnesota Pollution Control Agency (MPCA) engaged with Wisconsin, the federal Environmental Protection Agency (EPA), and the Fond du Lac Band of Lake Superior Chippewa in a collaborative effort to establish a TMDL here. Then suddenly the MPCA dropped out, saying it didn't have enough information to proceed. Citizen activists were outraged and some have remained distrustful of the agency.

Fast forward to a public meeting in mid-February. Slade was stunned to hear the MPCA's newly appointed Assistant Commissioner for Water Policy, Dana Vanderbosch, acknowledging the disappointment and suspicion felt by so many at that time. "It was an emotional moment: I just felt heard," Slade says.

Why would people feel so strongly about a scientific document? Because they love the St. Louis River and they've been [trying for years to clean it up](#). The TMDL is a key step to making that happen.

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#### REGIONAL ENVIRONMENTAL NEWS

The largest river flowing into Lake Superior on the U.S. side, the St. Louis River begins at Seven Beaver Lake in the Iron Range mining district and flows nearly 200 miles through conifer forests and peatlands to Duluth, where it becomes part of a 12,000-acre estuary. The estuary is a complex aquatic system rich in habitats for native fish and migratory birds and was once full of wild rice. Decades of industrial abuse led to clean-up efforts beginning in the late 1980s. Federal and state governments **have spent tens of millions of dollars addressing polluted hotspots**, but many of the fish **still aren't safe to eat**.

Back in 2007 the MPCA created a mercury TMDL for the entire state; it determined that the state needed to reduce 93% of anthropogenic (human-caused) sources to meet water quality standards in most of the state's lakes and rivers.

But many waterbodies in Minnesota, including the Red River of the North and the St. Louis River, are so loaded with mercury, including the kind of mercury that accumulates in organisms, that the statewide reduction goal would not be enough for them to meet standards. They need their own TMDLs. The MPCA is hoping the work on the St. Louis River will answer a lot of questions when it comes to doing TMDLs on the other problem water bodies.

## Mercury pollution is complicated

Regular Agate readers will recall our earlier coverage of mercury origins and impacts in the state, but here's a brief refresher:

Mercury enters Minnesota waters primarily by air; it can be blown from the other side of the world or from nearby. To a lesser degree, it can also occur naturally in rocks and sediments as part of the geochemical landscape. When it enters a water body, if the conditions are right, it can be transformed from that slippery silver element we learned about in chemistry class into a biologically active form, methylmercury. This happens through the work of bacteria that live in mucky, low-oxygen environments like marshes and peatlands. Once it enters the food chain, methylmercury bioaccumulates as larger animals consume many smaller animals, each of which delivers a toxic burden. Methylmercury is a neurotoxin that can affect loons, eagles, and humans.

In 2011 the Minnesota Department of Health found 10% of tested Minnesota newborns in the Lake Superior Basin region had **elevated mercury concentrations at birth**, mostly because their mothers ate contaminated fish.

The MPCA's chief effort for this TMDL is to create models that can show how mercury moves through the environment and where it becomes methylated. The watershed is complex and full of likely methylation hotspots. Upstream there is heavy pollution from taconite mines; in the middle sections it runs through drained peatlands and hydropower dams that produce fluctuating water levels, known to contribute to methylation. The estuary itself was literally killed by massive industrial pollution, now being cleaned up. And to top it all off, the seiche (an oscillation of the water level, often caused by atmospheric pressure) daily pushes the river upstream like a tide.

Scientists now know that another pollutant, sulfate, can boost the conversion of elemental mercury into methylmercury.

Taconite processing, a bedrock of Northeastern Minnesota's economy, produces both mercury and sulfate; the mines release both into the air and into their wastewater basins, which flow into the watershed. That combination of two related pollutants may help explain why the system produces so much methylmercury, but scientists need to learn more.



A researcher takes a sample from a bay in the St. Louis River estuary. Photo courtesy USGS



## Nothing to see here - yet

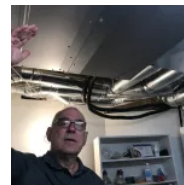
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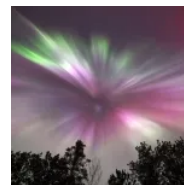
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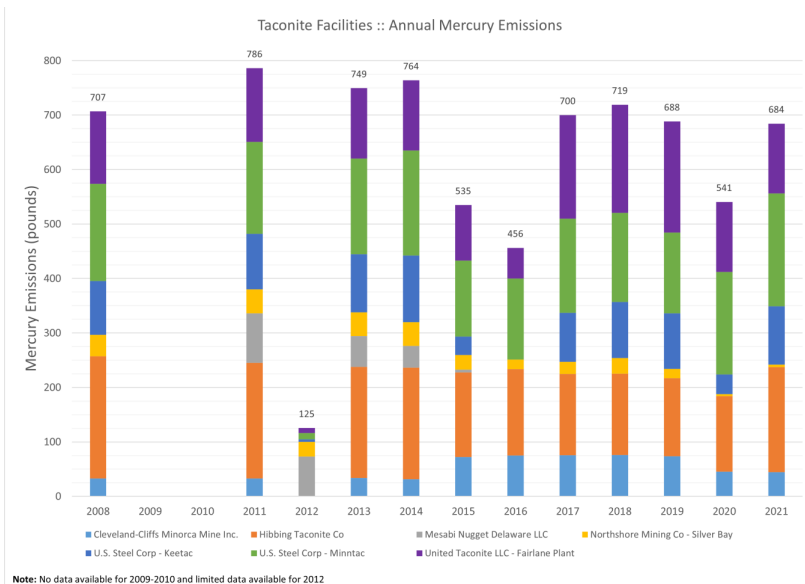
The St. Louis River estuary is full of bays and backwaters where elemental mercury can be converted to methylmercury. Photo courtesy USGS

"The environment is so methylating," says Catherine Neuschler, Manager of the Water Assessment Section of the MPCA. "The conditions in this landscape that result in more methylation might be more important than direct discharges; it's not just a matter of how much mercury is going into the environment, but how the environment works."

The agency's focus on watershed characteristics makes some participants in the process nervous. Nancy Schuldt, Water Projects Coordinator for the [Fond du Lac Band of Lake Superior Chippewa](#), is on the technical advisory group for the TMDL work.

"It's appropriate that we're trying to understand how the watershed works, but not to the exclusion of the elephant in the room," says Schuldt. "The taconite industry is the largest source of mercury emissions in Minnesota, in the Great Lakes, in fact in the entire upper Midwest. That fact needs to be acknowledged."

Indeed, as electric utilities add pollution controls to their generating plants, and shutter plants fired by coal, half of the mercury emissions statewide now come from taconite plants. MPCAs current goal is to limit yearly mercury emissions across the state to 789 pounds. All of Minnesota's six taconite plants combined emit nearly 700 pounds yearly.



Graph courtesy MPCA

## Regulatory efforts

For years, taconite mines have said there's no economically feasible way to achieve significant reductions in either their mercury or their sulfate outputs. Back in 2007, the statewide TMDL assigned a reduction of 72-percent of mercury for the mines. When the MPCA asked the mines for plans on how to achieve that reduction, four of the six companies responded that no further reductions are technically achievable.

The MPCA's Air Quality Engineer, Hassan Bouchareb, says the agency doesn't buy that. "We felt that they didn't adequately demonstrate that achieving these reductions wasn't technically

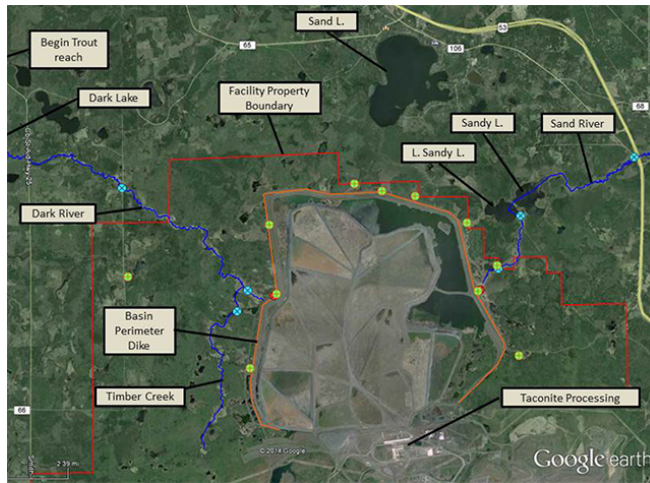
achievable," he says. On the contrary, the agency has identified three technologies that it says should work: two use activated carbon either injected into a waste gas stack or impregnated into a fixed bed through which the waste gas is passed; the third is a Gore company product, a composite material that captures mercury from the flue.

"They're commercially available, they have no other negative impacts, they don't cause issues like corrosion of equipment," says Bouchareb. "We told (the mines) to choose one and tell us how they would implement it."

The taconite facilities estimate these mercury reduction investments would have yearly operating costs of five-to-fourteen million dollars for each indurating (hardening) furnace, equivalent to more than \$100,000 to remove each pound of mercury.

The taconite industry has been doing well, as **U.S. Steel's president remarked** to investors: "2022 was another exceptional year... marking our second-best financial performance in the Company's history," and **Cliffs touting** "revenues of \$23.0 billion, a new all-time record."

Meanwhile, the federal EPA has not set a mercury emissions limit for taconite plants. As long ago as 2003, the agency declined to set a standard, and it repeated the decision in 2020. Minnesota and Michigan, along with tribal governments and environmental groups sued the EPA, and twice an appellate court



MinnTac tailings basin showing sources of effluent to streams flowing into the St. Louis River. Photo courtesy MPCA

told the agency to set a limit. Now the agency is supposed to come up with a limit by November of this year (2023). The MPCA wants the mines to have their reduction plans ready six months later.

One thing to remember about the TMDL process is that it is a description of the current situation, not a prescription for how to improve it. Once the mercury diet is defined, says TMDL Program Coordinator Andrea Plevan, the state will likely rely on existing frameworks to achieve enough reductions for the river to meet standards. Point sources such as wastewater treatment plants and taconite mines have water quality permits, which can include specified control measures. For non-point sources such as peatlands, the owners can be encouraged to use "best management practices" to restore them to health.

However, it should be noted that Minnesota is not on track to meet its statewide TMDL goals. In 2005 emissions were about 3,000 pounds; in 2021 they totaled about 1,400 pounds. The goal is 789 pounds.

The MPCA expects to work on the St. Louis River Mercury TMDL until early 2025. The agency's Catherine Neuschler says the work will be shared publicly as it goes along. "We will be transparent and open about what we're doing, we'll explain all the technical underpinnings... make sure everybody knows enough that they can trust the outcome." And she plans to rely heavily on the technical advisory group, which includes scientists from Wisconsin, tribal groups, the University of Minnesota Duluth and the EPA. "They have a lot of background and expertise; we want to make sure the way we're putting it together makes sense to them, and it will to the public," she says.

For the process to work—if trust is to be regained and the St. Louis River and its estuary are to benefit—Lucy will have to learn how to hold that football steady.

To learn more, including invitations to open forums, check out the [Minnesota Pollution Control Agency's TMDL page](#).

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