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COMMENTARY

Hope for the Iron Range economy, but we must put the past behind us

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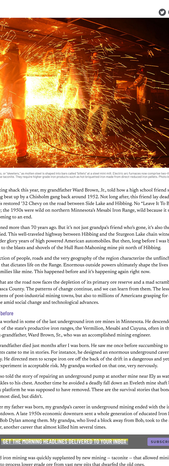
JANUARY 5, 2023 5:00 AM



Workers are showered with sparks in "steelworks," an outdoor street in Hibbing's Bethlehem Steel in about mid-mid. Electric arc furnaces now comprise two-thirds of the country's steel production, compared to 1% in 1970. "We have to find a place where we can produce steel in a way that's cleaner than it was in the past," Minnesota's Iron Range must learn from its past, author Aaron Brown writes. (Photo courtesy of Minnesota Historical Society)

At the turning shack this year, my grandfather Ward Brown, Jr., sold how a high school friend saved him from getting beat up by a Chisholm gang back around 1952. Not long after, this friend lay dead in the wreck of his restored '32 Chevy on the road between Side Lake and Hibbing. No "Leave It To Beaver" utopia here, the 1950s were solid on northern Minnesota's Mesabi Iron Range, solid because it seemed like it was all coming to an end.

This happened more than 70 years ago. But it's not just grandpa's friend who's gone, it's also the road where he died. This well-traveled highway between Hibbing and the Sturgeon Lake chain witnessed the eight-cylinder glory years of high powered American automobiles. But then, long before I was born, it succumbed to the blasts and shovels of the Hull Rust Mahoning mine pit north of Hibbing.

The destruction of people, roads and the very geography of the region characterize the unfolding march of progress that dictates life on the Range. Everyone outside powers ultimately shape the lives of whole families. Families like mine. This happened before and it's happening again right now.

The mine that ate the road now faces the depletion of its precious ore reserve and a mad scramble for new ore from Iowa Country. The patterns of change continue, and we can learn from them. The lessons relate to the decimess of post-industrial mining towns, but also to millions of Americans grasping for dignity and purpose amid social change and technological advances.

Hard times before

My grandpa worked in some of the last underground iron ore mines in Minnesota. He descended shafts on all three of the state's productive iron ranges, the Vermilion, Mesabi and Cuyuna, often in the employ of step-grass grandfather, Ward Brown, Sr., who was an accomplished mining engineer.

My great-grandfather died just months after I was born. He saw my once before succumbing to cancer. His achievements came to me in stories. For instance, he designed an enormous underground cavern at a mine near Crosby. He directed men to scrape iron ore off the back of the drift in a dangerous and yet highly profitable experiment in acceptable risk. My grandpa worked at that one, very nervously.

Grandpa also told the story of repairing an underground pump at another mine near Ely as water rose from his ankles to his chest. Another time he avoided a deadly fall down an Eveleth mine shaft by landing on a rickety platform he was supposed to have installed. These are the survival stories that bound people here. We almost died, but didn't.

Shortly after my father was born, my grandpa's career in underground mining ended with the industry's gradual shutdown. A late 1950s economic downturn sent a whole generation of educated Iron Rangers elsewhere, Bob Dylan among them. My grandpa, who lived a block away from Bob, took to the road as a truck driver, another career that almost killed him several times.

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But that old iron mining was quickly supplanted by new mining — taconite — that allowed mining companies to process lower-grade ore from a near-new plan that described the old mine.

Today, Iron Range mining companies produce as much iron ore as they did in the early 1950s. More people mine this ban, however, because mining companies employ fewer than a fifth of the workforce — due to automation, larger equipment and computerized controls.

In fact, the more mined mineral on Earth is iron ore. It's not close. In 2021, mining companies extracted more than 2.6 billion tons of iron ore from the planet. And yet, the Mesabi Range has produced a tiny of 40 million tons of iron ore, less than 2%of the world's total and yet between 75-85% of what America uses to make its domestic steel supply. That mining gap tells a story of mining's future.

Newer steel mills use recycled steel and specialized ores, not taconite. Steel companies are busy snatching up salvage yards and recycling plants. That's why northern Minnesota's Mesabi Range now arrives as a crossroads remarkably similar to the one it faced when grandpa raced those old green roads.

Change happens slowly, except when it happens all at once. An economic transition that began 40 years ago is about to break into a sprint. But news and fresh opportunities alike spew out of an industrial gale that blows through.

Just like the tumultuous transition from natural iron ore to taconite 70 years ago, the Iron Range today morphs from taconite to what's known as direct-reduced iron production. With this, companies like U.S. Steel and Cleveland Cliffs promise another century of iron production, much to the relief of the region's 4,000-plus miners and local politicians buttered on both sides by the industry.

The people of this place have ached for better times my whole life. And yet, longing for the past threatens to choke out a viable vision for the future. Northern Minnesota could be part of a climate change solution, a driver of cleaner energy and carbon-neutral transportation, and a hub for new technology.

Or it could spend like a souped-up Chevy down a road that runs out.

Assay it with me

In 2016, I toured a small private laboratory near Nashwauk called Midland Research. Its principal metallurgist, Doug Laurenson, showed me an experimental ore processing plant inside the building.

At the end of the line stood a collection of barrels, each filled with a different kind of iron ore. One barrel contained reached zero magnetic ore, similar to what the plant mined in the old days. Another barrel held old-fashioned taconite pellets, the kind you see piled at the ore docks in Duluth today. But the ore was many more barrels to see.

In one bin, I saw flux pellets, similar to taconite but mined to different specifications. There were iron nuggets and direct-reduced iron-ready pellets, higher grade ore that can be turned into direct-reduced iron, commonly called DRI. That's the good stuff. With the increased grade of iron in each barrel, the pellets grew darker and heavier. As barrels of iron go, it was like walking from the Kia dealership onto the BMW lot.

Laurenson then took me inside a kitchen-looking laboratory where he was busy melting elements in a small oven that looked like a microwave. It's weirdo for the glowing molten metal inside you might have thought he was reheating soup in a drab company break room.

All this happened six years ago. The science has progressed further since then. The Natural Resources Research Institute of the University of Minnesota Duluth maintains facilities that do similar research, including one on the western Mesabi Range.

For instance, the NRRI created a first-of-its kind direct-reduced iron simulator. This allows companies and investors to quickly calculate the feasibility and profitability of processing different ores into DR grade iron or steel.

An industry based on financial risk tolerance gains a lot of confidence this way. The process allows faster and more successful adaptation to new ore bodies and technology.

On Dec. 7 of this year, I hosted a local public television program about the future of iron mining in Minnesota. During the program, NRRI director Rolf Weberg told me about their efforts to help Minnesota's mining industry scale up their efforts to produce higher grade iron using lower grade ores while addressing pollution and water management.

Weberg told me electric arc furnaces now comprise two-thirds of the country's steel production.

Cleveland Cliffs began producing direct-reduced pellets almost three years ago to serve its new hot briquetted iron (HBI) plant in Toledo, Ohio. Cliffs first produced the special DR grade pellets at Northshore Mining in Silver Bay. But this year the company moved production to the Minorca Mine in the Mesabi Range city of Virginia, part of its 2020 acquisition of Arcelor Mittal's U.S. holdings. Northshore has been shut down ever since.

Meantime, this year U.S. Steel announced its own DR-grade pellet production at its Keewatin Taconite facility. CEO David Burritt and Gov. Tim Walz hailed the news as a much-ballyhooed Oct. 5 ceremony. Once the largest corporation on the planet Earth, U.S. Steel cuts a much more svelte silhouette on the world steel market today. Nevertheless, the company still owns America's largest iron mine at Minnesota's Minntac mine, which feeds its Gary, Indiana, mill and its share of the Keewatin taconite operation. Of the inevitable change that industry watchers have been talking about for at least a decade.

During the New Deal in the 1930s, government-backed companies turned farmers how to rotate crops and plant wind breaks to avoid another Dust Bowl. Today, Minnesota's NRRI guides Iron Range mines — typically more focused on today's production goals and profits — toward a future that is coming faster than a wind storm.

Weberg puts it simply.

"What we're trying to really deliver is to demonstrate on an industrial level what can be done so they can invest."

The great singularity of the American economy — rich people's money that wants to become more money — could rush to propounds that promise to revolutionize an old but indispensable industry like steel. This is especially true if they are part of a climate change solution. That prospect has already attracted the federal government.

Hydrogen steel

Steel is formed from the combination of iron and carbon. Thus, "carbon neutral" steel may seem an oxymoron. But something like that is coming. And Minnesota might be in a unique position to capitalize on the new technology.

Last February, the U.S. Energy Department announced a $7 billion program to create regional hydrogen energy hubs across the nation funded by the Bipartisan Infrastructure Law.

Robert Zullo of Sunex Newsroom reported in October that states were scrambling to access the new money now available for hydrogen fuel development. Minnesota, Montana, North Dakota and Wisconsin formed a coalition now among the bidders.

Hydrogen is a clean, abundant and potent element that, historically speaking, has been challenging to use safely as an industrial scale. (The words, "Oh, the humanity," come to mind).

Hydrogen fuel might one day power long distance transportation like trucks, trains and ships. But even bigger application might come in industrial settings like steelmaking, which produces as much as 9% of all the world's carbon emissions.

My father — you guessed it, Ward Brown III — worked for Eveleth Taconite, now called United Taconite, in the early 1980s. He recalls how rather trucks would be lined up 24 hours a day to maintain a constant supply of diesel fuel for the bullets that heated the iron ore. In the winter, lines of 20-30 trucks at a time were common. It suggests the mind, even more so when you consider that iron ore production is a much smaller part of steel's carbon emissions than steelmaking itself.

A hydrogen-based steelmaking process wouldn't just reduce fuel usage, it would replace coal altogether by using an alternative way to generate carbon atoms in the steel. If Minnesota is a federal hydrogen hub, couldn't it be a hydrogen steel hub, too?

That's the question. But you don't hear elected leaders in St. Paul or the Iron Range talking about it, at least partly because the answer defies partisan views on climate change and mining.

Forty years ago this month, Gov. Rudy Perpich — the only Iron Ranger ever elected governor — made a hard pitch to German steelmaker Willy Korf to build a mini mill on the Iron Range. Only the fullness of time reveals how visionary that idea was and what a huge difference it would have made. Unfortunately, Korf and most of the steel industry went bankrupt the next year in a recession that would devastate the Iron Range of my childhood. More than 10,000 workers lost their jobs here, my father among them.

Today is different. Those losses are now fully absorbed into the region's economy and culture, with great effect on mortale and political views. But the original idea — making small batches of steel near where iron is mined — remains plausible, even more so with the advent of hydrogen-based steelmaking.

But the innovation goes even further. What if Minnesota iron didn't just make steel, but could be used as an efficient way to store energy in cutting-edge batteries?

A viable climate change strategy entails electrification of things that once ran on gas and coal. Electricity isn't automatically cleaner, but it's a form of energy that can be produced many different ways, including from renewable, carbon-free sources. That's also why the sticking point on electric vehicles and solar power is really about energy storage, not energy production.

Battery technology advanced massively in the past decade, but still requires rare minerals difficult to source in sufficient quantities to eliminate the need for carbon fuels. Lithium, in particular, has been a challenge to find and, even then, can only store energy for hours.

Now mining by companies like PolyMet, Teck Resources, Talon and Twin Metals promises solutions, but the reality is that northern Minnesota doesn't have enough minerals to do the job alone, even if all those projects actually happened.

This is a well known problem, one that entrepreneurs and scientists are solving in new ways. When you don't have enough of something, you try to figure out how to use something you have in long around.

Something like iron

That's the concept behind iron-air batteries announced by companies like Form Energy, profiled by Jeremy Hawkins in the Oct. 4 Wall Street Journal. Raising $470 million, much of it from Bill Gates' net giant Arcelor Mittal, Form Energy wants to create modular energy storage units using direct-reduced iron — the very same iron now being used in modern steelmaking. And its results are promising. Iron-air batteries can store energy for days rather than hours, greatly improving the efficiency of solar and wind energy production.

Iron-air batteries turn iron to rust and then reverse the process to release energy. As a metaphor for Rust Belt renewal, this all feels too on the nose. But it's true.

Furthermore, iron-air batteries can be scaled up massively, stacked in small units or enormous plants. Sensing opportunity, the Minnesota Center for Environmental Advocacy proposed Thursday funding late last year. This proposal — which requires partnership and investor support — would use the former LTV Eric processing plant now owned by PolyMet as a solar and wind energy facility.

This idea is a long way from happening, but the same could be said of proposed new mining operations. The question becomes, what's the better option?

So, what about the environment? Green technology still uses mined elements, leaving questions about the environmental impact of mining, an inherently destructive process. There's no way out of this that doesn't require some mining. There again, Minnesota's iron could be part of the solution.

The aforementioned NRRI is working on a process that uses direct-reduced iron in a chemical process that can remove sulfates from mining wastewater. Sulfates can become harmful sulfides if they escape mine pits into rivers and lakes where certain bacteria create a chemical reaction.

Environmental engineer Jeffrey Hanson is also working on an iron-based solution to the sulfate problem. His Clearwater BioLogics company tested the use of anaerobic bacteria in consuming sulfates in a mine pit near Babbitt. These bacteria consume the sulfates as food, creating waste that can then be processed with DRI into hardpan, marketable pellets.

Minnesota's Iron Range produces 75% of American taconite (pictured) and 40% of all iron ore. Pictured here, the Minorca Mine in Virginia, Minn., is operated by Cleveland-Cliffs. Cliffs bought the Minorca Mine in 2020 from Arcelor Mittal, formerly the Mesabi Range city of Virginia, Minn., operated by Minnesota Steel Industries. (Photo courtesy of NRRI)

Try to wrap your head around this. These newer, purer iron ore products from northern Minnesota can create steel, of course, but could also be part of the delivery of renewable energy sources to make that steel and also the environmental mitigation of mining water waste. It's like a shiny new pan that cooks dinner for you and then cleans itself.

The only problem is the price tag. The federal government, private companies and utilities will have to spend billions to make this happen, a generational investment in a new way of doing business.

To the chagrin of skeptics, mining could become a critical component of solving climate change. But for this to happen, key political leaders and industry voices would have to accept that solving the climate crisis with the resources at hand requires a generational reckoning about change. This is not something that pre-mining lawmakers have shown much interest in doing.

If Minnesota is to maintain the so-called "world's best" environmental policies regarding mining, and also fair wages and collective bargaining for its workers, it has to embrace its most important assets: expertise and quality of life. Right now, some of the best minds in mining work in Minnesota. Our education and health care systems are some of the best in the nation. These factors, taken together, could make northern Minnesota a hub for development of green steel, iron-air batteries, and innovation in edible mitigation.

This isn't theoretical. It's already happening in northern Sweden, to the tune of tens of thousands of new jobs tied to these very technologies.

The future of Minnesota's iron industry will be different than in past. No longer will the Range produce a majority of the country's raw iron content. Rather, much of that iron will come from recycled scrap. What the Range will produce is specialized iron ore used in higher value products that can't be made from scrap alone.

In other words, we're making a few good steaks, not a million cheeseburgers. As this business model changes, so too should the relationship between Iron Range communities and the industry they have served these past 14 decades.

New copper-nickel mines in northern Minnesota — still long shots in many ways — promise to preserve a status quo for the jobs and politics I grew up around. These mines may be necessary someday, but they're not the jobs guarantee they claim to be. In fact, over-dependence on mining could hurt the Range long term and certainly does nothing to make up for the jobs permanently lost to automation. Growth will come from mineral products and technical services, not mining itself.

As such, a local political structure focused on mining alone misses the real opportunities that this adolescent century offers. Heck, it even hurts the potential of mining.

Here's why. If the region isn't open to developing markets for newer iron products — iron-air batteries, sulfur mitigation or electric vehicles — then we will watch helplessly as the old markers drop and blame for the change we resisted. The feeling of powerlessness experienced by rural workers here and elsewhere can only be reversed by participating in the actual economy as it transforms around us.

Don't believe me? Look at the materials circulated on Wall Street by U.S. Steel and Cleveland Cliffs. They're talking about mini mills and green steel. At the mouth of their mines we should do the same.

The reckoning

Twenty years ago, I attended a series of stuffy, staid meetings of official muckery-mucks in and around Hibbing in my capacity as local newspaper editor. Back then, mining bosses stared quite clearly that Hibbing Taconite would run out of ore in about 20 years.

Of course, nothing was done about this, not by either political party. Old people watched the retirement clock and young people grew old. Our region lost everything on promises made by developers and lobbyists while leaders failed to adjust to deindustrialization and a changing climate.

Perhaps now would be a good time to start. The Iron Range still retains some of its best source of iron ore for decades to come. How that may best benefit local citizens — especially the vast majority who don't work in the mines — remains an open question.

But there is growing evidence that solutions for many of civilization's most pressing problems — energy, pollution, climate change — may be found in these same old mines.

The old roads are rapidly aging. Soon enough, they'll be gone, just like the past. The future of places like the Iron Range — rural places, long dependent on their natural resources — can be much brighter than their nostalgia. But we have to let the lights in and accept that this region isn't a kid anymore. We need to work smarter, not just harder.

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