



## Natural Resources Research Institute

# NRRI Now

A monthly newsletter from the [Natural Resources Research Institute](#)

September 2024 | Volume 09 | Issue #9



NRRI Researchers Jasmine Blomgren and Britta Larson show a family how landscape pollutants impact water quality at the MN State Fair.

## Great Minnesota Get-Together

It was exhausting and exhilarating. NRRI was invited to staff a booth in the Minnesota State Fair's Eco Experience Building, a guest of the Minnesota Pollution Control Agency. We were told to expect 500 people at our table each of the two days we were there.

I'd be surprised if we didn't exceed that number! We shared information about NRRI research to make the best, most sustainable use of Minnesota's resources and improve water quality. The response from fair-goers was warm, friendly and encouraging.

We're grateful to the 12 NRRI staff who took on 4-hour shifts, had a great time engaging with the public... and hopefully had some time to grab something yummy-on-a-stick!

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## Keeping watch on rivers



NRRI Field Tech Becca Marston uses a Van Dorn sampler to collect water from the St. Louis River in August.

June Breneman  
Sep 4, 2024

### NRRI contributes to state's long-term stream and river monitoring efforts.

And you thought 10,000 lakes were a big deal. Minnesota also has 6,564 natural rivers and streams that cumulatively flow for 69,000 miles.

Keeping an eye on the water quality of the state's flowing waters is important and requires a statewide network of partners. NRRI is one of 18 skilled water monitoring organizations gathering data that is coordinated and analyzed by the Minnesota Pollution Control Agency.



*Photo left: Chris Filstrup*

"It's a massive program," said NRRI Applied Limnologist Chris Filstrup. "The state needs to know if the things we do in the watershed are impacting stream health, but also how the streams are changing or are impacted by climate change."

And thanks to the steady supply of students and recent graduates from the University of Minnesota Duluth, NRRI uses this opportunity to train the next generation of water scientists.

### Over the River

On a misty mid-morning in August, Becca Marston looks down over a bridge barrier rail at a section of the St. Louis River in Floodwood, Minn. She graduated from UMD in May with a bachelor's degree in Environmental Science. And that particular bit of river is one of her favorites.

This is her second year at NRRI and this project is one of several water related areas she's worked in.

"It's been great to transition from working as a student to a more permanent position," Marston added. "I've been able to see where research is going, and what type of research I see myself doing through the methods I learn and the methods of my peers."

For this project, Marston is gathering data on water flow, depth and temperature. She also fills a long tube with stream water and uses a small black and white Secchi disk to measure water clarity. A four-liter plastic jug of water is filled with river water to bring back to NRRI's Central Analytical Lab to analyze for nutrients, like nitrogen, phosphorus, and sediment.

## Sample. Analyze. Repeat.

This same data has been collected from the same 200 locations statewide since 2007. NRRI has been a partner from the beginning. NRRI collects data from six of those locations which, in addition to two sites on the St. Louis River, includes the Whiteface River, Swan River, Second Creek, and the Cloquet River. For ease of gathering, the sample locations are mostly on bridges.

NRRI employs its EPA-certified Analytical Lab, with strict quality control procedures, to ensure the data are of the highest quality for this, and many other projects.

"Climate change, especially, is making this long term monitoring really important to see incremental changes over time," said Filstrup, who oversees the lab. "We're a trusted partner in this effort."

And for students or early career scientists, contributing to the database and seeing the big reveal each year – whether water quality has gotten better or worse – is exciting.

"It's so cool to be part of a larger project with sampling and monitoring all over the state that builds a long term record of stream health," said Marston. "It's also nice to know that every sample I collect, every data point on a graph, is important to generate trends for stream health across the state."

The MPCA's Data Viewer makes the locations and data readily available. The program is funded with appropriations from Minnesota's Clean Water Legacy Fund.

(And, by the way, Minnesota's official lake count is more like 14,380, according to Minnesota Sea Grant.)

# Foundational research leads to mining industry progress

June Breneman  
Sep 4, 2024



## MagIron, LLC credits NRRI's research to identify ores for direct reduced iron production.

The legacy of Minnesota's Iron Range lives on – in the iron that built America, in its communities built from a cultural melting pot, in remaining iron resources in ponds and stockpiles. And in those legacy materials are potential for the industry to transition to greener iron and steel making.

NRRI is pleased to provide critically important research data that helps facilitate this transition in collaboration with industry partners such as MagIron, LLC.

According to MagIron's recent press release, the company recently announced a maiden inferred (i.e., based on limited sampling) mineral resource of 2.6 billion metric tonnes with an average iron content of 36.82 percent. According to the announcement, this estimate excludes the legacy iron-bearing stockpiled materials available to MagIron, which is expected to support over 20 years of MagIron Plant 4 operations.

Using developing technologies tested by NRRI on samples from the Canisteo mine pit, it was confirmed that this mineral resource should be amenable to Direct Reduced Grade (DRG) ore concentrate. This higher iron content product is an important step toward Direct Reduced Iron (DRI), which is the feedstock to more efficient steelmaking in electric arc furnaces.

In the release, Larry Lehtinen, CEO of MagIron commented: "We are delighted to announce this mineral resource that illustrates the globally significant endowment of Direct Reduced quality iron ore effectively controlled by MagIron. The presence of this large, partially pre-stripped deposit adjacent to MagIron's Plant 4 presents a compelling growth opportunity."

The location and quality of the resource positions MagIron to become a major supplier of direct reduction grade iron products. The mineral resource estimate was prepared by an independent firm, Global Minerals Engineering, in accordance with generally accepted mine and geologic engineering methods and standards for the State of Minnesota.

“This area has great potential for inground mining of hematite resources using present and future mineral processing technologies,” said David Meineke, president and CEO at Global Minerals Engineering, in the company’s press release.

MagIron will continue to make advancements in financing, engineering and permitting toward producing these direct reduction grade iron products. NRRI continues to provide material characterization and bench-scale beneficiation and pelletizing testing to support this effort.

## About MagIron

MagIron LLC is focused on the restart of Plant 4, a modern, past-producing iron ore concentrator benefiting from over \$170 million of prior investment. The facility has previously operated at an annualized run-rate of approximately 2.0 million tonnes per year of blast furnace grade concentrate and was designed to expand to 3.0 million tonnes per year.

## Meet the Researcher - Samantha Harbin



Samantha Harbin stands in Building 230, being prepped for the future sample warehouse at NRRI Coleraine.

June Breneman  
Sep 4, 2024

### Watching NRRI facility transform is satisfying work for this project engineer.

A first impression of NRRI's Coleraine Labs conveys an aging industrial site – a mish-mash of old pole buildings, other random facilities, and one towering steel structure.

Aside from the site's newish administrative building, the labs are legacy buildings from the early 1900s. And when NRRI acquired the site in 1986, there was a lot of old equipment left to deal with.

While clean-up has been ongoing for the past 10-plus years, a new 5S initiative has put that effort into overdrive. And that has been very satisfying for Samantha Harbin. She's a project engineer who joined the NRRI team in December 2023.

"I am thoroughly enjoying witnessing the transformation across the entire site," said Harbin. "It's incredible to see everyone contributing toward achieving this larger goal. And the before-and-after results are truly remarkable."



Five S is a continuous improvement methodology: sort, set in order, shine, standardize and sustain. It's an effort underway at all of NRRI's research facilities, but from her vantage point in Coleraine, Harbin sees the payoff in streamlining processes and improving workplace organization.

*Photo left: Samantha Harbin*

"We're enhancing our ability to deliver on our mission – integrated research solutions," she added. "And then we can better value and manage resources, protect the environment and contribute to a sustainable and resilient future for Minnesota."

## Homegrown

Developing efficiencies and appreciating nicely organized packages became part of Harbin's DNA after college.

She graduated from UMD with a mechanical engineering degree in 2008. Then worked as a packaging engineer for Minnesota Diversified Industries in Grand Rapids. She managed product costing models, coordinated production process improvements and collaborated with design and sales teams to develop competitive packaging solutions.

"My passion for learning and taking on new challenges has allowed me to develop knowledge across multiple areas, including engineering, design, accounting and business," said Harbin.

## Collaborator

In her current role, she prepares, coordinates and monitors the engineering aspects of projects, while also helping to implement innovative methods to solve complex problems. She leans heavily into her ability to be creative and collaborative.

Overseeing the installation of new equipment, for example, requires input from NRRI's finance, safety engineering, research and maintenance teams. She also engages the manufacturer and UMD facilities, as needed.

"It truly requires a collective effort to achieve a seamless installation," she said.

She also appreciates the effort of her colleague Principal Laboratory Technician Bailey Rohde who set up comprehensive manifests to streamline sample management, "especially as we transition an older building into a designated sample warehouse," added Harbin.

## Off Hours

Away from work, Harbin enjoys spending time with her family – husband and two young boys, ages 4 and 5. They enjoy hunting and fishing and many other outdoor activities, which is especially fun with boys this age.

"Any outing can turn into a lively event," she laughed. "Like a catchy song on the PA while grocery shopping can prompt a spontaneous breakdancing session that would put Australian Olympian Raygun to shame!"

## NRRI Organization Overview

NRRI was created by the MN Legislature in 1983 to deliver applied research informing environmental stewardship and economic development of the state's natural resources. It is a nationally unique model for integrated research focused on three strategic initiatives: Ecosystem Resilience, Future Forest Industries, and Iron and Minerals of the Future.

As part of the University of Minnesota system research enterprise, NRRI employs over 140 scientists, engineers, technicians, staff and students in two industrial research facilities. Through collaborative partnerships, we deliver the innovative tools and solutions needed to utilize and sustain Minnesota's valuable natural resources.

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## NRRI Facilities Overview

NRRI has extensive laboratory capabilities to discover and deliver at the bench-to-pilot scales, reducing risk inherent in commercializing innovations.

**NRRI Duluth** has 19 labs that address the needs of land, wildlife, water and minerals research, as well as several technology development labs and the LP Innovation Center, developed in partnership with LP Building Solutions.

**NRRI Coleraine**, a former U.S. Steel R&D facility, is a 27-acre industrial-scale site that was acquired in 1986. The minerals processing and metallurgy labs provide bench to pilot-scale research to broaden the state's portfolio of ore resources while impacting process efficiencies and improved production of taconite. The engineered biocarbon product development lab tests processes for converting a variety of biomass into fuel and carbon materials up to commercial demonstration scale.

**NRRI Fens** is a 425-acre property near Zim, Minnesota, was acquired in 1986 to restore its function as a valuable peatland and fens bog after being drained in the 1950s for farmland. Decades of effort have restored the peatland - nature's most effective carbon sequestration solution - and the restoration credits were sold to state agencies. Ongoing research on the site will continue to inform successful peatland restorations across the nation.

## NRRI Mission

Deliver integrated research solutions that value our resources, environment and economy for a sustainable and resilient future.

## NRRI Vision

Discover the economy of the future.