

NRRI Now

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NRRI Now is a 2021 CASE V Award Winning Newsletter!

Relevance. Monthly news from NRRI.

NRRI has a mission to deliver integrated research solutions that value our

**resources
environment
and economy**

for a sustainable and resilient future. That means NRRI's work is always relevant.

Relevant to agency and industry partners. To the state. To communities. But this month, I wrote a story that's especially relevant to me.

When I learned that NRRI was helping an industry partner develop their byproduct into a fertilizer that might work better for farmers, I had first hand... er, first hoof, experience. The stable where I board my horse has used this material to make the pastures more productive. So, straight from the horse's mouth – it works.

Read on. And please share this email with someone who you think will find it relevant.



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NRRI helps industry reduce costs, enhance value of waste material



April 7, 2021
June Breneman

Industry partner gets NRRI assistance to add value and improve byproduct for more efficient use.

“It’s like taking of years of baking experience and creating an entirely new recipe.” - Cally Hunt

Looking out over her 30 acres of horse pasture a few years ago, Anne Gullion knew it needed something. She called the agriculture experts at the University of Minnesota Extension Office in Carlton to come out and take a look.

“My pastures are sandy so they lack a lot of nutrients,” said Gullion who grazes 14 horses at her boarding facility.

The Extension expert put her in touch with local industry to get some of their lime/ash byproduct materials applied to her pasture. Like commercial fertilizer, this production waste stream improves soil alkalinity and water penetration, while adding calcium. One hundred tons of the gray-green, damp yet powdery material was applied to Gullion’s pastures. The result was greener grass, bare patches filling in and happy horses.

Finding beneficial uses for industrial byproducts is an environmental service that many industrial facilities are committed to, but it's expensive. The material is difficult to handle, so the company often covers the cost for the lime and ash to be hauled and spread on agricultural fields.

Can NRRI make the material easier to transport and apply? Perhaps in a granular form, land application of the materials can be simplified, improving the outcome for both industry and farmers. The hope is that NRRI could help generate new markets for the material.



Left: Cally Hunt inspects the agglomerated ash material generated at NRRI.

NRRI Engineer Cally Hunt is leading this research effort, which she likens to developing a new recipe.

“We’re trying different binders and playing with the moisture content and ingredient ratios,” she said. “It’s like taking of years of baking

experience and creating an entirely new recipe.”

The process of granulizing the material is called agglomeration, and it’s something NRRI has a lot of experience with -- from taconite pellets to gypsum and more. And at this point Hunt thinks they have a good formulation that readily agglomerates and holds together. NRRI produced 15 five-gallon pails of it for field testing.

“The one question we don’t have answered yet is, how will this agglomerated material interact in a soil environment? We are working with an industry partner to gather feedback from farmers to see if the disintegration profile meets their needs,” said Hunt. “We might have to further optimize the recipe if it doesn’t.”

The final goal will be finding a manufacturing partner that can agglomerate on a large scale and support a large scale field trial. Many industrial processes produce a fly ash byproduct and the total produced in the U.S. can reach 73 million tons annually. (Source: [Dwivedi* and Kumar Jain](#))

Hopefully, the project will result in hitting the NRRI trifecta: reducing waste, improving the environment and adding value to resources... with an added bonus of happy horses.

NRRI geologists save important drill core for future study



March 22, 2021
June Breneman

Drill core are rock samples pulled from the ground to study mineral deposits. NRRI's quick action saved important core from the dump.

“This core represents an incredible opportunity for my undergraduate students.” - Dr. Robert Lodge, UW-Eau Claire

Some 1.87 billion years ago, volcanic activity in north-central Wisconsin formed a unique mineral deposit that has piqued the interest of local geologists.

“The Lynne Deposit is different than other hydrothermal systems of the same era,” explained University of Wisconsin – Eau Claire Economic Geology Professor, Robert Lodge. “It has a lot of lead in it, but it might have formed in the right conditions to incorporate barium and indium, important minerals for technologies and U.S. defense.”

The only way to find out is to study drill core from the deposit.

But that opportunity nearly slipped away.

Back in the early 2000s, George Hudak (a former University of Wisconsin professor and now director of NRRI's Minerals and Metallurgy group) got word that the core from the Lynne Deposit was destined for the dump. His conscience made him spring into action.

"I am passionate about drill core. To me, dumping core is like burning books," said Hudak. "Getting the drill core out of the ground is a major investment. And once it's gone, you'll never get it back for future training, education and research opportunities."

Drill core are long, cylindrical samples drilled from rocks that can be interpreted by geologists to gain better understanding of how the rocks, and their mineral resources, formed. And while mineral deposits are set in stone – literally – ongoing analyses of drill core provides new and ever-expanding insights to understanding geological systems.

Hudak knew he couldn't save all the drill core from this hybrid zinc-lead-silver deposit, so he prioritized saving core from two perpendicular cross-sections through the deposit. Then he made a plan to get it to economic geology students for training and much needed study.

With the help of NRRI geology colleague Dean Peterson, 290 boxes of drill core were collected and stored at NRRI Duluth. Professor Lodge got some help and moved the collection to UW-Eau Claire in October 2020.

"This core represents an incredible opportunity for my undergraduate students," said Lodge. "Lynne is a different-looking hydrothermal system, so it's unique compared to other deposits in Wisconsin. The state had no drill core for this deposit."

And while it's very convenient to have the core right on campus, Lodge's goal is to get it to the Wisconsin Geological Survey so that it's accessible to other geologists, curators and librarians for broader distribution and analyses.

Currently, four University of Wisconsin undergraduate students have exploratory research underway with the Lynne Deposit drill core. Their work not only gives them experience that boosts their career opportunities but unearths – quite literally – how this deposit formed and its unique mineralization.

"This is applied geology," said Lodge. "The students are learning core logging and data analysis skills useful in mineral exploration or environmental consulting. Because of this drill core work, they'll come out as undergrads ready for work in the real world."

Advisory Board Spotlight: Mike Mlinar



PHOTO: Mike Mlinar out on a hike at Yellowstone National Park with his daughters Tessa and Arianna, June 2019.

March 22, 2021

Serving 10 years on NRRI's Advisory Board has given this former industry executive a front row seat to the institute's restructuring and future focus.

"Every person I've come into contact with [at NRRI] has shown an incredible passion for the work they're performing."

Mike began his professional career with Continental Oil Company as a Coal Mining Research Engineer in West Virginia. Mike then served in a variety of roles at Cleveland-Cliffs for their mines located in Michigan, Minnesota, Quebec and Newfoundland, before retiring as Vice President of North American Iron Ore Initiatives in September 2013. In addition to his membership on NRRI's board, Mlinar is a trustee for the Mesabi Trust, which controls mineral rights and collects royalties on the iron ore mined by the Northshore Mine in Babbitt, MN.

NRRI: Prior to your involvement on the NRRI Board what were your interactions with NRRI?

Mlinar: Especially during my tenure as general manager for three Minnesota iron mines, NRRI was a valued collaborator in a number of practical evaluations of new technologies for improving product quality, reducing environmental impacts, and increasing overall iron recovery.

Examples of these evaluations include; assessment of mineral characterizations, trials of a unique fines separation conveyor system, and tests of sulfide reduction techniques.

NRRI: How long have you been on the Board and has anything changed over your tenure?

Mlinar: I first joined the NRRI Board in 2011. During this 10-year period the board has gone through a number of step changes. The most significant was the creation of the current Strategy & Development Advisory Board in 2014. The previous advisory board had over 30 members, and while every person had valuable insights, the ability to meaningfully tap into each of these was difficult. With the restructured 8-member board we have improved in the areas of candor, efficiency, and decisiveness.

NRRI: Has your opinion of NRRI changed over this period?

Mlinar: I've gained a much deeper appreciation for the impressive talents and commitment of the NRRI employees. Every person I've come into contact with has shown an incredible passion for the work they're performing in support of the NRRI mission to balance community, environment, and industry. It is widely seen as not only something written for external communications but rather a reflection of the culture they all embrace.

NRRI: What are the major benefits that NRRI can deliver to industry, environment and communities?

Mlinar: Speaking directly to my area of experience, I've had the opportunity to be exposed to a number of mining research organizations over my 40-year mining experience. NRRI separates itself as the only one that can provide valuable insights to allow informed decisions to be made from evaluation of the ore in the ground through the final industrial product and even the environmental restoration after mining has been completed. And very importantly it does so in an unbiased, balanced manner.

NRRI: If money was not a limiting factor, what should NRRI do that we're not doing?

Mlinar: Due to the current financial constraints, in many cases NRRI must prioritize its research to address only the areas of most critical immediate need. As such many very important current and forward-looking endeavors are left behind due to the lack of funding and/or resources. The risk in this approach is that areas that might provide significant future potential to the State of Minnesota are not fully identified and evaluated.

Meet the Researcher: Chris Filstrup



March 22, 2021
June Breneman

Large numbers of tiny things can be a big problem. Applied Limnologist Chris Filstrup digs into the data of harmful algae blooms.

"Our goal is to develop an assessment tool that is quick and inexpensive."

A self-described data nerd, Chris Filstrup likes to wade deeply. An apt description for an applied limnologist who studies lakes and streams and their responses to human-caused stressors, like climate change and land use.

"I like to dig into the data to see how management strategies play out at large spatial scales, like lakes distributed across the entire United States," said Filstrup.

When he's not wearing his principal investigator hat for a large and complex project to discover chemicals in the sediment of the Great Lakes, or not wearing his Chief Editor hat for *Limnology and Oceanography Bulletin*, Filstrup looks at algae. Very, very closely. Specifically, he has an ongoing research project funded by Minnesota Sea Grant to understand what is causing increases in harmful algal blooms – the kind that produce toxins that make people sick and can kill pets and livestock.

Not an acceptable scenario for the Land of 10,000 Lakes.

Filstrup is excited about partnering with UMD's Large Lakes Observatory to use cutting-edge molecular methods that lead to a better understanding of these algal blooms at the genome level. Do the strains have the genes to potentially produce toxins? If they do, are the genes wired to produce them?

"With this information, resource managers will be able to develop proactive approaches to warn people about potential danger before the toxins are in the water," he said. "Current assessment approaches are expensive and require complex lab instruments and technical expertise. Our goal is to develop a tool that is quick and inexpensive."

Collaborations

To think about lakes in their larger context, Filstrup needs to understand the landscapes, forests and minerals that surround them.

"I come in with a limited understanding of these disciplines and NRRI has expertise in all of these areas," he said. "My colleagues are happy to sit down and chat about project ideas."

For example, Filstrup is interested in understanding how mine pit lakes function differently than natural lakes. He can easily have conversations with experts in the Minerals and Metallurgy Platform to understand how these lakes were created and how the underlying geology may affect lake quality.

He collaborates broadly across the University system to understand water quality issues, and with extension educators to increase awareness of issues in communities.

Within NRRI, Filstrup appreciates Grants Coordinator Megan Gorder who works with him from budget to proposal development to attract external research funding.

"This funding is critical to the operation of my lab and allows us to develop solutions to some of the most difficult management solutions facing Minnesota," he added.

Passing Pandemic?

In addition to being a data nerd, Filstrup admits to being a foodie. So when pandemic restrictions lift, he's really looking forward to restaurant dining again — from dive bar to Michelin star.

"But before I hit the road, I think having friends over for a barbeque sounds awesome."