

NRRI Mission:

Deliver research solutions to balance our economy, resources and environment for resilient communities.

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From the Editor:

To be 35 years old is to enjoy the vibrancy of youth, with a bit of aged wisdom.

NRRI is celebrating its 35th year this summer, and we're just hitting our stride. Governor Rudy Perpich signed the legislation that established this unique applied research organization in July 1983.



1986: NRRI Director Mike Lulich presents a commissioned print to Gov. Perpich.

The vision was built off the applied research done at the University's Mines Experiment Station to develop taconite pellets back in the 1940s.

In this issue, we're looking back on the past, so it keeps us on track for the future. We're also showcasing an amazing partnership that reduces waste and changes lives.



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Mr. Taconite: How innovation saved the Iron Range

“Geologists tell us that nature laid down the taconite here on the range a billion years ago. The next day Ed Davis started trying to sell it to the steel companies.”

The state legislator who spoke those words in the 1940s was growing weary of University of Minnesota researcher Edward W. Davis. Every two years he'd show up in St. Paul asking for continued research funding to develop low grade taconite into a viable product for steel production. But without Davis's dogged persistence, the Iron Range would not, truly could not, have continued to supply U.S. steel producers with iron ore all these decades to come.

It was Davis and his research team, with financial support from the state and the University, that allowed the Iron Range to transition their product from unprocessed lean ores to taconite pellets. And just in time. By the 1950s, the last of the high grade lean ores were mined.

The Iron Range was an important economic engine for Minnesota whose fate lies in just one thing: iron ore.

So this is taconite

Davis was introduced to the rock in 1913 as a young University of Mines mathematics professor when a University dean sent Davis a sample. The dean asked him to figure out a way to economically extract any valuable ore. It was the first time Davis had ever examined the material.

“It was a hard rock, mottled in appearance, with a few narrow bands of darker material passing through it,” Davis writes in his book *Pioneering with Taconite*, published by the Minnesota Historical Society in 1964.

He continues, “After breaking the sample into small pieces, I found that most of them could be picked up readily with a hand magnet.”

And so began a career – more like a lifelong quest – to develop this “useless” rock into something of value. Davis became director of the University's Mines Experiment Station in 1939, staying in the position until he retired in 1955. During that time, the lowly taconite of the Mesabi Range began a new



Staff of the University's Mines Experiment Station, Davis far left, gather for a photo.

trajectory worthy of the expanding, and demanding, steel industry.

“It was obvious... that taconite processing would be expensive. Therefore, we set out to make a superior final product, one that would smelt more rapidly and produce high-grade iron and steel more cheaply than other available ores,” Davis writes.

Research and more research

Through much trial and experimentation, the pellet – a shape that would permit the greatest use of air and circulation of gases in the blast furnace – was born. The next challenge was scaling up production to meet the needs of huge blast furnaces capable of producing a million tons of pig iron per day.

Davis worked closely with Reserve Mining to take his process to the first steps

toward commercialization in 1944. They were planning the world's first large taconite processing and pelletizing plant.

But, as Davis explains, Duluth's “mining men” were skeptical of Reserve's large and risky investment. One of Reserve's metallurgists, Oscar Lee, encountered some ribbing on a stop through Duluth at the Kitchi Gammi Club. Lee did not mince words in his response.

Davis recalls it this way: “He told them the days of putting raw ore... into a blast furnace were about over, and that they had better start modernizing their thinking or they would be left behind.”

Read the whole story on our website:
www.nrri.umn.edu/davis-taconite

Constructive deconstruction comes to Duluth, creating jobs

A project near and dear to NRRI researchers finally came close to home last month.

For a number of years now, NRRI's materials specialists have been working with two social enterprises – one in Minneapolis and one in Bemidji – on an alternative to demolition and landfilling of abandoned homes. Now St. Louis County is conducting a pilot project to test this alternative on tax-forfeited properties.

The alternative is deconstruction... and the benefits are numerous.

Both Better Futures Minnesota and Miigwech Aki (“Thank You, Earth”) are programs that train workers how to carefully dismantle old buildings to save the valuable materials for recycling and resale. The overarching goal is to give job skills, safety training and a good paycheck to help improve their lives.

“The mission of the organizations touches me personally,” said NRRI Scientist Victor Krause, “and that makes the research I provide especially satisfying. I'm very glad this method is starting to get the state-wide attention it deserves.”

Krause and his team have four goals with this effort:

- Examine the deconstruction methods to optimize the value of recovered materials and safety of the workers.
- Identify the various species of wood recovered to better assign value to the materials.
- Teach workers to turn reclaimed wood into value-added products, like benches and table tops.
- Quantify the environmental benefits of diverting the materials from landfills.

Compared to demolition, deconstruction of a building can divert more than 85 percent of the materials harvested. Better Futures uses a



Local workers were hired to learn deconstruction skills and site safety as part of St. Louis County's pilot program to instigate deconstruction instead of demolition of abandoned homes.

conversion model created by the Environmental Protection Agency to estimate the environmental impact of deconstruction versus demolition and landfilling. They found that reclamation of a typical house (37 tons of material) offsets 103 tons of carbon dioxide.

“Of course, the results depend on the age and condition of the structure,” Krause said. “But, for example, most buildings constructed before 1940 have rough sawn lumber which is valued higher than modern dimensional lumber.”

The older wood is sought by crafters and furniture builders due to its naturally aged appearance. Krause and his team offer technical support to properly train

the workers to ensure that the removal of the materials is done in a way that retains as much value as possible.

Markets for the materials include reusing as it was intended – framing components or hardwood flooring – or niche markets like craft picture frame manufacturers, bench and table top builders, artists and homeowners.

St. Louis County is deconstructing four tax-forfeited homes in this pilot program to determine if it makes sense to adopt deconstruction on a wider scale. This effort funded by the Environment and Natural Resources Trust Fund established with Minnesota State Lottery proceeds.

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