

NRRI Mission:

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

www.nrri.umn.edu



From the Director:

NRRI has been putting research to work for Minnesota for more than 30 years. We provide critical support to our stakeholders -- from large industry to resource managers to entrepreneurs.

Research requires time and top-notch talent. We have shown that consistent investment provides a significant return to Minnesota. The base funding that keeps our doors open has not changed since the mid-1980s while the scope and complexity of our work expands.

NRRI is a unique asset that helps meet the University's land grant mission to deliver real solutions. And we need a funding infusion.

Visit our website to view an interactive map that shows current projects across the state.

And contact your state leaders to confirm your support of your NRRI.

Thank you.

Rolf Weberg



NRRI Advisory Board Member Kate Ferguson (left) talks with researcher Adelle Schumann at the NRRI Advisory Board retreat in March.

NRRI Leadership

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Innovative Research: Land use changes with ethanol expansion

In 2008, the Renewable Fuel Standard set a goal for the U.S. to produce 15 billion gallons of conventional biofuels to supplement fossil fuels. That goal was reached in 2016 and with the expansion of the industry came new ethanol refineries and more demand for corn.

That demand resulted in nearly 4.2 million acres of land being converted to cropland from 2008 to 2012 during the peak of ethanol expansion, according to research published in the journal *Environmental Research Letters* this month. Ecologist Christopher Wright from the Natural Resources Research Institute worked with researchers from the National Wildlife Foundation and the University of Wisconsin-Madison in the first national assessment of the impact of growing demand for corn on the landscape.

"If there's a net shift in grass pastures or native prairies to corn, there will likely be associated landscape impacts, like increased water runoff and reduced land connectivity for wildlife," said Wright. "It also impacts the atmosphere, potentially turning lands that are carbon sinks into carbon sources."

The Renewable Fuel Standard was implemented under the Energy Independence and Security Act of 2007 with the intent of reducing U.S. dependence on foreign oil and to reduce greenhouse gas emissions associated with climate change.

The largest impact, according to the study, is not in heart of corn country -- southern Minnesota and Iowa -- but in the periphery of that core, the Dakotas,



NRRI Landscape Ecologist Chris Wright works in his office to map land use changes in the wake of recent ethanol refineries expansion.

Kansas, Missouri, and Nebraska.

Of particular interest is the conversion of Conservation Reserve Program (known as CRP) lands and native prairies that provide habitat for many species and improve water quality. The paper points to the need for a more comprehensive monitoring system to assess whether the Renewable Fuel Standard is having the intended effect of reducing greenhouse gases.

"I think if we're going to have a strategy for climate change mitigation through widespread manipulation of the landscape, we need to do the monitoring and accounting that would allow policymakers to consider potential

mid-course corrections," said Wright.

NRRI Executive Director Rolf Weberg says this is an excellent example of the institute's role in providing data for sustainable planning.

"Informed decision-making is vital as we enter the era of cellulosic biofuels with much greater potential to reduce the carbon footprint of our transportation sector," said Weberg. "NRRI plans to keep moving research forward to develop renewable fuels from a variety of resources."

This research is funded by the National Science Foundation, Macrosystems Biology program.

Minnesota Value: Minnesota 'Cooked wood' finds niche market

By Kevin Coss, UM Office of the Vice President for Research

A few years ago, architecture firm Perkins+Will came to a conclusion while drawing plans for the new Bell Museum of Natural History and Planetarium on the University of Minnesota's St. Paul campus: it was time to get cooking.

Now, following the architects' design, workers are covering nearly half of the Bell's exterior with Minnesota white pine that has been cooked in a giant kiln. The process, called thermal modification, is a chemical-free way to make wood more stable and water-resistant. Workers will finish installing the specialized wood in March, with the Bell Museum itself reopening in summer 2018.

The Bell project highlights an economic opportunity for Minnesota -- and one where the Natural Resources Research Institute plays a crucial role. Researchers involved in NRRI's Wood Products and Bioeconomy initiative, which focuses on helping strengthen Minnesota's forestry industry in an environmentally sound way, are leading research into the field of thermally modified wood.

"We have one of the only thermally modified wood pilot labs in the country," said Patrick Donahue, NRRI's research program manager for wood products and processing. "It's a very big part of our research program."

Normally, hemicellulose -- a natural sugar found in wood -- will cause most of the decay and discoloration that wood stains and coatings are meant to prevent. Thermal modification works by cooking



Thermally modified white pine, harvested in northern Minnesota, goes up on the UM Bell Museum.

most of that sugar out, resulting in a material that resists warping, weeping and decay and remains a uniform color even as it ages. This longer-lasting, lower-maintenance material is ideal for covering exterior walls and interior floors, as well as for window frames, door frames and deck railings.

The white pine used in the Bell Museum project was thermally modified by Superior Thermowood, a company in Palisade, Minn., that had previously worked closely with NRRI to research thermal modification methods for different species of wood. While white pine is not normally used outdoors, the weather-resistant cooked wood made it an option for the Bell Museum. The building project will soon be the largest commercial-scale use of thermally modified white pine in the country. And it may pay off, as the wood could lower maintenance costs in the long run.

Meanwhile, Donahue and his team are already working on new thermally

modified wood technologies. One project, funded by a grant from the National Science Foundation, aims to develop a kiln that can cook wood faster and at a higher temperature, similar to how a pressure cooker prepares food. Another strives to adapt thermal modification for use with engineered wood -- wood converted into a building material that often includes a veneer, resin or other additives.

According to the Minnesota Department of Natural Resources, forestry-related businesses currently contribute over \$16 billion to the state's economy and provide nearly 63,000 jobs. Donahue said thermally modified wood gives Minnesotans a way to boost the value of their forestry resources and better compete with regions that dominate the market, such as the West Coast.

"This is a good niche direction for Minnesota's wood products industry," Donahue said. "You can sell white pine as a modified wood siding for a lot more money than you can sell a two-by-four. We want to see businesses engage in and develop around this resource."

For the Bell Museum, the state's official natural history museum, sourcing building materials from within the state is a point of pride.

"Our goal is to showcase the great natural resources of Minnesota," said Denise Young, Bell Museum executive director. "The thermally modified white pine is a perfect example of how we intend to do that both inside and out."