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Natural Resources Research Institute

NRRI Now

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NRRI Executive Director Rolf Weberg shares research highlights with staffers from the Minnesota Legislative Higher Education Committee and members of the UMN Government Relations team last week during a visit to NRRI Duluth.

Attitude of Gratitude

Hello,

As we wind down 2024, it's time to reflect on a highly productive and exciting year. At the top of our list is gratitude to our amazing NRRI staff -- researchers extraordinaire and expert support staff that keep the wheels on the bus. We're also grateful for the support from the University Research Enterprise as we expand our reach and impact regionally and globally.

We extend that gratitude to our many stakeholders and collaborators who bring innovation and insight to our efforts.

Photo right: *Left to Right, Rolf Weberg, Sam Parmekar, Hayley Bloom Peterson and Ken Savary.*

And finally, thank you to our Minnesota State Legislators and their hardworking staff for ongoing support and enthusiasm. We thoroughly enjoyed engaging with leaders from the Higher Education Committee in early December to share our statewide impact.

Best wishes for good health and prosperity in 2025!

June

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Flying better, faster, higher

June Breneman
Dec 3, 2024

NRRI's new vertical take-off drone improves efficiency and accuracy of data-gathering.

Our first birds-eye view of the world began with balloons in the 1700s. Now aerial drones are tackling a lot of human-intensive chores – in search-and-rescue operations, package delivery, and gathering more efficient and precise data for research.

And that last point makes NRRI GIS Specialist Kristi Nixon very grateful. Especially since NRRI invested in a new vertical take-off and landing drone that covers twice as much area with twice the accuracy as the old eBee fixed-wing drone.

"For me, it's about quantifying a large area that would take a very long time to do on the ground," she said. "We can see what's out there and take measurements from one location."

The new Wingtra One Gen II was purchased in October 2023, and Nixon was surprised by how many research projects quickly queued up for assistance. Over the past year, she's monitored a mining site, emerging wild rice stands, forests for tree health and peatland bogs.

Benefits of the Wingtra over the old eBee quickly emerged. Aside from being faster, it takes off straight up, so doesn't need a large take off or landing area.

"With our old fixed wing drone, the belly landings were a bit terrifying. They were basically crash landings," said Nixon. "It would crash into trees and rocks. We were constantly getting it repaired."

The Wingtra is also larger and can carry a heavier, more powerful camera capable of imaging multiple spectral bands at once. The spectral bands are specific ranges of wavelengths in the electromagnetic spectrum and can capture detailed information about the Earth's surface.

Photo left: Kristi Nixon launches the eBee drone at NRRI Fens site.

Nixon's first test was a comparison of the eBee and the Wingtra on a 100-acre circle flight plan, which the Wingtra won hands-down. The 24 megapixel camera (Sony a6100) attains a ground resolution down to 1.2 centimeters – quite an improvement over the eBee's camera (Canon Powershot S110) at 12 megapixels. And the new multispectral camera (MicaSense RedEdge-P), which includes the near-infrared band, is especially good at gathering vegetation data.

And using downloadable data from the MnCORS (Continuously Operating Reference Station), the Wingtra obtains a higher "absolute accuracy" of the imagery's position on the landscape than using the statewide Global Navigation Satellite System alone. Absolute accuracy, unlike spatial accuracy, compares to what's actually on the ground without the need to trudge across a site to set markers that help make the accuracy corrections.

"And that means that we can get really high resolution and high accuracy imagery much more quickly, even for sites that are otherwise inaccessible – a huge improvement," Nixon added.

The value of the Wingtra investment has been demonstrated within NRRI's 500-plus acres of restored fens peatland. The site is being assessed for indicators of restoration success – the right plants coming back, the insects, birds and other wildlife – that show the results of the 20-year process. And to get the data, scientists had to don deep muck boots.

"Your typical cattail-type wetland is much better studied than fens and bogs which are difficult to work in," explained Valerie Brady, NRRI aquatic ecologist who is leading research at NRRI's Fens Research Site.

Nixon has now spent quite a bit of time at the Fens site, standing on solid ground and letting the Wingtra get the detailed vegetation information needed, without damaging the mosaic of vegetation and sensitive mosses.

"Kristi's drone flights allowed us to get tons more data, more accurately and much more quickly than we ever thought possible," added Brady.

Meet the Researcher - Joshua Kragthorpe

Josh Kragthorpe holds a 51.5 lb. muskie he caught in November on Lake Vermilion

June Breneman
Dec 2, 2024

NRRI's fast-growing, multi-purpose tree varieties captured this silviculturist's attention.

For a guy who's been working with trees for some 18 years, could anything possibly surprise Joshua Kragthorpe as NRRI's newest addition to the hybrid poplar team? Actually, yes.

"I was blown away by how many uses NRRI's hybrid tree varieties have," said Kragthorpe. "And I was surprised that we have our own named and patented tree, and by how they can be used for economic gain."

The InnovaTree™ is the first of NRRI's varieties to be commercially launched. This poplar is a cross between native Eastern cottonwood and European black poplar, naturally cross-bred over 25 years. It was cultivated to grow fast – up to 10 feet tall in just one year – with disease resistance in northern climates.

And it's getting a lot of attention to address many challenges – polluted soils, carbon capture, quick shade – with six nurseries selling them across Minnesota.

Now Kragthorpe is tasked with keeping up with the demand. In his role as Silviculture Staff Technician, he works in the greenhouse propagating more poplar crosses for spring planting, preparing tree seedlings for research, and managing the poplar nurseries in Grand Rapids and Cohasset, Minn.

"I'm also identifying new silviculture research sites, installing vegetation measurement plots and collecting forest inventory data for silviculture projects across northern Minnesota," he added.

But even though the InnovaTree is new to him, the work isn't.

Joining the Team

Photo left: Joshua Kragthorpe

Kragthorpe came to NRRI in March 2024 after 18 years working at the U.S. Forest Service Northern Research Station in Grand Rapids, Minn. And while the research world always intrigued him, he didn't know where he'd end up.

He received his bachelor's degree in biology at Bemidji State University in 2002 and was conferred a master's degree in 2009.

"I thought about aquatic ecology first, but started working summers in forest research," said Kragthorpe. "That opened up opportunities and ultimately I ended up doing silviculture research for the U.S. Forest Service."

At NRRI, he is enjoying learning about the practical applications of InnovaTree, including their natural ability to uptake pollutants through their roots. This phytoremediation application has been tested by the U.S. Forest Service as part of the Great Lakes Restoration Initiative across 16 locations in the watersheds of Lake Superior and Lake Michigan. The InnovaTree is also being tested at a site in Aurora, Minn., near the St. James Pit Lake to use the trees to take up sulfate in groundwater.

NRRI's program currently has over 500 hybrid poplar varieties archived in a nursery germplasm bank from 1,672 varieties and 115 families in 27 field tests at nine sites in Minnesota, as well as several trials in other states through cooperators.

Off Hours

When he's not up to his knees in trees, Kragthorpe likes to do a little fishing. Perhaps that's an understatement.

"My favorite activity is muskie fishing," he said. "In the summer months, I'm a part-time muskie guide in the Grand Rapids area."

Learn more about the InnovaTree: innovatree.umn.edu

One Last Thing

Cold War History

Many know that the NRRI Duluth building is a recycled U.S. Air Force command center: the Semi Automatic Ground Environment. It's history is part of a documentary released this month by PBS North.

Watch the Preview >

Photo left: Duluth's SAGE building in the 1960s.

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.

Find out more: NRRI website • Facebook • X • Instagram • YouTube • LinkedIn

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.