

NRRI Mission:

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

www.nrri.umn.edu



New expertise will drive commercialization of ideas

NRRI's new position of Business Development and Intellectual Property Manager, has been filled by Tim White to drive what he calls "Strategic Opportunism" — being nimble enough to catch opportunities while strategically staying on the right path.

Ultimately, he wants to find the right partners and pathways for NRRI innovations to reach commercial success. "My goal is to make sure Minnesota gets a return on its investment to NRRI," he said.

White's position is to be a liaison to the University of Minnesota's Office of Technology Commercialization on behalf of NRRI researchers, as well as innovations coming from the UMD campus and the Center for Economic Development. He'll be splitting his time between all three places.

White's background is a good complement to NRRI's applied research and UMD's academic goals. White spent the last 12 years with Kohler Company. His skills are in product development; understanding how to develop the commercial side of something new. In his last role at Kohler, he was responsible for creating and running an innovative water filter business that provided people in developing countries with safe water.

"Industries tend to innovate incrementally," said White. "But what I'm seeing at NRRI are leapfrog innovations. It's a really exciting, totally different scale of innovation."



NRRI Leadership

Rolf Weberg, Executive Director

Initiative Directors:

Don Fosnacht, Renewable Energy
Elaine Hansen, Business & Entrepreneurial Support

George Host, Forest & Land
George Hudak, Mining, Minerals & Metallurgy

Lucinda Johnson, Water
Eric Singaas, Wood & Bioeconomy

Duluth Labs & Administration
5013 Miller Trunk Highway
Duluth, Minn., 55811
218-788-2694

Iron Range Labs
One Gayley Avenue
Coleraine, Minn., 55722
218-667-4201

The University of Minnesota is an equal opportunity educator and employer.

NRRI, Audubon MN launch Breeding Bird Atlas

It took eight organizations, 700 field volunteers, 43 photographers, many researchers and an impressive technical review team to launch Minnesota's first Breeding Bird Atlas Website in November. With leadership from Audubon Minnesota and scientific expertise from UMD's Natural Resources Research Institute, the interactive website at mnbirdatlas.org is an astounding resource for naturalists, bird watchers, researchers and historians. For anyone.

Highlights in the new atlas include: proof of the effectiveness of conservation for bald eagles, ospreys, peregrine falcons and trumpeter swans; documented breeding sites for rare species like the bufflehead and common tern; and

the perilous state for species like the piping plover, sharp-tailed grouse, cerulean warbler, and chestnut-collared longspur.

NRRI Executive Director Rolf Weberg is proud of NRRI's role in delivering this important tool. "This is another great example of how NRRI fulfills its mission and provides science and data to inform natural resources management for the state of Minnesota," he said.

And this atlas is long overdue. Minnesota is an important avian flyway on the confluence of the eastern deciduous forest, the boreal forest to the north and the grasslands and prairies to the west. Work began in 2009 with major funding from the Minnesota and Natural Resources Trust Fund.

"Mostly, we needed observations of birds and their breeding behavior," explained NRRI Senior Program Manager and UMD Professor Jerry Niemi. "A nest, a



Field volunteers and researchers covered the state seeking signs of breeding bird species.

male singing or the best thing is a nest with eggs or young. Those are confirmed evidence of nesting by a species."

Once the volunteers and researchers covered all 2,352 townships in Minnesota, describing at least 20 possible categories of breeding evidence for each species, the data were scrutinized for any errors that ranged from potential misidentification to lack of details for rare or unusual observations. In the end over 380,000 records of breeding evidence were compiled for 249 species of birds that were documented nesting in Minnesota.

A comprehensive account of the status and distribution of Minnesota's breeding birds hasn't been compiled since 1936 when Professor T.S. Roberts

published his second edition of *Birds of Minnesota*, a two-volume tome.

Niemi added that a breeding bird survey should be done about every 20 years to better understand how bird populations and their distributions change over time, especially in response to changes in habitat, landscapes, and climate.

"Significant changes are always found — some positive and some negative," he said. "For this first atlas we dug back into the historical record as best we could to see how our Minnesota birds have changed over time. If we want to preserve our native wildlife, we must understand the past to better conserve their future."

NRRI biofuels tested in Milwaukee Zoo tourist trains

Two steam locomotives at the Milwaukee County Zoo were fueled with NRRI's renewable, solid fuel in November to reduce fossil coal emissions, with promising results.

Partnering with the Coalition for Sustainable Rail, a final series of three biofuel trials followed more than a year and a half of development at NRRI's Renewable Energy Lab in Coleraine, Minn. The Milwaukee County Zoo offered its small 15-inch gauge railroad to serve as a demonstration platform to see how this roasted and pressed biomass fuel product burns in locomotive-style boilers that typically run off fossil coal. Previous tests made sufficient steam to power the trains, but created sparks so improvements were needed.

"Following the first trials, our researchers set about devising a better method to compact the material, including acquiring an industrial scale densification machine," explained NRRI Associate Director Don Fosnacht. "Combined with a food-grade binding agent, we were able to make dense, durable pellets that burned like coal."

NRRI is currently researching the opportunities in "torrefied biomass," a wood-based biofuel that is roasted in a kiln similar to a coffee roaster. After being "roasted," the wood is transformed into a fuel that burns and reacts much like coal, with virtually no heavy metal pollutants and reduced carbon emissions. For the locomotive tests, NRRI provided three blends of torrefied biomass



NRRI researchers (from left) Matt Young, Tim Hagen and Don Fosnacht ride the mini trains powered by NRRI solid biofuels in November.

with varying amounts of binder and a blend with fossil coal. Two mixtures were found to be ideal stand-in fuels for fossil coal.

"The torrefied biomass with binder, and the 50/50 blend of coal and biofuel, worked quite well in both locomotives," said Coalition President Davidson Ward. "Both fuels burned nearly identical to coal, while being nearly smoke and odor free."

Initial temperature data also indicate that the biofuel heating value is equal to coal. The maximum firebox

temperatures recorded during the biofuel trials were in excess of 2,100 degrees Fahrenheit (1,149C).

The next round of testing will be early in 2018 on a full scale steam locomotive, Everett Railroad's No. 11, in Claysburg, Penn., where it has been undergoing restoration. NRRI and the Coalition are in the processing of manufacturing 10 tons of the solid biofuel for the tests.