

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

www.nrri.umn.edu



Happy New Year from NRRI Executive Director Rolf Weberg:

I want to take a moment to thank you for your support of our institute. I'd also like to thank my colleagues here at NRRI for making this such a special place to work, and doing such important work for the State of Minnesota.

2016 was a pretty interesting year. We covered new ground in identifying new mineral possibilities; finding new ways to preserve our water resources; and exploring new uses for biomass, keeping the value in Minnesota.

2017 will also be exciting, but will also come with challenges. We have a lot of new partners and technologies to drive innovation. We'll also be working with our legislators to drive stable funding for NRRI so that we can continue to deliver results in 2017 and beyond.

I'd like to thank you for subscribing to our newsletter. I hope it helps you keep in touch with us. We'd certainly like to stay in touch with you.

Thank you,

Rolf



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.

Global Relevance: NRRI develops biofuels for Senegal

Sure, Minnesota has an invasive cattail that is impacting native vegetation. But our problem is nothing compared to the urgent cattail invasion problems along the Senegal River in Africa. NRRI is working to develop a holistic solution to the *Typha australis* problem in the countries of Mauritania and Senegal.

And if the solutions work there, they will certainly benefit Minnesota.

First steps toward that goal were made in November as NRRI Associate Director Don Fosnacht went to Senegal with Peter Strzok, a retired U.S. Army Lt. Colonel who has travelled extensively throughout Africa. The solution they're developing will remove the cattail, provide a low-pollutant cooking fuel and create much needed jobs. They hope that the domino effect will stabilize the vulnerable communities along the river and discourage tree harvesting for fuel in this already barren landscape.

"Invasive *Typha* is a nasty plant that is causing pervasive problems," said Fosnacht. "We saw where a whole village had to move because they lost access to the river, they couldn't fish and the mosquitoes got even worse. They had to get away."

Harvesting this plant isn't easy. It grows densely, almost like a wall of tightly woven mass. And the mosquitoes thrive in the stagnant habitat. With the threat of malaria, that's a real problem.

NRRI is currently scaling up a hydrothermal carbonization process that will convert moisture-filled biomass, such as the *Typha*, into something like mud. Once dried and formed into biocoal pucks, the fuel burns very efficiently with low environmental impact.

NRRI will receive a delivery of *Typha* from Senegal to test the process with this plant. Meanwhile, funds are sought to purchase an aquatic vegetation cutter to mechanically chop the plant into biomass that can be gathered using traditional African pirogues



Continued use of the traditional 3-stone fire in Africa strains limited wood resources. NRRI hopes to turn an invasive plant into a clean, alternative fuel source and create jobs in struggling villages.

(long, low wooden canoes). A processing facility would be built to process and press the biomass into a coal-like fuel used in traditional African cooking fires.

Fosnacht estimates that there is currently enough *Typha* to make biocoal for 15 – 20 years, and that if allowed to reproduce in a controlled space, would be sustainable into the foreseeable future.

"Typically, they make charcoal for fuel by chopping down trees, which is causing deforestation and expanding the desert," FOSNACHT explained. During his visit to Senegal, he witnessed production of charcoal with available rice hulls. While this facility is managing to produce on a small scale,

Fosnacht saw that the NRRI process would be more efficient while also addressing the cattail problem.

"Our product has a much lower carbon content, but still high fuel value and is

solid," he said. "Their charcoal is very fragile and crumbly, on top of being inefficient." While managing the invasive cattails is critical, creating jobs is also important to the region. Senegal has a 13.4 percent unemployment rate, with rural village unemployment even higher.

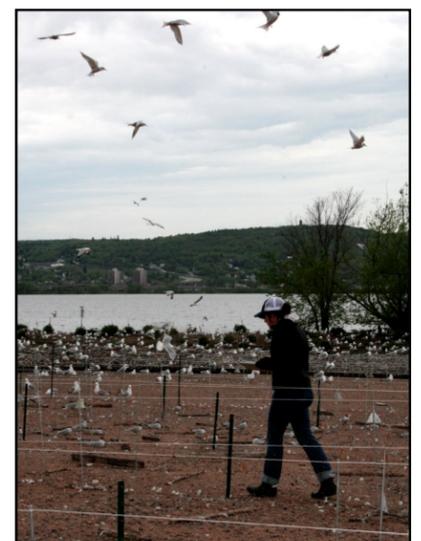
Fosnacht and Strzok have enlisted assistance from a Senegal farmer and a retired Senegalese army Colonel, both keen to find solutions. Crops are also affected by the spread of *Typha Australis* because it dams up water flow to agricultural fields and the airborne seeds kill flowering fruits.

Meetings with the African Development Bank's Rural Development & Environmental Expert were met with enthusiasm. The Director of Environment and Sustainable Development at the Senegal River Basin Development Organization envisioned a large commercial program and encouraged proposals to be submitted.

Minnesota Value: NRRI's top three stories in 2016 reflect balance

Perhaps it's coincidence, but the three most read stories about NRRI research in 2016 reflect the balance of NRRI's mission.

1. *We care for the creatures with which we share the environment.* NRRI Scientist and doctoral candidate Annie Bracey is studying ways to protect habitat for a vulnerable bird species — the common tern. In September she took us out to Interstate Island in the Duluth-Superior harbor where the tern fights for space overrun with gulls.
2. *We bring innovations to Minnesota.* A study led by NRRI Associate Director Don Fosnacht shows that the altered landscape of the Iron Range has possibilities for renewable energy storage. In November, we reported on a possible demonstration project here for underwater compressed air energy storage.
3. *We find high value uses for natural byproduct resources.* NRRI received a National Science Foundation grant this spring to move birch bark chemical extraction to a commercial scale. The hope is that a more efficient process will help The Actives Factory in Two Harbors, Minn., expand markets for the natural chemicals.



Annie Bracey walks inside an enclosure designed to keep gulls away from terns.

Niemi receives award for bird research career



Because his current book project dovetails an earlier two volume tome written by Thomas S. Roberts, NRRI Scientist Jerry Niemi was especially honored to receive a memorial award in Roberts' name from the Minnesota Ornithologists Union.

Niemi's project, the "Minnesota Breeding Bird Atlas" established the status of Minnesota's breeding bird population from 2009 to 2013. It will be published by the University of Minnesota Press in 2018.

Robert's work in the late 1800s and early 1900's provides the only basis for a historical comparison of changes on Minnesota's birds over the past 100 - 150 years.

The Thomas S. Roberts Memorial Award was presented at the Minnesota Ornithologists Union annual paper session at the University of Minnesota's Bell Museum. Niemi was nominated for the award by MOU members Janet Green and Lee Pfannmuller.

"Jerry's intimate engagement with all aspects of forest management has been instrumental in promoting bird conservation in this critical region," said Pfannmuller, "Among a very diverse group of stakeholders, who often have very polarized views about forest management, he is widely recognized as a calm, non-biased voice that all hold in high respect."