Natural Resources Research Institute
University of Minnesota Duluth
Driven to Discover

# NRRI Now

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## NRRI Mission:

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

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## NRRI Student Workers Get Real

There's a reason life outside the classroom is called the "real world." And Evan Myers learned why this past summer working at NRRI as an intern.

"Different problems come up that you didn't expect, where in school, everything you need to solve a problem is given to you," he said. "I realized how important testing and data gathering are when you're trying to figure out a problem."

NRRI gave 25 students – both undergrads and graduate level – real world, hands-on projects this summer. The experiences boost their confidence, their understanding and their resume.

Myers put his Process Optimization class to the test by improving the efficiencies of NRRI's hydraulic press. He also weighed in on brainstorming sessions to figure out problems with large scale biomass conversion. Since graduating this spring from UMD with a degree in chemical engineering, Myers is hoping to start a new job soon.

Kamryn Kalal, a UMD chemical engineering major on track to graduate in 2020, was introduced to value-added timber products as a NRRI technician. Her experience led her to add an environmental engineering minor to her program to learn more. She is developing a life cycle assessment of thermally modified strand veneer lumber; a project with Washington State University.

"I've always been like The Lorax. Don't cut down the trees!" Kalal said. "But now I realize how much energy and cost goes into making concrete and steel, and how much better it is to use renewable wood. It's been interesting."



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## Nighthawk migration in Duluth is largest in the world

How quickly can you count to ten thousand?

Last year, in one three-hour sit on a Duluth rooftop, Steve Kolbe counted 14,000 soaring nighthawks on their annual migration south.

"It's pretty spectacular," said Kolbe, a NRRI wild life biologist. "There's no place else in the world you can see that."

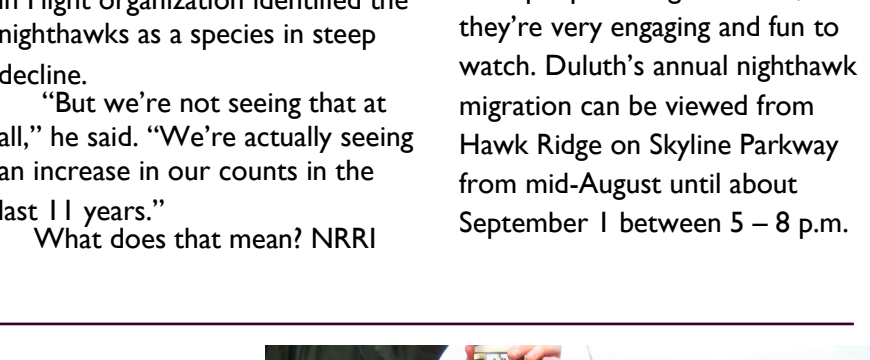
The annual common nighthawk migration is *the* reason Kolbe moved to Duluth after graduating from Miami University in Ohio and landing a job at Hawk Ridge in 2014. He's long had a "thing" for this particular winged species – not a hawk, as the name implies. These aerial insectivores are related to the whip-poor-will.

"They're odd and I like that. They look like a foot-long pile of leaves," he laughed.

Kolbe is in his sixth year of doing nighthawk monitoring at NRRI. It's an effort initiated 12 years ago and has been carried out by NRRI ornithologists. It's also the biggest data set on the species simply because of the sheer number that come through Duluth.

Also, because Kolbe is up there counting, trying to not panic when thousands swarm in.

But it's definitely worth it. His carefully collected data – combined with the previous six years – is showing something unexpected. And the new knowledge on these odd birds will be published as part of Kolbe's master's degree at UMD.



*NRRI Wildlife Biologist Steve Kolbe shares his knowledge of nighthawks on Duluth's Hawk Ridge.*

The common nighthawk has been designated as a Species of Greatest Conservation Need by the Minnesota Department of Natural Resources. Breeding bird surveys out of Canada say birds that rely on flying insects are declining dramatically, about six percent per year. And the Partners in Flight organization identified the nighthawks as a species in steep decline.

"But we're not seeing that at all," he said. "We're actually seeing an increase in our counts in the last 11 years."

What does that mean? NRRI ornithologists aren't sure, but they're keen to secure funding and develop a research program around it.

"We don't know where these massive flocks are coming from or where they go," said Alexis Grinde, NRRI Bird Lab program manager. "All we have is this baseline data to build hypotheses from."

Grinde would like to build a citizen science monitoring program around the nighthawks because once people recognize them, they're very engaging and fun to watch. Duluth's annual nighthawk migration can be viewed from Hawk Ridge on Skyline Parkway from mid-August until about September 1 between 5 – 8 p.m.

## Lake mud holds clues to environmental future

Once you see the hockey stick, you can't unsee it.

The infamous "hockey stick graph" shows the dramatic rise in global temperatures in the 20th century. From 1000 to about 1900, temps remain relatively flat, even trending down a bit (the hockey stick 'shaft'). Then it dramatically shoots up (the 'blade') to present day.

Since the original graph was first published in the late 1990s, it's been replicated many times across diverse fields of study. And now that "hockey stick" is showing up in Euan Reavie's research.

"Every time we collect a sediment core, we're analyzing diatom algae or chemicals or organic material, we keep seeing that same hockey stick," said Reavie, NRRI senior research associate in the Water Group. "It's a warning signal that things we care a lot about are changing rapidly."

In a paper published online in August in the journal *Lake and Reservoir Management*, Reavie promotes a tool that's not often used to understand contemporary environmental problems – paleolimnology. Paleo means old or ancient; limnology is the study of fresh water.

By pulling up a long tube of sediment that has settled on the bottom of a water body over hundreds of years, Reavie and his team can sift through the muck for tiny algae fossils and document environmental changes over time. It's a technique used often to go back hundreds or thousands of years to understand the history of a water system. But Reavie is seeing the dramatic upward swing of the graph in changes to the biology, chemistry and physics of lakes.

The first example of this surprised him. While gathering data to support removing the St. Louis River Estuary from the national Area of Concern list, the sediment record showed new problems messing up the water.

"The main stem of the estuary is much better now and the nutrient pollution targets set in the 1980s were met," Reavie said. "But near shore, the story isn't so great." New concerns are legacy phosphorous in the sediment, heavier storms and climate change impacts that weren't identified as problems in the 1980s.

*Scientist Euan Reavie gets dirty collecting sediment core samples from White Iron Lake.*

In another example, data collected from a core on Lake Kabetogama in northern St. Louis County showed an abundance of an invasive critter, the spiny water flea that goes back in the mid-20th century but wasn't detected in monitoring data until 15 years ago. Yet another hockey stick.

His third example is found in diatom algae fossils collected in the Great Lakes that shows a recent rise in species that should only be found in warmer lakes with shorter ice-cover seasons. Recent warming temperatures have apparently reorganized the biology of these historically cold lakes, like Lake Superior.

"Seeing the data shooting up on the graphs and quantifying how quickly things are changing, that's an early warning signal," said Reavie. "This allows us to project into the future so we can take action today."