

NRRI Mission:

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

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From the Editor:

Is it really spring?

NRRI's hybrid poplars look ready to get out of the greenhouse! These fast-growing trees will be planted in experimental plots this spring as part of a multi-state performance trial.

Our innovative forestry program is just one of the ways NRRI works to maximize value and sustainability of Minnesota's resources.



NRRI is also seeking state funding to accelerate the development of technologies for the economy of the future: the bioeconomy.

This new economy will use more renewable biological resources from land and water for energy and materials.

Stay tuned!



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Scientists puzzled over persistent algal blooms

It should have been this simple: stop sending excessive nutrients into Lake of the Woods and the toxic algal blooms will stop.

So the paper mills upstream curbed their phosphorous discharges in the 1980s. But the blooms persisted and the scientists were flummoxed. More than just gross, toxic blue-green algae (cyanobacteria) are bad for the fishery and a health concern for people and pets.

"We don't swim in August and we don't let the dogs in the water," said Kay Arnesen, co-owner of Arnesen's Rocky Point Resort on the shores of Lake of the Woods.

NRRI Researcher Euan Reavie teamed up with the St. Croix Watershed Research Station to find out what else might be causing the blooms. What they learned surprised them, and results were published in *Lake and Reservoir Management*, December 2017.

Using paleolimnology to reconstruct water quality changes over time, it was clear to Reavie that human activity on the land (agriculture, urbanization and industry) was a large part of the algal problem. But once best management practices were in place, the ecosystem should have recovered.

"Phosphorous problems in lakes can sometimes solve themselves if we cut off the source," Reavie explained. "Algae and other organisms take up the nutrients, die and sink to the bottom where it gets buried, hopefully forever."

The reason Reavie was surprised is that Lake of the Woods is a large, shallow lake. The water should readily mix, keeping the lake well oxygenated. The stored phosphorus at the bottom of the lake is more likely to release when it's deprived of oxygen; and that was not expected in Lake of the Woods.



Toxic blue-green algae at Fall Lake near Ely, Minn., 2011 [Photo: E. Reavie]

But they discovered that it does happen when the summers are particularly warm and calm. This could be the impact of climate change.

"Turns out, the lake is periodically stratifying," said Reavie. "The surface gets warm and creates a warm layer on top that doesn't mix with the lower, cooler layer, and bacteria in that isolated lower layer suck up all the oxygen. Deeper lakes typically stratify like this. I just never thought it would happen on Lake of the Woods."

Still, there's an end in sight. Reavie, Mark Edlund and other researchers from the Research Station concluded that the lake's flow-through system will eventually wash the excess nutrients out of the basin. They hope to get funding to continue the research.

"This is a hugely popular lake and I'm sure the resort and home owners would like to know that these algae problems won't last forever," Reavie added.

Local business gains efficiencies, saves money with Lean Six Sigma

In an ironic, self-perpetuating way, it takes a lot of paper to be in the paper printing business. Hundreds of print jobs daily with inches thick folders for each one – work orders, proofs, changes, notes – following the job through the print process.

And stacks of files stored for years, just in case. Rooms filled with shelves loaded down with boxes of files. Turns out, this is pretty typical for print shops. At least Midwest printers that Heidi Zierden called to ask about record keeping best practices.

Zierden is a UMD instructor in Lean Six Sigma helping Shima Hosseinpour become certified in the efficiency methodology. Working toward a so called "black belt," Hosseinpour, NRRI Strategic Project Manager, will have a skillset that could be useful to small businesses she helps move through hurdles to success.

And at ProPrint in Duluth, the project transitioned the printers away from thick paper files, saving the company more than \$40,000 while increasing space, efficiency and paper trail headaches.

"On any given day, the customer service rep could spend an hour chasing down a (work order) ticket through the process," said ProPrint President Creston Dorothy. "When Heidi took on this project, I wanted to fix the ticket flow and archiving – some files could be six inches thick. It was just overwhelming."

Zierden started with the low hanging fruit. Why keep boxes upon boxes of old files for five to seven years? The answer: Just in case customers wanted to do a reprint. Her study of how many customers actually needed old files to do a reprint showed that about 80 percent of the time they wanted files just two years old or less. An entire area dedicated to filing was eliminated, making room for new equipment.

"And this even impacts safety," said Zierden. "No one's been hurt, but standing on a ladder pulling down big boxes of files. It's easy to see how it could get away from you."

The more difficult part of the project was changing habits. ProPrint had the software to do electronic work orders, but the workers would



Heidi Zierden, left, talks with ProPrint CEO Creston Dorothy and an employee about the new paperless ticket system in place to increase efficiency.

print the orders and the change orders, just because that's what they were used to.

Zierden and Hosseinpour developed a Standard Operating Procedure for electronic work orders and trained the staff.

Ed Dallum, ProPrint plant manager, acknowledges that some staff were skeptical. Now, however, he thinks that if given the option to go back to paper tickets, no one would do it. Electronic work orders are always up-to-date and clear. Errors are reduced. Time is saved. "We're seeing benefits we didn't even anticipate," Dallum said.

But isn't it ironic that a business that promotes the use of hard copies has embraced paperless?

Perhaps the fact that ProPrint continues to grow is answer enough. But Dallum added with a grin, "Forms are

more efficient when they're electronic. Advertising is always more effective in print."



Hot off the press, Duluth's ProPrint saved time, space and money with implementation of Lean Six Sigma practices.