

## **Steel Corrosion Found in More Northland Harbors**

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Intro: This is Superior Science News. Today's program explores the deterioration of steel structures in the Duluth/Superior harbor.

You may have heard about the mystery of corroding steel in the Duluth-Superior Harbor. The problem could cause millions of dollars in damage to the harbor's steel docks and sheet pilings. Now, scientists have discovered that the situation is not unique to Duluth-Superior. According to Duluth Seaway Port Authority Facilities Manager Jim Sharrow, it's in other Northland harbors as well.

"What we have discovered is that this is a much more widespread problem on Lake Superior than was understood a year ago. Similar corrosion is being discovered or has been discovered in ports along the North Shore, as well as the South Shore of the lake."

The Minnesota and Wisconsin Sea Grant programs have been seeking the cause of the corrosion not long after it was first noticed in 1998. Minnesota Sea Grant Associate Director Jeff Gunderson describes their efforts.

"We met with the Duluth Seaway Port Authority folks and came up with a plan to identify the best research approach to take. At the time, there was just a myriad of ideas for what was causing this accelerated corrosion."

Ideas of the cause, ranging from power lines to bird droppings, were narrowed to focus on micro-organisms as a possible cause. Randall Hicks, Director of Freshwater Research and Policy, is spearheading efforts at the University of Minnesota-Duluth to identify whether micro-bacteria are to blame.

"The first thing we wanted to do was look at corroded surfaces and surfaces that weren't corroded or less corroded and see if the bacterial communities were different, which would give us a clue that there's something different about the microbes or their community on the corroded surfaces. And, we found that was the case using some DNA fingerprinting methods, which didn't tell us which microbes were there. It just gives us an idea of the diversity of the microbes in the community."

Hicks says it's difficult to pinpoint exactly what may be causing the corrosion, but they're making headway.

"We've isolated some iron-oxidizing bacteria, and one in particular that we know is an iron-oxidizing material is similar to the type that have been implicated in the corrosion of steel in other environments."

However, they don't have definitive proof that bacteria are causing the corrosion, and Minnesota Sea Grant's Maritime Transportation Educator Dale Bergeron says time is of the essence in developing a solution.

“What we’re worried about is failing sheet piles and some of the docks faces are at a very serious stage with corrosion holes the size of a football. Of course, that just won’t do.”

Bergeron says, if left unaddressed, corrosion could severely impact port economy.

“Because we have so many miles of steel sheet piling, something like thirteen miles of sheet piling, with a value of somewhere between \$1500 and \$2000 per running foot—we have a lot to lose.”

But, Facilities Manager Jim Sharrow thinks everyone is doing their part to arrive at answers as quickly as possible.

“I don’t think the owners of facilities in the area will let this greatly affect the economy. I think the dock owners are becoming well aware of the problem. They’re starting to anticipate whatever they’re going to have to do to address the long-term repairs and maintenance of the facilities.”

In the meantime, Bergeron says they are also looking at different coatings for the harbor’s steel in order to slow dock deterioration.

“There’s all sorts of products out there from epoxies to paints to tars to just a variety of different things that can be done to steel. Mostly you like to do it to the steel before you put it in, but we’ve got this 13 miles of steel in city right now. So, what we have to do is put in coffer dams, pump out the water, figure out a way to put in the very best coatings available.”

Coatings are the best solution for now. Randall Hicks says it’s too early to tell when they’ll be able to pin down the cause of the corrosion.

“Although we’re making progress not only in my laboratory, but in other groups that are working on this project, are making some great progress. We’re learning more each day, but we’re not going to find an answer in the next six months or years.”

Hicks says research is somewhat limited by the resources available to conduct studies.

“The Corps of Engineers didn’t have any funding this year, and it looks like they’ll have funding next year. So, it’s been a little spotty. I think if there was intense interest in solving this problem, it would require more funding.”

All in all, time and money will generate the answer to managing this threat to Northland harbors.

For Superior Science News, I’m Marie Zhuikov.

Outcue: This is a production of the Minnesota Sea Grant Program at UMD and KUWS Radio.