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The unnatural history of Minnesota's freshwater mussels

Daniel Ackerman

Northfield, Minn.

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This photo from the Minnesota Historical Society's archives shows freshwater mussel fishermen and their 'clam fishing' harvest on the Mississippi River around 1904.

Courtesy Minnesota Historical Society

Editor's note: This is the second in a three-part series airing this week on the role, the decline — and the restoration — of Minnesota's freshwater mussels.

Gary Wagenbach has a jar holding his grandmother's collection of shiny, iridescent buttons. They're about a century old, the size of a quarter — and striking.

"It's a beautiful opalescent pearl," he said. "A gorgeous button."

From some angles, the buttons look white. But when they catch the sunlight, they burst into a rainbow of color.

These smooth little trinkets are a family heirloom, but for Wagenbach, they're a little bit more: They were made from the pearly shells of freshwater mussels plucked from streams in the upper Midwest. And Wagenbach, now retired, spent a career studying the creatures as a mussel biologist.

Once abundant throughout Minnesota's waterways, native freshwater mussels have declined in the past century and a half; some mussel species have disappeared from the state altogether.

They're a crucial element of a river's health — they filter water, and provide food for other aquatic creatures. The city of Minneapolis is even putting them to work at its water treatment plant.

Gary Wagenbach pours out a jar of mussel-shell buttons that used to belong to his grandmother, who grew up on a northern Wisconsin farm in the 1800's. Wagenbach, who retired from Carleton College, spent a career studying the creatures as a mussel biologist.

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But these sentinels of river health have faced repeated setbacks, falling victim in part to turn-of-the-century fashion.

A rush on Midwest mussels

Wagenbach's grandmother grew up on a northern Wisconsin farm in the 1800's. She made her own clothes — like nearly everyone else back then. Before zippers, clothing often required buttons for fastening. But for a long time, buttons — made of pricey ocean shells or metal — were a luxury item.

That changed in the 1890's, when a German immigrant named John Boepple came to the U.S. with a new button-making technology.

In Germany, Boepple had developed a process for punching buttons out of material like steer horns. But in the streams of the upper Midwest, where he settled, Boepple soon found a new raw material to work with: freshwater mussels. The mollusks were plentiful in local waterways and relatively easy to harvest from the streambeds.

This photo from the Minnesota Historical Society's archives shows a freshwater mussel harvest at a 'clam fisherman's camp' along the Mississippi River around 1900.

Courtesy Minnesota Historical Society

He set up a factory along the Mississippi River in Muscatine, Iowa, to process the shells that had been harvested from streams in Minnesota and neighboring states.

Boepple's mass-produced buttons fed a growing nationwide demand for the accessories. And while that made buttons more accessible to a larger group of people, including Wagenbach's grandmother, it spelled bad news for mussels.

"They quickly depleted the mussel resources by making buttons out of everybody," said Mike Davis, a mussel biologist with the Minnesota Department of Natural Resources. More button factories sprung up in Muscatine. The city quickly became the epicenter of the U.S. button industry.

The mollusks weren't only sought-after for their shells. Fortune-seekers also killed mussels by the thousands, Davis said, in search of exceedingly rare freshwater pearls.

Pearl-hunters looking for a quick find built makeshift camps along local waterways, including the Cannon River near Northfield and the Mississippi River near Winona. They spent entire summers scouring the riverbed and prying open mussels in search of shiny treasure. Mostly, they came up empty. But Wagenbach says the process felled a lot of mussels, which raised a stink in Northfield.

This photo from the Minnesota Historical Society's archives shows a freshwater mussel fisherman and his boat — the work was known at the time as 'clam fishing' — on the Mississippi River around 1904.

Courtesy Minnesota Historical Society

"Shells dead and dying on the banks of the river created a terrible stench," said Wagenbach. "People were really upset with the pearl hunters because it created a stench over the entire town."

Those rotting mussel carcasses, which spawned bacteria, were also a major source of pollution. Regional newspapers even reported that the drinking water in Waterloo, Iowa, was contaminated as pearl hunters were getting "too familiar" in the area.

The harvest of freshwater mussels in the upper Midwest eventually declined in the mid-1900's, largely thanks to a new button-making material on the market.

"Buttons started to be made of plastic," said Tierra Curry, a senior scientist at the Center for Biological Diversity. "Then the freshwater pearl industry kind of fell off."

Problems persist for mussels

But the trouble wasn't over for Minnesota's freshwater mussels. The dwindling population was made even more vulnerable by the effects of development in the region.

"After the button industry, the first really big threat was dams," Curry said.

More than 90,000 dams hold back rivers and streams across the country, mostly for water storage or hydropower. Minnesota alone has about 1,100 of them. And those dams caused a flood of problems for mussels, Curry said.

"[Dams] reduced the amount of dissolved oxygen and they changed the water temperature," said Curry. "They also cut off the mussels from the host fish that they need to reproduce."

Juvenile mussels rely on fish to find their ideal habitat. Female mussels release their larvae onto the gills of a host fish. That fish gives the young mussels a free ride to new parts of a riverbed. But dams can block mussels from their fish hosts.

And as dams muddied America's rivers, industrial pollution turned them toxic for mussels. Before the Clean Water Act of the 1970's, "factories could dump dyes and chemicals and whatever they wanted into the water," Curry said.

Water quality has improved in the decades since, but already three freshwater mussel species have been lost from Minnesota waterways, and 38 species have vanished nationwide.

The mussels left remain in peril. Curry said 70 percent of native freshwater mussels are at risk of extinction globally. That number is slightly lower — 56 percent — for mussels in Minnesota. But Curry said she fears their downward spiral could continue.

Tagged Mucket mussels sit in a bucket where they live in East Side Lake near Austin, Minn., in September, as researchers reintroduce the mollusks to the Cedar River.

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These days, the dangers have evolved to include climate change, harmful invasive mussels — like zebra mussels, which that often make headlines in Minnesota — and pesticides that trickle into streams from lawns and farms. Mussel die-offs — possibly because of disease — have swept through rivers in Tennessee, Virginia, Oregon and Washington.

But despite all the bad news, Curry still sees room for optimism.

"I have a really big source of hope in that people really care about biodiversity and endangered species," said Curry. She pointed to restoration projects that have reintroduced mussel species to Minnesota waterways where they had been absent since the button-making days.

Near Austin, Minn., this summer, scientists with the state DNR reintroduced a species of mussel called the mucket to the Cedar River, after collecting juvenile muckets in Iowa where the species is still hanging on naturally.

And on the St. Croix River near Taylors Falls, Minn., scientists with the U.S. Fish and Wildlife service are working to protect the nation's only known reproducing population of the winged mapleleaf mussel. Curry said she's hopeful that projects like these can help bring back mussels — and improve stream health — after more than a century of decline.