

Culvert inventory aids road safety, trout



Before-and-after views of a failed culvert and collapsed road spanning Martin Branch, a trout stream that empties into Stoney Brook, illustrate the problem and solution. The culvert was removed and fixed in 2011, and held up well in the 2012 flood. The Fond du Lac Band of Lake Superior Chippewa has since seen the flooded wetland recover and the stream-dwelling macroinvertebrate population improve. **Photo Credits:** Fond du Lac Office of Water Protection

ST. LOUIS COUNTY — With more than 3,000 miles of roads spanning six watersheds from Lake Superior to the Canadian border, Carol Andrews figures St. Louis County must have hundreds of thousands of culverts.



Exactly how many — and the GIS coordinates, measurements and condition of each — is being tallied in a years-long inventory that will resume this spring. A \$205,000 planning grant from the Minnesota Board of Water and Soil Resources is funding the fifth phase, which started last year and is expected to cover 570 miles by the time it wraps up this season.

Andrews, St. Louis County Public Works’ environmental project manager, said the inventory will help staff move from “firefighting mode” to planning mode.



Andrews



Hedin

“Nothing gets fixed the next day, but knowing about it and getting it on a five- to 10-year plan (is) better than sinkholes in the road,” Andrews said.

Public safety is St. Louis County’s No. 1 priority, followed by infrastructure protection. Fish habitat and passage are other considerations in prioritizing culvert replacements. The Fond du Lac Band of Lake Superior Chippewa shares those priorities, and adds wild rice habitat protection to the list.

Data shared with universities and agencies such as the Minnesota Pollution Control Agency and the Minnesota Department of Natural Resources will be used in larger-scale

watershed models.

“There are so many uses for a culvert inventory,” said Kari Hedin, watershed specialist for Fond du Lac’s Office of Water Protection.

St. Louis County’s oldest metal culverts are about 50 years old, installed before rust-detering aluminized metal became standard. Concrete construction is reserved for large culverts on more heavily traveled roads. Culverts range from about 1 foot to 8 feet wide.

“The biggest disaster is during very, very high flows you can wash out enough material in and around the culvert that the road fails and the culvert washes away. That’s catastrophic failure,” Andrews said.

Taking inventory

St. Louis County’s culvert inventory starts on foot. LHB staff walk the roads, identifying culverts by sight and, to find those that are buried, by using a metal detector. GPS data is collected, maps are made, and the data is verified.

The most common problem is connectivity.

“Over time, especially if (culverts) are under-sized, the water — as it’s swirling around waiting to get in the culvert, and then as it comes out of the culvert at high speed — will erode the stream,” Andrews said.

Even culverts installed flush with the stream level can become perched, resulting in a 6- to 12-inch drop from pipe to pool.

“It disrupts the ability of fish and other aquatic organisms to move up and down a stream,” Andrews said. “For organisms to try to jump up and get through that — and then the flow in the culvert itself is too shallow and too fast — even if the pipe’s not sitting up in the air, if it’s under-sized, the velocity ... can impede organisms being able to swim against that flow.”

Some insects and other critters won’t cross exposed concrete or metal.

“Even if a fish could get through the culvert, if there’s no food upstream it’s not going to move up there,” Andrews said.

Now, replacement culverts match the width of the stream. They’re set 1 to 2 feet deeper to compensate for erosion. Substrate is designed to mimic the streambed.

About half of St. Louis

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Our first task is providing a safe and reliable road transportation system. It’s not very reliable if it gets holes.

— Carol Andrews, St. Louis County

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Culverts play a role in regulating water levels for wild rice production.

Photo Credit: Fond du Lac Office of Water Protection

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If you’re thinking about it from the Fond du Lac perspective, so much of what we do has to do with keeping healthy, productive wild rice populations on our wild rice lakes. Culverts and hydrology — they play an out-sized role in what we do.

— Kari Hedin, Fond du Lac Reservation

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County’s road miles and a quarter of its geographical area have

been inventoried so far. Starting west of Duluth, this spring’s work will

include the Stoney Brook watershed in Stoney Brook Township, which borders Carlton County. The Fond du Lac Band and U.S. Geological Survey have been developing a watershed model for Stoney Brook.

“Road crossings and culvert size are important. We can’t have an accurate watershed model without those,” Hedin said.

The 101,000-acre Fond du Lac Reservation spans St. Louis and Carlton counties.

Because the topography is flat, Hedin said a small change in culvert size can have a big effect on road crossings and wild rice habitat. The grain is susceptible to fluctuations in water level.

“In a landscape like the reservation where there isn’t a lot of development, road crossings are one of the biggest things that impact our water resources. We’ve got some really flat stretches of bog where these roads are the only thing (running) through them. Having the right-sized culvert can make the difference between having a tamarack bog that survives or one that dies,” Hedin said.

“For how small a culvert is, it can have these hugely out-sized impacts on the landscape.”