

TSA 8 staff propels dam replacement

Technical Service Area (TSA) 8 staff engineered and coordinated the Pine River rock dam replacement project, which restores fish passage, and enhances habitat for fish and other aquatic species in the Pine River and connected waters including the Mississippi River. Minnesota Native Landscapes finished construction in April. The rock riffle structure acts like a series of steps that maintain upstream elevations while allowing fish to pass. Each of the five rock weirs is anchored by boulders 4 feet in diameter.

Contributed Photos



Details
PARTNERS: Crow Wing SWCD, Crow Wing County, TSA 8, Crosslake, Big Pine Lake Association, DNR, U.S. Army Corps of Engineers, The Nature Conservancy

FUNDING: \$1.246 million: Outdoor Heritage Fund grant, expiring June 30, 2022

\$17,000: Crow Wing County for a study to ID options, costs

\$350,000: city of Crosslake to replace Big Pine Trail haul road

\$80,000: Big Pine Lake Association

COSTS: The two highest-cost elements:

\$872,000 to build rock weirs and complete the levee

\$100,000 for temporary repairs to stabilize a December 2017 breach that threatened to drain the lake

BRAINERD – The rebuilt Pine River dam, which restored fish passage and stabilized Big Pine Lake levels, drew from the organizational skills and engineering expertise of Technical Service Area 8 (TSA 8) employees working behind the scenes.



Clean Water Fund grants allow some TSAs to make shared technical assistance available to member SWCDs. Crow Wing SWCD-based TSA 8 serves nine north-central Minnesota SWCDs.

TSA 8 Project Facilitator Beth Hippert wrote and oversaw the \$1.25 million Outdoor Heritage Fund grant, which completed the project. She secured permits. She coordinated partners, who ranged from lake association members to legislators, and kept them up to date throughout planning, design and construction.

TSA 8 Engineer Bill Westerberg oversaw the design. He and his crew surveyed the 50-year-old dam. But modeling based on existing data didn't compute. Correlating modeling results to existing lake levels and Crosslake dam discharges required collecting more data. So, with rented sonar equipment and a GPS device mounted to a boat, he and TSA 8 engineer technicians Brad Kennedy and Dylan Nistler modeled the river bottom from the lake to the dam.

The river had changed over time; the new data resulted in more precise plans.

Hippert and Westerberg's work on much smaller but similar projects led Minnesota Department of Natural Resources (DNR) staff to request their assistance with the Pine River dam replacement.

The original 170-foot-long rock dam spanned the width of the river. The dam was built in 1970 to maintain the water level of Big Pine Lake, which fluctuates when water is retained or released from the U.S. Army Corps of Engineers' dam 4 miles upstream on the Pine River at Crosslake.

The rock dam required repairs after a few years. Over the dam's 50-year life, erosion ate away more than 130 linear feet of the east bank. Rock was added to

repair each new breach. The length of the dam eventually extended to more than 300 feet. Every failure or breach affected lakeshore residents because the water level would drop 3 or 4 feet until repairs were made.

The dam also blocked fish passage.

“The ecology was really important,” Hippert said. Surveys were starting to show trending changes to the macroinvertebrate and fish populations. “The rock dam was not functioning the way it was supposed to. It was in constant need of repair. The dam was at the end of its life.”

Now a rock riffle structure mimics a natural stream’s riffles and pools.

“The dam had been blocking fish passage for more than 47 years,” Hippert said. “This was about restoring fish passage and aquatic habitat passage where there had been none. That was the No. 1 purpose of this project. Luckily it helped people on Big Pine Lake, too. That was secondary.”

Among its ecological benefits: restored access to 15 lakes and 12 stream miles; expanded migration of walleye and smallmouth bass from the Mississippi River; and increased habitat for the threatened pugnose shiner and four species of special concern – the least darter, greater redhorse, black sandshell mussel and creek heelsplitter mussel.

By curbing erosion, the project will reduce turbidity. That should result in colder, clearer, more oxygenated water that can support more sensitive species.

Westerberg described the rock riffle structure, which



From left: Crow Wing SWCD Manager Melissa Barrick, TSA 8 Engineer Bill Westerberg and TSA 8 Project Facilitator Beth Hippert visited the site in April. TSA 8 staff are based at the SWCD office in Brainerd.

Crow Wing SWCD [video](#).

“ The dam had been blocking fish passage for more than 47 years. This was about restoring fish passage and aquatic habitat passage where there had been none. ” — Beth Hippert, TSA 8

acts like a series of steps that maintain upstream elevations while allowing fish to pass. Five rock weirs are placed 40 feet apart; each 0.8 feet lower than the one upstream. The weirs are composed of footers (boulders 4 feet in diameter), rocks ranging from 3 feet to less than 2 feet in diameter, and geotextile filter fabric.

A 21-foot-wide, 1-foot-deep spillway maintains low flow and fish passage. A walkway on the west bank increases the flood plain and serves as a paddlers’ portage.

The rock riffle structure is designed to withstand conditions exceeding once-every-100-years flows: 3,100 cubic feet per second. Westerberg estimated the highest flow in 50 years is closer to 2,300 cfs.

“We tried to think ahead. It was very important because things always seem to happen, especially when

you’re dealing with water and a river,” Westerberg said.

Among the challenging conditions during construction: Winter flow rates more than double the expected rate, high water levels, ice movement on the river, and temperatures that fluctuated from 40 degrees to minus 20 degrees.

Additionally, road weight restrictions were in effect, few stockpiling sites were nearby, and sightseers were present when trucks were hauling hundreds of loads of materials to the site.

To expedite work, Westerberg and his crew made a list of required materials, and then went to the source to verify and approve the rock, geotextile and seed mix specifications. Stockpiling materials onsite avoided delays due to spring weight restrictions on roads.

Minnesota Native Landscapes finished construction in

April. Work took about four months.

When Hippert inspected the site in July, the native plants were taking hold. A group was preparing to kayak. Anglers were catching bluegills and talking about the other fish species they’d seen.

Before the project began, Hippert said the dam wasn’t on the minds of most anglers or paddlers. Some lakeshore residents weren’t aware the water level was controlled by a dam.

“Everybody coalesced once they knew what we were doing and why,” Hippert said.

Twenty-five people turned out for a January groundbreaking on a day when the temperature fell well below zero.

“People care about the environment. They care about these projects. They are important. The local residents, the city, people in Crow Wing County care about the environment and keeping it clean, managing our resources to keep it clean,” Hippert said. “Every time projects like this happen, the general public learns a little bit more (about) how we’re all interconnected.”