



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Michigan

Removing Dam Improves Dissolved Oxygen Levels in the Thornapple River

Waterbody Improved

High sediment oxygen demand in a reservoir behind a dam contributed to low dissolved oxygen (DO) levels in Michigan's Thornapple River. Therefore, in 2010 the Michigan Department of Environmental Quality (DEQ) added a 27-mile reach of the Thornapple River to the state's Clean Water Act (CWA) section 303(d) list of impaired waters for low DO concentrations. After removing the dam, DO concentrations improved; the waterbody now meets water quality standards and supports its designated use as a warmwater fishery. DEQ intends to remove DO as a cause of impairment for the Thornapple River in the state's 2014 CWA section 303(d) list. The segment remains listed for polychlorinated biphenyls (PCBs) and mercury.

Problem

The Thornapple River (Waterbody ID AUID 040500070206-02) is a warmwater river in Michigan's central lower peninsula, near the village of Nashville in Barry County. It flows about 88 miles from its headwaters in Eaton County before emptying into the Grand River in Kent County. One major tributary, the Coldwater River, flows into the Thornapple River. The dominant land uses in the Thornapple River watershed are agriculture (83 percent) and forest (12 percent).

According to DEQ, low DO levels in the Thornapple River were believed to be caused by high sediment oxygen demand from silty sediments in an 83-acre reservoir behind a dam along the river in the village of Nashville (Figure 1). In 2008 DEQ conducted water quality monitoring in the reservoir. The data obtained showed that daily minimum DO concentrations had fallen below Michigan's warmwater stream water quality standard of 5.0 milligrams per liter (mg/L) on three of the 14 monitoring days, with a low of 4.2 mg/L (Table 1). In 2010, because the Thornapple River did not meet the minimum DO levels necessary to ensure support of its warmwater fishery designated use, DEQ added a



Figure 1. The Nashville Dam trapped sediment behind it, leading to low DO levels in the Thornapple River.

27-mile reach of the river (upstream of the confluence of the Thornapple River and Quaker Brook) to Michigan's CWA section 303(d) list of impaired waters for low DO.

Project Highlights

The Barry Conservation District in Hastings, Michigan, organized and coordinated the removal of the Nashville Dam in 2009. Michigan Department of Natural Resources (DNR) staff conducted the engineering, design, and construction of a four-tiered rock ramp in its place (Figure 2). Soon after the dam was removed, the river regained a more natural width, depth, and flow rate. DO concentrations increased to a level that met Michigan's water quality standards. After dam removal, Barry

Table 1. Dissolved Oxygen Concentrations Upstream of the Nashville Dam Site

Dissolved oxygen concentration (mg/L)	August 2008	August 2012
Daily maximum	9.3	10.0
Daily minimum	4.2	5.5
Daily mean	6.8	7.8



Figure 2. After the Nashville Dam was removed, Michigan DNR installed a four-tiered rock ramp.



Photo by Joanne Barnard, Barry Conservation District

Figure 3. Volunteers help transport mussels down the river to safety.

Conservation District staff and more than 130 volunteers stabilized 23.2 acres of newly exposed floodplain soil and 7,293 feet of shoreline by planting native shrubs, trees, and herbaceous plants. Removing the Nashville Dam and another dam (Maple Hill) also reconnected more than 60 river miles and 105 tributary miles in the upper and middle portions of the Thornapple River, facilitating fish passage and enhancing general recreation.

Results

Water quality monitoring conducted before dam removal indicated that the Thornapple River failed to meet Michigan's water quality standard of 5.0 mg/L minimum DO. After the dam was removed in 2012, the minimum DO concentration observed in the river increased to 5.5 mg/L. Daily mean DO concentrations also increased between 2008 and 2012—from 6.8 mg/L to 7.8 mg/L (see Table 1). The river now supports its warmwater fishery designated use. On the basis of these data, DEQ intends to remove DO as a cause of impairment for the Thornapple River in the state's 2014 CWA section 303(d) list of impaired waters. The segment will remain listed for PCBs and mercury.

DEQ Nonpoint Source (NPS) Program staff, supported by CWA section 319 funding, directed a mussel relocation project before removing the dam. In one day, volunteers helped DEQ NPS and Barry Conservation District staff move a total of 1,295 mussels, representing 11 species (including three species of special concern in Michigan). They relocated them from the area immediately below the dam to a stable river reach downstream, beyond the expected influence of the dam removal (Figure 3).

In August 2012, DEQ participated in the Thornapple River Expedition, an educational event with the goal of contributing to public knowledge, appreciation, and awareness of the Thornapple River, its history, and how it connects communities across the region. On August 6–11, 112 participants from six to 80 years of age paddled the river between Vermontville and Ada. Events like the Thornapple River Expedition provide an opportunity for DEQ's NPS Program to collaborate with local groups to raise awareness of the Thornapple River watershed, share information about ongoing social and environmental issues within the watershed, and inform stakeholders about the management techniques available to help preserve and restore the watershed's tributaries.

Partners and Funding

Funding from Michigan DNR (\$249,000), the U.S. Fish and Wildlife Service (\$101,000 in American Recovery and Reinvestment Act dollars), the National Oceanic and Atmospheric Administration (\$40,000), the National Fish and Wildlife Foundation (\$50,000), and the Barry Conservation District (\$98,000) supported the dam removal and floodplain plantings. Numerous other partners provided significant in-kind donations of equipment, materials, and labor to make the project possible. They included the Village of Nashville, the Potawatomi Resource Conservation and Development Council, the Eaton Conservation District, the Michigan Department of Transportation, the Thornapple River Watershed Council, the FishAmerica Foundation, and the Ocean Trust. Pre- and post-dam removal DO monitoring was performed by DEQ and partially funded by CWA section 319 base funds. This project took place in Michigan's 3rd Congressional District.



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