

**Title: Dam removal improves dissolved oxygen concentrations in the Thornapple River**

Waterbody Improved: A 27 mile reach of the Thornapple River (AUID 040500070206-02), a warm water river in the central lower peninsula of Michigan, is on the Michigan 303(d) list of impaired waterbodies for low dissolved oxygen (DO) concentrations due to sediment oxygen demand in a reservoir. After removing the dam, DO concentrations improved and the DEQ intends to remove this reach of the Thornapple River from the 303(d) list in 2014.

GRTS Numbers: Grant #97547408, Project #01, and Grant #98502312, Project #01.

Problem: A 27 mile reach of the Thornapple River, near the village of Nashville in Barry County, is on the Michigan 303(d) list of impaired waterbodies for low dissolved oxygen (DO) concentrations (< 5 mg/L) based on monitoring conducted in 2008. The cause of the low DO was believed to be high sediment oxygen demand in the 83 acre reservoir behind a dam in the Village of Nashville.

Project Highlights: This project removed the dam in 2009 and installed a 4-tier rock ramp, and soon thereafter the river regained a more natural width, depth, and flow rate, and higher DO concentrations that did not violate Michigan's water quality standards. After dam removal, Barry Conservation District staff and over 130 volunteers also stabilized 23.2 acres of newly exposed floodplain soil and 7,293 feet of shoreline by planting native shrubs, trees and herbaceous plants. Removal of the Nashville dam and another dam (Maple Hill) also reconnected over 60 river miles and 105 tributary miles in the upper and middle portions of the Thornapple River, facilitating fish passage and general recreation.

Results: The Michigan water quality standard for DO in warm water streams is a minimum of 5.0 mg/L. In 2008, daily minimum DO concentrations below 5 mg/L were observed in the reservoir above the dam on 3 of the 14 monitoring days, with a low of 4.2 mg/L (Table 1). In 2012, after the dam was removed, the minimum DO concentration was 5.5 mg/L. Daily mean DO concentrations also increased between 2008 and 2012, from 6.8 mg/L to 7.8 mg/L. Based on these data, DEQ intends to remove this reach of the Thornapple River from the 303(d) list in 2014.

Nonpoint source (NPS) staff also directed a mussel relocation project prior to the dam removal. A total of 1,295 mussels representing 11 species (including three species of special concern in Michigan) were moved by NPS staff, Barry Conservation District staff, and volunteers in one day, from immediately below the dam to a stable river reach downstream beyond the expected influence of the removal (Figure 2).

Partners and Funding: The dam removal and floodplain plantings were funded by the Michigan Department of Natural Resources (\$249,000), the U.S. Fish and Wildlife Service (\$101,00), the National Oceanic and Atmospheric Administration (\$40,000) the National Fish and Wildlife Foundation (\$50,000), and the Barry Conservation District (\$98,000). Additional partners included the Village of Nashville, Potawatomi Resource Conservation & Development Council, the Eaton Conservation District, the Michigan Department of Transportation, the Thornapple River Watershed Council, the FishAmerica Foundation, and the Ocean Trust. The pre- and post-removal DO monitoring reported here was performed by DEQ and partially funded with Section 319 base funds. This project is located in the Michigan 3<sup>rd</sup> Congressional District.

Photographs:

Figure 1. Pre- and post-construction photographs of the Nashville dam site.

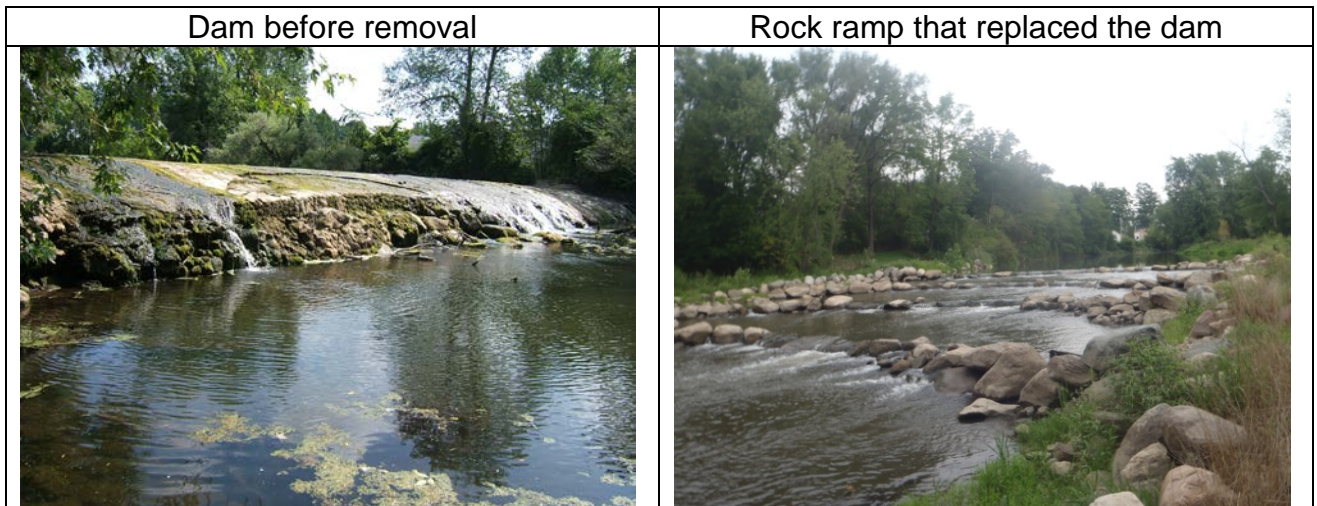


Figure 2. Photographs from the mussel relocation.  
(Photographs by Joanne Barnard, Barry Conservation District)



Data table/graph/chart:

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

<b>Dissolved Oxygen Concentration (mg/L)</b>	<b>August 2008</b>	<b>August 2012</b>
Daily Maximum	9.3	10.0
Daily Minimum	4.2	5.5
Daily Mean	6.8	7.8

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