Michigan DNR Fisheries– Southern Lake Huron Management Unit

Tittabawassee Fish Monitoring After the 2020 Dam Failures

2020-2024 Summary Report

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On the cover:
Muskellunge captured in the Edenville Dam, Tobacco River tailwater 2021. Photo credit MDNR.

Introduction

Overview of the Tittabawassee River Watershed
The Tittabawassee River watershed (Figure 1) is Michigan's fifth largest, spanning 2,471 square miles across 13 counties. The watershed includes 621 miles of tributaries feeding into the 91-mile mainstem Tittabawassee River (Schrouder et al. 2009). Four major hydroelectric dams—Secord, Smallwood, Edenville, and Sanford—form impoundments along the mainstem. The river originates from three branches (East, Middle, and West), with the East and Middle Branches converging north of Secord Lake in Gladwin County. The West Branch joins within Secord Lake's impounded area.

Overview of dams
Secord Dam
Secord Dam, the uppermost dam, is located five miles north of Wooden Shoe in Gladwin County. Built in 1925, this earth-gravity dam spans 2,085 feet, stands 55 feet tall, and has a hydraulic head of 46 feet. At normal pool elevation (750.8 ft NGVD), it creates Secord Lake, impounding 895 acres and forming 69 miles of shoreline. The dam includes a reinforced multiple arch spillway, two tainter gates, and a powerhouse with a 1.2 MW Francis turbine generator (Schrouder et al. 2009).

Smallwood Dam
Ten miles downstream, Smallwood Dam is located in Wooden Shoe. Constructed in 1925, it is the smallest of the four dams, with a height of 36 feet and a hydraulic head of 28 feet. At normal pool elevation (704.8 ft NGVD), it creates Smallwood Lake, impounding 402 acres with 25 miles of shoreline. It features a concrete spillway, two tainter gates, and a 1.2 MW powerhouse (Schrouder et al. 2009).

Edenville Dam
Thirteen miles downstream lies Edenville Dam, which impounded the Tittabawassee and Tobacco rivers to create Wixom Reservoir. Built in 1924, this earth-gravity dam spanned 6,600 feet and stood 54.5 feet tall with a hydraulic head of 44 feet. At full pool (675.8 ft NGVD), it created Wixom Lake, a 2,600-acre reservoir with 49 miles of shoreline. Its powerhouse had a 4.8 MW capacity. FERC revoked its license in 2018 due to safety concerns.

Sanford Dam
Sanford Dam, located in the village of Sanford, Midland County, is 10 miles downstream of Edenville. Built in 1925, it stands 36 feet tall with a hydraulic head of 26 feet. At full pool, it impounded 1,528 acres to form Sanford Lake.

All four dams were historically owned by Boyce Hydro, LLC and classified as high-hazard dams, indicating potential for loss of life and significant property damage in case of failure. Ownership has since transitioned to the Four Lakes Task Force, which is overseeing repairs and reconstruction; the FERC licenses were surrendered or revoked and currently Michigan Energy, Great Lakes, and Environment (EGLE) is the agency of oversight.

Fish Populations and Management
The Tittabawassee River basin supports diverse fish species, including coldwater, coolwater, and warmwater assemblages. The Michigan Department of Natural Resources (MDNR) actively manages the reservoirs through stocking programs and surveys. Key species include Black Crappie, Largemouth Bass, Northern Pike, Muskellunge, and Walleye.

A 2014 survey of Wixom Reservoir revealed Black Crappie as the most abundant gamefish, with fish ranging from 4.0 to 17.4 inches in length. Other notable species included Bluegill, Largemouth Bass, and Walleye. The lake was also a popular site for bass tournaments.

A 2015 survey of Sanford Reservoir found Bluegill to be the most abundant gamefish, followed by Black Crappie, Pumpkinseed, and Yellow Perch. Sanford Lake was a prominent destination for bass tournaments, Muskellunge anglers, and Walleye fishing prior to the dam failures.

The 2020 Dam Failure Incident
From May 16-19, 2020, the Tittabawassee River watershed received 6-8 inches of rain, triggering significant flooding. On May 19, Edenville Dam breached at 5:30 PM, followed by Sanford Dam at 7:30 PM. The breaches drained Wixom and Sanford reservoirs, causing a 500-year flood through Sanford, Midland, and downstream to Saginaw. The Tittabawassee River crested at 35 feet in Midland on May 20 and at 22.61 feet in Saginaw on May 22. At that time, Smallwood and Secord reservoirs were drawn down for safety and inspections. The four dams are currently in varied states of repair and reconstruction and are owned and operated by Four Lakes Task Force, the designated agent of Midland and Gladwin counties.

This reports documents and summarizes a variety of efforts to investigate, document, and, when feasible, salvage fish communities after the dam failures.

Methods and Results

Edenville Dam Tittabawassee River Tailwater Survey 2021
A boat electrofishing (pulsed DC, 60 Hz, 40% duty cycle, 7 A) survey occurred on July 8, 2021. Total electrofishing effort was 3600 sec (1 hr) covering the isolated pool that was disconnected from the Tittabawassee River when Edenville Dam breached and created a new channel.
Our main goal was to investigate if large numbers of fish were stranded and if a comprehensive fish salvage effort was warranted. Species observed were generally noted. There were very few fish observed. Common carp were the most abundant (>10 observed). Only 1-2 individuals of other species were seen although water clarity was poor. Species present were Golden Shiner, Moxostoma spp. (presumably Greater Redhorse), Northern Pike, Black Crappie, Bluegill, and Common Carp. Given what was seen, no further fish salvage was determined to be necessary.

Sanford Dam Tailwater Survey 2021
A boat electrofishing (pulsed DC, 60 Hz, 40% duty cycle, 7 A) survey occurred on July 12, 2021. Total electrofishing effort was 2400 sec (0.67 hr) from the face of the Sanford Dam downstream covering approximately 1.4 miles of the Tittabawassee River.

Fish were identified, measured and grouped into 1-in total length (TL) bins, and released. Abundance was expressed as catch per unit effort (CPUE, number/hr). Mean total length by species was expressed using the midpoint of each length bin to approximate the length of fish within that bin (e.g., the midpoint of a 1–2-inch bin is 1.5 inches). A total of 17 species were captured consisting of 90 individual specimens. Numerically, Golden Redhorse were most abundant followed by Common Shiner and Channel Catfish (Table 1).

Table 1. Number of species, catch per unit hour (CPUE) and mean total length (TL) of fish collected downstream of Sanford Dam on the Tittabawassee River in 2021.

Species	Number	CPUE (n/hr)	Mean TL (in)
Black crappie	3	4.5	5.8
Bowfin	1	1.5	28.5
Common carp	1	1.5	28.5
Channel catfish	7	10.5	20.5
Common shiner	9	13.5	3.2
Freshwater drum	5	7.5	19.5
Golden redhorse	28	42	21.1
Green sunfish	1	1.5	6.5
Gizzard shad	1	1.5	12.5
Longnose gar	1	1.5	14.5
Muskellunge	1	1.5	34.5
Northern pike	3	4.5	23.8
Quillback	6	9	15.5
Spotfin shiner	4	6	3.3
Smallmouth bass	8	12	12.9
Spottail shiner	5	7.5	2.5
Walleye	6	9	18.0
Total	90		

Edenville Dam Tobacco River Tailwater Survey 2021
A Boat electrofishing (pulsed DC, 60 Hz, 40% duty cycle, 7 A) survey occurred on July 16, 2021. Total electrofishing effort was 6000 sec (1.6 hr) covering approximately 1.4 miles of stream from the face of the Edenville Dam in the Tobacco River tailwater, downstream to the confluence with the Tittabawassee River.

Fish were identified, measured and grouped into 1-in total length (TL) bins, and released. Abundance was expressed as catch per unit effort (CPUE, number/hr). Mean total length by species was expressed using the midpoint of each length bin to approximate the length of fish within that bin (e.g., the midpoint of a 1–2-inch bin is 1.5 inches). A total of 21 species were captured consisting of 211 individual specimens. Numerically, Greater Redhorse were most abundant followed by Black Crappie, Walleye, and Smallmouth Bass (Table 2).

Fish species captured were the typical community that resided in the former impoundments. The Tobacco River tailwater reach was not impacted by the 2020 dam failures and this reach likely serves as a refuge for fish that might have been displaced.

Table 2. Number of species, catch per unit hour (CPUE) and mean total length (TL) of fish collected in the Tobacco River tailwater of Edenville Dam in 2021.

Species	Number	CPUE (n/hr)	Mean TL (in)
Black crappie	36	21.6	7.5
Bluegill	2	1.2	5.5
Bowfin	4	2.4	24
Common carp	1	0.6	28.5
Channel catfish	7	4.2	19.4
Common shiner	9	5.4	3.2
White sucker	4	2.4	14.7
Freshwater drum	5	3	19.5
Golden redhorse	5	3	17.4
Greater redhorse	45	27	21.6
Green sunfish	1	0.6	6.5
Gizzard shad	1	0.6	12.5
Largemouth bass	8	4.8	15.6
Longnose gar	1	0.6	14.5
Muskellunge	1	0.6	34.5
Northern pike	10	6	25.2
Quillback	7	4.2	12.5
Spotfin shiner	5	3	3.9
Smallmouth bass	22	13.2	13.5
Spottail shiner	5	3	2.5
Walleye	32	19.2	16.8
Total	211		