Middle Branch Big Creek
Crawford County, T27N/R1W
Au Sable River, Last Surveyed 2004

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Environment

Location
The Middle Branch of Big Creek is one of three primary tributaries, along with the East and West Branches, that join to form Big Creek, which ultimately flows into the North Branch Au Sable River. The Middle Branch of Big Creek watershed encompasses about 17,400 acres (EGLE Water Resources Division, 2023). The stream originates from West Twin Lake in southwestern Montmorency County near the town of Lewiston. From there it flows south through the northwest corner of Oscoda County and then follows along the Crawford–Oscoda County line (Figure 1).

Geology and geography
The Middle Branch Big Creek watershed lies within the glacial outwash plains of the Northern Lower Peninsula, a landscape shaped by retreating ice sheets of the Wisconsinan glaciation (Zorn and Sendek 2001). The terrain is characterized by gently rolling outwash deposits and kettle depressions that support numerous wetlands and small lakes. Elevations range from approximately 1,200 feet near the headwaters to about 1,030 feet near the confluence with the East Branch of Big Creek, with the stream flowing generally northeast toward the North Branch Au Sable River.

The underlying soils reflect glacial and riverine origins, composed primarily of sand with localized gravel and occasional cobble. These coarse-textured materials promote high infiltration rates and strong groundwater influence, maintaining cool, stable baseflows typical of northern Michigan coldwater streams.

Watershed description
The surrounding landscape is composed largely of state forest lands interspersed with wetlands and grasslands. The stream corridor alternates between upland forest and lowland swamp. Within the watershed, forest cover dominates (56.2%), followed by grassland (15.7%), urban areas (16.8%), wetlands (10.1%), agriculture (0.9%), and barren land (0.1%), based on recent land-cover data.

Chemical and physical characteristics
Temperature and dissolved oxygen profiles collected from the deepest part of the Big Creek Impoundment in 2024 confirmed limited coldwater habitat availability. In July, weak thermal stratification was observed, with dissolved oxygen declining rapidly below 10 feet and reaching less than 3 ppm beneath 11 feet, conditions unsuitable for most fish, particularly trout (Figure 2). By late August, the impoundment was fully mixed, with uniform temperatures near 69°F and dissolved oxygen levels between 7 and 9 ppm.

These results indicate that the impoundment does not currently, and likely never has, provided suitable coldwater habitat since its construction. Instead, it supports a warmwater recreational fishery dominated by Bluegill, Black Crappie, Largemouth Bass, Northern Pike, and Walleye (Godby 2022).

Development, public ownership, and access
The surrounding area is composed largely of state forest lands, providing a predominantly undeveloped and natural setting. Public access to the Middle Branch of Big Creek is moderate. Although much of the stream corridor lies within public ownership, formal access points are limited. Anglers and other users typically reach the creek by walking in from nearby forest roads or along informal footpaths, which can be difficult to traverse due to dense vegetation and wet terrain. Access is generally easier near the Big Creek Impoundment, where an unimproved boat launch on the southwest side provides entry to the lake. The site offers ample parking space for vehicles with trailers, though no developed facilities are present.

Fishery Resource

History
The history of Middle Branch Big Creek is closely tied to the Big Creek Impoundment, and both are central to management considerations past, present, and future. Few historical records describe the original fish community, but the stream almost certainly supported Arctic Grayling (*Thymallus arcticus*) as its sole native salmonid. Grayling were extirpated from Michigan's Lower Peninsula by the early 1900s due to a combination of overharvest, competition from introduced trout species, and extensive habitat degradation from logging activities (Vincent 1962).

Over the past century, fisheries management in the Middle Branch has evolved in response to changing resource conditions and recreational interests. Historical activities, including fish stocking, habitat surveys, dam construction, and chemical treatments, reflect the shifting strategies used to maintain and enhance the fishery.

Brook Trout stocking began in Middle Branch Big Creek in the late 1930s, with both fingerling and legal-sized fish introduced to support recreational angling. From 1937 to 1942, annual stocking totals ranged from 9,500 to 28,500 Brook Trout (Table 1). However, by 1950, the Michigan Department of Conservation (MDOC) noted that formal stocking had largely ceased due to limited public access: "the good water was posted and fenced." Despite reduced stocking, wild trout populations persisted.

Intermittent surveys since the 1920s provide some insight into habitat conditions and trout distribution. Early assessments, based largely on visual observation and hook-and-line surveys, which together suggested a clear gradient in habitat quality along the creek. A 1957 hook-and-line survey below West Twin Lake described the upper reach as a natural Brook Trout stream, with cold water, clean substrates, and abundant cover. Habitat quality declined farther downstream through what is now the impoundment area, where slower flows, warmer water, and accumulated sediment created less favorable conditions for trout. Historically, conditions appeared to improve again below the present-day dam site, where increased gradient, cooler groundwater inputs, and coarser substrates supported better trout habitat extending toward the confluence with the East Branch of Big Creek.

In 1964, the Big Creek Impoundment (T28N, R1W, Sec. 24 and 25) was constructed to support a rainbow trout fishery. Electrofishing surveys conducted before flooding showed Brook Trout as the only salmonid near West Twin Lake, with "good" reproduction a mile downstream. Near Chief's Trail few trout were captured, and field staff noted that the stream was "not much of a trout stream." Farther downstream near Walsh Road (about 4.5 miles below the dam), both Brook and Brown Trout were present in high numbers, with "very good reproduction." Near the mouth, Brown Trout dominated a mixed trout population, again with strong evidence of natural reproduction.

A creel survey conducted in May 1964 near the proposed dam location recorded four Brook Trout harvested by three anglers, suggesting modest angler use and trout presence prior to construction.

In September 1964, just before the impoundment was filled, the MDOC conducted a rotenone treatment from West Twin Lake downstream to the dam. This chemical treatment was intended to eliminate the remaining trout population in that portion of the creek in preparation for future stocking. Fisheries Division records indicate that the impoundment was constructed with the goal of resetting the fish community and creating a managed rainbow trout fishery. However, early management actions reflected a mixed or transitional approach as Brook Trout and Walleye fry were initially stocked in 1965, followed by Rainbow Trout from 1967 through 1970 to establish the intended coldwater fishery.

In 1966, the Big Creek Impoundment was temporarily drawn down due to significant seepage through the dam, temporarily disrupting its use as a managed trout fishery. A hook-and-line survey conducted prior to the drawdown recorded a substantial Brook Trout catch and the observed presence of Walleye fry, suggesting early stocking efforts were successful. After the impoundment was refilled, a 1969 gill net assessment of the impoundment documented the presence of Brook and Rainbow trout, along with other warmwater and coolwater species such as Pumpkinseed and Yellow Perch, reflecting a shift toward a mixed fish community. Beginning in 1988, Walleye were stocked on a roughly biennial basis until 2022 and were scheduled again for 2024, but stocking has since been suspended due to concerns about the integrity of the control structure.

Additional seepage was reported multiple times during the 1980s, including one drawdown instance to replace all the stop logs in the control structure. More recently, the impoundment was drawn down in 2016 to replace the deteriorating outlet pipe and apron. However, the original riser structure remains in place, and due to its deteriorating condition the stop logs are currently removed to lower the impoundment for inspection (fall 2025).

The last fish surveys prior to 2024 were conducted in the early 1970s near the confluence of the Middle Branch and the East Branch. Seine net surveys documented multiple year classes of Brook and Brown trout, evidence of continued natural reproduction and a self-sustaining coldwater fishery in the lower Middle Branch Big Creek.

Current status of the fish community

A fish community survey was conducted on July 1, 2024, to assess species composition and structure in the Middle Branch Big Creek near Lovells, Crawford County. The survey also evaluated potential effects of the Big Creek Dam on trout distribution. This was the first comprehensive assessment of the stream in several decades.

Methods

Two sites were established upstream and downstream of the Big Creek Dam for a comparative assessment. The upstream station extended 700 feet downstream from Chief's Trail, approximately 1.5 miles upstream of the Big Creek Impoundment. The downstream station encompassed an 800-foot reach beginning about 0.65 miles below the dam, downstream of a series of active beaver dams. Sites were selected based on accessibility and representative habitat conditions to provide a meaningful comparison of fish assemblages in both reaches.

Fish sampling followed MDNR Status and Trends protocols (Wills et al. 2011). Each station was sampled using a stream shocker equipped with three-electrodes in a single-pass, upstream run operated by a six-person crew. Electrofishing effort totaled 2,192 seconds for the upstream reach and 4,255 seconds for the downstream reach, as recorded by the electrofisher timer.

All fish captured were identified to species and enumerated in the field. For trout, total length was measured to the nearest 0.1 inch for up to 10 fish per inch group. Individuals measuring 4 inches or greater were also scale-sampled to estimate age and growth, while those under 4 inches were assumed to be age-0. Remaining trout were measured to the nearest inch. Scales were taken from the preferred area along the lateral line between the posterior edge of the dorsal fin and the anterior edge of the anal fin and stored in labeled scale envelopes.

Results

A total of 592 fish of 7 species were collected at the upstream site. The upstream reach supported only coolwater native, non-salmonid species typical of headwater streams. Blacknose Dace dominated the catch, making up more than two-thirds of the total number of fish captured and nearly half of the total biomass. Other species observed included Creek Chub, Northern Redbelly Dace, Central Mudminnow, and White Sucker (Table 3). No trout were captured in this reach.

In contrast, the downstream reach supported a mixed coldwater and coolwater assemblage with 7 species of fish captured. Total number of fish caught was low with 125 fish. Both Brook and Brown trout comprised most of the biomass and total catch (Table 3). Other species encountered included Slimy Sculpin, Brook Stickleback, White Sucker, Common Shiner, and Green Sunfish. The presence of Green Sunfish suggests some downstream drift from the impoundment.

Brook Trout captured ranged from 2.5 to 10.1 inches, with multiple size classes represented (Table 3; Figure 3). Brown Trout ranged from 2.9 to 14.1 inches, but size distribution was skewed toward larger individuals, with fewer smaller fish and strong representation of trout 6 inches and longer.

Age analysis supported the length-frequency patterns. Forty-two Brook Trout and thirty-three Brown Trout were aged. Brook Trout ranged from age-0 to age-3, and Brown Trout from age-0 to age-4. Growth for both species was considered satisfactory, as mean lengths were within ±1 inch of statewide averages for each age class (Schneider 2000). The mean growth index, the average difference in length from statewide mean values for a given age class, was +0.2 inches for Brook Trout and -0.3 inches for Brown Trout (Table 4; Figure 4).

Trout densities in the downstream reach were notably higher than regional averages (Wills et al. 2015) for small coldwater streams in Michigan. Brook trout density was estimated at 737 fish per mile (regional average: 266 per mile), while Brown Trout density was estimated at 380 fish per mile (regional average: 123 per mile). These findings reflect a healthy, self-sustaining trout population in the downstream reach.

Analysis and Discussion

The 2024 survey revealed a clear contrast in fish community composition and trout abundance at the two stations surveyed above and below the Big Creek Impoundment. There were only 3 species in common across both sites: Brook Stickleback, White Sucker and Common Shiner.

Downstream of the dam, coldwater species such as Brook Trout, Brown Trout, and Slimy Sculpin were common indicating that this section of stream continues to provide quality trout habitat. The stream here benefits from good groundwater inflows and maintains summer temperatures well within the coldwater range.

In contrast, the upstream reach supported only coolwater species such as Blacknose Dace, Creek Chub, and Central Mudminnow. No trout were captured in this section. The relatively high abundance and diversity of non-game fish may partly reflect the absence of trout, which often serve as top predators and can influence fish community structure through both competition and predation.

The lack of trout immediately upstream of the impoundment is consistent with historical surveys. A 1964 pre-impoundment assessment described this section as "not much of a trout stream," citing limited trout abundance and poor habitat conditions. Better trout habitat has historically been located either further upstream closer to West Twin Lake or downstream of the dam. While it's difficult to extrapolate from a single short sampling reach, the absence of trout in the upstream station likely reflects long-standing habitat limitations rather than a recent decline. Nonetheless, the potential for better habitat farther upstream remains and could be explored in future surveys.

Our 2024 observations support this pattern. In the area surrounding the Chief's Trail sampling site, upstream of the impoundment, we noted a large flooded riparian zone likely influenced by historic beaver activity, limited shading, and instream habitat dominated by cobble with little cover such as undercut banks. In contrast, immediately below the impoundment, downstream of the Pickerel Lake Road culvert, there is a series of beaver dams that may contribute to localized thermal influence. Yet this reach was also associated with a lush riparian corridor and strong groundwater inputs, suggesting that coldwater habitat conditions are reestablished relatively soon downstream of the dam.

The trout populations downstream of the dam appear healthy and self-sustaining. Both Brook and Brown Trout were well represented across multiple size classes, and length-frequency distributions showed evidence of natural reproduction. Brook Trout were especially abundant among age-0 and age-1 classes, while Brown Trout were more common as age-1 and older fish. This pattern suggests successful Brook Trout juvenile recruitment and acceptable survival of older Brown Trout. These differences may reflect spawning preferences: Brook Trout can reproduce in a broader range of substrates, while Brown Trout typically require larger, well-oxygenated gravel (McRae and Diana 2005). If such substrates are limited, Brown Trout recruitment may lag even in otherwise suitable coldwater conditions.

The presence of the impoundment does not appear to substantially degrade downstream habitat quality. Although some bottom-draw dams can provide cooler releases, that does not appear to be occurring here. In July 2024, the impoundment exhibited weak thermal stratification, with oxygen levels dropping sharply in deeper water, creating conditions unsuitable for fish. By August, the reservoir had fully mixed, eliminating any potential coldwater benefit from the bottom release. Fortunately, natural groundwater inflows downstream of the dam continue to maintain coldwater habitat capable of supporting trout. Seepage through the dam levee may also be occurring, potentially contributing small amounts of cold water to the lower creek. However, from an engineering perspective, seepage through a levee is an undesirable condition. It is also clear that a dam breach could have catastrophic effects on trout habitat in the lower reaches of Middle Branch Big Creek.

While the impoundment clearly fragments the stream and blocks fish passage, the middle reach of the creek sampled in 2024 has likely never supported strong trout populations. Historically, more trout were documented farther upstream near West Twin Lake, and those areas may still retain coldwater potential, particularly if connectivity were restored or natural recolonization occurs. Portions of the upper Middle Branch Big Creek may also be limited by current and past beaver flooding activity.

Overall, the 2024 survey confirmed that Middle Branch Big Creek remains a productive coldwater fishery below the impoundment, with high trout densities, satisfactory growth, and evidence of natural reproduction. These lower reaches remain at risk if a catastrophic dam breach occurs. In contrast, the upstream reach is constrained by natural habitat limitations and the barrier created by the dam, but it could present future restoration opportunities depending on habitat conditions farther upstream.

Management Direction

Current

The 2024 survey confirms that Middle Branch Big Creek downstream of the Big Creek Impoundment supports healthy coldwater fishery, with self-sustaining populations of Brook and Brown trout. Given these favorable conditions, management should prioritize protecting the high-quality habitat in this reach. Any management direction must also account for the presence of the Big Creek Impoundment dam, including its history and current poor structural condition.

Much of the riparian corridor is already protected within state forest lands, and continued stewardship of these areas will be critical. Management should focus on maintaining this protection while encouraging forest practices that enhance stream shading, bank stability, and infiltration. These practices help preserve strong groundwater inflows, an essential factor supporting coldwater conditions in this system. Where appropriate, maintaining or expanding forest cover in the uplands may further reduce thermal and sediment inputs into the stream.

Although the Big Creek Impoundment provides warmwater angling opportunities, it also fragments the stream and blocks upstream fish movement. Restoring connectivity would be possible through dam removal, which would be a major project with significant costs and challenges. At the same time, the existing structure requires ongoing maintenance and expensive repairs, meaning long-term management will need to weigh the trade-offs between maintaining the dam and considering alternatives. From a fisheries perspective, groundwater-fed coldwater streams like Big Creek are unique compared to the abundance of warmwater lakes, making it important to carefully weigh options for protecting and restoring these resources.

The upstream reach sampled in 2024 did not support trout, but historical records indicate that trout, particularly Brook Trout, were present farther upstream near West Twin Lake. If coldwater habitat persists in these areas, there may be potential for recolonization, especially if remnant populations remain. Management actions such as adding large woody debris or riparian shading could enhance stream conditions in select upstream reaches, supporting long-term recovery of trout habitat.

Future monitoring should continue to prioritize the downstream reach to track trends in trout abundance, growth, and habitat condition. Repeating temperature monitoring above and below the impoundment at intervals of 5 to 10 years would help assess whether the dam continues to influence thermal conditions in the stream. In addition, periodic surveys farther upstream, particularly in the

headwaters near West Twin Lake where trout have been documented in the past, could help determine whether remnant populations or suitable coldwater habitat remain. If coldwater habitat is found to be viable and trout populations are present, targeted habitat enhancement could be pursued to support population growth and expand the stream's overall coldwater potential Although staffing and funding limitations may restrict the frequency of field assessments, even infrequent surveys can provide valuable data to inform adaptive management.

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Tables and Figures

Table 1. Stocking history of Middle Branch Big Creek by the state of Michigan.

Year	Species	Number Stocked	Size
1937	Brook Trout	10,000	Fingerlings
1938	Brook Trout	9,500	Fingerlings
1939	Brook Trout	11,250	Fingerlings
1940	Brook Trout	28,500	Fingerlings
1941	Brook Trout	25,000	Fingerlings
1942	Brook Trout	20,000	Fingerlings
1944	Brook Trout	1,070	Legal
1946	Brook Trout	250	Legal
1947	Brook Trout	800	Legal
1950	Brook Trout	300	Legal
1965	Brook Trout	1,000	Sublegal

Table 2. Stocking history of Big Creek Impoundment by the state of Michigan.

Year	Species	Number Stocked	Size
1965	Brook Trout	20,785	Legal Size
1965	Walleye	400,000	Fry
1967	Rainbow Trout	4,840	Yearling
1968	Rainbow Trout	5,000	Yearling
1969	Rainbow Trout	4,000	Yearling
1970	Brown Trout	1,500	Adult
1970	Rainbow Trout	5,000	Yearling
1970	Walleye	294,000	Fry
1971	Brown Trout	2,500	Yearling
1972	Brown Trout	2,250	Yearling
1988	Walleye	4,500	Spring Fingerling
1990	Walleye	4,594	Spring Fingerling
1992	Walleye	4,712	Spring Fingerling
1995	Walleye	8,981	Spring Fingerling
1999	Walleye	9,004	Spring Fingerling
2004	Walleye	12,000	Spring Fingerling
2006	Walleye	15,100	Spring Fingerling
2012	Walleye	6,840	Spring Fingerling
2017	Walleye	194,000	Fry
2019	Walleye	7,253	Spring Fingerling

Table 3. Summary of fish species collected in Middle Branch Big Creek, above and below Big Creek Impoundment, including total number, biomass, and length ranges.

Species Above	Number	% by Number	Weight (lb.)	% by Weight	Length Range (in.)	Average Length (in.)
Blacknose Dace	409	69.1%	3.0	49.1%	1–3	2.5
Brook Stickleback	6	1.0%	0.0	0.0%	1	1.5
Creek Chub	90	15.2%	1.6	26.2%	1–6	3.3
Common Shiner	11	1.9%	0.2	2.4%	1–3	3.2
White Sucker	16	2.7%	1.0	16.0%	3–7	5.1
Central Mudminnow	19	3.2%	0.1	1.9%	1–3	2.5
Northern Redbelly Dace	41	6.9%	0.3	4.4%	1–2	2.4

Species Below	Number	% by Number	Weight (lb.)	% by Weight	Length Range (in.)	Average Length (in.)
Brook Trout	54	43.2%	3.9	33.5%	2–10	4.9
Brown Trout	36	28.8%	7.1	61.2%	2–14	7.5
Slimy Sculpin	15	12.0%	0.3	2.1%	2–3	3
Brook Stickleback	11	8.8%	0.0	0.0%	1	1.5
White Sucker	7	5.6%	0.3	2.8%	1–8	3.8
Common Shiner	1	0.8%	0.0	0.2%	3	3.5
Green Sunfish	1	0.8%	0.0	0.1%	2	2.5

Table 4. Length at age of Brook Trout and Brown Trout relative to the state average, in Middle Branch Big Creek at a station 0.65 miles downstream of Big Creek Dam, July 1, 2024.

Brook Trout Age	No. aged	Length range (in.)	Weighted mean length (in)	State avg. length (in)	Mean growth index
Age-0:	19	2.5-3.3	3.0	2.3	+0.7
Age-1:	12	3.7-7.0	5.6	5.3	+0.3
Age-2:	8	7.0-8.7	7.8	8.1	-0.3
Age-3:	3	9.5-10.1	9.8	10.9	-1.1

Brown Trout Age	No. aged	Length range (in.)	Weighted mean length (in)	State avg. length (in)	Mean growth index
Age-0:	2	2.9	2.9	2.5	+0.4
Age-1:	18	5.5-7.6	6.4	5.8	+0.6
Age-2:	7	7.7-9.5	8.3	8.8	+0.5
Age-3:	5	9.9-12.5	10.7	14.8	-4.1
Age-4:	1	14.1	14.1	17.8	-3.7

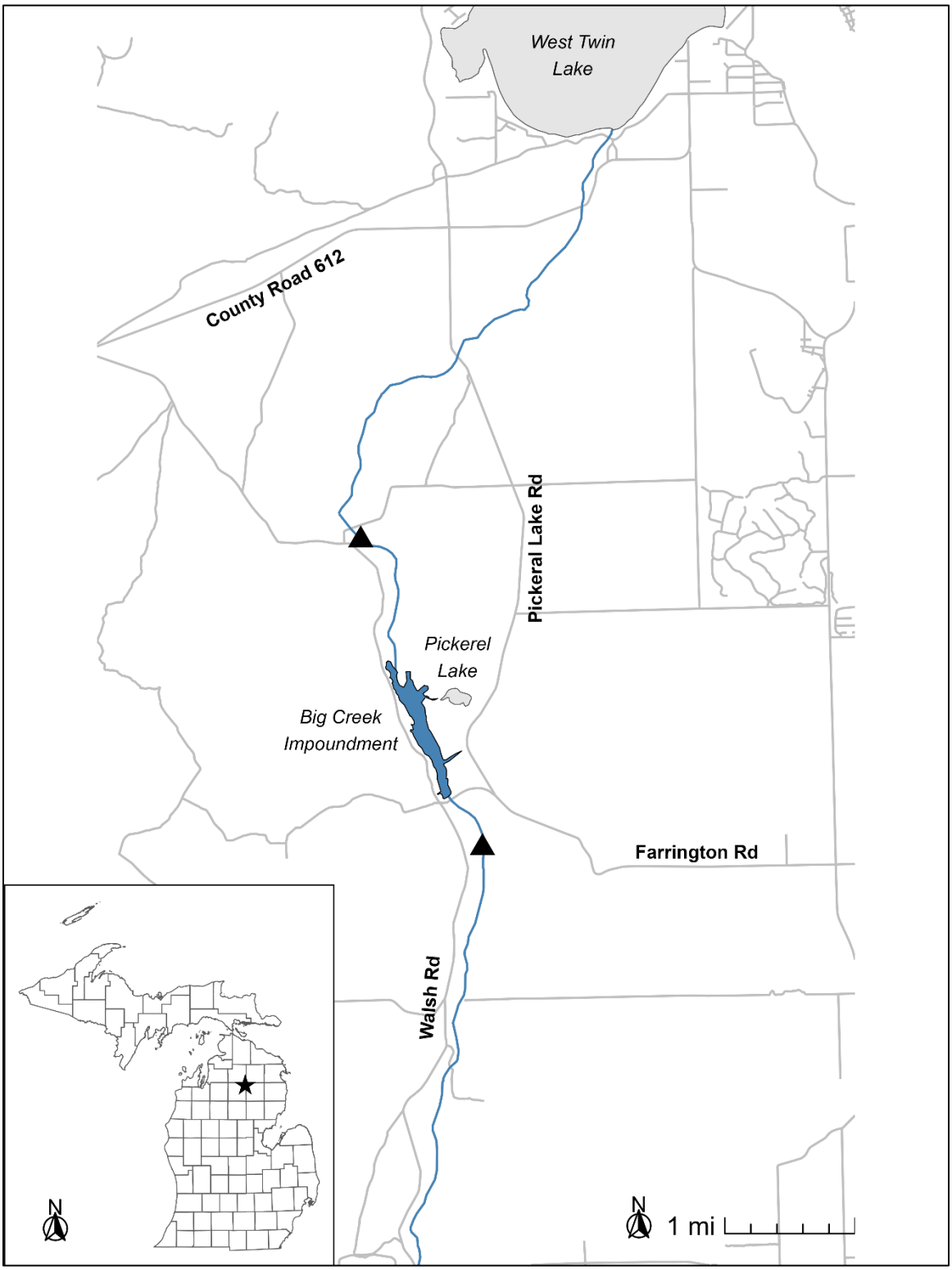

Figure 1. Map of Middle Branch Big Creek (shown in blue) with local roads and nearby lakes. Triangles indicate 2024 sampling locations.

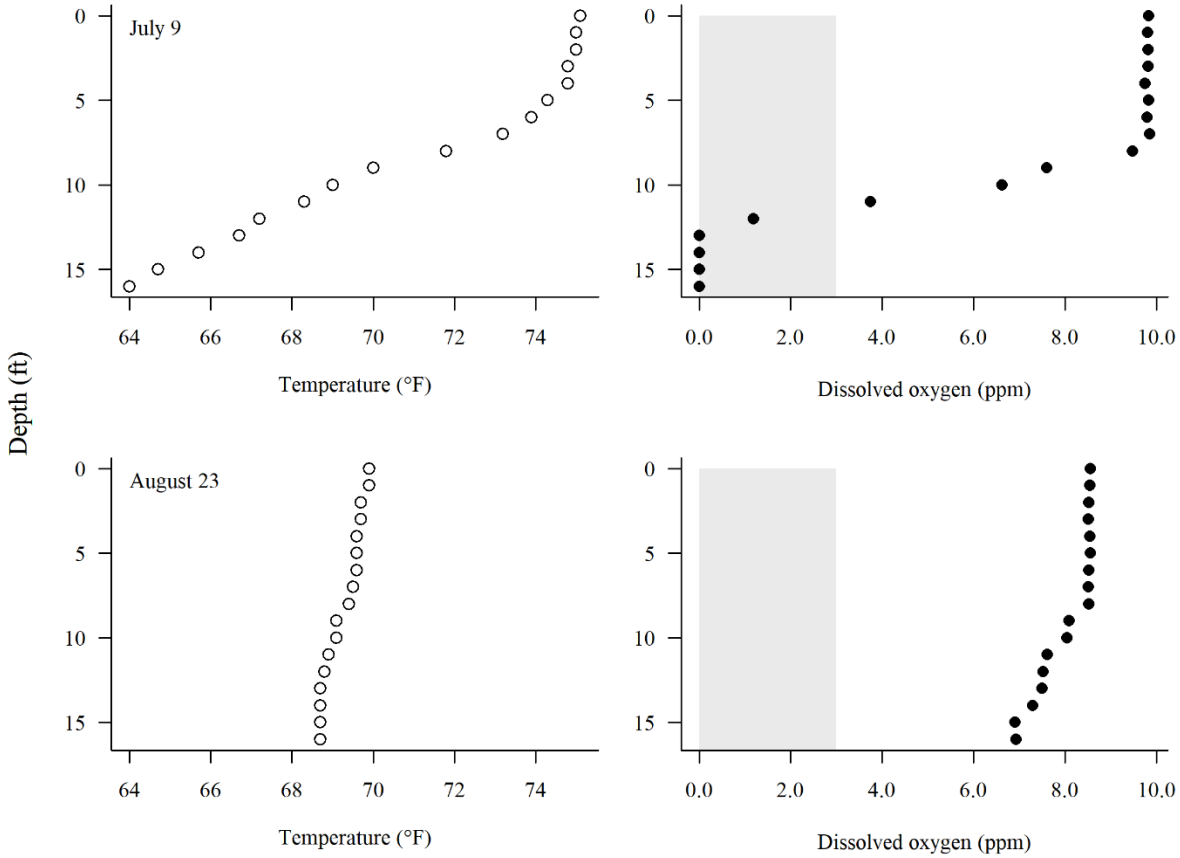

Figure 2. Temperature and dissolved oxygen profiles measured at the deepest point of the Big Creek Impoundment on July 9 (mid-summer) and August 23, 2024 (late summer). The gray-shaded area on the dissolved oxygen graphs indicates oxygen levels below 3 parts per million.

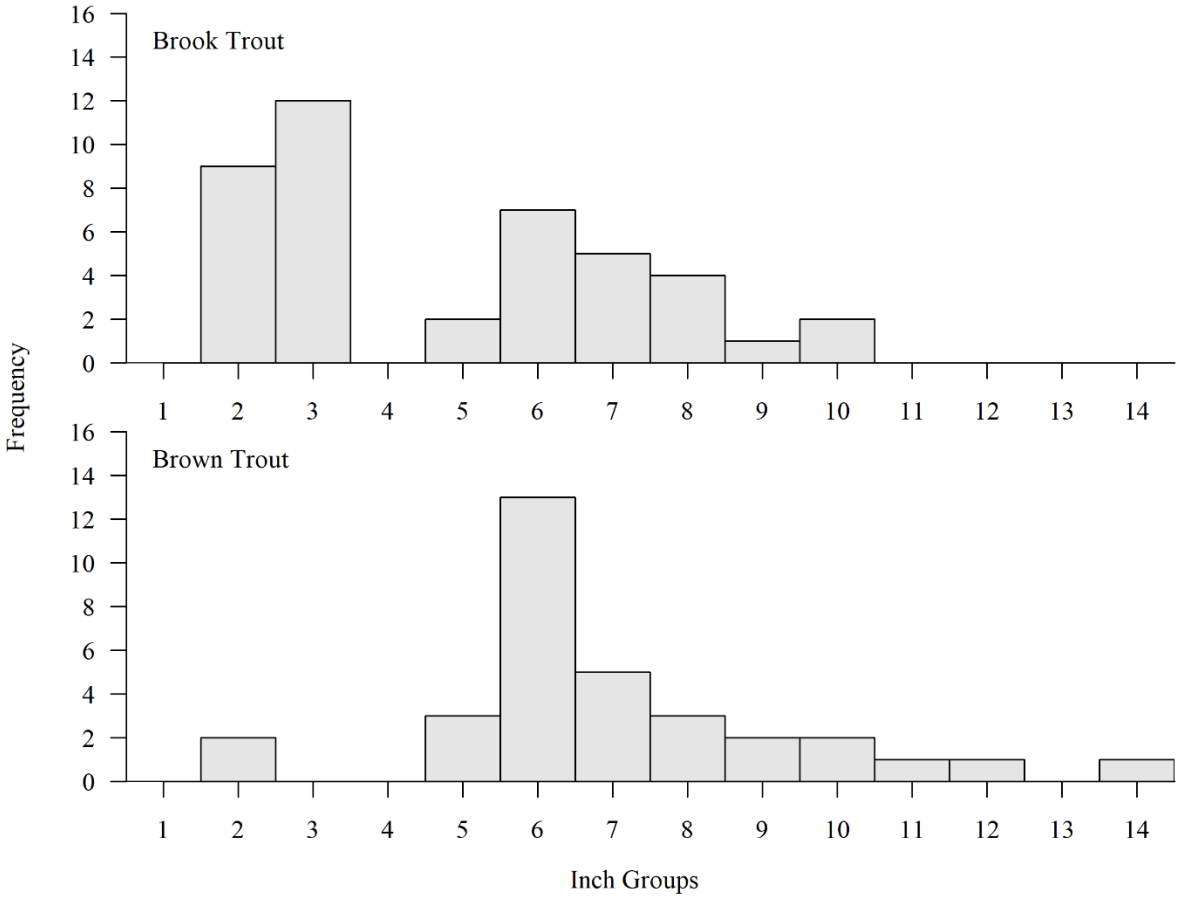

Figure 3. Length-frequency distributions of Brook Trout and Brown Trout captured in Middle Branch Big Creek downstream of Big Creek Dam on July 1, 2024.

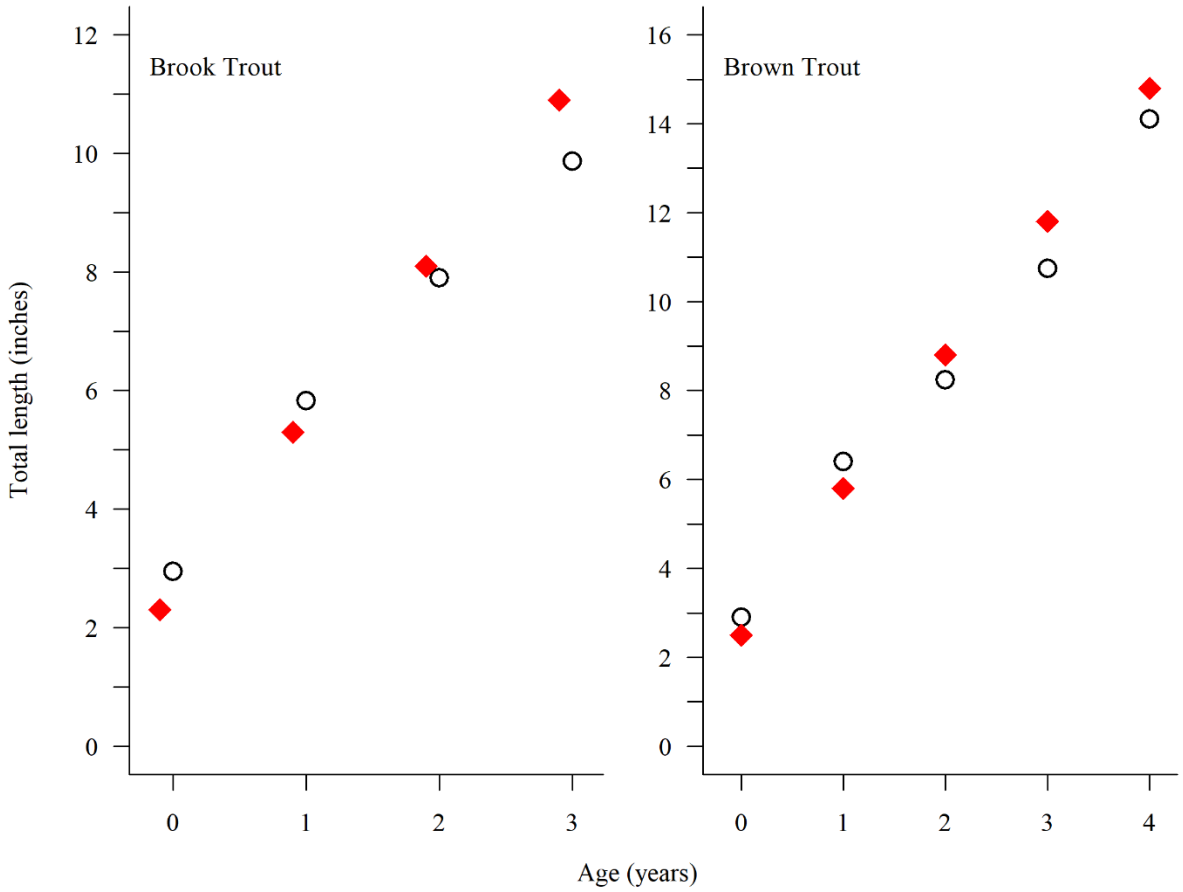

Figure 4. Mean length (inches) at age for Brook Trout and Brown Trout relative to the state average, in Middle Branch Big Creek at a station 0.65 miles downstream of Big Creek Dam, July 1, 2024. Red diamonds represent statewide average lengths at age from Schneider (2000).

Literature Path

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