Rice Creek

Calhoun County; T2S/R6W Sec 25 and T2S/R5W Sec 14, 15, 16, 17, 19, 20, 30
Kalamazoo River Watershed; last Surveyed July 22 and 23, 2019

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Environment

Rice Creek is located approximately 8 miles northeast of the city of Marshall near central Calhoun County. The North Branch (NB) and the South Branch (SB) of Rice Creek join just upstream of 22-1/2 Mile Road and the Easton and Becker Drain joins just downstream of 22-1/2 Mile Road. These three streams are classified as warm transitional. Downstream of the Easton and Baker Drain, the Rice Creek mainstem is classified as a cold transitional small river down to the confluence with the Kalamazoo River in the City of Marshall. The watershed drains 423 square miles. The land use is dominated by agriculture, making up 55% of the watershed, followed by wetland (19%), forest (16%), urban (8%), and small amounts of open water, grassland, and barren land. Rice Creek and most of its tributaries have been designated, and regularly maintained, as county drains. Only the portion of Rice Creek from approximately 20-Mile Road downstream to the outlet at the Kalamazoo River is not a part of a designated drain. Dredging operations of the past as well as increased human development along the corridor of Rice Creek have significantly altered this stream's character over time.

Rice Creek averages 25 feet wide and has a depth range of 0.5 to 4 feet. Gravel is the predominant substrate type in the stream, but sand, silt, and rock are also present. Fish cover consists of overhanging brush, in-stream wood, some undercut banks, and pools. Vegetation in the stream is sparse though eelgrass is moderately abundant. There are several cold-water springs that seep into Rice Creek that are found at various locations along this waterway. The creek is classified as a designated trout stream and has a long history of trout stocking dating back to the late 1800's. Rice Creek is currently managed as a type-4 trout stream up through the SB from the Concord Road crossing (Jackson County) downstream to the confluence with the Kalamazoo River. Fishing is open all year, but Brown Trout harvest is only allowed from the last Saturday in April through September 30 of each year. Brown Trout must be 10 inches to harvest, and the bag limit is five fish (no more than three trout over 15 inches). Public access to Rice Creek can be obtained through the City of Marshall's Ketchum Park or through the Holt property which is a DNR-owned site leased and managed by the Calhoun Conservation District. Both sites are angler friendly with parking onsite and trails along the creek.

History

Rice Creek has been stocked with various species of trout since 1890 when Brook Trout were first stocked (Table 1). Walleye fry were stocked in 1909 (120,000 fry) and 1910 (14,000 fry) and Yellow Perch were stocked in 1910 (600 fingerlings). Rice Creek has historically been managed as a trout fishery with Rainbow Trout, Brown Trout, and Brook Trout being stocked from 1934 through 1971. Stocking shifted to focus on Brown Trout alone beginning in 1978, and Brown Trout have been stocked annually since 1983 (Table 2). The SB Rice Creek had historically been stocked with Brown Trout, but stocking was discontinued in 2020 due to warm stream temperatures and lack of public access. Brown

Trout were stocked in the NB Rice Creek in 1989 and 1990, but the program was discontinued because the NB is too warm to support trout.

The first comprehensive fish survey on record was conducted in the fall of 1952. Two sites were surveyed in the mainstem of Rice Creek, eight on the NB, and four on the SB. Fifty-one Brown Trout ranging from 4.2 to 16.2 inches were caught on the mainstem at the 20 Mile Road site, and two fish were caught at the Michigan Ave Site. Twenty-nine Rainbow Trout were also captured at the 20 Mile Road site. No Brown Trout were caught at the NB sites, and only two Brown Trout (3 and 3.5 inches) were caught at the SB sites.

Rice Creek was surveyed again in November of 1971. Ten sites were surveyed along road crossings of Rice Creek and SB Rice Creek. Very few Brown Trout were captured, but all were large hold-over fish. Two 10-inch fish were caught at 20 Mile Road, a 22-inch fish at 21 Mile Road, and a 17-inch fish at 29 Mile Road.

In the early 1970's, Fisheries Division changed its policy from stocking legal size Brown Trout (8 inches) to stocking only yearling trout that averaged between 5 and 6 inches. The fisheries biologist at that time did not believe fingerling and yearling Brown Trout would make any significant contribution to the fishery and all Brown Trout stocking was discontinued in the Jackson management unit. The Brown Trout stocking program was resumed in 1978 using yearling fish in an attempt to create a stream fishery in southern lower Michigan where trout opportunities are limited.
Rice Creek was again electrofished in July/August of 1976. A total of 11 sites were surveyed along the mainstem and SB and only two Brown Trout (nine and 11 inches) were observed at the Marshall Ave site just below the dam at Ketchum Park. Five sites were electrofished in 1982. Only three Brown Trout were captured, a 13.5-inch fish at 24 Mile Road, and 9.1- and 10.5-inch fish at 20 Mile Road. Rice Creek was surveyed again in 1983 at 11 sites on the mainstem (three sites), NB (four sites), and SB (five sites). Only two Brown Trout (13 and 14 inches) were caught at the 20 Mile Road site.

Large numbers of white suckers were captured during the 1982 and 1983 surveys of Rice Creek. Northern Pike were also observed at several sites. As a result, a rotenone treatment was conducted in September of 1983 in an effort to remove all fish species that would compete with or prey on Brown Trout. Brown Trout stocking continued following treatment. With little competition for food and cover, the stocked Brown Trout grew very well and anglers reported good angling success for a few years following the reclamation project. Rice Creek was surveyed again in 1985. All three sites surveyed had Brown Trout present. A total of 87 Brown Trout were collected at 20 Mile Road, 53 at 21 Mile Road, and 14 on the SB at 26 Mile Road. Brown Trout ranged from 4 to 13 inches. No trout predators were observed, and abundance of other fish species was low.

Surveys were again conducted in 1988 to evaluate the Brown Trout stocking and reclamation effort. Four of the five sites electrofished contained Brown Trout. The site at 20 Mile Road had the highest abundance of Brown Trout with 46 fish being caught that ranged from 2 to 19 inches. Only a few Brown Trout were observed on the SB sites at 24 Mile, 26 Mile Road, and M-99 (five, four, and one fish respectively) and none were captured on the mainstem at 22.5 Mile Road. Large numbers of Creek Chubs and suckers were again dominant in Rice Creek and a second rotenone treatment was carried out in 1989. This treatment included the North Branch which was not treated fully in 1983. Fall fingerling Brown Trout were stocked in 1989 and yearlings were stocked annually following treatment.

A fish survey was conducted at the 20 Mile Road and 26 Mile Road crossings in 1992. A total of 29 Brown Trout ranging from 6 to 16 inches were captured at 20 Mile Road and eight Brown Trout were captured at 26 Mile Road. Anglers reported good success but noted some decline in catch rates. The 20 Mile Road sites was surveyed again in 1994 and 11 fish were captured that ranged from 6 to 12 inches. Nine of these fish were age 1 and had a mean length of 8.4 inches, which is 2.2 inches larger than the state average for age-1 fish. Brown Trout were growing well despite being captured in low numbers and few other fish species were observed.

Another survey to evaluate the Brown Trout stocking was conducted in 1997. Three sites were electrofished at Michigan Avenue, 20 Mile Road, and 22.5 Mile Road. A total of 60 Brown Trout were captured at 20 Mile Road ranging from 5 to 11 inches. Fifteen of these Brown Trout were above the legal size (8 inches). One trout (8.5 inches) was caught at Michigan Avenue and none were captured at 22.5 Mile Road.

Limited survival of Brown Trout in Rice Creek prompted local fisheries managers to recommend stocking larger, but fewer, Brown Trout. In 1998 and 1999, "accelerated growth Brown Trout" (Wild Rose strain) were stocked into Rice Creek. A survey conducted in August of 1999 documented the success. A total of 21 Brown Trout were caught at 20 Mile Road ranging in size from 7.9 to 10.5 inches and over 60 percent were larger than 8 inches. These were all age-1 fish that averaged 9.2 inches, 3 inches longer than the state average. Only one Brown Trout was collected at the 21 Mile site where habitat was determined to be limiting. The trout appeared very healthy and robust and were found to have excellent growth rates.

A fish survey was conducted in 2004 prior to proposed dam removal near Ketchum Park in Marshall. Two stations were surveyed at the 20 Mile Road and Michigan Avenue crossings. A total of 34 Brown Trout ranging from 7 to 11 inches were caught in 1,000 feet of electrofishing at the 20 Mile Road site. All Brown Trout were yearlings. Mottled Sculpin were also abundant. A total of 325 fish representing 16 species were collected at Michigan Avenue, but no Brown Trout were captured. White Sucker was the most abundant species at Michigan Avenue.

Recently many habitat improvement projects and access acquisitions have occurred in Rice Creek. The Calhoun Conservation District and the United States Department of Agriculture - Natural Resources Conservation Service (USDA-NRCS) received grant funds to reconnect the stream to adjacent floodplain and wetland habitats in 2010. The City of Marshall removed Ketchum Dam in 2011 opening fish passage between Rice Creek and the Kalamazoo River. The DNR purchased the Holt property in 2014 with an agreement with the Calhoun County Conservation District, who would lease and manage the property. The Holt property is located off Portello Road with over a mile of river frontage on Rice Creek. The Kalamazoo Valley Chapter of Trout Unlimited installed wood habitat and vane structures in the mill raceway near Ketchum Park in 2019 and 2020. Friends of Rice Creek has also conducted some wood clearing and has interest in habitat improvement projects at the Holt property in the near future.

Current Status

The Southern Lake Michigan Management Unit (SLMMU) of Michigan DNR - Fisheries Division conducted stream surveys at five locations (Figure 1) in 2019 to evaluate the Brown Trout population

and ongoing habitat projects. Electrofishing was completed at five sites on the mainstem of Rice Creek on July 22 and 23, 2019. All species were collected and measured for total length, and anal spines were collected from Brown Trout for age and growth analyses. The most upstream site was electrofished from the bridge at 22-1/2 Mile Road upstream 600 feet (22.5 Mile Site). The Holt Site was electrofished from the gazebo by the Holt property parking area, upstream for 1,000 feet. A site was electrofished from the confluence of the mill raceway and historic channel in Ketchum Park proceeding upstream into historic channel for 1,000 feet (Historic Site). Another site was electrofished from the confluence of the mill raceway and historic channel in Ketchum Park proceeding upstream into the mill race for 1,000 feet (Mill Site). A final site was electrofished from below the confluence of the Ketchum Park Mill Race and the historic channel starting immediately upstream of S. Marshall Avenue proceeding upstream 1,000 feet (Confluence Sites). At all sites, electrofishing was conducted using a barge streamshocker with two probes.

Brown Trout catch-per-effort (CPE) was calculated as the number of fish captured per 1,000 feet of stream. CPE was compared to data from DNR surveys conducted from 2011 through 2021. Catch rates were calculated for streams where Brown Trout were collected for SLMMU (n = 34) and statewide surveys (n = 214). CPE was also compared across years for surveys conducted in Rice Creek. CPE was considered high if above the 75th percentile and low if below the 25th percentile of comparable surveys. Fish species were classified as warm, transitional, or cold based on classification criteria developed by Lyons et. al (2009). Weighted-average lengths and weighted age composition for Brown Trout were calculated using the methods described by Schneider (2000).

A total of 29 species were captured across all five sites (Tables 3 and 4). The Confluence Site was the most downstream site and had the highest species diversity with 25 species present and the highest total CPE of 327 fish per 1,000 feet of stream. Forty-three percent of fish captured at the Confluence site were classified as warmwater species and only two species (Brown Trout and Mottled Sculpin) were classified as cold, making up 19 percent of the catch. Creek Chub (n = 69) was the most abundant species present followed by Mottled Sculpin (n = 55). Minnows and sunfish dominated the remainder of the catch. A total of eight Brown Trout were captured, averaging 7.0 inches in length (CPE = 8 fish per 1,000 feet). All but one of these fish were age-1, but one age-0 fish was also caught indicating some limited natural reproduction.

The Mill Race Site had the next highest catch rate with 278 fish caught per 1,000 feet of stream. Seventeen species were captured of which 38 percent were classified as warm and 30 percent classified as cold. Mottled Sculpin was the most abundant species (n = 57) followed closely by Creek Chub (n= 55). Minnows, suckers, and darters were common. The Mill Race had the highest catch rates of Brown Trout with 27 fish being caught (27 fish per 1,000 feet). These fish averaged 7.1 inches in length and ranged from 0 to 4 years old.

A total of 222 fish from 18 species were captured in the Historic Channel Site. White Sucker was the most abundant species (n = 47) followed by Rock Bass (n = 38) and Northern Hog Sucker (n = 24). Mottled Sculpin was the only cold species captured making up only 9 percent of total catch. No Brown Trout were collected. The majority of fish captured were classified as transitional (55 percent).

The Holt Site had lower catch rates with a total of 107 fish captured (CPE = 107 fish per 1,000 feet). Mottled sculpin were the most abundant species (n = 29) followed by Rock Bass (n = 18). The catch

was split between species classified as warm (41 percent), cold (32 percent), and transitional (27 percent). Only five Brown Trout were captured. All of the trout were age-1 fish, and the average length was 8.3 inches.

Catch rates at 22.5 Mile were the lowest of all sites with a CPE of 46.7 fish per 1,000 feet. Fish classified as warm species made up 50% of total catch and transitional made up 36%. This site was deep and slow moving. No Brown Trout were captured.

Temperature loggers were deployed at each site in Rice Creek in 2019-2021. Hourly water temperature was monitored using an Onset Hobo Water Temp Pro v2 temperature logger that was deployed within each sampling station. Temperature in Rice Creek varied across sites (Figure 2). The 22.5 Mile Site had the warmest temperature and was much warmer than the other sites in the summer. Mean July temperature was 74.1 F compared to the rest of the sites that ranged from 70.3 to 71.1 F (Figure 3). The Holt property was consistently the coldest, but was similar to the downstream sites (Historic, Mill, Confluence). This is warmer than reported by Michigan Trout Unlimited temperature logging conducted in 2017 where mean July temperature was 68.3 F, 67.9 F, and 67.7 F in the Historic Channel, Mill Race, and Upstream of the Diversion respectively (Thomas personal communication). DNR temp loggers deployed in 1998 indicated a mean July temperature of 66.7 F at 20 Mile Road (just upstream of Holt) and 61.6 F at 22.5 Mile. These readings are much colder and indicate the temperature regime has significantly changed in the last 20 years.

Brown Trout caught at all sites were combined to evaluate size structure and growth. Most of the Brown Trout captured were age-1 fish (70%). These were likely made up primarily of hatchery fish stocked in the spring of 2019. Length-at-age for Rice Creek Brown Trout was very similar to the statewide average resulting in a growth index score of +0.2 inches (Figure 4). Only six Brown Trout (15% of total capture) were above the 10-inch legal size limit (Figure 5).

Analysis and Discussion

Ketchum Park Mill Race and downstream at the Confluence Site had the highest catch rate of Brown Trout despite having the lowest stocking density. No Brown Trout were collected in the Historic Channel despite the close proximity to these downstream sites. The Historic Channel has much lower gradient due to the historic meander pattern, while the Mill Race is mostly a straight path from where these channels split (previous dam site) to where they converge. As a result water velocity is much lower in the Historic Channel. There are also several storm water outlets draining from Michigan Avenue and the roads to the north into the Historic Channel. There is a large pool near one of the drainage culvert inlets that contained a large number of suckers. Habitat is more suitable for these species than Brown Trout, which seem to prefer the Mill Race. Most of the Brown Trout collected from the Confluence Site were collected at the upstream end closer to the Mill Race Site. The Mill Race and the constructed habitat there seems to be supporting most of the habitat. Very few trout were captured at the DNR Holt property (downstream of 20 Mile Road). Rice Creek and the SB of Rice Creek are classified as a warm transitional upstream stream between 21 and 22.5 Mile Roads. Electrofishing at 22.5 Mile Road found only warmwater species and no Brown Trout despite years of stocking.

The confluence had the greatest species diversity and the highest catch rate most likely because it is just upstream of the confluence with the Kalamazoo River and is the widest of the sites. Warm water species were present and generally the most abundant at all sites surveyed in Rice Creek. This was commonly observed in past surveys and as a result there were several efforts to rotenone the stream to reduce competition and predation and focus on Brown Trout management. Despite these efforts, Brown Trout survival and growth has not increased from past surveys. Currently, low populations of Brown Trout have been observed, but there is an abundance of other species. DNR rarely utilizes piscicides as a management tool anymore, and Rice Creek Brown Trout populations have shown only a short duration of benefits from removing other fish species. Despite the presence of competitors, Brown Trout observed in the 2019 survey exhibit average growth rates. Several predators were present, but they did not make up significant proportions of the fish population. While predation on Brown Trout likely occurs, it is unlikely driving poor survival in Rice Creek. Habitat and temperature are more likely the limiting factors in Rice Creek. Habitat improvements conducted by the Kalamazoo Valley Chapter of Trout unlimited in the Ketchum Park Mill Race have resulted in higher catch rates than in the past. This site had the highest catch rate among the sites sampled in 2019, and the only age 4 fish observed was found in this stretch of the creek.

Brown Trout abundance was relatively low across all sites. Historically, CPE was always low in surveys conducted on Rice Creek except shortly following rotenone treatment (Table 5). CPE in 2019 on sites where trout were present ranged from 27 fish per 1,000 feet in the Mill Race to 5 fish per 1,000 feet at the Holt Property. Average CPE was 13.3 which is below the 25th percentile of SLMMU surveys (21.2 fish per 1,000 feet of stream) but just above the 25th percentile for statewide surveys (11.5 fish per 1,000 feet of stream). Past stocking has successfully maintained a low-density fishery in sites where habitat is present. Stocking should focus on the sites where Brown Trout have consistently been found during past surveys.

The biggest threats to trout management in Rice Creek are related to water temperature. The creek currently only marginally supports trout populations. Brown Trout have low survival in streams where mean July water temperature exceeds 68 F (Wehrly et al. 1998). Brown Trout growth occurs when water temperatures are between 39 F and 67 F (Elliott 1993), and McMichael and Kaya (1991) observed that Brown Trout catch per angler hour decreased when water temperatures exceeded 66 F. Although temperature monitoring in the past resulted in mean July temperatures below 68 F, this benchmark was exceeded at all sites in 2019, 2020, and 2021. Any increase in water temperature, in particular summer temperatures would result in limited trout survival and reduced growth rates and likely eliminate the fishery. The ground water withdrawal tool already indicates that withdrawals exceed the capacity of systems classified as cold-transitional. As a result, no additional withdrawals are permitted. There are expected impacts if existing wells are allowed to increase pumping rates. Other threats to water temperature include increasing temperatures expected to occur as a result of global climate change. Long term management of trout in Rice Creek is likely imperiled and measures to protect and reduce water quality and temperature are recommended. These would include vegetated stream buffers to increase shade, eliminating direct surface water input from tile and surface drains, and protection of known groundwater springs that occur throughout the coldwater section.

Despite limitations due to habitat and temperature, Rice Creek is a popular fishing destination. It is located in a county with very few trout fishing opportunities and almost no public land. As a result, it is very popular among anglers and fishing pressure and success is high. Public access is exceptional at

Ketchum Park and the DNR Holt Property and some (limited) Brown Trout natural reproduction was documented in 2019. These are also the coldest of the sites surveyed in 2019. The Holt Site had very low catch rates for Brown Trout. Catch rates could have been influenced by the deep water at the site and the site chosen for electrofishing. Some of the more popular fishing locations on the Holt property are downstream of the site selected for the 2019 DNR survey. Anglers indicate success fishing the mill race section downstream of the split in the river on the Holt property. A Calhoun County Conservation District survey was conducted in this section in 2015 (Riser 2015). They captured 22 Brown Trout in 1,325 feet (CPE = 16 fish per 1,000 feet). The Holt property stretch can hold Brown Trout but is lacking in habitat diversity. There may be opportunities to improve habitat at this site, especially in the mill raceway to improve trout cover and survival.

Management Direction

All stocking sites in the SB of Rice Creek (24, 26, and 27 Mile Roads) and at 21 and 22 ½ Mile Roads will be eliminated. Trout habitat at these sites is poor due to past dredging and warm water temperatures. These sites have historically not held significant numbers of trout despite decades of stocking. The 20 Mile Road stocking site will be moved downstream to the DNR Holt Property to promote fish remaining in the section with good public access. The number of fish stocked at Ketchum Park will be increased to 2,000 fish (200/acre) due to the improved habitat and good survival in the area with the hopes that fish better distribute into adjacent habitats. These changes will focus Brown Trout management to areas with the best historic survival and where the water temperatures are most appropriate.

Water temperature and quality are limiting in Rice Creek. Water temperatures in Rice Creek appear to have warmed significantly in the last two decades; however, historic temperature data are limited to sampling at two sites in 1998. DNR will continue to monitor the Rice Creek Brown Trout fishery through future electrofishing surveys and angler reports. The fishery can currently be maintained through stocking but is likely not resistant to climate change, continued groundwater withdrawals, and poor watershed and land use practices. If water temperatures continue to warm the stream may not support trout survival long term. Effort to protect the stream should focus on watershed and groundwater protection. DNR will continue to evaluate potential water withdrawal plans and attempt to limit impacts to the temperature regime of Rice Creek. DNR will review Michigan Department of Environment, Great Lakes, and Energy (EGLE) permits for shoreline modification and development to promote best management practices for trout stream shorelines. DNR will continue to work with local organizations and EGLE non-point source staff to install riparian buffers, reduce storm water runoff, and improve trout habitat in Rice Creek.

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Table 1. Trout stocking in Rice Creek from 1890 through 1971.

Year	Life Stage or Average Size (inches)	Brown Trout	Brook Trout	Rainbow Trout
1890	-	-	3,000	-
1898	-	-	-	3,000
1905	Fry	-	9,000	-
1909	Fry	-	10,000	12,000
1910	Fry	-	6,000	16,500
1934	Fingerling	5,500	5,500	-
-	Yearling	-	350	-
1935	Fingerling	17,000	-	-
1936	Fingerling	7,600	-	-
-	Yearling	-	290	-
1937	Fingerling	16,000	6,000	-
1938	Fry	12,000	-	-
-	Fingerling	1,000	6,000	-
1939	Fry	8,000	8,000	-
1940	Fingerling	10,500	3,000	-
-	Yearling	1,000	-	-
1941	Fry	12,000	-	-
-	Fingerling	1,360	-	-
-	Yearling	1,200	-	-
1942	Yearling	500	-	-
1943	Adults	-	50	250
-	Yearling	700	250	250
1944	Yearling	500	300	550
-	8	900	-	200
1945	1	10,000	-	-
-	7.7	1,800	-	-
1946	1	5,000	-	-
-	7 to 9.5	3,250	1,100	400
1947	1.5	18,000	-	-
-	7 to 8	3,000	-	325
1948	1.3	15,000	-	-
-	7.5 to 9.5	1,900	800	600
1949	9	-	350	1,550
-	12	150	-	-
-	23	50	-	-
1950	8 to 10	440	350	500

Table 1. Cont

Year	Size (inches)	Brown Trout	Brook Trout	Rainbow Trout
1951	1.25	-	10,000	-
-	8	1,700	1,150	1,000
1952	7.5	1,350	350	2,000
1953	7.5 to 10	500	350	3,000
1954	8.5 to 9.5	-	350	2,000
1955	Legal	750	350	2,500
1956	Legal	1,450	75	1,500
1957	Legal	-	50	1,500
1958	Legal	1,550	350	2,000
1959	Legal	1,875	350	2,000
1960	Legal	-	350	1,000
-	Sublegal	2,550	-	-
1961	Legal	2,550	175	2,000
1962	Legal	1,293	475	2,100
1963	Legal	1,000	350	2,000
1964	Legal	1,275	350	2,000
1965	Fingerling	27,000	-	-
1967	Yearling	6,000	-	-
1968	Yearling	2,700	-	-
1970	Yearling	2,000	-	-
1971	Fingerling	-	-	2,000

Table 2. Brown Trout stocked in Rice Creek (including the South Branch and North Branch) from 1972 to 2021.

Year	Size (inches)	Number
1978	-	2,000
1983	5.6	23,000
1984	5.9	12,500
1985	6.8	10,620
1986	5.6	10,500
1987	6.3	11,300
1988	5.4	12,500
1989	5.7	25,000
1990	5.5	12,450
1991	5.8	13,033
1992	6.0	12,379
1993	6.5	12,470
1994	7.0	12,473
1995	6.3	11,819
1996	6.2	9,257
1997	6.1	9,500
1998	5.2	9,290
1999	7.6	4,750
2000	6.7	7,965
2001	8.5	5,000
2002	7.5	5,000
2003	8.0	5,000
2004	7.9	5,000
2005	6.8	5,000
2006	6.3	5,000
2007	7.0	4,660
2008	4.8	5,000
2009	4.8	4,500
2010	5.2	5,000
2011	4.6	4,500
2012	4.1	5,303
2014	5.4	5,500
2015	5.4	6,050
2016	5.2	5,500
2017	5.2	5,820
2018	5.7	6,050
2019	5.0	5,500
2020	4.6	3,800
2021	4.8	2,864

Table 3. Fish captured at 22 Mile and Holt sites during electrofishing surveys conducted on July 23, 2019.

Species	22 Mile		Holt	
	Number	Mean Length (inches)	Number	Mean Length (inches)
Bluegill	3	6.5	1	6.5
Brown Trout	-	-	5	8.3
Blackside Darter	2	2.5	1	3.5
Creek Chub	-	-	5	2.9
Common White Sucker	6	14.0	1	1.5
Golden Redhorse	-	-	1	17.5
Grass Pickerel	-	-	9	6.7
Green Sunfish	3	2.2	9	3.4
Hornyhead Chub	-	-	1	4.5
Johnny Darter	1	2.5	5	2.5
Largemouth Bass	1	17.5	1	1.5
Mottled Sculpin	4	2.0	29	2.8
Central Mudminnow	1	3.5	11	2.5
Northern Hog Sucker	1	10.5	7	9.5
Northern Pike	1	7.5	-	-
Rainbow Darter	-	-	1	1.5
Rock Bass	5	6.7	18	4.3
Smallmouth Bass	-	-	1	8.5
Striped Shiner	-	-	1	6.5
Total	**28**	**6.9**	**107**	**5.2**

Table 4. Fish captured at Historic, Mill, and Confluence sites during electrofishing surveys conducted on July 22, 2019.

Species	Historic		Mill		Confluence	
	Number	Mean Length (inches)	Number	Mean Length (inches)	Number	Mean Length (inches)
American Brook Lamprey	-	-	-	-	4	6.5
Black Crappie	-	-	-	-	1	2.5
Black Bullhead	-	-	1	8.5	-	-
Brown Trout	-	-	27	7.1	8	7.0
Blackside Darter	-	-	-	-	6	2.2
Common Carp	-	-	1	3.5	-	-
Creek Chub	36	2.4	55	3.4	69	3.3
Common Shiner	-	-	-	-	27	3.9
Central Stoneroller	3	5.5	26	4.7	8	4.8
Common White Sucker	47	9.0	7	12.2	18	5.8
Golden Redhorse	5	16.9	-	-	1	13.5
Golden Shiner	2	4.0	-	-	3	2.8
Grass Pickerel	6	6.2	-	-	3	7.2
Green Sunfish	-	-	1	1.5	3	3.8
Hornyhead Chub	9	3.3	-	-	20	4.6
Johnny Darter	6	2.0	3	2.5	6	1.8
Largemouth Bass	4	2.5	2	2.5	2	5.0
Mottled Sculpin	20	2.2	57	2.2	55	2.2
Central Mudminnow	7	3.4	1	2.5	2	3.0
Northern Hog Sucker	24	5.0	20	6.8	18	8.4
Northern Pike	1	24.5	1	20.5	1	19.5
Pumpkinseed	1	2.5	-	-	-	-
Rainbow Darter	3	1.8	32	2.5	8	2.3
River Chub	-	-	-	-	2	6.5
Rock Bass	38	5.2	27	4.6	29	5.4
Smallmouth Bass	3	10.5	4	11.0	10	10.4
Striped Shiner	7	5.4	13	4.9	22	4.7
Yellow Perch	-	-	-	-	1	3.5
Total	**222**	**6.2**	**278**	**5.9**	**327**	**5.6**

Table 5. Brown Trout CPE (fish per 1,000 feet) from electrofishing surveys conducted on Rice Creek, North Branch Rice Creek, and South Branch Rice Creek from 1952 to present. The 25th and 75th percentile for Brown Trout CPE in surveys conducted on Southern Lake Michigan Management Unit (SLMMU) trout streams during 2011-2021 is included. CPE below the 25th percentile is considered low and CPE above the 75th percentile is considered high.

Year	Mainstem	North Branch	South Branch	SLMMU 25th/75th
1952	53.5	0.0	1.3	10.0/118.8
1971	2.5	-	1.5	10.0/118.8
1976	0.6	-	0.0	10.0/118.8
1982	2.4	-	0.7	10.0/118.8
1983	3.1	0.0	0.0	10.0/118.8
1985	233.3	-	18.7	10.0/118.8
1988	57.5	-	8.3	10.0/118.8
1992	38.9	-	10.3	10.0/118.8
1994	9.4	-	-	10.0/118.8
1997	25.8	-	-	10.0/118.8
1999	15.8	-	-	10.0/118.8
2004	17.0	-	-	10.0/118.8
2019	8.7	-	-	10.0/118.8

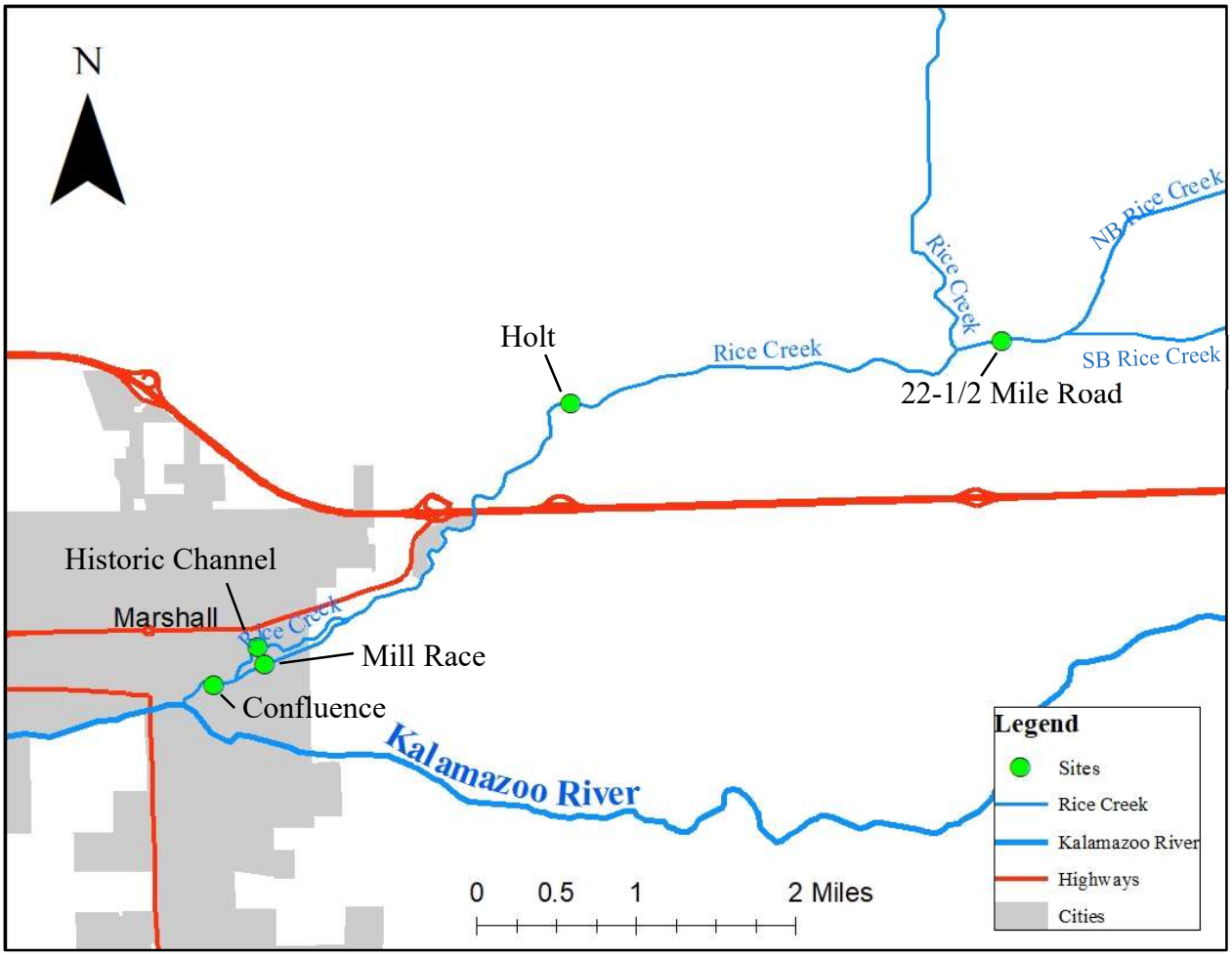

Figure 1. Map of the Rice Creek fish survey locations located on Rice Creek near Marshall, MI.

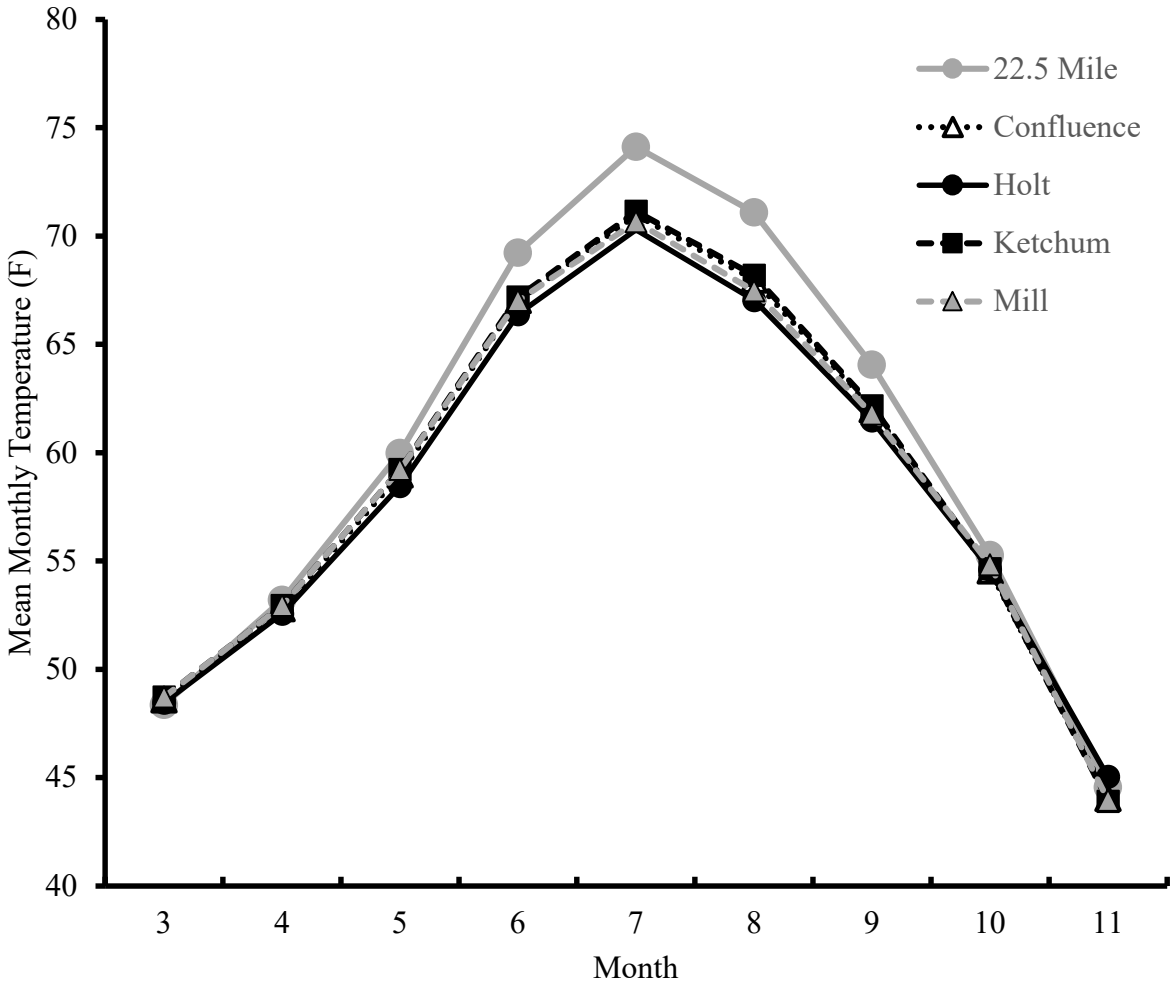

Figure 2. Mean monthly temperature (F) averaged for 2019 – 2021 at five sites in Rice Creek.

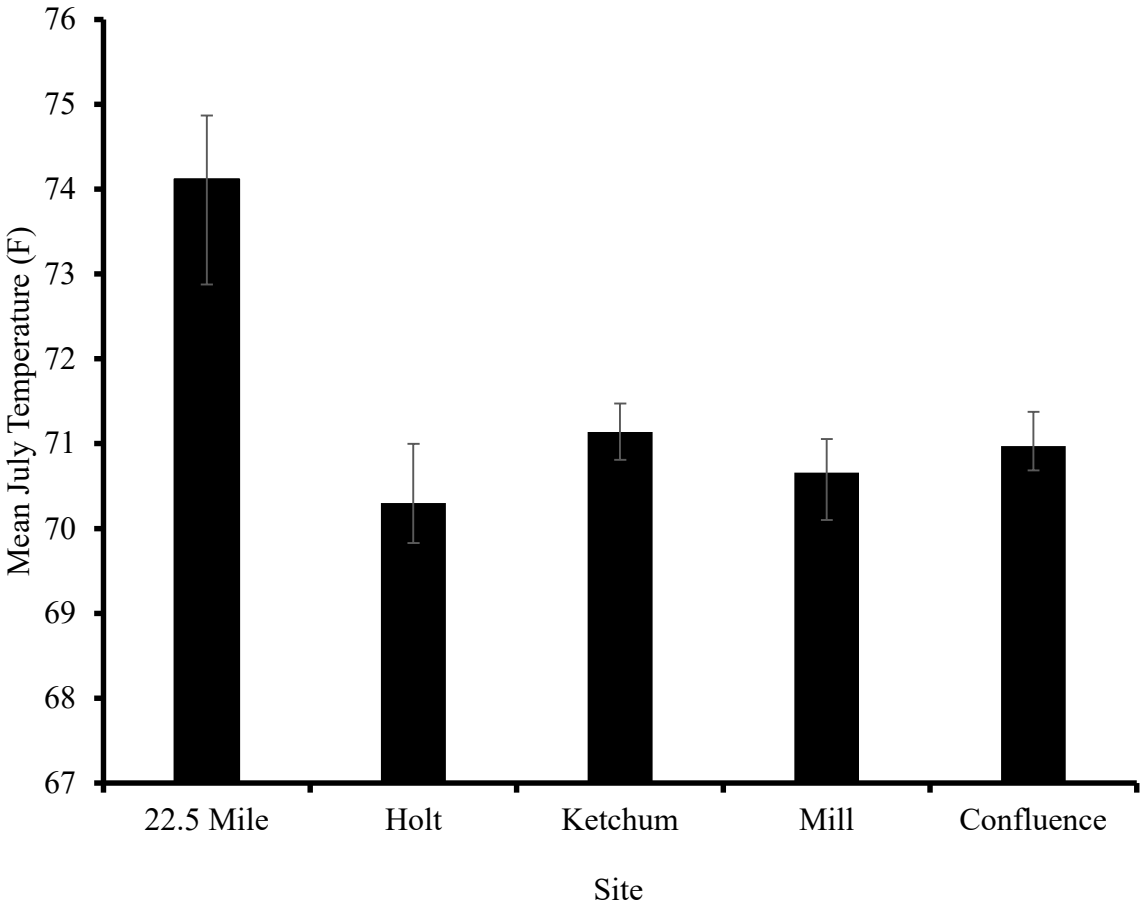

Figure 3. Mean July temperature (F) averaged for 2019 – 2021 at five sites in Rice Creek. Error bars represent the year with the highest/lowest mean July temperature. Sites are labeled from upstream (left) to downstream (right).

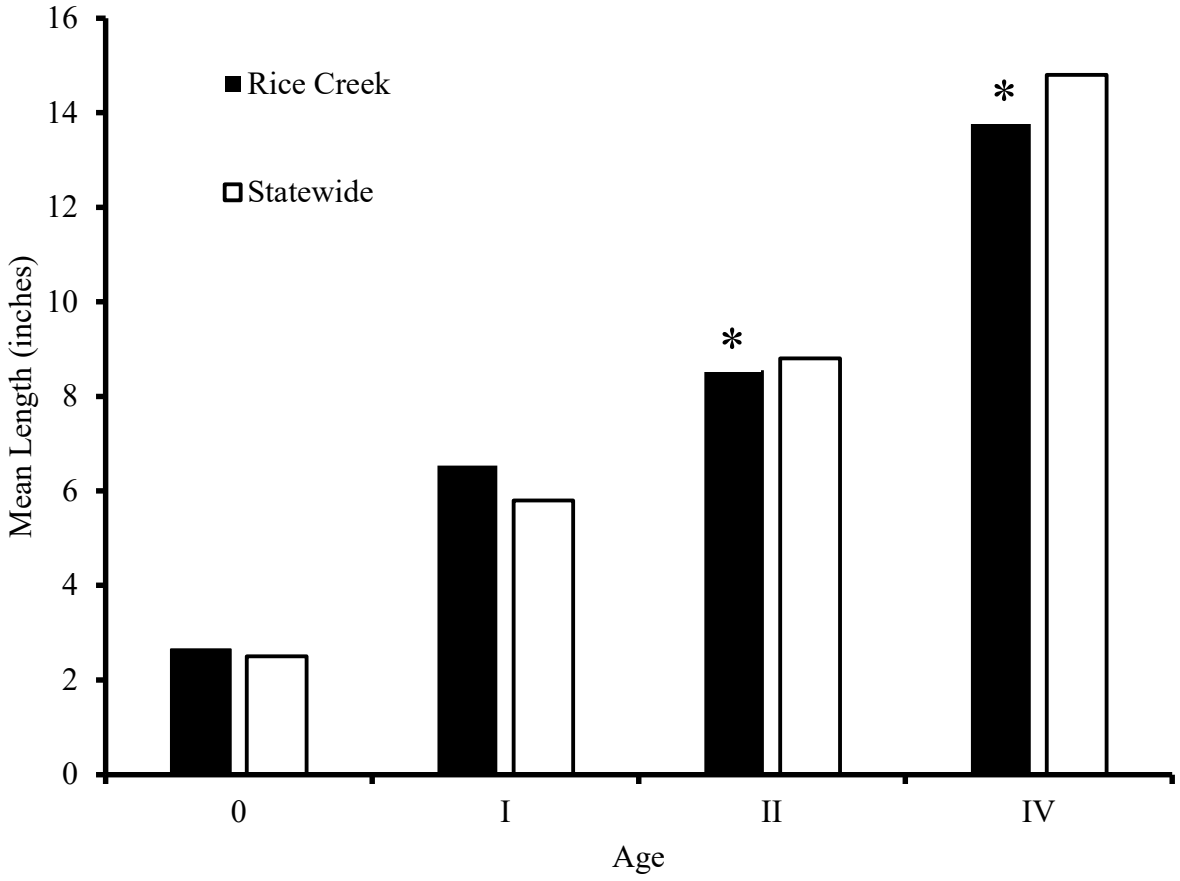

Figure 4. Mean lengths at age for fish captured in electrofishing surveys at five sites on Rice Creek in the 2019 survey compared to the statewide average lengths-at-age. Asterix represents age classes where less than 5 individuals were caught.

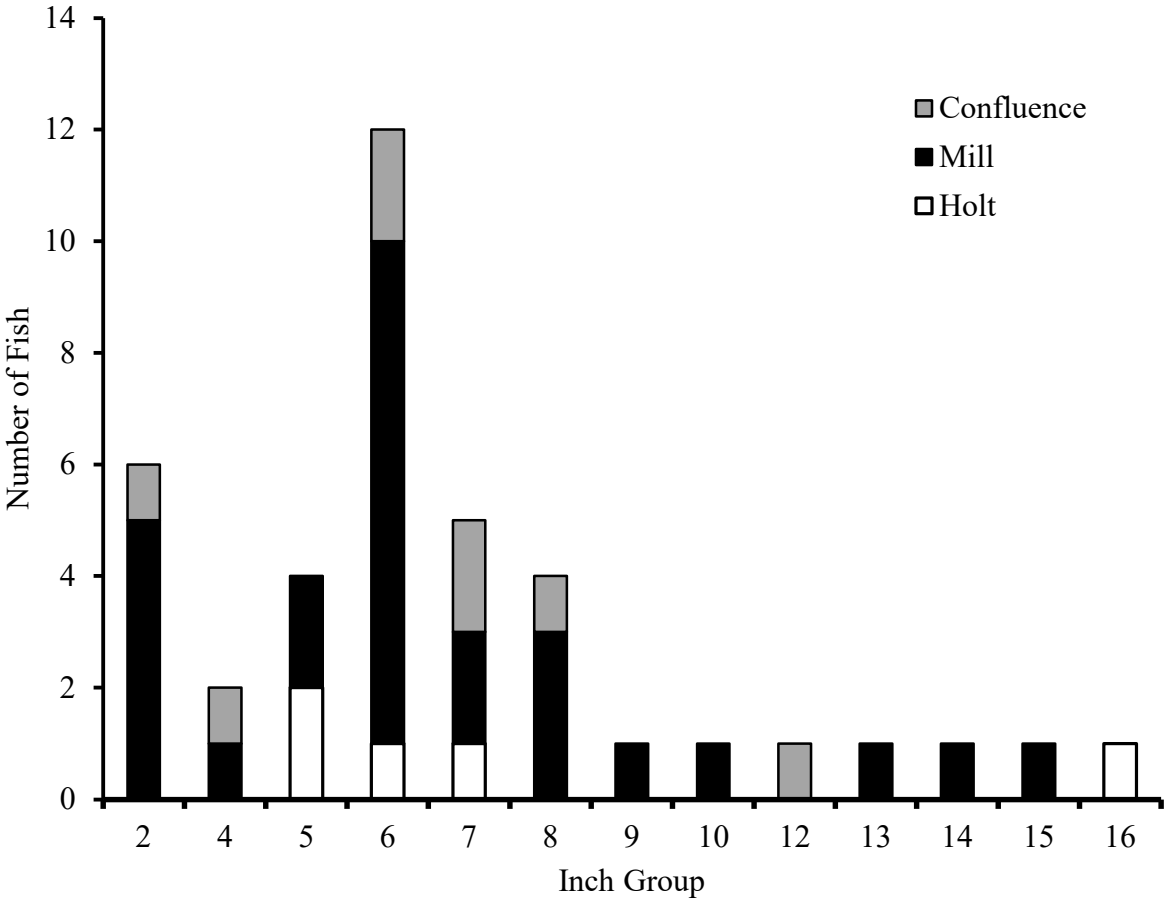

Figure 5. Length frequency of Brown Trout captured in Rice Creek at three sites during the July 22 and 23 fish survey.

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