Upper Manistee River

Kalkaska, Crawford, Antrim, and Otsego Counties
Manistee River Watershed, last surveyed 2019

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Environment

The Manistee River is located in the northwestern part of Michigan's Lower Peninsula and is one of the largest watersheds in Michigan. It is approximately 232 miles in length and drains an area of approximately 1,780 square miles (Rozich 1998). The watershed encompasses sections of ten different counties, including Antrim, Otsego, Crawford, Kalkaska, Missaukee, Grand Traverse, Wexford, Osceola, Lake, and Manistee. The Manistee River begins as springs emanating from cedar swamps in southeastern Antrim County. From there, it flows south through southwestern Otsego County and northwestern Crawford County. Shortly after flowing under M-72, the Manistee River turns to the southwest and enters Kalkaska County. It continues on a southwest course through Kalkaska, Missaukee, and Wexford Counties. Shortly after entering Manistee County, the river turns essentially due west and flows into Manistee Lake, and then into Lake Michigan.

This report will focus on the reach of the Manistee River from the headwaters to the Sharon area of Kalkaska County (Figures 1-3). This reach is approximately 50.8 river miles in length and is commonly known as the Upper Manistee River. It drains approximately 434 square miles and has an average discharge of 336 cfs (Hendrickson and Doonan 1972). The Upper Manistee River has cold water temperatures and robust wild trout populations.

Major road crossings of the Upper Manistee River include Mancelona Road, Cameron Bridge Road, County Road 612, M-72, Sunset Trail (CCC Bridge), North Sharon Road, and West Sharon Road (Figures 1-3). There are numerous public access sites along this reach. Most road crossings provide access for wading anglers. Public access sites with drift boat launches are available at the M-72 State Forest Campground, Hole in the Fence, Hole in the Wall, Tree Farm, Burnt Cabin, Yellowtrees Landing, CCC Bridge Campground, 3 Mile Bend, 4 Mile Bend, and at Thayer Road (just upstream of West Sharon Road Bridge).

The landscape surrounding the Upper Manistee River is hilly and mostly forested, primarily with northern hardwoods and conifers. There are also large wetland complexes present, along with a few agricultural areas. Land ownership is a mix of private and state, with large tracts of state forest land. Human development is relatively sparse, and there are no large towns near the Upper Manistee River. The highest elevation in the Upper Manistee River watershed is found just northeast of the headwaters, where a large glacial moraine reaches 1,515 ft in height. As the river flows south towards M-72, it flows through a valley with high hills on both sides with elevations over 1,400 ft in places. The area's soils are primarily highly permeable glacial sand and gravel. This leads to high groundwater recharge rates, making the Manistee River one of the most stable-flowing rivers in the United States (Rozich 1998). The Upper Manistee River watershed was heavily logged during the late 1800s and early 1900s, and it took many years for reforestation to occur. In a writeup for a 1958 survey, Fisheries Supervisor Harold Peterson described the Upper Manistee River landscape as "barren sandy plains" with some cherry, aspen, and oak, along with a few jack pines. Since that time, the forests have grown back.

Over its 50.8-mile course from the headwaters to Sharon, the Upper Manistee River falls approximately 192 ft, an average gradient of 3.8 ft/mile (Table 1). The reach from the headwaters to Mancelona Road has the highest gradient, at approximately 7.3 ft/mile, while the reach from Cameron Bridge to M-72 carries the lowest gradient, at approximately 2.6 ft/mile (Table 1). In contrast, other reaches of the Manistee River have higher gradients. According to Rozich (1998), the reaches inundated by Hodenpyl and Tippy dams, large hydropower facilities operated by Consumers Energy, have gradients of approximately 11 ft/mile and 6.0 ft/mile, respectively.

The Upper Manistee River has several notable tributaries (Figures 1-3). Frenchman's Creek joins near the Crawford/Otsego County Line. Goose Creek drains the Blue Lakes Chain and enters from the west, several miles upstream of M-72. Both streams host robust Brook Trout populations, along with some Brown Trout. Portage Creek flows out of Lake Margrethe for approximately 8 miles before joining the Upper Manistee River midway between M-72 and CCC Bridge. While Portage Creek starts as a warmwater stream as it exits Lake Margrethe, it gains groundwater as it flows downstream and eventually becomes a trout stream, supporting mostly Brook Trout. Black Creek joins several miles upstream of CCC Bridge. Black Creek supported trout populations at one time but has been heavily impacted by beavers. Between CCC Bridge and North Sharon Road, Big Devil and Big Cannon Creeks join. Both are trout streams; Big Devil Creek hosts mostly Brook Trout while Big Cannon Creek is unique among Upper Manistee River tributaries in that it hosts populations of Brown, Brook, and Rainbow Trout. All these tributaries are Michigan Department of Natural Resources (MDNR) Designated Trout Streams.

The Upper Manistee River is inaccessible to migratory fish from Lake Michigan due to the presence of Tippy and Hodenpyl Dams. This was not always the case, however. In 1958, Fisheries Supervisor Harold Peterson noted that the Upper Manistee River was famous for "lake run rainbows" before hydro dam construction (Tippy Dam was completed in 1918, while Hodenpyl Dam was completed in 1925). Hodenpyl Dam, located near Mesick in Wexford County, creates a 2,025-acre impoundment known as Hodenpyl Pond which has strong populations of Walleye, Smallmouth Bass, and Northern Pike (Tonello 2012). It is possible for fish to migrate upstream into the Upper Manistee River from Hodenpyl Pond.

The Upper Manistee River was adopted as a State-designated Natural River in 2003 (Anonymous 2003). The Natural River designation consists of zoning that is designed to protect the natural character of a river and applies from the headwaters downstream to the Missaukee/Wexford County line. Most of the Upper Manistee River's tributaries are also included in the Natural River designation (https://www.michigan.gov/dnr/0,4570,7-350-79136_79236_82211-95818--,00.html).

At the time of writing the Upper Manistee River has four different fishing regulations over its 50.8-mile length. From the headwaters downstream to County Road 612, the river is regulated by MDNR as a Type 2 trout stream. This means that it can only be fished during the "regular trout season" (the last Saturday in April through September 30), and minimum size limits are 10 inches for Brook Trout, 12 inches for Brown Trout, and 10 inches for Rainbow Trout. A total of five trout can be kept per day, with no more than three fish over 15 inches. From County Road 612 downstream to M-72, the river is regulated as an artificial lure only stream. It is open to year-round fishing, but harvest for Brown and Brook Trout is only legal during the regular trout season (Rainbow Trout can be harvested year-round).

The daily possession limit is two trout, with no more than one trout 18 inches or greater in size. Size limits are 10 inches for Brook Trout and Rainbow Trout, and 18 inches for Brown Trout. From M-72 downstream to CCC Bridge, the river is regulated as an artificial flies-only stream. Fishing seasons and possession limits are the same as those from County Road 612 to M-72. From CCC Bridge downstream to Sharon (and all the way to Tippy Dam Pond), the river is regulated as a Type 4 trout stream. It is open to fishing year-round, although Brook and Brown Trout can only be harvested during the regular trout season. Rainbow Trout can be harvested year-round. Minimum size limits are 7 inches for Brook Trout, and 10 inches for Brown and Rainbow Trout. Up to 5 trout per day can be harvested, with no more than 3 being 15 inches or greater.

The first known non-profit group dedicated to the Manistee River was the Manistee River Association that existed in the 1950s, based out of Fife Lake. However, that group went silent at some point, leading to the establishment of the Upper Manistee River Association (UMRA; http://www.umrasite.org/). The UMRA is a non-profit group that is dedicated solely to the Manistee River. The group, primarily made up of Manistee River riparian landowners, was established in July of 1966, and advocates for the Manistee River from its headwaters downstream to US-131 (although most of their members come from the Upper Manistee River upstream from Sharon).

In the late-1980s, a number of other conservation-minded groups joined together to form the Upper Manistee River Restoration Committee (UMRRC; Kutkuhn 1990, 1993). The UMRRC is dedicated to habitat improvement of the Manistee River. Primary participants of the UMRRC have included Conservation Resource Alliance, Huron Pines, MDNR, the Kalkaska Conservation District, several county road commissions, and a number of different Trout Unlimited chapters. Over the 30 years since its inception, UMRRC has tackled a number of different projects, including streambank stabilization, instream fisheries habitat improvement, sand trap establishment and maintenance, dam removal, road stream crossing replacement, and public access site maintenance and improvement.

History

Over the years, the Upper Manistee River, has captured far more attention from anglers and professional river guides than has the Middle Manistee River (Tonello 2018). The Upper Manistee is smaller, colder, more wadable, and easier to fish. The Middle Manistee is bigger, warmer, and more difficult to wade. The same can be said for fisheries management, as the Upper Manistee River has received far more attention from fisheries managers than the Middle Manistee River. This is likely due in part to the fact that it is colder, holds higher densities of trout, and is more heavily fished than the Middle Manistee River. Fisheries population index stations at Cameron Bridge and M-72 in Crawford County have been surveyed on a more regular basis than any station in the Middle Manistee River (Tonello 2011, 2015).

Although there are no records of the original fish community of the Upper Manistee River, the Arctic Grayling was likely the only native salmonid inhabitant of the river and existed in large numbers in the upper and middle reaches of the Manistee River. A robust fishery existed in the mid- to late 1800s and anglers traveled from all over to the Upper Manistee River specifically to catch the Arctic Grayling. According to Vincent (1962), Brook Trout were not native to the Manistee River, and were not present in the Upper Manistee River until around 1900. Brown and Rainbow Trout had been stocked in other streams in the mid-1880s but were not present in the Upper Manistee River until after the turn of the century. The Arctic Grayling disappeared from the Manistee River sometime in the early 1900s;

exactly why is unclear but overharvest and habitat degradation during the logging era likely played a part. Competition with introduced Brook Trout may have also played a role. By 1905 or shortly thereafter, Arctic Grayling were extirpated from all streams in the lower peninsula of Michigan (Vincent 1962).

In 1994, MDNR Fisheries Biologist Gary Schnicke wrote a note to MDNR Fisheries Biologist Tom Rozich detailing some of the history of the Upper Manistee River fishery (MDNR files, Cadillac). Schnicke had helped manage the Upper Manistee River for a number of years, starting in 1967, while Tom Rozich had recently inherited management of this reach. In particular, Schnicke discussed how for decades (from the 1940s through the mid-1960s) the Upper Manistee River had essentially been managed as a put and take trout fishery, with heavy stockings of legal-sized trout each year. Most anglers targeted the recently stocked trout, which were easy to catch. However, Schnicke explained that upstream of M-72, a small number of Brown Trout reached huge sizes (occasionally exceeding 10 and even 15 lbs.) by preying on the hatchery trout. These large trout were pursued by a few knowledgeable anglers. Schnicke noted that many of these fish were killed in a 1966 chemical treatment targeting native Chestnut Lamprey (see below), and that this trophy fishery hadn't existed to any major degree since.

Stocking History

The Upper Manistee River has an extensive history of fish stocking (tables 2-4). The first known fish stocking on the Upper Manistee River occurred in 1901 and 1902 when Atlantic Salmon were stocked in Otsego and Crawford Counties by the Michigan Fishery Commission (tables 3 and 4). This effort was unsuccessful, as there are no reports of adults ever returning. Brook Trout and Arctic Grayling were also stocked in the very early 1900s. Arctic Grayling were again stocked in the Kalkaska County section in 1934, unsuccessfully. It was not until the late 1930s and into the 1940s that regular stockings of Rainbow, Brook, and Brown Trout were recorded (tables 2-4). It is highly likely that earlier stockings occurred but were not documented. Several times over the years (once in the 1950s and twice in the 1970s) adult Steelhead were trapped below Tippy Dam on the Lower Manistee River and transported and released into the Middle and Upper Manistee River in Kalkaska County by the Michigan Department of Conservation (MDOC; the precursor to the MDNR of today).

In the mid-20th century, the Upper Manistee River was managed by MDOC as a put-take trout fishery. Larger, legal-sized trout were stocked early in the spring and then targeted by anglers throughout the summer (tables 2 and 3). In the mid-1960s, the Department began to move away from this strategy; instead, they began stocking sub-legal yearling trout for put-grow-take. However, in the 1980s and 1990s, both MDNR Biologists and anglers began to realize the potential of the Upper Manistee River as a wild trout stream. Trout stocking was gradually reduced, and then stopped altogether in 2000. The Middle Manistee River (still in Kalkaska County, but downstream from Sharon) is warmer and sees less natural reproduction and is therefore still stocked with modest numbers of Brown Trout (Table 2; Tonello 2018).

Another noteworthy stocking event was when Coho Salmon were passed upstream of Tippy and Hodenpyl Ponds in the fall of 1967. The effort was part of an experiment in which MDOC personnel passed adult Coho Salmon upstream over the dams to see if they would be able to successfully reproduce in the Manistee River or its tributaries. In the summer of 1968, juvenile Coho Salmon were abundant in surveys on reaches of the Upper and Middle Manistee River, as well as in nearly all

tributaries of the Manistee River from the headwaters to Mesick. These fish were no doubt the result of successful spawning by the transplanted adult Coho Salmon.

Private plantings of Rainbow Trout and some Brook Trout continued in the 1980s and 1990s, mostly funded by UMRA. King Trout Ranch was a private aquaculture facility along the Upper Manistee River, and Rainbow Trout occasionally escaped from the facility and wound up in the river. Also, Arctic Grayling were again stocked in the Upper Manistee River in 1987 in a reintroduction attempt. Unfortunately, the reintroduction attempt was not successful (Nuhfer 1992).

From 1997-2000, the MDNR conducted an evaluation of two different Brown Trout strains in the Upper Manistee River. Paired plants of Gilchrist Creek and Seeforellen strain Brown Trout (each with a different identifying fin clip) were made. Volunteer creel census, MDNR creel census (part of the 1998 summer), and electrofishing were utilized to evaluate the stocked Brown Trout. The study showed that neither strain performed well in the Upper Manistee River, and that wild Brown Trout were performing much better than either strain of the stocked Brown Trout. The study helped lead MDNR Fisheries Research Biologist Andy Nuhfer to recommend that Brown Trout stocking should be ceased in the Upper Manistee River (MDNR files, Cadillac). MDNR Fisheries Managers acted on Nuhfer's recommendation, and no Brown Trout have been stocked in the Upper Manistee River since 2000 (tables 2 and 3).

Habitat and Management

There are currently no dams on the Upper Manistee River, but that was not always the case. While the history of it is not well known, there was a dam in the Deward area (see below) in the early 20th century. The dam was likely related to the logging industry, and it washed out in 1936. There is discussion in the MDNR Cadillac office file from 1949 about potentially reconstructing the dam to create a waterfowl flooding. Fisheries Division biologists from MDOC opined against such action, particularly because it would have inundated some recently constructed habitat structures. Eventually the decision was made to not rebuild the dam.

Deward was a logging town on the Manistee River between Mancelona Road and Cameron Bridge in the early 1900s. At one point it had a population of as many as 800 people. As the timber ran out, the town was eventually abandoned and became a ghost town. In 1974, a "rearing station" for Brown Trout and Atlantic Salmon was proposed by MDOC in the vicinity of the old ghost town. The plans never came to fruition and the rearing station was never constructed. However, in 1980, a 4,720-acre Special Management Area called the "Deward Tract" was created by the MDNR Forest Management Division. Oil and gas exploration and development had led to increased off-road vehicle (ORV) activity that was impacting the Manistee River in multiple locations. The creation of the Deward Tract limited access of ORVs and motor vehicles to protect the river corridor, while maintaining several access sites for foot traffic.

A series of three reconnaissance reports explaining habitat issues on the Upper Manistee River were written by MDOC Biologist Roger Wicklund in the 1950s (1954, 1955, and 1957). Discussion topics included stream improvement conducted by Civilian Conservation Corps (CCC) crews (presumably in the 1930s) in which "channel narrowing devices, bank stabilization structures, and escape cover" were installed. Another similar project was apparently conducted by Fisheries Division crews from 1948-1950. The reports also mention Upper Manistee River Brook Trout being small and "overcropped".

Wicklund also speaks of the "national reputation" of the Upper Manistee River as a trout fishing stream, and the subsequent heavy fishing pressure it was receiving at the time.

The first report (Wicklund 1954) covered "Unit 1", which consisted of 17 river miles from the headwaters downstream to County Road 612. Concerns in this reach included the heavy sand bedload and a marked lack of fish cover. Recommendations included the installation of various trout habitat structures, the stabilization of several eroding streambanks, and the clearing of beaver dams on the headwaters of the river and Frenchman's Creek. Wicklund also recommended rehabbing some of the old CCC structures.

The Unit 2 report (Wicklund 1955) covered the river from County Road 612 to M-72. The report describes a 65% flow increase from County Road 612 to M-72, from both spring seepage and the flow of Goose Creek. The report touts the Manistee as "one of the most heavily fished trout streams in Michigan". Recommendations included 3,450 feet of streambank stabilization and fish habitat devices installed over the 10.6-mile reach. The report also recommended 3.7 miles of streambank plantings of coniferous trees for shading and the removal of beaver dams on Goose Creek.

The Unit 3 report (Wicklund 1957) covered the 29.1-mile reach from M-72 to Sharon. Apparently a 1956 electrofishing survey within this reach showed trout populations to be very poor, consisting of mostly hatchery Rainbow Trout and sublegal Brook Trout, with very few Brown Trout present. Recommendations included 16,650 feet of streambank repair (about 115 individual sites). The report also recommended 45 habitat structures be built in the mile below M-72. Planting trees for shade along the entire reach was another prominent recommendation. File entries (MDNR Cadillac office) from subsequent years indicate that many of the recommendations from the report series were implemented.

The effect of Michigan's native Chestnut Lamprey on Upper Manistee River trout populations has long been a topic of discussion. There are significant filings and much correspondence on them in the files in the MDNR Cadillac office, and they have been the subject of a number of different lamprey-targeted surveys and research reports (Crowe 1939, 1959; Allison 1944; Hall 1963; Nuhfer 1993). Most reports indicated that the largest populations of Chestnut Lamprey were found upstream from Sharon. In the fall of 1966, the Manistee River was treated for Chestnut Lamprey with Bayluscide, a commonly used lampricide, from Cameron Bridge in Crawford County downstream to M-66 (Jacob 1966). The treatment reportedly resulted in a good kill of Chestnut Lamprey, but other fish species, including many trout, were also killed. According to Nuhfer (1993), there were anecdotal reports of better trout fishing after the treatment, but there was insufficient data to prove its effectiveness.

The heavy sand bedload of the Upper Manistee River has also long been a topic of conversation among anglers and biologists. While some of the sand in the river is clearly of natural origin, human disturbances are also no doubt responsible for depositing untold amounts of sand into the river. These disturbances would have started with logging practices, including the cutting of trees throughout the watershed and along the streambanks, and using the river for log drives. Since the logging days, other sources of sand are road-stream crossings and human activities and development adjacent to the stream and on the streambanks. While sand had long been considered an enemy of wild trout populations, research in the 1980s verified it (Alexander and Hansen 1988, Nuhfer 2004). As a result, the first sand trap on the Upper Manistee River was installed near Deward in 1985. By 1997, a total of 8 sand traps had been dug/constructed by UMRRC. Five of these were on the mainstem of the Upper Manistee

River (all between Mancelona Road and Cameron Bridge), two were on Portage Creek, and one was on Goose Creek. By 1999, UMRRC meeting notes indicate that the traps seemed to be filling more slowly and not requiring maintenance as often. The notes also state "frequent observations continue to reveal unmistakably the effectiveness of these traps in helping the river system scour itself of gravel-smothering sediment, especially so in the mainstream's reaches above Cameron Bridge".

The same late 1980s public outcry over poor fishing in the Upper Manistee River that led to the forming of the UMRRC also led to a major cooperative habitat improvement effort. The effort consisted of digging and maintaining sand traps, stabilizing eroding streambanks, the rehabilitation of old habitat improvement structures, and the construction of new habitat improvement structures. The outcry also led to increased scrutiny on all aspects of MDNR's management of the river. A draft Manistee River Management Plan (no completed, official copy has been found) written in 1988 by Fisheries Biologist Kyle Kruger detailed the issues facing the Upper Manistee River fishery. To address some of these issues the number of electrofishing surveys to examine trout populations were increased, and the MDNR stocking regime was closely examined. The survey results and review of stocking practices of trout in the Upper Manistee River eventually led to the cessation of stocking after the year 2000, with the assumption that natural reproduction would be enough to sustain the fishery.

This same effort also led MDNR to study the native Chestnut Lamprey population in the Upper Manistee River and its impact on trout populations. The results of the study (Nuhfer 1993) showed that the distribution of Chestnut Lamprey in the Upper Manistee River from 1989 to 1991 was similar to that prior to the 1966 Bayluscide treatment, but that the overall abundance was probably lower. Nuhfer suspected that hatchery practices in the 1960s that included stocking legal-sized trout created ideal conditions for Chestnut Lamprey. Nuhfer recommended against further chemical lampricide treatments, believing that the costs (both financial and negative effects on trout and invertebrates) were not worth the potential short-term benefits. No lamprey treatments have been conducted on the Upper Manistee River since 1966.

In the late 1990s, conflicts between river users and riparian landowners led to the creation of an Upper Manistee River Access Committee. The committee had wide representation and consisted of representatives from MDNR, UMRA, Trout Unlimited, professional fishing guides, canoe livery owners, and riparian landowners. The goal of the committee was to identify and address access problems and issues along the Upper Manistee River corridor. The group produced a report and an action plan (Anonymous 2006). The efforts of the group were primarily focused upstream from Sharon, as that is where most of the conflict was occurring. One major recommendation from the group was to create a new public access site in the Sharon area. The previous Sharon access site was right along a dangerous curve on West Sharon Road, and had very little public parking. As a result of this recommendation a new, much safer access site was constructed by MDNR in 2008 off Thayer Road, just upstream of the West Sharon Road crossing of the Manistee River. Since then, numerous other access improvements have been made, both by MDNR and by UMRA/UMRRC.

Other correspondence in MDNR files (Cadillac office) refers to numerous different habitat improvement projects that have been conducted on the Upper Manistee River over the years, both on private and state-owned frontage. Other issues include continuous lively discussion over trout stocking (species, life stage, and location), erosion control, sand input into the river, and greenbelt zoning designed to protect the areas directly adjacent to the streambanks. The greenbelt zoning issue became

prominent when UMRA and the UMRRC (Kutkuhn 1990, 1993) requested that MDNR consider the Upper Manistee River for the Natural Rivers program. This finally came to fruition in 2003, when the Upper Manistee River (from the headwaters downstream to the Missaukee/Wexford county line) was adopted as a Natural River (Anonymous 2003).

Habitat improvement efforts on the Upper Manistee River have continued to the present time. In recent years, efforts by UMRA and UMRRC (with funding provided by MDNR, Trout Unlimited, Consumers Energy, and many other sources) have focused on directly improving fish habitat, particularly in the form of artificial log jams to provide overhead cover and depth for the larger Brown Trout preferred by anglers. Rehabilitating old habitat structures has also been a focus in recent years. Access sites have also been improved by UMRA/UMRRC in cooperation with MDNR.

In 2019, Michigan Trout Unlimited initiated a comprehensive look at habitat of the Upper Manistee River (Michigan Trout Unlimited 2019), calling the effort "The Upper Manistee River Watershed Collaborative Improvement Effort". They assembled a large group of participants, including UMRA, UMRRC, MDNR, and the Michigan Department of Environment, Great Lakes, and Energy (MDEGLE). Based on the efforts of this group, a large-scale trout habitat improvement effort is slated to commence in 2021. The immediate focus will be the area between Yellowtrees Landing and CCC Bridge, but other parts of the watershed are being considered for habitat improvement as well. Another document prepared by Michigan Trout Unlimited (Thomas and Burroughs 2019) investigated the habitat of the Upper Manistee River and is being relied upon heavily for the Collaborative Improvement Effort.

Regulations History

The Upper Manistee River has a long history of special regulations aimed at the conservation of trout populations. The reach from Yellowtrees Landing to CCC Bridge was first designated as flies-only in 1970. Then in 2000, the reach from M-72 to Yellowtrees was added, meaning that the entire 16.7-mile reach from M-72 to CCC Bridge was covered under flies-only regulations. Also, in 2000, the reach from the headwaters to US-131 in Wexford County was designated as a Type 2 stream, meaning it had more restrictive length regulations for trout species. However, that designation was open to fishing only during the regular trout season. Only the flies-only reach was open to year-round fishing, although Brown and Brook Trout could not be kept during the extended season (October 1 through the last Saturday in April).

In 2011, further regulations changes were enacted for the Upper Manistee River. The 9.2-mile reach from County Road 612 to M-72 was changed to artificial lures only, meaning that only lures and flies could be used, and that bait was now illegal in this section. Also, the reach from CCC Bridge downstream to US-131 was changed to a Type 4 designation, meaning it would be open to year-round fishing, although Brown and Brook Trout could not be kept during the extended season. The year-round designation also included the County Road 612 to M-72 reach, meaning that anglers could now fish year-round on nearly the entire Manistee River, except for those waters upstream of County Road 612. The changes were made in response to anglers and professional fishing guides requesting that more waters be opened to year-round fishing. Because the extended season fishery would be catch and release for Brown and Brook Trout, it was expected that the regulation change would not have any adverse impact on the trout populations of the river, while providing more fishing opportunities for anglers.

Historical Fisheries Surveys

The Upper Manistee River has a long and extensive history of fisheries surveys spanning over 70 years. Over that time, approximately 38 different fish species have been documented (Table 5). The first known electrofishing survey on the Upper Manistee River was conducted in 1948. Four sites were sampled, all in the Deward area. Brook and Brown trout were both abundant in these surveys, with the Brook Trout ranging up to 9.1 inches and the Brown Trout up to 21 inches. Only a few Rainbow Trout were captured in the 1948 surveys, but one of them was 30 inches in length.

Another electrofishing survey on the Upper Manistee River was conducted in 1956. Six sites were surveyed, ranging from the Deward area downstream to Sharon. The two sites in the Deward area were the most productive, with Brown Trout and Brook Trout abundant. Brown Trout were nonexistent at the downstream sites however, with only one caught at the other four sites. Brook Trout were present at all sites. Rainbow Trout were present at all sites except for one of the Deward area sites (albeit in low numbers).

A 1958 effort that was more extensive than the 1956 survey included 14 different survey sites, again ranging from Deward downstream to Sharon. Results were similar to the 1956 survey. Brook and Brown trout were abundant in the Deward area, but very sparse at sites below Cameron Bridge. Rainbow Trout were present in small numbers and in size ranges indicative of recently stocked fish. In a writeup for the 1958 survey, Fisheries Supervisor Harold Peterson mentions that fishing pressure on the stream is heavy in Crawford County.

In the late 1960s, a number of electrofishing surveys were conducted on the Upper Manistee River. In 1966, 9 sites from Deward to Sharon were shocked. Moderate numbers of Brown and Brook Trout were caught upstream of M-72, but numbers of both species were much lower below M-72. This survey was conducted prior to the lampricide treatment in the fall of 1966. As a follow-up to the treatment, 7 sites from Deward to Sharon were shocked in 1967, once in March and then again later in the year from August through October. There were better catches at most sites than prior to the Chestnut Lamprey treatment in fall of 1966. Length distributions of the Brown and Rainbow Trout caught in these surveys indicate that these were most likely fish that had been stocked the previous fall, after the lampricide treatment was conducted. The Brook Trout caught in this survey were clearly all wild fish that had survived the treatment, since no Brook Trout were stocked.

In the fall of 1967, adult Coho Salmon were trapped by MDNR and transported upstream of Hodenpyl Dam. Throughout 1968 there were many sites sampled in the Upper Manistee River to determine whether or not the Coho Salmon had successfully reproduced. Spring surveys in March and April showed juvenile Coho Salmon in large numbers. Follow up surveys in August also found large numbers of juvenile Coho Salmon. As with previous surveys, moderate numbers of Brown and Brook Trout were present upstream of M-72, but numbers of both species were much lower downstream of M-72.

More electrofishing surveys were conducted on the Upper Manistee River in 1969 (8 sites surveyed), and 1970 (10 sites surveyed). The 1969 surveys showed that the Coho Salmon were entirely gone, presumably having smolted out that spring. As with previous surveys of the Upper Manistee River, in both years there were good numbers of Brook and Brown trout upstream of M-72, but much lower

numbers downstream. The 1970 survey did find Brown Trout to be somewhat more abundant downstream in the vicinity of Black Creek and CCC Bridge, with some larger specimens present as well.

In the fall of 1976, 5 sites were sampled on the Upper Manistee River, all upstream from M-72. While Brook and Brown trout were abundant as expected, Rainbow Trout were more prevalent than in previous surveys. This led MDNR Fisheries Biologist Gary Schnicke to conclude that they were naturally produced parr/smolts from the adult Steelhead transfers of 1974 and 1975. He documented two different wild year classes and concluded that the Upper Manistee River was very capable of wild Steelhead smolt production (MDNR files, Cadillac).

Further electrofishing surveys of the Upper Manistee River were conducted in 1977 and 1978. In 1977, all four sites surveyed were upstream of M-72, and all showed good populations of Brown and Brook Trout, along with a few Rainbow Trout. The four 1978 survey stations were from M-72 downstream to CCC Bridge. While the M-72 survey showed good populations of Brown and Brook Trout, the downstream stations had fewer fish. Assessing lamprey populations also seems to have been a goal of the 1978 survey.

After a hiatus of a few years, electrofishing on the Upper Manistee River resumed in 1987, with 8 sites surveyed from Deward downstream to Sharon. Despite the many fisheries surveys that had been conducted since the 1950s, no reports on the Upper Manistee River had been written since the Wicklund (1954, 1955, 1957) reports in the 1950s. The first report since then was written by MDNR Fisheries Biologist Kyle Kruger in 1988. Again, only a draft of the report can be found, and it is unknown if the report was ever finalized. In the draft report, Kruger discusses the 1987 fisheries surveys, which, like nearly all prior surveys, showed good populations of Brown and Brook trout from M-72 upstream, and poor populations downstream through the Sharon area. One benefit of the Kruger report was that it led to more communication and cooperation between the MDNR and UMRA and eventually led to the creation of the UMRRC. Whether due to the Kruger report or not, from this point forward, fisheries management on the Upper Manistee River turned in the direction of habitat improvement and the favoring of wild, naturally produced trout over hatchery trout.

Starting in 1988 and proceeding through 1996, Fisheries Division conducted mark-recapture electrofishing population estimate surveys on the Upper Manistee River. In this effort, multiple sites were surveyed, including Deward, Cameron Bridge, County Road 612, and M-72. According to Smith (1996), the nine-year time series showed the trout populations of the Upper Manistee River to be relatively stable, although numbers varied dramatically between sites. The Cameron Bridge station had far higher numbers than any of the other sites. Smith (1996) also concluded that the Brown Trout being stocked by MDNR were having no impact at the three upstream sites. After 1996, the number of sites surveyed for population estimates annually was reduced to two, with Cameron Bridge and M-72 being the two that remained (tables 6 and 7).

Starting in 1995, three new sites were surveyed for 6 consecutive years. The sites included Livingston Lodge (also known as "the Tree Farm"), the Broadmanor Hunt Club, and 3 Mile Bend. Livingston Lodge and Broadmanor are between M-72 and CCC Bridge, while 3 Mile Bend is downstream from CCC Bridge, approximately halfway to Sharon. The surveys at these sites were one-pass electrofishing

efforts, with no population estimates established (tables 8 through 10). Survey notes indicate that these stations were difficult to shock, with some holes being too deep to effectively sample.

Creel Census Studies

A short creel census was conducted on the Upper Manistee River in the summer of 1998. The survey took place from June 13 through July 5 and covered the time period from 6:00 am through 12:00 pm. The study reach was from Deward to North Sharon Bridge. In that brief study, a total of 10,662 angler hours were generated. The total catch estimate for Brown Trout was 7,347, with 415 of those kept (and presumably legal) and another 2,566 legal Brown Trout released. For Brook Trout, the total catch estimate was 10,106, with 200 of those kept (and presumably legal) and another 2,122 legal Brook Trout released. The total catch estimate for Rainbow Trout was 418, with none kept and 317 legal Rainbow Trout released. The difference between the total catch and the sum of legal kept and released trout is assumed to be sub-legal released fish.

From 1988 through 2003, there was a volunteer creel survey conducted on the Upper Manistee River (Turney et al. 2004). The survey was started by MDNR in 1988 to track catches of Arctic Grayling that had been stocked. However, the Arctic Grayling project ended a few years later, and the state was planning to cancel the survey. The UMRA assumed responsibility for the survey in 1991 and continued to oversee it (with some assistance from MDNR) through the 2003 fishing season, after which it was ended due to lack of angler participation. Most of the fishing effort recorded in the survey took place between Mancelona Road and Yellowtrees Landing. The volunteer anglers kept track of their fishing effort and catch throughout the season, and then the data was compiled by UMRA and MDNR (Turney et al. 2004). Results from the long-term study showed that the period from 1998-2003 had the highest catch rates of Brown Trout. Not surprisingly, Brook Trout catch rates dropped over the period, and the authors surmised that it was due to competition with or predation from the increased Brown Trout population.

MDEGLE Habitat and Macroinvertebrate Sampling

Biologists from the Michigan Department of Environment, Great Lakes, and Energy (MDEGLE; formerly known as the Michigan Department of Environmental Quality or MDEQ) have conducted habitat and macroinvertebrate (aquatic insect) sampling on the Upper Manistee River a number of times in recent years. In 1999, stations at Cameron Bridge and Deward were sampled for aquatic insects (Walker 2004). The Cameron Bridge site earned a score of "Acceptable" for the macroinvertebrate sampling, while the Deward station earned a score of "Excellent". Those two stations, along with stations at M-72 and County Road 612 were also sampled for habitat quality. The M-72, County Road 612, and Cameron Bridge stations all received scores of "Good", while the Deward station received a score of "Excellent".

Similar surveys were conducted in 2004 (Chambers 2017). The most upstream site sampled was at Cameron Bridge. Scores of "Excellent" were achieved for both the habitat and macroinvertebrate sampling. Moving downstream, the second site sampled in 2004 was at County Road 612. Here, only habitat was sampled, which received a score of "Good". The furthest downstream site sampled in 2004 was just upstream of the State Forest Campground off M-72. At this site, the habitat received a score of "Good", while the macroinvertebrates received a score of "Excellent".

In 2009, similar surveys were conducted at four locations on the Upper Manistee River (Lipsey 2012). The first location was accessed through private property off Riverview Road, approximately 2 miles downstream from M-72. Both habitat and macroinvertebrate sampling scores at this location were "Excellent". Proceeding downstream, the next site was located off Weber Road via Sunset Trail (private property not far downstream from CCC Bridge). As with the first site, scores of "Excellent" were noted for both the habitat and macroinvertebrate sampling components. The next site was less than 2 miles further downstream, also through private property accessed from the end of Weber Road. Here, the habitat rated as "Excellent", and the macroinvertebrates rated as "Acceptable". The final site sampled in 2009 was approximately two miles downstream from site 3, off King Road. At this station, the habitat rated as "Good" and macroinvertebrates as "Excellent".

Further sampling of habitat and macroinvertebrate populations was conducted in 2014 (Lipsey 2016). Four sites were sampled. The Cameron Bridge station received a habitat rating of "Good" and a macroinvertebrate rating of "Excellent". Proceeding downstream, the next site was located off Weber Road via Sunset Trail (private property, not far downstream from CCC Bridge). Scores of "Excellent" were calculated for both the habitat and macroinvertebrate sampling components. The next site was less than 2 miles further downstream, also private property accessed from the end of Weber Road. Here, both the habitat and macroinvertebrates rated as "Excellent". The final site sampled in 2014 was approximately two miles downstream from site 3, off King Road. At this station, both the habitat and macroinvertebrates rated as "Excellent".

Current Status

Fisheries Surveys

In 2002 the Cameron Bridge station was designated as a fixed site in the "Status and Trends" program instituted by Fisheries Division (Wills et al. 2011). The station is 1,800 ft in length and per the protocol of the program fixed sites are sampled on a three years on/three years off sampling regime. The fisheries survey requires mark-recapture population estimates for salmonids conducted on two separate days with a tow barge stream electrofishing unit with three probes. In one of the three sampling years, non-trout species are to be collected, identified, and counted in half of the station during the marking run. The program also requires the use of a continuous recording instream temperature logger within the station during all three years of the cycle. Habitat data are collected in one of the three sampling years.

The Cameron Bridge Status and Trends index station was surveyed in 2002-2004, 2008-2010, 2014 (Tonello 2015), and 2017-2019, with population estimates established in those years (Table 6). Due to staffing reductions after the 2014 survey, the Cameron Bridge station was moved to a different three-year cycle, hence the 2017-2019 surveys. In each of those surveys, age and growth analysis was conducted on salmonids by examining scale samples for growth rings (tables 11 and 12). Habitat evaluation sampling was conducted in 2004, 2007, 2011, and 2017 (Table 13). Flow rates in those surveys ranged from 68.1-102 cfs. Temperature data was collected by continuous-recording thermometers in 2011-2013 and 2017-2019 (Table 14).

While the M-72 station is not an official station per the Status and Trends program, it has been surveyed multiple times since 2001. A one-pass electrofishing survey was conducted at M-72 in 2004. Starting in 2010, a new station was established at M-72, consisting of a 1,000-foot reach downstream of the bridge. The previous station began below the bridge and extended upstream of the bridge,

encompassing two different regulation types. Mark/recapture population estimates at this new station were established in 2010, 2016, and 2019 (Table 7). In each of those surveys, age and growth analysis was conducted on salmonids by examining scale samples for growth rings (tables 15 and 16). Temperature data were collected at M-72 in 2004, 2010, and 2016 (Table 17).

In 2017, as part of a study conducted by Michigan Technological University to assess the suitability of the Upper Manistee River for Arctic Grayling reintroduction, an 800-foot station at Mancelona Road was surveyed. In that survey, 79 Brook Trout from 1 to 9 inches were caught, along with 28 Brown Trout from 2 to 15 inches.

Temperature Monitoring

Extensive temperature monitoring has been conducted by MDNR and other partners on the Upper Manistee River in recent years. Temperature monitoring data are collected by placing continuously recording loggers in the river for an extended period of time. The most sampled site is Cameron Bridge, where MDNR has collected temperature data in 10 different years. This station hosts some of the coldest water of the Upper Manistee River. In this time series the warmest July average was 58.0°F in 2010, while the warmest July maximum ever recorded at this station was 66.8°F in 2018 (Table 14). Other stations where MDNR has collected temperature data include CCC Bridge, M-72, and Mancelona Road (tables 17, 18, and 19). While these stations host warmer water temperatures than Cameron Bridge, they are still within ranges that will support Brook and Brown trout.

Michigan Trout Unlimited collected temperature data at a number of Upper Manistee River sites in the summers of 2016 and 2017 (Michigan Trout Unlimited 2019). Mean July temperatures were typically in the low 60s °F, while maximum July temperatures were typically in the high 60s °F or low 70s °F. The coldest station in the Michigan Trout Unlimited study was County Road 612, where the July average was 58.0°F in 2016 and 57.3°F in 2017.

Invasive Species

While the Upper Manistee River has been kept relatively free of invasive species to this point, the New Zealand Mud Snail was first identified in the Upper Manistee River at the Cameron Bridge station in August of 2017. More intensive sampling of the entire Manistee River watershed by MDEQ personnel in the fall of 2017 documented New Zealand Mud Snails at only two locations in the Upper Manistee River, including Cameron Bridge and just upstream of the Otsego/Crawford County line. None were found in any locations further downstream. While the New Zealand Mud Snails continue to persist in the Cameron Bridge area (they were documented in 2020 by MDNR Fisheries personnel), further sampling by EGLE personnel since the original detection has not found further spread throughout the watershed (Tamara Lipsey, MDEGLE, personal communication).

Analysis and Discussion

Virtually all electrofishing surveys since 2000 lead to the conclusion that the Upper Manistee River supports robust populations of naturally reproduced Brown and Brook Trout. No Brown Trout have been stocked into the Upper Manistee River since 2000 (Table 3), and no Brook Trout have been stocked into the Upper Manistee River since 1994 (Table 2). Population, age, and growth analysis of both Brown and Brook Trout from the Upper Manistee River shows consistent, strong year classes of both species produced each year. Brown Trout routinely survive to ages 4 or 5, (tables 12 and 16), although Brook Trout only survive to age 1 or 2 (tables 11 and 15). Both species exhibit growth rates

that are on par with state average growth rates. When compared to other northern Michigan trout streams, the Upper Manistee River competes well numerically for both Brown and Brook trout (Table 20). Biomass levels of Brown Trout at the Cameron Bridge index station are somewhat lower than sites on other streams, including the Pere Marquette, Little Manistee, and Au Sable rivers. Brook Trout biomass levels are lower than those on the North Branch Manistee River (Table 20; Tonello 2017) and Bear Creek (Tonello 2014).

In particular, the Brown Trout fishery of the Upper Manistee River is a major draw for anglers. Trophy Brown Trout exceeding 20 inches in length are not uncommon. As a result, the Upper Manistee River supports a heavily utilized, economically important sport fishery, with numerous professional fishing guides taking clients on trips on the Upper Manistee River. During the "Hex Hatch" period in the summer when large Hexagenia species mayflies are hatching, the river often becomes somewhat crowded with anglers and guides. During this period large, trophy Brown Trout tend to be more vulnerable and are heavily targeted.

Age and growth analysis of the Brook Trout caught in recent surveys at M-72 and Cameron Bridge shows that while the age-0 and age-1 classes are very numerous, age-2 Brook Trout are rare, and no age-3 Brook Trout have been caught in any of the surveys (tables 11 and 15). In three surveys (2010, 2016, and 2019) at the M-72 station, a total of 1,000 individual brook trout were caught. Of those, two were in the 8-inch class, and one was in the 9-inch class. The rest were all smaller. In the ten surveys at Cameron Bridge since 2002, a total of 4,560 individual Brook Trout were caught. Of those, 22 were in the 8-inch class, 5 were in the 9-inch class, and 5 were in the 10-inch class. The remaining 4,528 were all smaller. Clearly, Brook Trout in the Upper Manistee River are not surviving to older ages or reaching larger sizes with any regularity. This was also the case in the 1950s as Wicklund (1957) stated that while wild Brook Trout were numerous, "very few were found that were larger than the fingerling size". Historical MDOC/MDNR electrofishing data between 1948 and 2000 shows that Brook Trout over 8 inches are rare, and Brook Trout over 10 inches are virtually nonexistent. Review of MDNR Master Angler Program data shows that since 1994, only three Brook Trout entries (all 16-17 inches) from the Upper Manistee River have been received. This shows that it is possible for Brook Trout to grow large in the Upper Manistee River, but it is not happening with any regularity.

It is highly unlikely that angler harvest is at all a factor in this phenomenon. There has been a 10-inch minimum size limit on Brook Trout upstream of M-72 since 2000, plus the flies only regulations with very restrictive harvest regulations from M-72 downstream to CCC Bridge. It appears that Upper Manistee River Brook Trout "live fast and die young", with the reason(s) for this being unknown. A similar phenomenon has been noted on the nearby Boardman River (Kalish et al. 2018, Hettinger 2020), as well as other trout streams in the region and state (Wills et al. 2015). As with the Upper Manistee River, despite many electrofishing surveys and thousands of Brook Trout sampled, Brook Trout older than age-2 and larger than 8 inches are very rare in the Boardman River. While there is no clear explanation for the phenomenon, it is possible that interactions with Brown Trout may play a role. Brown Trout are known to prey heavily on and possibly compete with Brook Trout. Two Manistee River tributaries where Brook Trout do live longer and grow to larger sizes include Bear Creek in Manistee County and the North Branch of the Manistee River in Kalkaska County (Table 20). Both of these streams have low Brown Trout population levels and habitat that seems to favor Brook Trout.

While Chestnut Lampreys were a prominent topic of discussion on the Upper Manistee River for much of the 20th century, they do not seem to be an issue at this time. They are still present in the watershed, but not in high enough population levels to affect the trout population. According to Turney (2004) they were no longer a problem in the 2003 fishing season, and that has continued to the present. Turney (2004) surmised that the erosion control and sand removal efforts of the UMRRC may have been responsible for the drop in the Chestnut Lamprey population by reducing usable habitat for various life stages. Another likely major contributor to the population decline is the lack of stocked trout, which Nuhfer (1993) believed were easy prey for the Chestnut Lamprey and subsequently bolstered their population.

Management Direction

In general, the Upper Manistee River watershed is intact and relatively healthy. Because of its high groundwater inputs and excellent habitat, it hosts self-sustaining populations of Brown and Brook Trout. Rainbow Trout are also present occasionally. For these reasons, no trout should be stocked into the Upper Manistee River. Instead, the river should continue to be managed as a wild trout fishery, supported by natural reproduction. One drawback of wild trout fisheries is that they can be subject to natural fluctuations related to weather events like floods, droughts, excessive heat, or excessive cold. For example, after two consecutive harsh, cold winters in 2014 and 2015, professional river guides reported that catch rates for Brown Trout on the Upper Manistee River were down for several years.

The Upper Manistee River has remained a high-quality stream in part due to a lack of intensive human development adjacent to it and its tributaries. Much of the watershed is in a forested, undeveloped state. The stream corridor is mostly forested and only lightly developed. Therefore, the primary goal for the Upper Manistee River watershed should be protection. Wetlands are critical to the continued health of the watershed and should also be protected. Future riparian development and wetland loss may result in deterioration of the water quality and reduced aquatic habitat. In particular, wetland loss and additional impervious surfaces in the watershed would lead to more surface runoff, increased flashiness, and higher summer water temperatures, all of which could potentially make the watershed less hospitable for salmonids. The State of Michigan's Natural Rivers designation helps protect the Upper Manistee River and its tributaries from ecologically unwise land-use practices within the stream corridor. Also, MDNR Fisheries Division should continue to work with MDEGLE to evaluate permit applications near the stream or wetlands to ensure that proposed projects will not result in damage to the watershed or its fish populations.

The intensive habitat improvement work that has been conducted on the Upper Manistee by many different partners is at least partly responsible for the excellent Brown Trout fishery, particularly downstream from M-72. We commend the many partners that have contributed to and conducted habitat improvement efforts on the Upper Manistee River over the years. Since some reaches of the Upper Manistee are shallow with little structure, habitat improvement efforts guided by sound design principles should continue in earnest and focus on appropriate techniques that provide depth and overhead woody cover, without compromising channel and bank stability, to benefit Brown and Brook Trout. Rehabilitation or replacement of old habitat improvement structures should also be a priority before they fall apart. Where necessary, road-stream crossings should be fixed if they are blocking fish passage or resulting in sediment delivery. Eroding streambanks should also be stabilized with the use of riprap or woody debris. The MDNR should continue to work and partner with UMRA, UMRRC,

and Michigan Trout Unlimited to support habitat improvement efforts. MDNR should also continue to be a participant in the Upper Manistee River Watershed Collaborative Improvement Effort.

Observations in the initial years of sand trap management on the Upper Manistee River suggest the traps (which were numerous, spaced closely together, and emptied frequently) were effective in reducing the amount of sand in the channel and exposing critical gravel habitat. In recent years however, the sand traps have been either abandoned or emptied very infrequently. This is partially due to the increased cost of emptying the traps and disposing of the spoils. In the past, a Fisheries Division heavy equipment crew was responsible for doing most of the work. Unfortunately, Fisheries Division no longer has a heavy equipment crew, meaning that the sand trap excavation and disposal work would have to be contracted, at a very high expense. Hessenauer et al. (2019) found that sediment traps that were too small, not emptied frequently enough, or sited improperly were not having the desired effects. In addition, most of the sources of sand input into the stream were addressed in earlier restoration efforts. Therefore, it is unlikely that non-regular maintenance of Upper Manistee River sand traps will have any measurable impact on the stream.

The regulations scheme on the Upper Manistee River is complex but seems to have support in general from the angling community. Occasional angler comments are received, some requesting further gear and harvest restrictions, and some requesting the allowance of bait and less restrictive harvest regulations. Due to its complexity, the regulations scheme does provide opportunities for the entire spectrum of anglers, and harvest levels are already low due to restrictive regulations on much of the river. Therefore, the regulations scheme for the Upper Manistee River is not in need of any change at this point.

The Upper Manistee River watershed should be considered for Arctic Grayling reintroduction. The MDNR and the Little River Band of Ottawa Indians, along with other partners and stakeholder groups have undertaken an initiative to reintroduce Arctic Grayling to Michigan waters where they once lived (Anonymous 2017). Several tributaries of the Upper Manistee River possess attributes that should make them potential candidates for Arctic Grayling reintroduction, including cold stream temperatures and low numbers of potential competitor species (Brown Trout in particular). The heavy presence of Brown Trout may preclude Arctic Grayling from thriving in the Upper Manistee River mainstem. However, if successful restoration occurred in some of the tributaries, the Arctic Grayling would likely also inhabit the Upper Manistee River, at least in some capacity, perhaps seasonally.

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Table 1. Stream gradient in defined reaches of the Upper Manistee River, Michigan.

Reach	Distance (miles)	Drop (feet)	Gradient (ft/mi)
Headwaters to Mancelona Rd.	3	22	7.3
Mancelona Rd. to Cameron Bridge	10.1	50	5.0
Cameron Bridge to M72	11.6	30	2.6
M72 to CCC Bridge	16.9	59	3.5
CCC Bridge to North Sharon Rd.	9.2	31	3.4
Total:	50.8	192	3.8

Table 2. Fish stocked in the Manistee River, Kalkaska County, Michigan, 1910-2019.

Year	Species	Number	Life stage	Strain
1910	Largemouth Bass	1,000	fingerlings	
1934	Arctic Grayling	2,500	yearlings	
1935	Rainbow Trout	6,000	fall fingerlings	
1937	Brook Trout	12,000	fall fingerlings-yearlings	
	Rainbow Trout	53,000	fall fingerlings	
1938	Brook Trout	6,000	adults	
	Rainbow Trout	30,518	fall fingerlings-adults	
1939	Rainbow Trout	45,876	fingerlings-adults	
1940	Rainbow Trout	25,200	fingerlings-yearlings	
1941	Rainbow Trout	12,600	yearlings-adults	
1942	Rainbow Trout	12,425	yearlings-adults	
1943	Rainbow Trout	10,159	yearlings-adults	
1944	Brown Trout	3,300	adults	
	Rainbow Trout	16,250	yearlings-adults	
1945	Brown Trout	1,200	adults	
	Rainbow Trout	22,645	yearlings-adults	
1946	Brown Trout	4,300	adults	
	Rainbow Trout	25,520	yearlings-adults	
1947	Brown Trout	3,100	adults	
	Rainbow Trout	14,365	yearlings-adults	
1948	Brown Trout	13,539	yearlings-adults	
	Rainbow Trout	11,800	yearlings-adults	
1949	Brown Trout	4,427	yearlings-adults	
	Rainbow Trout	20,980	yearlings-adults	
1950	Brown Trout	2,800	yearlings-adults	
	Rainbow Trout	29,834	yearlings-adults	
1951	Brown Trout	8,500	yearlings	
	Rainbow Trout	24,969	yearlings-adults	
1952	Brook Trout	2,000	yearlings	
	Brown Trout	5,926	yearlings-adults	
	Rainbow Trout	26,957	yearlings-adults	
1953	Brown Trout	17,950	yearlings	
	Rainbow Trout	27,046	yearlings-adults	
1954	Brown Trout	600	adults	
	Rainbow Trout	47,428	yearlings-adults	
1955	Rainbow Trout	70,629	yearlings	
1956	Rainbow Trout	96,168	yearlings	

Table 2 continued.

Year	Species	Number	Life stage	Strain
1957	Brown Trout	1,162	fall fingerlings-yearlings	
	Rainbow Trout	83,047	yearlings	
1958	Brown Trout	180	yearlings	
	Rainbow Trout	88,971	yearlings	
1959	Rainbow Trout	83,966	yearlings	
1960	Brown Trout	281	yearlings	
	Rainbow Trout	74,744	yearlings	
1961	Rainbow Trout	60,059	yearlings	
1962	Rainbow Trout	52,200	yearlings	
1963	Brown Trout	7,500	yearlings	
	Rainbow Trout	40,000	yearlings	
1964	Rainbow Trout	44,900	yearlings	
1965	Brown Trout	15,000	yearlings	
	Rainbow Trout	35,200	yearlings	
1966	Brown Trout	55,025	fall fingerlings	
	Rainbow Trout	18,000	adults	
1967	Brown Trout	127,846	fingerlings-adults	
	Rainbow Trout	15,934	yearlings-adults	
1968	Brown Trout	30,000	fall fingerlings	
1969	Brown Trout	33,723	yearlings	
1970	Brown Trout	39,000	yearlings	
	Rainbow Trout	39,158	yearlings-adults	
1971	Brown Trout	30,500	yearlings	
	Rainbow Trout	55,190	yearlings	
1972	Brown Trout	42,224	yearlings-adults	
1973	Brown Trout	37,775	yearlings	
	Rainbow Trout	7,680	yearlings	
	Steelhead	375	adults	
1974	Brown Trout	37,720	yearlings-adults	
	Rainbow Trout	43,495	yearlings	
	Steelhead	375	adults	
1975	Brown Trout	35,100	yearlings	
	Rainbow Trout	59,109	fall fingerlings	
	Steelhead	250	adults	
1976	Brown Trout	32,612	yearlings	
	Rainbow Trout	43,395	fall fingerlings	
1977	Brown Trout	17,550	yearlings	
1978	Brown Trout	27,215	fingerlings-yearlings	
	Rainbow Trout	13,750	yearlings-adults	
1979	Brown Trout	13,500	yearlings	
	Brown Trout	4,287	fall fingerlings	
	Rainbow Trout	8,766	adults	
	Rainbow Trout	60,960	fall fingerlings	
1980	Brown Trout	12,825	yearlings	
	Brown Trout	5,114	fall fingerlings	
	Rainbow Trout	16,945	fall fingerlings	

Table 2 continued.

Year	Species	Number	Life stage	Strain
1981	Brown Trout	13,500	yearlings	Harrietta
	Rainbow Trout	2,000	yearlings	private plant
	Brook Trout	6,000	yearlings	private plant
1982	Brown Trout	11,850	yearlings	Harrietta
	Brown Trout	2,943	unknown	private plant
	Rainbow Trout	5,000	unknown	private plant
	Brook Trout	3,000	unknown	private plant
1983	Brown Trout	24,500	yearlings	Harrietta
	Brown Trout	7,073	fall fingerlings	
	Rainbow Trout	4,700	yearlings	private plant
1984	Brown Trout	24,500	yearlings	Harrietta
	Brown Trout	3,920	yearlings	private plant
	Brown Trout	8,000	fall fingerlings	
	Rainbow Trout	4,774	yearlings	private plant
1985	Brown Trout	17,750	yearlings	Harrietta
	Brown Trout	3,000	fall fingerlings	
	Rainbow Trout	1,076	yearlings	private plant
1986	Brown Trout	15,860	yearlings	Plymouth Rock
	Brown Trout	9,500	fall fingerlings	Plymouth Rock
	Brook Trout	3,750	yearlings	Assinica
	Rainbow Trout	2,565	yearlings	private plant
1987	Arctic Grayling	13,139	yearlings	
	Brown Trout	18,000	yearlings	Plymouth Rock
	Brook Trout	4,500	yearlings	Assinica
1988	Brown Trout	19,500	yearlings	Plymouth Rock
	Brown Trout	5,000	yearlings	Soda Lake
	Brown Trout	5,850	fall fingerlings	
	Brook Trout	1,000	yearlings	Assinica
	Rainbow Trout	3,000	yearlings	private plant
1989	Brown Trout	26,037	yearlings	Plymouth Rock
	Brown Trout	20,400	fall fingerlings	Soda Lake
	Brown Trout	981	yearlings	private plant
	Brook Trout	1,000	yearlings	Maine
	Brook Trout	4,300	yearlings	private plant
	Rainbow Trout	1,500	yearlings	private plant
1990	Brown Trout	23,275	yearlings	Plymouth Rock
	Brown Trout	8,286	fall fingerlings	Plymouth Rock
	Brook Trout	4,500	yearlings	Assinica
	Brook Trout	200	yearlings	private plant
	Rainbow Trout	5,400	yearlings	private plant
1991	Brown Trout	24,500	yearlings	Plymouth Rock
	Brown Trout	600	yearlings	private plant
	Brown Trout	1,980	fall fingerlings	Plymouth Rock
	Brook Trout	5,000	yearlings	Owhi
	Brook Trout	400	yearlings	private plant
1992	Brown Trout	21,940	yearlings	Wild Rose
	Brown Trout	10,443	fall fingerlings	Soda Lake

Table 2 continued.

Year	Species	Number	Life stage	Strain
1992	Brown Trout	1,400	yearlings	private plant
	Brook Trout	4,500	yearlings	Owhi
	Brook Trout	800	yearlings	private plant
1993	Brown Trout	23,760	yearlings	Wild Rose
	Brown Trout	12,049	fall fingerlings	Saint Croix
	Brown Trout	1,300	yearlings	private plant
	Brook Trout	4,500	yearlings	Assinica
	Rainbow Trout	200	yearling	private plant
	Brook Trout	300	yearling	private plant
1994	Brown Trout	24,000	yearlings	Wild Rose
	Brown Trout	625	yearlings	private plant
	Brown Trout	9,862	fall fingerlings	
	Brook Trout	4,300	yearlings	Assinica
1995	Brown Trout	12,879	yearlings	Wild Rose
	Brown Trout	8,601	fall fingerlings	Wild Rose
	Rainbow Trout	100	yearlings	private plant
1996	Brown Trout	14,699	yearlings	Wild Rose
	Brown Trout	10,404	fall fingerlings	Wild Rose
	Brown Trout	300	yearlings	private plant
1997	Brown Trout	7,498	yearlings	Seeforellen
	Brown Trout	7,500	yearlings	Gilchrist Creek
	Brown Trout	9,467	fall fingerlings	Wild Rose
1998	Brown Trout	7,500	yearlings	Gilchrist Creek
	Brown Trout	7,500	yearlings	Seeforellen
	Brown Trout	5,298	fall fingerlings	Wild Rose
1999	Brown Trout	7,500	yearlings	Gilchrist Creek
	Brown Trout	7,500	yearlings	Seeforellen
	Brown Trout	11,876	fall fingerlings	Wild Rose
2000	Brown Trout	7,500	yearlings	Gilchrist Creek
	Brown Trout	7,500	yearlings	Seeforellen
	Brown Trout	10,079	fall fingerlings	Wild Rose
2002	Brown Trout	8,190	fall fingerlings	Wild Rose
2004	Brown Trout	9,344	fall fingerlings	Wild Rose
2007	Brown Trout	15,339	fall fingerlings	Wild Rose
2008	Brown Trout	14,097	fall fingerlings	Wild Rose
2009	Brown Trout	16,044	fall fingerlings	Wild Rose
2010	Brown Trout	15,486	fall fingerlings	Wild Rose
2011	Brown Trout	22,488	fall fingerlings	Wild Rose
2012	Brown Trout	50,000	fall fingerlings	Wild Rose
2013	Brown Trout	9,208	fall fingerlings	Wild Rose
2014	Brown Trout	9,160	fall fingerlings	Wild Rose
2016	Brown Trout	5,012	fall fingerlings	Wild Rose
2017	Brown Trout	18,627	fall fingerlings	Wild Rose
2018	Brown Trout	17,622	fall fingerlings	Wild Rose, Sturgeon River
2019	Brown Trout	10,000	fall fingerlings	Wild Rose

Table 3. Fish stocked in the Manistee River, Crawford County, Michigan, 1901-2019.

Year	Species	Number	Life stage	Strain
1901	Atlantic Salmon	100,000		
1903	Arctic Grayling	100,000		Montana
1904	Arctic Grayling	70,000		Montana
1905	Arctic Grayling	50,000		
1906	Arctic Grayling	70,000		
1913	Brook Trout	40,000	fry	
1914	Brook Trout	30,000	fry	
1934	Brook Trout	29,200	3 mo. - adults	
	Brown Trout	28,000	3 mo.	
	Rainbow Trout	35,000	3-4 mo.	
1935	Brook Trout	10,000	6 mo.	
	Brown Trout	46,000	7 mo.	
	Rainbow Trout	40,552	4 mo.	
1936	Brown Trout	20,550	6 mo.	
	Rainbow Trout	60,000	3 mo.	
1937	Brook Trout	36,000	6-7 mo.	
	Brown Trout	45,000	6 mo.	
	Rainbow Trout	28,200	3-5 mo.	
1938	Brook Trout	31,460	6 mo.	
	Brown Trout	29,360	6-7 mo.	
	Rainbow Trout	15,000	4 mo.	
1939	Brook Trout	55,250	6-8 mo.	
	Brown Trout	26,560	6 mo. - yearlings	
	Rainbow Trout	40,830	4 mo. - yearlings	
1940	Brook Trout	73,400	6-7 mo.	
	Brown Trout	62,300	7 mo. - adults	
	Rainbow Trout	45,500	5 mo. - adults	
1941	Brook Trout	31,000	7 mo - adults	
	Brown Trout	73,575	3 mo - adults	
	Rainbow Trout	31,000	5 mo. - adults	
1942	Brown Trout	75,000	4-6 mo.	
	Rainbow Trout	30,350	3 mo. - adults	
1943	Brown Trout	50,940	2 mo. - adults	
	Rainbow Trout	80,000	2 mo.	
1944	Brook Trout	2,000	adults	
	Brown Trout	2,000	adults	
	Rainbow Trout	1,000	adults	
1945	Brook Trout	1,250	adults	
	Brown Trout	600	adults	
	Rainbow Trout	600	adults	
1946	Brook Trout	3,600	adults	
	Brown Trout	4,000	adults	
	Rainbow Trout	2,550	adults	
1947	Brook Trout	3,300	adults	
	Brown Trout	1,300	adults	
	Rainbow Trout	3,700	adults	

Table 3 continued.

Year	Species	Number	Life stage	Strain
1948	Brook Trout	1,900	adults	
	Brown Trout	3,900	adults	
	Rainbow Trout	4,100	yearlings	
1949	Brook Trout	2,200	yearlings	
	Brown Trout	4,900	yearlings	
	Rainbow Trout	3,700	yearlings	
1950	Brook Trout	3,800	yearlings	
	Brown Trout	2,100	yearlings	
	Rainbow Trout	8,400	yearlings	
1951	Brook Trout	3,600	yearlings	
	Brown Trout	5,900	yearlings	
	Rainbow Trout	6,200	yearlings	
1952	Brook Trout	3,450	yearlings	
	Brown Trout	5,250	yearlings	
	Rainbow Trout	5,250	yearlings	
1953	Brook Trout	3,200	yearlings	
	Brown Trout	9,750	yearlings	
	Rainbow Trout	1,750	yearlings	
1954	Brook Trout	3,700	yearlings	
	Brown Trout	5,900	yearlings	
	Rainbow Trout	11,700	yearlings	
1955	Brook Trout	3,400	legal	
	Brown Trout	3,800	legal	
	Rainbow Trout	17,800	legal	
1956	Brook Trout	3,500	legal	
	Brown Trout	2,800	legal	
	Rainbow Trout	26,600	legal	
1957	Brook Trout	3,500	legal	
	Brown Trout	1,600	legal	
	Rainbow Trout	14,900	legal	
1958	Brook Trout	3,500	legal	
	Brown Trout	100	legal	
	Rainbow Trout	14,200	legal	
1959	Brook Trout	6,300	legal	
	Brown Trout	150	legal	
	Rainbow Trout	11,200	legal	
1960	Brook Trout	3,500	legal	
	Brown Trout	2,400	legal	
	Rainbow Trout	8,800	legal	
1961	Brook Trout	4,500	legal	
	Rainbow Trout	6,000	legal	
1962	Brook Trout	2,050	legal	
	Rainbow Trout	6,000	legal	
1963	Brook Trout	4,500	legal	
	Rainbow Trout	6,000	legal	
1964	Brook Trout	2,700	legal	
	Rainbow Trout	6,000	legal	

Table 3 continued.

Year	Species	Number	Life stage	Strain
1965	Brook Trout	3,176	legal	
1966	Brown Trout	14,000	fall fingerlings	
	Rainbow Trout	5,000	adults	
1967	Brown Trout	171,080	spring fingerlings, yearlings	
	Coho Salmon	2,309	adults	
	Rainbow Trout	5,397	spring fingerlings, adults	
1971	Brown Trout	640	adults	
1972	Brown Trout	8,014	yearlings	
1973	Brown Trout	9,000	yearlings	
	Rainbow Trout	12,800	yearlings	
1974	Brown Trout	8,000	yearlings	
	Rainbow Trout	6,650	yearlings	
	Steelhead	125	adults	
1975	Brown Trout	7,665	yearlings	
	Steelhead	125	adults	
1976	Brown Trout	6,465	yearlings	
	Rainbow Trout	6,666	yearlings	
1977	Brown Trout	7,665	yearlings	
1978	Brown Trout	3,000	yearlings	
1979	Brown Trout	3,000	yearlings	
1980	Brown Trout	2,850	yearlings	
1981	Brown Trout	3,000	yearlings	Harrietta
1982	Brown Trout	3,500	yearlings	Harrietta
1983	Brown Trout	6,000	yearlings	Harrietta
1984	Brown Trout	6,000	yearlings	Harrietta
	Brown Trout	2,232	adults	
	Rainbow Trout	876	adults	
1985	Brown Trout	3,180	yearlings	Harrietta
	Rainbow Trout	924	adults	
1986	Brown Trout	3,840	yearlings	Plymouth Rock
	Rainbow Trout	924	adults	
1987	Arctic Grayling	18,000	yearlings	
	Brown Trout	3,500	yearlings	
1988	Arctic Grayling	9,634	yearlings	
	Brown Trout	6,000	yearlings	Plymouth Rock
1989	Brown Trout	4,904	yearlings	private plant
	Brown Trout	5,187	yearlings	Plymouth Rock
	Brown Trout	12,000	fall fingerlings	Soda Lake
1990	Brown Trout	6,000	yearlings	Plymouth Rock
	Rainbow Trout	3,000	yearlings	Shasta
1991	Brown Trout	6,000	yearlings	Plymouth Rock
1992	Brown Trout	5,760	yearlings	Wild Rose
1993	Brown Trout	5,940	yearlings	Wild Rose
1994	Brown Trout	6,000	yearlings	Wild Rose
1995	Brown Trout	5,100	yearlings	Wild Rose
1996	Brown Trout	6,000	yearlings	Wild Rose
1997	Brown Trout	6,000	yearlings	Seeforellen, Gilchrist Creek

Table 3 continued.

Year	Species	Number	Life stage	Strain
1998	Brown Trout	6,000	yearlings	Seeforellen, Gilchrist Creek
1999	Brown Trout	6,000	yearlings	Seeforellen, Gilchrist Creek
2000	Brown Trout	6,000	yearlings	Seeforellen, Gilchrist Creek

Table 4. Fish stocked in the Manistee River, Otsego County, Michigan, 1901-2019.

Year	Species	Number	Life stage	Strain
1902	Atlantic Salmon	100,000		
1903	Brook Trout	10,000		
1904	Brook Trout	7,500		
1905	Brook Trout	7,500		
1909	Brook Trout	30,000	fry	

Table 5. Presence/absence of fish species in historical fisheries surveys at various locations on the Upper Manistee River between the headwaters and Sharon. Surveys in which trout were the primary focus are not included. Am. = American, N. = Northern, spp. = species.

Species	1958	1966	1967	1968	1969	1970	1987	1995	2000	2001	2004	2010	2014	2016	2017	2018
Am. Brook Lamprey	x	x	x				x			x						x
Black Bullhead			x						x	x						x
Blacknose Dace	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x
Blacknose Shiner								x							x	
Blacksided Darter		x						x	x	x						
Bluntnose Minnow	x															
Bluegill									x	x		x			x	
Brook Stickleback	x			x		x	x	x	x	x	x		x		x	
Brook Trout	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Brown Bullhead										x						
Brown Trout	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Bullhead spp.					x	x										
Burbot	x	x		x	x	x	x	x	x	x				x		
Central Mudminnow	x	x	x	x	x		x	x	x	x	x	x		x	x	x
Chestnut Lamprey	x	x	x				x									
Coho Salmon				x												
Common Shiner	x	x	x	x	x	x	x	x	x	x						
Creek Chub	x	x	x	x	x	x	x	x	x				x	x	x	
Golden Shiner					x			x								
Johnny Darter	x	x	x	x	x	x	x	x	x	x	x			x		
Logperch	x	x	x	x	x	x	x	x	x	x	x	x				
Longnose Dace	x	x					x	x			x			x		
Mottled Sculpin	x	x	x	x	x			x								x
Ninespine Stickleback	x															
N. Brook Lamprey	x															
Northern Pike		x														
N. Redbelly Dace	x							x			x		x		x	
Pearl Dace	x							x								
Pumpkinseed							x	x	x				x	x	x	
Rainbow Trout	x	x	x	x		x	x	x	x	x						
Redside Dace*		x														
Rock Bass						x										
Sculpin spp.	x			x			x	x	x	x	x	x	x	x		
Shorthead Redhorse											x			x		
Slimy Sculpin	x		x	x											x	x
Spottail Shiner							x									
Tiger Trout			x						x				x	x		
White Sucker	x	x	x	x	x	x	x	x	x	x	x	x				x
Yellow Bullhead										x						
Yellow Perch										x						

*Redside Dace have not been documented in the Manistee River watershed. This was likely an identification error.

Table 6. Michigan Department of Natural Resources salmonid population estimates for the Manistee River at Cameron Bridge, 1988-2019. Station length = 1,371 ft, station area = 1.4 acres.

	BKT #/acre	BKT lb/acre	BNT #/acre	BNT lb/acre
1988	596	9.41	688	51.43
1989	498	10.26	894	64.33
1990	598	14.73	938	58.59
1991	658	15.03	862	47.34
1992	733	21.72	562	35.63
1993	865	16.88	580	34.29
1994	657	14.75	519	35.08
1995	672	25.3	791	60.77
1996	442	10.26	804	76.58
1997	737	16.44	758	57.58
1998	704	13.87	943	68.17
1999	394	7.67	1,035	76.09
2000	387	7.87	1,094	83.12
2001	420	8.21	1,356	95.67
2002	309	6.84	1,369	121.76
2003	427	8.04	1,518	85.77
2004	599	10.96	1,492	80.81
2008	487	11.14	1,084	56.08
2009	485	11.26	883	50.19
2010	395	8.99	738	59.97
2014	788	15.2	930	44.39
2017	316	6.87	504	62.94
2018	268	6.05	564	49.35
2019	251	5.67	571	52.66
Average:	528.6	11.8	894.9	62.9

Table 7. Michigan Department of Natural Resources salmonid population estimates for the Manistee River at M-72, 1988-2019. The last year of brown trout stocking was 2000. A new station, 1,000 ft downstream of the bridge (1.0 acres), was surveyed beginning in 2010. The previous station (1,200 ft, 1.8 acres) began below the bridge and ended above the bridge, encompassing two different fishing regulations.

	BKT #/acre	BKT lb/acre	BNT #/acre	BNT lb/acre
1988	693	10.3	45	3.82
1989	537	13.02	176	26.01
1990	386	8.11	58	10.15
1991	506	10.66	76	7.17
1992	550	12.61	121	20.27
1993	846	14.87	66	5.38
1994	546	14.6	65	9.08
1995	755	15.17	73	12.71
1996	1454	27.48	52	6.03
1997	1610	28.54	82	7.23
1998	534	10.78	153	21.34
1999	591	12.09	195	26.75
2000	522	10.84	325	35.66
2001	421	9.35	353	35.38
2010	358	5.92	726	58.56
2016	677	12.6	693	68.24
2019	315	4.25	1,175	49.34

Table 8. Species and number of fish caught per inch class in Michigan Department of Natural Resources electrofishing surveys at the Livingston Lodge site (also known as the "Tree Farm") from 1995-2001. The station was 1,080 feet in length.

Brook Trout inch class	1995	1997	1998	1999	2000	2001
2	121	100	1	92	39	2
3	35	118	54	103	100	140
4	27	22	73	23	26	248
5	33	21	21	43	30	28
6	19	17	57	22	22	14
7	9	4	18	10	10	16
8		3	9	5	3	6
9			1	1	1	3
10	1		2	1		2
12				1		
Total:	245	285	236	301	231	459

Brown Trout inch class	1995	1997	1998	1999	2000	2001
2	2		8	4	2	15
3	4	23	20	30	18	69
4		3	1	5	11	14
6	1		2	5	1	2
7	6	1	6	5	16	7
8	1	1	4	10	15	11
9	2	1	2	14		5
10	2		2	2	5	2
11		1	3	4	8	10
12	3		1	4	2	4
13				5	4	3
14	2		1		4	3
15				2	2	
16				1		1
17		3	1	1		
20		1	1			
Total:	23	34	52	92	88	146

Tiger Trout inch class	1995	1997	1998	1999	2000	2001
3						1
Total:						1

Table 9. Species and number of fish caught per inch class in Michigan Department of Natural Resources electrofishing surveys at the Broadmanor Hunting and Fishing Club site from 1995-2001. The station was 900 feet in length.

Brook Trout inch class	1995	1997	1998	1999	2000	2001
1	9					
2	162	50	115	53	139	116
3	46	110	61	46	237	109
4	3	10	4	4	9	5
5	10	7	11	12		3
6	7	2	9	5	4	4
7	3	4	1	11	3	2
8	2	2	4	7	1	
9	1			5	1	
10		1			3	
Total:	243	186	205	143	397	239

Brown Trout inch class	1995	1997	1998	1999	2000	2001
2	25	4	7	2	13	16
3	37	28	22	100	221	119
4	1	2	6	36	57	25
5	1		5	2	4	
6	3	2	15	10	2	3
7	5	3	17	11	20	10
8	7	1	10	20	10	10
9	4		2	5	7	3
10	4	3	4	5	6	1
11	5	1	8	23	8	
12	4	1	2	5	7	6
13		1	1	2	4	1
14		1	1	5	4	
15			2	3	1	5
16					1	1
17	1	1				1
Total:	97	48	102	229	365	201

Rainbow Trout inch class	1995	1997	1998	1999	2000	2001
2		1	3			
3		7		9		
5						1
7						2
8			1			2
10				1	1	
11				3		
12					1	
Total:		8		13	2	5

Table 10. Species and number of fish caught per inch class in MDNR electrofishing surveys at the Three Mile Bend site from 1995-2001. The station was 582 feet in length.

Brook Trout inch class	1995	1997	1998	1999	2000	2001
1	2			1		
2	45	22	39	38	69	62
3	7	22	14	20	71	50
4		1		2	2	1
5	1	2	12	3	1	9
6		3	3	8	3	7
7		2	1	7	4	2
8	1			1		1
9	1	1				
Total:	57	53	69	80	150	132

Brown Trout inch class	1995	1997	1998	1999	2000	2001
2	7	1	4	2	1	14
3	15	19	17	27	38	58
4	1	11	1	7	24	13
6		2	8	4	1	4
7	5	9	7	15	2	5
8	3	2	4	9	4	5
9		1	1		2	2
10	2			2		
11			2	4	1	
12		1	1		6	1
13	1			1	3	
14				2	2	1
15					1	1
16		1				
Total:	34	47	45	73	85	104

Rainbow Trout inch class	1995	1997	1998	1999	2000	2001
1						2
2	8	2	2	2	1	
3		1		2	2	
7						3
8						1
10			1	1		
Total:	8	3	3	5	3	6

Table 11. Average total weighted length (inches) at age and mean growth index (average growth relative to the state average) for Brook Trout sampled from the Upper Manistee River at the Cameron Bridge index station by electrofishing, 2002-2019. Number of fish aged is given in parentheses. At least five individuals from any given age group must be caught to calculate mean growth index.

Year	Month	Species	Age 0	Age 1	Age 2	Mean Growth Index
2002	August	Brook Trout	3.0 (23)	7.6 (25)	8.9 (3)	+0.1
2003	August	Brook Trout	2.9 (30)	5.6 (31)	10.5 (1)	-0.1
2004	August	Brook Trout	3.1 (28)	5.8 (36)	7.3 (1)	+0.2
2008	August	Brook Trout	3.3 (29)	5.6 (22)	7.7 (9)	-0.2
2009	August	Brook Trout	3.0 (28)	5.9 (29)	7.9 (9)	-0.1
2010	August	Brook Trout	3.1 (26)	5.7 (33)	8.5 (3)	+0.2
2014	August	Brook Trout	3.0 (32)	5.8 (36)	8.3 (3)	+0.1
2017	August	Brook Trout	3.0 (40)	6.1 (22)	8.4 (5)	+0.1
2018	September	Brook Trout	3.1 (28)	6.2 (33)	9.4 (2)	+0.3
2019	September	Brook Trout	3.2 (18)	5.3 (33)	8.9 (6)	+0.1

Table 12. Average total weighted length (inches) at age, and mean growth index (average growth across all ages relative to the state average) for Brown Trout sampled from the Manistee River at the Cameron Bridge index station by electrofishing, 2002-2019. Number of fish aged is given in parentheses. At least five individuals from any given age group must be caught to calculate mean growth index.

Year	Month	Species	Age 0	1	2	3	4	5	6	Mean Growth Index
2002	August	Brown Trout	3.0 (26)	6.4 (34)	9.0 (26)	11.0 (23)	12.6 (16)	14.3 (3)		-0.8
2003	August	Brown Trout	2.9 (31)	6.0 (43)	8.9 (32)	11.1 (26)	14.1 (6)	19.7 (1)		-0.6
2004	August	Brown Trout	3.2 (28)	6.1 (37)	8.6 (36)	11.5 (23)	13.7 (8)			-0.7
2008	August	Brown Trout	3.2 (31)	6.5 (36)	9.4 (26)	11.5 (8)		16.2 (6)	18.5 (2)	-0.6
2009	August	Brown Trout	3.1 (25)	6.3 (42)	9.2 (25)	11.0 (6)	16.8 (3)	18.0 (2)	18.5 (2)	-0.4
2010	August	Brown Trout	3.2 (24)	6.2 (51)	9.4 (44)	12.2 (14)	15.1 (2)	18.1 (4)	19.3 (1)	+0.2
2014	August	Brown Trout	2.9 (25)	6.5 (40)	10.1 (14)	12.1 (3)	16.3 (2)	18.4 (1)	20.1 (2)	+0.3
2017	August	Brown Trout	3.0 (23)	6.7 (49)	10.2 (25)	13.1 (26)	15.9 (6)	22.1 (3)		+0.6
2018	September	Brown Trout	3.4 (31)	6.4 (29)	9.5 (34)	12.8 (12)	15.1 (19)		24.5 (1)	+0.2
2019	September	Brown Trout	2.9 (22)	6.0 (41)	9.3 (34)	13.2 (18)	16.4 (7)	19.8 (4)	24.5 (1)	+0.3

Table 13. Results of habitat evaluations from the Manistee River at the Cameron Bridge index station, 2004, 2010, 2014, and 2017. Cfs = cubic feet per second, sq = square.

	2004	2010	2014	2017
% Riffle	0.0	0.0	0.0	0.0
% Run	100	100	100	82.3
% Pool	0.0	0.0	0.0	17.7
Average width (ft)	45.7	45.2	40.7	47.1
Average depth (ft)	1.56	1.67	1.70	1.77
Max depth (ft)	3.9	3.3	4.3	4.6
Discharge (cfs)	96.8	70.1	68.1	102.0
Woody cover (sq ft)	3,083	1,292	3,681	4,144
Linear wood (ft)	246	294	792	582
Substrate				
% clay	0.0	0.0	0.0	0.0
% detritus/silt	22.7	9.5	11.5	17.2
% sand	39.7	35.9	37.2	37.5
% gravel	29.8	54.6	50.9	43.2
% small cobble	0.0	0.0	0.0	0.0
% large cobble	0.0	0.0	0.0	0.3
% boulder	0.2	0.0	0.0	0.0
% wood	7.4	0.0	0.4	0.5
% island	0.2	0.0	0.0	1.3

Table 14. Manistee River temperature data (°F) from the Cameron Bridge station, 2002-2019.

	2002	2003	2004	2009	2010	2014	2015	2017	2018	2019
January Minimum					34.2		32.3		32.2	32.0
January Average					38.7		37.1		38.0	36.8
January Maximum					42.2		41.4		43.2	41.2
February Minimum					34.0		32.3		34.4	32.6
February Average					39.0		35.9		39.0	37.9
February Maximum					43.2		39.3		45.4	42.7
June Minimum		45.2		46.8	47.7	46.0		47.0	47.8	47.0
June Average		52.0		55.0	55.4	55.1		55.6	55.5	54.4
June Maximum		60.2		65.7	62.8	64.5		64.2	67.2	62.6
July Minimum	50.3	48.4	48.4	48.4	48.8	49.5		50.8	50.7	50.5
July Average	56.0	53.2	53.8	54.8	58.0	54.9		56.3	57.5	57.0
July Maximum	63.4	58.7	60.5	63.0	64.3	63.6		62.7	66.8	63.5
August Minimum	49.1	48.1	46.50	47.2	49.2	48.8		47.9	50.4	48.7
August Average	53.7	53.7	52.4	55.2	57.3	54.7		54.7	56.2	55.1
August Maximum	59.4	59.1	59.2	63.0	64.6	59.9		62.5	63.5	62.4
December Minimum				34.0		35.3		32.4	36.2	
December Average				38.7		39.9		38.5	39.9	
December Maximum				43.0		43.6		44.9	42.9	

Table 15. Average total weighted length (inches) at age and mean growth index (average growth across all ages relative to the state average) for Brook Trout sampled from the Upper Manistee River at the M-72 survey station by electrofishing, 2010-2019. Number of fish aged is given in parentheses. At least five individuals from any given age group must be caught to calculate mean growth index.

			Age			Mean Growth
Year	Month	Species	0	1	2	Index
2010	August	Brook Trout	2.8 (20)	5.4 (26)	8.4 (4)	-0.2
2016	August	Brook Trout	2.8 (29)	5.5 (26)	7.4 (3)	-0.2
2019	July	Brook Trout	2.9 (29)	5.2 (22)		+0.3

Table 16. Average total weighted length (inches) at age and mean growth index (average growth across all ages relative to the state average) for Brown Trout sampled from the Manistee River at the M-72 survey station by electrofishing, 2010-2019. Number of fish aged is given in parentheses. At least five individuals from any given age group must be caught to calculate mean growth index.

Year	Month	Species	Age 0	1	2	3	4	5	6	Mean Growth Index
2010	August	Brown Trout	3.2 (27)	6.7 (37)	9.8 (27)	11.9 (7)	14.7 (4)	19.5 (2)		+0.3
2016	August	Brown Trout	3.4 (30)	7.0 (37)	10.1 (31)	12.4 (5)	15.4 (3)	19.2 (2)	20.7 (3)	+0.5
2019	July	Brown Trout	2.8 (30)	6.5 (35)	9.7 (17)	13.2 (11)	17.2 (5)	20.6 (1)		+1.1

Table 17. Manistee River temperature data (°F) from the M-72 station, 2004, 2010, and 2016.

	2004	2010	2016
June Average		59.8	59.8
June Maximum		69.3	70.5
June Minimum		49.4	48.6
July Average	60.7	63.7	62.6
July Maximum	68.9	71.4	71.3
July Minimum	53.1	51.9	52.7
August Average	58.3	62.4	61.8
August Maximum	67.1	70.9	69.9
August Minimum	49.9	52.0	55.6

Table 18. Manistee River temperature data (°F) from the CCC Bridge State Forest Campground, 2012 and 2016.

	2012	2016
June Average	61.9	60.8
June Maximum	72.5	70.3
June Minimum	49.2	50.8
July Average	65.8	64.2
July Maximum	75.7	72.1
July Minimum	56.3	55.4
August Average	61.5	63.3
August Maximum	71.8	71.3
August Minimum	52.6	57.6

Table 19. Manistee River temperature data (°F) from Mancelona Road, 2017.

	2017
June Average	60.7
June Maximum	72.1
June Minimum	47.1
July Average	61.2
July Maximum	73.0
July Minimum	51.4
August Average	58.9
August Maximum	71.9
August Minimum	47.0

Table 20. MDNR population estimate averages for trout and juvenile salmon from select northern Michigan fixed Status and Trends index stations, 2002-2020.

River	# surveys since 2002	Brown Trout		Brook Trout		Rainbow Trout	Coho Salmon
		#/acre	lbs/acre	#/acre	lbs/acre	#/acre	#/acre
Upper Manistee River at Cameron Bridge*	10	965.3	66.4	432.5	9.1		
Platte River at upper US-31 crossing	10	327.9	54.6			1,774.6	757.7
Pere Marquette River at Baldwin R. confluence	10	242.9	109.0			1,438.9	266.5
Little Manistee River at Johnson's Bridge	10	737.1	96.2			1,540.3	1,134.4
Boardman River at Ranch Rudolf*	10	283.1	29.9	358.6	9.9	16.5	
Bear Creek at Leffew Road	9	41.7	16.02	895.9	24.7	1,525.6	295.3
N. Br. Manistee River Kniss Rd.*	6	5.8	4.1	534.7	28.5		
Au Sable River at Stephan Bridge*	10	1,019.0	98.6	374.8	9.2	595.8	
S. Br. Au Sable River at Smith Bridge*	10	380.7	32.1	469.8	11.1		

* Stream stretch not accessible to Great Lakes migratory fish

Figure 1. The Upper Manistee River, headwaters to the Goose Creek confluence.

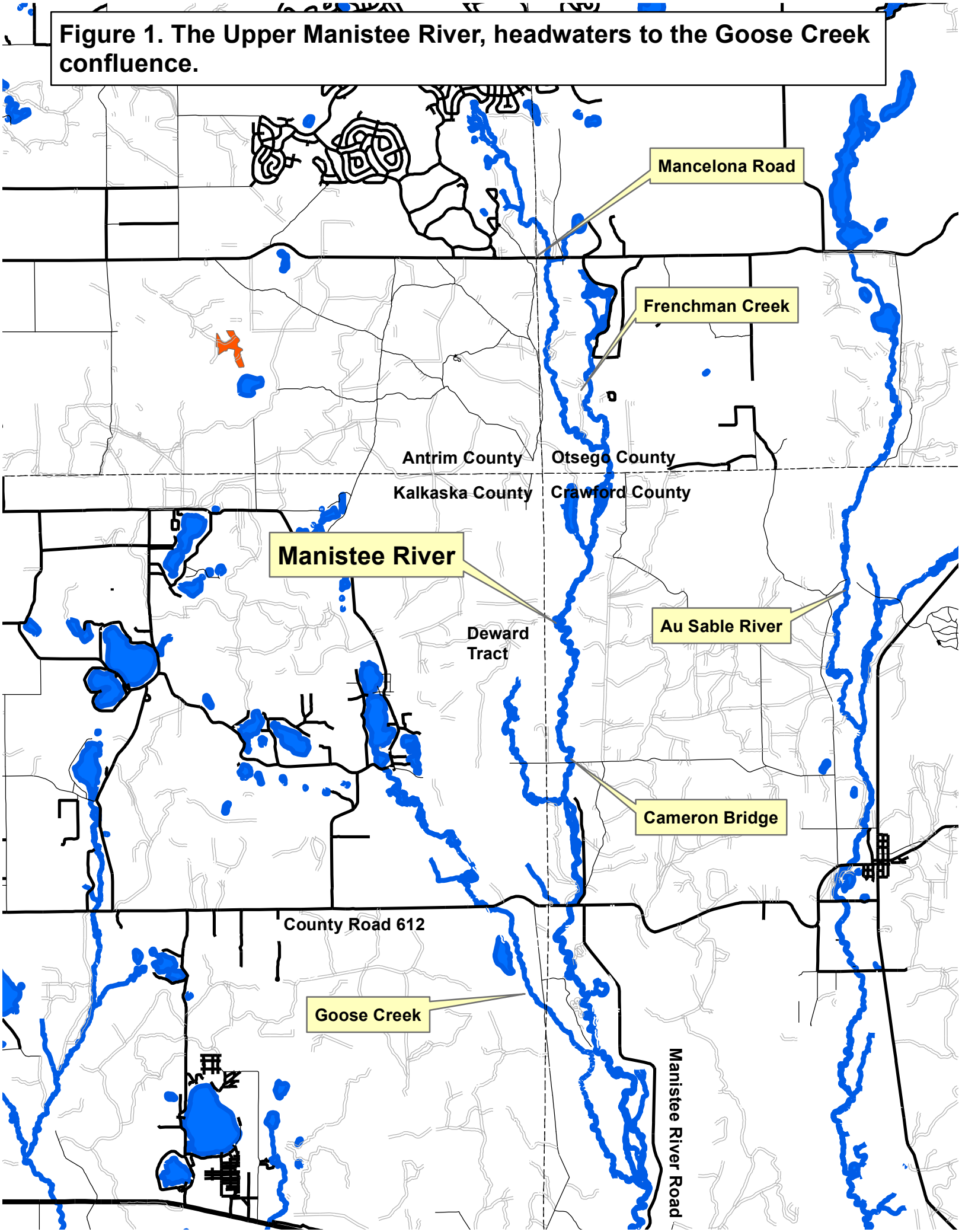


Figure 2. The Upper Manistee River between County Road 612 and CCC Bridge.

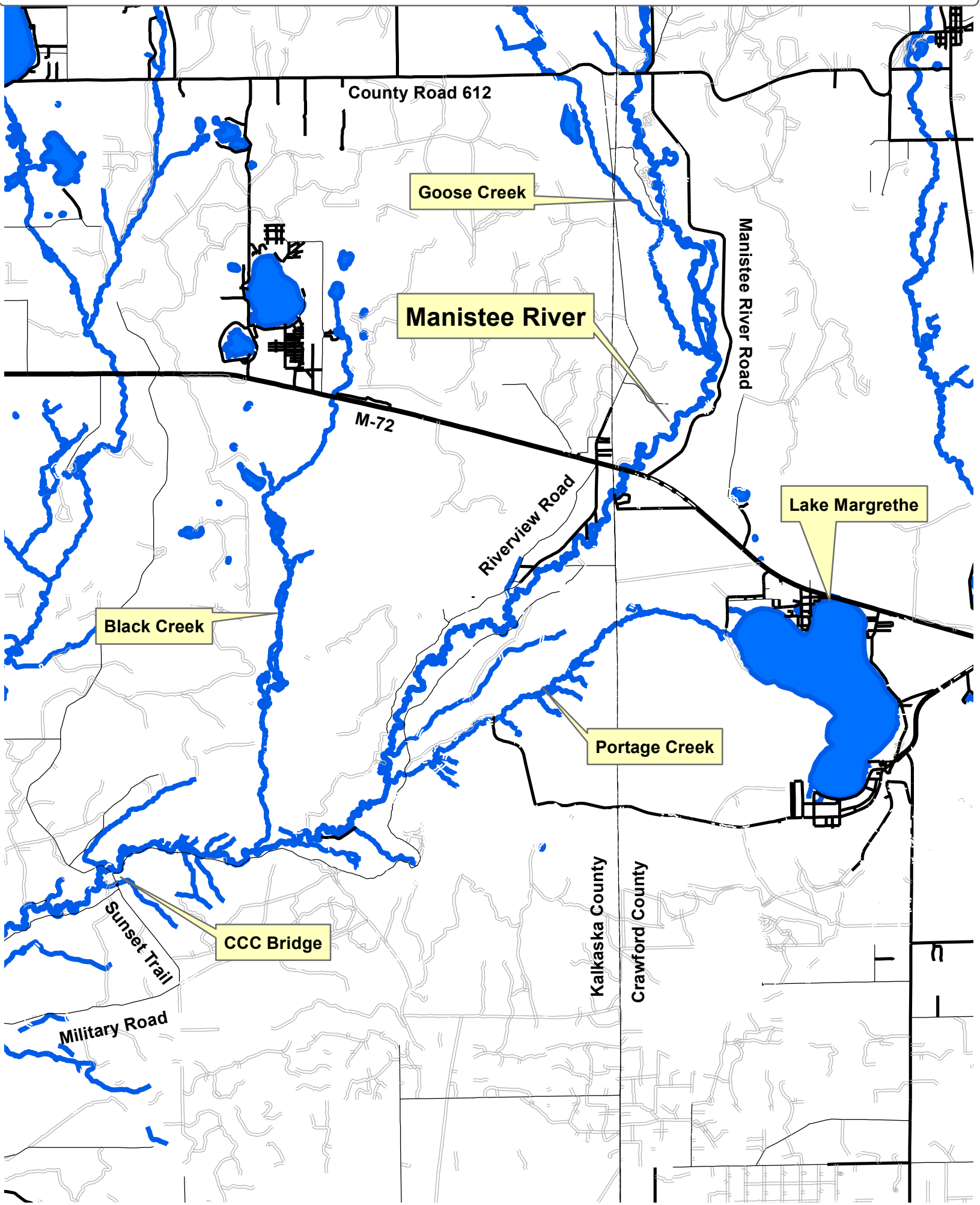
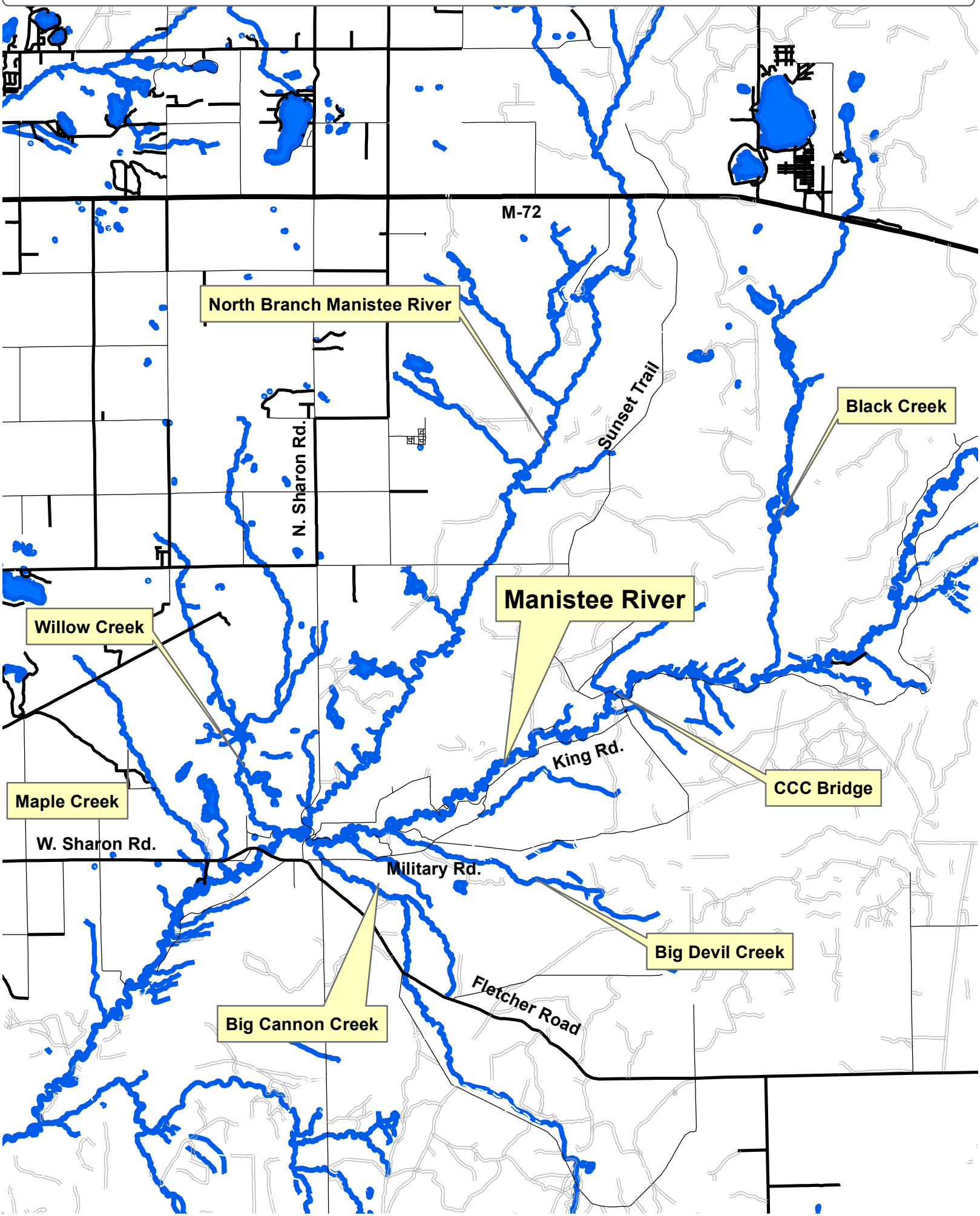


Figure 3. The Upper Manistee River between CCC Bridge and the Sharon area.



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