North Branch Manistee River
Kalkaska County
Manistee River Watershed; last surveyed 2016

Mark A. Tonello, Fisheries Management Biologist

Environment

The North Branch of the Manistee River (hereafter known as the "North Branch") is a tributary to the Manistee River in Kalkaska County, Michigan, between the cities of Kalkaska and Grayling (Fig. 1). The entire subwatershed lies in Kalkaska County. The North Branch begins as the outflow of Manistee Lake, which is located approximately 8 miles northeast of the village of Kalkaska. For the first four miles after it exits Manistee Lake, the North Branch flows in a southerly direction through a series of swamp potholes, beaver ponds, and one inland lake (Post Lake). It is fed by several other swampy tributaries, including the outflow from Grass Lake before being joined by Baker Creek approximately ½ mile north of M-72. At that point, Baker Creek is actually the larger of the two streams. After flowing under M-72, the North Branch flows generally southwest for approximate 17 miles before joining the Manistee River.

The North Branch subwatershed has several named tributaries, including Baker Creek, Flowing Well Creek, Sands Creek, and Morisson and Collar Creeks (both of which are tributaries to Flowing Well Creek, Fig. 1). There are also several unnamed tributaries in the subwatershed. These streams are typically coldwater streams that support self-sustaining populations of Brook Trout. Inland lakes in the North Branch subwatershed include Manistee, Pickerel, Grass, Post, Perch, and Kniss Lakes. Manistee Lake in particular is an excellent fishing lake (Tonello 2015b). Both Manistee and Pickerel Lakes are stocked with Walleye by MDNR.

The highest elevations found in the North Branch watershed are glacial moraines to the west of Manistee Lake (approximately 1,370 feet) and to the east of Pickerel Lake (approximately 1,420 feet). The elevation of Manistee Lake is approximately 1,189 feet, while Pickerel Lake sits at approximately 1,212 feet. The confluence of the North Branch with the Manistee River is at approximately 1,040 feet, so from its origins at Manistee Lake to the confluence, the North Branch drops approximately 172 feet over its 22.5 miles, for an average gradient of 7.6 feet per mile. This gradient is average for the Manistee River watershed. While the Pine River (another Manistee River tributary) gradient is much higher at 15 feet per mile, other reaches of the Manistee River have lower gradient (Rozich 1998). Also, according to Rozich (1998), the North Branch has an average discharge of about 26.4 cubic feet per second (cfs), although the site of that measurement is unknown. Measurements at the Kniss Road crossing have ranged from 23.0 to 90.0 cfs, while measurements taken at the Mecum Road crossing have ranged from 18.2 to 125.0 cfs (MDNR files, Lipsey 2012; Lipsey 2016; Chambers 2017). No discharge measurements are known to have been taken further downstream near the confluence with the Manistee River.

The landscape that forms the North Branch watershed is relatively undeveloped. Only 6% of the subwatershed is classified as "developed", while another 2% classified as "agriculture" (Lipsey 2016). The remainder is primarily forested or wetlands. Much of the subwatershed lies in State ownership as State forest land, although there are some private parcels interspersed. Much of the watershed is

remote and inaccessible due to the low, wetlands terrain that dominates much of the subwatershed. Tag alder is very common throughout the subwatershed. Where there is higher ground, forests consisting of aspen, white pine, and northern hardwoods are present. Beaver dams and their resulting impoundments are common on both the North Branch and its tributaries.

The North Branch is a State-designated Natural River, as it was included when the Upper Manistee River was designated in 2004. Natural Rivers designation consists of zoning that is designed to protect the natural character of a river. The North Branch and its tributaries are also Designated Trout Streams (Fisheries Order 210). The North Branch is classified as a top quality trout mainstream, while its tributaries are top quality trout feeder streams (Anonymous 2000). The North Branch and all tributaries are regulated as Type 1 trout streams, which means that they can be fished from the last Saturday in April through September 30. The minimum size limits are 7 inches for Brook Trout, 8 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.

The reach of the North Branch from Mecum Road to the mouth is considered a "Blue Ribbon Trout Stream" by MDNR. The Blue Ribbon designation is reserved for streams that are able to support stocks of wild, resident trout, have the physical characteristics to permit fly casting but be shallow enough to wade, produce diverse insect life and good fly hatches, have excellent water quality, and have earned a reputation for providing an excellent trout fishing experience.

History

Historical information regarding the North Branch is sparse. This is likely due to the relatively undeveloped, isolated, and swampy nature of the subwatershed. Anglers were (and still are) drawn to the larger, more easily fished waters of the mainstem Manistee and Au Sable Rivers, which are nearby.

Although there are no records of the original fish community of the North Branch, the Arctic Grayling was likely the only native salmonid inhabitant of the river. Exactly when the Arctic Grayling was extirpated from the North Branch is unknown. Exactly why they disappeared is also unclear, but overharvest and habitat degradation during the logging era may have played a part. By 1900 or shortly thereafter, Arctic Grayling were extirpated from all streams in the lower peninsula of Michigan (Vincent 1962).

The first known fish stocking on the North Branch occurred in 1934 when Brook and Rainbow Trout were stocked by the Michigan Department of Conservation (MDOC; the precursor to today's MDNR; Table 1). It is highly likely that earlier stockings occurred but were not recorded. Brook Trout were first noted as present in the Upper Manistee River watershed around 1900 (Vincent 1962), so it is likely they were in the North Branch of the Manistee River at that time as well. Brook and Rainbow Trout were regularly stocked by the MDOC from 1943 through 1967. No stocking has been conducted by the State of Michigan since then.

The largest human-caused impact on the subwatershed came from the Flowing Well Trout Farm (FWTF). The FWTF was developed in the mid-1900s. The land on which the FWTF was built was originally State-owned, but was then traded to its original owner, Pierce Stocking, for some of the land that eventually became the Sleeping Bear Dunes National Lakeshore. Numerous dams, raceways,

rearing ponds, and artificial stream channels were constructed over the years of its operation. Both Flowing Well Creek and the North Branch were heavily impacted by the FWTF. In the late 1990s, FWTF was infected with Whirling Disease, making it economically unfeasible to operate. In 2002, the facility was closed. Then in 2009, the 1,720 acres that made up the majority of the FWTF was reacquired by the State of Michigan. The Grand Traverse Regional Land Conservancy assisted with the re-acquisition effort.

There were at least twelve different dams and water diversion structures on the FWTF property. In a cooperative project spearheaded by the Conservation Resource Alliance (CRA), funding was raised from multiple sources to restore the streams on the Flowing Well tract to free-flowing condition. The dam removal work was completed mostly during the summers of 2010 and 2011. Numerous dams were removed, and the streams were returned to free-flowing condition. The old raceways were buried. Further site restoration work has continued occasionally since then, including woody debris installation and beaver dam removal. Prominent partners and funders of the project included the National Fish and Wildlife Foundation, the US Fish and Wildlife Service, the FishAmerica Foundation, Trout Unlimited, the US Department of Agriculture, the Great Lakes Restoration Initiative, the Trout and Salmon Foundation, and the DTE Energy Foundation.

Although there are few road/stream crossings in the North Branch subwatershed, there were some that were degrading the North Branch. For many years, the North Sharon Road culvert was severely undersized, creating a "fire hose effect" downstream of the crossing. This caused erosion and unnatural stream channel characteristics. In 2000, the culvert was replaced with a timber bridge that no long longer constricts the stream channel. The Mecum Road crossing was also historically one of the most environmentally challenged road/stream crossings in the entire Manistee River watershed. The crossing consisted of five different tubes that were mostly rendered ineffective due to sand. It was responsible for impounding water and degrading the habitat in a significant reach of the North Branch of the Manistee River. It was replaced with an appropriately spanned timber bridge in the fall of 2011. Both of these important projects were completed by the Kalkaska County Road Commission with funding support from CRA and MDNR Fisheries Division (through the use of Consumers Energy Habitat Improvement Funds), among others. Currently, the Kniss Road crossing is unsafe for vehicular traffic and therefore closed. There are no imminent plans for replacing this crossing due to a lack of funding (John Rogers, Kalkaska County Road Commission, personal communication).

Historical Fisheries, Habitat, and Temperature Surveys

Historically, the fish populations of the North Branch were rarely surveyed. One-pass electrofishing surveys were conducted by the MDOC in various locations in 1958, 1966, and 1971 (Table 2). In all but one of those surveys, Brook Trout were the only salmonid species collected. The exception was the collection of several juvenile Rainbow Trout at M-72 in the 1958 survey. Brown Trout were not caught in historical surveys of the North Branch. Other fish species encountered over the years included Northern Redbelly Dace, Pearl Dace, Bluntnose Minnow, Sculpin, American Brook Lamprey, Creek Chub, Central Mudminnow, Blacknose Dace, White Sucker, Burbot, Common Shiner, Johnny Darter, Logperch, Finescale Dace, Brassy Minnow, and Chestnut Lamprey. The Michigan Department of Environmental Quality (MDEQ) conducted a fisheries survey in 1999 at Kniss Road (Walker, 2004). One new species encountered during that survey was Blackside Darter (Table 2).

MDNR conducted fisheries surveys on the North Branch of the Manistee River in 2003 as part of an inventory of all Upper Manistee River tributaries (Tonello 2015a; Table 2). One pass electrofishing surveys were conducted at M-72 (backpack shocker with one probe), and Kniss and North Sharon Roads (tow barge with three probes). While Brook Trout were present in good numbers at all three sites, the Kniss Road site offered the best Brook Trout population, with 85 Brook Trout caught in 600' of stream. Of those, 34 were larger than eight inches, with the largest measuring 14 inches in length. One 8-inch Brown Trout was also caught at Kniss Road. This was the first official record of Brown Trout in the North Branch of the Manistee River. In addition, a number of Brown Trout were later captured at the N. Sharon Road site. Another new species encountered in the 2003 surveys included Northern Hog Sucker (at the North Sharon and Kniss Road sites).

Beginning in 2002, an index station was established at Mecum Road as a Fixed Site in the Stream Status and Trends Program that was implemented by MDNR Fisheries Division. The station began at the bridge and proceeded upstream for 1000 feet. Per the protocol of the program (Wills et al. 2011), Fixed Sites are to be sampled on a three years on/three years off sampling regime. The fish sampling involves mark-recapture population estimates for trout 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 on the marking run. Also, as much as possible in the three "on" years, continuous recording temperature monitors are to be placed in the stretch, and habitat data is to be collected in one of the three sampling years.

The Mecum Road station was sampled for fish from 2002-2004 (Tonello 2015a), and was again sampled in 2008 (Tables 3 and 4). Habitat and temperature sampling was also conducted in several other years (Tables 5 and 6). However, during the marking run of the 2008 fisheries survey effort, only two Brook Trout were caught. Because trout numbers were well below the threshold needed to calculate a population estimate, a recapture effort was not conducted. It was noted that the habitat within the reach had changed dramatically since 2004. There was more sand and silt throughout the station, and all of the deeper holes that formerly held trout were filled in. There were numerous different species of aquatic macrophytes in the stretch, and it was noted that the stretch resembled more of an impoundment than a stream. Also, numerous northern pike were present within the reach. During the 2002-2004 surveys, the occasional northern pike was observed in the catch, but in 2008 they were much more abundant. Therefore, in 2009, a new Status and Trends Fixed Site was established at the Kniss Road crossing. Kniss Road is located several miles upstream of the Mecum Road crossing. The Kniss Road station has since been sampled in 2010 and 2014-2016 (Tables 7 and 8). Habitat and temperature sampling has also been conducted in multiple years (Tables 9 and 10).

The Mecum Road crossing was replaced with a timber bridge in 2011. By the summer of 2014, the conditions upstream of the crossing had improved markedly. The impoundment caused by the old, five-tube crossing had disappeared. In 2014 a tow-barge electrofishing survey was conducted to investigate if the fish community had changed due to the improvement in habitat. The survey was a one-pass survey in which approximately 500 feet (half of the original station) was shocked. In this short survey, the researchers caught 19 Brook Trout from 5 to 12 inches, and one 9-inch Brown Trout. The results of the survey confirmed that the road crossing replacement had indeed improved conditions for salmonids in the North Branch.

As part of the 1999 MDEQ survey (Walker 2004), invertebrates were studied at the Kniss Road and M-72 crossings, with both stations receiving a Macroinvertebrate Community Rating of "Excellent". Also as part of the 1999 MDEQ survey, stream habitat quality was assessed at the Sharon Road crossing, at the Mecum Road crossing, and both upstream and downstream of the Kniss Road crossing. All but one station received a habitat rating of "Good (slightly impaired)". The Mecum Road station was the exception, receiving a rating of "Fair (moderately impaired).

In 2004, MDEQ conducted habitat sampling at the Kniss and Mecum Road crossings, and also conducted invertebrate sampling at the Kniss Road crossing (Chambers 2017). The Kniss Road crossing earned a rating of "Excellent", while the Mecum Road crossing earned a rating of "Good" (slightly impaired). The invertebrate populations at the Kniss Road station earned a rating of "Excellent". Flow measurements were recorded as 90 cfs at Kniss Road and 125.12 cfs at Mecum Road. These are the highest flow measurements ever recorded for the North Branch. Why they were so high compared to other measurements conducted since then is unknown.

MDEQ conducted invertebrate and habitat sampling at the M-72 crossing in 2009 (Lipsey 2012). At this site, the habitat received a rating of "Good" (slightly impaired), while the invertebrate populations received a rating of "Excellent". During this 2009 survey, the discharge at the M-72 crossing was recorded as 24 cfs. Another round of habitat and invertebrate sampling was conducted by MDEQ in 2014 (Lipsey 2016). Two sites were studied- the Kniss road crossing and the Mecum Road crossing. The habitat ratings at both sites were "Good" (slightly impaired), while the invertebrate population was rated as "Excellent" at both sites. Flow data was taken on the same day at both sites. At Kniss Road, the flow was recorded as 28.8 cfs, while at Mecum road it was 54.1 cfs.

Current Status

The most recent MDNR fisheries surveys of the North Branch were conducted in the summer of 2016. Population estimates were conducted at both the Mecum Road (Table 3) and Kniss Road stations (Table 7). The Kniss Road survey was a continuation of the Status and Trends program (with 2016 being the third year of the three year sampling cycle). The Mecum Road survey was a discretionary survey to assess the results of the road crossing replacement on the salmonid populations of that reach. The Mecum Road survey was conducted on July 18 and 19, while habitat assessment was conducted on July 20, 2016 (Table 3). Age and growth comparison data for the Mecum Road surveys is in Table 4, while age and growth comparison data for the Kniss Road surveys is in Table 8. The habitat evaluation portion of the Kniss Road Status and Trends survey was conducted in the summer of 2014 (Table 9).

Additional temperature data was collected in the summer of 2017, at the old FWTF dam site (Table 11), and at the North Sharon Road crossing (Table 12).

Analysis and Discussion

The 2016 fisheries surveys of the North Branch showed robust populations of Brook Trout, with smaller numbers of Brown Trout present as well (Tables 3 and 7). From a visual standpoint, the habitat at the Mecum Road station has greatly improved since the Mecum Road crossing was replaced.

Particularly just upstream of the new bridge, the stream has returned to a riverine state, as opposed to the impounded state it was in prior to removal of the old crossing. Temperature monitoring of the river (Tables 6, 10-12) showed that the North Branch continues to have cold temperatures that make the stream suitable for a robust, self-sustaining Brook Trout population.

As a self-sustaining trout stream, the North Branch is a very valuable resource. The North Branch is somewhat unique among Michigan trout streams in that it is dominated by Brook Trout. In many Michigan trout streams, Brown Trout tend to outcompete Brook Trout. While Brown Trout are present in low numbers in the North Branch, Brook Trout are numerically dominant. In addition, the North Branch provides the potential for older, larger Brook Trout that other streams typically do not provide. Most surveys of the North Branch have produced Brook Trout in excess of 10 inches that are age-2 or age-3 (Tables 4 and 8). These fish are very rare in other nearby rivers like the Upper Manistee or Boardman (Tonello 2015c; Hettinger 2017). In those rivers, the vast majority of the Brook Trout survive only to age-1 and rarely exceed 9 inches. This makes the North Branch a very valuable trout stream, in that it offers anglers the opportunity to target larger, older Brook Trout that are not common in many other Michigan trout streams.

Recent habitat improvement projects on the North Branch have been very successful. The FWTF project removed numerous small dams in the watershed, resulting in improved fish passage and lowered water temperatures. The Mecum Road crossing removal project successfully restored a significant reach of the North Branch upstream of the crossing. The installation of a timber bridge that spans the channel allowed the stream to flow and function normally, instead of the impounded condition created by the previous five-tube crossing.

Management Direction

In general, the North Branch watershed is relatively intact and healthy. It hosts self-sustaining populations of Brook Trout and Brown Trout. The North Branch has remained a high-quality cold-water 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. Extensive wetlands form much of the North Branch watershed. Therefore, the primary goal for the North Branch watershed should be protection. Wetlands are critical to the continued health of the watershed. Future riparian development and wetland loss may result in deterioration of the water quality and aquatic habitat. In particular, wetland loss and increasing impervious surfaces in the watershed could lead to more surface runoff, resulting in increased flashiness and increased summer water temperatures, potentially making the watershed inhospitable for salmonids. The State of Michigan's Natural Rivers designation currently helps protect the North Branch from ecologically unwise land-use practices.

Although the North Branch is relatively intact and healthy, there are several issues that should be considered. The first is the prominence of beaver in the watershed, and the dams they create. While beaver are a natural part of the northern Michigan landscape, in some cases they can become overpopulated. When this happens, excessive dam building can negatively impact trout streams by elevating water temperatures and preventing fish passage. An effort should be made to determine the carrying capacity and appropriate number of beaver dams on a coldwater, self-sustaining trout stream like the North Branch. Problem dams should also be removed.

Another issue on the North Branch is that of tag alder overgrowth. In the Kniss Road to Mecum Road reach, the tag alder growth has reached the point where the river has become impassable for canoes or kayaks. Walls of tag alders are growing mid-stream, making it virtually impossible for watercraft to proceed downstream. Therefore, a project should be conducted in which tag alders are thinned and removed from the stream channel. At minimum, the stream channel should be cleared enough to allow the public to navigate the stream for hunting, fishing, and trapping.

Although the Kniss Road crossing currently has minimal negative impact to the North Branch, it will need to be replaced at some point or removed and the site restored. Due to deterioration of the bridge, it is currently closed to vehicular traffic. Regardless of what option is chosen, MDNR, CRA, the Upper Manistee Restoration Committee, and other resource-minded groups should continue to communicate and work with the Kalkaska County Road Commission regarding this crossing. Especially if the removal option is chosen, funding for the project should be sought by MDNR and others.

The Kniss Road index station on the North Branch should continue to be surveyed on a three-year rotation per Status & Trends Fixed Stream protocol (Wills et al. 2011). Salmonid population estimates, habitat, temperature, and non-game fish data should be collected according to the protocol. The Mecum Road index station should be surveyed as frequently as time and workloads allow, with population estimates conducted each time. Other less comprehensive fisheries surveys should be conducted whenever possible at other stations throughout the watershed, including the tributaries. Also, temperature data should be collected periodically at multiple sites within the watershed.

The North Branch should be considered as a potential candidate for Arctic Grayling reintroduction. The State of Michigan and the Little River Band of Ottawa Indians, with a number of other partners, have undertaken an initiative to reintroduce Arctic Grayling to Michigan waters where they once lived (Anonymous 2017). The North Branch possesses a number of attributes which should make it a potential candidate for Arctic Grayling reintroduction, including cold stream temperatures and low numbers of Brown Trout.

References

Anonymous. 2000. Michigan stream classification: 1967 system. Chapter 20 in Schneider, James C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

Anonymous, 2017. Michigan's Arctic Grayling Initiative Action Plan. Michigan Arctic Grayling Initiative, Lansing.

Chambers, A. 2017. Biological and water chemistry surveys of selected stations in the Manistee River watershed in Crawford, Kalkaska, Missaukee, Lake, Manistee, and Wexford Counties, Michigan, June-August 2004. Surface Water Quality Division, Michigan Department of Environmental Quality, Lansing. Report No. MI/DEQ/WRD-17/027.

Hettinger, H. L. 2017. Boardman River at Brown Bridge 2016 Fisheries Survey. Michigan Department of Natural Resources, Traverse City.

Lipsey, T. 2012. Biological and Water Chemistry Surveys Of Selected Stations in the Manistee, Little Manistee, and Big Sable River Watersheds; Grand Traverse, Kalkaska, Lake, Manistee, Mason, Osceola, and Wexford Counties, Michigan; June and July, 2009. Surface Water Quality Division, Michigan Department of Environmental Quality, Lansing. Report No. MI/DNRE/WB-10/016.

Lipsey, T. 2016. Biological and Water Chemistry Surveys of Selected Stations in the Manistee River Watershed in Antrim, Crawford, Grand Traverse, Kalkaska, Missaukee, Lake, Manistee, Mason, Osceola, Otsego, and Wexford Counties, Michigan June-August 2014. Surface Water Quality Division, Michigan Department of Environmental Quality, Lansing. Report No. MI/DEQ/WRD-16/033.

Rozich, T. J. 1998. Manistee River Assessment. Michigan Department of Natural Resources, Fisheries Division, Special Report Number 21. Ann Arbor, MI.

Tonello, M. A. 2015a. Fisheries Survey Report: North Branch Manistee River. Michigan Department of Natural Resources, Cadillac.

Tonello, M. A. 2015b. Status of the Fishery Resource Report: Manistee Lake, Manistee County. Michigan Department of Natural Resources, Lansing.

Tonello, M. A. 2015c. Upper Manistee River 1988-2014 Fisheries Surveys. Michigan Department of Natural Resources, Cadillac.

Vincent, R. E. 1962. Biogeographical and ecological factors contributing to the decline of the arctic grayling, Thymallus arcticus pallas, in Michigan and Montana. Ph.D. Dissertation, University of Michigan, Ann Arbor.

Walker, B. R. 2004. A biological survey of the Upper Manistee River and selected tributaries. Michigan Department of Environmental Quality Staff Report #04/017, Lansing, MI.

Wills, T. C., T. G. Zorn, A. J. Nuhfer, and D. M. Infante. 2011. Stream Status and Trends Program sampling protocols. Chapter 26 in Manual of fisheries survey methods. Michigan Department of Natural Resources, Fisheries internal document, Ann Arbor.

Fig. 1. North Branch Manistee River, Kalkaska County, Michigan.

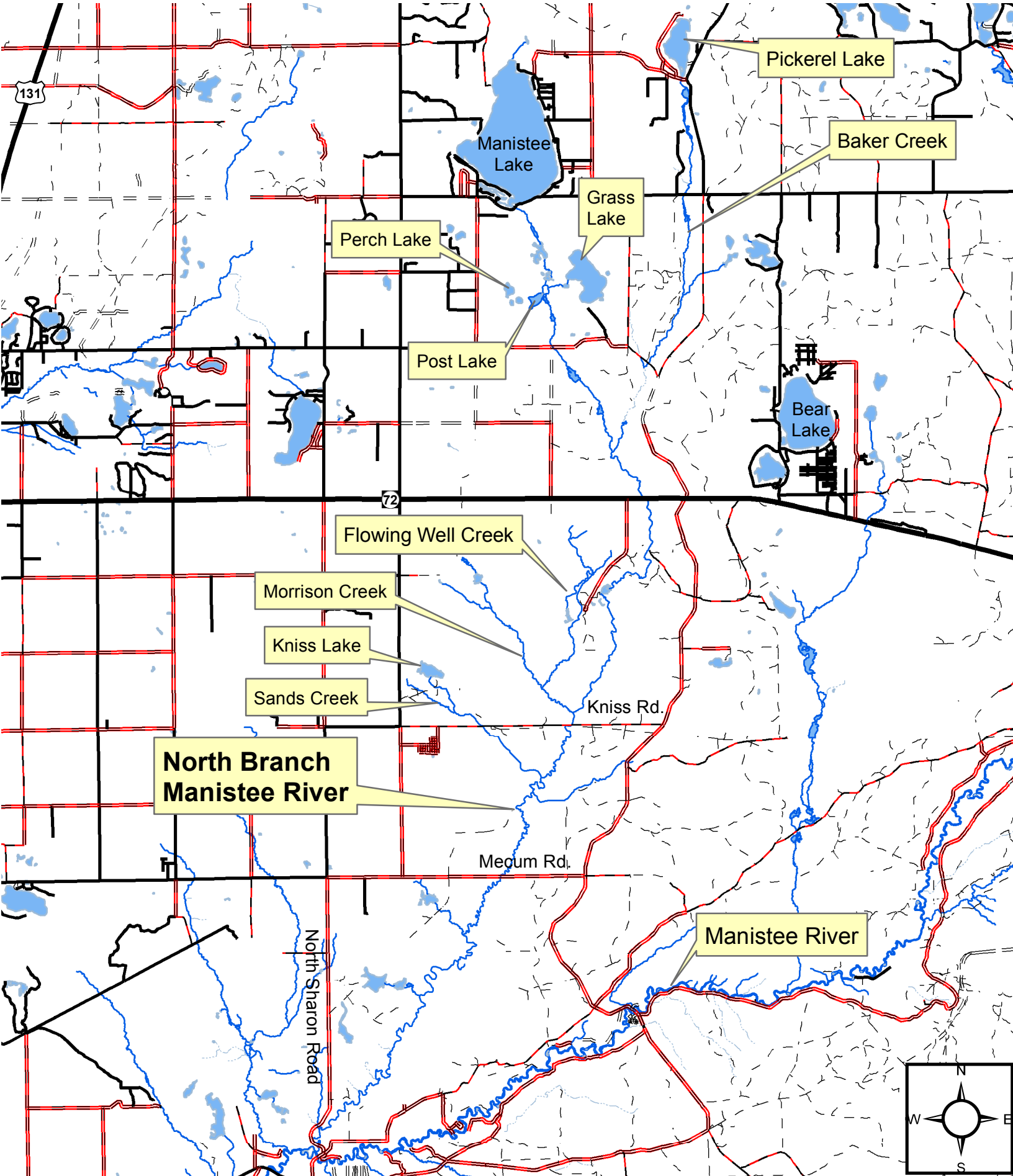

Table 1. Fish stocked in the North Branch Manistee River, Kalkaska County.

Year	Species	Number	Life stage	Strain
1934	Brook Trout	8,000	8 mo.	
	Rainbow Trout	30,000	2 mo.	
1935	Rainbow Trout	6,000	8 mo.	
1936	Brook Trout	7,000	8 mo.	
	Rainbow Trout	88,000	2-4 mo.	
1937	Brook Trout	3,000	8 mo.	
	Rainbow Trout	9,500	6 mo. - yearlings	
1938	Brook Trout	8,000	9 mo. - adults	
	Rainbow Trout	9,000	7 mo. - adults	
1939	Brook Trout	6,100	10 mo. - adults	
	Rainbow Trout	28,000	4 mo. - adults	
1940	Brook Trout	15,052	yearlings	
	Rainbow Trout	1,000	yearlings	
1941	Brook Trout	26,100	5 mo. - yearlings	
1942	Brook Trout	2,950	yearlings	
1943	Brook Trout	2,350	yearlings	
1944	Brook Trout	1,400	yearlings	
1945	Brook Trout	2,775	18 mo. - 2 yr.	
1946	Brook Trout	2,900	16 mo. - 27 mo.	
1947	Brook Trout	5,500	yearlings	
	Rainbow Trout	3,000	yearlings - adults	
1948	Rainbow Trout	1,700	yearlings	
1949	Brook Trout	1,100	yearlings	
1950	Rainbow Trout	2,350	adults	
1951	Brook Trout	700	yearlings	
	Rainbow Trout	1,500	yearlings	
1952	Brook Trout	2,100	yearlings	
1953	Brook Trout	400	yearlings	
	Rainbow Trout	400	yearlings	
1966	Brown Trout	3,000	fall fingerlings	
1967	Brook Trout	3,000	spring fingerlings	

Table 2. Presence/absence of fish species in historical fisheries surveys at various locations on the North Branch of the Manistee River.

Species	1958	1966	1971	2002	2003	2004	2009	2014	2015	2016
American Brook Lamprey	x	x								
Blacknose Dace	x	x		x	x	x	x	x	x	x
Blacknose Shiner	x								x	
Blackside Darter				x	x	x	x			x
Bluntnose Minnow		x								
Brassy Minnow	x									
Brook Stickleback				x		x	x		x	x
Brook Trout	x	x	x	x	x	x	x	x	x	x
Brown Trout					x			x	x	x
Burbot	x	x		x	x		x		x	x
Central Mudminnow	x	x		x	x		x	x	x	x
Chestnut Lamprey	x	x								
Common Shiner	x	x		x	x	x	x	x	x	x
Creek Chub	x	x		x	x	x	x		x	x
Finescale Dace	x									x
Golden Shiner								x		
Horneyhead Chub					x					
Johnny Darter	x	x		x	x	x	x	x	x	x
Logperch	x	x		x	x		x		x	x
Longnose Dace									x	
Mottled Sculpin	x	x		x		x				x
Northern Hog Sucker					x					
Northern Pike				x			x			x
Northern Redbelly Dace	x	x		x			x		x	
Pearl Dace	x	x							x	x
Rainbow Trout	x									
River Chub				x						
Sculpin spp.					x		x	x	x	
White Sucker	x	x		x	x	x	x	x	x	x
Yellow Perch				x	x		x			

Table 3. 2002-2016 MDNR population estimates from the North Branch Manistee River at the Mecum Road index station (1,000 feet upstream, 0.46 acres).

	BKT #/acre	BKT lb/acre	BNT #/acre	BNT lb/acre
2002	168	21.78		
2003	91	13.11		
2004	85	18.07	*	*
2008	Only caught two Brook Trout in the survey, did not recap.			
2014	Did the first half of station, one run for investigatory purposes			
2016	227	23.02	13	6.52

*Also caught four BNT from 8-10" on the marking run, none caught on recap run

Table 4. Average total weighted length (inches) at age, and growth relative to the state average, for fish sampled from the North Branch Manistee River at the Mecum Road index station by electrofishing, 2002-2016. Number of fish aged is given in parenthesis. At least five individuals from any given age group must be caught to make statistical inferences regarding growth.

			Age						Mean Growth
Year	Month	Species	0	I	II	III	IV	V	Index
2002	August	Brook Trout	2.6 (9)	7.1 (33)	9.1 (5)				+0.6
2003	August	Brook Trout	2.9 (7)	7.1 (23)	10.1 (3)				+0.6
2004	August	Brook Trout	3.3 (11)	8.5 (14)	11.5 (5)				+2.1
2004	August	Brown trout		8.7 (2)	10.4 (1)	10.9 (1)			--
2016	July	Brook Trout	2.7 (12)	5.3 (50)	10.2 (2)				+1.4
2016	July	Brown trout		7.9 (3)	11.6 (2)	15.0 (1)			--

Table 5. MDNR habitat evaluation from the North Branch Manistee River at the Mecum Road Index Station, 2004, 2008, and 2016.

	2004	2008	2016
% Riffle	0.0	0.0	0.0
% Run	100	100	84.6
% Pool	0.0	0.0	15.4
Average width (ft)	38.9	32.6	39.5
Average depth (ft)	1.4	0.9	1.1
Max depth (ft)	4.0	2.6	3.0
Discharge (cfs)	40.8	18.2	30.6
Woody cover (sq ft)	919	1,750	1,584
Linear wood (ft)	468	384	528
Substrate			
clay	0.4%	0.0%	0.0%
detritus/silt	39.8%	22.7%	51.8%
sand	59.0%	74.7%	45.1%
gravel	0.0%	0.0%	0.0%
small cobble	0.0%	0.0%	0.0%
large cobble	0.0%	0.0%	0.0%
boulder	0.0%	0.0%	0.0%
wood	0.0%	0.0%	0.8%
island	0.8%	2.3%	2.4%

Table 6. North Branch Manistee River temperature data (degrees F) collected by MDNR, Mecum Road index station, 2003-2004, and 2012.

	2003 (upstream end of station)	2003 (downstream end of station)	2004 (upstream end of station)	2012 (downstream end of station)
January Average			36.3	
January Minimum			32.8	
January Maximum			42.0	
February Average			38.4	
February Minimum			32.7	
February Maximum			45.6	
June Average	54.3	60.1		61.3
June Minimum	45.4	47.2		50.4
June Maximum	65.0	75.2		68.7
July Average	56.3	63.5	62.5	66.2
July Minimum	50.0	55.2	54.6	60.7
July Maximum	62.9	72.6	70.2	70.7
August Average	56.6	64.4	60.0	62.2
August Minimum	49.2	54.4	50.9	56.1
August Maximum	62.8	72.0	68.9	68.1
December Average	39.3			
December Minimum	35.7			
December Maximum	42.2			

Table 7. 2009-2016 population estimates from the North Branch Manistee River at the Kniss Road index station (1,000', 0.72 acres).

	BKT #/acre	BKT lb/acre	BNT #/acre	BNT lb/acre
2009	615	33.85	0	0
2010	593	40.44	7	4.82
2014	579	16.63	7	6.14
2015	589	29.25	8	3.22
2016	550	31.28	6	3.44

Table 8. Average total weighted length (inches) at age, and growth relative to the state average, for fish sampled from the North Branch Manistee River at the Kniss Road index station by electrofishing, 2009-2016. Number of fish aged is given in parenthesis. At least five individuals from any given age group must be caught to make statistical inferences regarding growth.

			Age						Mean Growth
Year	Month	Species	0	I	II	III	IV	V	Index
2009	August	Brook Trout	3.2 (29)	7.1 (51)	10.6 (10)				+1.3
2010	August	Brook Trout	2.9 (20)	7.0 (51)	10.7 (14)	14.3 (1)			+1.8
2010	August	Brown Trout			11.0 (2)	14.7 (1)			--
2014	August	Brook Trout	2.8 (20)	7.0 (29)	10.3 (3)				+0.6
2014	August	Brown Trout		9.1 (3)				21.1 (1)	--
2015	August	Brook Trout	2.1 (23)	6.8 (46)	11.8 (3)	13.7 (1)			+0.7
2015	August	Brown Trout		9.0 (5)	13.2 (1)				+2.8
2016	September	Brook Trout	3.0 (23)	7.0 (36)	10.6 (14)				+1.2
2016	September	Brown Trout		10.1 (2)	13.0 (2)				--

Table 9. Habitat evaluation from the North Branch Manistee River at the Kniss Road Index Station, 2009 and 2014.

	2009	2014
% Riffle	0.0	0.0
% Run	100	100
Average width (ft)	31.5	33.3
Average depth (ft)	1.1	1.6
Max depth (ft)	3.6	5.7
Discharge (cfs)	44.7	23.0
Woody cover (sq ft)	297	0
Linear wood (ft)	366	546
Substrate		
clay	0.0%	0.0%
detritus/silt	27.4%	20.7%
sand	37.5%	51.4%
gravel	34.1%	27.9%
small cobble	0.0%	0.0%
large cobble	0.5%	0.0%
boulder	0.0%	0.0%
wood	0.5%	0.0%
island	0.0%	0.0%

Table 10. Temperature data (degrees F) from the Kniss Road index station on the North Branch of the Manistee River, 2009-2016.

	2009	2010	2014	2015	2016
January Average		33.6		33.1	
January Maximum		36.7		36.5	
January Minimum		31.9		32.0	
February Average		34.4		32.6	
February Maximum		38.2		35.1	
February Minimum		31.9		32.0	
June Average	59.8	62.2	61.0		60.5
June Maximum	74.9	71.3	73.5		71.1
June Minimum	48.9	51.0	48.7		48.8
July Average	59.8	66.1	60.5		63.9
July Maximum	69.6	73.9	72.0		72.9
July Minimum	50.3	52.6	53.2		53.6
August Average	60.6	65.2	60.5		63.8
August Maximum	70.2	73.6	69.5		72.3
August Minimum	49.7	53.6	49.8		56.8
December Average	33.9		35.1		
December Maximum	38.9		38.8		
December Minimum	31.9		32.0		

Table 11. North Branch Manistee River temperature data (degrees F) from the old dam site at the Flowing Well Trout Farm.

	2012	2017
June Average	59.0	60.1
June Maximum	71.0	69.2
June Minimum	48.6	48.9
July Average	61.3	60.9
July Maximum	71.5	67.9
July Minimum	53.6	54.7
August Average	58.0	58.9
August Maximum	67.8	66.5
August Minimum	50.1	50.2

Table 12. North Branch Manistee River temperature data (degrees F) at North Sharon Road.

	2017
June Average	65.2
June Maximum	75.6
June Minimum	52.0
July Average	67.6
July Maximum	75.8
July Minimum	59.9
August Average	63.7
August Maximum	74.5
August Minimum	53.4