White River
Newaygo County
White River Watershed, last surveyed 2020

Mark A. Tonello, Senior Fisheries Biologist

Environment

The White River is a tributary to Lake Michigan that flows through Newaygo, Oceana, and Muskegon Counties. The White River enters Lake Michigan near the communities of Montague and Whitehall, after flowing through White Lake, a drowned river mouth lake. The White River begins as springs in the Oxford Swamp, near the unincorporated community of Woodville, in Newaygo County, Michigan. From its origins, the White River flows generally south until it enters Lake White Cloud, an impoundment in the Village of White Cloud (Figures 1 and 2). After exiting the impoundment through the White Cloud Dam, the White River flows generally west until it flows over Hesperia Dam in the Village of Hesperia. From there, it enters Oceana County and flows generally southwest. It eventually enters Muskegon County and flows into White Lake, and then into Lake Michigan. From its headwaters to Lake Michigan, the length of the White River is 89.8 miles (O'Neal 2012). The White River Watershed is 344,166 acres (538 square miles) in size (DeMol 2009). This report will focus on the middle reach of the White River upstream of Hesperia Dam and the upper reach upstream from White Cloud Dam (Figures 1 and 2).

The White River is the southern-most major coldwater system in Michigan, with roughly 80% of the watershed having a coldwater designation (Rippke 2013). According to O'Neal (2012), the White River drops 485.6 feet over its nearly 90-mile course, for an average gradient of approximately 5.8 ft/mi. O'Neal (2012) also reports that the highest gradient reach of the White River is that upstream from White Cloud Dam, averaging 11.1 ft/mile. The reach between White Cloud Dam and Hesperia Dam has a much lower average gradient of 4.4 ft/mile, although there are faster stretches within this reach. The White River has an average summer discharge of approximately 300 cubic feet per second (https://nwis.waterdata.usgs.gov/).

The landscape that forms the White River watershed is relatively undeveloped and is primarily forested (approximately 58%, DeMol 2009), with some agricultural areas and a few wetlands. Much of the subwatershed (23%) lies in federal ownership that is part of the Manistee National Forest, which is administered by the United States Forest Service (USFS). There are also privately-owned parcels interspersed throughout the watershed. The forested land within the subwatershed typically consists of aspen, white pine, and northern hardwoods. There are currently two large dams on the White River mainstem, the Hesperia Dam and White Cloud Dam. The White River hosts annual migrations of migratory fish from White Lake and Lake Michigan, including Rainbow Trout (Steelhead), Chinook Salmon, Coho Salmon, Walleye, White Suckers, and several Redhorse species. Hesperia Dam is the lower dam on the White River and is a fish passage barrier, so migratory fish cannot access the middle and upper reaches of the White River. The middle reach of the White River is joined by such tributaries as Martin, Mena, Robinson, and Wright's Creeks (Figure 1). Prominent tributaries of the upper reach of the White River include Flinton, Mullen, and Fivemile Creeks (Figure 2).

The White River is a State-designated Natural River. Michigan's Natural Rivers program was enacted by the legislature in 1970 and consists of individual zoning plans within river corridors designed to

protect the natural characteristics of each designated river. There are currently 16 designated Natural Rivers in Michigan. The White River was designated in 1975 and has been protected by the program since then. The entire mainstem of the White River (excluding those portions within the White Cloud and Hesperia city limits) and nearly all named tributaries fall under the protection of the program (Anonymous 1975).

White Cloud Dam effectively separates the middle and upper sections of the White River. White Cloud Dam was originally constructed as a logging dam in 1872. The dam has failed or been breached numerous times since then. It was severely damaged in the flood of 1986 and re-built in 1990. It most recently overtopped in 2017, sustaining damage and requiring repairs (Tonello 2020). White Cloud Dam has a profound impact on the White River. It acts as a fish passage barrier, and as a sediment transport barrier (O'Neal 2012). The 42-acre impoundment formed by the dam warms the White River dramatically in the summer. A recent fisheries survey on Lake White Cloud found that the pond is essentially filling in with sediment, with most of it shallower than 6 feet. The fisheries survey also found a poor fish community with few fish that would be considered desirable by anglers (Tonello 2020). The White Cloud Dam was inspected by the Michigan Department of Environment, Great Lakes, and Energy (EGLE) in 2019 and found to be in fair condition, with no apparent structural deficiencies that may lead to the dam's immediate failure (DeVaun 2019).

Upstream from White Cloud, the White River is classified as a top-quality trout mainstream, while its tributaries are top quality trout feeder streams (Anonymous 2000). Between Hesperia and White Cloud, the White River would be classified as a second-quality trout mainstream, mostly due to the warming effect of the White Cloud Dam. Upstream from Hesperia, the White River 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, Chinook Salmon, and Coho Salmon. A total of five trout can be kept per day, with no more than three fish over 15 inches. Downstream from Hesperia, the White River is classified as a Type 4 trout stream, so the river can be fished year-round. Salmon and Steelhead can be harvested year-round, while Brown and Brook Trout can only be kept during the "regular" trout season. Minimum size limits include 7 inches for Brook Trout, and 10 inches for Brown Trout, Rainbow Trout, and salmon. The daily limit is five fish per day, only three of which can be trout that are 15 inches or greater.

The primary citizen-led group for the White River is the White River Watershed Partnership (WRWP). According to their website (http://www.whiteriverwp.org), the mission of the WRWP is "To protect the unique characteristics and the natural resources of the White River Watershed by promoting conservation, restoration and preservation activities".

History

Although there are no records of the original fish community of the White River, it would have had the appropriate temperatures and gradient to support Arctic Grayling. Therefore, it is possible or even likely that the Arctic Grayling was the only native salmonid inhabitant of the river. Vincent (1962) lists the White River as having had Arctic Grayling in it. Whether Arctic Grayling were native to the White River or not, by 1900 or shortly thereafter, Arctic Grayling were extirpated from all streams in the lower peninsula of Michigan (Vincent 1962).

The first known stocking of the White River was in 1880 when Brook Trout were stocked (MDNR files, Cadillac). Rainbow Trout were first stocked in 1905. Fish stocking records for the early 1900s are sparse, as many were lost in a fire in Lansing. Brook Trout were regularly stocked into the White River upstream of White Cloud through 1964 (O'Neal 2012). It is unknown when Brown Trout were first stocked into the White River, but by the 1930s they were regularly being stocked in the middle reach of the White River. This has continued to the present (Table 1; O'Neal 2012).

For many years, Brown Trout were reportedly rare upstream from White Cloud. Apparently, they were inadvertently stocked there sometime in the 1940s because a fish stocking truck driver ran out of oxygen and feared that the fish might die. So instead of allowing that to happen, he stocked them into the upper White River. There is substantial correspondence in MDNR files (Cadillac office) between Michigan Department of Conservation (MDOC; the precursor to the MDNR of today) staff and angler/landowner Newt Dilley about the presence of Brown Trout upstream from White Cloud. According to Mr. Dilley, even into the 1950s, Brook Trout remained dominant upstream from White Cloud.

A report by former MDNR Fisheries Biologist David Borgeson (1973) provides an excellent description of the fisheries of the upper and middle reaches of the White River at that time. Borgeson mentions that the upper reaches of the upper White River hold more Brook Trout, but as the stream proceeds south toward White Cloud, Brown Trout become dominant. He also mentions that Lake White Cloud holds populations of White Suckers that migrate upstream and compete with the Brown and Brook Trout.

Historical Fisheries, Habitat, and Temperature Surveys

Many fisheries surveys have been conducted on the White River over the years. One particularly extensive fisheries survey was conducted by the MDOC in 1952 (Schultz 1953). Many sites were surveyed throughout the watershed, including tributaries. Schultz concluded that the middle reach of the White River was marginal trout water, due to warmer-than-desirable temperatures in this reach. He concluded that the upper reach of the White River was primarily Brook Trout water, but that Brown Trout were present and reproducing on their own. A total of 30 different fish species were documented in the watershed during that survey (Table 2).

A comprehensive habitat evaluation of the White River was produced by Tody et al. (1955). This report recommended habitat work in the form of multiple types of habitat structures designed to narrow and deepen the stream and improving overhead cover. The report also recommended removing beaver dams, stabilizing actively eroding streambanks, and adding fencing to keep livestock out of the river. The report also discussed the White Cloud Dam and its effects on water temperatures downstream.

In 1974, MDNR Fisheries Biologist Melvin Bonham produced a short report that discussed water temperature surveys conducted by the White River Watershed Council in 1972 and 1973 (MDNR files, Cadillac). One of the major findings of the report was that water temperatures below White Cloud are warmer than ideal, likely due to the dam and impoundment.

Electrofishing surveys of the White River were conducted in 1978 and 1989 (O'Neal 1991a). The 1978 surveys consisted of four mark/recapture population estimates, all conducted upstream from White Cloud. Brook Trout were dominant at the two furthest upstream stations, while Brown Trout were dominant further downstream closer to White Cloud (Table 3). The 1989 surveys consisted of one-pass surveys at four locations upstream of White Cloud and at six sites between White Cloud and Hesperia.

One interesting finding was the presence of Rainbow Trout (juvenile Steelhead) which had been naturally produced, since the Hesperia Dam had not been reconstructed yet and migratory fish could access the middle reach of the White River. O'Neal also discusses degraded habitat below White Cloud due to sand/silt inundation from the 1986 White Cloud dam failure. He recommended no stocking above White Cloud and stated that additional public access is needed in this reach. He also recommended further habitat improvement to benefit the wild Brown and Brook Trout populations. He also expressed concern that reconstruction of the White Cloud Dam would impair management for trout on the middle reach of the White River.

In 1991, six locations in the middle reach of the White River were surveyed by MDNR personnel (O'Neal 1991b). These were one-pass surveys conducted with a tow barge electrofishing unit with three probes. Brown Trout were present at all stations, and Rainbow Trout (juvenile Steelhead) were present at several stations as well. The results of this (and previous surveys outlined in O'Neal 1991a) led O'Neal to recommend a stocking increase for Brown Trout in the middle reach of the White River.

In 1992, MDNR conducted mark/recapture population estimate surveys at four locations in the middle reach of the White River (MDNR files, Cadillac), utilizing a tow barge electrofishing unit with three probes. Stations surveyed included M-37, the pipeline crossing below Echo Drive, M-20, and Warner Road. Both numbers/acre and biomass (lbs/acre) for Brown Trout were low at all sites, despite this reach being stocked with Brown Trout. Rainbow Trout (juvenile Steelhead) were present at the M-20 station.

Further fisheries surveys were conducted by MDNR in the middle reach of the White River in 1998 (O'Neal 1998). Sites surveyed included M-37, the pipeline crossing below Echo Drive, M-20, and Luce Road. Sparse numbers of Brown Trout and Rainbow Trout were present at all locations. Two Brook Trout were also caught at the M-20 station. O'Neal believed that the Rainbow Trout were likely juvenile Steelhead that were the offspring of adults that had somehow gotten over Hesperia Dam. He also believed that the Brook Trout were likely migrants from one of the cold-water tributaries in the area.

O'Neal (2011) evaluated the stream discharge and water temperatures in the mainstem of the White River, for the purpose of evaluating potential fisheries management objectives for the watershed. In particular, he investigated the impacts of White Cloud and Hesperia Dams on the watershed. He stated that "The potential for restoration of natural ecosystem condition and providing significant, sustainable fisheries in the White River watershed is limited without removing the deleterious effects of these two dams". The three management options he presented included removing both dams, removing only Hesperia Dam, and removing only White Cloud Dam. A follow-up temperature study was conducted in 2012 (O'Neal and Goldberg 2013), and the results supported the conclusions of the O'Neal (2011) report.

In 2002, staff from the Michigan Department of Environmental Quality (MDEQ, the precursor to the Department of Environment, Great Lakes, and Energy or EGLE of today) conducted a biological survey of the White River (Walker 2008). One site, Two Mile Road, was surveyed for fish. Species encountered included Brown Trout, Brook Trout, Common Carp, Blacknose Dace, Pearl Dace, Mottled Sculpin, White Sucker, and Johnny Darter. Three sites on the White River (2 Mile Rd., M-20, and the USFS campground downstream of Van Buren Rd.) were surveyed for macroinvertebrate community composition, with all three sites receiving scores of "Excellent". Habitat evaluation was conducted at the same three sites, with all three sites again earning scores of "Excellent". A number of tributaries were sampled in this effort as well.

A similar survey was conducted by MDEQ in 2007 (Rippke 2008). The survey consisted of invertebrate sampling and habitat evaluation. Nine stations were sampled, with 6 Mile Road being the furthest upstream, and Green Road being the furthest downstream. For macroinvertebrates, five of the stations earned scores of "Excellent", while the other four stations were "Acceptable". For habitat quality, two stations earned scores of "Excellent", while the remainder earned scores of "Good".

Another survey was conducted by MDEQ in 2012 (Rippke 2013), although this effort focused more on tributaries. Four sites on the mainstem of the White River upstream from Hesperia were surveyed. All four sites earned macroinvertebrate community scores of "Good". For habitat evaluation, three sites earned scores of "Good", and one site earned a score of "Marginal".

In July of 2016, USFS personnel conducted a mussel survey at the Baldwin Road crossing on the White River. In the survey, no live mussels were found. However, three dead mussels were found, including a Slippershell, a Cylindrical Papershell, and a Fatmucket (MDNR files, Cadillac).

In the summer of 2018, another temperature study of the White River was conducted by MDNR. Continuous recording thermometers were placed at three locations upstream from Hesperia, including Luce Rd., M-37, and 2 Mile Rd. (Table 4). The July average temperature at 2 Mile Rd. was 61.8°F, while at M-37 (downstream of White Cloud Dam) the July average temperature was 70.9°F. At Luce Rd., the July average temperature was 71.0°F. The White Cloud Dam and impoundment was clearly having a major impact on the temperatures of the White River downstream from White Cloud.

Current Status

The most recent MDNR fisheries surveys of the White River were conducted in the summer of 2020. One-pass surveys were conducted at Luce Road, 6 Mile Road, 8 Mile Road, and an unnamed tributary to the White River. A mark/recapture population estimate was conducted at 2 Mile Rd. The Luce Road survey was conducted according to the protocols for random site sampling that are outlined in the MDNR Stream Status and Trends Program Sampling Protocols (Wills et al. 2011). Although the 2 Mile Road site is not an official fixed site in the Status and Trends program, the MDNR protocols for sampling fixed sites (Wills et al. 2011) were used in that survey. MDNR Status and Trends protocols were not utilized for the other 2020 sampling sites.

The Luce Road crossing of the White River is located approximately two-thirds of the way downstream between White Cloud and Hesperia. It was the only site surveyed between the two dams, and was the furthest downstream site surveyed in 2020. The Luce Road survey station ran for 1,700 feet upstream from the bridge, and the survey was conducted on July 16, 2020, using a tow-barge electrofishing unit with three probes. At this station, non-salmonid species were collected for only the first 900 feet, while salmonids were collected through the entire station. A total of 216 Brown Trout ranging from 1 to 17 inches were caught, along with one 10-inch Rainbow Trout (Table 5). All Brown Trout were inspected for fin erosion, indicating hatchery origin, since this reach is annually stocked. A total of 80 Brown Trout from 4 to 11 inches were deemed to be of hatchery origin, while the other 136 Brown Trout from 1 to 17 inches were deemed to be of wild origin. Age and growth analysis of the Brown Trout indicated that fish were aged 0 to 4 and were growing slightly faster than the state average (Table 7). Non-salmonid species encountered in this reach included a total of 289 fish representing 19 different species (Table 6).

The Luce Road survey reach had private ownership on both sides, with a mix of wooded and cleared riparian zones. The river averaged approximately 49.2 feet wide, with an average depth of approximately 2 feet and a maximum depth of 4.1 feet. The stream morphology consisted of 15.4% riffle, 69.2% run, and 15.4% pool. Substrates consisted of 49.2% gravel, 32.3% small cobble, 9.2% large cobble, 4.6% sand, 1.5% clay, 1.5% silt and 1.5% boulder (Table 8).

The 2 Mile Road mark/recapture survey was conducted on July 14 and 15, 2020, with a tow-barge electrofishing unit with three probes. The survey reach was 1,200 feet in length, starting at the bridge remnant structure and proceeding upstream. Salmonids were collected for the entire length of the station, while non-game species were only collected for the first 600 feet of the station. In the survey reach, Brook Trout from 2 to 9 inches and Brown Trout from 2 to 17 inches were caught. Numerical population estimates were 1,424 Brown Trout and 66 Brook Trout per acre (Table 9). Biomass estimates were 109.4 lbs/acre for Brown Trout and 2.9 lbs/acre for Brook Trout. Abundance estimates for each inch class can be seen in Table 10. Age and growth analysis of the Brown Trout indicated that fish were aged 0 to 5 and were growing at the state average (Table 11). Brook Trout were aged 0 to 2 and growing faster than the state average. Non-salmonid species encountered in this reach included a total of 437 fish representing 16 different species (Table 12). White Suckers were by far the most abundant non-salmonid species caught, both in terms of numbers and biomass.

The 2 Mile Road survey reach was forested on both sides, with a mix of tag alder, cedar, and northern hardwoods. The river averaged approximately 36.0 feet wide, with an average depth of approximately 1.4 feet and a maximum depth of 3.2 feet. The stream morphology consisted of 7.7% riffle and 92.3% run. Substrates consisted of 63.1% gravel, 15.4% sand, 10.8% small cobble, 3.1% large cobble, 3.1% silt, 3.1% wood and 1.5% island (Table 13). A fisheries habitat project was completed at this location in 2012 by the White River Watershed Partnership and the White River Steelheaders. The habitat structures installed were still intact, providing overhead cover, and holding fish during the summer 2020 fisheries survey.

The next site upstream sampled in 2020 (on 9/9/20) was the 6 Mile Road crossing. For this site (and all the other upstream 2020 sample sites) one backpack electrofishing unit was used. At the 6 Mile Road site, 400 feet of stream was sampled. Just upstream of the 6 Mile Road crossing is an area that was formerly known as "The Pool". Years ago, it was famous for producing large trout. At present, "The Pool" is essentially filled in with silt and detritus, and very difficult to wade through. There are also groundwater seeps entering through the bottom here. The survey station began just upstream of "The Pool", where the stream bottom was solid enough for safe wading and proceeded 400 feet upstream from there.

In that reach, a total of 71 fish were caught, representing 8 species (Table 14). Salmonid species present included Brown and Brook Trout. Twelve Brown Trout were caught, ranging from 3 to 12 inches, while 7 Brook Trout were caught, ranging from 3 to 11 inches. The stream averaged approximately 18 feet wide and 6 inches deep, with a maximum depth of 2.5 feet. Stream morphology consisted of 95% run and 5% pool. Substrates consisted of 80% sand and 20% silt. Fish cover consisted of tag alders and instream aquatic vegetation beds, mostly elodea. In this reach the stream was very low gradient and flowed through a tag alder swamp. The water temperature was 54.5 at 2:00 pm.

Proceeding upstream, the next site sampled on the White River in 2020 (on 9/16/20) was the 8 Mile Rd. crossing. Here, the crew surveyed approximately 150 feet of the stream, proceeding upstream to the crossing. A total of 141 fish were caught representing 12 different species (Table 15). The only salmonid species present was Brook Trout, of which 31 were caught ranging from 5 to 12 inches in length. At this site, the stream averaged 8 feet wide and 3 inches deep, with a maximum depth of 4.0 feet. Stream morphology consisted of 50% run, 40% pool, and 10% riffle. Substrates consisted of 70% sand, 25% silt, and 5% gravel. Fish cover consisted of a large culvert plunge pool, tag alder, undercut banks and woody debris. Flow was low in this reach, likely less than 1 cfs. Most of the Brook Trout were captured from the culvert plunge pool. The water temperature at this site was 60.6 at 1:50pm.

The most upstream site in the White River watershed sampled in 2020 (on 9/16/20) was an unnamed tributary to the White River at the Oak Avenue crossing. Here, the crew surveyed 100 feet of the stream, ending at the road crossing. In this reach, a total of 29 fish were caught, representing 4 species (Table 16). Central Mudminnow were the most abundant species caught. Brook Trout were the only salmonid species present, with 9 caught from 2-9 inches. In this reach, the stream averaged 5 feet wide, and 6 inches deep, with a maximum depth of 1.5 feet. Stream morphology consisted of 85% run, 10% riffle, and 5% pool. Substrates consisted of 60% gravel, 30% sand, and 10% cobble. Streamside vegetation here consisted of grasses and deciduous trees. Woody debris was present and providing fish cover. Although flow measurements were not taken at either site, this reach appeared to have more flow than the 8 Mile Road station. The water temperature at this site was 62.0 at 2:50pm.

Analysis and Discussion

The 2020 fisheries surveys of the White River showed robust populations of Brown Trout and Brook Trout. All reaches surveyed had salmonids present. Upstream from White Cloud, the upper White River remains a self-sustaining Brown and Brook Trout stream, with no stocking required to maintain populations. Downstream from White Cloud, due to the effects of White Cloud Dam, water temperatures are less conducive to salmonid reproduction and survival. As a result, Brown Trout must be stocked annually by MDNR to maintain a robust fishery. The stocked fish, combined with some naturally reproduced Brown Trout, provide a good fishery in the middle reach of the White River. A total of 28 different fish species were documented in the watershed in the 2020 by MDNR (Table 2).

Although the 1978 and 2020 2-Mile Rd. surveys did not cover the exact same water (1978 was downstream, 2020 was upstream); they were both mark/recapture surveys conducted in close proximity. The 2020 survey found a much stronger Brown Trout population compared to 1978, while Brook Trout were rarer in 2020 than in 1978 (Tables 3 and 9). The 2020 survey also found a strong population of White Suckers. In his 1973 report, Borgeson surmised that the strong population of White Suckers upstream of White Cloud may be due them migrating upstream from Lake White Cloud.

The 2020 fisheries survey results at Luce Road were somewhat surprising, in that the survey found more Brown Trout than any previous fisheries survey conducted in the middle White River. The presence of some naturally reproduced Brown Trout was also encouraging and speaks to the potential of the middle White River, particularly if the White Cloud Dam was removed. White Cloud Dam continues to dramatically warm the temperatures of the middle White River (Table 4), as it has for many years. Also, the presence of one Rainbow Trout at Luce Road in 2020 and many Rainbow Trout in previous surveys shows the potential of the reach to produce wild Steelhead if they were allowed to pass upstream of Hesperia Dam, and if the temperatures were improved.

Management Direction

In general, the upper White River (upstream from White Cloud) is relatively intact and healthy. It hosts self-sustaining populations of Brook Trout and Brown Trout. The upper White River has not been stocked in decades and that should remain the case. The upper White River has remained a high-quality cold-water stream in large part due to a lack of intensive human development within the watershed. Much of the watershed remains in a forested, undeveloped state. Therefore, the primary goal for the upper White River should be protection. Protection from significant changes in land use in the future will be very important to maintain the excellent trout fisheries in the upper White River.

The future success of trout fisheries in the middle White River are tied directly to the White Cloud Dam. The White Cloud Dam has been shown in multiple temperature studies to dramatically impact the middle White River, as it has for many decades. White Cloud Dam warms the river downstream, halts upstream fish passage, interferes with other normal river functions including sediment and wood transport, and exacerbates the growing effects of climate change. If the dam remains in place, the fishery between White Cloud and Hesperia, at best, will continue to be a second-class, stocked Brown Trout fishery that will never rival other wild Brown Trout fisheries like the Pere Marquette or Little Manistee Rivers. However, if the dam were to be removed and natural temperature regime restored, Brown Trout natural reproduction would likely increase greatly, and the fishery would improve dramatically.

As long as the White Cloud Dam remains in place, MDNR should continue to stock 40,000 Brown Trout (197/acre, Wild Rose strain) at six locations between White Cloud and Hesperia. This stocking regime, along with limited natural reproduction will continue to maintain a Brown Trout fishery in the middle reach of the White River.

Land use will be critical to the continued health of both the upper and middle reaches of the White River. According to DeMol (2009), "Presettlement wetlands covered 56,339 acres while the 1978 coverage amounts to about 41,409 acres. This equates to a 27% loss of wetland acreage (14,930 acres). Most of this change was the conversion of wetlands for agricultural production". Future land use practices and wetland loss may result in the deterioration of the water quality and aquatic habitat. In particular, wetland loss and increasing impervious surfaces or agricultural impacts in the watershed could lead to more surface runoff, increased flashiness, and increased summer water temperatures, making the watershed less hospitable for salmonids and resulting in the watershed being less resilient to climate change.

Fish passage should be considered at Hesperia Dam. If jumping salmonids like Steelhead, Coho Salmon, and Chinook Salmon were allowed to pass Hesperia Dam, substantial natural reproduction would take place in both the mainstem and tributaries of the middle reach of the White River. Currently, Hesperia Dam is the Sea Lamprey barrier for the White River watershed, so any modifications or removal efforts at Hesperia Dam would have to take Sea Lamprey production into consideration. If White Cloud Dam were removed or fish passage provided there as well, even more natural reproduction of migratory salmonids would result upstream from White Cloud.

Prior to the 2020 MDNR survey of the White River, the river had not been surveyed since 1998. It should be surveyed more frequently than that. The Luce Road and 2 Mile stations can be used as index stations for the middle and upper reaches of the White River. Future surveys conducted at Luce Road should continue to follow the one-pass random protocols outlined by Wills et al. (2011), while surveys at 2 Mile

Road should be mark/recapture surveys following the fixed site protocols outlined by Wills et al. (2011). This will make direct comparison between years possible. In addition to the fisheries survey data, habitat evaluation and temperature data should also be collected. Other less comprehensive fisheries surveys should be conducted whenever possible at other stations throughout the watershed. Many of the tributaries of the White River have not been surveyed in decades and should also be surveyed as soon as possible. Also, temperature data should be collected periodically at multiple sites within the watershed.

References

Anonymous. 1975. White River Natural River Plan; Newaygo, Oceana, and Muskegon Counties. Michigan Department of Natural Resources, Lansing.

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.

Borgeson, D. P. 1973. The Trout Streams of Michigan: The White River. Michigan Department of Natural Resources, Fisheries Division, Technical Report 73-12. Lansing.

DeMol, N. 2009. The White River: Watershed Management Plan. Annis Water Resources Institute, Grand Valley State University, Muskegon, MI.

DeVaun, D. L. 2019. Dam Safety Inspection Report. White Cloud Dam-Dam ID No. 526, White River, Newaygo County, Section 5, T13, R12W. Michigan Department of Environment, Great Lakes, and Energy, Cadillac.

O'Neal, R. P. 1991a. White River Status of the Fishery Report with management plan. Newaygo, Muskegon, Oceana Counties. Michigan Department of Natural Resources, Lansing.

O'Neal, R. P. 1991b. White River fisheries survey, 1991. Michigan Department of Natural Resources, Cadillac.

O'Neal, R. P. 1998. White River fisheries survey, 1998. Michigan Department of Natural Resources, Cadillac.

O'Neal, R. P. 2011. Evaluation of habitat characteristics and fisheries potential of the White River watershed, 1993-1996. Michigan Department of Natural Resources, Cadillac.

O'Neal, R. P. 2012. Status of the Fishery Report: 2012-121. White River, Newaygo, Oceana, and Muskegon Counties. Michigan Department of Natural Resources, Lansing.

O'Neal, R. P., and D. Goldberg. 2013. Evaluation of water temperatures in the South Branch White River and North Branch White River in 2012. Michigan Department of Natural Resources, Cadillac.

Rippke, M. 2008. A biological survey of the White River and Flower Creek watersheds, located in Oceana, Muskegon, and Newaygo Counties, June-July 2007. Michigan Department of Environmental Quality, Surface Water Quality Division, Report MI/DEQ/WB-08/086, Lansing, MI.

Rippke, M. 2013. Biosurvey of the White River watershed, Oceana, Muskegon, and Newaygo Counties, June-July 2012. Michigan Department of Environmental Quality, Water Resources Division, Report MI/DEQ/WRD-13/013, Lansing, MI.

Schultz, E. E. 1953. Results of a biological survey of the White River drainage system in Newaygo, Oceana, and Muskegon Counties, Michigan. Michigan Department of Natural Resources, Institute for Fisheries Research Report No. 1378, Ann Arbor.

Tody, W. H., R. G. Wicklund, and B. C. Dean. 1955. Upper White River Watershed: Survey Plans and Report. Michigan Department of Conservation, Lansing.

Tonello, M. A. 2020. Fisheries Survey Report- Lake White Cloud, 2019. 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. 2008. A biological survey of the Upper South Branch White River and selected tributaries in Newaygo County, July 17-20, 2002. Michigan Department of Environmental Quality, Water Bureau, Report MI/DEQ/WB-08/078, 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.

Table 1. Fish stocked in the White River, Newaygo County, 2011-2021.

Year	Species	Number	Life stage	Strain
2011	Brown Trout	41,200	yearlings	Wild Rose
	Brown Trout	2,086	yearlings	Sturgeon River
2012	Brown Trout	46,640	yearlings	Wild Rose
2013	Brown Trout	38,580	yearlings	Wild Rose
	Brown Trout	2,111	yearlings	Gilchrist Creek
2014	Brown Trout	36,180	yearlings	Wild Rose
2015	Brown Trout	44,000	yearlings	Wild Rose
2016	Brown Trout	43,300	yearlings	Wild Rose
2017	Brown Trout	42,000	yearlings	Wild Rose
2018	Brown Trout	44,000	yearlings	Wild Rose
	Brown Trout	21,000	fall fingerlings	Gilchrist Creek
2019	Brown Trout	40,000	yearlings	Wild Rose
2020	Brown Trout	38,000	yearlings	Wild Rose
2021	Brown Trout	39,400	yearlings	Wild Rose

Table 2. Presence/absence of fish species in historical fisheries surveys at various locations on the White River upstream from Hesperia Dam, Newaygo County, Michigan.

Species	1952	1960	1972	1978	1991	1998	2004	2020
American Brook Lamprey	x	x		x	x			x
Black Crappie								x
Blacknose Dace	x	x	x	x	x	x	x	x
Blackside Darter	x		x		x		x	x
Bluegill	x	x	x				x	x
Bluntnose Minnow	x							
Bowfin	x							
Brook Stickleback		x					x	x
Brook Trout	x	x	x	x		x		x
Brown Trout	x	x	x	x	x	x	x	x
Bullhead spp.				x				
Burbot	x		x		x	x		x
Central Mudminnow	x	x		x	x	x	x	x
Central Stoneroller	x		x					
Common Carp					x			
Common Shiner	x		x		x	x	x	x
Creek Chub	x	x	x	x	x	x	x	x
Golden Shiner		x			x		x	x
Grass Pickerel					x			x
Green Sunfish						x	x	x
Horneyhead Chub					x			
Johnny Darter	x	x	x	x	x	x	x	x
Largemouth Bass	x				x			x
Longear Sunfish	x							
Longnose Dace	x	x			x	x		
Mimic Shiner	x							
Mottled Sculpin		x	x	x				x
Northern Brook Lamprey	x							
Northern Hog Sucker	x	x	x		x	x	x	x
Northern Pike	x		x	x	x			
Northern Redbelly Dace	x	x						x
Pearl Dace	x	x						x
Pumpkinseed	x		x		x			x
Rainbow Darter	x		x		x	x		x
Rainbow Trout			x		x	x	x	x
Rock Bass			x					
Sculpin spp.	x				x	x	x	x
Smallmouth Bass	x		x					
Warmouth		x						x
White Sucker	x	x	x	x	x	x	x	x
Yellow Bullhead	x	x						x
Yellow Perch	x		x					

Table 3. MDNR/USFS mark/recapture population estimates for the White River conducted in May 1978, at four stations upstream from White Cloud. Station lengths were 1,000 feet. 6 Mile Road was the furthest upstream site, while 2 Mile Road was the furthest downstream site.

1978	BNT		BKT	
Station	#/acre	lbs/acre	#/acre	lbs/acre
6 Mile Rd.	47	7.6	216	24.0
Van Buren Rd.	85	35.5	215	19.0
3 Mile Rd.	189	54.7	109	8.1
2 Mile Rd.	941	60.1	210	8.2

Table 4. Temperature data from the summer of 2018 from various locations on the White River, upstream from Hesperia.

Location	Month	Min.	Ave.	Max.
2 Mile Rd.	June	52.6	59.9	69.9
2 Mile Rd.	July	55.8	61.8	69.4
2 Mile Rd.	August	56.1	61.6	67.8
M-37	June	59.4	65.8	75.2
M-37	July	66.0	70.9	77.3
M-37	August	61.6	68.3	73.1
Luce Rd.	June	59.6	66.9	79.5
Luce Rd.	July	62.9	71.0	80.5
Luce Rd.	August	61.8	68.8	76.9

Table 5. Species and number of salmonids caught per inch class in the July 16, 2020, MDNR electrofishing survey of the White River at the Luce Road survey station. The survey consisted of one pass with a tow-barge electrofishing unit with three probes, and the station was 1,700 feet in length.

inch class	Brown Trout	Rainbow Trout
1	10	
2	76	
3	14	
4	1	
5	6	
6	34	
7	36	
8	8	
9	9	
10	5	1
11	5	
12	4	
13	4	
14	1	
15	2	
17	1	
Total:	216	1

Table 6. Non-salmonid catch from a July 16, 2020, MDNR electrofishing survey of the White River at the Luce Road survey station. The survey consisted of one pass with a tow-barge electrofishing unit with three probes. Non-salmonids were only collected for the first 900 feet of the station.

	Inch Class														
Species	1	2	3	4	5	6	7	8	9	10	11	13	15	16	Total:
Black Crappie					1	2									3
Blacknose Dace	7	34	2												43
Blackside Darter	1	2	4												7
Bluegill				1	1										2
Burbot						1	8	2	1	1					13
Central Mudminnow		13	2	1											16
Common Shiner		1			1										2
Creek Chub	14	11	13	15	5	1									59
Golden Shiner				1											1
Green Sunfish		2	1												3
Johnny Darter	1	18													19
Largemouth Bass	1														1
Longnose Dace		2	4	3											9
Northern Hog Sucker	2		1		1	1	1		1	1	5	2			15
Northern Redbelly Dace		1													1
Pumpkinseed		1													1
Rainbow Darter	15	15													30
White Sucker	21	4	7	8	3	2	3			4	1	3	1	1	58
Yellow Bullhead				2	2	1		1							6
											Total:				289

Table 7. Average total weighted length (inches) at age, and growth relative to the state average, for salmonids sampled from the White River at the Luce Road survey station by electrofishing, July 16, 2020. Number of fish aged is given in parenthesis.

	Age					Mean Growth
Species	0	I	II	III	IV	Index
Brown Trout	2.6 (30)	6.1 (8)	9.9 (13)	12.7 (11)	16.1 (3)	+0.6
Rainbow Trout		10.0 (1)				--

Table 8. Habitat evaluation data from the White River at the Luce Rd. survey station, 2020.

	2020
% Riffle	15.4
% Run	69.2
% Pool	15.4
Average width (ft)	49.2
Average depth (ft)	2.0
Max depth (ft)	4.1
Discharge (cfs)	102.4
Woody cover (sq ft)	1,592
Linear wood (ft)	228
Substrate	
clay	1.5%
detritus/silt	1.5%
sand	4.6%
gravel	49.2%
small cobble	32.3%
large cobble	9.2%
boulder	1.5%
wood	0.0%
island	0.0%

Table 9. MDNR population estimates for the White River at the 2 Mile Rd. index station. The survey was a mark/recapture effort conducted on July 14-15, 2020.

	BNT		BKT	
Year	#/acre	lbs/acre	#/acre	lbs/acre
2020	1,424	109.4	66	2.9

Station length = 1200 feet
Station average width = 36.0 feet
Station area 2020 = .99 acre

Table 10. White River Brown Trout and Brook Trout population abundance estimates by inch class for the 2020 survey of the 2 Mile Rd. index station.

Size (inches)	Brown Trout	Brook Trout
2	715	28
3	176	19
4	28	
5	154	2
6	123	7
7	34	7
8	47	1
9	53	1
10	37	
11	14	
12	13	
13	6	
14	5	
15	3	
16		
17	1	
Total	1,410	65

Table 11. Average total weighted length (inches) at age, and growth relative to the state average, for salmonids sampled from the White River at the 2 Mile Road survey station by electrofishing, July 14-15, 2020. Number of fish aged is given in parenthesis.

	Age						Mean Growth
Species	0	I	II	III	IV	V	Index
Brook Trout	2.9 (20)	6.8 (15)	9.2 (1)				+1.1
Brown Trout	2.7 (20)	5.9 (34)	9.3 (38)	11.7 (18)	14.1 (14)	17.8 (1)	+0.0

Table 12. Non-salmonid catch from a July 14, 2020 MDNR electrofishing survey of the White River at the 2 Mile Road survey station. The survey consisted of one pass with a tow-barge electrofishing unit with three probes. Non-salmonids were only collected for the first 600 feet of the station.

	Inch Class																
Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total:
American Brook Lamprey			1			2	1										4
Black Crappie				2													2
Blacknose Dace	7	29	1														37
Brook Stickleback	2																2
Central Mudminnow	9	30	24	7													70
Common Shiner		4		1													5
Creek Chub	2	12	12	9	4												39
Green Sunfish		1															1
Johnny Darter		2															2
Mottled Sculpin	4	43	19	2													68
Northern Redbelly Dace	18	15															33
Pearl Dace	1	37		1													39
Pumpkinseed		1															1
Warmouth					1												1
White Sucker	2		3	10	7	3	4	13	19	14	20	12	9	12	1	3	132
Yellow Bullhead								1									1
											Total:						437

Table 13. Habitat evaluation data from the White River at the 2 Mile Rd. index station, 2020.

	2020
% Riffle	7.7
% Run	92.3
% Pool	0.0
Average width (ft)	36.0
Average depth (ft)	1.4
Max depth (ft)	3.2
Discharge (cfs)	38.3
Woody cover (sq ft)	2,182
Linear wood (ft)	288
Substrate	
clay	0.0%
detritus/silt	3.1%
sand	15.4%
gravel	63.1%
small cobble	10.8%
large cobble	3.1%
boulder	0.0%
wood	3.1%
island	1.5%

Table 14. Catch from a 9/9/2020 MDNR electrofishing survey of the White River near the 6 Mile Road crossing. One backpack electrofishing unit was utilized for the survey. The survey station began at the upstream edge of "The Pool" and ran 400 feet upstream from there.

	Inch Class												
Species	1	2	3	4	5	6	7	8	9	10	11	12	Total:
Blacknose Dace	2	4	1										7
Brook Trout			1				2			3	1		7
Brown trout			3	3			3	1			1	1	12
Central Mudminnow		6											6
Grass Pickerel							1						1
Johnny Darter	4	5											9
Mottled Sculpin	5	2	4	1									12
White Sucker					1	3	3	1	4	2	1	2	17
											Total:		71

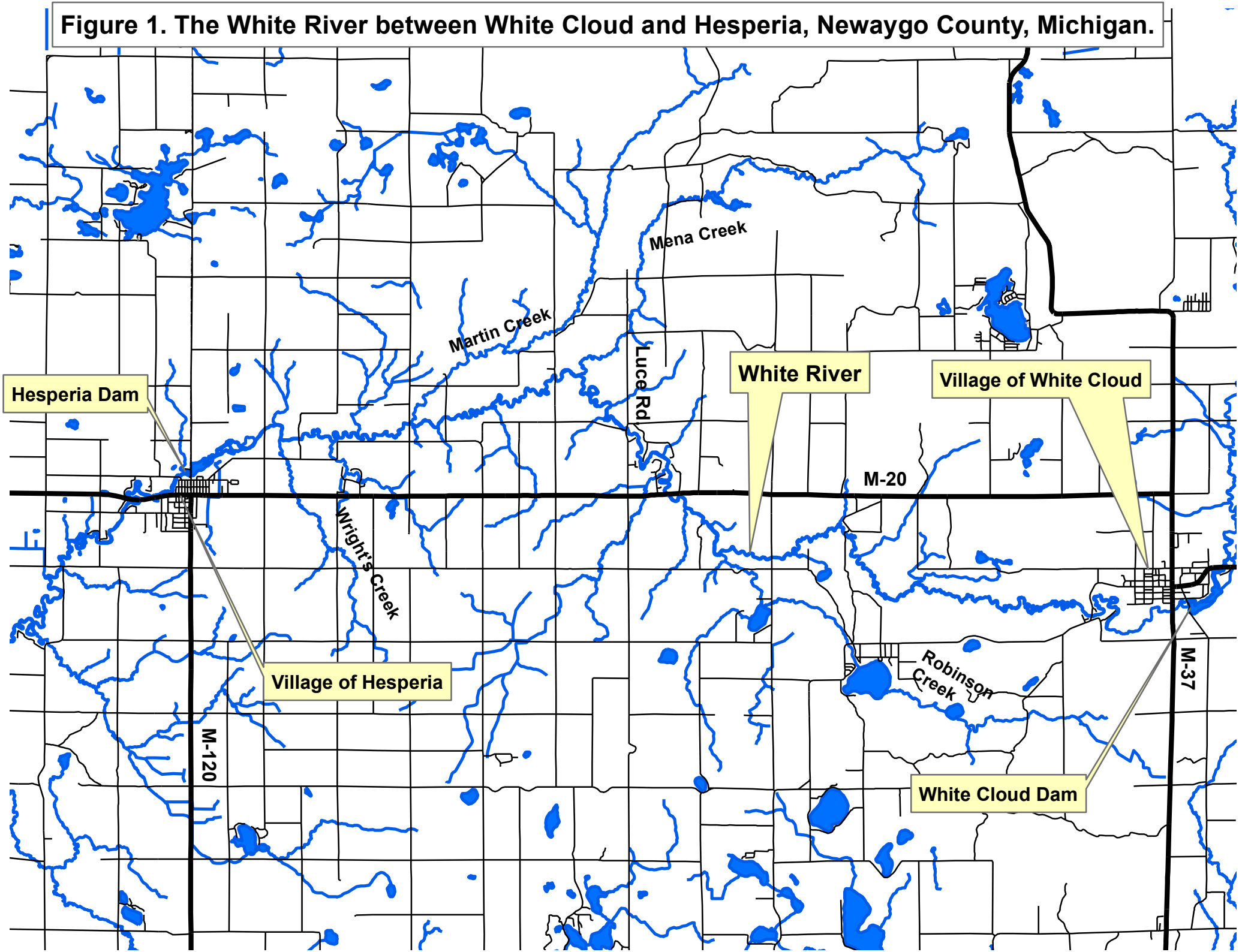
Table 15. Catch from a 9/16/2020 MDNR electrofishing survey of the White River at the 8 Mile Road crossing. One backpack electrofishing unit was utilized for the survey. The survey station ran 150 feet upstream to the 8 Mile Road crossing.

	Inch Class											
Species	1	2	3	4	5	6	7	8	9	10	12	Total:
Blacknose Dace	2	8	3	1								14
Brook Stickleback	1											1
Brook Trout					1	2	11	10	3	2	2	31
Central Mudminnow	18	31		1								50
Creek Chub			2	4		4	2	1				13
Green Sunfish			2									2
Johnny Darter		1										1
Northern Redbelly Dace	2	3										5
Pearl Dace	1	9	3	2								15
Pumpkinseed Sunfish			1									1
Sculpin spp.		4	1									5
White Sucker				1	2							3
										Total:		141

Table 16. Catch from a 9/16/2020 MDNR electrofishing survey of an unnamed tributary to the White River at the Oak Avenue crossing. One backpack electrofishing unit was utilized for the survey. The survey station ran 100 feet upstream to the Oak Avenue crossing.

	Inch Class							
Species	1	2	3	5	6	7	9	Total:
Blacknose Dace			1					1
Brook Trout		1	3	1	1	2	1	9
Central Mudminnow	9	8	1					18
Creek Chub				1				1
						Total:		29

Figure 1. The White River between White Cloud and Hesperia, Newaygo County, Michigan.



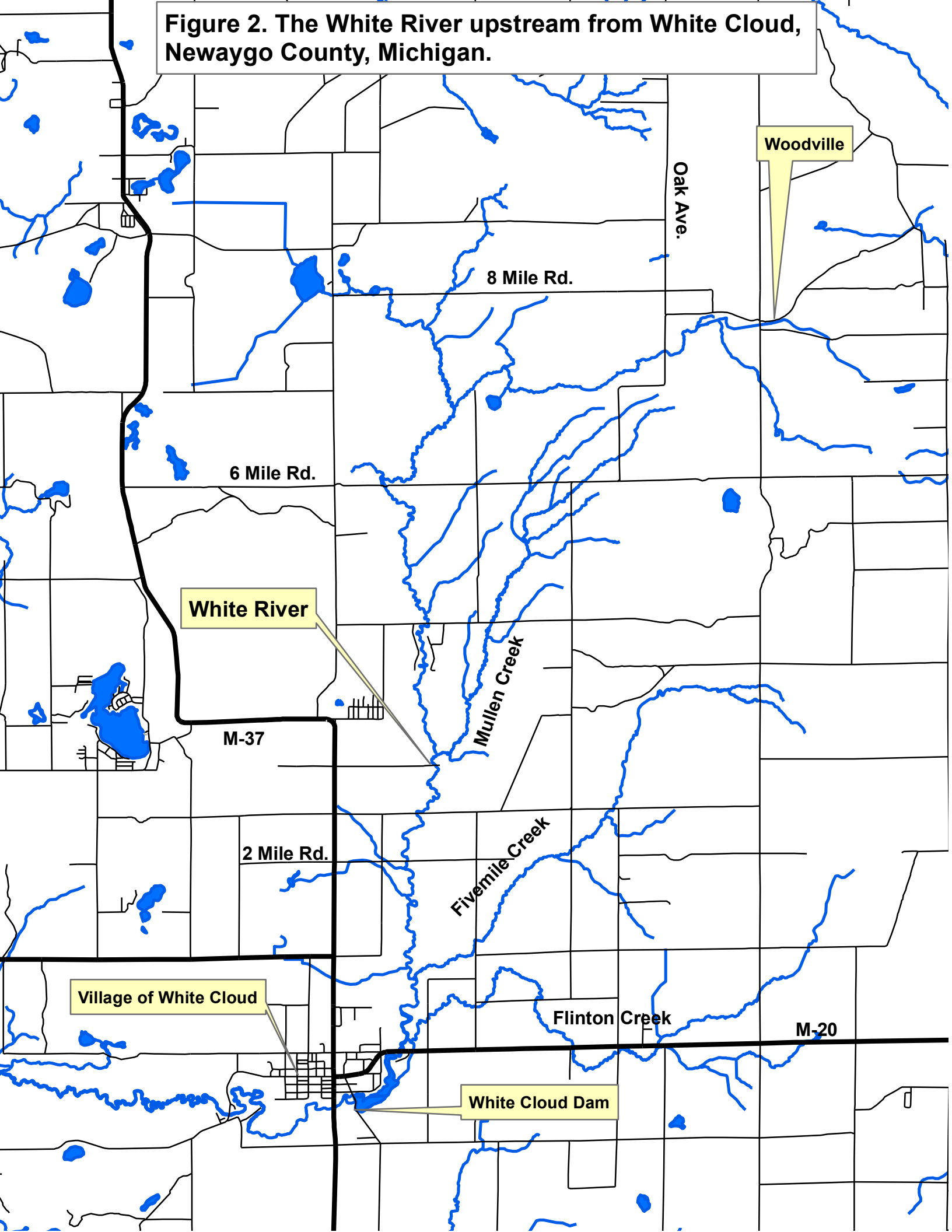


Figure 2. The White River upstream from White Cloud, Newaygo County, Michigan.
Woodville
Oak Ave.
8 Mile Rd.
6 Mile Rd.
White River
Mullen Creek
M-37
2 Mile Rd.
Fivemile Creek
Village of White Cloud
Flinton Creek
M-20
White Cloud Dam

Received July 14, 2021; published November 4, 2021

Scott Heintzelman, Unit Review and Approval

Dave Clapp, External Reviewer

Tim Cwalinski, SFR Facilitator

Randall M. Claramunt, Desktop Publisher and Approval