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Manistee River
Hodenpyl Dam to Red Bridge

Manistee County (T23N, R13W Section 25, 26 , 35, 36, and T22N, R13W Sections 2, 11, 14, 15, 22, 23)
Surveyed June, 2000

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Environment

The Hodenpyl Dam to Red Bridge stretch of the Manistee River is located in eastern Manistee County, MI, near the town of Mesick. After the Manistee River flows out of Hodenpyl Dam, it runs for 12.9 miles before entering Tippy Pond at Red Bridge (Figure 1). The land along this stretch of river is owned primarily by the U. S. Forest Service as part of the Manistee National Forest. Consumers Power Company is the only other significant landowner in the corridor. There is very little private ownership along this stretch, and the only structures located along this stretch of river are two seasonal cabins. This is an undeveloped stretch of river with a very "wild" character. The only true boat launch on the stretch is located at Red Bridge and is maintained by the U. S. Forest Service. Other access is available at Hodenpyl Dam itself and at the Woodpecker Creek access site a short distance below the dam, which is maintained by Consumers Power Company under the FERC (Federal Energy Relicensing Committee). Walk-in access is available throughout the corridor.

This stretch of river flows through a very impressive river valley with high banks as the river cuts through a glacial moraine. Much of the land is heavily forested, with the uplands consisting of second-growth northern mixed hardwood-conifer forest, and the lowlands and river bottoms consisting of cedar/hemlock swamps. This is a fairly swift reach, with an average gradient of 7.1 feet/mile (Rozich, 1998). Average annual discharge at Hodenpyl Dam is 1253 cfs (Lawler, Matusky, and Skeller, Binder 29, 1991). Hodenpyl Dam inundates what was once some of the highest gradient water on the Manistee River, at 11 feet/mile (Rozich, 1998) and it creates a normal head of 71 feet (Lawler, Matusky, and Skeller, Binder 29, 1991).

The substrate in this stretch of river consists largely of cobble and gravel due to the high gradient and the fact that Hodenpyl Dam acts as a sand trap. There is also some sand, as well as clay deposits. According to Rozich (1998), this stretch of river used to be a high quality spawning area for many potomadromous fish species. The river averages 132.6 feet in width between Hodenpyl Dam and Slagle Creek (Lawler, Matusky, and Skeller, 1991). Much of the river is between two and six feet deep, but there are many pools up to 15 feet deep, and at least one that is 21 feet deep.

Consumers Power Company operated the Hodenpyl hydroelectric dam in peaking mode prior to 1989. River discharge during, full peaking operations ranged from leakage flow (50 cfs) up to 4000 cfs (Lawler, Matusky, and Skeller, Binder 31, 1991). This resulted in major habitat degradation to the river downstream of the dam, in the form of temperature fluctuations, and increased erosion. Abnormally high flows increased bed and bank erosion and summer water temperatures were elevated when discharge was reduced to far below normal. The flow fluctuations had devastating effects on larval and juvenile fishes, and on invertebrates. Consumers Power switched to run-of-the-river flows voluntarily in

1989, and flows have remained that way (Rozich 1998). The Manistee River has a very stable flow regime when it is not altered by dams. Upstream of Hodenpyl at Sherman, the 10 percent exceedence flow of 1,420 cfs is only 1.7 times higher than the 90 percent exceedence flow (baseflow) of 820 cfs (USGS data). The operating license for Hodenpyl Dam was renewed in 1994 as a run-of-the-river facility (Rozich 1998).

Since Hodenpyl Dam discharges surface water from Hodenpyl Pond, it significantly warms the temperature regime of the stretch of river below. Horne (2001) found that average July temperatures were 1.3-2.2°C higher below the dam than above. The dam and impoundment also delays spring warm-up and fall cool-down, and reduces daily temperature fluctuation from more than 2°C upstream of the dam to less than 0.5°C below the dam (Horne 2001). Unimpounded streams in Michigan typically cool down substantially during summer nights, thereby reducing thermal stress on coldwater species such as trout. Mean daily water temperatures during July and August 2002 were well above the optimum for brown trout (Table 1). Mean July water temperatures averaged around 22.3 ^{0}C (72.1 ^{0}F) at three sites downstream of Hodenpyl dam. Elliot (1994) reported an upper thermal limit for brown trout growth at about 19 ^{0}C (66.6 ^{0}F). He further reported that feeding is likely to cease at temperatures higher than 19.5 ^{0}C. The upper incipient lethal temperature for brown trout, i.e. the temperature beyond which death occurs, is 24.7 ^{0}C (Elliot 1994). Lobon-Cervia and Rincon (1998) observed some brown trout growth at higher temperatures than predicted by Elliot but clearly, summer temperatures below Hodenpyl are well into the stress zone for trout. Possibly, brown trout in the river get some relief from high temperatures by moving to areas where local inflow of groundwater or coldwater tributaries provide local refugia. Garrett and Bennett (1995) found that radio-tagged brown trout moved to cool tributary streams when water temperatures reached 19-20 ^{0}C.

The river corridor between Hodenpyl Dam and Red Bridge is used for many forms of recreation besides fishing, both consumptive, and nonconsumptive. Canoeists and kayakers regularly float the river, although no liveries are currently licensed by the U. S. Forest Service to operate on this stretch of river. Hikers, backpackers, campers, birdwatchers, and mushroom hunters use two hiking trails that run along the river. The North Country Trail is on the west side of the river, and the Manistee River Trail is on the east side. The trails are linked by a footbridge that spans the river approximately ½ mile below Hodenpyl Dam. Hunters and trappers also use the river corridor. The river bottoms provide good winter habitat for whitetail deer (R. Perez, MDNR Wildlife Division, personal communication). The river corridor is managed as a "Semi-Primitive, Non-Motorized Area" by the U. S. Forest Service (B. Stuber, USFS, personal communication), which means that motorized vehicles are allowed only on existing county roads.

Fishery Resource

The stretch of the Manistee River between Hodenpyl Dam and Red Bridge is designated as a Type 4 trout stream by MDNR Fisheries Division. Anglers can fish all year, but harvest for brook and brown trout is only allowed during the regular trout season (the last Saturday in April through September 30). Minimum size limits for harvest are 8 inches for brook trout, and 10 inches for rainbow and brown trout. The daily possession limit for trout is five fish, with no more than three fish 15 inches or larger. Fishing pressure on this stretch is moderate in the late spring and summer, and light at other times of the year. Several river guides are active on the stretch. The river is popular with fly anglers, spin anglers, and bait anglers. Many anglers fish the river from canoes, drift boats, or small motor boats. Bank and wading anglers also walk in via various trails and two-tracks along the stretch. One reason this stretch of river is so popular with anglers is the variety of gamefish that can be caught, including brown trout, rainbow trout, walleye, northern pike, and smallmouth bass. Trophy -sized walleye, rainbow trout, and brown trout live in this river reach. In fact, some anglers claim that this stretch of river is the "best trophy brown trout

stretch of river in the Midwest". Angling for white sucker is also popular in the spring.

Tippy Dam blocks upstream migration of potomadromous fish from Lake Michigan, such as chinook and coho salmon, rainbow (steelhead) trout, brown trout, lake trout, sturgeon, walleye, and other species, to this stretch of river. Fish do migrate up into the Manistee River from Tippy Pond and the Pine River, a large tributary that flows into Tippy Pond. In fact, a walleye that was captured and tagged in August of 2000 in the Pine River below Stronach Dam was captured by an angler up in the Manistee River, several miles below Hodenpyl Dam, in August of 2001 (B. Burroughs, Michigan State University, personal communication). The Pine River is a DNR-designated Blue Ribbon Trout Stream with naturally reproducing populations of brook, brown, and rainbow trout. Other tributaries to the Manistee River between Hodenpyl Dam and Tippy Pond include Woodpecker, Eddington, Slagle, Cedar, Arquilla, Hinton, and Peterson Creeks. Most of these tributaries are spring creeks with very good water quality and naturally reproducing populations of brook and/or brown trout.

Next to the Pine River, Slagle Creek is the most important tributary to the system. Slagle Creek originates in the large hills east of Harrietta and flows westward, joining the Manistee River in the Flower Flats area. There are two hatcheries located on the creek, one private (Harrietta Hills Trout Farm) and one state-owned (Harrietta State Fish Hatchery). Slagle Creek has excellent naturally reproducing populations of brown and brook trout. Rainbow trout are also present, but they are probably escapees from the hatcheries or fish planted by the Slagle Club, which owns the land surrounding a significant portion of Slagle Creek below M-37. Slagle Creek is a cold, groundwater-fed stream, and has a cooling effect on the Manistee River.

In the summer of 2001, brown trout from Slagle Creek tested positive for Whirling Disease. Whirling disease spores from Slagle Creek could be exported downstream and potentially have adverse effects on the trout fishery in the Manistee River and Tippy Pond system, as well as the Pine River. Whirling disease is a fish disease caused by a microscopic parasite, *Myxobolus cerebralis*. In other parts of the country, Whirling disease has devastated rainbow trout populations (Nehring and Thompson 2002). Although Whirling disease had been present in the Tobacco and Sturgeon Rivers for over 30 years, no adverse effects on the trout populations in those streams has been documented. Brown trout are very resistant to effects of whirling disease and rainbow trout are most susceptible to the organism at before they are one year old. Thus, I do not expect whirling disease to adversely effect brown and rainbow trout populations because brown trout are resistant to the disease and rainbow trout are stocked as yearlings. Whirling Disease is not transmitted to humans.

Fish have been planted by MDNR in Tippy pond since 1934 and in the Manistee River itself (at Red Bridge) since 1938 (Table 2). Between 1934 and 1944, various species of fish were planted, including bluegill, yellow perch, smallmouth bass, and walleye. Between 1938 and 1955, adult rainbow trout (steelhead) were captured in the Manistee River below Tippy Dam and transferred over the dam or planted at Red Bridge. In 1970 and 1976, adult steelhead from the Little Manistee weir were also stocked at Red Bridge. Since 1970, fish plantings in the Manistee River below Hodenpyl have consisted primarily of brown and rainbow trout yearlings. Since 1984, walleye fingerlings and fry have been planted occasionally (four years) in Tippy Pond and at Red Bridge. Channel catfish were stocked at Red Bridge in 1988 and 1991. Since the mid-1980s, all trout for this stretch have been stocked at Woodpecker Creek. In recent years, river guides have sometimes assisted MDNR by scatter-planting the brown and rainbow trout yearlings.

Other management actions undertaken in the Manistee River below Hodenpyl Dam have included the installation of large woody debris, stabilization of eroding streambanks, and actions to reduce erosion into streams at poorly designed road/stream crossings. The Lower Manistee River Partnership Agreement was formed in 2000 to oversee those activities. The Conservation Resource Alliance (CRA)

administers the Partnership Agreement, which to date has been signed by 30 private, public, and governmental organizations. Since 1999, CRA has overseen work on five severely eroding streambanks (M. Johnson, CRA, personal communication). Recent road stream crossing improvements were conducted by the Manistee County Road Commission and the U. S. Forest Service on the Warfield Road crossing of Cedar Creek, and the #1 Road crossing of Slagle Creek.

From 2000-2003, a total of 680 whole trees (mostly red pines, along with a few oaks and maples), including the root wad, were placed in the Manistee River by a helicopter. The trees were placed to make up for the lack of woody debris in the stretch of river caused by Hodenpyl Dam, as the dam halts downstream recruitment of large woody debris. The project is a cooperative venture between CRA, the U. S. Forest Service, and MDNR. The Little River Band of Ottawa Indians provided logistical support. Project funding was provided by Consumer's Energy as part of the licensing agreement for hydroelectric dam operations, with matching contributions from the U. S. Forest Service. The trees provide overhead cover for many species of fish, including brown trout, rainbow trout, and smallmouth bass, in particular. The trees will also provide habitat for invertebrates that are preyed upon by fish, and also basking habitat for turtles. More trees may be placed in the future.

Previous Fisheries Surveys

Only two fisheries surveys have been conducted on the Manistee River below Hodenpyl Dam prior to the 2000 survey. Consumers Power Company conducted a fisheries survey in October 1990 (Lawler, Matusky, and Skeller, Binder 30, 1991). Two stream stretches were sampled, the first about 1.5 miles below the dam, and the other was further downstream, about 4.5 miles above Tippy Pond, in the Flower Flats area. Fish population estimates were obtained by using the generalized removal model in the CAPTURE program. Stretches of the river from 900-1200 feet long were sealed with blocking nets on the upstream and downstream ends of each station. Then, multiple passes (three passes at the station below Hodenpyl and five passes at Flower Flats) were made in each station with two large boat shockers and one small boat/stream shocker. Some supplemental sampling was also conducted to better estimate species composition and abundance.

At the upstream site near Hodenpyl Dam, 31 fish taxa were captured during the survey (Lawler, Matusky, and Skeller, Binder 30, 1991). Gamefish only represented 10.7% of the total catch. Gamefish caught at that site included brown trout, walleye, smallmouth bass, largemouth bass, rock bass, yellow perch, and bluegill. The mean population estimate for brown trout was 8/acre, with a biomass estimate of 1.69 lbs/acre. The most abundant species by number were those from the family Catostomidae (not keyed to species), shorthead redhorse, logperch, mottled sculpins, smallmouth bass, and longnose dace.

At the downstream site in the Flower Flats area, 26 taxa were captured (Lawler, Matusky, and Skeller, Binder 30, 1991). Gamefish represented 10.5% of the catch, and species observed included brown trout, smallmouth bass, walleye, northern pike, rock bass, bluegill, and yellow perch. The mean population estimate for brown trout was 11/acre, with a biomass estimate of 1.35 lbs/acre. The most abundant species by number were logperch, fish from the family Catostomidae (not keyed to species), shorthead redhorse, blacksided darter, lampreys (not keyed to species), mottled sculpins, rock bass, smallmouth bass, and tesselated darters (most likely johnny darters which were misidentified).

The other fisheries survey conducted on the Manistee River below Hodenpyl Dam was an MDNR boomshocking effort in August, 1995 (Rozich, 1995). The crew electrofished for 1.3 hours upstream of Red Bridge. Walleye were the most abundant gamefish, with 22 individuals from 9-22 inches collected. Twenty smallmouth bass from 3-18 inches were also captured. Nine brown trout from 6-10 inches and one seven-inch rainbow trout were captured. One three-inch largemouth bass and two northern pike (22 and 25 inches) rounded out the gamefish catch. Shorthead redhorse were the most abundant species, with 122 individuals collected.

Seventy-silver redhorse were also captured. Other species captured in smaller numbers included white suckers, log perch, rock bass, yellow perch, creek chubs, common shiners, johnny darters, hornyhead chubs, longnose dace, trout-perch, bluegill, pumpkinseed sunfish, emerald shiners, spottail shiners, and bluntnose minnows.

Recent fish survey

In the 2000 survey, two stretches of the Manistee River below Hodenpyl Dam were sampled by boomshocking on 6/12-6/14, 2000. The upper station runs from the Hodenpyl Dam spillway (Lat. 44° 21' 47.31989" N, Long. 85° 49' 13.27657" W) 14,163 feet downstream (2.7 miles) to just downstream of a spot locally known as "the waterfall" (Lat. 44° 20' 59.04212" N, Long. 85° 50' 10.90676" W). The area for this stretch is 43.11 acres. The lower station runs downstream from the mouth of Slagle Creek (Lat. 44° 18' 55.70064" N, Long. 85° 51' 05.89915" W) for 6,321 feet (1.2 miles) to the point of a very sharp horseshoe bend (Lat. 44° 18' 40.77368" N, Long. 85° 50' 56.60168" W). The area for the downstream station is 19.24 acres.

Both stream stretches were sampled by two electroshocking boats, with one chase boat for each boomshocker to assist with processing fish. Each site was sampled for three consecutive days. Each salmonid captured on the first day was marked with a top caudal fin clip, and those captured on the second day received a bottom caudal clip. Brown trout populations were estimated by the Schumacher-Eschmeyer formula. Inch groups 3 through 6 and 9 through 24 were combined to increase recapture numbers before initial estimates were made. These combined estimates, and their variance, were then prorated back to individual inch groups. Brook and rainbow trout populations were not estimated because not enough were caught for reliable population estimates. Other gamefish species were measured and scale samples were collected for aging. Due to the nature of the survey equipment and the size, depth, and current velocity of the Manistee River below Hodenpyl Dam, we most likely undersampled the fish population of each stretch. The capture radius of the boomshockers probably does not exceed eight feet in depth, and many spots in each station exceed that depth. Therefore, the population estimates obtained in this survey are probably lower than the actual populations to some degree. However, the data obtained in this survey should still be very useful, and will provide a basis for management decisions and further study.

Upper Station

Brown trout comprised 94% of the numerical catch from the upper station (Table 3). A total of 1,585 brown trout ranging from 2-21" were captured from the upper station over the three days of the survey. The vast majority of the fish were age 1, averaging 7.1 inches in length. Most of those were probably hatchery fish stocked one month earlier at an average length of 6.5 inches (24,490 yearling brown trout were stocked in 2000). There were a few age-0 fish in the 2-4" range in the catch as well. Only four brown trout over 11.9 inches were caught from the upper station. Brown trout population estimates for this stretch were 260/acre and 32.1 lbs/acre (Table 4).

Eight brook trout from 5-9 inches and two rainbow trout in the six-inch class were caught in the upper station. Forty-four smallmouth bass from 3-17 inches were also caught, along with twenty-four walleye, which ranged from 6-28 inches in size. Although walleye were not numerically abundant they comprised over 15% of the pounds of gamefish captured. Other gamefish present in smaller numbers included northern pike, largemouth bass, rock bass, and yellow perch. Nongame species that were observed but not counted included white sucker, silver redhorse, sculpins, blacksided darters, logperch, chestnut lampreys, and trout perch.

Lower Station

Brown trout comprised 72% of the numerical catch in the lower station with 263 individuals ranging from 5 to 24 inches caught (Table 5). However, the brown trout from the lower station were larger in size than their counterparts from the upper station, as they averaged nearly ten inches in length, with a fair number of

individuals in the 14-19 inch range. Brown trout population estimates for the lower stretch were 67/acre and 47.4 lbs/acre (Table 6). These estimates are imprecise because there were very few recaptures of marked fish. The 95% confidence limits for pounds per acre ranged from 12.6 to 86.2 (Table 6).

More rainbow trout were present in the lower stretch, as 27 individuals up to 18 inches in length were caught (Table 5). Smallmouth bass, walleye, and northern pike were also present in respectable numbers. Twenty-six smallmouth bass from 10-19 inches and 26 walleye from 11-18 inches were captured, along with 19 northern pike from 12-26 inches in length. Northern pike composed 16% of the poundage of fish collected from the lower station while smallmouth bass made up 17%. Other game fish present in smaller numbers included channel catfish, rock bass, and yellow perch. Nongame species that were observed but not counted included white sucker, silver redhorse, sculpins, logperch, chestnut lampreys, and trout perch. One common carp was also captured in the lower station.

Age and Growth

Brown and rainbow trout were substantially larger than the statewide average for the species (Table 7). This difference in length at age is primarily due to the good conditions for growth in the hatchery. A closer evaluation of the data shows that growth *rates* are much closer to average. The state average length at age table was developed from data collected in unstocked streams where annual growth increments are about three inches per year (Table 7). Most growth in unaltered trout streams occurs during the months of May through October with little growth occurring during colder months. These fish are thus growing about a half-inch per month. The yearling brown trout stocked in 2000 averaged 6.52 inches when they were stocked about a month before I collected fish. The 0.4 inch increase in length of yearling trout accordingly reflects “about average” growth rates. Nonetheless, the growth advantage conferred by the hatchery results in fish growing to legal size at an earlier age than unstocked trout. Wild brown trout growing at about average rates would not usually grow to the legal minimum size limit of 10 inches until they are three years old, whereas the average size of two-year-old brown trout below Hodenpyl was 10.6 inches in June 2000. Brown trout exceeded the state of Michigan average length at age for age groups 0-5 by 1.9 inches. Rainbow trout exceeded the state of Michigan average length at age for age groups 2-3 by 3.9 inches. Only a few brook trout were captured, (all age 1) and they exceeded the Michigan average length at age by 0.7 inches (Table 7).

Over 90% of the brown trout in the two river reaches surveyed were yearlings that were planted about one month earlier (Table 8). Only 1.1% of the population was four or more years old — age groups that offer trophy fishing opportunities for fish over 15 inches long. Survival rates for brown trout may be relatively high after age 2, ranging from 25 to 57 percent (Table 8). It not possible to calculate true cohort survival rates from a single survey. However, stocking rates, and hence yearling recruitment, was fairly stable from 1994-98 so the survival rates have some validity. Percentage survival of naturally reproduced YOY to yearlings can not be determined because yearlings in the sample are stocked fish. Similarly, survival of yearlings to age 2 could not be determined because the river was stocked prior to the survey. We believe that survival of yearlings to age 2 is low. In 1999, brown trout were stocked at a rate of approximately 78 per acre, yet in 2000 the density of two-year old brown trout was only 4.3 per acre. This suggests that 95% of stocked brown trout died or emigrated during the first year after stocking.

Coolwater species grew slower than the state average rate (Table 9). Smallmouth bass from age groups 5-6 were smaller than the State of Michigan mean length at age by 0.3 inches. Walleye from age groups 2-4 were smaller than the State of Michigan mean length at age by 0.6 inches. Not enough northern pike, rock bass, or yellow perch from any one age group were captured to make statistical inferences about growth. However, the vast majority of individuals aged were smaller than average for their age. Coolwater fish species probably grow slower than average below Hodenpyl because

water temperatures are lower than their optimal growth temperature (Eaton et al 1995).

Analysis

There were some major differences in the fish catch between the upper and lower stations. Brown trout were nearly four times more abundant in the upper station than in the lower station, but those in the lower station were generally larger. The vast majority of the brown trout in the upper station were smaller fish, and most appeared to be recently stocked hatchery fish. A few young-of-the-year brown trout were found in the upper station, but none were found in the lower station. Although some natural reproduction apparently does occur, the brown trout population in the Manistee River below Hodenpyl is undoubtedly dependent upon stocking. Without stocking, a low-level population might still occur, but not enough fish would be present to support the present sport fishery.

The brown trout population estimates obtained in the survey were fairly low when compared to others around the state. Brown trout populations in some other rivers around the state can exceed 2,000/acre. Previous brown trout population estimates for the Manistee River below Hodenpyl Dam have also been quite low (Lawler, Matusky, and Skeller, Binder 30, 1991). However, we feel that the low estimates obtained on this stretch of river may be due to sampling inefficiency that exists due to the large size and depth of the river. The acclaim given to this stretch of river by knowledgeable anglers suggests that large trout may be under-sampled by electrofishing in proportion to their true abundance.

Nearly all of the rainbow trout captured were in the lower station. They may be emigrants from Slagle Creek, which enters the Manistee River at the top of the lower station. The Slagle Club, a private club located several miles upstream of the confluence, has planted rainbow trout in Slagle Creek in recent years. The rainbow trout may also be escapees from the Harrietta Hills Trout Farm that migrated downstream into the Manistee River. Either way, although rainbow trout were sparse, those that were present were generally of large size, and they were very healthy, robust looking fish. Their large size relative to state average length-at-age also suggests that they spent part of their life in a hatchery. Although it is possible that some natural reproduction of rainbow trout may be occurring, no young-of-the-year were captured in this or previous surveys.

The reason for the paucity of trout natural reproduction in the stretch of the Manistee River below Hodenpyl is most likely the warmer than ideal summer water temperatures. According to Horne (2001), July and August temperatures in the Manistee River below Hodenpyl Dam average near or greater than 70° in the period from 1997-2000. Similar summer temperatures also occurred in 2002 (Table 1). Therefore, the trout fishery in the Manistee River below Hodenpyl Dam is similar to other tailwater fisheries in the state, including the Muskegon River below Croton Dam and the Au Sable River below Mio Dam. The warm water temperatures in these rivers are conducive to good growth for stocked trout, but inhibit natural reproduction.

Modest numbers of walleye were captured from both stations, although population estimates were not obtained. Although walleye fingerlings were stocked (Table 2) at Red Bridge and in Hodenpyl Dam Pond (walleye from Hodenpyl Pond could conceivably enter the system by going through Hodenpyl Dam) in 1992 and 1999, age and growth data showed that only two of the 43 walleye aged in this survey were from years when stocking had occurred. Therefore, since most of the walleye captured in this survey were hatched in years when stocking did not take place, they must be naturally reproduced. Recent walleye plantings have apparently had little effect on the walleye population in the Manistee River below Hodenpyl Dam. However, the goal of those plantings is to supplement the walleye population in Tippy Pond. Further study is required to determine if they are having the desired effect. Either way, natural reproduction of walleye is occurring in the Manistee River below Hodenpyl Dam, and the Tippy Pond walleye population likely has a strong proportion of naturally reproduced fish.

Modest numbers of smallmouth bass were caught at both stations, although population estimates were not obtained. Fish up to 19 inches were observed, and many of those caught exceeded the minimum legal size of 14 inches. The smallmouth bass population in the Manistee River below Hodenpyl Dam is entirely self-supporting, as none are stocked.

Northern pike were more numerous in the downstream station, and most likely become even more numerous as the river approaches Tippy Pond. No population estimates were obtained. As with smallmouth bass, the northern pike in this stretch of river are completely self-supporting. Most of the northern pike encountered were smaller than the legal minimum size of 24 inches, but some nice fish up to 29 inches in length were caught.

Management Direction

Summer warming of the river caused by the Hodenpyl Dam is probably the major factor limiting trout survival and suppressing growth to below what could be achieved in cooler water. Temperature monitoring (Kyle Kruger, MDNR, unpublished data) has shown that during June, July, and August, Hodenpyl Dam is in violation of its operating license, as the water released below the dam in those months is usually warmer than allowed. Therefore, lowering the temperature regime in this stretch is a very high priority. One way to improve the temperature regime would be to install some sort of coldwater discharge at Hodenpyl Dam. Theoretically, the discharge would draw from the cold water present at the bottom of Hodenpyl Pond, which is known to stratify in the summer. There should be sufficient cold water in the hypolimnion of Hodenpyl Pond to lower the water temperature in the river below the dam. While there may not be enough cold water in Hodenpyl Pond to run the coldwater discharge all the time, there should be a way to strategically manage the cold water supply. Possible strategies could include discharging only on hot, sunny days, or maybe during warm nights, to mimic "diurnal cooling" which takes place on trout streams that are not influenced by dams. Such a device would likely allow increased survival of stocked trout, and increased natural reproduction. Currently, MDNR Fisheries Division is negotiating with Consumers Power regarding the implementation of a plan to spill cold water below the dam.

Until something is done to moderate the extreme water temperatures below the dam, the Manistee River below Hodenpyl Dam will continue to be managed as a put, grow, and take trout fishery. The sparse natural reproduction that may take place in some years is not sufficient to support the fishery. In January of 2000, before this survey took place, a Fisheries Prescription (#600, by Ralph Hay) was written to increase brown trout stocking numbers from 15,000 to 25,000 yearlings annually. This was done because Fisheries Division has had major successes with high stocking rates in other similar waters, including the Muskegon River below Croton Dam, and the Au Sable River below Mio Dam. Also, extra brown trout had become available for stocking when plants had been cut elsewhere. Subsequently, 24,990 brown trout were stocked in May of 2000 (Table 2). In the three years since the survey was conducted, at least 25,000 brown trout were stocked in each year (Table 2).

A direct result of this survey was Fisheries Prescription 720 (Tonello, January, 2001), requesting 25,000 Eagle Lake strain rainbow trout to be planted in addition to the 25,000 Wild Rose strain brown trout being stocked, resulting in a total trout stocking rate of 262/acre. Eagle Lake strain rainbows have performed extremely well in other similar waters, particularly the Au Sable below Mio Dam, and the Muskegon River below Croton Dam. Subsequently, at least 25,000 Eagle Lake strain rainbow trout have been stocked in each of the three years since. Fishing reports regarding the stocked rainbow trout for the past three summers have been very positive. Anglers have reported good catches of the stocked rainbows, and brown trout fishing has also continued to be excellent. The only negative comment is that anglers are not catching "holdover" rainbows (those that have been in the river for more than a year). The stocked rainbows seem to do very well in their first year, reaching lengths of 10-13 inches by the end of September. However, rainbows from

14-20 inches in length are very rare, indicating that they are either not surviving over the winter or that they are migrating out of the area. Further research is required to determine the reason for the lack of holdover rainbow trout. We recommend implantation of radio transmitters into rainbow trout to determine their movement and mortality.

This survey showed that walleye stockings at Red Bridge and in Hodenpyl Pond are likely not having much effect on the walleye population in the Manistee River below Hodenpyl Dam, and that the walleye population consists primarily of naturally reproduced fish. Therefore, walleye should not be stocked with the goal of improving walleye populations in the Manistee River. Also, the walleye population in Tippy Pond should be assessed to determine the effects of stocking on that population. If natural reproduction is sufficient to support the population, then walleye stocking should be discontinued.

The survey also showed that smallmouth bass and northern pike are present in decent numbers in the Manistee River below Hodenpyl Dam. Although recent habitat improvement projects should directly benefit the populations of both species, no direct management actions are necessary for smallmouth bass and northern pike. It can be said that this stretch of river offers some of the best stream smallmouth bass fishing in Northwest Michigan. The northern pike population in this stretch of river will continue to supplement the fishery.

Fisheries Division should continue to work with the Lower Manistee River Partnership Agreement and CRA to remediate severely eroding streambanks and fix poor road stream crossings in the watershed. Fisheries Division should also continue to assist with the helicopter large woody debris project, as more trees are scheduled for placement in the fall of 2002.

Other actions that should be taken include assessing fish populations (particularly walleye) in Tippy Pond, and also in the small tributaries that enter the Manistee River below Hodenpyl Dam. Many of these tributaries are trout streams which have not been surveyed by Fisheries Division since the 1960s.

References

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Table 1. –July and August 2002 water temperatures at three locations downstream of Hodenpyl dam. Data were summarized from hourly temperatures recorded with electronic thermometers. Values shown for maximum and minimum temperatures are the averages of daily maximum or minimum temperatures for each month. Temperature data is presented in centigrade (to facilitate comparisons to literature values) and Fahrenheit (to facilitate communication with the public). Electronic data provided by Matt Klungle, Michigan State University.

	Average of daily values in month						Highest July or August			
	Maximum		Minimum		Mean		Weekly mean		Range	
Month	^{0}C	^{0}F	^{0}C	^{0}F	^{0}C	^{0}F	^{0}C	^{0}F	^{0}C	^{0}F
	2.25 miles downstream of Hodenpyl dam									
July	23.0	73.4	21.8	71.3	22.3	72.1	22.7	72.9	1.2	1.7
August	22.0	71.6	21.1	69.9	21.4	70.6			1.0	1.7
	4.5 miles downstream of Hodenpyl dam									
July	23.8	74.8	21.6	70.9	22.5	72.4	22.9	73.1	2.2	3.9
August	22.7	72.9	20.9	69.6	21.6	70.9			1.8	3.2
	5.25 miles downstream of Hodenpyl dam									
July	23.7	74.6	21.3	70.4	22.2	72.0	22.6	72.7	2.3	4.2
August	22.6	72.7	20.6	69.1	21.4	70.5			2.0	3.5

Table 2.-MI DNR Manistee River Fish Plantings, Hodenpyl Dam-Tippy Dam, 1934-2003.

Year	Species	Site	Number	Size	Strain
1934	Yellow perch	Tippy Pond	15,000	7 mo.	
	Bluegill	Tippy Pond	12,500	3 mo.	
1935	Walleye	Tippy Pond	170,000	Fry	
	Yellow perch	Tippy Pond	25,000	7 mo.	
1936	Walleye	Tippy Pond	450,000	Fry	
1937	Rainbow trout	Tippy Pond	264	Adults	
	Walleye	Tippy Pond	450,000	Fry	
	Smallmouth bass	Tippy Pond	3,000	3 mo.	
	Bluegill	Tippy Pond	15,000	5 mo.	
1938	Rainbow trout	Red Bridge	380	Adults	
	Walleye	Red Bridge	320,000	Fry	
	Yellow perch	Tippy Pond	96,000	7 mo.	
	Bluegill	Tippy Pond	25,200	5 mo.	
1939	Rainbow trout	Red Bridge	193	Adults	
	Walleye	Tippy Pond	300,000	Fry	
	Smallmouth bass	Tippy Pond	2,000	5 mo.	
	Bluegill	Tippy Pond	80,000	4-5 mo.	
1940	Rainbow trout	Red Bridge	5,000	4 mo.	
	Walleye	Tippy Pond	120,000	Fry	
	Smallmouth bass	Tippy Pond	700	4 mo.	
	Bluegill	Tippy Pond	400	Yearlings	
1941	Rainbow trout	Red Bridge	72	Adults	
	Rainbow trout	Tippy Pond	181	Adults	
	Smallmouth Bass	Tippy Pond	600	4 mo.	
	Yellow perch	Tippy Pond	23,000	5 mo.	
	Bluegill	Tippy Pond	104,000	4 mo.	
1942	Walleye	Tippy Pond	300,000	Fry	
	Smallmouth bass	Tippy Pond	500	Adults	
	Bluegill	Tippy Pond	24,500	Adults	
	Rainbow trout	Red Bridge	338	Adults	
1943	Rainbow trout	Red Bridge	162	Adults	
	Smallmouth bass	Tippy Pond	750	3 mo.	
1944	Rainbow trout	Red Bridge	205	Adults	
	Smallmouth bass	Tippy Pond	1,000	4 mo.	
	Bluegill	Tippy Pond	2,000	4 mo.	
1946	Rainbow trout	Red Bridge	110	Adults	
1948	Rainbow trout	Red Bridge	105	Adults	
1949	Rainbow trout	Red Bridge	174	Adults	
1950	Rainbow trout	Red Bridge	370	Adults	
1951	Rainbow trout	Red Bridge	176	Adults	
1952	Rainbow trout	Red Bridge	160	Adults	
1953	Rainbow trout	Red Bridge	197	Adults	
1955	Rainbow trout	Red Bridge	50	Legal	

Table 2.-Continued

1970	Rainbow trout	Red Bridge	7,000	Yearlings	
	Rainbow trout	Red Bridge	560	Adults	
	Rainbow trout	Woodpecker Creek	3,000	Yearlings	
	Rainbow trout	Woodpecker Creek	220	Adults	
1971	Brown trout	Woodpecker Creek	4,000	Yearlings	
	Rainbow trout	Woodpecker Creek	13,738	Yearlings	
1972	Brown trout	Red Bridge	5,010	Yearlings	
	Brown trout	Woodpecker Creek	5,010	Yearlings	
	Rainbow trout	Red Bridge	4,187	Yearlings	
	Rainbow trout	Woodpecker Creek	5,814	Yearlings	
1973	Brown trout	Red Bridge	5,000	Yearlings	
	Brown trout	Woodpecker Creek	5,000	Yearlings	
	Rainbow trout	Red Bridge	5,000	Yearlings	
	Rainbow trout	Woodpecker Creek	5,000	Yearlings	
1974	Brown trout	Red Bridge	5,000	Yearlings	
	Brown trout	Woodpecker Creek	5,000	Yearlings	
	Rainbow trout	Red Bridge	5,010	Yearlings	
	Rainbow trout	Woodpecker Creek	10,080	Yearlings	
1975	Brown trout	Red Bridge	10,000	Yearlings	
1976	Brown trout	Red Bridge	400	Adults	
	Brown trout	Red Bridge	5,000	Yearlings	
	Rainbow trout	Red Bridge	5,000	Yearlings	
1977	Brown trout	Red Bridge	589	Adults	
	Brown trout	Red Bridge	5,000	Yearlings	
	Brown trout	Woodpecker Creek	10,000	Yearlings	
	Rainbow trout	Red Bridge	5,000	Yearlings	
	Rainbow trout	Woodpecker Creek	226	Adults	
	Rainbow trout	Woodpecker Creek	5,000	Yearlings	
1978	Brown trout	Red Bridge	5,000	Yearlings	
	Brown trout	Woodpecker Creek	5,000	Yearlings	
	Rainbow trout	Red Bridge	5,000	Yearlings	
	Rainbow trout	Woodpecker Creek	5,000	Yearlings	
1979	Brown trout	Red Bridge	4,000	Yearlings	
	Brown trout	Woodpecker Creek	2,000	Yearlings	
	Rainbow trout	Red Bridge	2,500	Yearlings	
	Rainbow trout	Woodpecker Creek	2,500	Yearlings	
1980	Brown trout	Red Bridge	3,000	Yearlings	
	Brown trout	Woodpecker Creek	3,000	Yearlings	
	Rainbow trout	Red Bridge	5,000	Yearlings	
	Rainbow trout	Woodpecker Creek	5,000	Yearlings	
1981	Brown trout	Red Bridge	3,000	Yearlings	
	Brown trout	Woodpecker Creek	3,000	Yearlings	
	Rainbow trout	Red Bridge	5,000	Yearlings	
	Rainbow trout	Woodpecker Creek	5,000	Yearlings	

Table 2.-Continued

1982	Brown trout	Red Bridge	4,700	Yearlings	
	Brown trout	Woodpecker Creek	4,700	Yearlings	
	Rainbow trout	Red Bridge	5,000	Yearlings	
	Rainbow trout	Woodpecker Creek	5,000	Yearlings	
1983	Brown trout	Red Bridge	5,000	Yearlings	
	Brown trout	Woodpecker Creek	5,000	Yearlings	
	Rainbow trout	Red Bridge	5,000	Yearlings	
	Rainbow trout	Woodpecker Creek	5,000	Yearlings	
1984	Walleye	Red Bridge	172,500	Fry	
	Walleye	Red Bridge	7,972	Fall fingerlings	
1985	Walleye	Red Bridge	125,000	Fry	Manistique
	Walleye	Red Bridge	13,500	Spring fingerlings	Muskegon
	Walleye	Red Bridge	87,500	Fry	Muskegon
1986	Brown trout	Woodpecker Creek	11,400	Yearlings	
1987	Brown trout	Woodpecker Creek	11,901	Yearlings	
1988	Brown trout	Woodpecker Creek	15,000	Yearlings	
	Channel catfish	Red Bridge	16,530	Fall fingerlings	
1989	Brown trout	Woodpecker Creek	15,000	Yearlings	
1990	Brown trout	Woodpecker Creek	14,498	Yearlings	
1991	Brown trout	Woodpecker Creek	15,540	Yearlings	
	Channel catfish	Red Bridge	20,000	Fall fingerlings	
1992	Brown trout	Woodpecker Creek	14,597	Yearlings	Soda Lake
	Walleye	Red Bridge	44,479	Spring Fingerlings	Muskegon
1993	Brown trout	Woodpecker Creek	14,900	Yearlings	Plymouth Rock
1994	Brown trout	Woodpecker Creek	14,992	Yearlings	Saint Croix
1995	Brown trout	Woodpecker Creek	13,600	Yearlings	Wild Rose
1996	Brown trout	Woodpecker Creek	13,153	Yearlings	Seeforellen
1997	Brown trout	Woodpecker Creek	12,517	Yearlings	Wild Rose
1998	Brown trout	Woodpecker Creek	14,480	Yearlings	Wild Rose
1999	Brown trout	Scatter	15,000	Yearlings	Seeforellen
	Walleye	Tippy Pond	43,029	Spring Fingerlings	Muskegon
2000	Brown trout	Scatter	24,990	Yearlings	Wild Rose
	Rainbow trout	Woodpecker Creek	71,263	Fall fingerlings	Eagle Lake
2001	Brown trout	Woodpecker Creek	25,800	Yearlings	Wild Rose
	Rainbow trout	Woodpecker Creek	29,616	Yearlings	Eagle Lake
	Walleye	Tippy Pond	52,499	Spring Fingerlings	Muskegon
2002	Brown trout	Woodpecker Creek	25,800	Yearlings	Wild Rose
	Brown trout	Woodpecker Creek	10,585	Yearlings	Gilchrist Creek
	Rainbow trout	Woodpecker Creek	29,680	Yearlings	Eagle Lake
2003	Brown trout	Woodpecker Creek	30,500	Yearlings	Wild Rose
	Rainbow trout	Woodpecker Creek	34,464	Yearlings	Eagle Lake

Table 3.-Number, weight, and length (inches) of fish collected from the upper station of the Manstee River below Hodenply Dam by boomshocking, June 12-14, 2000.

Species	Number	Percent by number	Weight (Pounds)	Percent by weight	Length range (inches)[1]	Average length	Percent legal size[2]
Bluegill	1	0.1	0.19	0.1	6-6	6.5	100 (6")
Brook trout	8	0.5	0.9	0.3	5-9	6.5	11 (8")
Brown trout*	1,585	94.4	230	65.5	2-21	7.1	24 (8")
Largemouth bass	1	0.1	0.6	0.2	10-10	10.0	0 (14")
Northern pike	5	0.3	15.2	4.3	16-29	22.9	60 (24")
Rainbow trout	2	0.1	0.2	0.1	6-6	6.5	0 (10")
Rock bass	4	0.2	2.9	0.8	7-12	9.5	100 (7")
Smallmouth bass	44	2.6	46.5	13.2	3-17	11.6	34 (14")
Walleye	24	1.4	54.6	15.5	6-28	17.6	71 (15")
Yellow perch	5	0.3	0.1	0.0	1-5	3.4	0 (7")
Total	1,679	100.0	351.19	100.0			

[1]Note some fish were measured to 0.1 inch, others to inch group: e.g., "5"=5.0 to 5.9 inch, 12=12.0 to 12.9 inches; etc.

[2]Percent legal size or acceptable size for angling. Legal size or acceptable size for angling is given in parentheses.

*Does not include recaptures

Table 4.–Brown trout numbers and pounds per acre in a 2.7-mile reach (43.11 acres) of the Manistee River extending downstream from the Hodenpyl Dam spillway to the "waterfall". Populations were estimated by the Schumacher-Eschmeyer formula from three-pass mark and recapture data, June 12-14, 2000.

	Number per acre				Pounds per acre		
		95% confidence limits				95% confidence limits	
Inch group	Estimate	Lower	Upper		Estimate	Lower	Upper
3	0.96	0.00	1.95		0.01	0.00	0.03
4	39.87	27.71	52.03		1.28	0.89	1.66
5	45.40	31.77	59.02		2.66	1.86	3.45
6	72.30	51.54	93.05		7.00	4.99	9.01
7	54.56	38.44	70.68		8.12	5.72	10.52
8	29.71	26.85	32.58		6.45	5.83	7.07
9	13.93	10.22	17.63		4.22	3.10	5.35
10	2.67	1.37	3.98		1.10	0.56	1.63
11	0.14	0.00	0.42		0.08	0.00	0.23
12	0.00	0.00	0.00		0.00	0.00	0.00
13	0.00	0.00	0.00		0.00	0.00	0.00
14	0.14	0.00	0.42		0.15	0.00	0.46
15	0.00	0.00	0.00		0.00	0.00	0.00
16	0.00	0.00	0.00		0.00	0.00	0.00
17	0.14	0.00	0.42		0.27	0.00	0.80
18	0.14	0.00	0.42		0.32	0.00	0.95
19	0.00	0.00	0.00		0.00	0.00	0.00
20	0.00	0.00	0.00		0.00	0.00	0.00
21	0.14	0.00	0.42		0.50	0.00	1.49
Total	**260.1**	**187.9**	**333.0**		**32.1**	**22.9**	**42.7**

Table 5.-Number, weight, and length (inches) of fish collected from the lower station of the Manistee River below Hodenply Dam by boomshocking, June 12-14 2000.

Species	Number	Percent by number	Weight (Pounds)	Percent by weight	Length range (inches)[1]	Average length	Percent legal size[2]
Brown trout*	263	72.1	127.9	45.5	5-24	9.8	56 (8")
Channel catfish	1	0.3	3.2	1.1	21-21	21.5	100 (12")
Northern pike	19	5.2	44.9	16.0	12-26	21.7	16 (24")
Rainbow trout*	27	7.4	33.2	11.8	8-18	14.8	93 (10")
Rock bass	2	0.5	0.7	0.2	4-9	7.0	50 (7")
Smallmouth bass	26	7.1	48	17.1	10-19	14.9	70 (14")
Walleye	26	7.1	23.3	8.3	11-18	13.8	15 (15")
Yellow perch	1	0.3	0	0.0	1-5	3.4	0 (7")
Total	365	100.0	281.2	100.0			

[1]Note some fish were measured to 0.1 inch, others to inch group: e.g., "5"=5.0 to 5.9 inch, 12=12.0 to 12.9 inches; etc.

[2]Percent legal size or acceptable size for angling. Legal size or acceptable size for angling is given in parentheses.

*Does not include recaptures

Table 6.–Brown trout numbers and pounds per acre in a 1.2-mile reach (19.24 acres) of the Manistee River extending downstream from the mouth of Slagle Creek. Populations were estimated by the Schumacher-Eschmeyer formula from three-pass mark and recapture data, June 12-14, 2000.

	Number per acre				Pounds per acre		
		95% confidence limits				95% confidence limits	
Inch group	Estimate	Lower	Upper		Estimate	Lower	Upper
3	0.00	0.00	0.00		0.00	0.00	0.00
4	0.00	0.00	0.00		0.00	0.00	0.00
5	1.14	0.33	1.95		0.07	0.02	0.11
6	7.49	6.23	8.75		0.72	0.60	0.85
7	8.42	5.35	11.49		1.25	0.80	1.71
8	6.03	4.92	7.14		1.31	1.07	1.55
9	7.56	3.59	11.54		2.29	1.09	3.50
10	7.56	3.59	11.54		3.10	1.47	4.73
11	2.52	0.40	4.65		1.36	0.21	2.50
12	7.14	3.31	10.98		4.95	2.29	7.61
13	1.68	0.00	3.39		1.47	0.00	2.96
14	6.72	3.02	10.42		7.28	3.27	11.29
15	2.94	0.63	5.25		3.89	0.84	6.95
16	1.68	0.00	3.39		2.69	0.00	5.42
17	1.68	0.00	3.39		3.21	0.00	6.47
18	2.52	0.40	4.65		5.68	0.90	10.47
19	1.26	0.00	2.73		3.33	0.00	7.21
20	0.84	0.00	2.03		2.58	0.00	6.24
21	0.00	0.00	0.00		0.00	0.00	0.00
22	0.00	0.00	0.00		0.00	0.00	0.00
23	0.00	0.00	0.00		0.00	0.00	0.00
24	0.42	0.00	1.26		2.21	0.00	6.60
Total	**67.62**	**31.76**	**104.55**		**47.4**	**12.56**	**86.2**

Table 7.-Average total length (inches) at age, and size relative to the state average, for trout sampled from the Manistee River below Hodenpyl Dam during June, 2000. Annual growth increments for brown trout were computed for each age group by subtracting mean length at age in year 1 from mean length at year 2.

								Annual growth increment			
Species	Age Group	Number of fish	Length range in inches	Mean length in inches	State average length	Growth index* (by age group)	Mean growth index for species	Below Hodenpyl	State average		
Brown trout	0	7	2.6-4.1	3.7	2.5	+1.2	+1.9				
	I	255	4.2-10	6.9	5.8	+1.1		3.2	3.3	WR stocked 5/16 at 6.52”	
	II	38	8.6-13.8	10.6	8.8	+1.8		3.7	3.0	SF browns stocked in 99 at 6.56”	
	III	21	11.9-17.1	14.7	11.8	+2.9		4.1	3.0	WR stocked end of April 98 at 6.7”	
	IV	11	15.1-18.8	17.1	14.8	+2.3		2.4	3.0	WR stocked in May 97 at 6.7”	
	V	5	18.5-21.1	19.6	17.8	+1.8		2.5	3.0		
	VI	2	19.1-20	19.6	20.8			0.0	3.0		
	VIII	1	24.3	24.3	23.8						
Rainbow trout	I	4	6.3-10.2	8.0	5.2		+3.9				
	II	5	8.2-14.3	12.0	8.0	+4.0		4.0	2.8		
	III	11	14.3-17.6	15.8	11.0	+4.8		3.8	3.0		
	IV	7	12.3-21.3	16.8	14.0	+2.8		1.0	3.0		
Brook trout	I	6	5.2-7.3	6.0	5.3	+0.7	+0.7				

* Growth index is the deviation from the state average length; at least five individuals must be aged from any one age group to make the comparison.

WR = Wild Rose, strain; SF = Seeforellen, strain

Table 8.-Brown trout numbers per acre by age, percent by age, and annual survival for the Manistee River below Hodenpyl Dam. These estimates were computed by first combining data for both the upper and lower stations before computing Schumacher-Eschmeyer estimates.

Number per acre by age							
0	1	2	3	4	5	6	7+
2.2	170.9	8.1	3.6	1.4	0.7	0.3	0.0
Percent of population by age group							
0	1	2	3	4	5	6	7+
1.2	91.4	4.3	1.9	0.7	0.4	0.1	
Percent survival from previous age							
0	1	2	3	4	5	6	7+
	N/A*	N/A*	44.2	36.8	57.1	25.0	0.0
* Survival to age 1 and age 2 can not be computed because yearling brown trout were stocked one month prior to the survey							
Survival estimates for older age groups are more likely to be valid because stocking rates were relatively stable from 1994-98.							
Plant Year							
		1999	1998	1997	1996	1995	1994
Total yearling plant		15000	14,480	12517	13,153	13600	14,992

Table 9.-Average total length (inches) at age, and growth relative to the state average, for other species sampled from the Manistee River below Hodenpyl Dam during June, 2000.

Species	Age Group	Number of fish	Length range in inches	Mean length in inches	State average length	Growth index* (by age group)	Mean growth index for species
Northern pike	II	1	17.8-17.8	17.8	19.0		
	III	1	21.1-21.1	21.1	21.8		
	IV	2	22.9-23.2	23	24.2		
	V	2	24.6-25.5	25.1	26.1		
	VI	1	24.9-24.9	24.9	27.8		
Rock bass	VI	1	9.2-9.2	9.2	8.1		
Smallmouth bass	I	1	3.8-3.8	3.8	5.5		-0.3
	II	1	8.6-8.6	8.6	8.8		
	III	3	8.8-10.6	9.6	11.1		
	IV	4	11.1-13.8	12.0	13.0		
	V	8	12.6-14.9	13.9	14.7	-0.8	
	VI	5	14.8-16.6	15.7	15.5	+0.2	
	VII	4	16.7-17.5	17.1	16.6		
	VIII	1	17.3-17.3	17.3	17.4		
	XII	1	18-18	18.0			
Walleye	I	1	7.3-7.3	7.3	8.2		-0.6
	II	6	10.3-12.2	11.4	11.4	0.0	
	III	15	12.3-15.3	13.6	14.4	-0.8	
	IV	11	14.3-18.6	15.3	16.2	-0.9	
	V	3	17.1-17.8	17.3	18.0		
	VI	1	18-18	18.0	19.6		
	VIII	2	22.6-23.5	23.1	21.7		
	IX	1	27.3-27.3	27.3	22.6		
	X	1	28.5-28.5	28.5	23.1		
	XII	2	20.7-22	21.4			
Yellow perch	I	1	4.2-4.2	4.2	4		
	II	1	4.9-4.9	4.9	5.7		
	III	1	5-5	5	6.8		
	IV	1	4.7-4.7	4.7	7.8		

* Growth index is the deviation from the state average length; at least five individuals must be aged from any one age group to make the comparison.

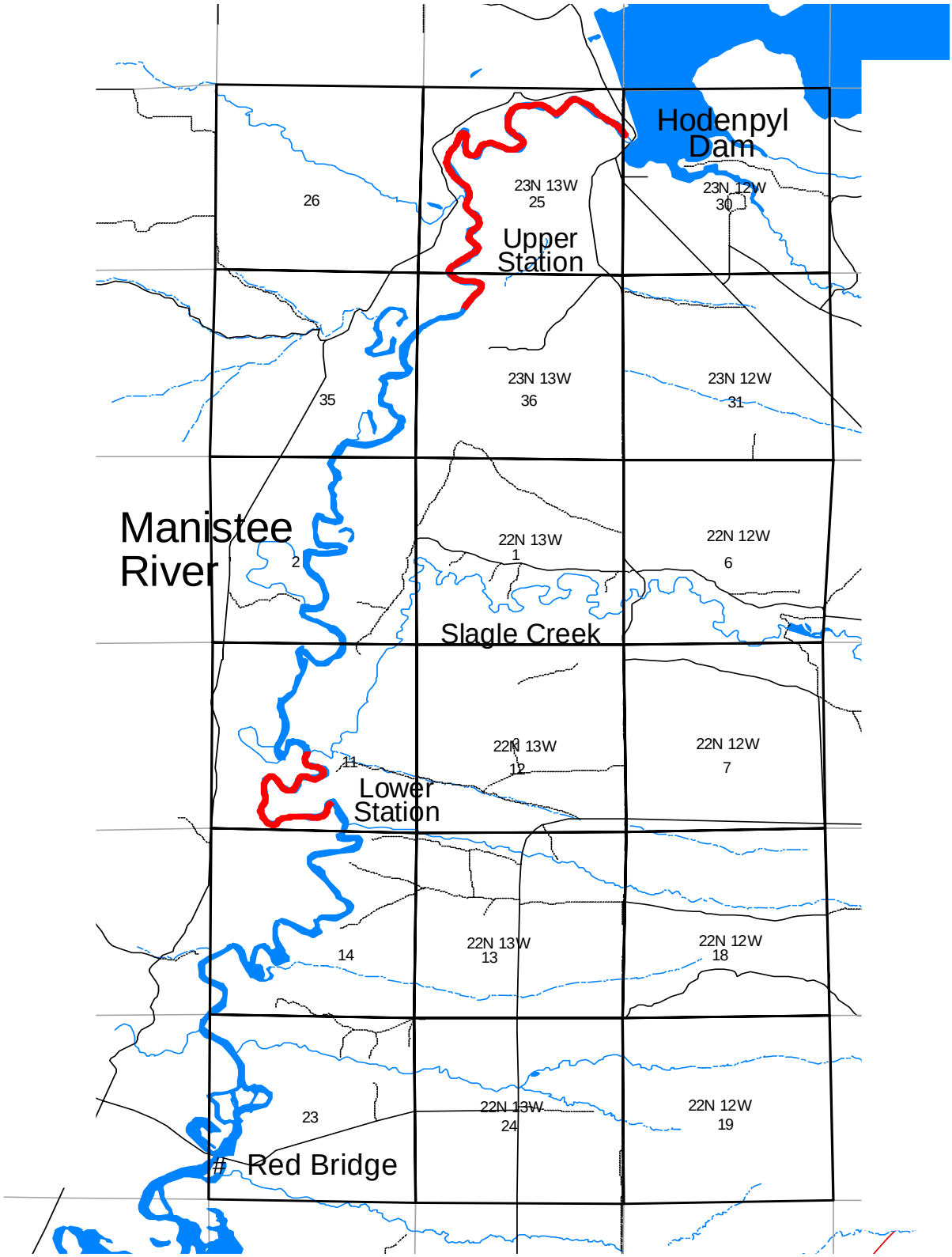

Figure 1. The Manistee River below Hodenpyl Dam, including the two stretches sampled by MDNR Fisheries Division during June, 2000.