Tahquamenon River
Chippewa County, T48N, R06W, Sec 14
Last Surveyed 2001

James R. Waybrant

Environment

The Tahquamenon River drains an area of 790 square miles, originating from small lakes at the Alger/Luce County border. For practical management purposes, the Tahquamenon River is divided into three main segments (Figure 1). The Upper River is higher gradient and contains native brook trout. Spring fed tributaries entering the Upper River segment include Kings and Syphon creeks. The Middle River segment begins at County Road 415 Bridge north of McMillan and extends to the Upper Falls. It has very little gradient, is warmed by the Dollarville Flooding, and supports a good coolwater fish community. Tributaries entering the Middle River segment include East, Silver, Teaspoon, Thirty nine, Sixteen, Gimlet, Murphy, and Linton creeks, and Auger, Sage, Hendrie, and East Branch Tahquamenon rivers. The Lower River is separated from the upper segments by the Upper and Lower Falls. It also supports a coolwater fish community, but in addition is open to migrating fish species from Lake Superior. Tributary streams include Bowers and Cheney creeks. Principal soil types vary from rock rubble, gravel and sand in the Upper River segment to sand, sandy loams, muck, clay, marl and silt substrates in the rest of the river. Through the stretch of river from Dollarville Dam to McPhee's Landing, sandy clay loams dominate. From McPhee's Landing to the mouth of the Hendrie River, there is more mud and silt, while the rest of the river from the Hendrie to Lake Superior contains a mixture of rubicon sand, griffin sand, fine silt, muck and clay. The Falls themselves, both Upper and Lower, are exposed sandstone bedrock of stair-step gradients. The Upper Falls "step" is a large one, about 49 feet, which precludes any fish migration into the middle reaches of the River. This report discusses the Middle and Lower segments of the river.

In the portion of the Middle River from Dollarville Dam to McPhee's Landing (9 miles), the Tahquamenon River winds through sand hills vegetated with poplar, white birch, soft maple, jack pine, and thornapple. Marshy bayous have developed in this area over the years, most notably two large bays collectively called Spider Bay, about two miles downstream from Dollarville Dam. Here, the river is relatively shallow and littered with debris. In the first mile below McPhee's, the river flows through marginal swamp vegetated with elm, soft maple, ash and alder. From there to the mouth of the Hendrie, the river meanders through low marshland vegetated with alder, low brush, cattails, and sedges. Aquatic weed growth is moderate to heavy. From the Hendrie down to the Upper Falls, the river channel straightens somewhat, flowing through marginal swamp vegetated with soft maple, elm and conifers and then through low rolling sand plains vegetated with poplar, white birch, marginal hardwoods, and alder. In the Lower River segment downstream from the Falls, stream banks become steep and relatively high.

The Tahquamenon is a productive system. The water color is light to dark brown in color, due to tannins from the surrounding forest and wetlands.

The river ranges in depth from 1 to 60 feet, which occurs near Joy Island, upstream from the Upper Falls. Deep holes have been scoured where the larger streams or tributary rivers join with the main

branch. Width ranges from 20 to 200 feet, widening progressively as one proceeds downstream. Cover is adequate in most areas, provided by downed trees, weed beds, and sharp drop offs.

Access sites to the Tahquamenon River are very limited. Both upstream and downstream accesses exist at the Dollarville Dam. McPhee's Landing, however, located ½ mile north and 5 miles east of Newberry, handles the majority of the above-falls boat traffic. The site can handle about 5 - 6 vehicle/trailer combinations with trailers encroaching into the surrounding brush. Occasionally, more anglers, use the site, and park along the roadway. Anglers routinely boat many miles downstream to fish, while recreational boaters occasionally go all the way downstream to the Upper Falls, a journey of roughly 60 miles round-trip. Boaters must make sure that 1) they have enough gas, remembering that they will be boating against the current on the return trip, and 2) their outboard engine is in excellent shape. Mechanical problems in the "wasteland" between McPhee's and the Falls would be either a nightmare or a life-threatening situation, as there is no other way out. A non-marked, private access exists in the East Branch Tahquamenon River, about ¼ mile upstream from the mouth, northwest of Hulbert. However, the mouth of the East Branch is not marked either. Unless one has prior experience in the area or has recently launched from the East Branch access site, finding your way up that stream to the access would be difficult.

The Lower River contains only one public boat access. The Michigan Department of Natural Resources (MDNR) maintains an excellent ramp and parking area at the mouth of the River, just off highway M-123. From there, boaters can motor upstream to the Lower Falls, about 17 river miles. Depending upon seasonal rainfall, anglers can often motor over a shallow area just downstream from the Lower Falls to fish at the Lower Falls basin.

History

Early loggers and lumbermen used the river to assist in the promotion of their fortunes or mishaps. Environment was not considered important in those days, and the Tahquamenon Improvement Company in 1883 cleared obstructions from the upper Tahquamenon River, from the Eagle's Nest bridge downstream to Dollarville Flooding (Barnett 1990). The river in that area has still not recovered from the huge sand bedload resulting from that habitat destruction. As a result, Fisheries personnel were able in 1995 to force net handles through over three feet of sand bedload in several areas before contacting hard gravel substrate. In addition, the Tahquamenon Improvement Company in 1982-1983 blasted a channel in the bedrock 4 ft deep and 80 ft wide, about 1/2 mile long, immediately above the Upper Falls to facilitate log movement (Barnett 1990). Numerous landmarks associated with the lumber industry are still located along the river such as Underwoods Fur Farm, the "ghost town" of Dollarville, railroad trestles, booms, and building foundations, Chamberlain`s Mill, and old trapper/farmer camps of the post logging era.

In post logging days the river has been used for trapping fur bearers, fishing, waterfowl hunting, and canoeing. An MDNR survey of the Mainstream from Newberry to the Upper Falls in 1970 documented the presence of minnows, northern pike, northern musky, walleye, largemouth bass, rockbass, brown bullheads, and white suckers. Largemouth bass are currently absent from most of the river, although they are still found in Mud Lake, a shallow, warm water "appendix" to the river just downstream from McMillan. In addition, smallmouth bass are captured occasionally throughout the river. Yellow perch have become a significant factor in the more recent surveys. Historically, the Middle Tahquamenon

(Newberry to Falls) has been stocked with northern musky, walleye, largemouth bass. No species, however, has been stocked in over ten years.

In the early 1990's, a dispute arose between the Tahquamenon Area Sportsmans Club and the DNR. Club members felt that the muskies were foraging on walleyes, so they were killing every musky they caught, no matter what size it was. Concurrently, the minimum legal size (MSL) of muskies was raised statewide in 1993 to 42 inches. However, because of the local dispute, the musky MSL for the Tahquamenon River remained at 30 inches, while we tried determine the fish community dynamics in the river. We therefore began a series of annual boomshocking surveys in 1993 that lasted until 2001. Muskellunge MSL was increased to 42 inches in the Tahquamenon River in 1996, during the extended study. The nine-year effort targeted eight common sites from Dollarville Dam downstream to the Upper Falls, and three sites from the Lower Falls to the mouth of the river. Each site other than the Dollarville site was measured for a uniform one mile of shoreline. We surveyed the same exact shoreline sites every year to minimize sampling variance. For brevity, the following history will describe some of the 1996 survey analysis as a baseline, and then the 1999 survey in more detail. The final survey in 2001 will be discussed in the Current Status section. Full data files and complete analyses for each year are available in the Newberry Operations Service Center, Fisheries Division files.

The 1996 survey captured fewer fish than 1995, but similar to the numbers captured during 1994. We had lots of rain and very high water in 1996, and went back into a couple of sites just to get enough fish to analyze.The approximate ratios of walleye to muskie, however, were changing dramatically, from roughly 2.5 walleyes per muskie in 1994 to roughly 3.7 in 1996, with 1995 being a transition year.

Above the Falls in 1999, all four targeted species declined in numbers. Muskellunge had an average size of about 26 inches, with none captured of legal size. Pike had an average size of 17 inches, although 21 percent were legal at 24+ inches. Walleye numbers fell about 50%, but average size was 16 inches, with 55 percent legal. Perch numbers continued a multi-year decline. However, 53 percent were over 7 inches. We again observed enormous numbers of small forage (small suckers and minnows) at almost all sampling stations.

Below the Falls, muskie numbers also fell slightly, with an average size of 29.9 inches. We again did not capture a legal muskie. We also caught 10 smallmouth bass that averaged 8.7 inches. Only one was legal sized, at 15 inches. We captured no walleyes in the lower river. Pike numbers again went up, with 13 percent legal at 24+ inches. Perch numbers fell from about 50%, while 71 percent were over 7 inches.

Current Status

The 2001 boomshocking survey concluded a 9-year effort to determine the population dynamics and fish community interactions within the Tahquamenon River (Table 1). Musky numbered 55, averaging 25.0 inches, with 2% legal sized at 42+ inches and 32.8% of the total fish community biomass. Northern pike numbered 113, averaging 19.5 inches, with 18% legal sized at 24+ inches and 25.2% of total biomass. Walleye numbered 226, averaging 14.9 inches, with 54% legal at 15+ inches and 36.6% of total biomass. Yellow perch numbered 198, averaging 7.6 inches, with 66% acceptable at 7+ inches

and 4.5% of total biomass. Only the larger perch were targeted; netters every year observed large numbers of forage minnows, small perch and white suckers. All four species were predominantly in the Middle River segment. Smallmouth bass, however, were almost all caught in the Lower River segment. Smallmouth numbered 10, averaging 11.7 inches, with 10% legal at 14+ inches and 1% of the total biomass.

Through the river as a whole, musky growth index was -0.9 inches slower than state average (Table 2). That index was considerably better than northern pike, which grew more slowly at -1.9 inches. Walleyes and yellow perch both grew very well, at +1.3 inches and +1.0 inches, while smallmouth bass grew at roughly state average. The greatest population density occur among those fish aged 2 - 5 (Table 3). Although some musky in the survey were 12 years old, the oldest smallmouth bass was age 5.

Mortality rates were estimated for musky, northern pike, smallmouth bass, walleyes and perch (Table 4). Mortality estimates were determined by entering ages and weighted age frequencies into a MDNR spreadsheet which concurrently calculates R-C survival estimate, Heincke's survival estimate, Chi-Squared calculation for significance, mortality estimate, and an instant mortality estimate (Appendix 1). The youngest ages of all five species showed very high mortality. Older musky experienced 51.3% mortality, pike 63.0%, smallmouth bass 66.4%, walleye 30.5%, and perch 71.0%. The high mortality rates of the younger fish are to be expected, as all piscivorous predators target prey of that size. However, estimates for adults are all quite high for each species except walleye. For comparison, Houghton Lake mature walleyes had 46% and mature pike had 51% estimated mortality (Clark et al. 2004).

The MDNR jaw-tagged 1,000 mature walleyes during spring 2001 at the Lower Falls. The effort was conducted to determine angler harvest and the size of the adult spawning population. Then, from May 15 until June 30, 2001, over 100 tags were returned by anglers and recorded. Anglers also described catching many more walleyes that were not tagged, producing a crude estimate of between 500 - 1,000 walleyes harvested early in the season. Since estimates of river surface area downstream from the Lower Falls are about 617 acres, the harvest estimate was roughly one walleye per acre below the Falls during the first half of 2001. This is a very nice fishery that we had not previously documented. The estimated 2,300 walleyes imply about 3.5 walleyes per acre in the lower river (Appendix 2).

Analysis and Discussion

The every-year survey regime was initiated in 1993 due to concerns about inter-species dynamics between northern musky, northern pike and walleyes in the upper river. It ended in 2001. The 2000 survey found that both numbers and average size of all three species above the Falls had increased. Below the Falls, pike numbers had fallen while musky and walleye numbers had risen. In 2001, however, numbers of all three species above the Falls increased while average sizes decreased. Concurrently, numbers below the Falls in 2001 fell while average sizes either increased or else stayed the same. In both sections of river, however, fluctuations were similar for all three species. The changes observed appear to be natural fluctuations in these populations. Every year, we document large numbers of forage minnows and white suckers, which apparently supply enough biomass to support all three predator species. Growth rates discussed in the "Current Status" section verify that assumption. The rates are relatively good to very good growth rates for waters this far north.

Many anglers who target musky are upset at the small number of legal sized musky in the river. Although there are many musky 30 - 40 inches in the river, they must now be 42 inches to be legally kept, and musky of that large size are rare. The river between Dollarville Flooding and the Upper Falls stretches about 36 miles and covers about 530 surface acres, with considerable seasonal acreage of adjacent flooded marshy areas. Below the Lower Falls, the 17 river miles cover about 617 surface acres. A fish population dynamics computer modeling program was used to determine that very few legal musky will ever be available in this small volume of water (Clark, 1989). The model calculated that there would be an estimated 15 or 16 fish at or above the 42-inch minimum legal size. In fact, the estimate remained constant at 15 or 16 despite parameter changes in both catch-and-release mortality and sub-legal harvest. Despite the seemingly counter-intuitive results, validation of that odd phenomenon showed up in Ontario's workshop about managing for musky. In effect, so many fish die of natural or angler-caused (catch-and-release) mortality that changes in number of trophy fish will be negligible. Following is part of an abstract from that workshop (J. M.Casselman, E.J. Crossman and C.J. Robinson 1995).

"Average age of a trophy muskie went from 23 to 21 yrs over the 16-year study, associated with an annual mortality increase from 18 to 20%. The 2% increase in annual mortality is comparable to a decrease in recruitment of about 70%. To compensate for a 2% increase in mortality of the oldest, largest trophy muskellunge in the 25-30 yr age range, recruitment would need to be doubled. Harvest reduction and catch-and-release procedures which reduce mortality are easier and more effective ways of sustaining or increasing numbers of trophy muskellunge than by trying to supplement recruitment through stocking. Given the stocking route, excessively large year classes of the smaller muskies would be required in order to produce good numbers of old, large trophy muskies. The existing forage base generally cannot support the unnaturally large muskellunge population necessary to compensate for any small increase in mortality of trophy muskies."

The pragmatic result of the above article is that musky should not be stocked to increase the number of legal sized fish. Musky mortality estimates using the same protocol shown in Appendix 1 ranged from 20.0% to 26.4% for the younger fish during 1996 - 1999. But for Ages 4 - 11, estimates ranged from 36.0% to 51.0%. This implies that mortality estimates for larger musky in this river are roughly double those necessary to sustain a trophy population. In order to change the number of legal fish in this river, we would have to stock so many young fish in that we would adversely affect the other fishable populations. Other sports fish species themselves already experience high mortality rates. Because of the large number of predator species in the river, one can assume that they contribute significantly to the high mortalities of young fish of all species. The adult mortality estimate for smallmouth bass of 66% might be somewhat influenced by predation by the larger esocids, while the perch estimate of 71% is likely influenced by predation by both esocids and walleyes. Numbers of each species might be variable due to inconsistent spawning related to environmental fluctuation, but mortality estimates are of the fish already present.

Other factors influencing mortality are certainly present. This river gets fished hard by both local and transient anglers. Results from the walleye tagging project indicated a heavy angling harvest in the Lower River segment, but little mention was made by anglers of harvest of any other species. At this time, it is not possible to accurately partition the mortality estimates between anglers, natural predators, and other causes.

The Tahquamenon River currently provides a diverse fishery for yellow perch, walleye, northern pike, and musky. Some large fish are present. Several year classes are present in the species collected, indicating survival and recruitment to older ages. Consistent survey observations describe large numbers of forage consisting of minnows, suckers and small sports fish. For that reason, forage should be considered plentiful and not a problem relating to decreased survival and growth.

Management Direction

The Tahquamenon River in this section should be managed for the coolwater species present. Since the early 1990's, the whole system has been entirely supported by natural reproduction. This is a very productive river, providing a unique, "isolation aesthetics" theme concurrently with its excellent fishery. Even so, the river is not very large in terms of surface acreage. The narrow river width in many places implies that any significant increase in angling pressure would produce a crowded, degraded fishing experience. For that reason, limited parking availability at the few access sites serves to protect both the fishery and the fishing experience.

The Tahquamenon River shorelines are generally shallow with mud and silt substrates and inundated with aquatic macrophytes. The dense shoreline corridors of emergent and submergent vegetation continue almost uninterrupted for much of the Middle River segment length. The several boomshocking surveys conducted since 1993 have documented by capture and visual observation that the vegetation is home to large numbers of minnow species and immature sport fish. In addition, many adult sport fish are also often pulled out of dense vegetation by the electric current.

Almost the entire 20 mile riparian corridor immediately upstream from the Upper Falls is in private ownership. For that reason, efforts including walleye and muskellunge radio-tracking and substrate sampling are currently on-going to describe the critical habitats that will require additional protection. Preliminary tracking conclusions imply that both musky and walleye spawn along the mainstem, over submerged vegetation. For example, much of the river where both species congregated during April and May does not contain any tributary streams. Therefore, potential exists that private shoreline modifications detrimental to the continued existence of the local macrophyte community could adversely affect the fish community. If the preliminary investigations prove accurate and consistent, the results will require MDNR protection against shoreline modification activities in the future.

The Tahquamenon River in this section should be surveyed again in 2010, or earlier if we begin to receive an increase in angler complaints.

References

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Table 1. – Number, weight, and lengths of fish species caught from the Tahquamenon River by boomshocking, July 2001.

Species	Number	Percent By Number	Weight (pounds)	Percent By weight	Length Range (inches)[1]	Average length	Percent Legal Size[2]
Northern musky	55	9.1	295.5	32.8	12 – 48	25.0	2
Northern pike	113	18.8	226.9	25.2	4 – 35	19.5	18
Smallmouth bass	10	1.7	9.2	1.0	8 – 17	11.7	10
Walleye	226	37.5	330.2	36.6	6 – 27	14.9	54
Yellow Perch[3]	198	32.9	40.4	4.5	5 – 12	7.6	66
Total		99.9		100.2			

[1]Note: some fish were measured to 0.1 inch, other to "inch group": eg., "5" = 5.0 to 5.9 inches; "12" = 12.0 to 12.9 inches; etc.
[2]Percent legal size or acceptable size for angling harvest.
[3]MDNR personnel only targeted the larger perch; there was a very large number of smaller perch not captured.

Table 2. – Average total length (inches) and numbers at age, and growth relative to the state average, for five species sampled from the Tahquamenon River by boomshocking, July 2001. Number of fish aged is given in parentheses.

Species	I	II	III	IV	V	VI	VII	VIII	Mean growth index[1]
Northern musky	13.6 (9)	20.7 (12)	23.2 (15)	30.6 (9)	34.8 (5)		42.8 (2)		-0.9
Northern pike	12.3 (1)	16.8 (6)	20.8 (10)	22.0 (24)	25.6 (12)	25.8 (1)	26.7 (5)		-1.9
Smallmouth bass		9.4 (3)	11.2 (5)	12.1 (2)	17.8 (1)	11.7			+0.1
Walleye	9.5 (14)	12.7 (13)	15.9 (51)	17.9 (51)	19.3 (24)	20.3 (20)	19.4 (1)	27.0 (1)	+1.3
Yellow Perch[3]	5.1 (1)	6.9 (13)	7.8 (30)	8.6 (8)	10.8 (3)	11.7 (1)	11.3 (2)		+1.0

[1]Mean growth index is the average deviation from the state average length at age.

Table 3. – Weighted age frequency (percent) of five species of fish caught from the Tahquamenon River by boomshocking, July 2001.

Species	Age I	II	III	IV	V	VI	VII	VIII	Number Caught
Northern musky	16	22	27	18	11		4		55
Northern pike	3	13	26	38	14	1	6		113
Smallmouth bass		27	45	18	9				11
Walleye	26	5	23	23	11	10	2		226
Yellow perch	1	34	47	16	2	1	1		198

Table 4. – Annual mortality estimates for five species of fish collected from the Tahquamenon River by boomshocking, July 2001. Estimates were made using the weighted age frequencies from Table 3. Individual mortality estimate Excel forms are in Appendix 1.

Species	Estimated Mortality (%)
Northern muskellunge	51.3
Northern pike	63.0
Smallmouth bass	66.4
Walleye	30.5
Yellow perch	71.0

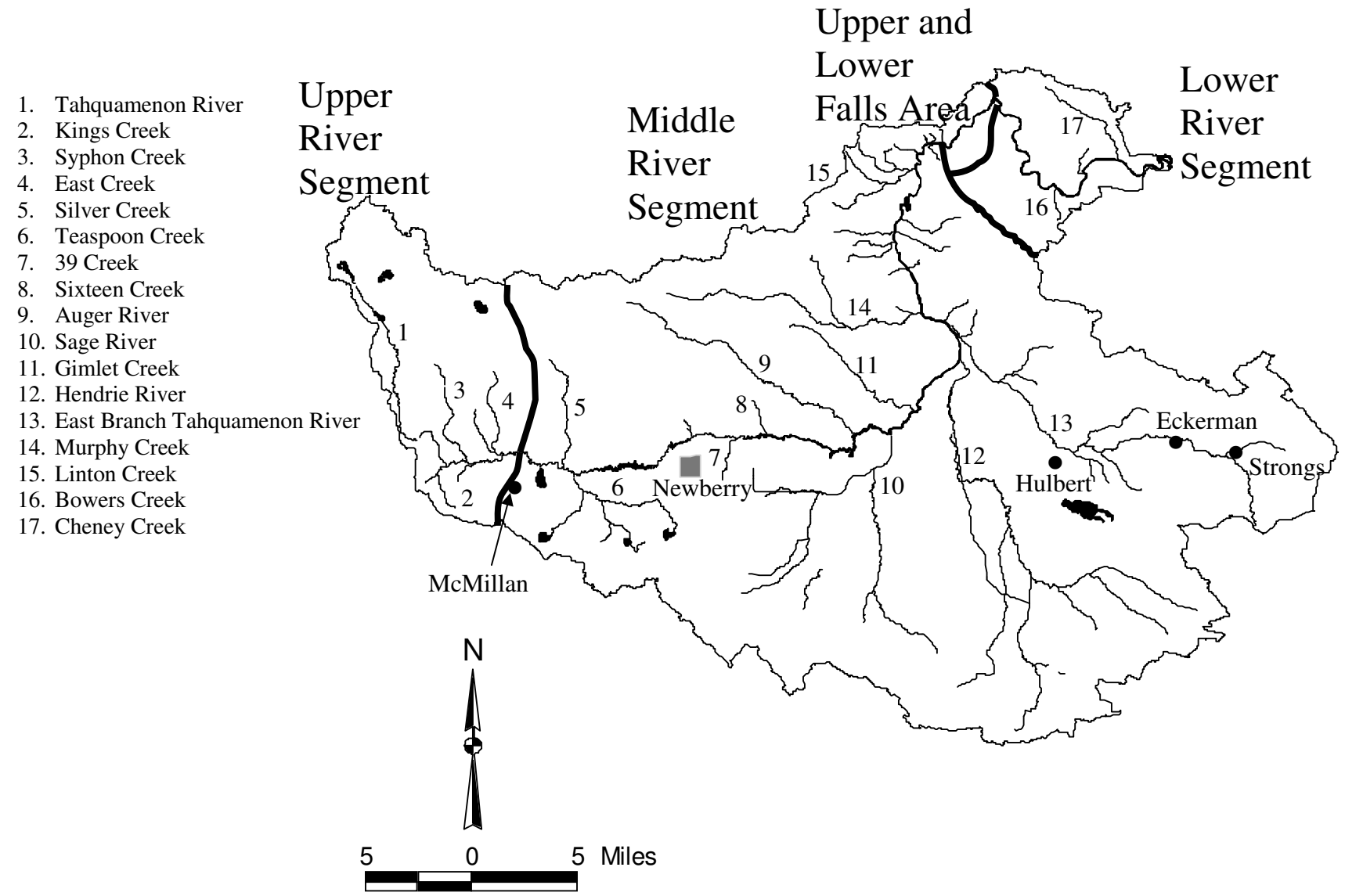

Figure 2. – Named tributaries to the Tahquamenon River, and a watershed map with numbers corresponding to the names. Names were taken from the United States Geological Survey (USGS) topographic maps, county maps produced by the Michigan Department of Natural Resources (MDNR) Engineering, Cartographic Services, and from the Graphic Information Database on the MDNR intranet website.

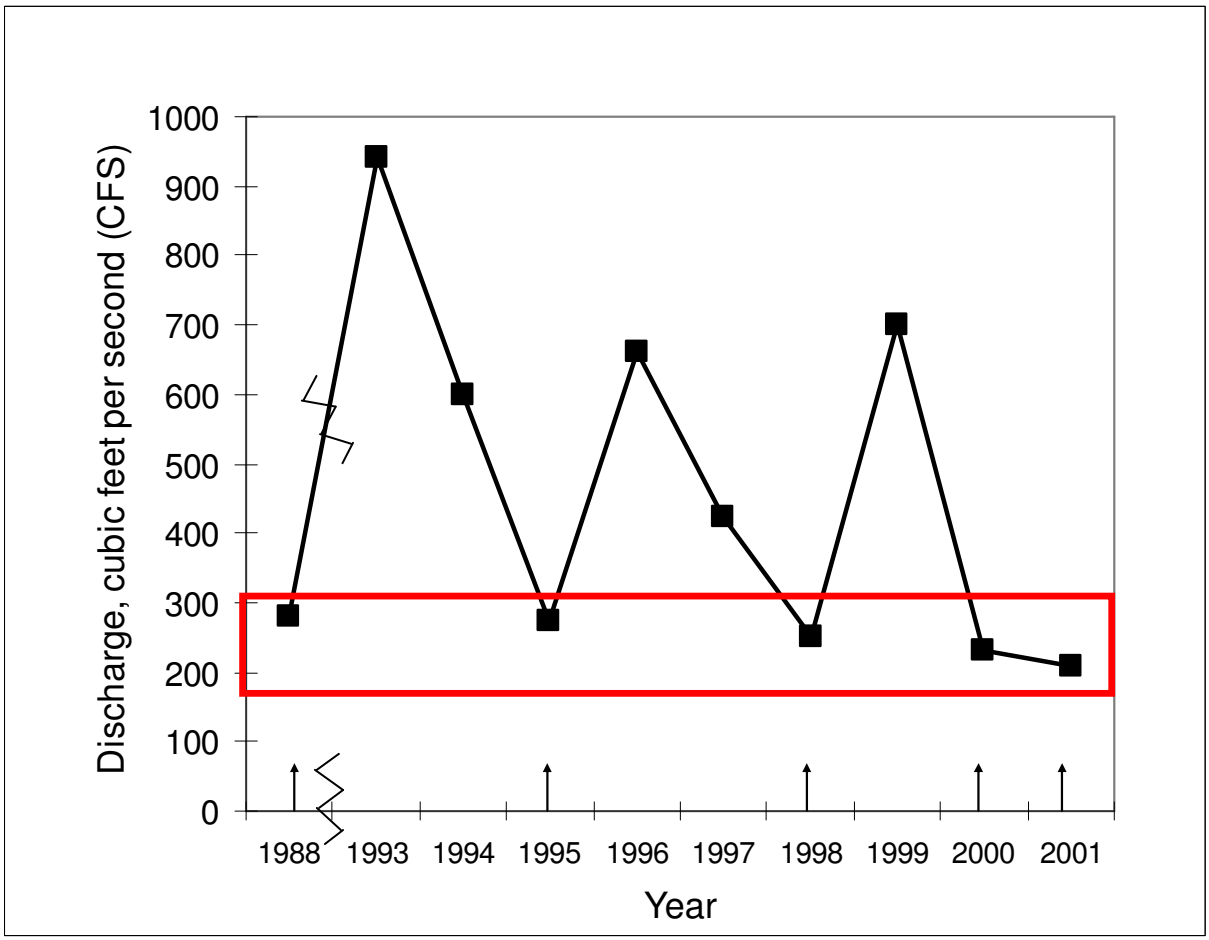

Figure 2. Tahquamenon River discharge in cubic feet per second (CFS) during each July boomshocking effort in 1988 and 1993 – 2001. The data are from the United States Geological Survey gage just upstream from the Tahquamenon Falls. The years of relatively uniform flow rates were used to compare fish numbers and biomass between surveys.

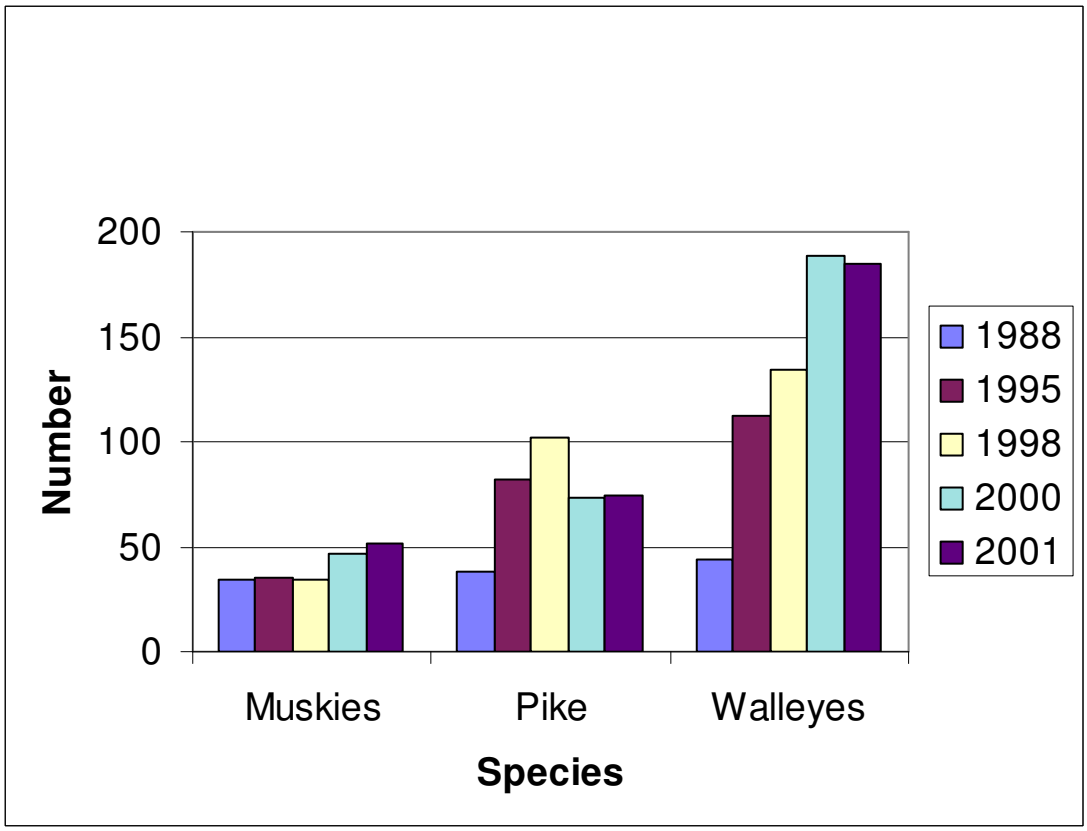

Figure 3. – Numbers of muskellunge, northern pike, and walleye in the Tahquamenon River, collected by boomshocking during July of 1988, 1995, 1998, 2000, and 2001.

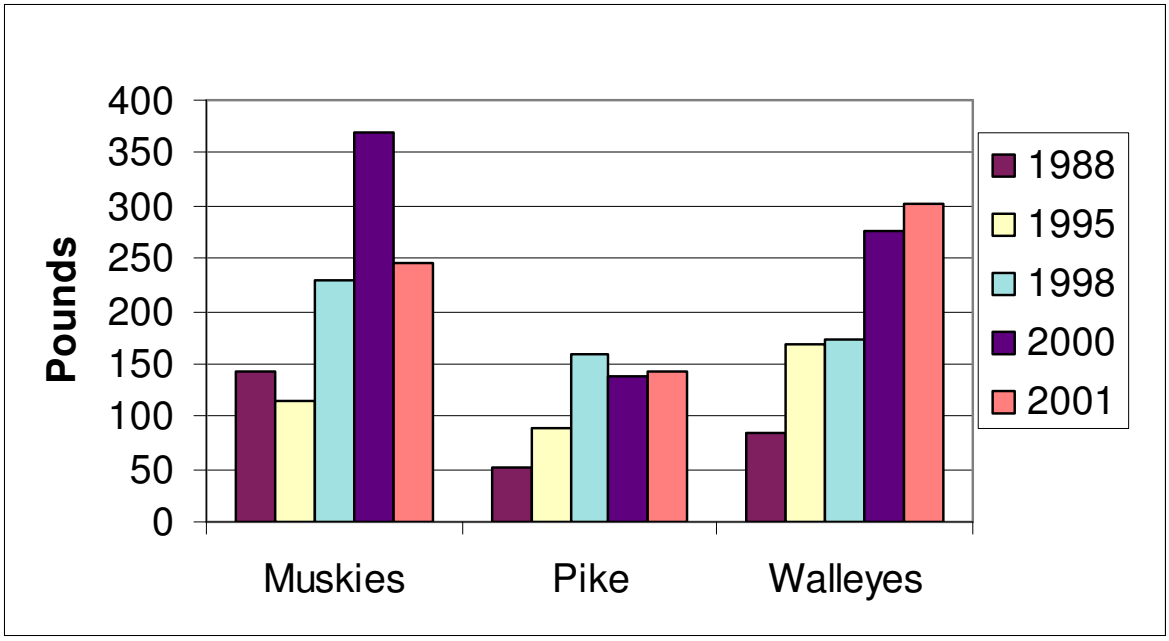

Figure 4. – Pounds of muskellunge, northern pike, and walleye in the Tahquamenon River, collected by boomshocking surveys during July of 1988, 1995, 1998, 2000, and 2001.

Appendix 1. – Mortality estimates for northern muskellunge, northern pike, smallmouth bass, walleye, and yellow perch in the Tahquamenon River. Tables are on the following pages. These estimates were calculated from weighted age frequencies derived from the July 2001 boomshocking survey.

This is standard Excel spreadsheet with instructions for data entry and use of the Chi-Square estimate.

Mortality Estimate for

CODED AGE	AGE	FREQ	CA*F		
0			0		
1			0	R-C S :	0.0%
2			0	HEINCKE'S S:	#DIV/0!
3			0		
4			0	CHI-SQUARED:	#DIV/0!
5			0		
6			0	V[S]:	0.0%
7			0		
8			0	S.E.[S]:	0.0%
9			0		
10			0	2 S.E.[S]	0.0%
11			0		
12			0	MORTALITY A:	100.0%
13			0		
14			0	INST.MORT. Z:	#DIV/0!
				AGES:	
TOTAL		0	0		

Make sure that the "D" column is a horizontal multiplication of columns "A" and "C".

In order to assume a uniform mortality rate for the population, the Chi-Squared value must be 3.84 or LOWER. If higher, you have a statistically different mortality rate between younger and older fish.

The Heincke survival estimate is generally for the coded Age 0 fish. For the best estimate pertaining to the rest of the population, you must eliminate the youngest Age Group. IMPORTANT! You must then bring ALL OTHER Age Groups UP so that Column A, Coded Age O has the first data set. If Chi-Squared value is still higher than 3.14, you must then eliminate the now-youngest age and again bring all remaining Age Groups UP one column to again start at Coded Age Group 0.

Leaving one or more "empty" rows at Coded Age 0, or especially leaving the several top rows empty, starting for example at Coded Age 3 will definitely distort the resulting mortality estimate!!!

MORTALITY A (ANNUAL) IS THE VALUE WE USE...

Table 1. - Tahquamenon River northern muskellunge mortality estimate based on weighted age frequency from boomshocking, July 2001.

CODED AGE	AGE	FREQ	CA*F		
0	3	27	0		
1	4	18	18	R-C S :	48.7%
2	5	11	22	HEINCKE'S S:	55.0%
3	6	0	0		
4	7	4	16	CHI-SQUARED:	1.879508
5			0		
6			0	V[S]:	0.2%
7			0		
8			0	S.E.[S]:	4.7%
9			0		
10			0	2 S.E.[S]	9.4%
11			0		
12			0	MORTALITY A:	51.3%
13			0		
14			0	INST.MORT. Z:	72.0%
				AGES: 3 - 7	
TOTAL		60	56		

Table 2. - Tahquamenon River northern pike mortality estimate based on weighted age frequency from boomshocking, July 2001.

CODED AGE	AGE	FREQ	CA*F		
0	4	38	0		
1	5	14	14	R-C S :	37.0%
2	6	1	2	HEINCKE'S S:	35.6%
3	7	6	18		
4			0	CHI-SQUARED:	0.121841
5			0		
6			0	V[S]:	0.3%
7			0		
8			0	S.E.[S]:	5.1%
9			0		
10			0	2 S.E.[S]	10.1%
11			0		
12			0	MORTALITY A:	63.0%
13			0		
14			0	INST.MORT. Z:	99.5%
				AGES: 4 - 7	
TOTAL		59	34		

Table 3. - Tahquamenon River smallmouth bass mortality estimate based on weighted age frequency from boomshocking, July 2001.

CODED AGE	AGE	FREQ	CA*F		
0	3	45	0		
1	4	18	18	R-C S :	33.6%
2	5	9	18	HEINCKE'S S:	37.5%
3			0		
4			0	CHI-SQUARED:	1.373441
5			0		
6			0	V[S]:	0.2%
7			0		
8			0	S.E.[S]:	4.6%
9			0		
10			0	2 S.E.[S]	9.2%
11			0		
12			0	MORTALITY A:	66.4%
13			0		
14			0	INST.MORT. Z:	108.9%
				AGES: 3 - 5	
TOTAL		72	36		

Table 4. - Tahquamenon River walleye mortality estimate based on weighted age frequency from boomshocking, July 2001.

CODED AGE	AGE	FREQ	CA*F		
0	1	26	0		
1	2	5	5	R-C S :	69.5%
2	3	23	46	HEINCKE'S S:	74.0%
3	4	23	69		
4	5	11	44	CHI-SQUARED:	1.320407
5	6	10	50		
6	7	2	12	V[S]:	0.1%
7			0		
8			0	S.E.[S]:	2.6%
9			0		
10			0	2 S.E.[S]	5.1%
11			0		
12			0	MORTALITY A:	30.5%
13			0		
14			0	INST.MORT. Z:	36.3%
				AGES: 1 - 7	
TOTAL		100	226		

Table 5. - Tahquamenon River yellow perch mortality estimate based on weighted age frequency from boomshocking, July 2001.

CODED AGE	AGE	FREQ	CA*F		
0	3	47	0		
1	4	16	16	R-C S :	29.0%
2	5	2	4	HEINCKE'S S:	29.9%
3	6	1	3		
4	7	1	4	CHI-SQUARED:	0.07213
5			0		
6			0	V[S]:	0.2%
7			0		
8			0	S.E.[S]:	4.7%
9			0		
10			0	2 S.E.[S]	9.5%
11			0		
12			0	MORTALITY A:	71.0%
13			0		
14			0	INST.MORT. Z:	123.7%
				AGES: 3 - 7	
TOTAL		67	27		

Appendix 1. - Lower Tahquamenon River walleye Schumacher-Eschmeyer population estimate, spring 2001. Because this was conducted during the spawning run at the Lower Falls basin, 17 miles upriver from Lake Superior, the situation resembled that of a lake, with a finite mature population. This estimate was made concurrently with a walleye tagging project.
U = Unmarked fish caught each day; R = Recaptured fish each day; C = Total number of fish caught each day; and M = Total marked fish at the start of each day.
Total fish caught = 999, Total recaptures = 246.

Walleyes	**U**	**R**	**C**	**M**	**Pop Est**	**Std Error**
Day 1	38		38	0		
Day 2	172	2	174	38	**3,306**	
Day 3	225	26	251	210	**2,027**	**28**
Day 4	159	48	207	435	**1,876**	**11**
Day 5	239	72	311	594	**2,566**	**202**
Day 6	113	63	176	833	**2,327**	**115**
Day 7	53	35	88	946	**2,379**	**98**

Chapman var., Petersen Formula, bi-census

Each Day Stand-Alone Estimate

Day 2	**2,275**	**170**
Day 3	**1,969**	**44**
Day 4	**1,851**	**32**
Day 5	**2,543**	**259**
Day 6	**2,307**	**229**
Day 7	**2,341**	**297**