Au Train Lake

Alger County, T46N, R20W. Sec 05
Last year surveyed 2002

Jim Waybrant

Environment

Au Train Lake lies in northwestern Alger County in Michigan's Upper Peninsula, about 9 miles east of Munising. This is a large inland lake with a surface area of 830 acres, a maximum depth of 30 feet and a drainage area of approximately 35 square miles (the Au Train River Watershed). Area soils are chiefly glacial outwash in origin, predominantly composed of sand with scattered deposits of gravel. Rolling hills covered with northern hardwoods surround the lake on the north, west, and south, while flat lowland with white cedar predominates on the east.

There are four inlet streams. The main one is the Au Train River, which flows from the Au Train Storage Basin (also known as Au Train Basin, or Forest Basin) about four miles to the south. The three miles closest to Au Train Lake provide good fisheries for brook, brown and occasional rainbow trout. Flow in the stream is controlled somewhat by operation of the power plant which is situated below the falls draining from Au Train Basin. Active or inactive status at the plant can affect the lake level by a foot or more. Two smaller streams, Cole Creek and Buck Bay Creek, enter the lake from the south and southeast. These are both cold water streams and good producers of brook trout. A fourth and much smaller unnamed stream enters from the east, is warmer and is not designated as trout water. There is also a channel between Au Train Lake and Paulson Lake, a pond of about 6-8 acres on the west side of the north end of Au Train Lake. Water flowing from this area passes through a culvert under the road USFS 2278, which skirts the west shore of Au Train Lake. The outlet of Au Train Lake is the lower Au Train River. It flows from the northeast corner of the lake, in a very convoluted manner, generally northward to Lake Superior. That portion of the Au Train River is not considered trout water. It does, however, allow seasonal migrations of cold water potamodromous fish into and through Au Train Lake.

Au Train Lake was a favorite fishery for the local and Marquette residents since the early 1900s. The lake gained a reputation as being particularly productive for large northern pike and walleyes. Partly because of the fishing quality, this lake was one of the first in the area to see extensive resort and private cottage development. Today, the U.S. Forest Service owns much of the east and south frontage, and maintains a campground and public boat launch on the southeast shore. Most privately owned shoreline is extensively developed with cottages and resorts.

More than 50 % of the lake has a depth less than 15 feet, which supports a variety of aquatic vegetation. Lake substrates are primarily composed of sand with some gravel in the shoal areas. The sand is overlain with organic, pulpy peat materials in the deeper waters. Extensive bulrush beds occur on the sandy substrate along the east, south and a portion of the southwest and northwest shorelines. USFS property contained most of the bulrush colonies, while the private riparian shorelines were generally devoid of any structure. Visual observation during the 2002 survey showed very little submerged woody debris (logs, sticks, etc). The water is moderately fertile, well oxygenated, and light brown in color. In 2002 the water was found to have moderate transparency with a Secchi Disc reading of 8 feet. Methyl Orange alkalinity ranged from 111 to 120 ppm in August, 1953 and has apparently stayed very uniform, as measurements in 2002 were 107 ppm.

History

As more and more anglers participated in the fishery, complaints arose in the early 1900s that fishing was not as good as it used to be. For that reason, walleye fry were planted for many years, perch were planted occasionally, and some pike and smallmouth bass were also planted by the state. Even so, complaints continued. Locals assumed that the large white sucker population in the lake may have been the cause of poor fishing. However, there are no comprehensive netting surveys in the file to address the issue of too many suckers. In late September, 1951, a commercial trap net was set in Au Train Lake. Results implied a large population of white suckers, a moderate population of walleyes, and very few yellow perch. Beginning in the winter 1951, manual sucker removal efforts using trap nets were employed to attempt removal of enough white suckers to cause a positive change in fishing success for game fish. These efforts persisted off-and-on into the 1990s. Prior to 1991, netting activity consisted of sucker manual removals, all of which targeted the specific habitat and season to catch white suckers. The netting efforts were not designed to provide an indication of general fish community structure or species balance. Suckers, however, have always been able to gain access to the lake from Lake Superior via the Au Train River, which probably precludes much positive result from that effort. The Analysis section will discuss suckers in relation to the rest of the fish community. Even so, many of the seasonal efforts resulted in removal of over 8,000 lbs. of suckers, while a few efforts removed up to 25,000 lbs. A few other efforts, however, removed only about 1,650 lbs. Suckers generally remained the same size, with averages roughly 2.8 lbs per fish between 1983 and 1993.

File records show several management efforts other than sucker removals were conducted previously. A walleye reef was constructed in 1972, fish shelters were installed in 1975, and black crappies, smallmouth bass, and tiger muskellunge were stocked. Walleyes were found to be using the spawning reef, but no estimate was made of contribution to the walleye population. Fifteen small tiger muskellunge were captured in March 1987. However, neither the tiger muskellunge nor black crappies have been captured in recent years. In the early 1990's, MDNR stocked over 30,000 additional smallmouth bass, with the existing small population now entirely supported by natural reproduction.

A fisheries survey in 1994 found that the fish community structure after five years of extensive sucker removals showed very little change when compared to the community prior to those removals. In both 1989 and 1994, suckers comprised 9.1 % of the total catch by number, while predators (pike, walleyes and smallmouth bass) also comprised 9.1 %. Of the predators, pike comprised 3 %, walleyes 21 % and smallmouth bass 9 % of the total catch by weight. Perch contributed another 6 % of the total catch by weight. The 34 net lifts (fyke nets, gill nets, and shoreline small mesh nets) in 1994 produced a total of 295 lbs of fish. Estimated annual mortality of walleyes (Appendix 1) derived from the 1994 growth analysis sheet was very moderate at only 17.9 %. Estimated annual mortality rates for northern pike, smallmouth bass, and perch were 54.3 %, 35.7 % and 29.2 % (Appendix 1). The 1994 survey effort included stomach analyses of walleye, northern pike and smallmouth bass. The predominant food item for all three species was juvenile yellow perch, with representation in the diet of trout perch, common shiner, bluntnose minnow and various insects..

Current Status

The status and trends netting survey in 2002 was the first comprehensive fish community survey since 1994. Sampling gear similar to the 1994 study was used, but the 2002 study also included trap nets, and shoreline seining (Table 1). Shoreline seining added common shiner and Johnny darter to the survey, but little biomass to skew any comparison with the 1994 survey. The 40 net lifts produced a total of 565 lbs of fish. Bullheads were more numerous than in previous surveys, comprising 21% of the catch by number. White suckers comprised 11% of the total numbers, a slight increase from 1994, even though their percent of the total catch by weight fell to 38%. Predators totaled 37.9% of the catch by weight, with pike comprising 28.9%, walleye 5.1%, and smallmouth bass comprising 3.9%. The increase in northern pike numbers and weight was significant, while the walleye and smallmouth bass remained relatively similar to their numbers in the 1994 survey. Sizes of most fish were acceptable, with 29% of the northern pike at 24 inches or larger (legal sized), 53% of the walleyes were legal-sized (15 inches and over), 40% of the smallmouth bass were legal-sized (14 inches and over), and 50% of the rock bass were acceptable at 6 inches and over. Angler harvest of walleyes was not excessive, as their annual mortality (Appendix 2), based on the growth analysis sheet, had risen to only 23.5%. For comparison, St. Marys River walleye annual mortality in 1995 was 51%. Smallmouth bass mortality had dropped from 35.7% in 1994 to 24% in 2002. In contrast, northern pike mortality was slightly lower than in 1994, with 51.5%. However, the pike mortality increased to 68% when only considering ages 4 through 6. Average size for pike at age 3 during this survey was 22.1 inches, and 23.6 inches for age 4, 24.1 inches for age 5, and 27.8 inches for age 6. So, the higher estimated mortality for pike at sizes 24 - 28 inches implies a heavy angling harvest. Although yellow perch estimated annual mortality in 1994 was 29.2%, the estimate for the 2002 survey was 42.9%. Partitioning the perch mortality between natural and angler harvest is not possible with the current data.

The 2002 survey was conducted in early June, while the 1991 survey was conducted in October. For that reason, seasonal dynamics may help explain some of the changes we observed in fish community structure. Suckers in 2002 comprised 38% of the total catch, which is not an unusually high proportion, so the sucker component did not seem to be out of balance. The pike growth rate of just under state average was good for the Lake Superior watershed (Table 2). The heavy annual snow fall contributes to long dark winter seasons, short growing seasons, and generally results in slower than normal growth rates. Other species in the catch also displayed good growth rates.

Since 1991, MDNR has stocked over 276,000 walleyes (Table 3). Even though 41,000 to 54,000 fingerlings were stocked on alternate years, the walleyes we captured came mostly from non-stocked years. Implications are that stocked fingerlings were probably competing with naturally reproduced fish for a finite forage base. If so, then the extensive walleye stocking regime might help explain the poor perch representation in our survey, and quite possibly the low numbers of walleye and smallmouth bass as well. Predators target smaller fish, even the young of their own species, thereby possibly limiting the survival of all species.

Yellow perch, in addition to being few in number, had the worst length-frequency ratio with only 18% being acceptable at 7 inches or larger. Our seines collected larger numbers of small perch along the shoreline, and those smaller fish skewed the average size to smaller than that observed from our nets. Without the seine data, roughly 67% of the perch would have been acceptable at 7 inches or larger. Resort owners had perceived a decline in the open water perch harvest, but no change in the ice fishing harvest. Combining the two perceptions, resort owners therefore perceived an overall lower angler harvest. That perception does not correlate well with the higher estimated mortality If resort owner perceptions were indeed accurate, the higher estimated mortality could potentially have come from another source, such as predation by piscivorous fish or bird species. Those species generally target perch sizes smaller than those acceptable to anglers. Resort owners did not mention any observed increase in piscivorous birds, which implies that the increased mortality might be due to large numbers of sports fish predators. For that reason, we feel that reducing or eliminating the walleye stocking has good probability of enhancing the perch population as well. Walleye are the only major predator in the lake over which we have some potential control.

The walleye recruitment survey in 2003 consisted of night-time boom shocking in very shallow water along the shoreline near the USFS 2278 road, then north and east roughly to the river mouth. We did not target water depths that hold most fish species, as we were strictly targeting young-of-the-year walleyes. For that reason, most of our survey was in water less than 2 ft deep. Numbers of young walleyes were very good, but they were very small size, averaging 1-1.5 inches smaller (about 5.0" versus 6.5") than walleyes from several nearby lakes surveyed in the same month. They also exhibited poor condition compared with the fingerlings in other lakes. These results corroborated the possibility of previously over-stocking walleyes. With over-stocking, average sizes, growth rates, and condition factors deteriorate, all of which appears to be exactly what was observed during this walleye recruitment index survey.

Analysis and Discussion

The fish community in Au Train Lake appears to be in good balance (predators vs forage species). Similarly, growth rates and size ratios of most of the sport fish species are good. The pike growth rate of just under state average is good for a water body within the heavy snow belt waters of the Lake Superior shoreline. The other species also displayed good growth rates.

Smallmouth bass, northern pike and perch populations are entirely supported by natural reproduction. In addition, there appears to be a significant natural population of walleyes, although it is currently being supplemented by stocking. Because of potential and implied impacts of stocking walleyes over an existing population, we have reduced the number stocked to 25,000 spring fingerlings every two years.

Riparians have for over 20 years conducted sucker netting manual removals. Suckers, however, have open water access from Lake Superior via the Au Train River, which probably precludes any positive result from that effort. Suckers in this survey comprised 38 percent of the total catch, while northern pike comprised 29 percent. From these data, the sucker component does not seem to be out of balance.

The small perch population does not seem to be forage limited. Zooplankton samples during this survey were so dense, they looked as if we had sampled our heavily fertilized rearing ponds. Such a dense population of zooplankton implies that newly hatched fish fry all have plenty of forage and thus the potential for good growth and survival. For that reason, low numbers of perch cannot be explained by a lack of food early in their lives. Instead, we feel that low perch numbers are probably a result of predation by the abundance of predators in the lake.

It is interesting that complaints of poor fishing began to surface within a couple of decades after people began living around the lake. In corroboration of that phenomenon, a visual survey of the current shoreline shows very sparse large woody material lying submerged or partially submerged near any riparian residence. All of the shoreline except USFS property is heavily developed. Most of the near-shore waters adjacent to those developed shorelines are generally barren of any structure including aquatic vegetation. It is likely that removal of vegetation and near-shore woody structure occurred almost immediately after each additional lot became developed. After decades of MDNR effort to manage and enhance the fish community, perhaps it is time to look at the shoreline habitat. Indeed, the shoreline is where most spawning and nursery activities occur, for almost all species. It is also the primary habitat for smaller fish species. For that reason, riparian education and MDNR effort should include re-establishing a modicum of near-shore habitat.

Management Direction

Au Train Lake will continue to be managed for coolwater sport fish with special emphasis on walleye. Walleye numbers have apparently dropped in recent years despite a large stocking effort over the past decade, so walleye management will be a high priority. Yellow perch should be an integral part of this coolwater fish community, but they comprise a much smaller percent of the fish community than is usually found in good perch fishing lakes. As discussed previously, there is potential that walleye over-stocking has curtailed the perch population. However, lack of submerged large woody shoreline structure will also hurt the perch by limiting spawning habitat and structure over which to drape the egg skeins. Suckers and northern pike appear to be in appropriate balance. Observed bullhead population increases are cause for some moderate concern, but the change could be an artifact of sampling in different seasons or with additional gear. It has been our experience, however, that the different net types generally collect similar species with similar relative abundance from a lake. We will, however, keep a watch on the bullhead population. There are two primary goals for Au Train Lake in the near future.

Goal 1: Begin adjusting the stocking rate of walleye fingerlings to better mesh with the available forage base. Instead of 50,000, we will decrease the number to 25,000. Then, in 2008, or sooner if there are strong indicators of problems, we will again survey this lake to determine walleye age distribution, growth rates, mortality rates and if time and funding allows, some indication of abundance.

Goal 2: Initiate an educational campaign which demonstrates the importance of woody structure in the near-shore waters of lakes like Au Train. .This structure will serve as fish shelter from predators as well as spawning habitat structure. This lake of 830 acres could easily use 50 downed, partially submerged trees along its shoreline.

References

Table 1. – Number, weight and length indices of fish collected from Au Train Lake June 3 – 7, 2002 using fyke, gill and trap nets, and seining.

Species	No.	Percent by Number	Weight (pounds)	Percent by Weight	Length range (inches)[1]	Average length	Percent legal size[2]
Brown bullhead	129	21.3	117.4	20.8	6 - 15		98
Common shiner	165	27.2	0.8	0.1	0 - 2		100
White sucker	67	11.1	216.3	38.3	7 - 24		100
Johnny darter	15	2.5	0.1	0.0	1 - 2		100
Lake herring	5	0.8	3.0	0.5	8 – 17		100
Northern pike	63	10.4	163.4	28.9	8 – 30		29
Rock bass	30	5.0	6.4	1.1	3 - 9		50
Sea lamprey	2	0.3	0.6	0.1	9 – 18		100
Smallmouth bass	15	2.5	21.8	3.9	7 – 20		40
Walleye	17	2.8	28.3	5.1	8 – 22		53
Yellow perch	98	16.2	6.2	1.1	2 – 13		18

[1]Note that some fish were measured to 0.1 inch, others 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.

Table 2. – Average total length (inches) at age, growth relative to the state average, and weighted age frequency for seven species of fish sampled from Au Train Lake with fyke, trap, gill nets and seine, June 3-7, 2002.

Species / Age	Number aged	Length (inches)	State average length (inches)	Weighted mean Length (inches)	Weighted age frequency	Mean growth index[1]
White sucker						
Age VII:	1	18.3-18.3	18.1	18.3	100.00%	0
Lake herring						
Age II:	1	08-Aug	9.2	8	20.00%	0
Age III:	2	11.7-12.2	10.3	11.95	40.00%	0
Age IV:	1	14.5-14.5	11.3	14.5	20.00%	0
Age IX:	1	17.3-17.3		17.3	20.00%	0
Northern pike						-0.6
Age I:	1	11.2-11.2	14.5	11.2	1.69%	0
Age II:	6	16.5-21	19	18.69	10.36%	1
Age III:	23	17-26.9	21.8	22.06	38.56%	1
Age IV:	18	19.9-26.7	24.2	23.42	31.60%	1
Age V:	9	20.5-27.5	26.1	24.21	14.40%	1
Age VI:	2	26-28.5	27.8	27.25	3.39%	0
Rock bass						
Age III:	2	4.8-5.8	5.4	5.27	67.86%	0
Age IV:	1	5.1-5.1	6.4	5.1	32.14%	0
Smallmouth bass						-0.4
Age II:	2	7.8-7.8	8.8	7.8	13.33%	0
Age III:	5	9.9-11.2	11.1	10.66	33.33%	1
Age IV:	1	11.8-11.8	13	11.8	6.67%	0
Age V:	3	13.6-15.3	14.7	14.7	20.00%	0
Age VII:	2	16.5-17.6	16.6	17.05	13.33%	0
Age VIII:	1	17.4-17.4	17.4	17.4	6.67%	0
Age XIV:	1	20.4-20.4		20.4	6.67%	0
Walleye						
Age II:	2	10.7-11.8	11.4	11.25	12.50%	0
Age III:	2	13.6-13.7	14.4	13.65	12.50%	0
Age IV:	4	13.7-17.9	16.2	14.98	25.00%	0
Age V:	1	15.6-15.6	18	15.6	6.25%	0
Age VI:	3	17.6-20.8	19.6	19.53	18.75%	0
Age VII:	1	22.9-22.9	20.8	22.9	6.25%	0
Age VIII:	3	20.4-22	21.7	21.03	18.75%	0
Yellow Perch						-0.4
Age III:	14	5.6-7.6	6.8	6.4	45.64%	1
Age IV:	11	5.9-9	7.8	7.38	34.02%	1
Age V:	5	7.3-9.4	8.7	8.16	13.93%	1
Age VIII:	1	7.8-7.8	11.3	7.8	3.08%	0
Age X:	1	12.1-13.3	12.1	13.3	3.33%	0

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

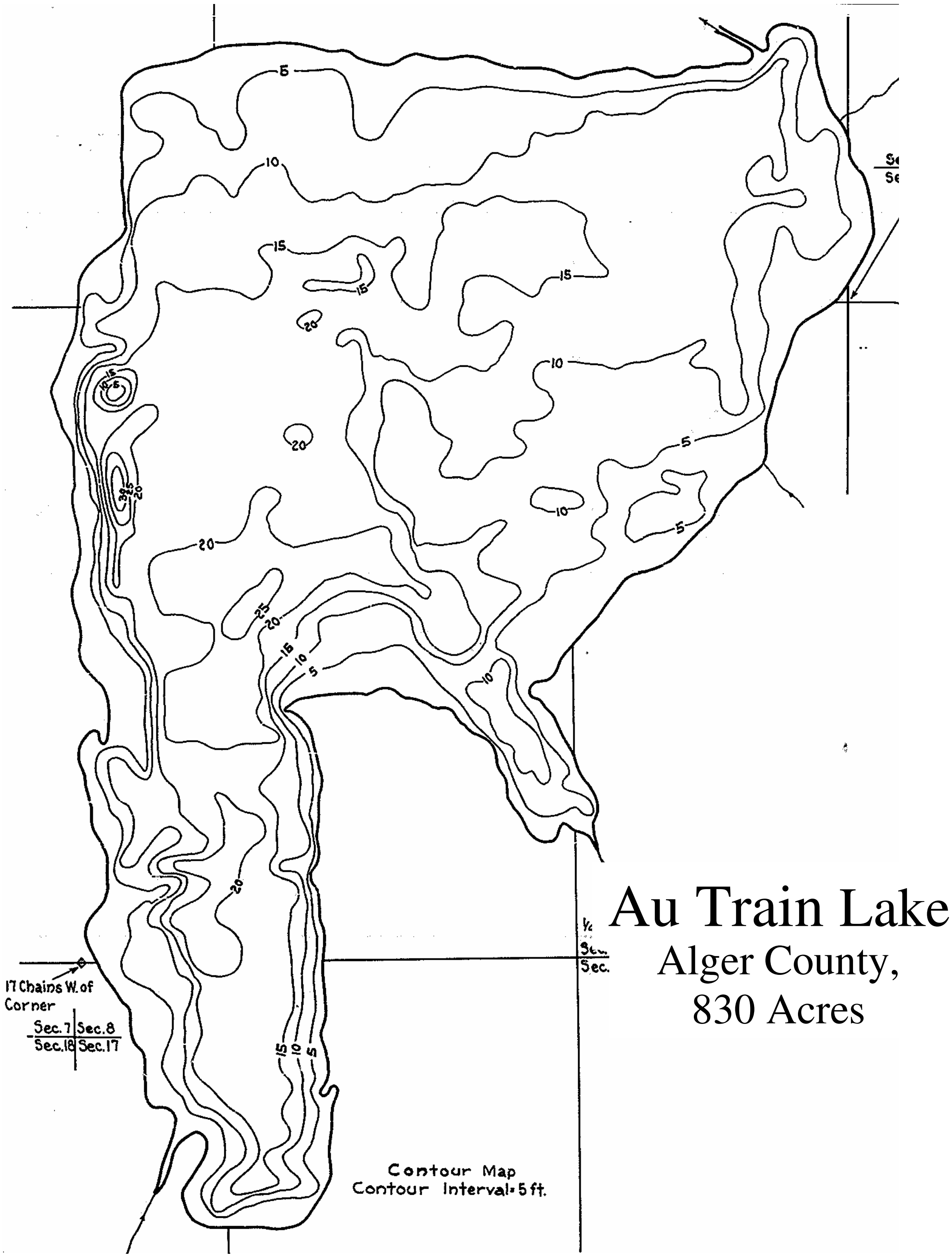
Table 3. – Walleye population in Au Train Lake, Alger County, captured in the June 2002 netting survey using fyke, trap, and gill nets, and seines. Numbers at age are listed above the numbers of fingerlings stocked during years corresponding to the age groups.

Age							
I	II	II	IV	V	VI	VII	VIII
0	13	9	28	6	19	6	19

Fish stocked during year corresponding to the above age groups

2001	2000	1999	1998	1997	1996	1995	1994
54,314	0	43,152	0	41,627	0	41,057	8,973

Figure 1. – Au Train Lake, Alger County



Appendix 1. – Mortality estimates for northern pike, smallmouth bass, walleye, and yellow perch in the Au Train Lake. Tables are on the following pages. These estimates were calculated from growth analyses derived from the October 1994 netting survey utilizing fyke and gill nets.

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. - Mortality estimates for walleye in Au Train Lake, from an October 1994 survey using fyke nets, gill nets, and small mesh fyke nets.

CODED AGE	AGE	FREQ	CA*F		
0	0	3	0		
1	1	1	1	R-C S :	82.1%
2	2	1	2	HEINCKE'S S:	85.0%
3	3	5	15		
4	4	2	8	CHI-SQUARED:	0.126665
5	5	2	10		
6	6	2	12	V[S]:	0.1%
7	7	1	7		
8	8	0	0	S.E.[S]:	3.7%
9	9	1	9		
10	10	0	0	2 S.E.[S]	7.5%
11	11	1	11		
12	12	1	12	MORTALITY A:	17.9%
13			0		
14			0	INST.MORT. Z:	19.8%
				AGES:	0 - 12
TOTAL		20	87		

Table 2. - Mortality estimates for northern pike in Au Train Lake, from an October 1994 survey using fyke nets, gill and nets, small mesh fyke nets.

CODED AGE	AGE	FREQ	CA*F		
0	2	11	0		
1	3	4	4	R-C S :	45.7%
2	4	3	6	HEINCKE'S S:	45.0%
3	5	2	6		
4			0	CHI-SQUARED:	0.007917
5			0		
6			0	V[S]:	0.7%
7			0		
8			0	S.E.[S]:	8.5%
9			0		
10		0	0	2 S.E.[S]	17.1%
11			0		
12			0	MORTALITY A:	54.3%
13			0		
14			0	INST.MORT. Z:	78.3%
				AGES:	2 - 5
TOTAL		20	16		

Table 3. - Mortality estimates for smallmouth bass in Au Train Lake, from an October 1994 survey using fyke nets, gill nets, and small mesh fyke nets.

CODED AGE	AGE	FREQ	CA*F		
0	3	1	0		
1	4	2	2	R-C S :	64.3%
2	5	2	4	HEINCKE'S S:	83.3%
3	6	1	3		
4			0	CHI-SQUARED:	0.962963
5			0		
6			0	V[S]:	1.8%
7			0		
8			0	S.E.[S]:	13.3%
9			0		
10		0	0	2 S.E.[S]	26.6%
11			0		
12			0	MORTALITY A:	35.7%
13			0		
14			0	INST.MORT. Z:	44.2%
				AGES: 3 - 6	
TOTAL		6	9		

Table 4. - Mortality estimates for yellow perch in Au Train Lake, from an October 1994 survey using fyke nets, gill nets, and small mesh fyke nets.

CODED AGE	AGE	FREQ	CA*F		
0	0	10	0		
1	1	16	16	R-C S :	70.8%
2	2	5	10	HEINCKE'S S:	80.4%
3	3	6	18		
4	4	6	24	CHI-SQUARED:	3.088346
5	5	3	15		
6	6	2	12	V[S]:	0.1%
7	7	0	0		
8	8	2	16	S.E.[S]:	3.5%
9	9	0	0		
10	10	1	10	2 S.E.[S]	7.0%
11			0		
12			0	MORTALITY A:	29.2%
13			0		
14			0	INST.MORT. Z:	34.6%
				AGES: 0 - 10	
TOTAL		51	121		

Appendix 2. – Mortality estimates for northern pike, smallmouth bass, walleye, and yellow perch in the Au Train Lake. Tables are on the following pages. These estimates were calculated from growth analyses derived from the June 2002 status and trends netting survey utilizing fyke, trap, and gill nets, and seines.

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.

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Table 1. - Mortality estimates for walleye in Au Train Lake, from a June 2002 survey using fyke nets, trap nets, gill nets, and seines.

CODED AGE	AGE	FREQ	CA*F		
0	2	2	0		
1	3	2	2	R-C S :	76.5%
2	4	4	8	HEINCKE'S S:	88.2%
3	5	1	3		
4	6	4	16	CHI-SQUARED:	1.493069
5	7	1	5		
6	8	3	18	V[S]:	0.3%
7			0		
8			0	S.E.[S]:	5.2%
9			0		
10			0	2 S.E.[S]	10.4%
11			0		
12			0	MORTALITY A:	23.5%
13			0		
14			0	INST.MORT. Z:	26.8%
				AGES: 2 - 8	
TOTAL		17	52		

Table 2. - Mortality estimates for northern pike in Au Train Lake, from a June 2002 survey using fyke nets, trap nets, gill nets, and seines.

CODED AGE	AGE	FREQ	CA*F		
0	3	23	0		
1	4	18	18	R-C S :	48.5%
2	5	9	18	HEINCKE'S S:	56.6%
3	6	2	6		
4	7	0	0	CHI-SQUARED:	2.728603
5	8	0	0		
6	9	0	0	V[S]:	0.2%
7	10	1	7		
8			0	S.E.[S]:	5.0%
9			0		
10			0	2 S.E.[S]	10.0%
11			0		
12			0	MORTALITY A:	51.5%
13			0		
14			0	INST.MORT. Z:	72.3%
				AGES: 2 - 8	
TOTAL		53	49		

Table 3. - Mortality estimates for smallmouth bass in Au Train Lake, from a June 2002 survey using fyke nets, trap nets, gill nets, and seines.

CODED AGE	AGE	FREQ	CA*F		
0	2	2	0		
1	3	5	5	R-C S :	75.9%
2	4	1	2	HEINCKE'S S:	86.7%
3	5	3	9		
4	6	0	0	CHI-SQUARED:	1.079702
5	7	2	10		
6	8	1	6	V[S]:	0.3%
7	9	0	0		
8	10	0	0	S.E.[S]:	5.7%
9	11	0	0		
10	12	0	0	2 S.E.[S]	11.3%
11	13	0	0		
12	14	1	12	MORTALITY A:	24.1%
13			0		
14			0	INST.MORT. Z:	27.6%
				AGES:	2 - 14
TOTAL		15	44		

Table 4. - Mortality estimates for yellow perch in Au Train Lake, from a June 2002 survey using fyke nets, trap nets, gill nets, and seines.

CODED AGE	AGE	FREQ	CA*F		
0	3	14	0		
1	4	11	11	R-C S :	57.1%
2	5	5	10	HEINCKE'S S:	58.8%
3	6	0	0		
4	7	1	4	CHI-SQUARED:	0.063843
5	8	1	5		
6	9	0	0	V[S]:	0.3%
7	10	2	14		
8			0	S.E.[S]:	5.7%
9			0		
10			0	2 S.E.[S]	11.4%
11			0		
12			0	MORTALITY A:	42.9%
13			0		
14			0	INST.MORT. Z:	56.0%
				AGES:	3 - 10
TOTAL		34	44		