

Nawakwa Lake

Alger County, T 48N, R 13W, Sec. 19, 20, 29, 30
Sucker River Watershed, Last Surveyed 2004

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Environment

Nawakwa Lake (Sucker Lake) is located in Alger County, approximately 15 miles north of Seney and one mile east of M77. Nawakwa Lake is the origin of the Sucker River which flows northerly, emptying into Lake Superior. Tributaries of Nawakwa Lake include Sullivan Creek in the northwest corner and three small unnamed creeks. The surrounding area is characterized by gentle rolling hills. The immediate and surrounding vegetation consists mostly of mixed hardwood (birch, maple and beech), and mixed swamp types (hemlock, spruce, and cedar). A bald eagle nest has been located on the 18-acre island for many years. Very little development exists around the lake. A sportsman's club (the Newton Club) owns considerable property on the west side. Their caretaker has a house at the shore. Another small group of cabins exists on the central east shoreline.

Nawakwa Lake is 369 acres in size. Its shoreline is very irregular, having 9 points and 9 bays (Figure 1). The bottom varies from mud in the shallow north bay to sand, to gravel, to rocks and to pulpy peat in the deeper waters. Although the lake has a maximum depth of 37 feet, 70% of the surface is less than 15 feet deep and sand bars and shallow reefs challenge navigation. The water is stained brown and slightly turbid. The pH was 7.6 and the MO alkalinity was 60ppm CaCO₃ during a chemical survey in 1989. Other past water chemistry data have indicated that the lake becomes strongly stratified in the summer and that oxygen deficits have occurred near the bottom. Most of the littoral zone supports aquatic vegetation, which consists of Potomageton sp., Elodea sp., and lily pads. Emergent vegetation consists of mostly bulrushes and cattails.

The public access at Nawakwa Lake was opened in 1966. The access site is located on the Sucker Lake Road off of CR703, the Old Seney/Grand Marais Road. The boat ramp is concrete and there is a courtesy pier. However, there is not much parking area for vehicles and trailers, and boaters must use caution when exiting through the shallow narrows into the rest of the lake.

History

Smallmouth bass, walleyes, and bluegills were stocked from 1937 to 1942. A general survey in 1966 showed that smallmouth bass, rock bass, pumpkinseed sunfish, bluegill, yellow perch, northern pike, bullheads, white suckers, and bluntnose minnows were fairly abundant in Nawakwa Lake. Another survey in 1967 added walleyes to the species list. Since 1976, the lake has been managed for cool water species: northern pike, walleyes, smallmouth bass, yellow perch and rock bass. In 1981, a manual removal was conducted for suckers and bullheads, removing 1517 lbs (4.1 lbs/acre) of bullheads and 434 lbs (1.2 lbs/acre) of white suckers. Walleye fry were stocked intermittently until 1990 to supplement natural reproduction. Early records indicated good survival and recruitment of walleyes in Nawakwa Lake. There was also evidence of natural reproduction.

A 1989 netting survey revealed a species composition similar to the 1967 survey, with the deletion of smallmouth bass and bluegills. Walleyes, northern pike, rock bass and brown bullhead dominated the 1989 survey catch both by number and by weight. Growth analyses showed walleyes, pumpkinseed sunfish, and yellow perch to be growing near state average. Nine year classes of walleyes were present, indicating excellent survival, recruitment and evidence of successful natural reproduction. Walleyes ranged from 10-25 inches and had an average length of 16.6 inches. Northern pike were represented by five year classes, ranging from 6-28 inches with an average length of 19.8 inches. Pumpkinseed sunfish were represented by seven year classes, ranging from 2-8 inches with an average length of 6.9 inches. Yellow perch were represented in the netting by three year classes. Rock bass were not aged, but the length frequency (2-12 inches) and average length (8.6 inches) indicated a healthy population.

Brown bullheads dominated the survey catch, comprising 29% of the biomass. However, the bullheads did not appear to be stunted. They ranged in length from 3-16 inches with an average length of 13.0 inches. White suckers represented only 8.4% of the catch biomass. Suckers ranged in size from 14-22 inches, averaging 18.7 inches.

A 1994 netting survey found the same species composition as the 1989 survey. However, the walleye growth rate had fallen more than 2.6 inches from that of 1989. In addition, northern pike growth had fallen slightly from 1989. Legal sized walleyes (15+ inches) comprised 69% of the survey, while only 4% of the pike captured were legal sized at 24+ inches. Walleyes comprised 20% of the total catch biomass, while pike comprised 15%. Suckers comprised 19% of the catch biomass, while bullheads comprised 40%. Both sucker and bullhead percentages of the catch biomass had increased from the 1989 survey.

The Michigan Department of Natural Resources (MDNR) conducted several nighttime boomshocking surveys during the 1990's, targeting fingerling walleyes. Natural reproduction was shown to be so high during the early 1990's that the stocking program was cancelled. Later surveys continued to document excellent numbers of fingerling walleyes. Natural reproduction appeared to be easily capable of sustaining the walleye fishery.

Current Status

The 2000 netting survey restored smallmouth bass to the lake's species list, but did not capture any pumpkinseeds. There were good numbers of large pike, walleyes and rock bass. Most sports fish species present in that survey had a large percentage of legal or acceptable sized fish. For example, 96% of the walleyes captured were 15+ inches, 23% of the northern pike were 24+ inches, and 94% of the rock bass were 6+ inches (Table 1). However, there was also a huge increase in bullhead numbers, comprising 66% of the catch biomass. Even though more numerous and smaller than those of the 1989 and 1994 surveys, bullheads averaged 11.3 inches. Once again, only a few small perch were captured.

Walleye abundance has apparently decreased since 1989, as indicated by the catch per effort (CPE, no. fish per net-night), which fell from 3.3 in 1989, to 2.2 in 1994, to 1.2 in 2000. However, their growth rate had increased about 0.5 inches from 1994, to -2.3 inches (Table 2). The mortality estimate (Robson and Chapman 1961) using ages 6-13 was only 26% (Table 3). Ages 2-5 all experienced extremely low mortality rates. Perhaps the relatively low walleye mortality rate and resultant increase

of older walleyes in the lake (Table 4) had produced their slow growth by increasing competition for the available forage. For comparison, other good walleye lakes in the area support mortalities of over 30%.

Northern pike CPE has remained quite uniform at roughly 2.5 over the years, but only 22% of pike captured in 2000 were smaller than 20 inches, while roughly another 23% were legal at 24+ inches (Table 5). The larger pike were also older fish (Table 4). Pike aged 4-9 had a mortality estimate of 69% (Table 3), but mortalities were only 1-20% for ages 1-3. At age 4 when mortality increased, pike average size was 22.6 in, implying that angler harvest was a significant factor influencing their high mortality.

Yellow perch CPE dropped from 3.3 in 1984 to 1.7 in 1989, to 0.1 in 1994, and was 0.4 in 2000 (Table 1). This decline was probably the result of predatory control exerted by the bullhead, northern pike, and walleyes. Even so, the growth rate for the much-reduced perch population was still slower than state average (Table 2). Similar to the 1989 survey, all perch collected were smaller than 7 inches. White sucker abundance was also less than in the previous study, quite low at only 6.6% of the total catch biomass (Table 1).

The capture of two smallmouth bass in the 2000 netting survey was somewhat of a relief, as no smallmouth bass had been captured during either the 1989 or 1994 surveys. Since several large smallmouth bass had been caught by anglers during recent years, their continual absence from netting surveys was disconcerting. It can be assumed, however, that smallmouth bass are rare in this lake.

The MDNR conducted a manual removal for bullheads during the spring of 2001. However, the weather and prior commitments combined to produce a poor result. The effort started when water was too warm, resulting in the removal of only 1,550 lbs (4.2 lbs/acre) of bullheads in 15 days. For comparison, 1,974 lbs were removed during the normal 2000 netting survey. An October 2001 walleye fingerling boomshocking survey captured 91 fingerlings, 21 yearlings, and 14 adults in only 1 mile of shoreline. All of those fish were the result of natural reproduction.

A walleye fingerling boomshocking survey was conducted in September 2004 after a long, cold, and wet spring season that was marginal for walleye spawning. Compared with the 2001 survey results, fingerlings comprised only a small fraction of the catch. The survey resulted in capture of 83 walleyes but only six fingerlings from 3-4 inches (Table 6). Age analyses verified that only the six smaller walleyes were young of the year (Table 7). The boomshocking effort resulted in capture of walleyes up to age 6.

Analysis and Discussion

Northern pike in Nawakwa Lake have historically been of small average size. The 2000 survey, however, documented good numbers of larger pike up to 36 inches. They were growing well for this area, averaging -0.6 inches below state average. Because management direction was initiated to favor the walleye population, however, the Nawakwa Lake northern pike regulation was changed in 2002 to no minimum size limit. Decreased numbers of small pike due to angler harvest was expected to increase the available forage base and subsequent growth of walleyes. If anglers do not remove

enough small pike, however, there will be little change in the fish community structure. This experimental management effort will be further studied after the next netting survey.

Since the MDNR has stopped stocking walleyes, the lake should reach an equilibrium between species reproduction, forage base and angler harvest within a few more years. The recent increase in bullhead numbers has skewed the species relative abundance of the fish community. Although walleye numbers are lower, their growth rate has increased about 0.5 inches from the 1994 survey. Yellow perch CPE has increased from 0.1 in 1994 to 0.4 in 2000. Pike average size has improved from 19.3 inches in 1994 to 22.5 inches in 2000. White suckers have declined from 19% of the biomass in 1994 to 6.6% in 2000. The only active management effort occurring at present is no minimum size limit on northern pike, so the observed changes should be relatively stable. All of those changes, however modest, are producing a more balanced fish community.

Management Direction

Fisheries management in Nawakwa Lake will continue for the cool water species present: northern pike, walleye, smallmouth bass, sunfish, yellow perch and rock bass. However, management direction will favor walleyes over northern pike. A lake with this abundant walleye natural reproduction and large resident walleye population is rare in the Eastern Upper Peninsula. Although Nawakwa is considered one of the finest walleye lakes in the area, the other sports fish in the lake are also reproducing naturally and experiencing good growth. It continues to provide excellent fisheries for both walleye and northern pike, with occasional catches of smallmouth bass, yellow perch and large bullheads.

One potential obstacle to attaining management goals is the apparent disparity between predators and their forage base. Netting survey results implied that the forage base may not be able to sustain itself in the presence of such a large number of predators. The decline of the yellow perch population is a prime example of this. Since walleyes naturally target perch, the MDNR considered dropping 15-20 trees near the shoreline to provide spawning structure and shelter for the remaining perch. Enhancing such habitat might have helped the perch population to sustain itself naturally, thus providing increased forage for the walleyes. Fall night boomshocking surveys, however, have documented "clouds" of small perch within the extensive shoreline bulrush colonies. For that reason, it seems doubtful that even 20 trees along the shoreline would make a significant difference. The conclusion is that this lake is all that it can be, and any attempt to change fish community structure and balance or enhance the habitat would be either insignificant or detrimental.

References

Robson, D.S. and D.G. Chapman. 1961. Catch curves and mortality rates. Transactions of the American Fisheries Society 90: 181-189.

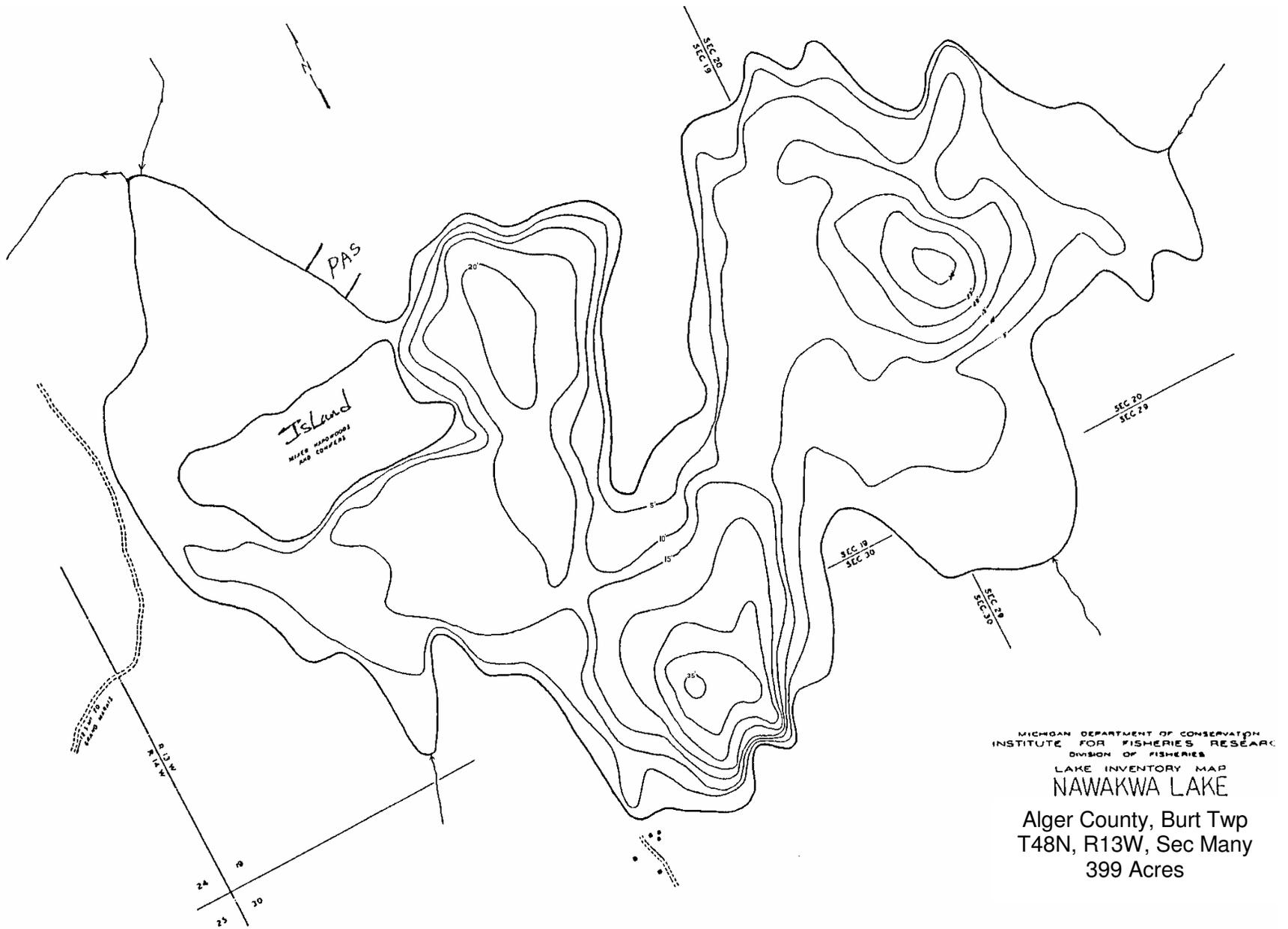


Figure 1 – Nawakwa Lake, Alger County, contour map.

Table 1 – Number, weight, and length indices of fish collected from Nawakwa Lake with trap, fyke and gill nets, 5/22-26/2000.

Species	Number	Percent by number	Weight (pounds)	Percent by weight	Length range (inches) ¹	Average length	Percent legal size ²
Brown Bullhead	1974	83.4	1421.5	65.5	7 - 15	11.3	100
Golden Shiner	4	0.17	0.08	0	2 - 4	4	---
Northern Pike	133	5.6	361.3	16.7	12 - 36	22.5	22.6
Rock Bass	113	4.8	85.5	3.9	3 - 11	9.7	93.8
Smallmouth Bass	2	0.08	1.6	0.07	8 - 13	11	0
Walleye	71	3	154.8	7.1	11 - 23	18.6	95.8
White Sucker	49	2.1	142.4	6.6	9 - 23	19.1	---
Yellow Perch	22	0.9	1.1	0.05	3 - 6	4.9	0
Total		100.0		100.0			

¹Note 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.

²Percent legal size or acceptable size for angling.

Table 2 – Average total length (inches) at age, and growth relative to the state average, for four species of fish sampled from Nawakwa Lake with trap, fyke and gill nets, 5/22-26/2000. Number of fish aged is given in parentheses.

Species	Age									Mean growth index ¹
	I	II	III	IV	V	VI	VII	VIII	IX	
Northern Pike	12.1 (1.0)	18.2 (16.0)	20.8 (13.0)	22.6 (36.0)	23.8 (10.0)	26.5 (7.0)	35.6 (4.0)	35.8 (1.0)	36.1 (1.0)	-0.6
Smallmouth Bass	---	---	11.2 (2.0)	---	---	---	---	---	---	---
Walleye	6.7 (1.0)	10.8 (4.0)	14.8 (1.0)	---	17.1 (2.0)	17.1 (9.0)	18.1 (5.0)	19.2 (4.0)	20.0 (7.0)	-2.3
	X	XI	XII	XIII						
	20.1 (4.0)	22.9 (1.0)	19.0 (3.0)	21.1 (2.0)						
Yellow Perch	---	4.5 (10.0)	6 (5.0)	---	7.1 (1.0)	7.3 (1.0)	---	---	---	-0.6

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

Table 3 – Mortality estimates (percent) from Nawakwa Lake catch curves using fyke, trap, and gill nets, May 22-26, 2000. Estimates were made using the Robson-Chapman catch curve mortality method (Robson and Chapman 1961).

Species	Included Ages	Percent Annual Mortality	Percent Instantaneous Mortality
Northern Pike	4 – 9	68.8	116.3
Walleye	6 - 13	26.1	30.3
Yellow Perch	2 – 6	57.1	84.7

Table 4 – Estimated age frequency (percent) of four species of fish caught from Nawakwa Lake with trap, fyke and gill nets, 5/22-26/2000.

Species	Age									Number caught
	I	II	III	IV	V	VI	VII	VIII	IX	
Northern Pike	1.1	18	14.6	40.4	11.2	7.9	4.5	1.1	1.1	133
Smallmouth Bass	---	---	100		---	---	---	---	---	2
Walleye	2.3	9.3	2.3	---	4.7	20.9	11.6	9.3	16.3	71
	X	XI	XII	XIII						
	9.3	2.3	7	4.7						
Yellow Perch	---	58.8	29.4		---	5.9	5.9	---	---	17

Table 5 – Catch summary for the Nawakwa Lake survey using fyke nets, trap nets, gill nets, May 22-26, 2000.

Species	Brown		Golden		Northern		Rock		Smallmouth		White		Yellow			
	Bullhead		Shiner		Pike		Bass		Bass		Walleye		Sucker		Perch	
Legal size (in)	>=7		>=0		>=24		>=6		>=14		>=15		>=0		>=7	
Avg. length (in)	11.3		4.0		22.5		9.7		11.0		18.6		19.1		4.9	
Avg. weight (lb)	0.72		0.02		2.72		0.76		0.79		2.18		2.91		0.05	
	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.
Total	1974	1421.5	4	0.1	133	361.3	113	85.5	2	1.6	71	154.8	49	142.4	22	1.1
No. legal	1974		4		30		106		0		68		49		0	
% Legal size	100%		100%		23%		94%		0.0%		96%		100%		0.0%	
% Total catch	83%	66%	0.2%	0.0%	6%	17%	5%	4%	0%	0%	3%	7%	2%	7%	1%	0%
CPE	34.0	24.5	0.1	0.0	2.3	6.2	1.9	1.5	0.0	0.0	1.2	2.7	0.8	2.5	0.4	0.0
Inch group																
2			1													
3							1		0						2	
4			3		0.08										12	
5							6		0.7						6	
6							2		0.4						2	
7	19	3.9					7		2.2							
8	192	56.9					13		6		1	0.31				
9	250	102.2					15		9.7				1	0.3		
10	296	161.5					47		41				2	0.9		
11	447	317					22		25.4		2	1	1	0.6		
12	508	458.2			1	0.4										
13	203	228.7							1	1.26						
14	20	27.7									1	1				
15	39	65.4									1	1.2	1	1.5		
16					2	1.9					6	8.7	1	1.8		
17					3	3.4					14	24.4	2	4.2		
18					9	12.1					16	33	8	19.9		
19					14	22.2					15	36.3	10	29.1		
20					12	22.2					10	28.2	15	50.7		
21					27	58.1					4	13	5	19.5		
22					13	32.3					1	3.7	2	8.9		
23					22	62.6					1	4.3	1	5.1		
24					11	35.7										
25					9	33.1										
26					2	8.3										
27					1	4.7										
28					2	10.4										
29					1	5.8										
30																
31					1	7.2										
35																
36					2	22.7										
37																
38																
Sample total:	1974	1421	4.0	0.1	133.0	361.3	113.0	85.5	2.0	1.6	71.0	154.8	49.0	142.4	22.0	1.1
All species total:	Number:		2,368		Pounds:		2,168									

Table 6 – Catch summary for Nawakwa Lake nighttime walleye boomshocking survey, September 14, 2004.

Size (in)	Number
3.0 – 3.9	2
4.0 – 4.9	4
5.0 – 5.9	1
6.0 – 6.9	18
7.0 – 7.9	37
8.0 – 8.9	7
9.0 – 9.9	1
10.0 – 10.9	2
11.0 – 11.9	3
12.0 – 12.9	1
13.0 – 13.9	2
14.0 – 14.9	1
15.0 – 15.9	2
16.0 – 16.9	
17.0 – 17.9	
18.0 – 18.9	1
19.0 – 19.9	1
20.0 – 20.9	
Sample Total:	83

Table 7 – Walleye growth analysis for Nawakwa Lake, Alger County, from data taken during night boomshocking survey on September 14, 2004.

Species	Age Group	Number of fish	Length range (in.)	Mean length (in.)	State average length (in.)	Growth index	Mean growth index for species*
Walleye	0	6	3.0 - 4.9	4	---	---	-2.3
	1	29	5.8 - 8.9	7.3	9.8	-2.5	
	2	8	9.6 - 13.0	11.2	13.3	-2.1	
	3	4	13.3 - 15.6	14.7	15.2	---	
	4	0	---	---	---	---	
	5	1	18.7	18.7	18.6	---	
	6	1	19.0	19.0	20.3	---	

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