East Lake
Luce County, T45N, R11W, Sec. 10,11
Tahquamenon River Watershed, Last surveyed 2006

James R. Waybrant

Environment

East Lake is located in the southwest corner of Luce County, approximately 10 miles west of Newberry, in the Tahquamenon River watershed. Summer and resident homes surround most of the lake and it is easily accessible from M28. While the land surrounding the lake has historically been held in private ownership, public access has been allowed intermittently since 1922. In 1988, the Michigan Department of Natural Resources (MDNR) purchased public access just east of the corner of M-28 and H-33. The site is currently not developed; there is an open field for parking and the boat launch is across solid but uneven and unimproved shoreline substrate. The landscape surrounding East Lake is relatively flat with sandy soils. Primary land uses of the watershed include residential homes, agriculture, and forestry. The local forests are logged primarily for northern hardwoods.

East Lake is a shallow lake encompassing 122 acres. While the maximum depth of the lake is 22 feet, about 70% of the lake ranges from 5 to 15 ft in depth. Heavy submergent vegetation was identified in 1995 as Eurasian Milfoil which is an invasive species. East Lake is one of the few spots in the Upper Peninsula where it has been found. In response to this finding, the East Lake Association was organized to produce the tax base and subsequent funding to buy the aquatic herbicide 2-4-D. After several treatments since 1997, East Lake is relatively free of Eurasian Milfoil, and native macrophyte species such as potamogetons are rebounding.

The outlet stream of East Lake is East Lake Creek which is an intermittent stream that drains into Teaspoon Creek. A berm for a private road impounds East Lake as it crosses East Lake Creek in the northeast corner of the lake. The culvert under the road berm controls the lake water level. Early records are scarce, but beaver and human (road) dam building at this site probably increased lake levels artificially in the late 1960's and 1970's, providing northern pike spawning habitat formerly lacking in the lake. The adjacent wetlands and emergent shoreline vegetation produced by raising the lake level still exist today.

Little water chemistry history is available for East Lake. On August 1, 1988, the water was reportedly clear in color with visibility ranging to 10 feet. The pH ranged from 8.5 on the surface to 6.9 on the bottom and alkalinity was approximately 50 mg/l CaCo3. Water temperatures ranged from 81 F on the surface to 76 F at 20 ft. Local records documented that the 1988 summer was exceptionally hot and dry, which probably resulted in water temperatures warmer than normal. No dissolved oxygen measurements were taken at the time. On August 2, 2006, surface water temperature was 78 F, with dissolved oxygen at 8.7 mg/l and pH was 8.5. Water chemistry parameters remained uniform down to 14 ft, where the dissolved oxygen concentration began to decrease. At 16 ft, temperature was 75 F, dissolved oxygen was 0.8 mg/l, and pH was 7.9. Dissolved oxygen was virtually non-existent at 19 ft, the bottom of the vertical profile. Therefore, roughly 75-80% of the lake was well oxygenated and habitable for the fish community.

History

The MDNR history of East Lake is one of trying to develop and maintain an acceptable angling fishery. Smallmouth bass were stocked from 1922 to 1927 (except 1925). Walleye were also stocked in 1922 and bluegill were stocked sporadically in 1922, 1923, 1926, and 1927. A single stocking of largemouth bass occurred in 1928 and of brook trout in 1940. The smallmouth bass stocking produced a good fishery in the 1920's. However, this fishery disappeared in the late 1940's when the walleye population peaked. Because no state stocking records exist and due to the lack of spawning habitat, the increase in walleye was probably the result of private stocking efforts. By the 1960's, survey data showed the walleye population was substantially reduced and smallmouth bass had reappeared, but at a lower population level. Northern pike were first collected during a survey in 1965 and have increased in abundance since that time.

East Lake was surveyed with nets in June 1988. Bluegill were abundant, as 511 fish were collected in 14 net nights. Thirty northern pike were also collected, with 53 percent legal sized (20 in at that time). Other fish sampled in decreasing abundance were rock bass, largemouth bass, yellow perch, brown bullhead, smallmouth bass and white sucker.

During 1991 and 1992, East Lake riparians and MDNR manually removed bluegill in an attempt to remedy the stunted population. About 28.5 lbs. per acre of bluegill were removed over two years. About 500 lbs. (4 lbs. per acre) of bullheads were also removed. In addition, MDNR stocked 13,500 fingerling walleyes from 1991-1993.

East Lake was surveyed again in 1995. Panfish from the 1995 survey were considerably larger than those sampled during the 1988 survey. Apparently, the "double whammy" of manual removal and walleye stocking was at least partially successful in increasing the average bluegill size. Even so, the perch and bluegill populations were still very thin, almost emaciated. Pike, however, were in good condition, although their growth was very slow. Four walleyes were captured averaging 19.3 inches, 46 pike averaged 20.1 inches, 15 perch averaged 6.6 inches, and 308 bluegills averaged 5.4 inches. Bullheads were still abundant; 151 were caught, averaging 9.4 inches. Workers noticed, however, that the entire shoreline was inundated with one species of submerged vegetation, so thick that boat passage was almost impossible. It was during this survey that the plant was identified as Eurasian Milfoil and 2-4-D treatments occurred in 1997 and 1998. Another 5,538 walleye fingerlings were stocked in 1997-99.

The East Lake fish community experienced dramatic changes immediately after the Eurasian Milfoil was brought under control. During the next four years, anecdotal stories described how heavy bodied but slow growing northern pike provided an excellent winter ice fishery. Other anecdotal reports told of limit and over-limit catches being taken during those winter seasons. In addition, an angler caught a 48-inch pike during February, 1997. That size had never been seen previously in East Lake. The 2000 netting survey showed that, beginning in 1995, growth rates of young northern pike increased every year, finally approaching state average growth in 1998. Largemouth bass growth had increased to roughly state average. Two walleyes were captured, sized 23 and 26 inches. However, no walleye from the 1997-1998 stocking were captured during the 2000 survey.

Small, slow growing bluegills were the reason for stocking walleyes into East Lake during the early 1990's. About the time that walleyes should have begun acting as a predation control on the bluegills, however, the lake was treated with 2-4-D to remove the Eurasian Milfoil. With little remaining cover, bluegills could not escape predation by walleyes, bass or pike. Because the youngest bluegill captured during the 2000 survey was age 5, there was no determination of growth rate changes resulting from the milfoil treatments. Even so, anglers in 2000 were beginning to catch bluegills of good size. Rock bass averaged over 9 inches, with many in the master angler category. Failure to capture younger and smaller bluegills in the nets was a matter of Fisheries Division concern. For that reason, the walleye stocking program was discontinued, and northern pike harvest regulations were changed in 2002 to 0-inch minimum size limit (MSL) and five fish per day.

Current Status

In May 31, 2006 the lake was surveyed using a standardized status and trends protocol. We found a fish community significantly different from the one described in the May 16, 2000 survey (Table 1). Brown bullheads were more numerous, comprising 16% of the catch biomass compared with 8% in 2000. They were also larger, with average size of 13.1 inches compared with 11.5 inches. Bluegills comprised 33% of the catch and averaged 7.7 inches, with 99% greater than 6 inches. In contrast to the slow growth noted in the 2000 survey (Table 3), bluegills were found to be growing 0.5 inches faster than the state average rate (Table 2). Golden shiners were captured for the first time, providing an alternative forage species for bass and pike. Pumpkinseed sunfish were smaller than bluegills at 5.9 inches, comprised only 8% of the catch biomass, and were growing just faster than state average rate. None had been captured during the 2000 survey. The rock bass population was similar to the bluegills, averaging 7.5 inches and comprising 24% of catch biomass, an increase from 11% in 2000. The rock bass population, however, included several master angler-sized specimens. Yellow perch were small and rare, comprising only 1% of the catch biomass, and averaging only 3.5 inches.

The sampled predator populations in 2006 were dissimilar to their counterparts in 2000. This observation could be a result of sampling bias due to water temperature differences during each survey. The 2000 mid-May survey was in water temperature of 61 F, while the 2006 late-May survey was in 71 F. A ten degree temperature difference in the spring can easily cause changes in locations occupied by each species, as well as changes in netting vulnerability. Northern pike comprised 19% of the catch biomass, and averaged 14.2 inches with only 5% larger than 24 inches (Table 1). They were also the only fish species growing slower than the state average rate, at -3.3 inches (Table 2). In contrast, northern pike in 2000 comprised 62% of the total catch, averaged 21.4 inches, and were growing slightly faster at -2.7 inches (Table 3). Despite the 0-inch MSL and five fish per day creel limit for northern pike, anglers interviewed during this survey said that they still released all the small pike they caught. Largemouth bass comprised 1% of the catch biomass, and averaged 6.5 inches with only 4% larger than 14 inches. Although the largemouth bass were low in number with a small average size, the bass were growing 1.6 inches faster than the state average rate. In comparison, largemouth bass in 2000 comprised 17% of the catch biomass, averaged 13.8 inches with 69% over 14 inches, and were growing considerably slower at -0.7 inches (Table 3). No walleyes were captured in 2006.

Analysis and Discussion

During the late 1990s and early 2000s, East Lake was anecdotally considered one of the best largemouth bass lakes in the area by local anglers. Chemical control of Eurasian Milfoil had reduced aquatic vegetation to allow anglers to target many areas of the lake for both largemouth bass and northern pike. Estimated 2006 bass annual mortality from the catch curve data (Robson and Chapman 1961) was 57% (Table 4), indicating a high harvest rate. The 2006 catch data also implied that they were no longer a significant component of the predator category. They comprised only 1.4% of the total catch biomass and only 4% were over 14 inches. Northern pike comprised 15% of the catch biomass. They were also targeted and harvested by anglers, with 52% estimated 2006 annual mortality (Table 4). Despite a 0-inch MSL and five fish per day regulations on northern pike since 2002, 78% of the pike caught during the 2006 survey were 10-15 inches and only 5% were over 24 inches (Table 5). Due to their small size, the majority of the pike population probably does not target the larger panfish. Brown bullhead numbers were increasing in abundance in 2006 and an average size of 13.1 inches indicated an abundance of forage. MDNR management files on several local lakes show that removing too many large predators will allow bullhead numbers to increase into nuisance proportions. Northern pike are predators upon small bullheads (Carlander, 1969), so we must make sure that the 0-inch minimum size limit for northern pike does not result in excess harvest. We will have to keep a close watch on the total fish community dynamics and balance in this lake.

A major concern stemming from both the 1995 and 2000 netting surveys was overall fish community balance. In 1995, the Eurasian Milfoil was ubiquitous in East Lake with its dense colonies crowding out almost all other aquatic macrophytes. Data from that survey showed the forage component of the fish community comprised only 24% of the total catch biomass (Table 6). Partitioning the 2000 catch data , 2-3 years after most of the Eurasian Milfoil was eradicated, produced a forage component of 12%, while predator species comprised 81%. In contrast, 2006 catch data shows a nice balance of predators to forage.

One of the concerns from the 2000 survey was the dearth of smaller panfish, especially bluegills. Their absence implied either a lack of reproduction or survival of age-0 fish or a failure to survive and recruit to the larger year-classes. If low survival persisted, the panfish populations could collapse, leading to a subsequent collapse of the predator population. The May 2006 survey again found very few small panfish, with 99% over 6 inches. In addition, an August 2006 targeted boomshocking effort failed to capture more than three small bluegills. Although six years have passed since the first recruitment concerns were raised, the 2006 survey captured 689 bluegills averaging 7.7 inches. It appears that small bluegills survive well enough to sustain the population. Even so, we will have to keep a close eye on the panfish populations in the future.

Management Direction

East Lake should be managed as a self-sustaining cool and warm water fishery featuring northern pike, largemouth bass, bluegills, trophy brown bullheads, and occasionally other panfish. To sustain that fish community, three parameters have to be carefully monitored.

Eurasian Milfoil virtually eliminates native aquatic plants via competition and grows so dense that predation on small panfish is minimal because predators cannot swim through the vegetative mass. Most lakes contaminated with this exotic plant suffer from stunted panfish populations. For that reason, Eurasian Milfoil must continue to be controlled. When the plant once again begins to dominate

the East Lake aquatic plant community, for example, dominating 30% of the vegetated area, it must be treated with an appropriate aquatic herbicide.

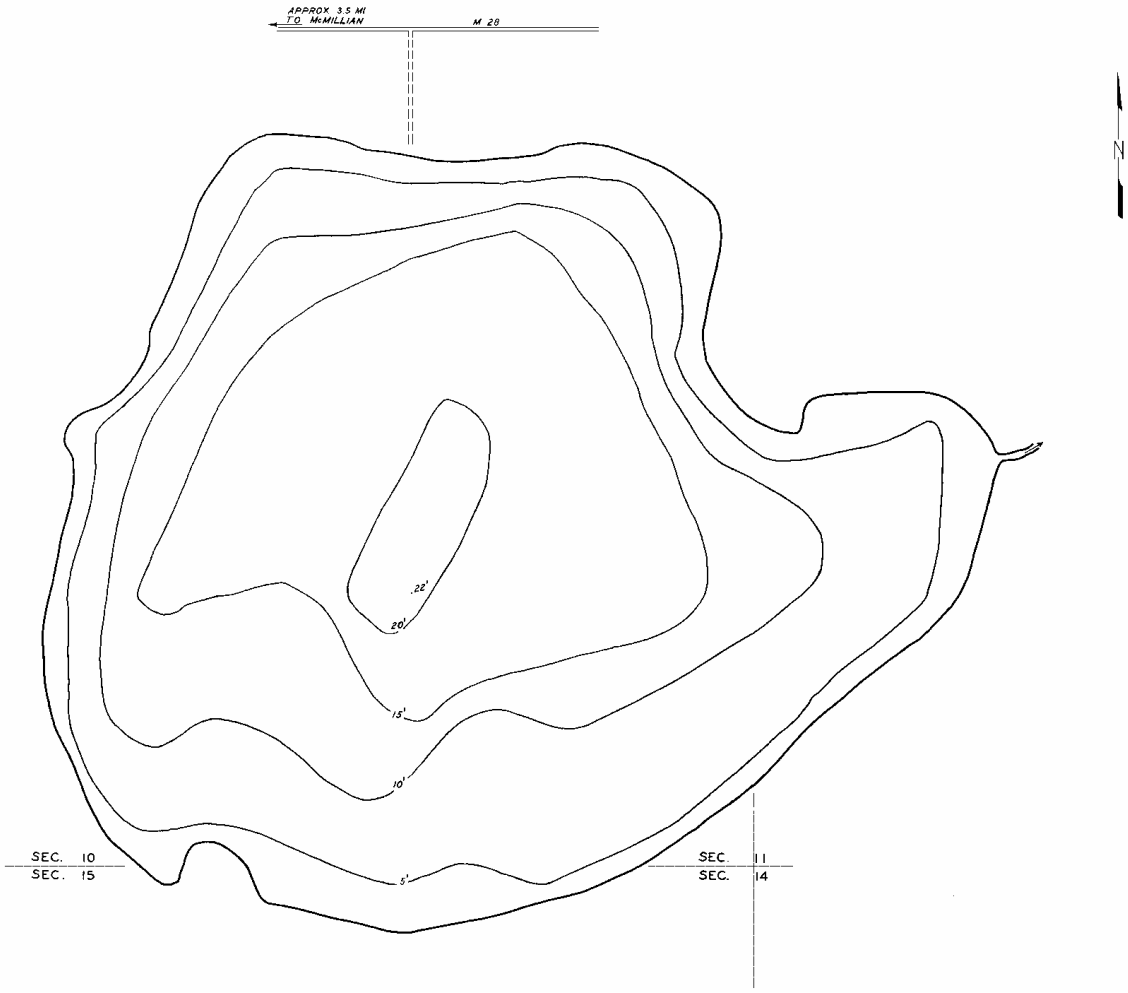
The bullhead population has to be kept in check. If numbers begin to climb concurrently with a significant decrease in size, this lake will be ready for a bullhead manual removal. Removals in the local region have proven successful in the past. Several lakes, after two or three removals, have not needed another bullhead removal for over ten years. Both walleyes and northern pike are predators upon small bullheads (Carlander, 1969). Despite stocking, walleyes have not become a significant factor in the fish community, so their stocking program will terminate. Management direction will work to ensure the presence of a relatively large northern pike population, which will in turn help ensure the sustainability of any manual removal effort.

The bluegill population balance is cause for concern. However, large bluegill specimens have been continually harvested by angling and caught in surveys for several years, during the time when we can find only a few small fish. The duration of this situation implies reasonable population balance. Even so, sampling results imply an apparently fragile balance due to poor survival of the smaller fish Current aquatic plant colonies are apparently sparse enough to allow excessive predation of smaller panfish by northern pike, bullheads, and largemouth bass. As a supplement to native aquatic plants, bluegill management should include placement of large woody structure around the lake perimeter. That woody structure would serve as shelter for small panfish, allowing better survival to maturity. It would also provide solid surfaces for colonization by periphyton (surface dwelling algae and associated microscopic animals) communities which will enhance the forage base for small fish. Efforts should begin to educate riparians of the value of near shore large woody structure.

References

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

Carlander, K.D. 1969. Handbook of Freshwater Fishery Biology. The Iowa State University Press, Ames, Iowa.



East Lake, Luce County
T45N, R11W, Sec. 10,11
122 acres

Figure 1 – East Lake contour map.

Table 1 – Number, weight, and length indices of fish collected from East Lake, Luce County, with trap, fyke, and gill nets, 5/30-6/2/2006.

Species	Number	Percent by number	Weight (pounds)	Percent by weight	Length range (inches)[1]	Average length	Percent legal Size[2]
Brown bullhead	111	4.7	113	15	5 - 15	13.1	95
Bluegill	689	30	236	31	1 - 10	7.7	99
White sucker	1	0	0.3	0	9	9.5	100
Golden shiner	182	8	2	0	2 - 6	3.2	100
Largemouth bass	28	1	9	1	1 - 14	6.5	4
Central mudminnow	2	0	0	0	2	2.5	100
Northern pike	193	8	145	19	6 - 31	14.2	5[3]
Pumpkinseed	332	14	60	8	2 - 8	5.9	54
Rock bass	503	22	179	24	3 - 12	7.5	87
Yellow perch	260	11	8	1	2 - 10	3.5	7

[1] Note 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.

[3] All northern pike in East Lake are legal to harvest due to "0" inch Minimum Size Limit. The percent legal size listed is for comparison with lakes having standard harvest regulations.

Table 2 – Average total length (inches) at age, and growth relative to the state average, for six species of fish sampled from East Lake with trap, fyke and gill nets, 5/30-6/2/2006. Number of fish aged is given in parentheses.

Species	Age I	II	III	IV	V	VI	VII	VIII	IX	Mean growth Index[1]
Bluegill			5.4 (1)	6.5 (2)	7.2 (12)	7.6 (4)	8.0 (4)	8.3 (4)	8.4 (2)	+0.5
	X	XI	XII	XIII						
	8.5 (2)	8.9 (7)	9.4 (1)	9.7 (1)						
Largemouth bass	4.2 (5)	8.7 (8)	12.8 (3)	12.1 (1)	14.2 (1)					+1.6
Northern pike	10.6 (13)	13.4 (41)	14.9 (15)	21.0 (1)	26.3 (6)	27.6 (2)	26.8 (2)			-3.3
Pumpkinseed			4.8 (13)	5.9 (9)	6.4 (14)	7.7 (2)	7.8 (2)			+0.2
Rock bass		3.7 (5)	6.2 (15)	6.6 (9)	7.6 (1)	8.1 (5)	8.7 (10)	9.3 (12)	9.5 (4)	+0.3
	X	XI	XII	XIII						
		11.2 (3)	11.2 (2)	11.4 (1)						
Yellow perch	4.4 (10)	5.8 (1)	6.4 (11)	7.3 (6)	8.3 (5)	7.8 (1)	10.4 (1)			0.0

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

Table 3 – Average total length (inches) at age, and growth relative to the state average, for four species of fish sampled from East Lake with trap, fyke and gill nets, 5/16-19/2000. Number of fish aged is given in parentheses.

Species	Age I	II	III	IV	V	VI	VII	VIII	IX	Mean growth Index[1]
Bluegill					4.2 (1)	5.4 (4)	5.6 (12)	6.8 (2)	7.8 (5)	-1.4
	X	XI	XII	XIII						
	8.1 (1)		7.9 (1)	7.7 (1)						
Largemouth bass			9.0 (6)	12.6 (6)	13.6 (11)	14.5 (14)	14.8 (13)	15.3 (5)	16.6 (5)	-0.7
Northern pike		17.4 (6)	20.0 (29)	21.6 (17)	22.8 (11)	22.3 (6)	23.2 (7)		37 (1)	-2.7
Walleye	X	XI								----
	23.6 (1)	25.3 (1)								

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

Table 4 – Mortality estimates (percent) for six species from East Lake using catch curve data from fyke, trap, and gill nets, 5/30-6/2, 2006. Estimates were made using the Robson-Chapman catch curve mortality method (Robson and Chapman 1961).

Species	Included ages	Percent annual mortality	Percent instantaneous mortality	Comments
Bluegill	5 – 13	37	46	Growth levels off at ages 8-13.
Largemouth bass	2 – 5	57	85	
Northern pike	3 – 7	52	73	Good growth above age 5.
Pumpkinseed	6 - 8	46	61	Earlier ages not uniform.
Rock bass	3 – 13	30	36	
Yellow perch	1 – 7	39	50	72% of population age 3or less

Table 5 - Survey catch summary for the East Lake status and trends survey using fyke, trap, and gill nets, boomshocking and seines, 5/30-6/2/2006.

Species		Bluegill		Br bullhead		C. mudminnow		Golden shiner		Largemth bass		Northern pike		Pumpkinseed		Rock bass		White sucker		Yellow Perch	
Legal size (in)		>=6.00		>=7.00		>=		>=		>=14.00		>=24.00		>=6.00		>=6.00		>=		>=7.00	
Avg. length (in)		7.7		12.8		2.5		3.2		6.5		14.2		5.9		7.5		9.5		3.5	
Avg. weight (lb)			0.3		1.0		0.0		0.0		0.3		0.8		0.2		0.4		0.3		0.0
Total		689	235.6	111	112.9	2	0.0	182	2.0	28	8.8	193	145.1	332	60.2	503	178.7	1	0.3	260	7.8
No. legal		680		106		0		0		1		9		180		437		0		17	
% Legal size		98.7%		95.5%						3.6%		4.7%		54.2%		86.9%				6.5%	
% Total catch		29.9%	0.3	4.8%	0.2	0.1%	0.0	7.9%	0.0	1.2%	0.0	8.4%	0.2	14.4%	0.1	21.8%	0.2	0.0%	0.0	11.3%	0.0
CPE		25.5		4.1		0.1		6.7		1.0		7.1		12.3		18.6		0.0		9.6	
Inch group	1	3	0.0							3											
	2					2	0.0	68	0.3	6	0.0			2	0.0					142	0.8
	3	3	0.1					104	1.3	1	0.0			6	0.2	12	0.4			60	0.9
	4	1	0.1					9	0.2	5	0.2			34	2.4	2	0.1			26	0.9
	5	2	0.2	5	0.4									110	14.5	52	6.3			6	0.4
	6	57	10.8					1	0.1	1	0.1	2	0.1	163	36.7	167	33.8			9	1.0
	7	369	109.7											15	5.4	52	16.3			11	1.9
	8	243	107.5							3	0.9			2	1.1	133	61.0			4	1.0
	9	10	6.3							4	1.7	3	0.5			68	43.8	1	0.3	1	0.4
	10	1	0.9	2	1.1							9	2.1			10	8.7			1	0.5
	11			5	3.6							20	6.0			6	6.9				
	12			34	30.7					3	3.0	33	12.9			1	1.5				
	13			51	57.5					1	1.3	48	24.0								
	14			13	18.0					1	1.6	51	31.8								
	15			1	1.7							6	4.6								
	16											2	1.9								
	17											4	4.5								
	18																				
	19											2	3.2								
	20											1	1.9								
	21											1	2.2								
	22											1	2.5								
	23											1	2.9								
	24																				
	25											2	7.4								
	26											1	4.2								
	27											2	9.3								
	28											2	10.4								
	29											1	5.8								
	31											1	7.2								
Sample total:		689	235.6	111	112.9	2	0.0	182	2.0	28	8.8	193	145.1	332	60.2	503	178.7	1	0.3	260	7.8

All species total: Number: 2305 Pounds: 751.4

Table 6 – East Lake, Luce County, survey catch comparison data from netting surveys in 1995, 2000, and 2006.

	Bluegill			Brown Bullhead			White Sucker		
Year	Number Caught	Percent Biomass	Percent Legal	Number Caught	Percent Biomass	Percent Legal	Number Caught	Percent Biomass	Percent Legal
1995	308	14	11	151	34	8	2	3	100
2000	30	1.2	27	44	8	100	0	0	0
2006	689	31.3	99	111	15.0	95	1	0	100

	Largemouth Bass			Northern Pike			Pumpkinseed		
Year	Number Caught	Percent Biomass	Percent Legal	Number Caught	Percent Biomass	Percent Legal	Number Caught	Percent Biomass	Percent Legal
1995	2	1	0	46	36	20	54	3	43
2000	5	2.1	80	136	73.2	7	0	0	0
2006	28	1.4	4	193	19.3	5	332	8.0	54

	Rock Bass			Walleye			Yellow Perch		
Year	Number Caught	Percent Biomass	Percent Legal	Number Caught	Percent Biomass	Percent Legal	Number Caught	Percent Biomass	Percent Legal
1995	33	6	82	4	4	100	15	1	7
2000	83	11	95	2	2	100	0	0	0
2006	503	23.8	87	0	0	0	260	1	7

Fish community analysis for percent each of species comprising Forage, Predator, and Rough fish components. Forage species are bluegill, pumpkinseed sunfish, rock bass, and yellow perch. Predators are largemouth bass, northern pike and walleyes. Rough fish species are brown bullhead and white suckers.

	Forage		Predators		Rough Fish	
Year	Number Caught	Percent Biomass	Number Caught	Percent Biomass	Number Caught	Percent Biomass
1995	410	24	52	41	153	37
2000	113	12	143	77	44	8
2006	1592	68	144	16	108	16