Characteristics of Waterbody and Biological Communities

Houghton Lake is part of the Muskegon River and Lake Michigan watersheds. Higgins Lake drains into Houghton through the Cut River. The outlet of Houghton Lake is the beginning of the mainstem of the Muskegon River. Houghton Lake is 20,075 acres in size and is the largest inland Lake in Michigan. Maximum depth is 22 feet, but the largest portion of the lake is shallow with an average depth of 8 feet. There are extensive sand and gravel shoals.

Nearly the entire shoreline of this lake has been heavily developed. Nearly all of the natural shoreline vegetation and wetlands have been removed from the lake. The water level of Houghton Lake is manipulated by a lake-level control structure located in the Muskegon River. The legally established lake level is 1138.1 feet but is often maintained at levels higher than the legal level. Establishment of the unnatural lake levels has resulted in seawall construction around a substantial portion of the shoreline. Elevated lake levels have almost completely eliminated the extensive wild rice beds found in the lake, and much of the emergent vegetation from the near-shore areas of the lake. Abundant submerged vegetation was always present, covering approximately 50% of the lake. Recently, Eurasian milfoil has become abundant throughout much of the lake. There has been an ongoing chemical control program for milfoil and more recently a concurrent weevil control program sponsored by the Houghton Lake Improvement Board.

Primary game fish species found in this lake include bluegill, walleye, yellow perch, northern pike, crappie, largemouth bass, smallmouth bass, pumpkinseed, and rock bass. Walleye were the only species stocked in recent years.

Refer to the site descriptions for specific information collected in this survey. Refer to the catch summary and fish growth analysis portion of this report for detailed information on catch rates, lengths, and growth of fish.

Purpose and Results of Survey

The purpose of this survey was to evaluate the fish community using trap nets at index sites sampled during June since 1972, and electrofishing specifically for walleye. Information from this survey was compared to other surveys conducted since 1922. Information on fish growth, catch rates, and age composition were compiled from Fisheries Division surveys and reports.

Growth rates of various fish species in Houghton Lake have been relatively constant since 1922 (Table 1). Walleye, northern pike, and yellow perch have consistently had growth rates below state average. Smallmouth bass, largemouth bass, bluegill, pumpkinseed, rock bass, and black crappie have all exhibited relatively consistent growth rates near or above state average.

The length distributions of walleyes in June trap net surveys were similar between 1972 and 2007, although larger fish were collected in greater numbers in 1972 and 1983 (Table 2). The spring surveys conducted in 2001 and 2007 had much greater sample sizes, with modal lengths of 16 in or 17 in, and more typical length distributions (Figure 1). Good numbers of legal sized (≥ 15 in) fish were present in all of the collections. The size distribution in 2001 was similar for both net and electrofishing samples. Ages ranged from 2 to 15 with a mode at age-6 for both 2001 and 2007 spring collections (Figure 2). The 2001 age distribution was similar for both net and electrofishing samples. Walleye appear to be fully recruited to trap nets and electrofishing at 16 in – 17 in and age-6. Younger ages were present in the catch in both 2001 and 2007. Walleye catch rates in June net collections were relatively constant between 1972 and 2007 (Figure 3).

The length distributions of northern pike in June trap net samples were similar between 1972 and 2007 with a low percentage of fish in the legal (≥ 24 in) size range (Table 3). Sample sizes of northern pike in the 2001 spring trap net collections were much larger with a greater size range. Approximately 27% of the northern pike collected in 2001 were legal size. The catch of larger fish in the 2001 spring trap nets may indicate greater vulnerability of larger fish in the spring, but the greater effort expended may also have been a factor. Age distributions of northern pike from trap net collections in June 2007 and spring 2001 were similar (Figure 4). Northern pike appear to be fully vulnerable to trap and fyke nets at 20 in and age-3. June trap net catch rates of northern pike in 2007 were threefold greater than in any previous surveys (Figure 3).

Bluegill collections in June trap nets contained many large fish in all years between 1972 and 2007 (Table 4). Modal lengths have been 6 in, 7 in and 9 in and average lengths have ranged from 6.5 in to 8.8 in. Annual ranking of bluegill sizes have ranged from Good to Superior and ranking of growth rates have ranged from Satisfactory to Superior based on Schneider's (1990) classification methods (Table 5). Catch rates of bluegill in June trap nets have increased each year since 1983 (Figure 3).

Length ranges and average lengths for smallmouth bass, largemouth bass, pumpkinseed, black crappie, and rock bass indicated good size structure and continued natural reproduction for these species (Table 6). Other species of fish present in the catch included channel catfish, brown bullhead, bowfin, common carp, longnose gar, and white sucker.

Conclusions and Recommendations

During the 1920's and 1930's northern pike and walleye were the predominant species in the Houghton Lake fishery (Laarman 1976). During the mid-1930s, the catch of northern pike declined dramatically and panfish catch increased proportionally. This shift in dominance of northern pike to panfish resulted from the filling of wetlands and shoreline development of Houghton Lake, with resulting loss of spawning habitat for northern pike. Survey data through 1972 generally indicated that growth rates of yellow perch, northern pike, and walleye were below state average, while growth rates of other game species were near or above state average (Laarman 1976). Similar trends in growth continue through 2007.

The walleye population appears to have been stable between 1972 and 2007. Length distributions, age distributions, growth, and catch rates remain relatively unchanged. Modal lengths in the catch have been 16 - 17 in and good numbers of fish larger than 15 in were present. Anglers reported low catches of walleye during recent years which are not consistent with survey information. Clark et al. (2004) estimated adult walleye abundance in 2001 at approximately 58,000-60,000 (3/acre). They found that walleye abundance and harvest per acre were average or above compared to other Michigan lakes, and total mortality and exploitation were average.

The length and age distributions of northern pike do not appear to have changed substantially between 1972 and 2007. However, the catch rate tripled since the last survey in 1998. The high catch rate is consistent with angler reports of catching many sublegal fish in recent years. This indicates a strong year-class was recently produced. Growth can be affected by high population abundance but the 2007 growth rate was similar to historical growth rates. Clark et al. (2004) found harvest per acre of northern pike was above average for Houghton Lake in 2001, but population density was below average (0.3 – 1.6 /acre of ≥ age-2 fish). Total mortality and exploitation were average to above average compared to other Michigan lakes. Harvest of northern pike was much greater in winter than in summer.

The effectiveness of sampling northern pike with trap nets in June should be evaluated. Although CPUE can be high in June samples, larger fish may be more vulnerable during spring, or greater effort may need expended to capture a representative sample of larger fish during June.

Bluegill sizes and growth rates ranged from Satisfactory to Superior in all years between 1972 and 2007. Catch rates in trap nets have increased steadily since 1983. This is inconsistent with angler reports of poor bluegill catches during recent years. Other panfish also appear to have good size structure and large mean sizes. The panfish populations appear in good condition with no substantial changes since 1972.

Clark et al. (2004) found that total fish harvest from Houghton Lake during summer 2001 and winter 2002 was 386,287 fish. Panfish (bluegill, yellow perch, black crappie, pumpkinseed, and rock bass) accounted for 92.2% of the harvest, with 152,237 bluegill harvested. Predator species accounted for 7.7 % of the harvest including smallmouth bass (1,888), largemouth bass (340), walleye (18,265), and northern pike (9,291). A small number of white suckers were also harvested.

Overall, the fisheries of Houghton Lake are dominated by panfish, walleye, and northern pike. The 2007 survey indicates stable or increasing abundance of these species. Substantial changes in growth rates and sizes were not evident.

Healthy biological communities in lakes require suitable natural habitat. Human development within the lake watershed, along the shoreline, and in the lake proper has a tendency to change and diminish natural habitat. Appropriate watershed management is necessary to sustain healthy biological communities, including fish, invertebrates, amphibians, reptiles, birds and aquatic mammals. Generally for lakes this includes maintenance of water quality, especially for nutrients; preservation of natural shorelines, especially shore contours and vegetation; and preservation of bottom contours, vegetation, and wood debris within the lake. The reader should refer to the Conservation Guidelines for Michigan Lakes and Associated Wetlands (MDNR Fisheries Division Special Report Number 38), and the Muskegon River Watershed Assessment (MDNR Fisheries Division Special Report Number 19) for a detailed discussion of appropriate watershed management techniques for Houghton Lake.

References

Clark, R. D., Jr., P.A. Hanchin, and R. N. Lockwood. 2004. The fish community and fishery of Houghton Lake, Roscommon County, with emphasis on walleyes and northern pike. Michigan Department of Natural Resources, Fisheries Division Special Report 30, Ann Arbor.

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O'Neal, R. P. 1997. Muskegon River watershed assessment. Michigan Department of Natural Resources, Fisheries Division Special Report 19, Ann Arbor.

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Schrouder, K. S. 1993. Houghton Lake, Roscommon County, status of the fishery report. Michigan Department of Natural Resources, Fisheries Division, Ann Arbor.

Figure 1. Length distribution of walleyes in Houghton Lake, from spring collections in 2001 and 2007.

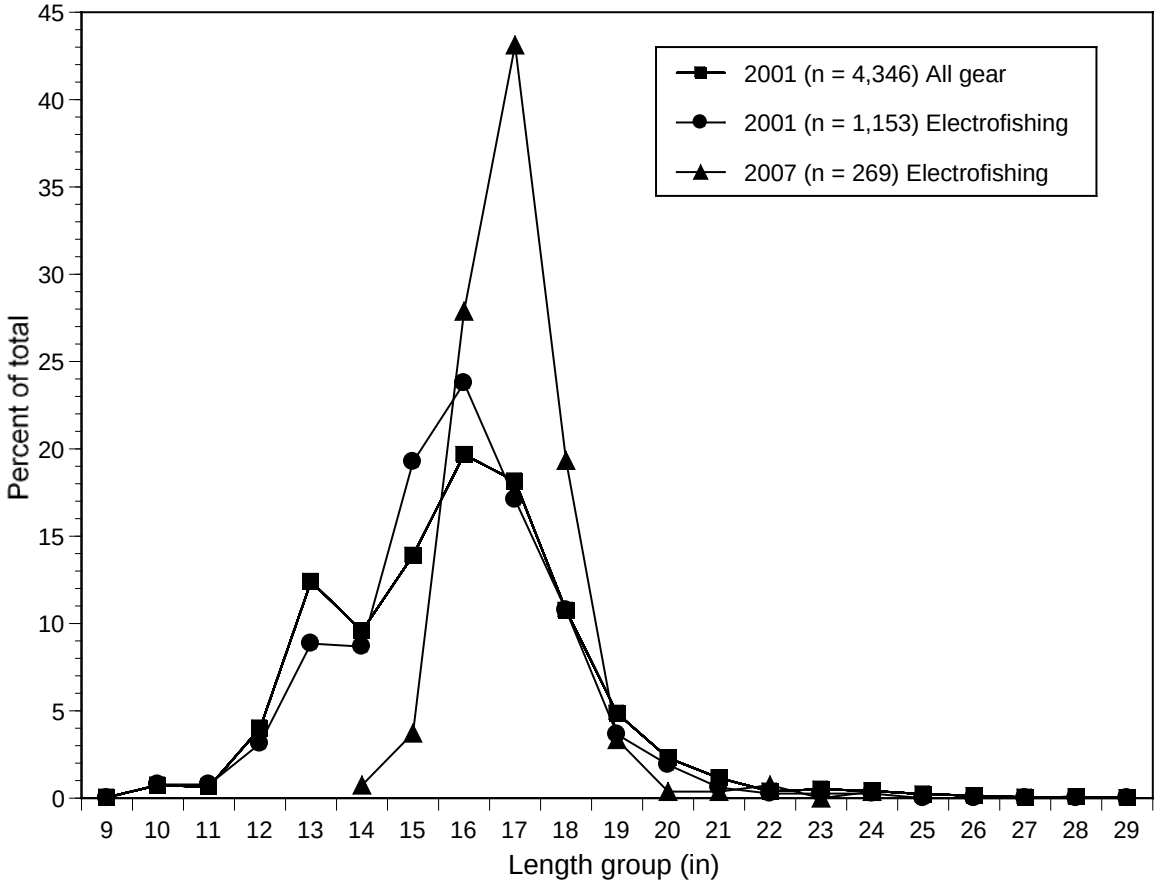

Figure 2. Age distribution (apportioned by length-age keys) of walleyes in Houghton Lake, from spring collections in 2001 and 2007.

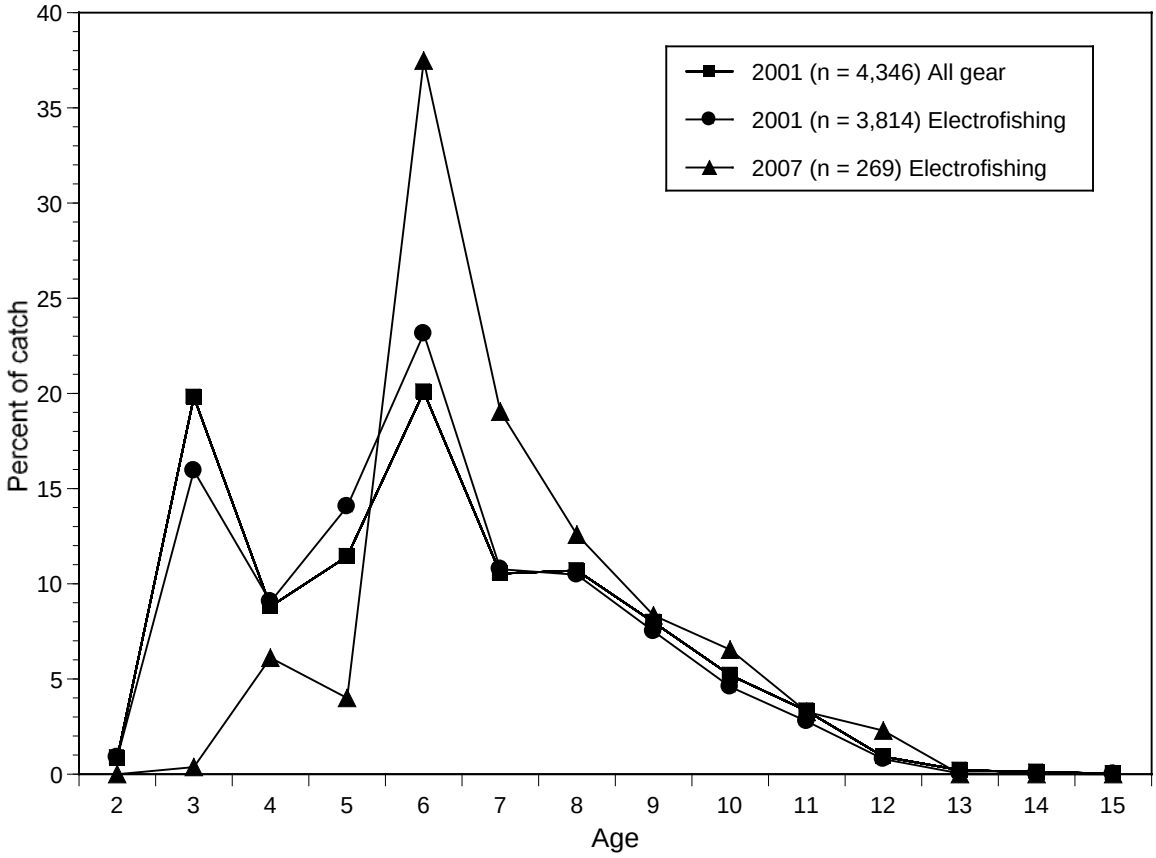

Figure 3. Catch rates of walleye, northern pike, and bluegill in Houghton Lake, from June trap net collections between 1972 and 2007.

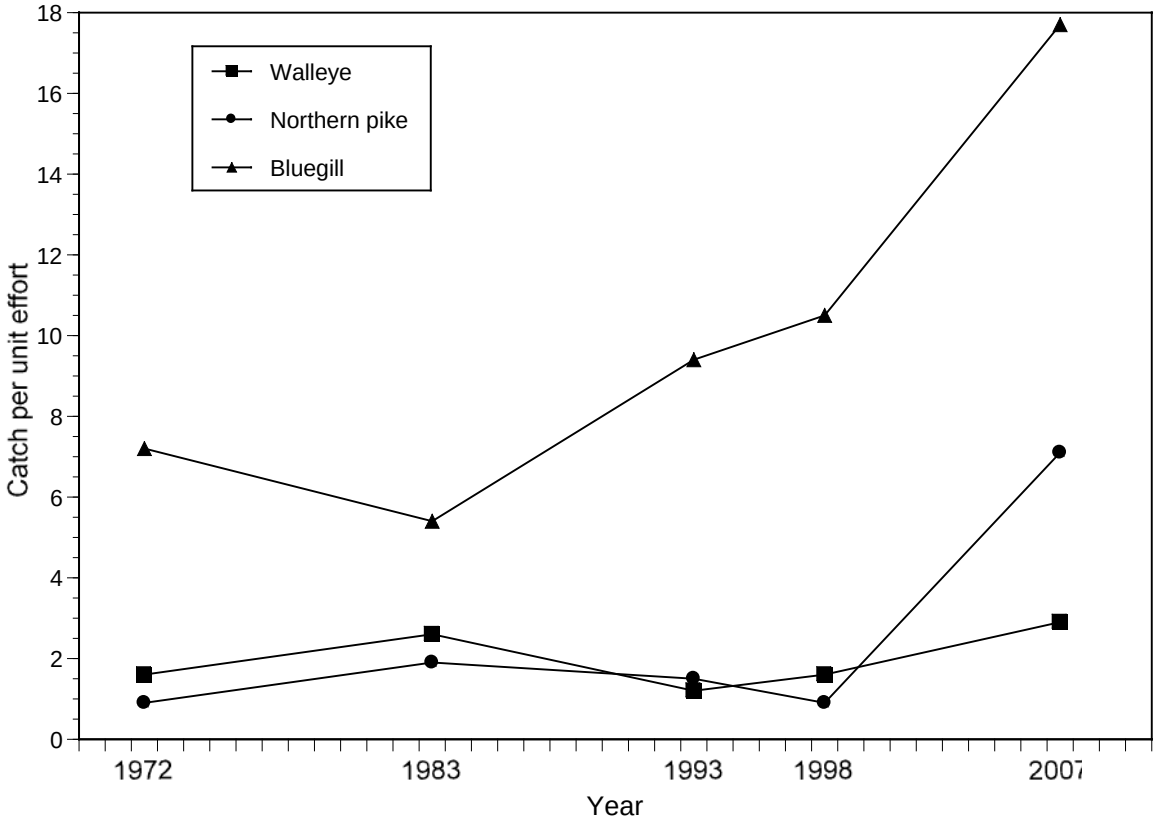

Figure 4. Age distribution (apportioned by length-age keys) of northern pike in Houghton Lake, from trap net collections in spring 2001 and June 2007.

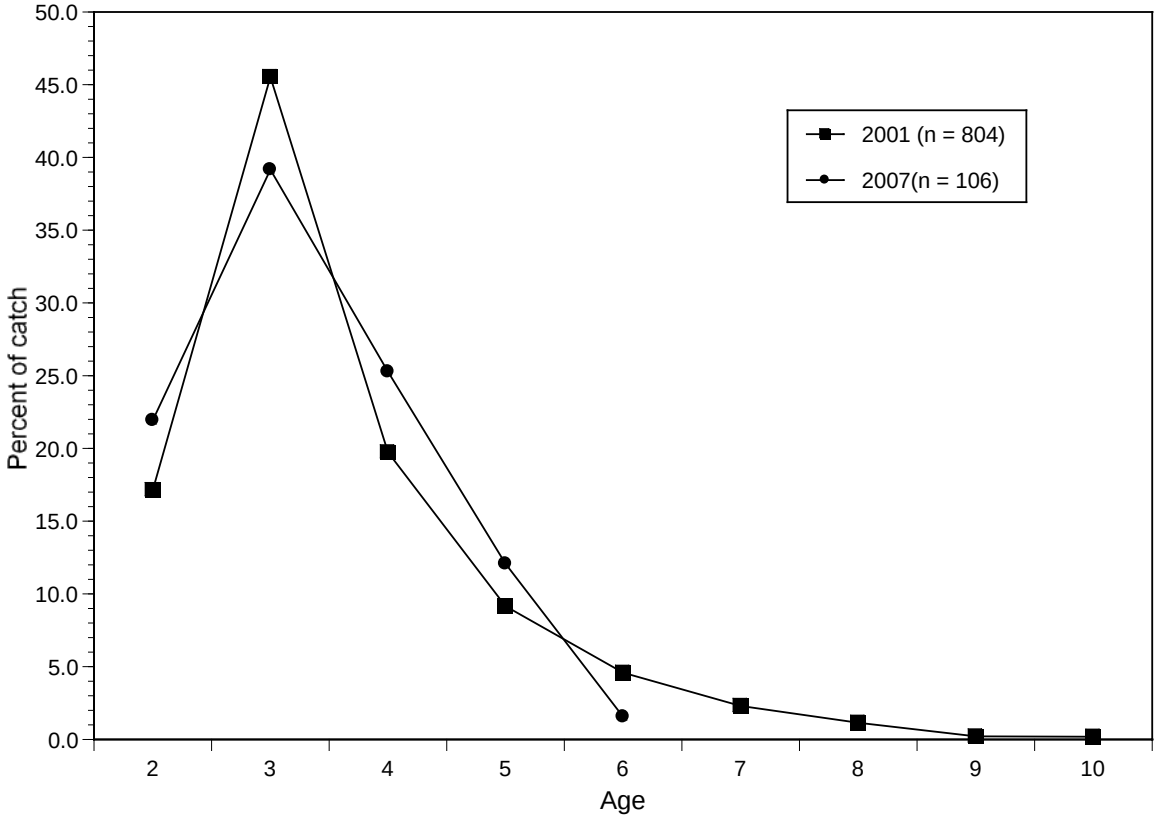

Table 1. Mean growth indices from 1922-2007 for Houghton Lake. Values in parentheses indicate number of fish aged. Mean growth index is a comparison to state average growth rates.

	July-August 1922	July 1948	May-June 1955	May 1962	June-July 1967	July 1971	June 1972	June 1983	June 1993	June 1998	June 2007
Walleye			-2.9 (52)	-1.1 (45)		-2.0 (15)		0.0 (87)	-1.1 (151)	-1.1 (53)	-0.8 (46)
Largemouth bass		2.2 (8)	0.0 (37)		0.2 (8)				0.1 (29)	0.3 (27)	0.8 (28)
Smallmouth bass		0.2 (5)			1.6 (5)			0.6 (53)	0.4 (32)	-0.1 (51)	1.6 (26)
Northern pike				-1.8 (29)	-1.5 (53)			-2.0 (50)	-2.2 (58)	-0.5 (20)	-2.1 (93)
Bluegill	0.6 (23)	1.1 (55)	0.2 (78)	0.7 (59)	0.4 (327)		0.6 (108)	0.2 (99)	1.0 (97)	0.9 (85)	0.5 (101)
Pumpkinseed	-0.2 (79)	1.2 (71)	0.8 (80)	0.3 (18)	0.6 (134)		0.6 (104)	0.7 (32)	0.8 (39)	1.0 (35)	1.4 (44)
Rock bass	0.4 (115)	0.8 (28)	0.6 (72)	0.6 (50)	1.6 (131)		0.5 (85)	0.8 (51)	0.8 (74)	1.1 (49)	1.1 (28)
Black crappie		0.1 (5)	0.7 (40)	0.6 (5)			0.5 (13)	0.4 (39)	0.2 (89)	0.2 (36)	0.5 (34)
Yellow perch				-0.7 (14)	-1.5 (43)		-1.4 (14)	-1.9 (43)	-1.7 (52)	-0.6 (31)	-1.9 (27)

Table 2. Walleye size distributions, catch per unit effort (CPUE), and average lengths from net and electrofishing surveys in Houghton Lake.

	June					Spring		Spring	
	Trap nets					Trap nets	Fyke nets	Electrofishing	
Length (in)	1972	1983	1993	1998	2007	2001	2001	2001	2007
9			1			2			
10					6	20	3	9	
11	1				1	8	11	9	
12		2	1	1	4	83	55	36	
13	6	8	5	5	3	258	179	102	
14		5	9	6	2	199	117	100	2
15	3	9	6	5	2	238	144	222	10
16		6	4	2	9	371	210	274	75
17	3	5	3	2	6	401	191	197	116
18		2	4	5	2	220	123	124	52
19	7	9		1	3	110	59	42	9
20		2			4	46	32	22	1
21	11		2			30	13	7	1
22			1	1	1	10	4	3	2
23						13	6	3	
24						8	7	3	1
25		1				5	5		
26		1				3	3		
27		1				1	1		
28						2	1		
29						1			
Total	31.0	51.0	36.0	28.0	43.0	2028.0	1164.0	1153.0	269.0
Effort	20.0	20.0	29.0	18.0	15.0	336.0	215.0		3.5
CPUE	1.6	2.6	1.2	1.6	2.9	6.0	5.4	23.4[a]	76.9
Average length	18.2	17.0	15.9	16.0	15.8	16.5	16.3	16.3	17.5

a. CPUE determined from 2 efforts

Table 3. Northern pike size distributions, catch per unit effort (CPUE), and average lengths from net and electrofishing surveys in Houghton Lake.

	June					Spring		Spring	
			Trap net			Trap net	Fyke net	Electrofishing	
Length (in)	1972	1983	1993	1998	2007	2001	2001	2001	2007
9						0	1		
10						0			
11					1	1			
12						0			
13						4	1	1	
14					1	3	1		
15						6	2		
16			2		5	13	9		
17	6	1	2		8	19	7	2	
18		7	4		12	64	16	1	
19	8	13	9	2	17	85	22	5	
20		7	17	6	15	111	40	4	
21	3	3	5		19	104	34	3	2
22		3		2	14	92	40	1	
23		2	2	3	7	68	25	4	
24			1	1	4	73	14	1	
25			1	3	1	41	7	2	
26		1			1	25	7	1	
27					1	25	6	1	
28						17	9		
29						13	5		
30						9	5		
31		1				4	2		
32						4	1		
33						4	1		
34						6			
35						5			
36						1			
37						3	1		
38						3			
39						1			
40						0			
41						1			
Total	17	38	43	17	106	805	256	26	2
Effort	20	20	29	18	15	336	215		3.5
CPUE	0.9	1.9	1.5	0.9	7.1	2.4	1.2	0.4[a]	0.6
Average length	19.1	20.6	20.2	22.3	20.5	22.6	22.3	21.8	21.5

a. CPUE determined from 2 efforts

Table 4. Bluegill size distributions, catch per unit effort (CPUE), and average lengths from June trap net surveys in Houghton Lake.

Length (in)	1972	1983	1993	1998	2007
2				2	
3	3	1			5
4	3	5		11	5
5	27	5	6	41	4
6	27	21	17	81	19
7	28	29	39	45	117
8	27	24	57	3	90
9	20	21	121	3	23
10	9	2	32	3	3
Total	144	108	272	189	266
Effort	20	20	29	18	15
CPUE	7.2	5.4	9.4	10.5	17.7
Average length	7.4	7.7	8.8	6.5	7.8

Table 5. Bluegill size structures, length frequency ranks, and growth ranks in Houghton Lake from June trap net catches. Size and growth ranks (very poor, poor, acceptable, satisfactory, good, excellent, superior) determined by methods described by Schneider (1990). Refer to Table 1 for growth indices.

Date of sample	Sample size	Length Range (in)	Average size	% > 6"	% > 7"	% > 8"	Size rank	Growth rank
June 1972	144	3.5-10.5	7.4	77.1	58.3	38.9	Excellent	Good
June 1983	108	3.5-10.5	7.7	89.8	70.4	43.5	Excellent	Satisfactory
June 1993	272	5.5-10.5	8.8	97.8	91.5	77.2	Superior	Excellent
June 1998	189	2.5-10.5	6.5	71.4	28.6	4.8	Good	Good
June 2007	266	3.5-10.5	7.8	94.7	87.6	43.6	Superior	Superior

Table 6. Average lengths and length ranges for five fish species collected in trap nets during June 2007.

Species	Average length (in)	Length range (in)
Smallmouth bass	15.0	10 - 18
Largemouth bass	14.0	10 - 16
Pumpkinseed	7.9	6 - 9
Black crappie	10.1	5 – 12
Rock bass	8.9	4 - 11