Long Lake

Cheboygan County
Black River Watershed, last surveyed 2019

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Environment

Long Lake is 400 acres in size and located in northeastern Cheboygan County approximately 10 miles southeast of the town of Cheboygan (Figure 1). Its maximum depth is approximately 60 feet with most of the lake more than 20 feet deep (Figure 2). There are no significant inlets to the lake. The outlet of Long Lake flows into the Lower Black River, which is part of the Cheboygan River watershed that empties into Lake Huron. There is no lake level control structure. The outlet is intermittent and lacks flow during drier periods of the year.

The shoreline of Long Lake is mostly developed and private. A Department of Natural Resources (DNR) managed public boat launch is located on the northwest shore and provides a hard surface boat launch, a dock, and ample parking for trailers. The bottom substrate of Long Lake is primarily sand and marl. Periodic monitoring of Long Lake since the early 1990s by Tip of the Mitt Watershed Council has documented high water clarity. Water clarity was always high at Long Lake but has increased since the invasion of dreissenid mussels, which were thought to be present by the late 1990s or early 2000s. Measured levels of chlorophyll, an indicator of lake productivity, have decreased at Long Lake over the same time frame.

Aquatic vegetation is relatively abundant, including invasive and native species. A private applicator, on behalf of individual lake property owners, has applied for permits for chemical treatments of nuisance aquatic vegetation at Long Lake annually from 2015 through 2019 (Ryan Crouch, Michigan Environment, Great Lakes, and Energy, personal communication). Treatments have been for mixed nearshore plants and algae as well as exotic plant control (Eurasian water milfoil) in offshore areas. Non-native milfoil has been treated with systemic herbicides over varying acreages in this time frame, with a high of 42 acres treated in 2015.

Standard State of Michigan fishing regulations apply for Long Lake.

History

Historical stocking records for Long Lake are lacking and only begin after 1978 (Table 1). Walleye have been the primary fish stocked periodically in the lake from 1978 through 2019. Early stocking events included the release of summer or fall fingerlings from a rearing pond or marsh attached to Long Lake. This was followed by the private stocking of clipped fall fingerlings from 1989 through 1993 (Table 1). The DNR took over stocking efforts following this period by stocking larger numbers of spring fingerlings, while reducing stocking rates over time to account for documented natural reproduction.

The first known examination of the Long Lake fish community by an agency was done in 1950 by the Department of Conservation (DOC). Trap netting in the early spring found abundant White Suckers in Long Lake, along with lesser numbers of Rock Bass, Smallmouth and Largemouth bass, and bullheads.

A more extensive review of the fish community was made in fall of 1961 and 1962. Sampling effort included seine hauls the first year and trap netting in the following year. This effort was made to examine the fish community at the time when the State of Michigan was seeking to obtain public access on Long Lake. The public boat launch was developed in 1962. Fourteen species of fish were collected in the 1960s' efforts. Dominant game fish were Bluegill, Pumpkinseed, Rock Bass, Yellow Perch, Smallmouth Bass, Walleye, and Northern Pike. Most panfish collected were less than 8 inches in length, but some larger fish were found (Table 2). Predators were captured at larger sizes. Smallmouth Bass were the most abundant predator game fish with nine year-classes represented while growth was considered excellent. Walleye were found to have seven year-classes with fish up to 23 inches collected. Good numbers of Walleye 15 inches or larger were collected. Northern Pike were relatively lower in abundance. Other species collected included White Sucker, Common Shiner, Bluntnose Minnow, Bowfin, and Brown Bullhead. A recommendation from the survey was for managers and lake residents to investigate the potential for a pike spawning and rearing marsh adjacent to the lake in attempt to increase pike densities.

The DNR surveyed the Long Lake fish community in August 1973. Sampling effort consisted of 4 trap-net nights and 10 experimental gill-net nights. Fish catches were low but dominated by Bluegill, Rock Bass and Northern Pike. Lesser numbers of Smallmouth and Largemouth bass, and Walleye were collected. All Walleye were 15 inches or larger and assumed to be wild fish since stocking efforts had not begun yet. Most Northern Pike collected were in the 18-22-inch size range (Table 3). Most panfish collected were less than 8 inches in length. Temperature and dissolved oxygen profiles were also generated (Table 4), which showed Long Lake having strong thermal stratification with lower dissolved oxygen levels below 35 feet. Alkalinity values were low, ranging from 51 parts per million (ppm) at the surface to 119 ppm near the bottom.

DNR again surveyed the Long Lake fish community in mid-July 1980 with 33 trap-net nights and 3 experimental gill-net nights. Eleven species of fish were collected (Table 5). Panfish including Rock Bass, Bluegill, and Pumpkinseed were common while Yellow Perch were scarce. Panfish made up 64% of the total catch by number and 32% by weight. Most panfish were again less than 8 inches. Growth rates were very slow for Bluegill and Rock Bass, and average for Pumpkinseed.

Predator game fish in the 1980 survey were Smallmouth Bass, Northern Pike, Largemouth Bass, and Walleye, in that order of abundance (Table 5). These predators made up 11% of the total catch by number and 30% by weight. Smallmouth Bass were represented by eight year-classes (Table 6), and growth rates were slow compared to the statewide average. Largemouth Bass were less abundant and displayed fewer age classes (Table 6), but growth rates were good. Northern Pike displayed only four age-classes with most fish age 2. Few legal Northern Pike were collected, and growth rates were average. Low level Walleye stocking efforts had begun recently at Long Lake (Table 1). Few Walleye were collected in the survey, and these were presumed to be the result of five wild year-classes.

Non-game fish diversity based on the 1980 survey was typical for a northern Michigan lake and comprised of bullheads, Bowfin, and White Sucker. These species made up 19% of the catch by number and 33% by weight.

Walleye spring and fall fingerlings had been stocked in Long Lake or the adjacent rearing marsh by the DNR or private sources from 1978-1986 (Table 1). The rearing pond or marsh was considered to produce

marginal rearing results by 1988. From 1989-1993, fall fingerling Walleye were stocked annually by the lake association (Table 1). In addition, these fish were clipped each year per the request of the DNR to evaluate future stocking effectiveness. Stocking rates of these fall fingerlings were near or slightly below the DNR recommended stocking rate guidelines for fall fingerlings.

The next fish community survey was made at Long Lake by DNR in early-May 1994. The purpose was to evaluate the fish community with special emphasis on the Walleye population following stocking efforts of marked fish from 1989-1993. Effort consisted solely of large- and small-mesh trap nets for a total of 22 net nights. A total of 874 fish were collected weighing over 1,000 pounds (Table 7). Ten species of fish were collected, and species composition was like past surveys.

The panfish catch from the 1994 survey was dominated by Rock Bass, while lesser numbers of Bluegill, Pumpkinseed, and Yellow Perch were collected. Panfish showed a small size structure except for Rock Bass which could attain larger sizes (Table 8). Many Yellow Perch were observed spawning but capture rates of this species were poor.

Predator numbers were considered good for Smallmouth and Largemouth bass, Walleye, and Northern Pike. Largemouth Bass were more abundant in the early-May 1994 survey than Smallmouth Bass. Both species of bass displayed good size ranges and age distributions (Tables 7 and 8). Growth rates for both predators remained near the state average for both species (Table 6). Northern Pike were also common in the survey catch. Pike growth rates were average while only five age groups were represented. Most of the pike were 20 inches or smaller while some larger fish were collected. Walleye were the most abundant predator in the survey and may have been more susceptible to netting efforts since it was closer to spawning season. Walleye comprised 9% of the total catch by number and 14% by weight. They ranged in length from 12-24 inches (Table 8) with excellent numbers of legal size (15 inches and larger) fish present. Walleye growth was considered excellent, and six year-classes were each well represented (Table 6). Eleven of the surveyed Walleye had visible clips from the recent private stocking efforts, and in particular, from the 1991 stocking effort. Few Walleye were found from the other clipped year classes (Table 1) while most of the fish collected were from non-stocking years.

Stocking efforts of Walleye at Long Lake changed and became more consistent following the 1994 survey. The DNR began stocking spring fingerlings directly into Long Lake at higher rates (70-125/acre) on three occasions from 1996-2003. Surplus Walleye fry were also stocked in this period on two occasions (Table 1). This period marked the termination of experimenting with fall fingerling stocking efforts.

Current Status

The most recent fish community survey of Long Lake was made in mid-May 2004 by DNR. The survey was done under the statewide Status and Trends sampling protocol where sampling effort is a product of lake size, and gear is standardized to sample a broader range of fish species and sizes. Effort consisted of 10 large-mesh fyke-net nights, 3 maxi-mini fyke-net nights, 11 large-mesh trap-net nights, and 8 experimental gill-net nights. A total of 1,246 fish were collected for an estimated weight of 1,313 pounds (Table 9).

Panfish were not captured in high numbers during the 2004 survey. It was suggested that this was a result of: a lack of abundant panfish in the lake; unequal vulnerability of panfish to the sampling gear; or the

lack of vulnerability of panfish to the gear due to the cold water temperatures. The species of panfish that were collected included Yellow Perch, Bluegill, Pumpkinseed, and Rock Bass. Growth of perch and Rock Bass were slightly below the statewide average for each species (Table 6). Few panfish except for Rock Bass displayed large sizes and older ages.

Predator game fish such as Smallmouth and Largemouth bass, Northern Pike, and Walleye were well represented in the survey catch. Smallmouth Bass were the most abundant of these species (Table 9) and 83% of those collected were legal size (14 inches and larger) fish (Table 10). Growth rates of Smallmouth Bass were average (Table 6). Age 2-11 fish were represented in the catch indicating many cohorts and strong recruitment. Largemouth Bass were fairly common in the survey catch with fish up to 20 inches present and displaying average growth rates.

Northern Pike, though common, were represented by only four age-classes (Table 6) which may indicate of lack of ability to find suitable spawning conditions in some years. Growth of this species was also below the statewide average (Table 6). Twenty percent of the pike captured were legal-size (24 inches or larger).

Age-2 and age 4-9 Walleye were present in varying numbers in Long Lake in 2004 (Table 6). This species was stocked in 1996, 1998, 2000, 2001, and 2003 (Table 1). Based on the cohort analysis of the survey catch, some natural reproduction of Walleye was occurring in Long Lake. For example, a fair number of age-5 Walleye were collected in the recent survey, and this year class was from a non-stocking year (1999). Walleye growth was deemed average compared to statewide growth rates for this species (Table 6).

Non-game fish such as Common Shiner, White Sucker, Bowfin, and Brown Bullhead were numerous in the 2004 survey catch (Table 9). These species may compete with game fish for some resources, but also act as a forage source (particularly suckers) at young ages.

In addition to the fish survey, limnological parameters were measured in Long Lake on August 7, 2004. Profiles were taken in 54 feet of water (Table 11). Water temperature was stratified throughout the water column, and dssolved oxygen was suitable for most fish (6 ppm or more) down to 35 feet deep. The Secchi-disk reading was 24 feet, indicating high water clarity. The pH level throughout the water column was slightly basic. Total phosphorus levels were very low, indicating low productivity in Long Lake.

A comprehensive aquatic vegetation survey was made at Long Lake in June 2005. The survey was done in response to complaints from lake residents regarding plant proliferation, particularly from non-native species. The survey was completed by Tip of the Mitt Watershed Council (2005) who classified the lake as oligotrophic with high water clarity and low nutrient input. Aquatic vegetation was identified and mapped, with qualitative and quantitative analysis completed. A total of 18 different aquatic plant species were collected (Table 12). Their analysis revealed that only 10% of the lake acreage contained plant cover, but the invasive Eurasian water-milfoil was common in the vegetated zones. The study provided a baseline for future vegetative analyses and a platform from which to make future recommendations on invasive species management. Researchers also noted the presence of invasive zebra mussels and rusty crayfish in Long Lake during the study.

Spring fingerling Walleye stocking rates were again tweaked at Long Lake by the DNR starting in 2005. Prescribed rates were reduced (Table 1) to account for known natural recruitment of Walleye, the likely effects of zebra mussels on the food web, and complaints from anglers suggesting reduced panfish numbers. Stocking rates ranged from 43-54 spring fingerlings per acre every other year or every third year from 2005-2019 (Table 1). Fish were not stocked from 2006-2010 due to statewide production of Walleye being temporarily halted. It was during this period (2005-2019) that Walleye evaluations were done frequently and may have provided the most insight into stocking effectiveness and natural reproduction. There were seven fall juvenile Walleye assessments made during this period by DNR or Little Traverse Bay Band of Odawa Indians (LTBB), as well as two spring adult Walleye population estimates by LTBB (2007 and 2012).
The fall juvenile Walleye assessments were completed in both stocked and non-stocked years. Sampling effort consisted of 2-3 hours of shoreline night electrofishing in 2005, 2007, 2008, 2011, 2013, and 2019 (Table 13). Age-0 Walleye were caught in all these survey years and most of the time in large numbers. Catch rates were high in stocked years 2005, 2011, 2013, and 2019. Fish were marked prior to stocking in both 2005 and 2011 with the antibiotic oxytetracycline (OTC). This would allow managers the ability to sacrifice a subsample of age-0 fish and search for the mark on the fish's bone structure. Results in both 2005 and 2011 indicated a high reliance on stocking of those year-classes (Table 13). Fall assessments in 2007, 2008, and 2009 (non-stocking years) also showed acceptable to high numbers of age-0 Walleye. This again demonstrated strong natural reproduction and recruitment of Walleye in those years. Adult Walleye of many sizes were also collected during the night electrofishing runs in all years. In summary, stocking of Walleye was supplementing an acceptable number of wild fish in the Long Lake population.

LTBB also conducted population estimates of adult Walleye at Long Lake following ice-out in 2007 and 2012. Fyke nets and nighttime electrofishing were used to mark and recapture sexually mature Walleye. Adult Walleye estimates were 1.2/acre in 2007 and 2.3/acre in 2012 (Table 14). These estimates were within the range considered to be a healthy population of Walleye and one that could support a fishery.

Analysis and Discussion

The Long Lake aquatic community and limnology can be characterized as having the following: 1) A panfish community with moderate diversity and quality. Few fish reach larger sizes and growth rates are generally average compared to statewide growth rates for each species. Panfish have reduced longevity in the lake, possibly a result of predation and harvest. The lake is oligotrophic and has reduced nutrient input. This is particularly true since zebra mussels have invaded the lake and altered the food web; 2) An acceptable predator population of Smallmouth and Largemouth bass, Northern Pike, and Walleye. Bass numbers and sizes for both species are good, which is unique for a northern Michigan natural lake. Northern Pike are present in the lake but may be limited by natural spawning areas. Pike are represented by a limited number of cohorts. Walleye populations are generally strong and sustained by natural reproduction and supplemental stocking. Based on previous surveys, it is hard to determine which recruitment source is more important to the population and fishery. Analysis of origin in some surveys has demonstrated a high reliance on stocking. While surveys in many non-stocking years have demonstrated a high reliance on natural reproduction; 3) A non-game fish community which is typical for an isolated and sterile natural lake and believed to be in balance with the game fish community; 4) An environment that is naturally low in primary productivity and limited food resources available to the fish community. This is indicated from low phosphorus and chlorophyll levels and high water clarity; 5) A lake that has likely changed from the invasion of zebra mussels in the late 1990s or early 2000s which filter out primary productivity. It is likely that Long Lake is past the typical invasive curve and that the

greatest (or most notable) impacts from invasive mussels have already come to fruition; 6) A diverse aquatic vegetation community with many native species as well as nuisance non-native milfoil.

Management Direction

1. The standard State of Michigan fishing regulations (bag limits and size limits) for game fish are appropriate at Long Lake. Growth rates for most species are around average. Longevity of some fish may be below average, but it is likely not a result of angler harvest.

2. Spring fingerling Walleye stocking efforts have been relatively consistent at Long Lake in recent years. Stocking supplements the population though natural reproduction is likely the stronger component. The current prescription for spring fingerling stocking is 40/acre every other year. Stocking may continue but can be modified to be less frequent or reduced in number each year when stocked. This may not change the Walleye fishery significantly and may even improve recruitment of panfish to catchable sizes.

3. Spot treatments of aquatic vegetation at Long Lake have been ongoing by private contractors since 2015. Efforts should be made by government agencies or organizations to survey the current aquatic vegetation community of the lake to gather insight into effectiveness of nuisance plant control, particularly for Eurasian water-milfoil.

4. Anglers of Long Lake should share their catch information with fisheries managers. This allows for a more complete understanding of the fishery and can help result in better management of the lake, both today and in the future.

5. The next general fish community survey of Long Lake should be between the years 2025 and 2035. Survey effort should mimic the survey protocol done in the 2004 survey, so that better comparisons can be made between years. Spot checks of Walleye can continue to be made periodically in stocking or non-stocking years to evaluate stocking effectiveness or wild fish contribution.

References

Tip of the Mitt Watershed Council. 2005. Long Lake aquatic plant survey 2005. Tip of the Mitt Watershed Council, Petoskey, MI.

Figure 1. General location of Long Lake, Cheboygan County in the northern Lower Peninsula of Michigan.

Figure 2. General area around Long Lake, Cheboygan County, and water depths in feet.

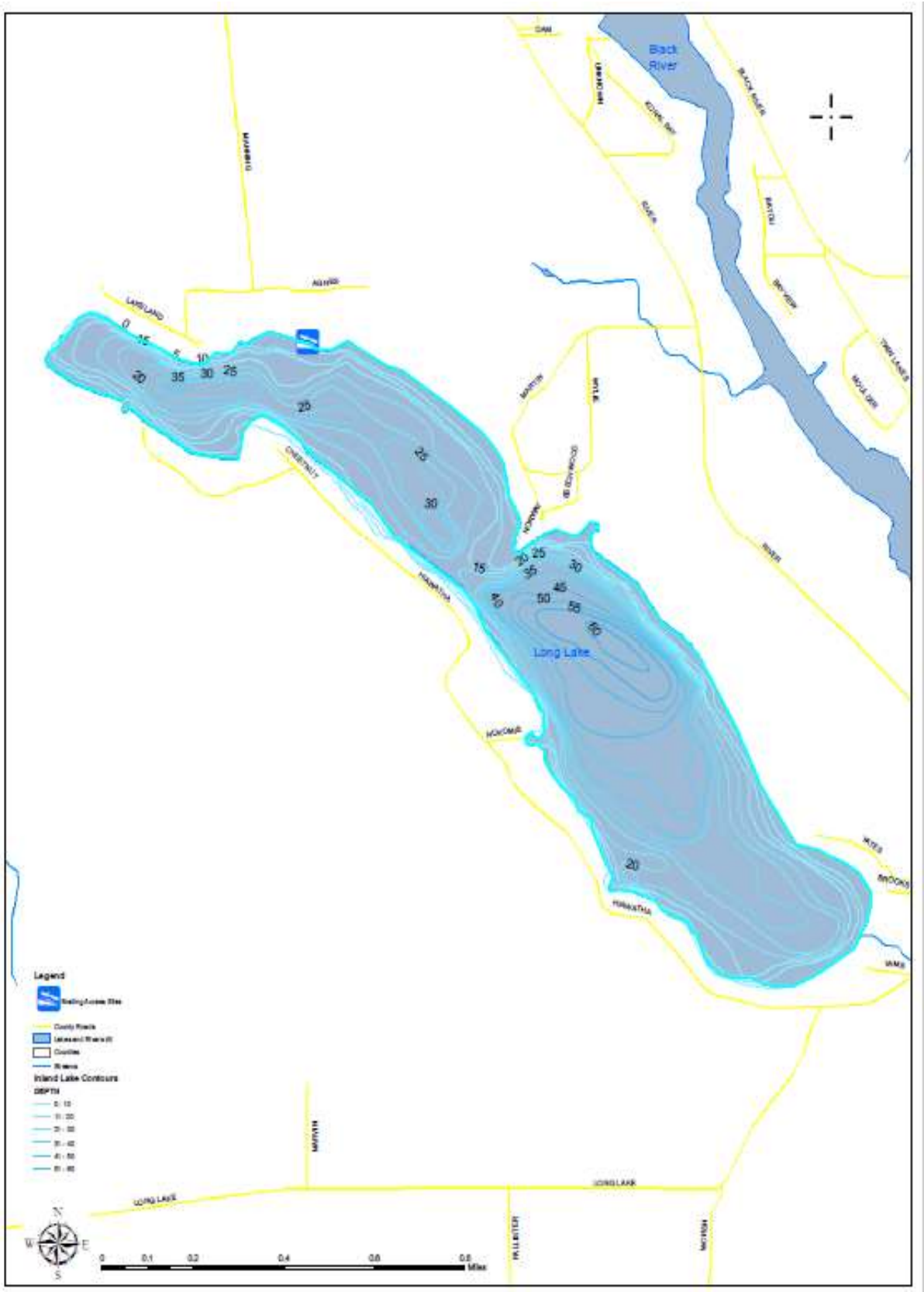

Table 1. Walleye stocking history for Long Lake, Cheboygan County. All years were stocked by DNR except from 1978-1983 when they were stocked either by private sources or in collaboration with DNR.

Year	Strain	Length (in)	No. Stocked	Mark
1978	--	--	1,200	--
1979	--	--	5,000	--
1980	--	3.5	1,000	--
1981	--	1.5	7,000	
1982	--	--	300	--
1983	--	1.5	150	--
1984	--	2.0	2,000	--
1985	--	2.0	2,000	--
1986	--	2.0	2,000	--
1989	--	--	4,000	Right Ventral Fin
1990	--	4.5	3,320	Left Ventral Fin
1991	--	4.5	4,000	Right Pectoral Fin
1992	--	3.5	4,000	Left Pectoral Fin
1993	--	3.5	4,000	Right Pectoral Fin
1996	Muskegon	1.7	28,200	--
1998	Bay De Noc	1.0	50,000	--
2000	Bay De Noc	0.4	500,000	--
2001	Tittabawassee	1.1	35,000	Oxytetracycline
2003	Bay De Noc	0.2	200,000	--
2005	Tittabawassee	1.5	17,685	Oxytetracycline
2011	Muskegon	2.0	17,493	Oxytetracycline
2013	Muskegon	1.5	21,828	--
2015	Muskegon	1.5	19,530	Oxytetracycline
2017	Muskegon	1.4	19,910	Oxytetracycline
2019	Muskegon	1.3	18,734	--

Table 2. Length-frequency of certain fish collected October seine hauls 1961 and 10 trap-net nights 1962.

Length group (in)	Bluegill	Pumpkinseed	Rock Bass	Yellow Perch	Smallmouth Bass	Walleye	Northern Pike
< 6	99	23	71	52	6		
6.0-6.9	97	4	91	1	16		
7.0-7.9	55	1	50		7		
8.0-9.9	28	1	29		64	1	
10.0-14.9				1	43	5	
15.0-19.9					12	23	9
>=20						14	6

Table 3. Length-frequency of certain fish collected from Long Lake August 1973 with 10 experimental gill-net nights and 4 trap-net nights.

Length group (in)	Bluegill	Pumpkinseed	Rock Bass	Yellow Perch	Smallmouth Bass	Walleye	Northern Pike
< 6							
6.0-7.9	36	9	29	2			
8.0-9.9	14	4	21		2		
10.0-11.9							
12.0-13.9					1		1
14.0-15.9					2		
16.0-17.9						2	3
18.0-19.9						3	14
20.0-21.9						8	12
>=22						3	5

Table 4. Water temperature, dissolved oxygen, and pH profile for Long Lake August 1, 1973.

Depth (ft)	Temperature (°F)	Dissolved Oxygen (ppm)	pH
Surface	70	9.0	8.5
24	67	--	--
26	63	--	--
28	61	8.0	--
30	59	--	--
32	57	--	--
34	56	--	--
36	55	5.0	--
38	54	--	--
40	54	1.0	--
42	53	--	--
44	52	--	--
46	51	--	--
48	51	--	--
50	50	--	--
52	50	--	--
54	49	--	--
56	49	--	7.5

Table 5. Fish collected from Long Lake July 8-16, 1980 by DNR with trap nets and experimental gill nets. Weight was estimated from Michigan length-weight relationships.

Species	Total Catch	Percent by number	Weight (lbs)	Percent by weight
Rock Bass	195	30	58.6	17
Bluegill	161	25	40.6	11
Brown Bullhead	115	18	72.2	21
Pumpkinseed	62	9	16.0	4
Smallmouth Bass	46	7	41.9	12
Northern Pike	18	2	30.5	8
Largemouth Bass	16	2	17.5	5
Bowfin	8	1	30.0	8
Walleye	7	<1	20.5	5
White Sucker	6	<1	15.2	4
Yellow Perch	2	<1	0.1	<1
Total	**636**		**343.1**	

Table 6. Comparison of mean length (inches) at age for prominent game fishes of Long Lake from 1973 to 2004. Number in parentheses represents number aged. The growth index is the growth for each species at Long Lake in 2004 compared to the statewide average for that species.

Species	Age group	August 1973	July 1980	May 1994	May 2004	Growth Index (in)
Bluegill	I	--	--	--	--	-0.7
	II	--	--	--	3.0 (8)	
	III	--	4.8 (8)	--	4.6 (2)	
	IV	6.0 (20)	5.3 (6)	--	--	
	V	7.0 (13)	6.2 (15)	6.7 (30)	--	
	VI	7.7 (4)	7.3 (10)	7.5 (4)	--	
	VII	8.1 (2)	7.9 (1)	--	--	
Pumpkinseed	I	--	--	--	--	--
	II	--	4.0 (1)	--	--	
	III	5.7 (5)	5.2 (7)	--	3.4 (2)	
	IV	6.4 (5)	5.8 (8)	--	--	
	V	7.5 (3)	6.4 (6)	6.4 (4)	--	
	VI	--	6.9 (5)	6.8 (5)	--	
	VII	8.1 (1)	7.4 (3)	--	--	
	VIII	--	7.6 (3)	8.4 (1)	--	
	IX	--	8.2 (1)	--	9.5 (2)	

Table 6. -continued.

Species	Age group	August 1973	July 1980	May 1994	May 2004	Growth Index (in)
Rock Bass	I	--		--	--	-0.8
	II	--		--	3.8 (1)	
	III	--	5.3 (10)	--	4.6 (3)	
	IV	5.9 (17)	5.9 (5)	5.5 (5)	5.3 (5)	
	V	7.1 (12)	6.7 (11)	6.5 (10)	--	
	VI	7.7 (11)	7.9 (13)	7.5 (18)	--	
	VII	8.3 (5)	8.3 (5)	8.7 (7)	--	
	VIII	--	9.4 (4)	9.4 (7)	--	
	IX	--	--	10.0 (2)	--	
	X	--	--	--	--	
	XI	--	--	--	11.1 (2)	
Largemouth	I	--	--	--	--	0.0
Bass	II	--	--	--	--	
	III	--	10.8 (3)	10.0 (2)	--	
	IV	12.7 (1)	13.0 (3)	12.6 (5)	--	
	V	14.3 (1)	13.9 (9)	13.8 (23)	--	
	VI	--	--	15.5 (10)	15.4 (10)	
	VII	--	--	16.6 (5)	16.1 (8)	
	VIII	--	19.2 (1)	18.1 (1)	16.7 (11)	
	IX	--	--	19.1 (1)	19.1 (1)	
	X	--	--	--	19.2 (2)	
	XI	--	--	--	20.4 (2)	

Table 6. -continued.

Species	Age group	August 1973	July 1980	May 1994	May 2004	Growth Index (in)
Smallmouth	I	--	--	--	--	+0.3
Bass	II	7.5 (2)	9.0 (13)	--	9.3 (1)	
	III	11.3 (1)	10.7 (10)	10.0 (3)	12.4 (1)	
	IV	--	12.5 (10)	12.6 (6)	12.8 (8)	
	V	14.7 (2)	14.7 (1)	13.9 (5)	13.9 (11)	
	VI	--	15.7 (5)	15.8 (3)	15.8 (4)	
	VII	--	17.9 (3)	16.2 (3)	17.2 (13)	
	VIII	--	17.6 (2)	18.3 (4)	17.5 (7)	
	IX	--	19.8 (1)	19.1 (2)	18.2 (4)	
	X	--	--	--	18.9 (13)	
	XI	--	--	--	19.7 (4)	
Walleye	I	--	--	--	--	-0.3
	II	--	10.3 (1)	12.9 (8)	10.8 (4)	
	III	16.4 (2)		16.0 (32)	--	
	IV	17.8 (1)		17.6 (4)	15.3 (2)	
	V	18.5 (2)	20.1 (1)	18.7 (13)	17.1 (5)	
	VI	19.2 (3)	22.6 (1)	21.6 (11)	18.9 (5)	
	VII	20.4 (4)	22.6 (1)	21.1 (9)	20.2 (4)	
	VIII	21.7 (3)	24.0 (1)	24.5 (1)	25.0 (1)	
	IX				24.1 (2)	

Table 6. -continued.

Species	Age group	August 1973	July 1980	May 1994	May 2004	Growth Index (in)
Northern Pike	I	14.1 (2)	17.1 (3)	--	--	-1.3
	II	18.2 (19)	19.4 (13)	18.9 (20)	--	
	III	20.1 (11)	23.2 (2)	20.4 (29)	20.3 (6)	
	IV	--	24.3 (1)	22.1 (15)	21.5 (11)	
	V	--	--	25.7 (10)	23.7 (17)	
	VI	27.7 (1)	--	--	24.5 (4)	
	VII	30.6 (2)	--	--	--	
	VIII	--	--	--	--	
	IX	--	--	38.4 (1)	--	

Table 7. Fish collected from Long Lake May 2-6, 1994 by DNR with trap nets. Weight was estimated from Michigan length-weight relationships.

Species	Total Catch	Percent by number	Weight (lbs)	Percent by weight	Length Range (in)
Rock Bass	431	49	153.3	13	5-10
White Sucker	115	13	415.2	37	14-23
Walleye	86	9	161.9	14	12-24
Northern Pike	81	9	177.7	16	16-38
Largemouth Bass	62	7	103.6	9	10-19
Bluegill	40	4	8.7	<1	5-7
Smallmouth Bass	26	2	48.7	4	9-19
Bullhead sp.	22	2	27.7	2	11-15
Pumpkinseed	10	1	3.0	<1	6-8
Yellow Perch	1	<1	0.1	<1	5
Total	**874**		**1,099.9**		

Table 8. Length-frequency of certain fish collected from Long Lake May 1994 with 22 trap net nights.

Length group (in)	Bluegill	Pumpkinseed	Rock Bass	Yellow Perch	Smallmouth Bass	Walleye	Northern Pike
< 6	2		7	1			
6.0-6.9	26	6	64				
7.0-7.9	12	3	217				
8.0-8.9		1	13				
9.0-9.9			28		1		
10.0-10.9			2		2		
11.0-11.9					1		
12.0-12.9					3	3	
13.0-13.9					4	5	
14.0-14.9					3	4	
15.0-15.9					3	10	
16.0-16.9					3	16	3
17.0-17.9						7	9
18.0-18.9					4	15	9
19.0-19.9					2	11	8
20.0-20.9						9	20
21.0-21.9						4	8
22.0-22.9						1	7
23.0-23.9							4
24.0-24.9						1	5
25.0-25.9							3
26.0-26.9							2
27.0-27.9							2
28.0-28.9							
29.0-29.9							
>30							1

Table 9. Fish collected during a Status and Trends fish community survey from Long Lake May 10-14, 2004 by DNR. Weight was estimated from Michigan length-weight relationships.

Species	Total Catch	Percent by number	Weight (lbs)	Percent by weight	Length Range (in)
Common Shiner	730	59	--	--	--
White Sucker	191	15	644	49	16-25
Smallmouth Bass	104	8	284	22	9-20
Northern Pike	41	3	96	7	2-26
Largemouth Bass	34	3	87	7	14-20
Yellow Perch	28	2	2	<1	2-8
Walleye	24	2	49	4	7-25
Bowfin	22	2	119	9	13-28
Brown Bullhead	22	2	28	2	10-15
Bluegill	17	1	0	<1	1-4
Rock Bass	15	1	2	<1	1-11
Pumpkinseed	10	<1	2	<1	1-9
Iowa Darter	5	<1	0	<1	1
Johnny Darter	3	<1	0	<1	2
Total	**1,246**		**1,313**		

Table 10. Length-frequency of certain fish collected from Long Lake May 2004 with standardized Status and Trends protocol sampling gear.

Length group (in)	Bluegill	Rock Bass	Yellow Perch	Largemouth Bass	Smallmouth Bass	Walleye	Northern Pike
< 6	17	14	14				4
6.0-6.9			12				
7.0-7.9			1			1	
8.0-8.9			1			1	
9.0-9.9					1		
10.0-10.9							
11.0-11.9		12			1		
12.0-12.9					7	3	
13.0-13.9					7		
14.0-14.9				3	2	1	
15.0-15.9				12	3	1	
16.0-16.9				9	11	2	
17.0-17.9				4	31	2	
18.0-18.9				1	23	4	
19.0-19.9				2	14	3	2
20.0-20.9				3	4	3	6
21.0-21.9							7
22.0-22.9							7
23.0-23.9						1	4
24.0-24.9						1	7
25.0-25.9						1	3
26.0-26.9							1
27.0-27.9							
28.0-28.9							
29.0-29.9							
>30							

Table 11. Water temperature and dissolved oxygen profiles for Long Lake August 7, 2004.

Depth (ft)	Temperature (°F)	Dissolved Oxygen (ppm)
Surface	74	8.6
2	73	8.6
4	73	8.6
6	73	8.6
8	73	8.6
10	73	8.6
13	73	8.6
15	73	8.6
17	73	8.6
19	73	8.6
21	73	8.5
23	73	8.5
25	71	8.5
27	68	7.4
29	66	7.1
31	60	6.9
33	59	6.7
35	58	6.1
37	56	2.6
39	55	1.8
41	54	1.4
43	53	1.3
45	53	1.3
47	52	0.9
49	51	0.4
52	50	0.1
54	50	0.1

Table 12. Aquatic vegetation species and number of sites the species were found among 104 survey locations at Long Lake in 2005. Table reproduced by Tip of the Mitt Watershed Council, 2005.

Aquatic plant species	**Number of sites where found**
Vale (eel-grass)	50
Slender naiad	37
Eurasian water-milfoil	28
Muskgrass	28
Broad-leaved pondweed	26
Fries' pondweed	18
Illinois pondweed	18
Common water-milfoil	11
Elodea	11
Floating-leaf pondweed	8
Sago pondweed	7
Water marigold	4
Whitestem pondweed	4
Common bladderwort	2
Haynes' pondweed	2
Richardson's pondweed	2
Slender pondweed	2
Straight-leaf pondweed	1

Table 13. Fall Walleye nighttime electrofishing assessments at Long Lake. Percent stocked determined in years when fingerling Walleye were stocked and marked with oxytetracycline. Sample size of age-0 fish tested is in parentheses. Assessments were made by DNR in 2005 and 2019, while assessments were made by LTBB in remaining years.

Year	Date	Water Temp (F)	Hours shocked	Miles shocked	Age-0 Walleye	No. Age-0 per hour	Age-1+ Walleye	Percent stocked (n)
2005*	10/27	53	2.0	2.5	60	30.0	27	81 (31)
2007	10/3	62	3.2	5.0	110	34.3	84	--
2008	9/24	65	3.1	5.0	52	16.7	64	--
2009	10/15	49	3.0	5.0	24	8.0	47	--
2011*	9/21	62	2.5	5.0	74	29.6	69	95 (19)
2013*	9/30	65	3.3	5.4	161	48.1	10	--
2019*	9/17	66	2.2	4.0	110	49.3	14	--

Table 14. Adult Walleye population estimates conducted by LTBB at Long Lake. Fish were captured with fyke nets and nighttime electrofishing following ice-out. Adult fish were considered sexually mature.

Year	Period	Marked Walleye	Recaptured Walleye	Population Estimate	95% Confidence Interval	Adult Walleye Per Acre
2007	April 16-23	199	52	494	392-597	1.2
2012	March 21-April 2	603	63	930	845-1,015	2.3