

Long Lake

Lapeer County, T8N, R10,11E, S18, 19, 24
South Branch Flint River Watershed, Last surveyed 2009

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Environment

Long Lake is an impoundment of Abbot Drain located in the Lapeer State Game Area of Lapeer County four miles northeast of the town of Lapeer (Figure 1). Abbot Drain is a tributary to Plum Creek which flows to the South Branch Flint River. The South Branch Flint River flows to the Shiawassee River which flows to the Saginaw River which discharges to Saginaw Bay of Lake Huron.

The origin of the Lapeer State Game Area dates back to 1955 when the Michigan Department of Conservation purchased the 3,351 acre estate of James Vernor. James Vernor was a pharmacist from Detroit who later went on to market "Vernors Ginger Ale". The estate included the entire shoreline of Long Lake as well as other small water bodies and wetland complexes. Vernor developed the northwest shore of Long Lake into the Acadia Ridge Farm where he raised thoroughbred horses.

Long Lake is the middle of three consecutive impoundments built in 1964 in a cooperative effort between Michigan Department of Natural Resources and Environment (DNRE), Wildlife and Fisheries Divisions (Figure 2). The upper impoundment (Flooding 27) is approximately 50 acres. Long Lake is approximately 204 acres and includes the original lake contours prior to flooding. The lower impoundment (Flooding 29) is approximately 45 acres. In 1968, Wildlife Division established waterfowl refuge boundaries which encompassed one-half of Flooding 27, all of Long Lake, and Flooding 29 (Figure 1). Under refuge designation, the public was prohibited access to Long Lake. Public opposition to the loss of angling opportunities resulted in a decision which allowed limited access for angling using buoys to mark refuge areas. In 1973, the buoy concept was discontinued and Wildlife and Fisheries Divisions agreed that Long Lake would be open to angling beginning July 4th weekend through Labor Day weekend and January 1st until ice out. In 2008, a less ambiguous definition of angling seasons was adopted specifying open seasons from July 1-August 31 and December 15-March 1. Public access to Long Lake is available from Five Lakes Road where a small concrete boat launch is located.

The primary water control structure on Long Lake is the Upper Long Lake Dam (Figure 2). Upper Long Lake Dam is a 660 foot earthen dike and steel control structure which uses boards to maintain water level. Typically, the hydraulic height of this dam is maintained at 5 feet. The secondary water control structure for Long Lake is the Lower Impoundment Dam (Figure 2). Equalization of water levels between the two water bodies routinely occurs during high precipitation and flooding. During summer months, the water level of Long Lake is typically 0.5 ft. higher than in the lower impoundment.

The Long Lake drainage area lies within the Huron district of the Southern Lower Michigan Regional Landscape Ecosystem and is described by features identified in the Lum Interlobate sub-district (Albert 1995). The Lum Interlobate sub-district description includes medium and coarse textured end moraines with kettle lakes and wetlands dispersed among pitted outwash deposits. Soil textures range

from sand to clay with a common occurrence of sandy loam on the elevated moraines, sand on the outwash, and organic peat in the depressions. Soils are of Boyer-Montcalm-McBride association and drain well. The hilly topography and permeable soils found in the Long Lake area provide hydraulic head for moderate groundwater inflow. As a result, numerous wetland complexes and small kettle lakes are common to the area.

In the 1800's, loggers harvested vast stands of oak, hickory, and white pine from the area around Long Lake. After the logging era (1870-1885), agriculture became the dominant landuse and remains so to this day. The primary crops are corn, soybeans, and warm season grasses. Presently, the immediate drainage area for Long Lake is best described as 50% oak-hickory forest, 25% wetland complex, and 25% wildlife managed warm season grasses. The shoreline is in a semi-natural state with no residential development. The north and south shores have been modified into dikes to separate the upper and lower impoundments. Lapeer State Game Area offices are located on the northwest shore but are set back approximately 500 feet from the waters edge.

Long Lake is elongate in shape and has a fairly regular shoreline (Figure 3). The maximum fetch is estimated to be 1 mile. A single small island is located in the southern basin. Changes in bottom contour are gradual and 60% of the lake is 5 feet or less in depth. There are six holes of various sizes where water depths are greater than 15 feet. Maximum depths of 27 feet are found in the northern basin. The bottom substrate is primarily sand and organic peat.

Aquatic vegetation is common and seasonally excessive in the shallow waters of Long Lake. A dense cattail complex occupies the north basin. Other emergents including bulrush and arrowhead are sparsely scattered along the shore. Water lily, floating pondweed, and water shield are common leaf-floating plants. Milfoil (native and Eurasian), coontail, curly leaf pondweed, and large leaf pondweed compose the submerged plant community and are common.

In general, Long Lake is classified as a warmwater, medium size, and shallow lake of mesotrophic limnological characteristics. The United States Geological Services (USGS) evaluated the chemical water characteristics of Long Lake in April and August of 2008 (Tables 1 and 2). Measured parameters were consistent with historical values and typical of this region of the State. August measurements of secchi disk (8 ft.), total phosphorus (15 ug/l), and chlorophyll-a (5.3 ug/l) yielded a Trophic Status Index (TSI) of 46 on a scale of 0-150. A TSI of 46 is consistent with mesotrophic lake classification. Mesotrophic lakes generally have intermediate nutrient levels, moderate water clarity, relatively abundant aquatic vegetation, and support diverse biological communities.

Temperature, oxygen, and pH profiles were conducted by Fisheries Division in August, 2009 (Table 3). These profiles were consistent with historical measurements and show summer thermocline development between 15 and 20 feet. In addition, during summer months and thermocline development, dissolved oxygen concentrations appear fish limiting (<3 mg/l) in the hypolimnion. The epilimnion and littoral zone of the lake provide the most desirable habitat for fish species. Thermal characteristics of the epilimnion and littoral zone are consistent with warmwater classification where summer temperatures approach the mid to upper 70°F's for an extended period of time. pH values ranged from 7.1 in the lower water column to 7.7 at the surface and fall within an acceptable range to support aquatic life.

History

Long Lake has an extensive history of fisheries management. Experimental thinning of stunted panfish using low concentrations of rotenone occurred annually from 1962 to 1967. In 1971, rotenone was applied to the entire lake to eradicate nuisance carp. In 1986, Wildlife Division de-watered the lake for dike and control structure maintenance eliminating the majority of the fish population. Since 1986, fish stocking has occurred sporadically (Table 4). Fish stocked include black crappie, bluegill, channel catfish, largemouth bass, northern muskellunge, and pumpkinseed sunfish. The northern muskellunge stocking in 1988 was a transfer of 14 adult fish from nearby Murphy Lake. Seven of these muskellunge have been reported in the harvest in subsequent years. Largemouth bass stocking in 1997 was a transfer of adults from nearby Twin Lake which was undergoing a bass thinning project. Since 2002, there has been an ongoing request to stock northern pike to supplement the fishery.

Since 1986, fish community assessments have occurred on Long Lake in 1989, 1991, 1993, 1998, 2005, and 2009. Nineteen fish species were documented in those assessments (Table 5). Bluegill occurred as the most abundant species and represented the dominant sportfish. Bluegill size structure showed slight improvement between 1989 and 1993 and then stabilized (Table 6). Relative abundance estimates for bluegill were highest in 2005 (Table 5). Channel catfish were abundant in the 1993 assessment which prompted a 1994 transfer of 979 adult fish to Park Lake in Clinton County. Since 1994, the abundance of channel catfish is lower and fish do not appear to be reproducing. No northern muskellunge have been captured since 1989 and their population is believed extirpated. Largemouth bass and northern pike are present in acceptable numbers. Common carp have been consistently abundant in Long Lake.

Long Lake has maintained a good reputation for its bluegill, largemouth bass, and northern pike fisheries. Harvested bluegill typically average 6 inches and a few reach into the 7 inch size range. Bluegill in the 8 inch size range are uncommon. Anglers report good largemouth bass fishing and Long Lake is a favorite destination among locals for winter northern pike spear fishing.

Current Status

In June, 2009, Fisheries Division conducted a fisheries assessment on Long Lake using trap net, gill net, seine, and electrofishing gear. The use of multiple gear types helps to present a generalized picture of the fish community. Large mesh trap nets are used to capture larger (>3 inches) fish species that inhabit the littoral zone or that move inshore at night. Gill nets sample fishes that occupy offshore waters and are particularly effective at capturing perch and northern pike. Night electrofishing is best at capturing species and life stages that inhabit the littoral zone or that move inshore at night. Seining captures representative samples of small-bodied nongame species and smaller sizes (<3 inches) of sport fishes that inhabit the littoral zone.

A total of 1,901 fish representing 16 species were collected in the 2009 assessment (Table 7). Trap nets accounted for 71% of the total catch while electrofishing, gill nets, and seine accounted for 24%, 4%, and 1%, respectively. Bluegill were the most abundant species collected comprising 82% of the total catch. Other species collected in relatively low abundance included black crappie, brook

silverside, black and brown bullhead, channel catfish, common carp, golden shiner, Iowa darter, largemouth bass, northern pike, pumpkinseed, warmouth, and yellow perch.

A total of 1,568 bluegill averaging 5.6 inches were collected in the 2009 assessment (Table 7). Seventy-six percent of the bluegill catch was captured with trap net gear compared to 22% captured with electrofishing gear. Average size of the bluegill trap net catch was 6.0 inches compared to 4.1 inches with electrofishing gear. Fifty-six percent of the trap net catch met or exceeded the acceptable harvest size of 6 inches compared to 11% of the electrofishing catch. Bluegill size structure was dominated by fish in the 5-6 inch size range. Age and growth analysis indicated bluegill were growing near State average having a mean growth index of -0.3 (Table 8). Age frequency showed good representation of the 2006 (age 3) and 2004 (age 5) year classes (Table 9). Bluegill longevity appears to peak at age 5 and older fish experience mortality either by harvest or natural causes. A sub-sample of bluegill tested negative for Viral Hemorrhagic Septicemia (VHS).

A total of 88 black crappie averaging 7.0 inches were collected in the 2009 assessment (Table 7). Eighty-two percent of the total black crappie catch was captured with trap net gear. Black crappie size structure was dominated with fish in the 5 inch and 7-8 inch size range. Fifty-one percent of the black crappie met or exceeded the acceptable harvest size of 7 inches. Age and growth analysis indicated black crappie were growing below State average having a mean growth index of -1.5 (Table 8). Age frequency showed highest representation of the 2007 year class (age 2) (Table 9). The 2004, 2005, and 2006 year classes were fairly well represented. Black crappie longevity appears to peak at age 7. A sub-sample of black crappie tested negative for VHS.

A total of 65 yellow perch averaging 4.9 inches were collected in the 2009 assessment (Table 7). Eighty-six percent of the yellow perch catch was captured with electrofishing gear. Yellow perch size structure was dominated by fish in the 3-5 inch size range. Only 3% of the catch met or exceeded the acceptable harvest size of 7 inches. Age and growth analysis indicated yellow perch were growing below State average having a mean growth index of -0.6 (Table 8). Age frequency showed relatively equal representation of the 2006-08 year classes (ages 1-3) (Table 9). Yellow perch longevity appears to peak at age 3 and older fish experience mortality most likely from natural causes. A sub-sample of yellow perch tested negative for VHS.

A total of 41 largemouth bass averaging 9.2 inches were collected in the 2009 assessment (Table 7). Fifty-nine percent of the total largemouth bass catch was captured with electrofishing gear compared to 27% with trap nets and 14% with gill nets. Average size of the electrofishing catch was 6.6 inches, average size of the trap net catch was 13.7 inches, and average size of the gill net catch was 11.3 inches. Largemouth bass size structure was dominated by fish in the 5-7 inch size range but fish in the 9-12 inch size range were common. Seventeen percent of the largemouth bass catch met or exceeded the legal harvest size of 14 inches. Age and growth analysis indicated largemouth bass were growing below State average having a mean growth index of -1.6 (Table 8). Age frequency showed highest representation of the 2007 (age 2) year class and good representation of the 2008 (age 1) and 2003-06 year classes (ages 3-6) (Table 9). Largemouth bass longevity appears to peak at age 5 but a few older fish were collected.

A total of 25 pumpkinseed sunfish averaging 5.6 inches were collected in the 2009 assessment (Table 7). Ninety-two percent of the pumpkinseed catch was captured with trap net gear. Pumpkinseed size

structure was dominated by 5 inch fish. Twelve percent of the total catch met or exceeded the acceptable harvest size of 6 inches. Age and growth analysis indicated pumpkinseed sunfish were growing slightly below State average having a mean growth index of -0.3 (Table 8). Age frequency indicated highest representation of the 2005 year class but the 2004 and 2006 year classes were well represented (Table 9). Pumpkinseed longevity appears to peak at age 4 and older fish experience a high mortality most likely from natural causes.

Seventeen northern pike averaging 22.0 inches were collected in the 2009 assessment (Table 7). Sixty-five percent of the northern pike catch was captured with gill net gear and 29% with trap net gear. Average size of the gill net catch was 22.0 inches and average size of the trap net catch was 20.7 inches. Northern pike size structure was dominated by fish in the 20-25 inch size range. Twenty-nine percent of the northern pike collected met or exceeded the legal harvest size of 24 inches. Age and growth analysis indicated northern pike were growing below State average having a mean growth index of -1.4 (Table 8). Age frequency indicated highest representation of the 2003, 2005 and 2007 year classes (Table 9). Year classes corresponding to recent stockings (2002, 2004, 2006) were represented but in lower abundance. Northern pike longevity appeared to peak at age 6 and older fish experience mortality either from natural causes or harvest.

Seventeen channel catfish averaging 24.8 inches were captured in the 2009 assessment (Table 7). All but one of these fish were captured with trap net gear. The channel catfish size structure was composed of in the 22-28 inch size range. All of these fish met or exceeded the legal harvest size of 12 inches. Age and growth analysis was not performed on this species.

Other fish species collected in the 2009 assessment were collected in either low abundance or do not significantly contribute to the sport fishery. Although only 14 common carp were collected, visual observations made during the night electrofishing effort suggest a relatively high abundance. Golden shiners and brook silversides represent the nongame forage base.

Analysis and Discussion

The Long Lake fish community remains similar in species composition and size structure to that which was detailed in the 1998 and 2005 assessments. Bluegill are the most abundant species. Black crappie, largemouth bass, northern pike, and channel catfish occur in lesser abundance but provide additional angling opportunities.

In southern Michigan warmwater lakes, bluegill are typically the most abundant fish species present and play a key role in community structure and overall sport fishing quality (Schneider 1981). Schneider (1990) suggests indices of bluegill characteristics which can be used to classify the status of populations. The "Schneider Index" uses size scores of length frequency and growth data and relates them to a subjective ranking system ranging from "very poor" to "superior". Using the Schneider Index for classifying bluegill populations, Long Lake scored 3.75 for an acceptable-satisfactory rating (Table 6).

Bluegill population dynamics have been studied extensively in southern Michigan lakes (Schneider 1981, 1990, 1991, 1993, Schneider and Lockwood 1997, Breck 1997). Generally, lakes like Long

Lake, which are shallow and weedy, exhibit high bluegill recruitment and have relatively low abundance of predators, typically have low proportions of large (> 8 inches) bluegill. Even when the abundance of predators is increased in such systems, excessive vegetation often reduces their effectiveness to control bluegill recruitment. High recruitment of young bluegill results in over population and competition for food leading to slow growth and reduced size structure. Competition for food is likely the leading cause of mortality for Long Lake bluegill after 5 years of age. Angler harvest may play a limited role in mortality but since angling is restricted for parts of the year, it is not likely the key factor.

Despite exhibiting symptoms of a "stunted" population, the Long Lake bluegill size structure is satisfactory and provides ample opportunities for anglers. A slight improvement in the size structure was observed in 2009 compared to 2005 (Table 6). Evidence suggests the Long Lake bluegill population has stabilized and will most likely be resilient to drastic changes in the immediate future.

Black crappie catch rate and size structure in 2009 were consistent with historical observations indicating a relatively small yet stable population in Long Lake. Black crappie growth is slow suggesting less than ideal habitat and forage conditions. Despite slow growth, the black crappie size structure is skewed towards fish in the 7-9 inch size range and offer opportunities to catch harvestable fish.

Largemouth bass and channel catfish represent two of the primary predator fish in Long Lake. The size structure and catch rates of largemouth bass in 2009 were comparable to previous assessments indicating a self-sustaining population which supports a reasonable sport fishery. Channel catfish occur in lesser abundance and do not appear to be reproducing in significant numbers. Channel catfish had little impact on bluegill size structure despite their high abundance in the early 1990s. Presently, angling opportunities for channel catfish are limited to incidental catch.

Northern pike represent the third primary predator fish in Long Lake and current management efforts seek to bolster the population with alternate year stocking at a rate of 10 spring fingerlings per acre. Data collected on northern pike in 2009 is difficult to interpret due to the low sample size. The data suggests recent stockings (2002, 2004, and 2006) have not substantially contributed to the fishery. Year-class representation was higher from non-stocked years and may indicate natural reproduction is occurring at a sufficient level. Northern pike size structure is acceptable; sufficient numbers of younger fish are available and should recruit to the harvestable fishery. Presently, acceptable angling opportunities are available for harvesting northern pike.

Although yellow perch were found in appreciable numbers, their size structure and age distribution was relatively poor. Few yellow perch appear to survive beyond age 3 or grow large enough to recruit into the harvestable fishery. Mortality is most likely due to natural causes, and predation from other piscivorous species may play a role. At best, the current fishery only offers an opportunity for incidental catch of a few yellow perch which reach harvestable size.

Past reclamation efforts to reduce carp numbers in Long Lake have met with little success. The warmwater shallow habitat of Long Lake and the lower impoundment is ideal for carp and methods to effectively reduce their numbers are not available. Presently, carp are relatively high in abundance and are not highly valued as a sport fish.

Management Direction

Management objectives for Long Lake should continue to focus on warm and cool water species. Specific management for bluegill, largemouth bass, black crappie, channel catfish, and yellow perch is not warranted. The current fisheries management prescription for Long Lake recommends stocking 2,050 spring fingerling northern pike on an alternate year schedule through 2015 with the next stocking to occur in 2011. Since 2007, northern pike stocking has been halted statewide due to concerns with the spread of VHS and it is unlikely fish will be available in 2011. Northern pike data collected in 2009 does not fully support the continuation of the stocking practice however, results are too ambiguous to merit changes to the stocking recommendation if northern pike become available. Management recommendations are to proceed cautiously with stocking at the prescribed number and schedule. A more thorough evaluation of the northern pike population would help to clarify the value of northern pike stocking in Long Lake.

References

- Albert, D. A. 1995. Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: a working map and classification, fourth edition. Michigan Natural Features Inventory, Lansing.
- Schneider, J. C. 1981. Fish communities in warmwater lakes. Michigan Department of Natural Resources, Fisheries Research Report 1890, Ann Arbor.
- Schneider, J.C., 1990. Classifying bluegill populations from lake survey data. Michigan Department of Natural Resources, Fisheries Technical Report No. 90-10. Ann Arbor, Michigan.
- Schneider, J.C., 1993. Dynamics of good bluegill population in two lakes with dense vegetation. Michigan Department of Natural Resources, Fisheries Research Report 1991. Ann Arbor, Michigan.
- Schneider, J.C. and R.N. Lockwood, 1997. Experimental management of stunted bluegill lakes. Michigan Department of Natural Resources, Fisheries Research Report 2040, Ann Arbor, Michigan.
- Breck, J.E., 1997. Hurry up and wait: growth of young bluegills in ponds and in simulations with an individual-based model. Michigan Department of Natural Resources, Fisheries Research Report 1995, Ann Arbor, Michigan.

Figure 1. Lapeer State Game Area map showing the location of Long Lake. Data from MDNR, Wildlife Division.

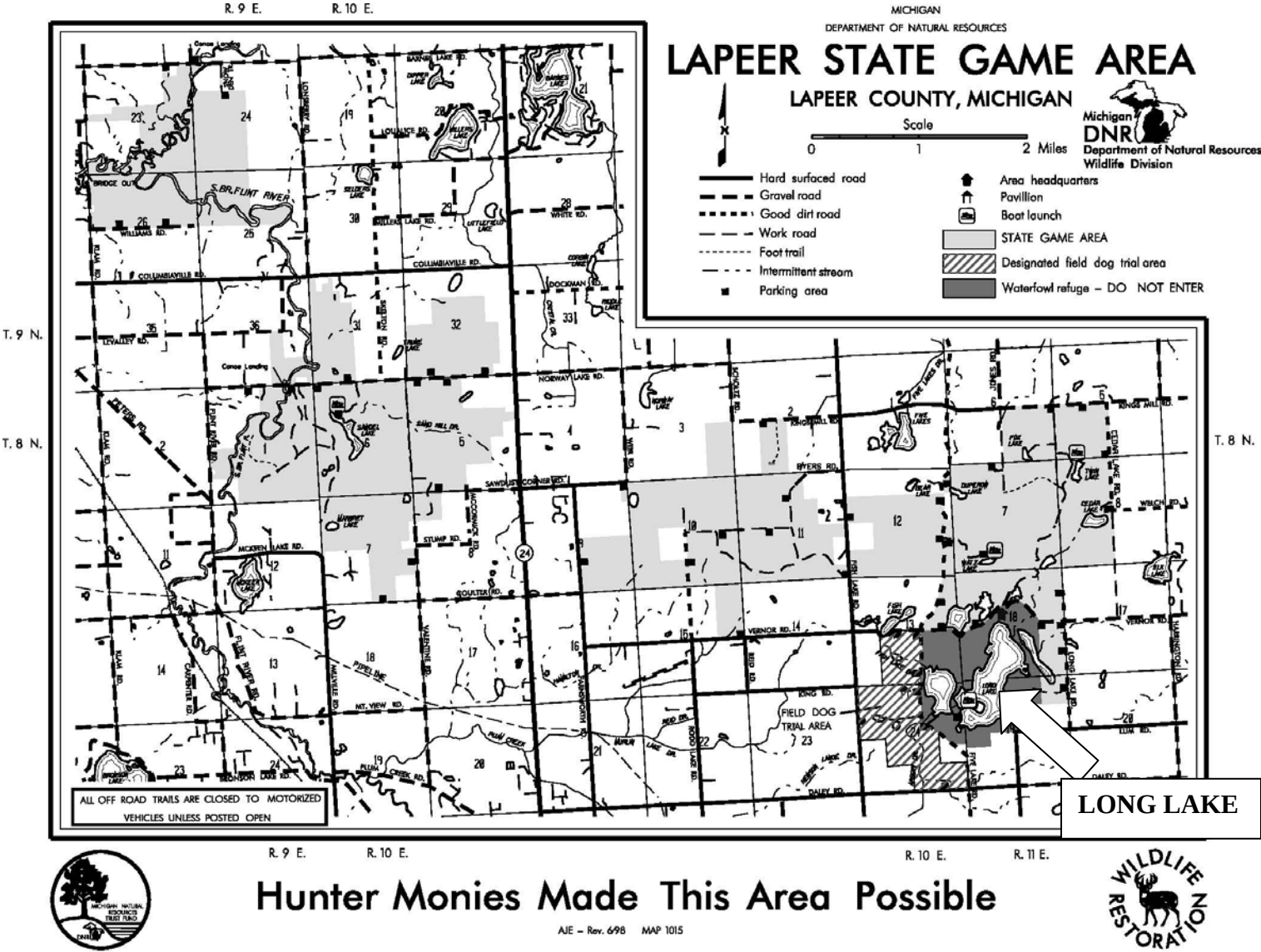


Figure 2. Aerial view of Long Lake, Lapeer County.

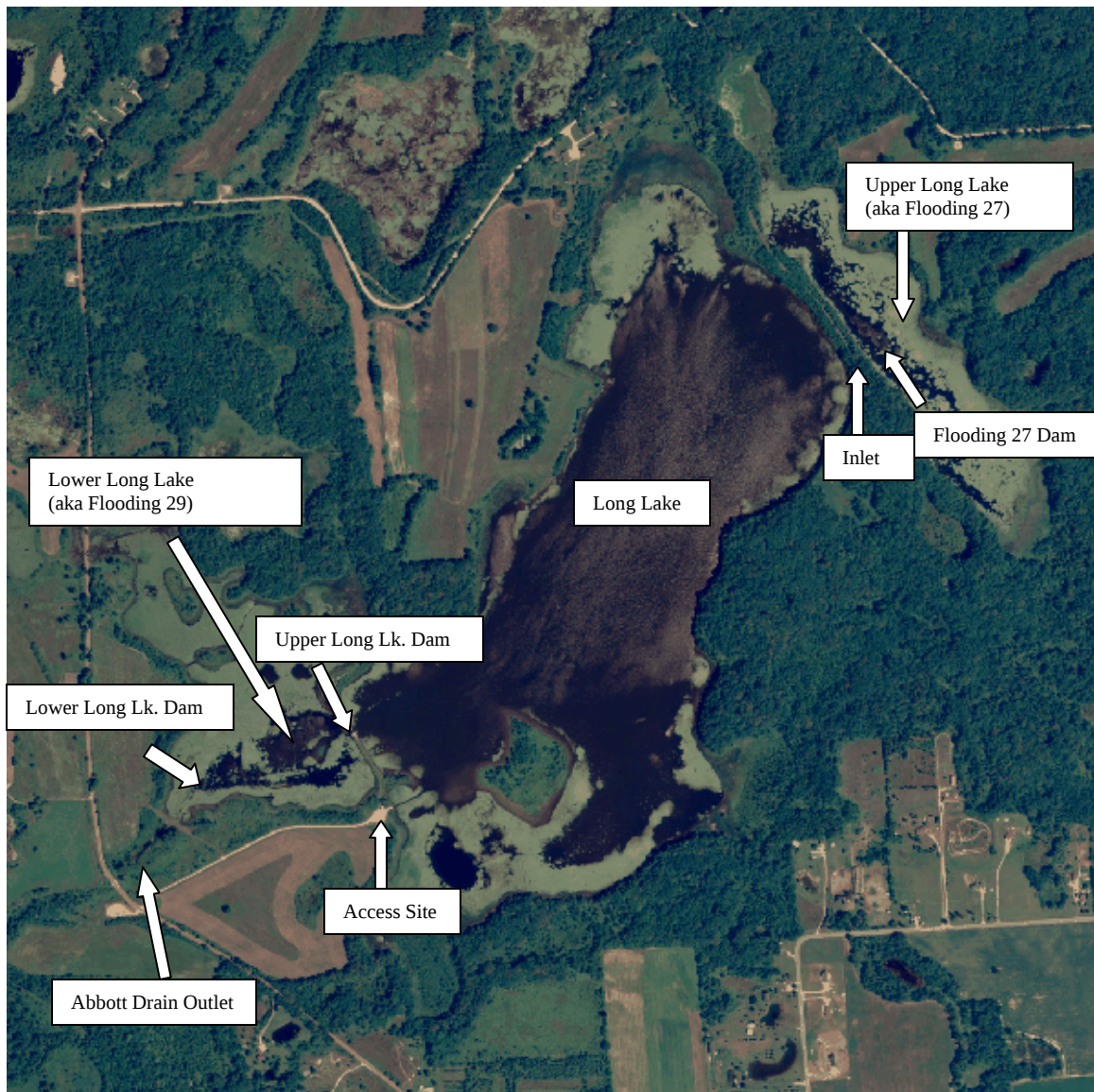


Figure 3. Hydrographic map of Long Lake, Lapeer County. Data from MDNR, files.

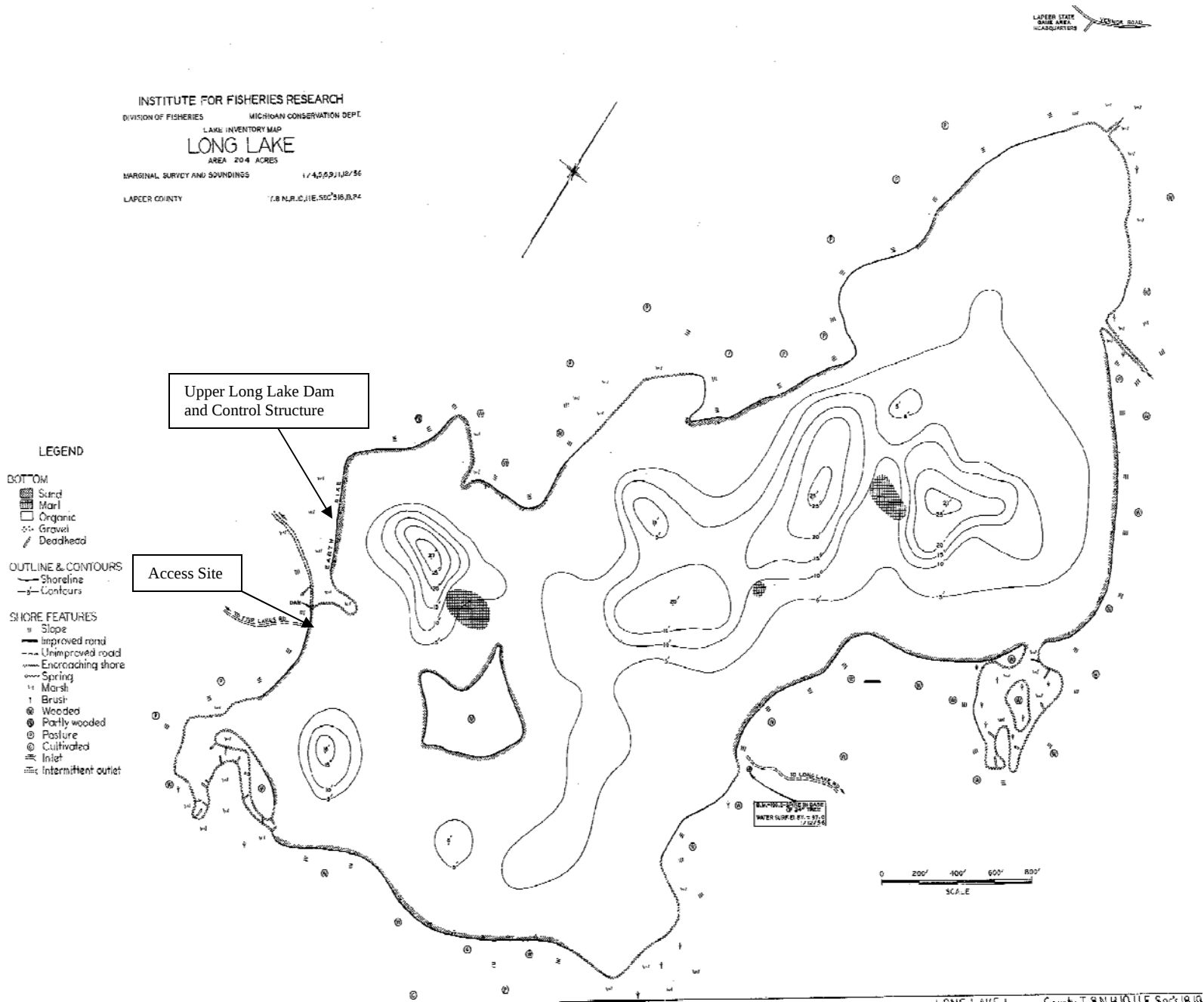


Table 1. Water chemistry parameters from north basin of Long Lake, Lapeer County. Data collected by USGS, April and August, 2008.

Parameter	Surface	Mid-depth	Bottom	Sample date
Ammonia, total as NH ₄	0.01 mg/l	0.01 mg/l	0.01 mg/l	04/16/08
	0.01 mg/l	0.01 mg/l	0.39 mg/l	08/19/08
Nitrogen, total	0.70 mg/l	0.69 mg/l	0.75 mg/l	04/16/08
	0.74 mg/l	0.71 mg/l	1.10 mg/l	08/19/08
Nitrogen, organic	0.63 mg/l	0.62 mg/l	0.67 mg/l	04/16/08
	0.74 mg/l	0.70 mg/l	0.75 mg/l	08/19/08
Nitrogen, ammonia total	0.005 mg/l	0.004 mg/l	0.005 mg/l	04/16/08
	0.006 mg/l	0.010 mg/l	0.300 mg/l	08/19/08
Nitrogen, ammonia + organic total	0.63 mg/l	0.62 mg/l	0.67 mg/l	04/16/08
	0.74 mg/l	0.71 mg/l	1.10 mg/l	08/19/08
Nitrogen, nitrate + nitrite, total	0.074 mg/l	0.073 mg/l	0.076 mg/l	04/16/08
	0.003 mg/l	0.003 mg/l	0.001 mg/l	08/19/08
Nitrogen, total as nitrate	3.1 mg/l	3.1 mg/l	3.3 mg/l	04/16/08
	3.3 mg/l	3.2 mg/l	4.7 mg/l	08/19/08
Phosphorus, total	0.020 mg/l	0.019 mg/l	0.025 mg/l	04/16/08
	0.014 mg/l	0.016 mg/l	0.027 mg/l	08/19/08
Alkalinity (acid neutralizing capacity)		155 mg/l		04/16/08
Hardness, total as CaCO ₃		190 mg/l		04/16/08
Hardness, total non-carbonate		31 mg/l		04/16/08
Calcium, total recoverable		46.3 mg/l		04/16/08
Sodium, total recoverable		4.4 mg/l		04/16/08
Magnesium, total recoverable		17.1 mg/l		04/16/08
Potassium, total recoverable		1.1 mg/l		04/16/08
Chloride, dissolved		12.0 mg/l		04/16/08
Sulfate, total recoverable		10.0 mg/l		04/16/08
Chlorophyll a (from photic zone)	7.0 ug/l			04/16/08
	6.2 ug/l			08/19/08
Secchi disk	6.6 ft.			04/16/08
	7.9 ft.			08/19/08

Table 2. Water chemistry parameters from southwest basin of Long Lake, Lapeer County. Data collected by USGS, April and August, 2008.

Parameter	Surface	Mid-depth	Bottom	Sample date
Ammonia, total as NH ₄	0.01 mg/l	0.01 mg/l	0.03 mg/l	04/16/08
	0.01 mg/l	0.01 mg/l	2.7 mg/l	08/19/08
Nitrogen, total	0.69 mg/l	0.67 mg/l	0.68 mg/l	04/16/08
	0.73 mg/l	0.71 mg/l		08/19/08
Nitrogen, organic	0.63 mg/l	0.61 mg/l	0.68 mg/l	04/16/08
	0.73 mg/l	0.70 mg/l	1.10 mg/l	08/19/08
Nitrogen, ammonia total	0.007 mg/l	0.008 mg/l	0.026 mg/l	04/16/08
	0.006 mg/l	0.010 mg/l	2.100 mg/l	08/19/08
Nitrogen, ammonia + organic total	0.63 mg/l	0.61 mg/l	0.61 mg/l	04/16/08
	0.73 mg/l	0.71 mg/l	3.20 mg/l	08/19/08
Nitrogen, nitrate + nitrite, total	0.059 mg/l	0.058 mg/l	0.070 mg/l	04/16/08
	0.002 mg/l	0.003 mg/l		08/19/08
Nitrogen, total as nitrate	3.1 mg/l	3.0 mg/l	3.0 mg/l	04/16/08
	3.2 mg/l	3.2 mg/l		08/19/08
Phosphorus, total	0.025 mg/l	0.022 mg/l	0.021 mg/l	04/16/08
	0.015 mg/l	0.015 mg/l	0.056 mg/l	08/19/08
Alkalinity (acid neutralizing capacity)		152 mg/l		04/16/08
Hardness, total as CaCO ₃		180 mg/l		04/16/08
Hardness, total non-carbonate		33 mg/l		04/16/08
Calcium, total recoverable		45.3 mg/l		04/16/08
Sodium, total recoverable		4.2 mg/l		04/16/08
Magnesium, total recoverable		17.5 mg/l		04/16/08
Potassium, total recoverable		1.0 mg/l		04/16/08
Chloride, dissolved		12.0 mg/l		04/16/08
Sulfate, total recoverable		10.0 mg/l		04/16/08
Chlorophyll a (from photic zone)	6.6 ug/l			04/16/08
	4.4 ug/l			08/19/08
Secchi disk	6.9 ft.			04/16/08
	8.9 ft.			08/19/08

Table 3. Oxygen, temperature, and pH profiles from Long Lake, Lapeer County, August 2009.
Data from MDNR, Fisheries Division.

Depth (ft.)	Temperature (F)	Oxygen (mg/l)	pH
1	74	7.2	7.7
2	74	7.1	7.7
3	74	6.3	7.6
10	73	7.1	7.7
11	73	7.1	7.7
12	73	7.1	7.7
13	72	7.1	7.7
14	71	7.2	7.7
16	71	7.1	7.7
17	66	7.0	7.6
18	65	6.9	7.6
19	63	6.5	7.6
20	61	4.3	7.5
21	60	2.7	7.4
23	59	1.1	7.3
24	58	0.6	7.3
25	57	0.5	7.2
26	57	0.4	7.1

Table 4. Fish stocking in Long Lake, Lapeer County, 1986 to present. Data from MDNR, Fisheries.

Year	Species	Number	Number/acre	Average size (in.)
1986	Channel catfish	5,000	25	9.6
1987	Black crappie	16	<1	7.0
	Bluegill	1,800	9	5.6
	Channel catfish	20,000	98	4.5
	Channel catfish	21	<1	20.2
	Largemouth bass	10,838	53	5
	Largemouth bass	155	<1	12.3
	Northern muskellunge	14	<1	39.8
	Pumpkinseed sunfish	1,492	7	3.6
1988	Largemouth bass	5,758	28	5.7
1997	Largemouth bass	1,430	7	8.9
1999	Largemouth bass	334	1	9.0
2001	Northern pike	461	2	6.1
2002	Northern pike	2,100	10	2.1
2004	Northern pike	2,448	12	3.6
2006	Northern pike	2,118	10	4.2

Table 5. Comparison of catch (percent) for recent fish surveys of Long Lake, Lapeer County. Data from MDNR, Fisheries.

Species	Year					
	1989	1991	1993	1998	2005	2009
Black crappie	6	<1	<1	23	<1	5
Bluegill	34	71	23	60	86	82
Brook silverside					<1	<1
Bullhead sp.	2		<1			
Bullhead, black						<1
Bullhead, brown		1				<1
Bullhead, yellow				2		
Channel catfish	3	11	32	2	2	<1
Common carp	47	10	43	<1	3	<1
Golden shiner					<1	1
Green sunfish				<1		
Iowa darter					<1	<1
Lake chubsucker				<1		
Largemouth bass	5	5	<1	8	12	2
N. muskellunge	<1					
Northern pike	4	<1		3	<1	<1
Pumpkinseed			<1	1	<1	1
Warmouth					<1	<1
Yellow perch				<1	3	3
Total catch (#)	421	971	860	280	1,562	1,901

Table 6. Long Lake bluegill size structure ranking using the Schneider Index (Schneider 1990). Data from MDNR, Fisheries Division.

Sample date	7/19/89	5/30/91	6/22/93	4/29/98	6/2/05	6/8/09
Sample size	141	689	201	167	1084	1189
Average length (inches)	4.4 (1)	5.0 (2)	6.0 (4)	6.2 (4)	5.8 (3)	6.0 (4)
% $\geq$ 6 inches	4 (1)	10 (2)	54 (4)	65 (4)	44 (3)	56 (4)
% $\geq$ 7 inches	3 (2)	5 (3)	2 (1)	10 (3)	6 (3)	9 (3)
% $\geq$ 8 inches	1 (5)	2 (5)	0 (2)	0 (2)	0.7 (4)	0.3 (4)
Schneider Index	2.25	3.0	2.75	3.25	3.25	3.75
Rank ¹	Poor	Acceptable	Poor-acceptable	Acceptable	Acceptable	Acceptable-satisfactory

¹Rank: 1 = Very poor, 2 = Poor, 3 = Acceptable, 4=Satisfactory, 5 = Good, 6 = Excellent, 7 = Superior

Table 7. Total catch (all gear) from Long Lake, June, 2009. Data from MDNR, Fisheries Division.

Common name	Number	Percent by number	Length range (inches)	Weight (lbs.)	Percent by weight	Percent legal size	Average size (inches)
Black crappie	88	5	4-10	19.3	4.4	51	7.0
Bluegill	1568	82	1-8	213.2	48	46	5.6
Brook silverside	17	<1	2-4		<1		3.5
Bullhead, black	1	<1	7.5	0.2	<1	100	7.5
Bullhead, brown	8	<1	7-10	2.5	<1	100	8.5
Channel catfish	17	<1	22-27	86.9	20	100	24.8
Common carp	14	<1	15-20	36.2	8		17.4
Golden shiner	22	1	5-6	0.1	<1		6.2
Iowa darter	1	<1	2.5		<1		2.5
Largemouth bass	41	2	3-19	26.9	6	17	9.2
Northern pike	17	<1	15-28	43.2	10	29	22.0
Pumpkinseed	25	1	4-6	0.1	<1	12	5.6
Warmouth	17	<1	3-8	3.6	<1	53	6.0
Yellow perch	65	3	3-7	3.5	<1	3	4.9

Table 8. Age and growth data from six fish species collected in Long Lake, Lapeer County, June, 2009. Data from MDNR, Fisheries.

Species/Age	No. aged	Length range (in.)	State avg. length (in.)	Weighted mean length (in.)	Mean growth index*
Black crappie					-1.5
Age II	16	4.6-6.1	6.5	5.3	
Age III	7	5.0-7.3	7.9	5.9	
Age IV	11	6.9-8.6	8.9	7.8	
Age V	16	6.8-10.2	9.7	8.3	
Age VI	4	8.4-9.7	10.4	8.9	
Age VII	5	8.4-10.5	11.1	9.5	
Age VIII	1	10.3-10.3	11.6	10.3	
Bluegill					-0.3
Age I	24	1.4-2.5	2.4	2.0	
Age II	10	3.0-3.8	4.2	3.4	
Age III	21	4.3-6.4	5.3	5.1	
Age IV	5	5.8-6.5	6.2	6.1	
Age V	13	6.2-7.5	6.9	6.6	
Age VI	5	7.2-8.3	7.4	7.5	
Age VII	1	8.4-8.4	8.0	8.4	
Age VIII	2	8.3-8.8	8.4	8.6	
Largemouth bass					-1.6
Age I	4	3.1-5.1	5.4	4.1	
Age II	18	5.8-7.4	8.7	6.7	
Age III	3	9.1-11.2	10.6	10.2	
Age IV	4	9.9-14.9	12.0	11.3	
Age V	7	11.0-15.6	13.7	12.5	
Age VI	2	15.7-16.4	15.0	16.1	
Age VII	1	17.4-17.4	16.7	17.4	
Age IX	1	19.6-19.6	18.6	19.6	
Northern pike					-1.4
Age II	5	15.5-18.7	19.0	17.6	
Age III	2	20.7-21.3	21.8	21.0	
Age IV	6	20.4-25.2	24.2	22.9	
Age V	1	22.0-22.0	26.1	22.0	
Age VI	3	27.4-28.3	27.8	27.7	
Pumpkinseed					-0.3
Age III	2	4.8-5.1	5.2	5.0	
Age IV	10	5.2-6.0	5.8	5.5	
Age V	3	5.9-6.1	6.3	6.0	
Yellow perch					-0.6
Age I	13	3.5-4.2	4.0	3.8	
Age II	12	4.3-5.8	5.7	5.0	
Age III	10	5.6-6.6	6.8	6.0	
Age IV	1	6.4-6.4	7.8	6.4	

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

Table 9.-Weighted age frequency (percent) of six fish species collected June, 2009 from Long Lake, Lapeer County. Data from MDNR, Fisheries Division.

Species	Age/percent									Number caught
	1	2	3	4	5	6	7	8	9	
Black crappie		34	15	17	22	5	6	1		88
Bluegill	6	4	40	15	31	3	<1	<1		1,568
Largemouth bass	12	44	7	10	17	5	2		2	41
Northern pike		29	12	35	6	18				17
Pumpkinseed			12	72	16					25
Yellow perch	31	41	27	2						65