Long Lake

Montmorency County, T31/32N, R4E, many sections
Thunder Bay River watershed, last surveyed 2006

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Environment

Long Lake is a 295 acre kettle lake located 7.5 miles northwest of the town of Hillman, Michigan in northeastern Montmorency County. It has a watershed size of 997 acres and completely exchanges its water roughly every 6.1 years (Fusilier and Fusilier 2005). This rather small lake has nearly 5.7 miles of shoreline. It lies at an elevation of 810 feet above sea level in the Thunder Bay River watershed, and has an established legal lake level of 811.5. There are no inlets to this lake. Long Lake Outlet leaves the north shore of the lake through a small control structure with a one-foot head that was constructed in 1977. The outlet flows to the North Branch Thunder Bay River.

Long Lake has two prominent basins connected by a 500 foot long channel called "the Narrows". The northern basin is much larger, has a maximum depth of 90 feet deep, and an average depth of 22 feet deep (Fusilier and Fusilier 2006). This basin is mostly developed with private residences, but does include a semi-wooded riparian zone comprised of both coniferous and hardwood trees. The north basin has an island and many mid-water sunken islands which can be viewed with the naked eye. Bottom type consists primarily of sand, gravel, and marl while aquatic vegetation is virtually absent. The outlet leaves the north basin on the north shore at the control structure.

The south basin is much smaller, has a maximum depth of 60 feet deep, and an average depth of 22 feet deep. This unique basin is also developed much like the larger basin. There is significantly less shoal area in this basin compared to its neighbor. The littoral zone is limited in the south basin, although aquatic vegetation, both near shore and submersed is more common. Substrate types of the south basin are predominatly sand and marl. A public access ramp is located on the south shore of this south basin. It is operated by the Michigan Department of Natural Resources (MDNR) Parks and Recreation Division and supplies a gravel surfaced ramp. Parking is limited to only four boat-trailers.

History

Early fish community surveys at Long Lake began in 1925 by fisheries personnel with the Michigan Department of Conservation (MDOC). Fish were sampled with seines from the lake proper and directly below the outlet. A variety of species, dominated by bass and panfish, were collected. The fish community was typical for a northern Michigan waterbody. Fish stocking efforts soon followed this survey which was a typical management practice by the state during the first half of the twentieth century (Cwalinski et al. 2006). Species of fish including bluegill, largemouth bass, smallmouth bass, and walleye were stocked in varying numbers between 1938 and 1945. These are the earliest and only known stocking records for Long Lake.

A partial fish community survey and limnological analysis of Long Lake was conducted in 1952. Seining was the gear used to assess the fish community but provided little information. Water quality surveys documented good amounts of dissolved oxygen concentrated in the colder, deeper waters of

the lake in August. As a result, fisheries personnel recommended stocking of trout into Long Lake to utilize this niche. Recommendations soon followed to lower water levels at least 4-6 inches through the control structure in attempts of reducing northern pike spawning habitat. Shoreline marsh habitat, which is suitable to pike spawning, was noted as abundant at this time. Reducing pike numbers through manipulation of habitat could enhance future trout survival. It is unknown if this was actually accomplished. Despite this, trout stocking efforts soon commenced in 1953 (Table 1).

A fish community survey was made at Long Lake in June 1955 following the initial trout stocking efforts. General lake observations noted a lack of cover in the lake, with aquatic vegetation only present in the connecting channel and south basin. Good northern pike spawning grounds were noted in localized areas and spawning pike were also believed to migrate into the lake from the outlet. Shoal areas were considered abundant in the lake with the bottom substrate dominated by sand and gravel. Game fish collected from gill nets and seines included bluegill, pumpkinseed, rock bass, yellow perch, largemouth and smallmouth bass, walleye, cisco, and rainbow trout. Northern pike were not collected with the gear, despite the apparent abundance of pike spawning habitat. Other non-game species of fish were collected and typical for a northern Michigan waterbody. Only four species of aquatic vegetation were noted during the survey.

Seining surveys continued in June 1961 on Long Lake by MDOC but provided little information. Species collected included those that are still present in the lake today. Fishing was noted as good for bass, bluegill, and trout. MDOC followed up this survey with one in July of 1962. Trap nets and fyke nets were used to assess the fish community with an emphasis on assessing the walleye population. Bluegill were the most dominant species in the catch with many ages and sizes present. Another panfish, black crappie, were also noted as common in the lake and collected for the first time. Both species of bass were also present and abundant. Northern pike were noted as present, but uncommon. A few rainbow trout were collected (Table 1) along with a good number of cisco. Only nine walleye were collected during this survey and this small number provided little insight into population numbers and growth.

Rainbow trout stocking efforts continued at variable rates of approximately 30/acre into the 1970s at Long Lake (Table 1). Trout were not stocked though in both 1973 and 1974 in an effort to prevent overgrazing of the native zooplankton. Stocking efforts started again in 1975.

MDNR Fisheries Division next surveyed the lake in late April of 1977. Electrofishing gear was used to try and determine critical spawning areas for walleye in Long Lake. Only 12 walleye were collected representing five age groups. The water temperature was 57F, past peak spawning, thus leading to the low walleye catch. Growth of these few walleye was considered average. Yellow perch and white suckers were also collected and observed in high numbers. A hook and line survey was also completed by MDNR personnel later that same year with a focus on capturing walleye. Eleven specimens were collected over six days of fishing in June. Growth of these fish was average.

By 1986, Fisheries Division recommendations were to continue yearling rainbow trout stocking efforts at annual rates of 34/acre. In addition, recommendations were also made to stock fingerling walleye on a three year rotational basis at a rate of 85 spring fingerlings/acre to increase sportfishing opportunity. This walleye stocking recommendation was never accomplished.

Fall gill netting was used to assess the trout population in October 1990. Only one large trout was collected along with five walleye. Questions began to arise from managers regarding the suitability of Long Lake for trout as a result of continued poor survey catches. As a result, additional limnological sampling of the lake was made by MDNR Fisheries Division personnel in August 1993. Results again indicated that good amounts of dissolved oxygen could be found throughout the water column as well as cold water suitable for trout survival. Recommendations soon followed to continue the trout stocking efforts, and to rely on natural reproduction of walleye to support this species. Reasons for these recommendations included the suitability of this water for trout survival, and lack of reliability in rearing fingerling walleye, respectively. The decision to continue stocking trout occurred despite the lack of information on trout catches by anglers.

Despite the trout stocking efforts, hook and line surveys by Fisheries Division in 1994 and 1995 produced no trout catches in thirty angler hours. Recommendations soon followed to discontinue the trout stocking program, yet this didn't occur immediately. Questions about the stocking location of the trout were discussed by managers. Trout had been stocked in Long Lake in several locations. A recommendation was settled on to reduce trout stocking numbers from 10,000 to 3,000 annually. In addition, all trout would be stocked in the south basin. This management practice began in 1997. Managers decided that if survival was inadequate, then the trout stocking efforts would be discontinued for good.

The next trout and walleye evaluation survey was conducted in July of 2001. Fisheries Division personnel used 6 experimental gill net lifts to assess these species. At the time, Long Lake was regulated under a Type B designation in which all gear types could be used throughout the year, and the minimum size limit for rainbow trout was 12 inches. Water chemistry analysis still showed water suitable to trout survival, and cisco were even collected during the survey. Despite this, no trout were collected in the nets. Twenty-five walleye were instead collected in the nets along wtih northern pike and bass species. The naturally reproducing walleye were represented by 6 different age groups. Recommendations followed to completely discontinue the trout stocking efforts and to remove the status of Long Lake as a designated trout lake. In addition, recommendations were made to supplement the low level walleye population with stocking when fingerlings were available. Despite this, fish did not become available until 2006.

In addition to all previous state surveys, Long Lake water quality was also analyzed by private consultants from 1992 through 2005. Results are briefly summarized here, but detailed analysis can be found in Fusilier and Fusilier 2005. Dissolved oxygen and water temperature profiles were determined in eight years between 1996 and 2005, and often by basin. Mid- or late-summer results always indicated a thermocline layer ranging from 11-33 foot. On many occasions, low levels of oxygen could be detected nearly down to the bottom of the deep basins. This is not typical for most Michigan waterbodies. In addition, there often was a supersaturated layer of oxygen in the thermocline layer or above. These are conditions that are highly suitable to cisco and trout which often graze on plankton in the cold, oxygenated depths of the lake.

Chlorophyll (a) was measured in both basins in varying months from 1996 through 2005 (Fusilier and Fusilier 2005). This pigment is a measure of biological productivity and high measures can often lead to algal blooms. Results for Long Lake ranged from 0.3 to 3.0 micrograms per liter. This is a low measure which is typical for a northern Michigan waterbody. Chlorophyll (a) measurements were often

higher in the southern basin. Secchi-disk readings were taken by local lake residents from 1980 to 2005 in the north basin, and from 1995 to 2005 in the south basin. This reading is a universally accepted measurement of water clarity. In general, clearer lakes have higher water quality, but are often less productive. Water clarity measurements ranged from 7 to 28 feet in the north basin and 10-23 feet in the southern basin. Total phosphorus was also measured in both basins from 1996 through 2005 (Fusilier and Fusilier 2005). Phosphorus concentrations were generally less than 15 micrograms per liter in Long Lake which is considered low, but just below average for a natural lake. Concentrations ranged from 6 to 26 micrograms per liter in the south basin, and averaged 13 micrograms per liter. Concentrations ranged from 5 to 24 micrograms per liter in the north basin, and averaged 11 micrograms per liter. The typical values of chlorophyll, clarity, and total phosphorus for Long Lake indicate its status as an oligotrophic waterbody. Oligotrophic lakes can be defined as those having low concentrations of nutrients required for plant growth and thus the overall productivity of the lake is low.

Another nutrient measured by Fusilier and Fusilier (2005) was nitrate-nitrogen. This is also considered as a limiting factor nutrient at many waterbodies and often limited in lakes. The consultants measured it during the same period and found it ranging from 4 to 113 micrograms per liter in Long Lake, and averaging 38 micrograms per liter. Alkalinity is a measurement of a lakes ability to buffer from the effects of acid rain and ultimately determines a lake water's pH. This measurement was collected at Long Lake from 1996 through 2005 and ranged from 93 to 142 milligrams per liter. These are relatively normal values for northern Michigan lakes. Fusilier and Fusilier (2005) also summarized other variables for Long Lake such as Hydrogen Ion Concentration, Specific Conductivity, Water Quality Index, and others. The reader is encouraged to refer to this document for further details.

Current Status

The most recent fish community survey was conducted at Long Lake by MDNR Fisheries Division from May 15-19 and June 29, 2006. Sampling effort consisted of 8 large-mesh trap net lifts, 7 large-mesh fyke net lifts, 2 mini-fyke net lifts, 6 experimental gill net lifts, and 30 minutes of direct-current nighttime electrofishing. The latter effort was conducted in late June. Eighteen species of fish were collected during the survey (Table 2). Total catch was 797 fish weighing 386 pounds. Large predator fish including bass, walleye, and northern pike made up 16% of the total catch by number and 36% by weight. Non-game species such as bullheads and white suckers made up 11% of the total catch by number and 36% by weight. The panfish community of Long Lake is dominated by bluegill, rock bass, pumpkinseed, yellow perch and black crappie. Panfish comprised 64% of the total catch by number and 32% by weight.

Bluegill were the most commonly collected fish in the survey (Table 2). Bluegill ranged in size from 1-9 inches, with many quality size fish available to anglers (Table 3). Angler reports have also indicated the presence of bluegill up to 11 inches in length. Bluegill ages 3 through 8 were noted through scale analysis, however, younger bluegill were found in the catch. Growth of this species is at or slightly above the statewide average for this species (Schneider 2000). Despite this, it appears that bluegill are exhibiting a slight decrease in growth rates compared to previous surveys (Table 4). This may be a result of an increase in population size or competition from other species, thus resulting in reduced growth.

Rock bass were also common as indicated by the catch (Table 1). This species can grow to large sizes in Long Lake and exhibit good growth. Pumpkinseed are present in Long Lake much as they were in previous decades. This species attains quality size in Long Lake less often than bluegill. Growth, however, is also quite good for pumpkinseed compared to the statewide average (Table 4). Yellow perch are present in Long Lake, but were not captured in high numbers. Most of the perch collected were less than 5 inches in length. Black crappie appear to have a cyclical nature of abundance in Long Lake. Crappie appear to have been absent in many historic surveys, and abundant in others. Only two black crappie were collected during the current survey. This species is native to northern Michigan but is often not abundant or even present in natural lakes. This species may have been introduced from private stocking efforts or from nearby waters where this species is more abundant (e.g. Fletchers Floodwaters).

The predator game fish population in 2006 at Long Lake was dominated by smallmouth and largemouth bass, and walleye. Smallmouth bass are very abundant and can reach lengths of up to 20 inches (Table 3). Nine year classes of this species were present with each year class somewhat common. Growth rates suggest that smallmouth bass grow more than one-inch slower in Long Lake when compared to smallmouth bass populations statewide. This may be a result of high survival, low lake productivity, and intra-specific competition. Despite this, smallmouth bass remain a healthy and vital component of the Long Lake fish community. Largemouth bass are also common in Long Lake, although they are less abundant than their cousin species. Most of the largemouth bass collected were less than the statewide minimim size for this species (14-inches) yet growth rates appear well within the typical range for this species statewide (Table 4). Only one large northern pike was collected during the summer survey (Table 2). This species remains in very low numbers.

Twenty walleye were collected and ranged in length from 13-23 inches (Table 2). Sixty-percent (12/20) of the walleye were larger than the minimum size limit of 15 inches. Five ages of walleye were represented in the catch with the 2002 year class (age-4 fish) the most abundant. The largest walleye was 23 inches in length and was 8 years old. Walleye growth was slightly below the statewide average for this species (Table 4). This slower growth is probably more a result of limited lake productivity than high abundance.

No trout from the remnant stocking efforts were collected in 2006. This was not surprising based on previous trout catches during stocking years. Four ciso, or lake herring, were however captured with gill nets in the north basin. These specimens ranged from 14-16 inches in length and represented by ages 4 and 5 (Table 4). The presence of these species continue to indicate a cold water refuge in the summer water column that exists much like it did in the past. Cisco were first collected in Long Lake in 1955 (Latta 1995) Other species collected in the 2006 Long Lake survey included white sucker, bullhead species, and a variety of minnows, shiners, and a darter. These species are all typical of northern Michigan waterbodies.

A management plan to periodically stock spring fingerling walleye into Long Lake was initiated immediately following the May 2006 fish community survey. This plan called for supplementing the low level native walleye population with spring fingerling (1-2 inch) walleye stocked no more than 2 or 3 times over a 6 year period. Suggested stocking rates are for 20,000 spring fingerlings to be stocked at a rate of 68/acre. This is classified as a lower priority stocking effort since a native population

already existed in Long Lake. In addition, fish would be required to be marked with oxytetracycline (OTC) by Fisheries Division prior to stocking. This would allow fisheries managers to distinguish the ratio of marked (stocked) to unmarked (wild) young walleye present in the lake in a given period.

The first walleye supplemental stocking effort occurred in early June 2006 at Long Lake. A total of 20,000 spring fingerling walleye averaging 1.4 inches in length were stocked at the public access site on the south shore. These fish were marked with OTC.

Fisheries Division personnel returned to Long Lake on September 11, 2006 in attempts to evaluate the current year stocking effort. Nighttime electrofishing gear was used over a period of two total hours in both basins to capture walleye. No young-of-the-year (age-0) walleye were collected possibly indicating near failure of the 2006 stocking attempt. In addition, no wild age-0 walleye were collected. Six total walleye ranging in length from 14 to 16 inches were collected.

Analysis and Discussion

The overall fish community of Long Lake has not changed drastically through time, yet management of the resource has changed. The current fish community can be generally characterized as having the following: 1) a diverse and fair growing panfish community dominated by bluegill, 2) a diverse predator population dominated by smallmouth and largemouth bass along with a scarce northern pike component, 3) a naturally reproducing walleye population that may be periodically supplemented with stocked fish to produce a fishery, 4) a remnant cisco population which utilizes the cold water niche, and 5) a typical non-game fish component comprised of bullheads and white suckers. Management of Long Lake has changed from reliance on a natural warm- and cool-water fish community that was supplemented through trout stocking efforts to a current native fish community that may periodically be supplemented with walleye.

The Long Lake panfish community includes bluegill, rock bass, pumpkinseed, yellow perch, and black crappie. These species thrive in varying numbers in Long Lake and tend to exhibit good growth. Their is a quality bluegill population in this lake with a variety of age classes and size groups present. The abundance of predators, particularly bass and walleye, may help to maintain the bluegill population at appropriate carrying capacities which may stimulate growth. Elimination of the rainbow trout stocking program may help preserve the zooplankton base and allow for additional grazing on this part of the food chain by adult bluegill.

This lake had a notable history of rainbow trout stocking efforts dating back to the 1950s. Fish community and species specific evaluations over many decades have documented low numbers of rainbow trout in the lake despite these stocking efforts. In addition, survey catches tended to document a low level, naturally sustaining walleye population. Water quality has always been suitable to trout survival in Long Lake and cisco still can be found in this waterbody. It is believed that trout survival may have been better than what was documented by the netting operations. Regardless, angler effort for rainbow trout was negligible and warranted a change in management philosophy. It is believed that termination of the trout stocking program will benefit many native lake species, including walleye.

Walleye have been documented in low levels in Long Lake for many decades and are maintained by natural reproduction. It is believed that supplemental stocking of walleye may enhance the fishery in this lake. In doing so, managers need to find the appropriate balance between creating a walleye

fishery and maintaining a quality bluegill population. Walleye should be stocked in varying places in the lake, particularly in the north basin, but not near the outlet. Bass populations remain strong in Long Lake and should be promoted as part of the fishery

Overall, the fish community of Long Lake appears relatively stable and will continue to change following the termination of the rainbow trout stocking efforts. Game fish are abundant and offer diverse angling opportunity. Important panfish such as bluegill, rock bass and pumpkinseed are abundant and grow well. Walleye natural reproduction in Long Lake has allowed fisheries managers to allocate stocked fish to other waterbodies in the State of Michigan. Despite this natural reproduction, walleye numbers are low and periodic supplemental stocking may enhance the fishery and maintain the quality panfish population. Northern pike densities are extremely low today in Long Lake. Reports from the past suggest higher densities were found for unknown reasons. Suitable flooded spawning habitat may have been more abundant in the past while movement of spawning pike from downstream may be more restricted today as a result of the control structure. Consideration should be given to periodic stocking of this species in attempts of creating a trophy pike fishery. Protection of all aquatic vegetation should also be followed in Long Lake to provide for essential lake nutrients and fish cover.

Management Direction

1) The Long Lake fish community currently is in good shape and has a fish community typical of a northern Michigan inland waterbody with limited production. A couple of minor fish management practices (stated below) may be used to enhance the fishery if resources are available.

2) Managers should continue to preserve the naturally sustaining walleye population in Long Lake. This wild population provides for a low level fishery, and thus could be periodically supplemented with stocked fish. This can occur when fish become available or a surplus of pond reared spring fingerlings occurs. Stocked walleye should always be marked with oxytetracycline. In doing so, managers will be able to conduct fall walleye evaluations following a stocking effort and thus determine survival of stocked fish and the ratio of wild to stocked young walleye. Such information gathered over a decade or more can be vital to lake management.

3) Northern pike are native, but currently uncommon in Long Lake and may be so as a result of limited spawning habitat. This could be a result of shoreline development and water level management. The few pike that have been collected in this lake during previous surveys have been large fish. Currently there is no reliable pike fishery at Long Lake. Consideration could be given to stocking this lake with low levels of northern pike when available. Another alternative is to conduct trap and transfers of this species from another lake (where populations are stunted or need removed) into Long Lake in low numbers of less than one per acre.

4) A follow-up complete fish community survey documenting changes should be accomplished no later than 2020 at Long Lake. Periodic fall walleye evaluations can be made periodically following walleye stocking efforts. Information will provide managers on the success of periodic walleye

stocking relative to natural reproduction of this species. A final decision on the benefits of supplemental walleye stocking should be made at that time.

5) The remaining riparian wetlands and undeveloped riparian zones adjacent to Long Lake are critically important to the health of the fish community. These wetlands should be preserved and protected for the purpose of filtering water quality and providing critical fish spawning and nursery habitat.

References

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Table 1.-Rainbow trout stocking history for Long Lake, Montmorency County.

Year	Strain	Number	Number /Acre	Average Size (in)	Stocking Location
2001	Eagle Lake	3,000	10	6.0	Public access site
2000	Eagle Lake	2,700	9	7.1	Public access site
1999	Gerrard Kamloops	3,600	12	8.1	Public access site
1998	Shasta	2,900	10	7.5	Public access site
1997	Eagle Lake	3,210	11	6.6	Public access site
1996	Eagle Lake	10,130	34	7.5	Section 32
1995	Eagle Lake	10,996	37	6.5	Section 32
1994	Eagle Lake	12,000	41	6.7	Near outlet
1993	Eagle Lake	10,000	34	6.8	Section 32
1992	Eagle Lake	10,000	34	6.7	Section 32
1991	Arlee	10,000	34	7.1	Public access site
1990	Eagle Lake	10,000	34	6.7	Section 32
1989	Shasta	10,000	34	7.0	Section 32
1988	Eagle Lake	10,000	34	6.1	Section 32
1987	Shasta	10,000	34	7.3	Section 32
1986	Shasta	10,000	34	7.5	Section 32
1985	--	10,000	34	5.7	Section 32
1984	Shasta	9,700	33	5.1	Section 32
1983	Harrietta	10,000	34	6.3	Section 32
1982	Harrietta	10,000	34	6.7	Public access site
1981	Harrietta	10,000	34	6.2	Public access site
1980	--	10,000	34	7.8	Public access site
1979	Steelhead	7,300	25	5.9	Public access site
1978	--	9,873	33	Yearlings	Public access site
1977	--	11,000	37	Yearlings	Public access site
1976	--	10,507	36	Yearlings	--
1975	Steelhead	10,000	34	Yearlings	--
1972	--	14,675	50	Yearlings	--
1971	--	20,000	--	Year/Fall Fing	--
1970	--	10,000	34	Yearlings	--
1969	--	10,000	34	Yearlings	--
1968	--	5,000	17	Yearlings	--
1966	--	7,000	24	Fall fingerling	--
1965	--	2,500	9	Sub-legals	--
1964	--	2,500	9	--	--
1963	--	5,000	17	--	--
1962	--	5,000	17	--	--
1961	--	5,000	17	--	--
1960	--	5,000	17	--	--
1953-59	--	53,000	--	various	--

Table 2.-Species catch and relative abundance of fishes collected during the Long Lake fish community survey, May 15-18 and July 29, 2006. Weight is calculated.

Species	Number	Percent by number	Weight (lb.)	Percent by weight	Length range (in.)
Bluegill	321	40.3	67.5	17.5	1-9
Rock bass	121	15.2	47.7	12.4	2-10
Smallmouth bass	71	8.9	79.8	20.7	3-19
White sucker	67	8.4	106.1	27.5	8-18
Largemouth bass	38	4.8	23.0	6.0	3-15
Pumpkinseed	37	4.6	7.3	1.9	2-8
Yellow perch	28	3.5	1.2	0.3	3-8
Sand shiner	24	3.0	0.1	-	2-3
Blackchin shiner	21	2.6	0.1	-	1-2
Bluntnose minnow	20	2.5	0.1	-	1-2
Walleye	20	2.5	27.8	7.2	13-23
Yellow bullhead	12	1.5	6.8	1.8	8-13
Brown bullhead	8	1.0	8.6	2.2	9-14
Cisco	4	0.5	3.0	0.8	14-16
Black crappie	2	0.3	0.4	0.1	5-8
Iowa darter	1	0.1	0.0	-	1
Northern pike	1	0.1	6.5	1.7	30
Shiner sp.	1	0.1	0.0	-	2
Total	**797**		**386**		

Table 3.-Length-frequency distribution of important game fishes collected during the 2006 netting survey at Long Lake.

Length (in)	Bluegill	Largemouth bass	Pumpkinseed	Rock bass	Smallmouth bass	Walleye
1	1					
2	7		1	1		
3	18	5	1	3	1	
4	25	4	2	6	4	
5	56	3	5	10	1	
6	81		17	7	4	
7	64	1	6	24	7	
8	45		1	47	5	
9	8	3		20	2	
10		6		3	2	
11		3			7	
12		7			8	
13		5			6	1
14					4	7
15		1			5	7
16					6	1
17					2	2
18					3	
19					2	1
20						
21						
22						
23						1

Table 4.-Comparison of mean length (inches) at age for various game fishes of Long Lake from 1962 to 2006. Number in parentheses represents number aged. Growth comparison in last column was across all ages.

Species	Age group	1962 July	1977 April	1990 October	2001 July	2006 May	2006 growth compared to state average
Bluegill	II	4.4 (6)	--	4.7 (1)	--	--	+0.4 in
	III	6.1 (35)	--	--	--	4.4 (4)	
	IV	7.4 (8)	6.1 (2)	6.8 (1)	5.7 (1)	6.1 (21)	
	V	8.0 (26)	--	7.3 (1)	7.8 (4)	7.0 (20)	
	VI	8.6 (4)	--	--	8.3 (4)	8.2 (6)	
	VII	9.4 (7)	--	--	--	8.5 (2)	
	VIII	10.8 (1)	--	--	--	9.4 (7)	
	IX	--	--	--	--	--	
	X	--	--	--	--	--	
	XI	--	--	--	--	--	
Largemouth bass	I	4.8 (1)	--	--	--	--	-0.1 in
	II	8.1 (11)	--	9.5 (1)	--	--	
	III	10.6 (17)	--	--	--	9.7 (4)	
	IV	12.2 (1)	--	--	--	11.5 (10)	
	V	--	--	--	--	13.2 (5)	
	VI	--	--	--	--	--	
	VII	-	--	--	--	15.7 (1)	
Smallmouth bass	II	7.3 (26)	--	9.2 (1)	--	7.3 (3)	-1.2 in
	III	10.3 (16)	10.0 (1)	--	11.1 (2)	9.1 (6)	
	IV	--	11.5 (12)	--	12.7 (8)	11.3 (9)	
	V	14.2 (2)	13.5 (1)	--	12.5 (1)	13.4 (11)	
	VI	--	--	--	15.0 (1)	15.2 (7)	
	VII	--	--	--	17.2 (1)	16.1 (3)	
	VIII	--	18.7 (1)	--	--	16.8 (4)	
	IX	--	--	--	18.0 (1)	18.4 (2)	
	X	--	--	--	18.8 (1)	19.2 (3)	

Table 4.-continued

Species	Age group	1962 July	1977 April	1990 October	2001 July	2006 May	2006 growth compared to state average
Rock bass	I	--	--	--	--	--	+0.9 in
	II	--	--	4.1 (2)	--	--	
	III	--	--	5.8 (15)	4.1 (4)	5.2 (3)	
	IV	--	--	6.8 (9)	5.5 (7)	6.1 (13)	
	V	--	--	--	6.8 (18)	8.0 (15)	
	VI	--	--	8.6 (4)	7.6 (11)	8.6 (9)	
	VII	--	--	--	--	9.2 (6)	
	VIII	--	--	--	--	10.2 (3)	
	IX	--	--	--	9.9 (1)	--	
Pumpkin-seed	IV	--	--	--		6.1 (12)	+0.6 in
	V	--	--	--		6.9 (6)	
	VI	--	--	--		6.8 (2)	
	VII	--	--	--		--	
walleye	II	--	13.1 (2)	12.2 (1)	12.4 (15)	--	-0.7 in
	III	16.6 (6)	13.6 (1)	15.0 (3)	15.4 (5)	14.2 (2)	
	IV	17.5 (1)	16.8 (4)	--	18.5 (2)	15.1 (12)	
	V	--	18.5 (4)	--	19.5 (1)	15.0 (1)	
	VI	--	--	--	--	18.5 (2)	
	VII	--	--	--	21.3 (1)	--	
	VIII	19.9 (1)	26.5 (1)	--	--	23.0 (1)	
	IX	--	--	--	--	--	
	X	--	--	--	--	--	
	XI	26.0 (1)	--	--	24.8 (1)	--	
	XII	--	--	--	--	--	
Cisco	III	13.5 (1)	--	--	--	--	--
	IV	--	--	16.1 (1)	--	15.1 (2)	
	V	--	--	--	--	16.6 (2)	
	VI	16.4 (2)	--	--	--	--	
				VII	16.8 (7)	--	