Big Lake

Otsego County, T30N, R2W, Section 8
Pigeon River watershed, last surveyed 2011

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Environment

Big Lake is located in central Otsego County in the northern Lower Peninsula, five miles east of the town of Gaylord. The lake size is 120 acres. Although a legal lake level was established at 891.3 feet in 1970 for a period of May 1 though September 30, there are no outlets or inlets and no water level control structures on Big Lake.

Big Lake consists of one basin with multple coves or bays. The lake has a maximum depth of 81 feet and reaches over 80 feet at two different locations. The lake is entirely surrounded by private land except for a small public access site along the west shore. This site is owned and maintained by the Michigan Department of Natural Resources (MDNR), has a gravel parking lot and small concrete pad boat launch. Parking for about 3-4 boat trailers is available. The shoreline is mostly developed with houses and summer cottages as evidenced by the summer 2011 count of 76 shoreline dwellings. The lakeward shoreline is relatively unaltered except for permanent and removable docks (55 small docks, 7 large docks in the summer of 2011). A mix of coniferous and deciduous trees are intermingled among the housing establishments. The bottom of Big Lake is primarily sand and marl. Gravel pockets are not uncommon but are also not centered in any single location. Pulpy peat material is the substrate in deeper waters, while soft silt can be found in the south cove. Aquatic vegetation is located at the north end of the lake and the south cove, but is relatively limited. A privately owned island of 1-2 acres in size can also be found on the lake. One very unique characteristic of Big Lake is its very narrow littoral zone. This shallow water (prior to the dropoff) zone for Big Lake is often less than 40 feet wide (approximated) and deep water drop-offs are abrupt. Water clarity as measured by a secchi-disk was nearly 15 feet on August 17, 2011. This indicates very high water clarity. The shoreline is relatively un-armored today and submerged large woody debris is limited in the littoral zone.

History

Fish management practices date back to the 1930s at Big Lake when the lake was first stocked with fish by the Michigan Department of Conservation (MDOC). From 1934 to 1945, a number of fish species were stocked regularly into Big Lake, despite the fact that this lake already had many of these species. Smallmouth bass adults were stocked in both 1937 and 1938. Largemouth bass fingerlings were stocked on four occasions from 1937 through 1945. One-million walleye fry were stocked in Big Lake in 1938, while 5,000 fingerling yellow perch were placed in the lake the year before. Fingerling bluegill were also stocked on eight occasions from 1934 through 1945. The stocking of such warm and cool water species was a regular practice at lakes statewide at the time, despite often knowing these species were already inhabiting various lakes that were stocked. By 1945, managers would begin stocking trout in Big Lake for many years until such stocking efforts ceased and more recent walleye stocking efforts began (Table 1).

The first examinations of Big Lake by MDOC personnel really began in 1945 when the lake was mapped. Big Lake had 25 cabins on its shore along with one summer camp. Angling pressure during this period was considered low and the perception existed among anglers that the lake had "been failing for several years". A temperature and dissolved oygen profile was made during the summer of 1945 which determined that the lake contained a strong thermocline with reduced oxygen levels for fish in the deeper, colder water (Table 2). Secchi-disk reading at the time was 13 feet, indicating high water clarity which still exists today. A survey of aquatic vegetation was also made and documented 13 species present.

The final survey aspect of Big Lake in 1945 involved the fish community. The fish survey was done with shoreline seining and experimental gill nets in late July. Fish sampled included largemouth and smallmouth bass, northern pike, yellow perch, bluegill, rock bass, pumpkinseed, white sucker, bluntnose minnows, golden shiners, killifish, and black bullheads. Most panfish were considered common but not abundant, while yellow perch could be caught in fair numbers. Records indicated that northern pike were transferred to Big Lake from Fletcher Floodwaters in Alpena County at some point, though numbers are unknown. Some pike and bass could be caught during this period and records indicate Big Lake was a popular lake for fish spearing.

Based on the 1945 survey results, recommendations were made to discontinue stocking warm water species (Table 1). Instead, managers began stocking trout to take advantage of the cold water niche that was available in this lake (Table 2). Rainbow trout adults and fingerlings were stocked frequently beginning in 1945 and continued in most years into the 1970s. Brown trout fingerlings and yearlings were also stocked frequently between 1966 and 1972. Recommendations were also made to install brush shelters into Big Lake for additional habitat, and this was accomplished in 1948.

The next fish survey was done by MDOC in 1959, utilizing small numbers of trap nets and gill nets. The survey produced relatively small numbers of fish including white suckers, bullheads, northern pike, largemouth bass, rock bass, and pumpkinseed. No previously stocked rainbow trout were collected, but this may have been due to the timing of the survey. Instead, MDOC personnel evaluated trout stocking efforts by conducting a trout angler census in the winter of 1961. A total of 2,000 adult rainbow trout were stocked prior to the winter survey. Results showed that 20% of the stocked trout were caught by anglers (405 fish +/- 93) which was considered good. Anglers caught 0.69 trout per trip, expended 587 angler trips and 1,655 angler hours. As a result, trout stocking efforts continued.

The next Big Lake survey was done by MDOC in June of 1961 and also was done with trap nets and shoreline seining. Largemouth bass adults were common but low numbers of juvenile bass were collected. Bass growth rates were slightly above statewide average. White suckers were thought to be very common while other species typical of a northern Michigan natural lake were still present (bluegill, northern pike, sunfish, rock bass, yellow perch).

Both rainbow and brown trout stocking efforts continued at Big Lake through the 1960s. In 1970, MDOC used four experimental gill nets in the fall to assess the trout community of Big Lake. No rainbow trout were collected while a total of five brown trout were caught. The brown trout were all large, ranging in size from 16-22 inches. As a result of the survey, trout stocking efforts ceased at Big Lake by 1974.

Fish and angler survey effort was moderate at Big Lake in the 1980s. The MDNR conducted angler surveys at many northern Michigan lakes during 1982, including Big Lake. A total of 1,386 boat angler hours was expended on Big Lake based on aerial counts. This was relatively low compared to other area lakes (Ryckman and Lockwood 1985).

By 1985, stocking efforts at Big Lake, for any species, had been discontinued for over a decade. A general fish community survey was made in the summer of 1985 by MDNR. Survey effort consisted of 38 trap net and fyke net total overnight lifts, utilizing all large mesh gear. Angler fishing pressure at this time was considered light. The survey produced all the common species of Big Lake observed in the past. Bluegill were common with eight year classes present. Bluegill growth was considered very slow and most fish captured were less than 6 inches long. Rock bass were abundant while pumpkinseed sunfish were rare. Both species of panfish were growing slow. Yellow perch were not caught in high numbers, and in fact, only one year class of young fish were present. However, this may have been a consequence of not using small mesh nets. Non game species such as bullheads and white suckers were common. Northern pike, largemouth bass, and bluntnose minnows were also caught. In contrast, no smallmouth bass were captured during this 1985 survey. All fish tended to grow slow in Big Lake with the exception of northern pike. Based on this survey, managers deemed this fish community acceptable and normal for such a northern Michigan lake. Recommendations soon followed to stock spring fingerling walleye every third year in Big Lake at a rate of approximately 100/acre, or 12,000 fingerlings per stocking event. Walleye fingerling stocking efforts soon began in 1988 (Table 1) but did not gain momentum till 1991. It was believed that an additional and efficient predator such as walleye could forage on the slow growing panfish and white suckers, possibly helping shape a better overall fish community.

The next fish community assessment and walleye stocking evaluation was done by MDNR at Big Lake in 1995. Sampling effort totals were 30 overnight large mesh trap and fyke net lifts and one small mesh fyke net. Very few young fish were again caught during the survey, again, most probably as a result of not using enough small mesh gear. Despite this, MDNR personnel gained valuable information from the survey. It appeared that walleye were doing well in Big Lake. Five year classes of walleye were collected, but four year classes had been stocked prior to the 1995 survey. A strong year class of walleye from the 1993 year class was present. Growth of this species was considered excellent. Anglers reported catching a lot of sublegal walleye prior to the survey along with lesser adult numbers. Northern pike and largemouth bass catches were low but considered normal, while growth for each of these species was average. Panfish populations were considered to be in fair condition, while growth for panfish was generally average to slightly below average. A fishable population of bluegill was present. After this survey, managers recommended that walleye stocking should continue since the lake had developed a respectable walleye fishery supporting modest angler hours.

MDNR continued to stock spring fingerling walleye of various strains (Table 1) into Big Lake. Stocking rates were relatively high for this period in each year. A fall juvenile walleye assessment was made by MDNR on one night in the fall of 2005. The evaluation was made to determine contribution of stocked fish versus the natural component of wild young walleye. The previous spring MDNR stocked 9,300 spring fingerlings which were marked internally (bone stain) with an antibioticl known as OTC, or oxytetracycline. The entire shoreline of Big Lake was electrofished in the fall of 2005 for a total of 2.3 miles (not including the island shoreline) over 1.42 hours. Thirty-seven walleye were collected ranging in length from 6-21 inches, and included a sample of 22 age-0 fish from the 2005

year class. The catch of age-0 (YOY, or young-of-year) fish was 15.5 per hour which indicated a relatively strong 2005 year class. These age-0 juveniles were sacrificed and examined for having the OTC mark. Results demonstrated that 23% of these juveniles were from hatchery origin, while 77% were of wild status. Four additional year classes of walleye were collected (I, II, V, VI) with this same effort.

The Little Traverse Bay Band of Odawa Indians (LTBB) conducted the next fish walleye assessment at Big Lake in the spring of 2010. Big Lake is one of many lakes that are located geographically within the 1836 treaty ceded waters of Michigan. Walleye density in Big Lake was predicted based on a model in the 2007 Inland Consent Decree (see Table 1, Consent Decree). This Decree is a court finding and order between the State of Michigan and five tribal agencies which governs allocation of walleye harvest between the State recreational fishery and the tribes. The model (Table 1, Consent Decree) predicted walleye abundance based on lake acreage and production source (wild versus stocked). The estimated number of adult Big Lake walleyes from the model was 213 fish, and most walleye were believed to be of stocked origin. The survey by LTBB in spring of 2010 used trap netting and nighttime shoreline electrofishing to catch and mark 163 adult walleye immediately after ice out. The recapture phase was done solely with electrofishing and caught 43 adult walleye, of which 30 were already marked. The final population estimate of adults was calculated at 233 walleye, or 1.9 adults per acre. This estimate was close to the predicted value and agreed on by the State of Michigan as the actual value.

LTBB followed up the spring 2010 effort with a fall juvenile walleye index the same year. This was a year when MDNR did not stock, thus any age-0 walleye collected would be regarded as wild fish. LTBB electrofished 2.7 miles of shoreline (including island shoreline) for 1.79 hours and collected 40 age-0 fish for a good catch rate of 22.3 per hour. Thus, a strong wild year class was found. No yearlings from the previous year stocking event (Table 1) were collected.

Current Status

A fish community survey was conducted at Big Lake by MDNR Fisheries Division in June 2011. Effort consisted of 4 large-mesh trap-net nights (lifts), 9 large-mesh fyke-net nights, 4 experimental gill-net nights, 4 maxi-mini fyke net nights, and 4 shoreline seine hauls. Each lift was equal to an overnight gear sit in the lake. This survey effort was done from June 8-23 . Lead lengths for the larger mesh trap- and fyke-nets were typically 75-100 feet. Additional sampling effort included 30 minutes of nighttime direct current electrofishing nearshore. Most of the survey was done during a week where water temperature ranged from 67-70F and was accompanied by storms. Survey notes indicate that this (storms and cooler water) may have led to reduced panfish catches.

A limnological profile was made of Big Lake on August 17, 2011. Results showed a very low alkalinity value of 18 mg/L. This measurement is low when compared to many other northern Michigan lakes which typically are 50-150 mg/L. Alkalinity is a chemical measurement which has a well studied relationship with lake productivity. Typically, the higher the value, the more productive the lake is for fish and plant communities. The Carlson Trophic State Index was calculated for Big Lake which uses water clarity, chlorophyll-a concentrations, and total phosphorus measurements to make a rough estimate of the waterbodies biological condition. These measurements placed Big Lake in the oligotrophic state which is indicative of low primary productivity as a result of low nutrient content.

A temperature and dissolved oxygen profile was also collected in August of 2011 (Table 3). The thermocline was established at 18 feet below the surface. Dissolved oxygen suitable to fish populations (6ppm and greater) was good above this depth, but oxygen levels plummetted below this depth. Water temperature ranged from 75F on the surface to 45F on the bottom. Secchi-disk reading, which is a measure of water clarity, was nearly 15 feet deep. Overall, water clarity, summer temperature, and oxygen measurements in Big Lake have not changed significantly since the 1945 (Table 2) measurements.

Thirteen species of fish were collected during the 2011 fisheries survey (Table 4). Total catch was 2,210 fish weighing 313 pounds. Large predator fish included smallmouth and largemouth bass, walleye, and northern pike which, in total made up 7% of the total catch by number and 64% by weight. Non-game species such as bullheads and suckers were less of a component in Big Lake compared to many other northern Michigan waterbodies. The panfish community of Big Lake is dominated by bluegill, pumpkinseed, yellow perch, rock bass, and to a lesser extent, black crappie (Table 4).

Bluegill are an important component of the Big Lake fish community and the most abundant panfish captured during the 2011 survey. Bluegill ranged from 1-11 inches in length (Table 5) and were represented by nine ages (Table 6). Few bluegill larger than 6 inches in length were collected which was similar to the 1985 survey (Table 5). On average, a Big Lake bluegill will need about seven years to reach eight inches in length, which is relatively slow growing. Smaller bluegill tend to be more abundant in the catch suggesting the possibility for stunted growth conditions, which again is most likely due to limited lake fertility. Growth for this species is very slow, particularly for young fish and the average size of bluegill in this survey was 3.2 inches. Overall, growth appears slower today for small bluegill in Big Lake than in past years (Table 6).

Rock bass are also relatively common in Big Lake and represented by ten year classes. Rock bass up to 11 inches were caught and growth of this species appears average when compared to the statewide average for this species. Growth of rock bass has not changed noticeably from past surveys (Table 6) and average size in this survey was 7.5 inches. Yellow perch are also common in Big Lake but rarely reach large sizes (Table 5) today. This is also true based on past surveys. Only five year classes or fewer of perch have been found in any one survey year (Table 6). Growth of this species is slow. Pumpkinseed sunfish are also found in Big Lake, but in low numbers. Pumpkinseed sunfish tend to inhabit lakes with shallower, warmer conditions and an abundance of submersed aquatic vegetation. These characteristics are generally lacking in Big Lake which explains why pumpkinseed abundance is relatively low compared to other panfish. Growth of pumpkinseed is nearly one-inch slower than the statewide average. Despite this, this species can occasionally get large (7 inches and larger) in Big Lake. Black crappie are also found in lower numbers in Big Lake, but can attain adequate sizes for harvest.

Largemouth bass are likely the most abundant predator in Big Lake (Table 4). A greater number of largemouth bass were collected in this survey compared to past surveys (Table 5), although the difference may not be significant since sampling effort was different over time. Very few legal size (14 inches and larger) bass were collected in the 1985 and 2011 surveys (Table 5) and the average size

largemouth bass in this survey was 10.6 inches. Seven year classes of this species were collected and growth was very slow at 1.5 inches slower than the statewide average (Table 6).

Smallmouth bass are also relatively common in Big Lake and can reach large sizes (Table 5). Their growth is average and many year classes were observed (Table 6) while the average size for this survey was 12.7 inches. This species appears to be at a historical high point in Big Lake. Smallmouth bass were collected during the 1945 survey, but none or very few were collected during the 1985 and 1995 survey (Table 6). Reasons for this are unclear.

Walleye have been stocked in Big Lake by MDNR since 1988 (Table 1). A typical stocking pattern for spring fingerlings (1-2 inches) has been in alternate years at high stocking rates (per acreage basis) (Table 1). No walleye have been stocked here since 2009 and natural reproduction has been noted on different occasions. The catch of walleye during the 2011 general fish community survey indicates that this species is a common part of the game fish population. Forty-three walleye were collected during the netting efforts and ranged in length from 6-24 inches. A healthy length- and age-frequency distribution was noted for walleye (Table 5 and 6). Good numbers of age-1 walleye (6-7 inches) were collected from the 2010 year class, a year which MDNR did not stock. Quality numbers of legal size (15 inches and larger) walleye were collected as well (Table 5). Many walleye were from year classes (based on aging) not represented by stocked years, thus natural reproduction of this species is considered good. Walleye were relatively common in the 1995 survey following initial stocking efforts, yet they were not present in the 1985 survey which was prior to any stocking events (Table 1 and 5). Current walleye growth is average in Big Lake when compared to the statewide average for this species.

Northern pike are an important predator in Big Lake, but they are not abundant (Table 4). Catches of pike have been variable between the last three surveys (Table 5). Big Lake has limited spawning habitat for northern pike and their abundance may rise and fall with annual water levels and in-lake aquatic vegetation. Pike growth is slow in Big Lake, although an occasional large fish can be found (Table 5).

Other species collected during the 2011 survey by MDNR were mimic shiners, bluntnose minnows, brown bullheads, and white suckers. Mimic shiners are near-shore small shiners which are common to many northern Michigan natural lakes. Bluntnose minnows are also common to the lake region, but are there most likely as by-products of the baitfish industry. Bullheads are rare in Big Lake which is not surprising since the habitat they prefer (soft bottom muck) is limited. White suckers are common to many mesotrophic and oligotrophic Michigan lakes, but they are rare in Big Lake (Table 4).

In addition to the MDNR spring survey, a follow-up fall walleye evaluation was done by the Little Traverse Bay Band of Odawa Indians on October 6, 2011. This was done to evaluate juvenile walleye production in recent years (particularly 2011) when stocking didn't occur. Effort consisted of 1.22 hours of nighttime shoreline shocking over a distance of 2.7 miles. Moderate numbers of age-0 and age-1 walleye (n=26) were collected (Table 7) indicating natural reproduction of walleye continues in Big Lake.

Analysis and Discussion

The current fish community and morphological characteristics of Big Lake can be generally characterized as having the following: 1) a slow growing panfish community considered to have moderate diversity, and dominated by bluegill, 2) a predator population having moderate density and dominated by largemouth bass and walleye, 3) a walleye population relatively new to Big Lake and currently sustained by natural reproduction and supplemental stocking, 4) remaining predators such as smallmouth bass and northern pike in lower densities and produced naturally, 5) a probable cold-water niche in the lake that is currently not used since species such as trout or herring are not present in Big Lake, 6) a typical population of small bait fish including shiners and minnows, 7) a non-game fish community with low diversity and numbers, and 8) a lake with low fertility based on an extremly low alkalinity measurement. Management of Big Lake fishes has primarily been with the use of statewide regulations, maintenance of most species through natural reproduction, and providing low level, periodic stocking of walleye in past decades.

The Big Lake panfish community is moderate in diversity and fairly poor in quality. Species available to anglers include bluegill, rock bass, yellow perch, pumpkinseed sunfish, and an occasional black crappie. Growth of panfish is typically slow when compared to growth rates for each species statewide which may be a result of competition for sparse nutrients found in this highly infertile lake. This infertility is natural to Big Lake and its small watershed. Some individual panfish do attain quality harvest size though, particularly bluegill, pumpkinseed, and black crappie.

The predator base of Big Lake is dominated by smallmouth and largemouth bass, walleye, and northern pike. Both bass species are important predators which are needed to help keep many other species in balance by thinning slow growing panfish populations. Smallmouth bass are an important predator on rusty crayfish which is a non-native species and now inhabits many of northern Michigan's lakes, although it is unknown if they are found in Big Lake as of this survey. Smallmouth bass provide a quality fishing experience in Big Lake. Largemouth bass appear to be at acceptable levels despite exhibiting slow growth. There are not many lakes that offer good opportunities to catch a trophy fish of each species in the same lake.

Walleye fingerlings were stocked frequently at high stocking rates in Big Lake from 1988 through 2009. Recent survey results and previous fall juvenile surveys suggest that stocking will compliment wild recruitment and bolster the population. It was not known, however, to what extent stocking is needed to create a viable fishery in Big Lake. Natural reproduction is quite evident for this species today, and future stocking practices may be reduced if natural reproduction continues to be strong. Walleye can be an important component of the predator base because they are capable of assisting in thinning out slow growing panfish populations (which is evident here), and at the same time they can increase the quality of the fishery experience. Walleye should continue to be managed in Big Lake with the goal of maintaining quality numbers. Fall juvenile walleye assessments should continue and allow managers to adjust stocking practices if it is determined that stocked fish survive poorly compared to wild fish.

Northern pike remain in low but acceptable numbers in Big Lake, but survey results suggest that they can attain large sizes. Pike spawn on flooded aquatic vegetation and can even leave their egg masses on submersed aquatic vegetation. These types of habitat are not prevalent in Big Lake and might help explain the low natural densities of this species.

Management Direction

1) The Big Lake aquatic community is dynamic and should be monitored on a fairly consistent basis. Most game fish play a vital role not only in the fishery, but also for overall ecosystem balance. A complete fish community survey documenting changes should be accomplished approximately every 10-15 years at Big Lake. Previous fish community surveys were done in 1985, 1995, and 2011 although survey effort varied.

2) The management plan for walleye at Big Lake will continue to call for supplemental stocking of spring fingerling walleye. Spring fingerlings have not been stocked here since 2009 although natural reproduction has been evident in both 2010 and 2011 and we are encouraged to see this. It is always the goal of fisheries managers to create walleye fisheries through stocking which eventually become self-sustaining. Stocking spring fingerling walleye on top of healthy juvenile wild populations is not wise, and often leads to stocking failure. We will continue to monitor walleye natural reproduction and respond to stocking practices based on results.

3) Northern pike are native to Big Lake but are found in very low numbers, possibly as a result of lake levels. Numbers were never high in the past or in current surveys. Efforts should not be made to bolster their numbers through stocking, but instead the focus should be on walleye because they better compliment the existing predator base, they have a better chance for survival, and are more valued by local fishers.

4) Smallmouth bass, largemouth bass, and northern pike can be found in Big Lake and help control existing panfish populations. Sport fishing regulations for these species follow statewide standards and are appropriate for this lake.

5) Natural shoreline habitat should be maintained at Big Lake to act as a buffer against soil and sediment entering the lake. Large woody debris should be maintained in the lake and riparians should be encouraged to let such natural shoreline materials recruit naturally to the lake.

6) Information and education materials on the impacts of non-native species (e.g. zebra mussels, rusty crayfish, Eurasian water milfoil) should be erected at the public access site.

References

Ryckman J.R., and R.N. Lockwood. 1985. On-Site Creel Surveys in Michigan 1975-82. Fisheries Research Report No. 1922. Michigan Department of Natural Resources, Fisheries Division, Lansing.

Table 1.-Recent walleye stocking history for Big Lake, Otsego County.

Month	Year	Strain	Number	Number/Acre	Avg. Length (in)
June	1988	-	1,500	13	1.9
June	1991	Muskegon	11,000	92	1.6
June	1993	Bay De Noc	11,000	92	1.6
June	1995	Bay De Noc	14,200	118	1.6
June	1997	Tittabawassee	12,000	100	1.4
June	1999	Bay De noc	11,000	92	1.7
May	2001	Tittabawassee	17,500	146	1.1
June	2003	Tittabawassee	10,500	88	1.2
June	2005	Tittabawassee	9,300	78	1.7
July	2008	Muskegon	24,825	207	2.0
June	2009	Muskegon	14,000	117	1.6

Table 2.-Water temperature and dissolved oxygen profile for Big Lake, July 26, 1945.

Depth (ft)	Temperature (F)	Dissolved Oxygen (ppm)
Surface	74	
3	74	
6	74	7.5
9	74	
12	73	7.3
15	68	
18	66	
21	63	
24	57	
27	54	6.2
30	52	
33	52	5.0
36	52	
39	51	
42	51	4.3
45	51	
48	51	
51	50	4.3
54	50	
57	50	
60	50	3.4
63	50	
66	50	
69	50	3.1
72	50	
75	50	
78	50	3.0
80	49	

Table 3.-Water temperature and dissolved oxygen profile for Big Lake, August 17, 2011.

Depth (ft)	Temperature (F)	Dissolved Oxygen (ppm)
Surface	75	8.7
3	74	8.6
6	74	8.6
9	73	8.5
12	72	8.2
15	72	8.0
18	69	7.2
21	60	2.3
24	55	1.9
27	51	2.0
30	49	1.5
33	48	1.1
36	47	1.1
39	46	1.1
42	46	1.1
45	45	0.7
48	45	0.5
51	45	0.3
54	45	0.2
57	45	0.2
61	45	0.2
64	45	0.2

Table 4.-Species and relative abundance of fishes collected with survey gear at Big Lake, June 8-23, 2011.

Common Name	Number	Percent	Length Range *(inches)*	Weight	Percent	Growth* (inches)
Bluegill	1,232	56	1 - 11	42.5	14	-1.1
Mimic shiner	484	22	1 - 3	3.0	1	
Yellow perch	124	6	2 - 6	2.2	< 1	-0.7
Rock bass	117	5	1 - 11	46.7	15	-0.2
Largemouth bass	60	3	2 - 20	51.2	16	-1.5
Pumpkinseed sunfish	59	3	2 - 9	5.6	2	-0.9
Walleye	43	2	6 - 24	53.5	17	+0.1
Bluntnose minnow	41	2	1 - 3	0.2	< 1	
Smallmouth bass	26	1	3 - 20	43.1	14	+0.2
Northern pike	14	< 1	17 - 42	52.8	17	-1.5
Black crappie	6	< 1	8 - 12	3.8	1	
Brown bullhead	3	< 1	12 - 13	3.2	1	
White sucker	1	< 1	23	5.1	2	
TOTAL	2,210			312.9		

** growth is compared to statewide average for that species*

Table 5.-Length-frequency distribution of certain game fishes collected during the 1985, 1995, and 2011 netting survey at Big Lake.

Length (in)	N. pike 85	N. pike 95	N. pike 11	Walleye 85	Walleye 95	Walleye 11
1						
2						
3						
4						
5						
6						13
7						5
8						
9						
10					2	
11					9	2
12					28	
13		1			10	
14						
15		1				3
16		2				3
17		3	1			3
18		10			4	5
19	2	5	1		4	5
20	3	2	3		3	
21		1	2		1	2
22	2	9				1
23	1	5	3		2	
24		6	1			1
25		4	1			
26	1	1				
27						
28	1					
29						
30			1			
31						
32						
33						
34						
35						
36						
37		1				
38						
39						
40						
41						
42			1			
43						

Table 5.-Continued

Length (in)	Y. Perch 85	Y. Perch 95	Y. Perch 11	S. Bass 85	S. Bass 95	S. Bass 11
1						
2		109	26			
3	6	3	87			3
4	3		5			2
5		5	2			1
6		1	4			1
7						2
8						
9						
10						
11						
12					1	
13						
14					2	2
15						3
16						7
17						2
18						1
19						1
20						1
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42						
43						

Table 5.-Continued

Length (in)	L. bass 85	L. bass 95	L. bass 11	Bluegill 85	Bluegill 95	Bluegill 11
1						202
2			1	139		275
3			2	284		575
4			3	239	8	102
5			5	106	9	35
6			4	37	49	20
7	1		2	26	30	8
8			3	4	2	3
9	4		3	3		1
10	6		3			1
11	2	3	3			
12		1	11			
13	1	2	12			
14		7	4			
15		7	2			
16		6	1			
17		6				
18		1				
19						
20			1			
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Table 6.-Comparison of mean length (inches) at age for various game fishes of Big Lake from 1961 to 2011. Number in parentheses represents number aged. Growth comparison in last column was across all ages for 2011. Dorsal spines, in addition to scales, were used to age some of the walleye, northern pike, and smallmouth bass in 2011. Statewide growth comparisons are based on ages with scales.

Species	Age group	June 1961	June 1985	May 1995	June 2011	2011 growth compared to state average
Yellow perch	I	--	--	2.7 (10)	3.3 (14)	-0.7
	II	--	3.7 (13)	4.5 (4)	5.1 (5)	
	III	6.2 (6)	--	--	6.2 (4)	
	IV	6.9 (8)	--	6.9 (1)	--	
	V	8.2 (3)	--	--	--	
Walleye	I				6.8 (23)	+0.1
	II			12.3 (35)	11.5 (1)	
	III					
	IV			19.1 (6)	16.5 (8)	
	V			19.5 (5)	18.5 (6)	
	VI			20.4 (2)	20.5 (6)	
	VII			23.2 (2)	19.0 (2)	
	VIII				24.0 (1)	
Pumpkinseed	I	--	--	--	2.2 (2)	-0.9
	II	3.4 (8)	3.3 (5)	--	2.7 (3)	
	III	4.2 (3)	3.9 (4)	--	3.4 (12)	
	IV	4.9 (15)	5.6 (6)	--	5.9 (11)	
	V	--	6.6 (3)	7.2 (1)	7.9 (2)	
	VI	--	7.3 (1)	7.2 (1)	9.7 (1)	
	VII	--	--	7.9 (2)	--	
	VIII	--	--	8.5 (3)	8.5 (1)	
Bluegill	I	--	2.5 (3)	--	1.8 (8)	-1.1
	II	--	3.2 (20)	--	2.7 (4)	
	III	4.7 (3)	4.6 (15)	4.8 (3)	3.1 (14)	
	IV	5.6 (27)	5.6 (8)	5.8 (16)	3.9 (11)	
	V	6.7 (1)	6.9 (6)	7.0 (14)	5.4 (17)	
	VI	7.4 (1)	6.8 (8)	7.9 (2)	7.3 (18)	
	VII	--	7.6 (6)	--	8.4 (5)	
	VIII	--	9.1 (2)	--	8.2 (1)	
	IX	--	--	--	--	
	X	--	--		11.1 (1)	

Table 6.-continued

Species	Age group	June 1961	June 1985	May 1995	June 2011	2011 growth compared to state average
Rock bass	I	--	1.6 (1)	--	1.7 (3)	-0.2
	II	--	3.0 (13)	3.8 (4)	3.2 (5)	
	III	--	4.8 (14)	--	4.3 (7)	
	IV	--	6.2 (12)	5.1 (21)	6.0 (4)	
	V	--	7.0 (9)	5.6 (11)	7.4 (15)	
	VI	--	7.8 (8)	7.1 (7)	8.7 (4)	
	VII	--	8.5 (6)	7.3 (3)	9.2 (10)	
	VIII	--	9.0 (2)	8.3 (3)	10.1 (6)	
	IX	--	--	8.6 (4)	10.2 (5)	
	X	--	--	--	11.3 (1)	
S. bass	I	--	--	--	3.7 (4)	+0.2
	II	--	--	--	6.3 (3)	
	III	--	--	--	7.0 (1)	
	IV	--	--	--	16.1 (1)	
	V	--	--	14.7 (2)	15.7 (3)	
	VI	--	--	--	15.7 (5)	
	VII	--	--	--	17.2 (4)	
	VIII	--	--	--	20.9 (1)	
N. pike	I	14.3 (15)	--	13.1 (1)	--	-1.5
	II	21.4 (16)	20.4 (6)	18.6 (2)	17.2 (1)	
	III	--	23.1 (2)	21.5 (6)	21.3 (4)	
	IV	--	18.2 (3)	23.9 (14)	22.7 (6)	
	V	--	--	24.5 (6)	30.7 (1)	
	VI	--	--	--	--	
	VII	--	33.0 (1)	--	--	
	VIII	--	--	--	--	
	IX	--	--	37.5 (1)	--	
	X	--	--	--	--	
	XI	--	--	--	42.5 (1)	

Table 6.-continued

Species	Age group	June 1961	June 1985	May 1995	June 2011	2011 growth compared to state average
L. bass	I	--	--	--	3.6 (6)	-1.5
	II	9.8 (1)	--	--	5.9 (11)	
	III	11.3 (5)	10.6 (9)	--	9.8 (10)	
	IV	13.2 (15)	--	11.3 (3)	12.0 (12)	
	V	15.8 (3)	--	14.0 (8)	13.2 (12)	
	VI	15.9 (2)	14.6 (1)	15.1 (9)	15.0 (2)	
	VII	--	--	16.6 (11)	15.3 (2)	
	VIII	--	--	17.9 (2)	--	

Table 7.-Results of fall walleye indexes at Big Lake using nighttime boomshocking data. Data collected by MDNRE (2005) and LTBB tribe (2010 and 2011). Adult walleye were considered age 2 and older.

Year	***Date***	***Hours***	***Miles Shocked***	***Age-0 walleye***	***No. age-0 per hour***	***No. age-0 per mile***	***Yearling walleye collected***	***Adults***	***% Age-0 Stocked (sample no.)***
2005	10/25	1.42	2.3	22	15.5	9.6	10	5	23% (NA)
2010	9/30	1.79	2.7	40	22.3	14.8	0	1	0%
2011	10/6	1.22	2.7	16	13.1	5.9	10	4	0%