

## **BEAR LAKE**

*Manistee County (T23N, R15W, Sections 4-6; T24N, R15W, Sections 28-29, 31-33 )*

**Surveyed June 7-11, 1999**

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### **Environment**

Bear Lake ([Figure 1](#)) is located in western Manistee County, within the northwestern Lower Peninsula of Michigan. The town of Bear Lake lies on the southern shore of the lake. Bear Lake is a natural lake, having been formed during the Wisconsin glacial stage (10,000 to 75,000 years ago). The Bear Lake watershed encompasses about 7,543 acres within the Manistee River watershed of Lake Michigan. There are no significant tributary streams to the lake. The outlet, Little Bear Creek, which exits from the eastern shore, is a designated trout stream and a tributary to Bear Creek.

The topography of the watershed is rolling hills. The soils are primarily well drained, sandy, of the Kalkaska series; there are also some isolated clay pockets in the area. Wetlands are located along the northwest shore of the lake near Big Bay, and near the outlet on the eastern shore of the lake. The watershed is made up primarily of privately owned land, although there is one large block of the Pere Marquette State Forest that lies several miles east of Bear Lake. Predominant land uses in the watershed include orchards, agriculture fields, and forested areas. The forested areas are mostly high-quality northern hardwoods, with some red pine plantations mixed in. The majority of the lakeshore of Bear Lake is developed with homes and cottages.

Although earlier records indicate that Bear Lake is 1,744 acres in size and up to 23 feet deep, Water Quality Investigators found in 1994 that Bear Lake was 1,843 acres and up to 24 feet deep. Currently, due to extremely low water levels, the surface area of Bear Lake is most likely less than the earlier recorded size of 1,744 acres. About two-thirds of the lake is shallower than 20 feet. The flushing rate of the lake is approximately 2.19 years (Water Quality Investigators 1994). Aquatic vegetation is sparse in water shallower than 10 feet. Chara, Elodea, Potamogeton, and Eurasian milfoil are present, along with lily pads, cattails and bulrushes near the shorelines. Shore vegetation includes cedar, white pine, and oak trees.

Water quality conditions were surveyed July 29, 1999. The water color was light brown, and the Secchi disc reading was 10.6 feet. Within the water column, alkalinity ranged from 96 to 98, and pH from 8.7 to 8.8. These values are not unusual, although the pH is somewhat high.

There are historical water quality data from July 23, 1932, September 3, 1974, and August 6, 1976. In 1932, Secchi depth was 11.3 feet, pH was 7.1-7.7, and dissolved

oxygen ranged from 8.5 to 6.0. In 1974, water color was "clear", with a Secchi disc reading of 8 feet. Alkalinity at the surface was 87 and pH was 8.1. In 1976, the water color was again recorded as clear, but no Secchi disc reading was taken. Within the water column, alkalinity ranged from 103 at the surface to 86 at the bottom in 23 feet of water. The pH readings were 8.5 at both the surface and the bottom. Extensive amounts of Secchi disc data collected from 1974 to 1994 show some year-to-year variation but have generally averaged 11 feet (Water Quality Investigators 1994). These data suggest that no major limnological changes have occurred in Bear Lake in the last 25 years.

Bear Lake is a popular recreational lake, both summer and winter. There are two boat launches on Bear Lake. One is a DNR-owned site on the west shore of the lake, just south of Big Bay. The other is on the southeastern shore of the lake, and is owned by the Village of Bear Lake. The lake receives a good deal of recreational boating and personal watercraft traffic in addition to the boating pressure it gets from anglers. Bear Lake is heavily ice-fished in winter.

### **Fishery Resource**

The earliest report regarding Bear Lake is Institute for Fisheries Research Report No. 174, dated 1932. The report stated that the fish population consisted of warmwater species, including walleye, northern pike, smallmouth bass, pumpkinseed sunfish, bluegill, yellow perch, common sucker, dogfish (bowfin), bluntnose minnow, and straw-colored minnow (probably sand shiner). Largemouth bass was not mentioned. The report explained that walleye were first introduced in 1900, although no exact records are available. It also stated that yellow perch were transplanted from Lake Michigan. Three adult lake sturgeon were also transplanted into the lake from unknown sources. One of these sturgeon may be still alive, as sturgeon sightings have been reported as recently as 1992 (Jaquish 1992). The 1932 report recommended stocking 20,000 walleye fingerlings or 200,000 fry annually, as well as habitat improvements including spawning boxes, brush shelters, slab devices, and macrophyte plantings in shoal areas.

DNR records indicate that 2000 smallmouth bass and 2500 bluegills were stocked in 1929 ([Table 1](#)). Since that time, however, the majority of the management effort on Bear Lake has been directed at walleye. In 1933, 200,000 walleye fry were stocked, and annual stocking of 160,000 to 375,000 continued until 1943. During that same period, a few yellow perch were stocked, as well as 250,000 shiners (species not indicated). Some large brush shelters were installed in 1948. The only recorded survey from that time period, in 1947, with gillnets (275' in length) and a 10' seine. Very few fish were caught. The gill nets yielded 4 walleye, 1 northern pike, 1 brown bullhead, 1 yellow perch, 5 bluegill and 1 pumpkinseed sunfish. The seine caught 50 mimic shiners, 2 bluntnose minnows, and 25 banded killifish.

The sport fishery of Bear Lake was extensively studied via creel census from 1951 to 1965 (Schneider and Lockwood 1979). Several different topics were studied with the creel data, including the effects of removing closed seasons on game fish, restricting

fishing for northern pike, and stocking walleye fingerlings. In years when the creel survey covered the entire year, angler hours spent on Bear Lake ranged from 59,208 in 1959 to 85,342 in 1954. Interestingly enough, in the period from 1959-65, over 65% of the anglers were from other states, and 25% of the anglers were from southern Michigan. Only 10% resided locally. Most of the fishing pressure, from 63 to 85%, occurred in the summer.

Bluegill were generally the predominant fish in the sport catch in 1951-1965, with rock bass, yellow perch, and pumpkinseed also represented. Largemouth and smallmouth bass were the most common game fish taken until 1963, after which walleye and northern pike became more prevalent. Bullhead and bowfin were also recorded in the catch from time to time. Walleye fishing varied considerably over the 14-year period of the study. Walleye harvest estimates varied from a high of 1,333 in 1952 to a low of 124 in 1960. Walleye fingerlings were stocked in Bear Lake from 1960-1962, and a study assessed the success of those plants (Schneider 1969). Schneider estimated that stocked walleye did supplement the naturally reproduced fish, adding an average of about 312 fish per year class during the 3 years of study.

No other management actions were recorded until Bear Lake was surveyed in 1971. There were two phases to the 1971 survey. The first phase was a spring electroshocking survey to investigate walleye spawning. It was discovered that walleyes were actively spawning along 1 mile of the north shoreline of the lake, west of Little Bay. Small walleyes and white suckers were captured along the south shoreline. In all, 67 walleyes from 6-22" were captured, plus lower numbers of other species. The second phase of the 1971 survey utilized trap and gillnets. The results of the netting showed excellent populations of largemouth bass, smallmouth bass, rock bass, bluegill, brown bullhead, and white sucker. The only species reported as not doing well in 1971 was northern pike, as only five individuals were captured in the survey. Since no walleyes had been stocked since 1962, it appeared that the population was being supported by natural reproduction. Other reported species included pumpkinseed sunfish, yellow perch, and bowfin.

In response to angler complaints about poor fishing, Bear Lake was surveyed again in 1976 with trap and gillnets, plus a brief electrofishing effort. As with the 1971 survey, good populations of walleye, smallmouth bass, rock bass, bluegill, and brown bullhead were observed. Largemouth bass were not as numerous, but northern pike numbers were much higher than in 1971. Northern pike reproduction must have been good in 1972 and 1973 because most individuals were from those year classes. Hay (1980) determined that the lake was capable of holding more walleye, so he recommended stocking walleye to supplement the naturally reproducing population. Walleye fingerling plantings began again in 1984, and have continued on a more or less regular basis to the present ([Table 1](#)). A cooperative walleye pond was operated with the Bear Lake Association in the mid-1980s. In the 1990s, a total of 203,430 walleye fingerlings were stocked, including 43,366 in 1999. A plant of 48,705 spring fingerlings was made in 2000.

The next Bear Lake survey occurred in 1990. The results of that survey were very similar to the previous several surveys, although fewer walleyes were captured. Age data showed that natural reproduction continued to be a factor in the Bear Lake walleye population, as individuals were present from year classes not supplemented by stocking. The smallmouth bass, largemouth bass, and bluegill populations appeared to be in good shape. Very few yellow perch were observed. Also, two species not collected (or not identified properly) in prior surveys were captured-yellow bullhead and black crappie.

The most recent Bear Lake survey was conducted in June, 1999, using four 4' x 6' x 2" large mesh fyke nets, two 4' x 6' x 3/4" small mesh fyke nets and two 125' experimental inland gill nets. The large mesh fyke nets were set for 4 nights, the inland gillnets were set for 3 nights, and the small mesh fyke nets were set for 2 nights. Results are summarized in [Tables 2-4](#).

The fish community found in 1999 differed somewhat from previous surveys. In 1999, the small-mesh fyke nets captured 702 small (2-inch) bluegills and 449 small (2- and 3-inch) yellow perch. In 1990, only two small bluegills were captured, and no yellow perch were seen in the small-mesh fyke nets. In 1999, the catch of largemouth bass, smallmouth bass, and northern pike consisted of fewer large adults. However, more than twice as many walleyes were captured in 1999 when compared with the 1990 catch. Green sunfish were also observed in the 1999 catch. They had never been reported in Bear Lake before then.

The bluegill was the most abundant species collected by number. Again, over 700 bluegill (assumed to be age 1) were collected in the small-mesh fyke nets, indicating a very strong 1998 year class. The bluegill population as sampled by the large mesh fyke nets is more representative of the fish available to anglers. Eighty-three percent of the bluegill sampled in the large mesh fyke nets were of acceptable size (over 6"). In fact, almost 25% of the bluegills taken in the large mesh fyke nets exceeded 8 inches in length. The bluegills exhibited excellent growth, exceeding the state average by 1 inch. This is similar to results found in previous surveys.

The yellow perch was the second most abundant species collected in the survey. Again, the majority of those were yearlings captured in the small mesh fyke nets, indicating a very strong 1998 year class. Few perch of catchable size were encountered during the survey, indicating a weak adult population. Growth for the few adult perch that were sampled was very poor. One possible explanation for the poor growth observed in yellow perch is competition with the large population of adult white suckers in Bear Lake. Although yellow perch fishing may improve somewhat as the large class of yearlings matures, Bear Lake will most likely not provide a quality fishery for yellow perch in the near future.

Rock bass were also fairly numerous in the survey. One hundred eighty-two were captured, and over half of those were over 7 inches in length. The largest specimen was

10 inches in length. Rock bass growth rates were about 0.6 inches above the state average.

Other panfish species encountered during the survey included pumpkinseed sunfish, black crappie, and green sunfish. Although the populations of these fish do not appear to be as large as the bluegill population, they supplement the panfish catch for anglers. Twelve black crappie up to 9 inches in length, 15 pumpkinseed sunfish up to 8 inches in length, and 2 small green sunfish were observed in the survey.

Both largemouth bass and smallmouth bass were captured in the nets. Seventeen largemouth bass up to 18 inches in length, and 36 smallmouth bass up to 15 inches were sampled. Only three individuals from each species exceeded the minimum legal size of 14 inches. Six different year classes of both largemouth bass and smallmouth bass were represented. Growth was excellent for young largemouth bass, but seemed to slow as the fish got older. Smallmouth bass growth was subpar, as they were over an inch behind the state average. Fyke nets and gill nets are not specifically designed to sample bass, so the catch may not be fully representative of the bass populations in Bear Lake. Indeed, angler reports indicate that smallmouth bass fishing on Bear Lake is much better than the survey data shows.

Only 9 northern pike were sampled in the 1999 survey, compared with 28 in the 1990 survey. Only 2 of the northern pike observed in 1999 exceeded the minimum legal size of 24 inches. Growth was poor for the younger northern pike, as age 2 fish were over 2 inches behind the state average ([Table 3](#)). It appears that the northern pike population in Bear Lake may have declined some in the 1990s. On a positive note, six different year classes of pike were captured in the survey, indicating that natural reproduction is occurring in most years.

Twenty-eight walleyes up to 22 inches in length were captured in the 1999 survey, as compared with only 13 in the 1990 survey. All but four of the walleye observed in 1999 were over the minimum legal size of 15 inches. Seven different year classes were represented, and growth for age 4 and 5 walleyes exceeded the state average by at least an inch ([Table 3](#)). The presence of all those year classes indicates that walleye recruitment is occurring even in years when walleye are not stocked. This indicates that walleyes are reproducing naturally to some extent in most years. It appears that the walleye population in Bear Lake is very healthy at this time, and that the current stocking regime is adequate for enhancing the population of naturally reproduced fish.

Other species captured in the 1999 survey included bowfin, brown bullhead, yellow bullhead, bluntnose minnow and white sucker. Bowfins are important native predators; they help to thin panfish populations and keep panfish from stunting. Bullheads are, most likely, underutilized as a fisheries resource. Bluntnose minnows are an excellent source of forage for piscivorous fishes. Smaller white suckers can be utilized as forage by predators, but large populations of adult suckers can compete for food with young walleye, yellow perch, and other more desired species.

A total of 11 turtles were captured in the fyke nets during the 1999 survey. Six of those were painted turtles ranging from 5 to 7 inches in carapace length. Four snapping turtles from 8 to 13 inches were also captured, along with one 10-inch map turtle. All turtles were released alive.

### **Management Direction**

Bear Lake will continue to be managed as one of northwestern Michigan's better coolwater fishing lakes. Walleye stocking will continue to supplement natural reproduction. Walleye stocking rates are currently 25 fingerlings/acre (43,000 fish), every third year. Bear Lake was stocked with 43,366 spring fingerlings in 1999. In years when walleye are stocked, Serns Index sampling should occur the following fall to assess the success of the plant. Other gamefish and panfish species will continue to support excellent populations through natural reproduction.

Our goal through the first part of the 21st century will be to maintain the excellent health of the current fishery and continue the walleye stocking program. If time and manpower allow, assessing the extent of walleye natural reproduction (possibly through a Serns index electroshocking survey) in Bear Lake should become a priority. Based on the results of such a study, the walleye stocking program could be further refined to reduce competition of stocked walleye with naturally reproduced walleye. Also, electroshocking will provide more information on prey species in Bear Lake, as well as information on the reproduction and recruitment of other species.

Another goal for Bear Lake for the 21st century should be to maintain the health of the aquatic ecosystem. All remaining riparian wetlands should be protected from development. Such wetlands are a critical component to the lake ecosystem and should remain in a natural state. Other goals for Bear Lake must include educating riparian landowners about ecologically wise management practices for their lands and shoreline.

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### **References**

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Schneider, James C. and R. N. Lockwood. 1979. Effects of Regulations on the fisheries of Michigan lakes. Michigan Department of Natural Resources, Fisheries Research Report No. 1872.

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**Table 1.**-Fish stocked in Bear Lake, Manistee County, 1928-2000.

Year	Species	Number	Size
1928	Bluegill	2500	?
	Smallmouth bass	2000	?
1933	Walleye	200,000	fry, most likely
1934	Walleye	?	fry
	Yellow perch	2,500	7 mo.
1935	Walleye	255,000	fry
	Great Lake shiners (spp?)	500,000	Adult?
1936	Walleye	375,000	fry
	Great Lake shiners (spp?)	250,000	Adult?
1937	Walleye	375,000	fry
1938	Walleye	200,000	fry
	Yellow perch	15,000	7 mo.
1939	Walleye	200,000	fry
1940	Walleye	160,000	fry
1942	Walleye	300,000	fry
1960	Walleye	2,500	fingerlings
1961	Walleye	8,960	fingerlings
1962	Walleye	24,285	fingerlings
1984	Walleye	10,026	fall fingerlings
1985	Walleye	9,500	spring fingerlings
1986	Walleye	8,084	spring fingerlings
1989	Walleye	2,372	fall fingerlings
1990	Walleye	11,542	spring fingerlings
	Walleye	23,252	fall fingerlings
1991	Walleye	35,213	spring fingerlings
1993	Walleye	92,870	fall fingerlings
1995	Walleye	17,187	spring fingerlings
1999	Walleye	43,366	spring fingerlings
2000	Walleye	48,705	spring fingerlings

**Table 2.**-Number, weight and length (inches) of fish collected from Bear Lake with small-mesh fyke nets, large mesh-fyke nets, and inland gillnets, June 21-25, 1999.

Species	Number	Percent by number	Weight (pounds)	Percent by weight	Length	Average length	Percent legal size <sup>2</sup>
					range (inches) <sup>1</sup>		
Black crappie	12	0.7	2.95	0.6	4-9	7.3	67
Bluegill	899	48.9	53.43	10.4	2-9	3.5	42
Bluntnose minnow	2	0.1	0.03	0.0	3-3	3.5	100
Bowfin	14	0.8	36.57	7.1	3-26	14.8	100
Brown bullhead	25	1.4	20.67	4.0	10-13	12.0	100
Green sunfish	2	0.1	0.09	0.0	3-4	4.0	0
Largemouth bass	17	0.9	12.63	2.5	7-18	10.5	9
Northern pike	9	0.5	16.85	3.3	15-29	19.4	23
Pumpkinseed	15	0.8	3.58	0.7	3-8	6.4	38
Rock bass	182	9.9	52.31	10.2	2-10	6.9	77
Smallmouth bass	36	2.0	28.78	5.6	3-15	10.9	4
Walleye	28	1.5	58.69	11.4	11-22	18.2	91
White sucker	88	4.8	208.43	40.6	10-21	18.0	100
Yellow bullhead	16	0.9	7.23	1.4	3-12	9.1	65
Yellow perch	495	26.9	10.66	2.1	2-8	3.5	14
Total	1,840	100	512.9	100			

<sup>1</sup> Note some fish were measured to 0.1 inch, others to inch group: e.g., "5"=5.0 to 5.9 inch, "12"=12.0 to 12.9 inches; etc.

<sup>2</sup> Percent legal size or acceptable size for angling. Legal size or acceptable size for angling is given in parentheses.

**Table 3.**-Average total weighted length (inches) at age, and growth relative to the state average, for fish sampled from Bear Lake with small-mesh fyke nets, large-mesh fyke nets, and inland gill nets June 21-25, 1999.

Species	Age								Mean Growth Index
	1	2	3	4	5	6	7	10	
Black crappie	5.1 (4)	8.2 (3)	9.0 (2)	8.6 (2)	...	...	...	...	...
Bluegill	4.0 (1)	4.8 (20)	6.1 (10)	7.6 (13)	7.9 (8)	8.9 (2)	...	...	+1.0
Bowfin	...	25.1 (1)	23.6 (4)	28.0 (1)	...	...	...	...	...
Green sunfish	4.0 (1)	...	...	...	...	...	...	...	...
Largemouth bass	8.6 (7)	10.0 (6)	9.3 (1)	... ...	14.7 (1)	14.3 (1)	... ...	18.1 (1)	+2.3
Northern pike	17.3 (2)	16.9 (5)	... ...	21.8 (1)	... ...	30.5 (1)	25.2 (1)	...	-2.1
Pumpkinseed	...	5.5 (2)	5.9 (5)	6.6 (3)	7.3 (3)	8.1 (1)	...	...	+0.7
Rock bass	...	4.6 (8)	5.7 (12)	7.0 (12)	8.0 (15)	8.9 (9)	9.6 (1)	...	+0.6
Smallmouth bass	4.8 (1)	8.3 (9)	10.5 (4)	12.0 (6)	13.3 (9)	13.5 (6)	...	...	-1.2
Walleye	11.3 (2)	14.6 (2)	16.7 (4)	18.5 (5)	19.0 (9)	21.2 (3)	21.6 (3)	...	+1.7
Yellow perch	...	4.4 (10)	5.8 (6)	6.6 (5)	7.2 (3)	7.1 (9)	8.6 (1)	...	-1.6

**Table 4.**-Estimated age frequency (percent) of fish caught from Bear Lake with small-mesh fyke nets, large-mesh fyke nets, and inland gill nets, June 21-25, 1999.

Species	Age								Number caught
	1	2	3	4	5	6	7	10	
Black crappie	36	27	18	18	...	...	...	...	12
Bluegill	2	37	19	24	15	4	...	...	899
Bowfin	17	67	17	...	...	...	...	...	14
Green sunfish	100	...	...	...	...	...	...	...	2
Largemouth bass	41	35	6	---	6	6	---	6	17
Northern pike	20	50	...	10	...	10	10	...	9
Pumpkinseed	...	14	36	21	21	7	...	...	15
Rock bass	...	14	21	21	26	16	2	...	182
Smallmouth bass	3	26	11	17	26	17	...	...	36
Walleye	7	7	14	18	32	11	11	...	28
Yellow perch	...	29	18	15	9	26	3	...	495

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