

## **Big Bass Lake**

Lake County

Big Sable River Watershed; last surveyed in 2018

**Mark A. Tonello, Fisheries Biologist**

### **Environment**

Big Bass Lake is a 290-acre natural lake in Elk and Sauble Townships in northwestern Lake County, approximately 5 miles southwest of Irons, Michigan. Big Bass Lake is irregularly shaped, with four distinct lobes. Most of the lake is less than 15 feet deep, although there are three different holes that are in excess of 30 feet. The deepest point is approximately 45 feet deep, in the northern basin of the lake. Big Bass Lake has approximately 7.1 miles of shoreline, including four islands. The substrate in the lake is mostly organic, with sand and a few patches of marl in the shoreline areas. The shoreline is highly developed with many homes surrounding the lake and only a few areas of undeveloped shoreline. The geography in the vicinity of Big Bass Lake is hilly and forested, with predominantly sandy soils. Big Bass Lake lies within the boundaries of the Manistee National Forest (administered by the US Forest Service or USFS), although no USFS land directly abuts Big Bass Lake.

Big Bass Lake is in the Muckwa Creek subwatershed of the Big Sable River watershed and has one stream flowing into it- the outflow from Little Bass Lake, which lies just to the northeast. The Little Bass Lake outlet flows directly into Big Bass Lake through a short ¼ mile stream channel. The outflow from Big Bass Lake is intermittent, but when it carries water it flows into a stream channel that eventually joins Muckwa Creek after flowing through a series of wetlands.

Public access to Big Bass Lake is gained at a Michigan Department of Natural Resources (MDNR) boat launch located on the southwestern lobe of the lake. The site has a hard surface boat launch with one skid pier, a pit toilet, and parking for 10 vehicles and trailers. Aside from the MDNR access site, riparian land ownership on Big Bass Lake, including the islands, is private.

Because it has extensive shallow areas, Big Bass Lake has an abundance of aquatic vegetation. In the past, there have been problems with Eurasian milfoil and other nuisance aquatic vegetation. The first permit for aquatic nuisance treatment on Big Bass Lake was issued by the Aquatic Nuisance Control Section (ANC) of the Michigan Department of Environmental Quality in 2009. The most recent permit from ANC for chemical treatment of aquatic nuisance macrophytes (issued in April 2019) allows the treatment of up to 95 acres of the lake but does not specify exactly which chemicals will be used or the species to be targeted.

The primary citizen group involved with vegetation management is the Big Bass/Little Bass Lake Association (BB/LBLA). The BB/LBLA was established in 1981 to "maintain, preserve, regulate, improve, and beautify the area" and "promote the common benefit and enjoyment of residents of land located on or in proximity to the lakes" (MDNR files, Cadillac office). The primary focus of the BB/LBLA is to oversee the aquatic nuisance weed treatments on Big Bass Lake, in addition to hosting social functions for lakefront landowners.

There is a local ordinance related to the operation of watercraft on Big Bass Lake. It includes a moratorium on high speed boating (including waterskiing and tubing) between the hours of 6:30 pm and 10:30 am the next day.

### **History**

The first recorded fish stocking of Big Bass Lake took place in 1905, when Largemouth Bass were stocked by the Michigan Fish Commission (MFC; Table 1). From that time until the mid-1940s, fish were sporadically stocked by the MFC and the Michigan Department of Conservation (MDOC; the precursor to today's MDNR). In addition to Largemouth Bass, other species stocked into Big Bass Lake included Bluegill, Smallmouth Bass, and Warmouth. Eventually, MDOC Fisheries Researchers determined that stocking native species on top of existing populations was counter-productive and a waste of finances. Most native species can sustain themselves through natural reproduction.

The first fisheries survey of Big Bass Lake was conducted by the MDOC in the summer of 1953 (Taube and Crowe 1953). Seines, gill nets, and hook and line were used in the survey. Species recorded as caught included Bluegill, Largemouth Bass, Northern Pike, Pumpkinseed Sunfish, Rock Bass, and Yellow Perch (Table 2). The study documented satisfactory growth rates for most species and mentioned high angler success rates. The authors noted that spawning habitat for native species was adequate and that no stocking of these species was necessary.

Another fisheries survey of Big Bass Lake was conducted by MDNR in June of 1982. The survey consisted of trap nets, fyke nets, and inland gill nets. Twelve different fish species were caught in the survey (Table 2). The survey documented respectable panfish (Bluegill, Black Crappie, and Yellow Perch) populations with growth rates at or above the state average. Growth rates for Largemouth Bass however were well below the state average, and of 61 caught in the survey, only 4 exceeded 14 inches in length. One 13-inch Cisco was also caught in the survey, marking the only time that Cisco have been caught or reported in Big Bass Lake. Cisco (also known as Lake Herring) are listed as a State-threatened species in Michigan and have been well-documented in Little Bass Lake, so it is likely that the Cisco caught in the 1982 survey was a migrant from Little Bass Lake.

The next fisheries survey of Big Bass Lake was conducted in 1998. The 1998 effort consisted of large mesh fyke nets, small mesh fyke nets, and inland gill nets (Tonello 2004). The 1998 survey showed a fair population of Bluegill. Other panfish species caught included Black Crappie, Green Sunfish, Pumpkinseed Sunfish, Rock Bass, and Yellow Perch. Gamefish caught in the survey included Largemouth Bass, Northern Pike, and one Smallmouth Bass. Very few of the Largemouth Bass captured in the survey exceeded the minimum legal size of 14 inches, and Largemouth Bass were growing 2.1 inches below the state of Michigan average. Other species caught in the 1998 survey included Golden Shiner and Yellow Bullhead (Table 2). Fish species seen in earlier surveys but not in 1998 included Warmouth, Cisco, Brown Bullhead, and Black Bullhead.

In response to angler concerns regarding emaciated and sickly-looking Largemouth Bass, an electrofishing survey was conducted on August 3rd, 2005 (Tonello 2005). A total of 129 Largemouth Bass were caught in the survey. Sixty were sacrificed and sent to the Aquatic Animal Health Laboratory at Michigan State University for testing, and they tested positive for Largemouth Bass Virus (LMBV). Of the 129 Largemouth Bass caught in the survey, only one was larger than the minimum size limit of

14 inches. Also, age and growth analysis indicated that the Largemouth Bass caught in the 2005 survey were growing well below the State of Michigan average (Tonello 2005).

While managers recommended changing the minimum size limit on bass in Big Bass Lake to 10 inches (Tonello 2005), this regulation change did not happen until 2010. After continued angler complaints regarding overabundant small Largemouth Bass and poor growth rates, the minimum size limit on bass in Big Bass Lake was reduced to 10 inches (14 inches is the standard statewide size limit). This regulation remains in place at present. Although the primary target of the regulation is Largemouth Bass, Smallmouth Bass are also included, even though they are rarely found in Big Bass Lake.

Since 1994, a total of 12 exceptional fish caught from Big Bass Lake have been entered in the MDNR Fisheries Division Master Angler program. Master Angler species caught from Big Bass Lake have included Bluegill, Black Crappie, and Northern Pike (Table 3). Bluegill was the most numerous species entered, with 9 entries.

### **Current Status**

The most recent comprehensive fisheries survey of Big Bass Lake was conducted in June of 2018. The survey consisted of netting, electrofishing, and habitat evaluation. In this survey, fish sampling was conducted with trap nets, large-mesh fyke nets, small-mesh fyke nets, inland gill nets, minnow seines, and electrofishing gear. The netting portion of the survey occurred from June 11-15, and the electrofishing and seining portion was completed on June 26. Habitat evaluation and water chemistry data were collected in August 2018.

In the June netting portion of the 2018 survey, a total of 891 fish representing 18 different species were captured (Table 4). Bluegill was the most frequently collected species in the survey, with 380 caught from 1-10 inches. Other panfish species caught included Black Crappie (21 individuals ranging from 3 to 13 inches), Pumpkinseed Sunfish (21 caught from 3-7 inches), Rock Bass (25 caught ranging from 2 to 10 inches), and Yellow Perch (53 caught ranging from 1 to 12 inches). Largemouth Bass were the most numerous game fish species caught in the survey, with 131 individuals ranging from 1 to 14 inches in size. Only six Northern Pike were caught, ranging from 19 to 27 inches in length. Mean lengths at age for all species (except for Largemouth Bass) captured during the netting portion of the 2018 survey were substantially higher than the state average lengths at age (Table 5). There were not enough Northern Pike collected during the 2018 survey to make inferences regarding age and growth.

Limnological and shoreline data were collected on August 17 and 24, 2018 (Table 6). Big Bass Lake had 22.7 docks/km, 21.3 dwellings/km, 28.1% shoreline armoring, and 40.1 submerged trees/km. Big Bass Lake is heavily developed with cottages and residences along most of its shoreline. Compared to other deep, medium-sized lakes in Michigan and in the Central Lake Michigan Management Unit (CLMMU; basically, the northwestern portion of the Lower Peninsula), Big Bass Lake has an above-average number of docks and dwellings, and a high percentage of armored shoreline (Wehrly et al. 2015; Table 6). However, Big Bass Lake did have an above-average amount of submerged trees per kilometer.

### **Analysis and Discussion**

Big Bass Lake remains an excellent destination for anglers, particularly those with an interest in panfish. Angler reports for those species remain positive. Other than Largemouth Bass, the 2018 MDNR fisheries

survey of Big Bass Lake found healthy fish populations. Good numbers of "keeper" sized Bluegill, Pumpkinseed Sunfish, Black Crappie, and Yellow Perch are available and growth rates for those species were above average. CPE (catch per effort) rates for Bluegill in trap nets and large-mesh fyke nets in the 2018 Big Bass Lake survey were generally better than other medium-sized, deep lakes in the northwestern Lower Peninsula of Michigan (Wehrly et al. 2015), although other parts of the state do show higher catch rates. The size structure of the Bluegill population seems to be better than it has been in the past. According to the Schneider Index, which is a scoring/ranking system for Bluegill populations (Schneider 1990), the Bluegill population ranked as "Excellent" in the 2018 survey (Table 7). In previous surveys, the Bluegill population had ranked as "Satisfactory".

Largemouth Bass in Big Bass Lake however, continue to grow slowly and rarely exceed 14 inches, with the reason(s) for this being unclear. Despite this, Largemouth Bass are very abundant in Big Bass Lake. CPE rates for the electrofishing and fyke net efforts of the 2018 Big Bass Lake survey were better than those from other medium-sized, deep lakes in the northwestern lower peninsula and other areas of the state (Wehrly et al. 2015). With the 10-inch minimum size limit in place, their abundance provides anglers with an excellent opportunity for harvest. Although Northern Pike were not well represented in the 2018 survey, angler reports indicate a viable fishery in the lake, with some very large Northern Pike present. Northern Pike are often pursued in the winter through the ice by spear fishers and anglers fishing with tip ups.

The Largemouth Bass in Big Bass Lake have likely remained infected with LMBV. While LMBV can cause fish kills in some lakes, none have been reported in Big Bass Lake. Fortunately, LMBV is not known to infect humans. Exactly how LMBV is spread is unknown but moving fish from one lake to another (despite this being illegal) is a potential cause. There is no known eradication method for LMBV.

### **Management Direction**

The 10-inch minimum size limit on bass should remain in effect on Big Bass Lake. Since Largemouth Bass in Big Bass Lake rarely grow to 14 inches, the 10-inch minimum size limit allows anglers the opportunity to harvest the smaller bass for human consumption. The regulation has been popular with anglers. Comprehensive fisheries surveys should be conducted periodically to monitor population levels and growth rates of important species such as panfish, Largemouth Bass, and Northern Pike.

Eurasian milfoil will likely continue to require treatment, at least in some years. We recommend small-scale spot treatments for dealing with the Eurasian milfoil, but only when absolutely necessary. We also recommend that native plants not be treated. A diverse aquatic plant community reduces shoreline erosion and is critical to healthy fish communities. Many of the desired fish species in Big Bass Lake, including Northern Pike, Largemouth Bass, Bluegill, Black Crappie, Pumpkinseed Sunfish, and Yellow Perch require healthy native aquatic plant communities for spawning and juvenile habitat. In addition, a healthy, robust aquatic plant community will help sequester nutrients in Big Bass Lake and keep algae blooms at a minimum.

The remaining riparian wetlands adjacent to Big Bass Lake act as natural filters that remove sediment and other pollutants before they reach the lake. These wetlands should be protected and considered critical to the continued health of the lake's aquatic community. The Big Bass Lake shoreline is already more developed than most other lakes in Michigan. Future riparian development and wetland loss would likely diminish water quality and degrade fish habitat.

Appropriate watershed management is necessary to sustain healthy biological communities, including fish, invertebrates, amphibians, reptiles, birds and aquatic mammals. For inland lakes this means maintaining good water quality by limiting sediment and nutrient inputs, preserving areas of natural shoreline, (especially shore contours and vegetation), and avoiding removal of submerged logs and brush piles. Guidelines for protecting fisheries habitat in inland lakes can be found in Fisheries Division Special Report 38 (O'Neal and Soulliere 2006). Also, the Michigan Natural Shoreline Partnership, an organization dedicated to promoting natural shoreline landscaping to protect Michigan's inland lakes (<http://www.mishorelinepartnership.org/>), can provide guidance and training on how best to manage the land/water interface for the benefit of the Big Bass Lake ecosystem.

### **References**

- O'Neal, R. P., and G. J. Soulliere. 2006. Conservation guidelines for Michigan lakes and associated natural resources. Michigan Department of Natural Resources, Fisheries Special Report 38, Ann Arbor.
- Schneider, J. C. 1990. Classifying bluegill populations from lake survey data. Michigan Department of Natural Resources, Fisheries Division, Technical Report 90-10, Ann Arbor.
- Taube, C. M. and W. R. Crowe. 1953. Results of Fishery Investigations Made in 1953 on Fourteen Lakes in Lake County. Michigan Department of Conservation, Institute for Fisheries Research Report 1389, Ann Arbor.
- Tonello, M. A. 2004. 1998 Fisheries Survey, Big Bass Lake, Lake County. Michigan Department of Natural Resources, Cadillac.
- Tonello, M. A. 2005. 2005 Fisheries Survey, Big Bass Lake, Lake County. Michigan Department of Natural Resources, Cadillac.
- Wehrly, K. E., D. B. Hayes, and T. C. Wills. 2015. Status and trends of Michigan inland lake resources 2002-2007. Michigan Department of Natural Resources Fisheries Report 08. Institute for Fisheries Research, Ann Arbor.

Table 1. Fish stocked in Big Bass Lake, Lake County, 1905-2019.

Year	Species	Number	Age
1905	Largemouth Bass	2,000	fingerlings
1908	Warmouth	750	yearlings
1910	Smallmouth Bass	6,500	fingerlings and fry
	Warmouth	500	yearlings and 2 yr.
1929	Bluegill	3,000	5 months
1930	Smallmouth Bass	2,800	1 month
1939	Bluegill	15,000	3 months
	Largemouth Bass	4,000	3 months
	Yellow Perch	7,000	7 months
1940	Bluegill	5,000	3 months
	Largemouth Bass	200	3 months
1941	Bluegill	5,000	3 months
	Largemouth Bass	1,000	3 months
1942	Bluegill	11,559	4 months
	Largemouth Bass	600	4 months
1943	Bluegill	454	4 months
	Largemouth Bass	313	4 months
1944	Bluegill	4,632	3 months
	Largemouth Bass	1,500	3 months

Table 2. Presence/absence of fish species in historical fisheries surveys of Big Bass Lake, Lake County.

Species	1953	1982	1998	2005	2018
Black Bullhead		x			
Black Crappie		x	x		x
Bluegill	x	x	x	x	x
Bluntnose Minnow					x
Brook Silverside					x
Bowfin					x
Brown Bullhead		x			x
Central mudminnow					x
Channel Catfish					x
Cisco		x			
Golden Shiner		x	x		
Green Sunfish			x	x	x
Johnny Darter					x
Iowa Darter					x
Largemouth Bass	x	x	x	x	x
Northern Pike	x	x	x	x	x
Pumpkinseed	x	x	x		x
Rock Bass	x	x	x	x	x
Smallmouth Bass			x		
Tadpole Madtom					x
Warmouth		x			
Yellow Bullhead			x	x	x
Yellow Perch	x	x	x	x	x

Table 3. Michigan DNR Master Angler awards issued for fish caught from Big Bass Lake, Lake County, Michigan, 1994-2019.

Species	Number of Master Angler awards issued
Bluegill	9
Northern Pike	2
Black Crappie	1
Total:	12

Table 4. Number, weight, and length of fish collected from Big Bass Lake, Lake County, with trap nets, large mesh fyke nets, small mesh fyke nets, inland gill nets, seining, and electrofishing, June 11-26, 2018.

Species	Number	Percent by number	Weight (pounds)	Percent by weight	Length range (inches) <sup>1</sup>	Average length	Percent legal size <sup>2</sup>
Black Crappie	21	2.4	9.0	3.0	3-13	8.7	95 (7")
Bluegill	380	42.6	86.2	28.7	1-10	5.4	43 (6")
Bluntnose Minnow	205	23.0	1.1	0.4	1-3	2.4	
Bowfin	9	1.0	54.6	18.2	22-28	25.7	
Brook Silverside	1	0.1	0.0	0.0	3-3	3.5	
Brown Bullhead	1	0.1	0.9	0.3	12-12	12.5	100 (7")
Central Mudminnow	2	0.2	0.0	0.0	2-2	2.5	
Channel Catfish	1	0.1	8.9	3.0	29-29	29.5	100 (12)
Green Sunfish	8	0.9	0.3	0.1	1-5	3.4	0 (6")
Iowa Darter	2	0.2	0	0.0	2-2	2.5	
Johnny Darter	2	0.2	0.0	0.0	2-2	2.5	
Largemouth Bass	131	14.7	83.9	27.9	1-14	10.0	2 (14")
Northern Pike	6	0.7	17.9	6.0	19-27	23.5	50 (24")
Pumpkinseed Sunfish	21	2.4	4.3	1.4	3-7	6.0	52 (6")
Rock Bass	25	2.8	6.5	2.2	2-10	6.3	56 (6")
Tadpole Madtom	1	0.1	0.0	0.0	2-2	2.5	
Yellow Perch	53	5.9	11.6	3.9	1-12	7.3	47 (7")
Yellow Bullhead	22	2.5	15.0	5.0	8-12	11.2	100 (7")
Total	891	100	300.2	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 5. Average total weighted length (inches) at age, and growth relative to the state average, for fish sampled from Big Bass Lake, Lake County, with trap nets, large mesh fyke nets, inland gill nets, seining, and electrofishing, June 11-26, 2018. Number of fish aged is given in parenthesis. A minimum of five fish per age group is statistically necessary for calculating a mean growth index, which is a comparison to the state of Michigan average.

Species	0	I	II	III	Age IV	V	VI	VII	VIII	IX	Mean Growth Index
Black Crappie		3.5 (1)	7.9 (11)	8.2 (5)	11.6 (2)		12.9 (1)	13.8 (1)			+0.9
Bluegill		1.9 (20)	3.7 (17)	5.9 (25)	7.4 (8)	8.7 (8)	9.1 (7)	8.9 (3)	9.1 (3)	10.2 (1)	+0.7
Largemouth Bass	1.3 (2)	3.8 (10)	7.3 (26)	10.7 (19)	11.4 (10)	12.4 (8)	12.5 (9)	12.5 (3)	13.6 (2)	14.7 (1)	-1.2
Northern Pike			19.5 (1)	24.2 (2)	27.5 (1)	21.0 (1)	25.3 (1)				--
Pumpkinseed Sunfish		3.1 (1)	4.3 (4)	6.3 (8)	6.6 (8)						+1.0
Rock Bass		2.3 (3)	4.3 (5)	5.6 (4)	7.3 (5)	7.4 (2)	8.6 (3)	10.1 (1)		10.2 (1)	+0.9
Yellow Perch	1.3 (1)	4.1 (6)	6.6 (19)	7.9 (14)	10.4 (7)	10.9 (2)	12.9 (1)				+1.2



Table 6. Shoreline data for Big Bass Lake, Lake County, compared with that for other medium, deep lakes in the Central Lake Michigan Management Unit (CLMMU; essentially the northwestern Lower Peninsula) and statewide (from Wehrly et al. 2015). Sampling was conducted by MDNR Fisheries personnel on August 17 and 24, 2018.

	Total docks per km	Dwellings per km	Percent shoreline armoring	Submerged trees per km
Big Bass Lake	22.7	21.3	28.1	40.1
Average for other medium-sized, deep inland lakes in the CLMMU	10.5	16.3	19.2	4.9
Michigan statewide average for medium-sized, deep inland lakes	12.7	16.7	25.3	14.5

Table 7. Big Bass Lake Bluegill size structure rating using the Schneider Index (Schneider 1990). Schneider Index rankings are as follows: 1 = very poor, 2 = poor, 3 = acceptable, 4 = satisfactory, 5 = good, 6 = excellent, 7 = superior.

Year Surveyed	Trap/fyke net catch average length (in.)	%>6 in.	%>7 in.	%>8 in.	Growth Index	Schneider Index
1982	6.8	87.9	36.0	9.1	-0.4	4.8
1998	6.2	71.4	36.0	9.0	-0.5	4.2
2018	8.0	90.0	78.9	73.9	+0.7	6.2