Ocqueoc Lake

Presque Isle County, T36N, R03E
Ocqueoc River Watershed, last surveyed 2016

Tim Cwalinski, Senior Fisheries Management Biologist

Environment

Ocqueoc Lake is a 132-acre natural lake located in northern Presque Isle County in Michigan's northern Lower Peninsula (Figure 1) between the cities of Cheboygan and Rogers City. The Ocqueoc River enters the lake along the south shore, and exits the lake on the north shore (Figure 2). No official lake level control structure exists on the lake; however, a sea lamprey electrical weir exists on the river a short distance downstream of the lake, and this structure may influence higher lake levels by acting as a type of lowhead dam. The river outlet flows about five miles to Lake Huron, thus, potadromous fish species such as Rainbow Trout (Steelhead) or various salmon species can at times be found in Ocqueoc Lake. The river channel flows through Ocqueoc Lake, and most of the lake is shallower than 20 feet (Figure 3), with the deepest area greater than 30 feet deep. Despite this shallower nature, the lake stratifies thermally and will typically have lower dissolved oxygen levels in deeper water during the summer. The water of Ocqueoc Lake is typically stained black from the upstream conifer swamps that the river drains. The riparian zone of the lake consists mainly of birch, cedar, and white pine along its hilly slopes (Photo 1). As of 2016, there were 23 small docks along the lake, 31 dwellings, and a low percentage of the shoreline was armored.

The land around Ocqueoc Lake is a mixture of private residences and State of Michigan owned forest. An unimproved boat launch is located along the south shore and is owned by Presque Isle County (Figure 3; Photo 2). Parking for trucks and trailers is along the county road adjacent to the launch, and is very limited in space.

History

Stocking records indicate five species of fish were stocked into Ocqueoc Lake from 1933 through 1945. Yellow Perch fall fingerlings were stocked from 1933 through 1945, while Walleye fry were stocked in 1935. Brook Trout yearlings, and Brown and Rainbow trout adults were all stocked in 1944. This was the extent of early stocking efforts by the Michigan Department of Conservation (MDOC). MDOC conducted winter creel census at various northern Michigan lakes during 1935-1936, including Ocqueoc Lake. It was found that no winter fishing pressure occurred on the lake during that winter (Institute for Fisheries Research 1936).

A fairly intensive aquatic community survey was conducted at the lake in 1947 by MDOC with the interest of future trout stocking efforts by managers. This survey examined lake limnology, aquatic vegetation, and the fish community. Fishing pressure was considered light at that time. Surveyors documented that Ocqueoc Lake exhibited a summer thermocline and had low dissolved oxygen levels below the thermocline. These conditions are not suitable to summer trout survival and trout stocking was not initiated. Alkalinity values for Ocqueoc Lake ranged from 100-120ppm, while pH through the water column ranged from 7.6-8.0. Submerged aquatic vegetation was considered abundant, while

emergent and floating vegetation was scarce. Numerous "cut" logs could be found in the lake, possibly reflecting the past days of the logging era.

The fish community during the 1947 examination was surveyed with a minimal amount of gear which included experimental gill nets, small mesh trap nets, and seining. The species documented were similar to those found today, although abundances varied. For the panfish community, Yellow Perch were most abundant but were considered severely stunted in size. Pumpkinseed and Rock Bass were common and both had average growth rates; Bluegill were scarce. For predators, Northern Pike were common and displayed average growth and size, whereas Largemouth Bass and Walleye were uncommon. Based on the lake survey, Ocqueoc Lake had an acceptable warm and cool water fish community.

Nearly four decades passed until the fish community was surveyed again at Ocqueoc Lake in 1984. During that span (starting 1973), the minimum size limit for Northern Pike was removed in the lakes of the entire Ocqueoc River watershed, including Ocqueoc Lake. This was in attempt to liberalize harvest and reduce pike stunting by reducing their numbers. The 1984 fish community assessment was done in June by the Michigan Department of Natural Resources (MDNR). Effort consisted of 8 experimental gill net lifts, and 39 net nights of trap and fyke nets. Fourteen species of fish were collected during the survey. The purpose of the survey was to evaluate current numbers of Walleye in the lake, and to determine future stocking suitability of this species. Yellow Perch were again considered the most abundant panfish, yet no perch older than age 5 or larger than 8 inches were collected, both indicators of a stunted population. Black Crappie were collected for the first time. They were considered abundant, with most in the 5-8 inch size range and exhibiting good growth rates. Other panfish species were caught in low numbers. The Northern Pike population was showing normal growth rates compared to statewide averages, but very few fish were larger than 24 inches. Largemouth Bass were absent during the survey, and Smallmouth Bass were uncommon. A total of 21 Walleye were collected in the 1984 survey represented by 7 age classes. Their numbers are likely traced back to stocking efforts prior to the 1984 survey (although no records could be found). White Sucker were caught in large numbers and sizes. Based on the survey results, MDNR managers recommended: 1) stocking 6,500-13,000 spring fingerling Walleye every 2-3 years, and 2) manually removing overabundant White Sucker and Yellow Perch from the lake. Of these recommendations, only one was carried out (future Walleye stocking).

Spring fingerling Walleye stocking efforts by MDNR began in 1986 and are ongoing (Table 1). Stocking efforts were initially based on the potential for good growth of Walleye in Ocqueoc Lake, and limited natural recruitment. The original stocking rates were near 100 spring fingerlings per acre every three years. Today, stocking rates are near 75/acre every other year.

The next fish community assessment was made by MDNR in 1998 with the purpose of evaluating Walleye stocking. Sampling effort consisted of 23 large mesh trap net lifts, and 11 fyke (small and large mesh) net lifts. Notes from the survey indicated a balanced fish community, with Northern Pike, Walleye, and Black Crappie being the most attractive game fish for anglers. Black Crappie were again common, ranging in size from 4-12 inches, with most in the 6-9 inch size range. Growth of crappie was considered good, and many age classes were observed. Yellow Perch were again very common, particularly in the 3-5 inch size range, and demonstrated slow growth. Despite a decade of Walleye stocking, perch numbers remained high and were stunted in size. Rock Bass were considered common

and Pumpkinseed uncommon. Bluegill had become a more prominent member of the Ocqueoc Lake community by this time, but were still considered uncommon. Seven age classes of this species were observed during the 1998 survey, with fish up to 10 inches collected, though most were in the 7-8 inch size range.

The predator species composition was similar to past surveys, with Largemouth and Smallmouth bass found in very low numbers. Northern Pike were common, demonstrated fair growth rates, but most were in the 18-23 inch size range. Nine year classes of Walleye were collected, with fish up to 29 inches long at age 12. It was apparent that Walleye could live long in Ocqueoc Lake if given the chance. However, growth of this species was considered slow. Legal size (15 inches) was met around age 5. Anglers reported catching Walleye, but overall fishing pressure remained unknown.

Fall juvenile walleye indexes were completed at Ocqueoc Lake following stocking years in 2005 and 2013. MDNR used 2 hours of nighttime boomshocking in fall 2005 to capture 11 Walleye in 3.1 miles of shoreline. Seven of those fish were age 0 fish. A subsample was analyzed for OTC (oxyteracycline) analysis which is an antibiotic that MDNR uses to stain bony structures of stocked fingerlings prior to stock out as a means of marking stocked Walleye. Eighty-three percent (5/6) of the sample were stocked fish indicating stocking contribution, but overall low survival. A similar index was made in fall 2013 (another stocking year, Table 1) by the Little Traverse Bay Band of Odawa Indians. Effort consisted of 1.5 hours of boomshocking 3 miles of shoreline. No walleye were collected that night, but efforts indicated abnormally low water temperatures for this type of survey.

Current Status

The most recent fish community survey was conducted at Ocqueoc Lake by MDNR Fisheries Division in 2016. Effort consisted of 2 large mesh trap net nights (lifts), 9 large mesh fyke net nights, 4 small mesh fyke net nights, 4 experimental gill net nights, 4 small mesh fyke net nights, and 3 seine hauls. Each lift was equal to an overnight gear sit in the lake. This survey was conducted in mid-May when the water temperature was 55-58 degrees Fahrenheit. 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 in late-May when the water temperature was 66 degrees Fahrenheit. In addition, a water temperature and dissolved oxygen profile was done at Ocqueoc Lake on August 30, 2016 (Table 2). As in the past, the water was thermally stratified, and dissolved oxygen in the deeper water declined to levels unsuitable to survival and growth of fish (below 13 feet of water).

Twenty-four species of fish were collected during the 2016 survey (Table 3), which was a higher diversity than for most northern Michigan natural lakes. Total catch was 1,416 fish weighing 497 pounds. Large predator fish included Largemouth Bass, Walleye, and Northern Pike and made up 5% of the total catch by number and 29% by weight. Non-game species such as bullheads and suckers contributed a signficant amount to the catch which is similar to many other northern Michigan waterbodies. The panfish community was dominated by Bluegill, Rock Bass, and Yellow Perch, and to a lesser extent, Black Crappie and Pumpkinseed (Table 3). Large numbers of shiners were caught as well as some migratory trout.

Bluegill, once uncommon in Ocqueoc Lake, have become a more important component of the fish community, being the most abundant panfish captured during the 2016 survey. Bluegill ranged from 1-8 inches in length (Table 4) and were represented by seven ages (Table 5). A marginal length-

distribution of fish was demonstrated (Table 3), with fewer Bluegill exceeding 8 inches captured. It is likely that some of the Bluegill in Ocqueoc Lake are migrants from lakes in the upper Ocqueoc River drainage, or from nearby Orchard Lake. Growth for this species was considered average and less when compared to specimens from the 1998 survey (Table 5).

The next most abundant panfish captured was Rock Bass. This species grew up to 10 inches (Table 4) and were considered common. The Yellow Perch were again common, and their size structure was similar to what was exhibited in all previous surveys at Ocqueoc Lake. Most perch were 3-4 inches (Table 4), growth was considered slow (Table 5), and fish older than age 6 were not captured. Black Crappie were less abundant in the 2016 survey compared to surveys of the 1980s and 1990s. This is a highly cyclic species, and it is unknown if they are just at lower densities now and will likely be more prominent in the future. Crappie ranged from 1-13 inches, with fair numbers captured in the larger size ranges (10-13 inches) (Table 4). Crappies ranged from age 1-9 (Table 5).

Northern Pike remain the most abundant predator game fish in Ocqueoc Lake (Table 3), ranging in length from 11-31 inches (Table 4), and ages 1-7 (Table 5). There appears to be a good number of pike in the 12-25 inch size range. There is no minimum size limit on pike, and the bag limit is 5. Despite this, some larger (24 inches and larger) pike are available to anglers. Northern Pike growth is average in Ocqueoc Lake when compared to the statewide averages for this species.

Walleye and Largemouth Bass were caught in equal numbers during the 2016 survey. Walleye were less abundant in this survey compared to previous surveys, despite continued stocking efforts (Table 1). Fish up to 22 inches were collected, as well as some younger fish (Table 4). Five year classes were represented in the 2016 catch, compared to 9 year classes in 1998, and 7 year classes in 1984. Largemouth Bass are sustained in Ocqueoc Lake through low levels of natural reproduction. Few legal-sized fish (14 inches and larger) were collected, though more year classes were represented in the 2016 survey compared to past surveys (Table 5).

Both Rainbow and Brook trout were collected in the survey. The migrant Rainbow Trout (Steelhead) were likely fish on their downstream migration back to Lake Huron, following spawning. This species is stocked in the lower river (below the lake), but fish can migrate upstream of the lake. Some tributaries to the upper river support natural reproduction of Brook Trout (and other salmonids). This fish was likely in a downstream migration phase of its life.

Non game large fish such as White Sucker, and various bullhead species made up a significant part of the biomass of Ocqueoc Lake. The sucker population is also likely a mixture of migrating fish from Lake Huron, and fish that live all year around in Ocqueoc Lake. One Common Carp was captured. This is a species highly rare to northern Michigan small inland lakes.

Analysis and Discussion

The current fish and aquatic community of Ocqueoc Lake can be generally characterized as having the following: 1) a panfish community considered to have high diversity but generally low quality, and dominated by Bluegill, Yellow Perch, and Rock Bass, 2) a predator population having moderate diversity and dominated by Northern Pike, 3) Walleye are generally in low numbers and reliant on stocking efforts, 4) Smallmouth and Largemouth bass that are present but in naturally low numbers, 5) a migrant salmonid community, particularly Steelhead, that uses the lake periodically, 6) a fair

population of small bait fish including shiners, Logperch, darters, and chubs, 7) a non-game fish community with moderate diversity and numbers, and 8) a summer lake profile which stratifies thermally and has declining dissolved oxygen levels in the deeper reaches. Management of Ocqueoc Lake fishes has primarily been with the use of statewide regulations, maintenance of most species through natural reproduction, and providing periodic stocking of Walleye in past decades.

The Ocqueoc Lake panfish community is moderately diverse and fairly poor in quality. Species available to anglers include Bluegill, Rock Bass, Yellow Perch, Pumpkinseed, and Black Crappie. Compared to previous surveys, Black Crappie were less abundant in this survey, whereas Bluegill were more abundant but 80% of the catch was age 1 fish. Growth of panfish is typically average to slow when compared to growth rates for each species statewide, with the exception of crappie. Panfish generally do not live long in Ocqueoc Lake. This may be a result of competition for sparse nutrients found throughout this forested watershed lake. Some individual fish do attain quality harvest size though, particularly Black Crappie.

The predator base of Ocqueoc Lake is dominated by Northern Pike. Regulations for this species are liberal in attempt to simplify pike regulations in the entire watershed, and to allow harvest. Some larger pike are available to anglers. Largemouth Bass are not common in the half lake/river environment, nor have they ever been common. Smallmouth Bass were never common in past surveys, and were not even captured in the most recent survey, though likely are still present in low numbers. Walleye are present in Ocqueoc Lake, but not in high numbers currently. This population is likely reliant on stocking efforts to produce a viable fishery.

The rest of the fisheries community is rather diverse and reflective of a lake environment with a river flowing through it. Migratory Steelhead can be caught in the lake on occasion, as likely can Coho and Chinook salmon on occasion. The non-game fish community of suckers and bullheads are very typical of a northern Michigan lake. Zebra mussels have been part of the lake community for a number of years and have likely changed the base of the food chain by their competitive interactions (something that has occurred on many northern Michigan inland lakes).

Management Direction

1) The Ocqueoc Lake aquatic community is relatively stable and should be monitored infrequently. Each game fish plays 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 20-30 years at Ocqueoc Lake. Previous fish community surveys were done in 1984, 1998, and 2016 although survey effort and timing varied.

2) Supplement the marginal Walleye population at Ocqueoc Lake through stocking and continue to produce a fishery. Angler reports, although not in abundance, generally suggest that stocking has improved a Walleye fishery at this lake. Walleye spring fingerlings (1-2 inches) should continue to be stocked in alternating years at a rate of 75/acre (10,000 fingerlings). Walleye have the ability to grow large in this lake, and higher numbers may lead to a small naturally reproducing population that uses the Ocqueoc River. Fingerlings should be OTC marked when possible to allow managers to distinguish wild versus stocked contribution during fall juvenile indices with boomshocking gear.

3) Northern Pike are the most abundant predator in the lake, and are managed with liberal harvest regulations (no size limit, daily bag limit of 5) when compared to the standard State of Michigan pike regulation (24 inch size limit, daily bag limit of 2). This remains appropriate for Ocqueoc Lake and the entire watershed where pike and their spawning habitat are generally abundant, and fish generally are slower growing.

4) Anglers are urged to report catches of all species to the local MDNR fisheries management unit. Such reports are useful for management of the fishery not only currently, but for future managers as well. Current standard State of Michigan fishing regulations are appropriate for Ocqueoc Lake for most species with the exception of Northern Pike.

References

Institute for Fisheries Research. 1936. Creel census on 12 northern Michigan lakes, winter of 1935-36. Report No. 369, Ann Arbor, MI.

Figure 1. Ocqueoc Lake in the northeastern Lower Peninsula of Michigan. Arrow indicates lake.

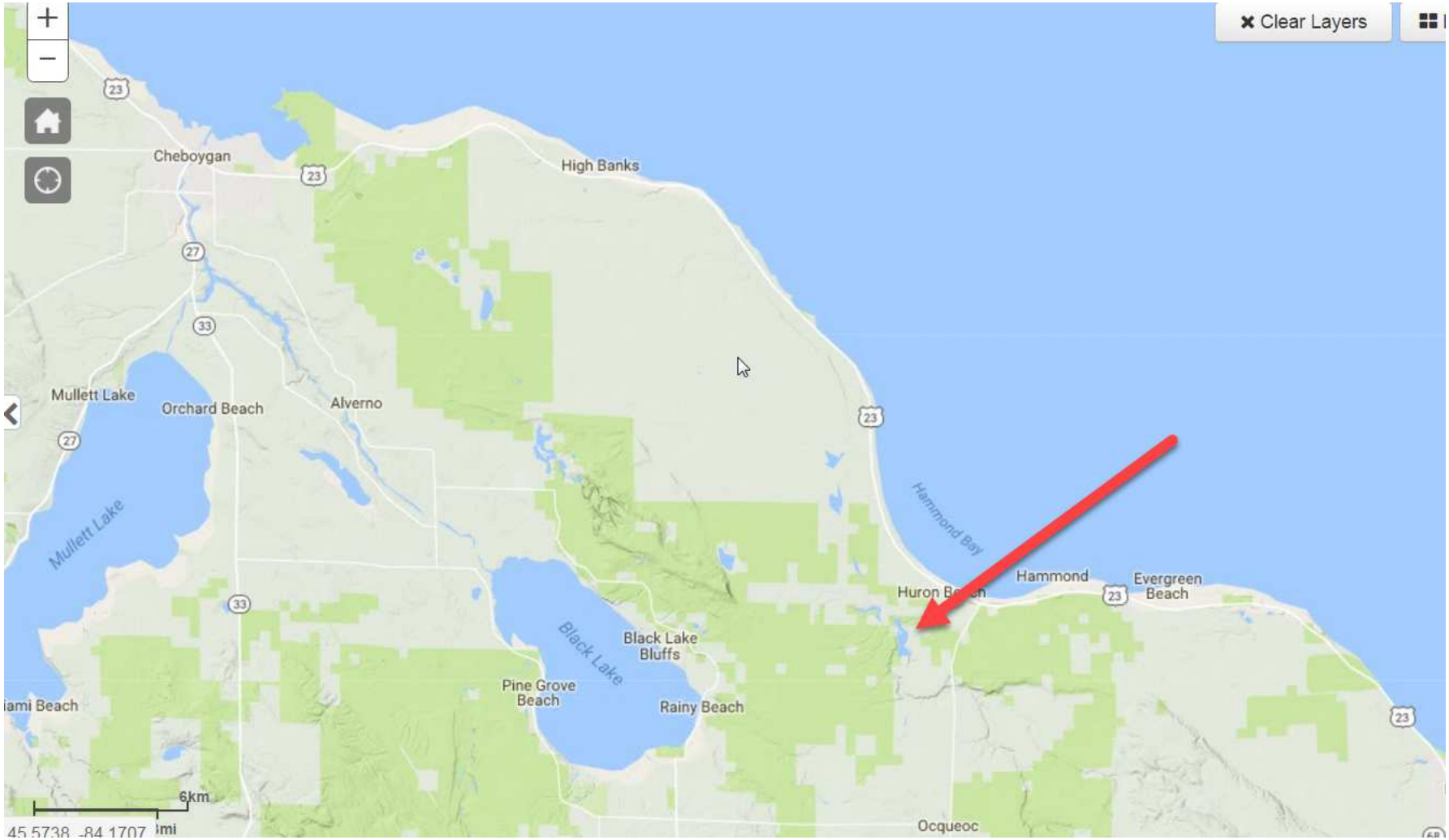

Figure 2. Aerial view of Ocqueoc Lake, showing river that flows in and out of lake, and toward Lake Huron. Arrows indicate river flow.

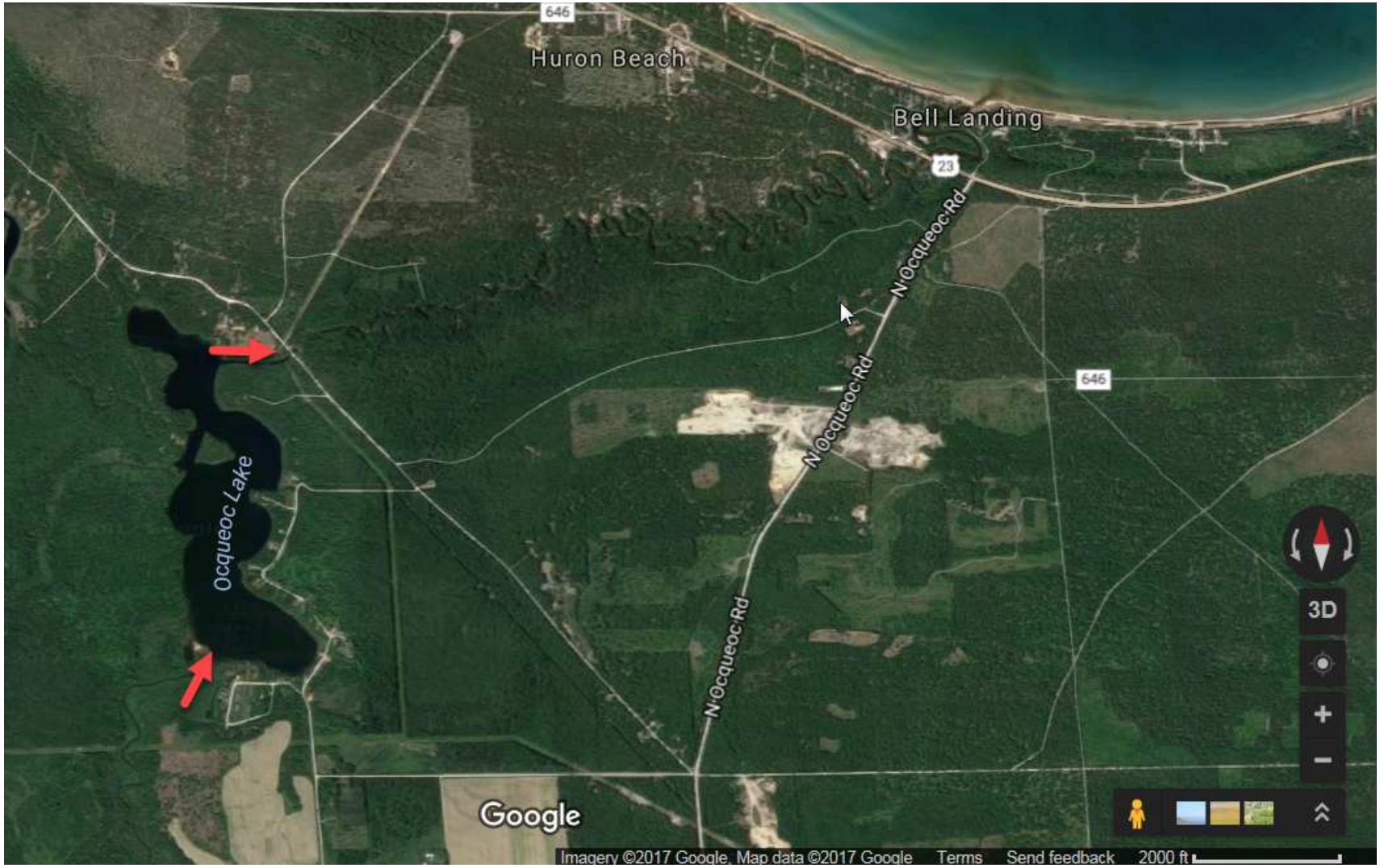

Figure 3. Bathymetric map of Ocqueoc Lake. Red arrow indicates location of unimproved boat launch.

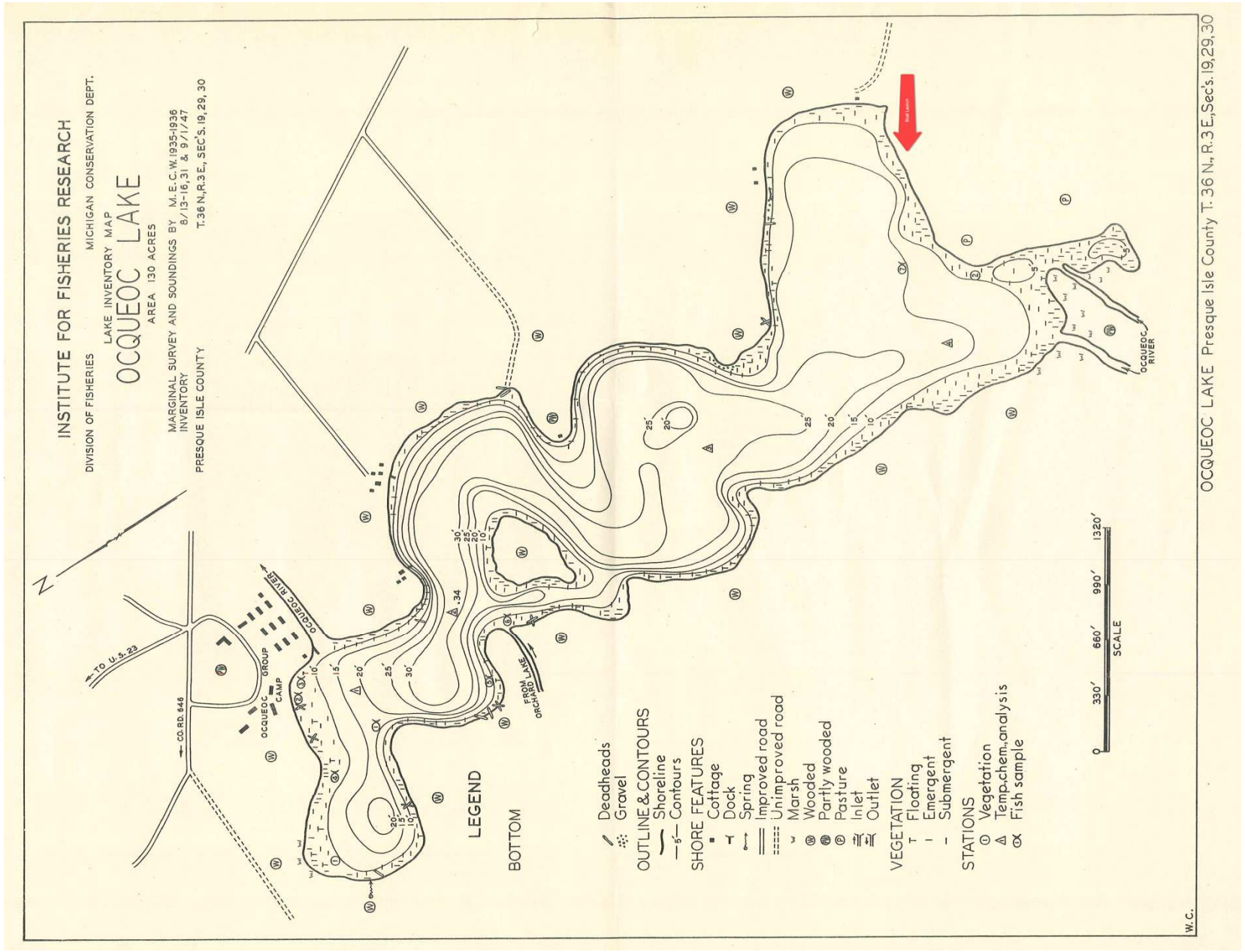

Photo 1. Typical shoreline view of Ocqueoc Lake.

Photo 2. Unimproved boat launch site at Ocqueoc Lake.

Table 1.-Recent spring fingerling walleye stocking history for Ocqueoc Lake, Presque Isle County. All stocking efforts completed by MDNR, except for a private stocking effort in 1993.

Year	Number	Strain	Avg. Length (in)	OTC marked
2015	11,250	Muskegon	1.6	Yes
2013	11,260	Muskegon	1.5	No
2010	10,912	Muskegon	2.0	No
2009	20,787	Muskegon	1.6	No
2008	13,620	Muskegon	2.2	No
2005	11,560	Tittabawassee	1.5	Yes
2003	9,000	Tittabawassee	1.1	Yes
2001	17,500	Tittabawassee	1.1	Yes
1998	16,000	Bay De Noc	1.0	No
1996	10,000	Muskegon	1.7	No
1994	10,000	Muskegon	1.4	No
1993	1,500	--	8.0	No
1991	10,000	Muskegon	1.6	No
1989	16,000	Muskegon	1.3	No
1986	14,000	--	1.4	No

Table 2.-Water temperature and dissolved oxygen profile for Ocqueoc Lake, August 30, 2016.

Depth (ft)	Temperature (F)	Dissolved Oxygen (ppm)
Surface	76	11.3
1	76	11.4
2	76	11.4
3	76	11.4
4	71	10.7
5	69	10.5
6	69	10.4
7	68	9.3
8	67	8.4
9	67	8.0
10	66	7.0
11	66	6.2
12	66	6.1
13	66	5.6
14	65	4.4
15	65	3.3
16	65	2.9
17	63	1.1
18	61	0.5
19	59	0.1
20	57	0.1

Table 3.-Species and relative abundance of fish collected with survey gear at Ocqueoc Lake, May 9 – May 24, 2016.

Common Name	**Number**	**Length Range** *(inches)*	**Weight*** (in)	Growth Index** (in)
Blackchin Shiner	492	1	0.5	
Bluegill	219	1 - 8	9.7	-0.2
Rock Bass	126	1 - 10	35.6	
Black Bullhead	120	3 - 14	64.9	
Yellow Perch	119	2 - 8	4.2	-1.2
White Sucker	63	9 - 21	147.5	
Northern Pike	61	10 - 31	118.1	-0.3
Yellow Bullhead	52	6 - 14	25.6	
Common Shiner	29	1 - 5	0.5	
Brown Bullhead	28	7 - 13	17.6	
Logperch	26	1 - 3	0.1	
Black Crappie	23	1 - 13	15.0	+1.7
Pumpkinseed	14	1 - 8	1.8	+0.5
Golden Shiner	9	3 - 4	0.2	
Walleye	8	9 - 22	18.9	
Iowa Darter	8	1 - 2	0.0	
Largemouth Bass	8	2 - 16	7.4	-0.3
Rainbow Trout	4	18 - 27	22.6	
Johnny Darter	2	2 - 2	0.0	
Brook Trout	1	9	0.3	
Common Carp	1	24	6.8	
Green Sunfish	1	2	0.0	
Hornyhead Chub	1	1	0.0	
Tadpole Madtom	1	1	0.0	
Total	**1,416**		**497.2**	

*growth was calculated based on length-weight regressions, it was not measured in the field

** growth index is the deviation from the statewide average for that species in Michigan

Table 4.-Length-frequency distribution of certain game fishes collected during the May 2016 netting survey at Ocqueoc Lake.

Length (in)	Bluegill	Black Crappie	Rock Bass	Yellow Perch	Walleye	L. Bass	N. Pike
1	174	1	8				
2	3		13	7		1	
3			10	52		1	
4	3	1	11	45			
5	10		17	5			
6	8	2	13	6			
7	19		16	3			
8	2	2	12	1			
9		4	15		1		
10		7	11			2	
11		1					3
12		2			1	1	1
13		3				1	3
14						1	
15							3
16						1	7
17							5
18					1		8
19					1		5
20					1		1
21					1		7
22					2		5
23							1
24							4
25							4
26							
27							2
28							
29							1
30							
31							1

Table 5.-Comparison of mean length (inches) at age for various game fishes of Ocqueoc Lake from 1984 to 2010. Number in parentheses represents number aged. Sampling effort varied among surveys.

Species	**Age group**	**June 1984**	**May 1998**	**May 2016**
Yellow Perch	I	3.6 (11)	2.8 (16)	2.8 (7)
	II	4.9 (16)	4.0 (8)	3.9 (25)
	III	6.3 (14)	5.4 (28)	4.6 (8)
	IV	7.4 (10)	6.6 (9)	6.4 (8)
	V	8.7 (1)	7.9 (2)	6.6 (2)
	VI	--	8.9 (1)	7.0 (2)
	VII	--	10.0 (1)	--
Bluegill	I	--	--	1.4 (10)
	II	--	--	2.0 (4)
	III	5.9 (2)	5.6 (9)	4.6 (2)
	IV	6.2 (2)	6.9 (10)	5.9 (11)
	V	7.2 (2)	7.6 (14)	7.0 (18)
	VI	8.4 (1)	8.1 (7)	6.8 (7)
	VII	--	8.6 (4)	7.4 (1)
	VIII	9.6 (1)	9.7 (1)	--
	IX	--	8.8 (2)	--
Black	0	2.9 (8)	--	--
Crappie	I	4.7 (1)	--	1.6 (1)
	II	6.7 (26)	5.4 (3)	4.6 (1)
	III	8.4 (5)	7.3 (29)	9.2 (6)
	IV	9.8 (2)	9.1 (18)	9.4 (4)
	V	11.0 (2)		--
	VI	--	10.9 (5)	--
	VII	--	11.5 (5)	12.3 (3)
	VIII	--	11.9 (8)	--
	IX	--	12.2 (4)	13.3 (2)

Table 5.-continued

Species	Age group	June 1984	May 1998	May 2016
Largemouth	I	--	--	3.6 (1)
Bass	II	--	--	--
	III	--	--	10.7 (2)
	IV	--	--	13.8 (2)
	V	--	13.7 (1)	13.6 (1)
	VI	--	13.6 (1)	--
	VII	--	--	--
	VIII	--	15.5 (2)	16.3 (1)
Walleye	I	--	--	--
	II	12.9 (4)	9.6 (2)	9.7 (1)
	III	13.9 (1)	13.0 (3)	--
	IV	16.8 (2)	14.2 (3)	--
	V	18.3 (6)	15.8 (9)	--
	VI	20.4 (3)	18.3 (1)	19.0 (2)
	VII	22.6 (4)	20.4 (4)	--
	VIII	--	--	--
	IX	23.3 (1)	22.2 (2)	19.2 (1)
	X	--	--	21.8 (2)
	XI	--	24.2 (1)	22.4 (1)
	XII	--	29.8 (1)	--
Northern	I	13.8 (8)	13.3 (7)	13.0 (6)
Pike	II	18.3 (41)	18.5 (18)	17.1 (21)
	III	21.9 (18)	21.6 (28)	20.9 (9
	IV	25.2 (6)	24.2 (8)	21.9 (9)
	V	27.2 (3)	25.5 (5)	24.8 (6)
	VI	--	28.4 (1)	28.1 (4)
	VII	--	--	27.0 (1)
	VIII	--	--	--
	IX	40.3 (1)	--	--