Original: Fish Division
cc: Education-Game
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DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

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July 24, 1941

REPORT NO. 681

FISHERIES SURVEY OF WHITMORE LAKE, WASHTENAW AND LIVINGSTON COUNTIES

by

C. J. D. Brown

Whitmore Lake is located on the boundary between Washtenaw and Livingston Counties in Northfield and Green Oak Townships -- about half of the Lake is in each County (T. 1 N., 1 S., R. 6 E., Sec. 5, 32). It lies 10 miles directly north of Ann Arbor and about 10 miles southeast of Brighton on U. S. Highway 23. The village of Whitmore Lake occupies the south and southwest shores. Although Whitmore Lake has no outlet and only one inlet (dredged), it is definitely in the Huron River drainage area and is surrounded by lakes and streams which feed this river.

A map of the lake was prepared by an Institute for Fisheries Research party* during January of 1940. This gives a graphic account of depths and the kind of bottoms present in the Lake. Much to the consternation of residents, the deepest depression was found toward the north end rather than to the south, where it was previously thought to be.

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* The mapping party was as follows: G. Perry, Leader, Clifford Long and Oscar Jasmin, assistants.

The Fisheries survey* was made August 20 - 28, 1940 and the data and collections taken at that time have been analyzed and assembled.

Whitmore Lake has been a popular resort lake for many years but has never been the site of any industrial establishment of consequence. In earlier times, however, a huge ice house stood on the northwest shore and large quantities of ice cut from the lake each winter were stored here, later to be shipped to various towns in southern Michigan and northern Ohio. The Lake has always been considered as fair to good fishing and during certain years produced excellent catches. Pike, perch, bass and bluegills are the predominant species of game fish.

There are approximately 230 cottages, one hotel, two resorts and eight boat liveries on this lake. In addition there are many permanent homes in the village of Whitmore Lake. Because of its accessibility and fairly good beaches, this lake affords fishing, boating and swimming to a large number of vacationists each year.

Like most of the lakes in Michigan, Whitmore is of glacial origin. Dr. I. D. Scott in his book, "Inland Lakes of Michigan", describes this lake as follows:

> "The lake lies in a region of complicated glacial deposits and many interesting features of this type as well as shore features may be seen. The high hills at the north end are kames. On the east a strip of outwash borders the lake but gives way to ground moraine which extends to the south end of the lake. The south side consists of a flat outwash plain, on the west of which lies a narrow stretch of ground moraine followed by a moraine of low relief along the greater part of the west side. The lake has neither outlet nor inlets and for the most of its extent the shore is bounded by banks which are of moderate height but steep for unconsolidated material. The basin appears to be a pit formed by a rather large block of ice of irregular thickness buried by outwash

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*The Fisheries survey party included: John Funk, leader, Dave Anderson, Wm. Reavley and M. Meyers, assistants.

> which developed from the southward. The outwash is a broad channel which carried the water escaping from the ice when the front of the glacier stood a short distance northwest of Ann Arbor."
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> "As to the shore features, the chief interest lies in the higher level of the lake during which the water discharged through an outlet at the southeastern part. After leaving the lake the former outlet turns abruptly to the north and extends to the Huron valley. The development of the shores at the higher level was exceptional for a lake of this size and resulted not only from the activity of waves and currents but of ice as well. The best locality for study is along the northwestern shore where excellent examples of cliffs, spits, bars and ice ramparts may be found. At present the encroachment of vegetation is beginning in parts of the basin and is progressing rapidly on the spit-like form extending out from the south shore of the lake."

The surrounding country has irregular topography and a great deal of the land in this area is under cultivation. The soil is generally of fair quality.

As previously stated, Whitmore Lake has no natural inlets or outlets. The dredged canal from Horseshoe Lake has more than doubled the original drainage basin which was 3 - 4 square miles. The present level is considerably higher than in the years immediately preceding the construction of this canal in 1937, but not greatly different from the high water periods of normal cycles. The maintenance of a more constant higher water level is undoubtedly beneficial to fish and also to resort development since it prevents the exposure of rather large areas of muddy shoal and makes the water deep enough to launch boats directly off the shore line. The damage to the aquatic plants in deeper water probably had no very serious effect on the general well being of the lake. The adjustment was very rapid.

The surface area of Whitmore Lake is 677 acres. About 80% of the lake bottom is shoal (less than 15 ft. in depth). There are two major depressions -- the larger one being located toward the north end of the lake and

the other near the south end. They have maximum depths of 69 ft. and 35 ft. respectively. The deepest point is about 1000 feet directly west of Grooms Beach.

The shore line is somewhat irregular with a development of 1.8 which means that it is 1.8 times longer than it would be if the lake were perfectly round and of the same area. Ordinarily an irregular shore line is indicative of high productivity because it is associated with the development of bays and coves in which aquatic animals and plants find conditions ideal for growth and reproduction. In Whitmore Lake this development is fair. This is supplemented by extremely large shoal areas which accounts, at least in part, for the consistent production of fish in this lake.

The bottom of the shoal areas is composed mainly of sand in the shallowest water, strewn with gravel and rubble and fibrous peat beyond. The bottom of the depressions is almost exclusively pulpy peat.

Wind and wave action do not curtail plant growth in Whitmore Lake, mainly because of the extensive shallow areas and because the lake's short axis is more or less parallel to the direction of the prevailing winds.

The water of Whitmore Lake is without noticeable color and the turbidity is low. A secchi disc was visible at 14 ft. during the latter part of August. A certain degree of turbidity (that arising from the presence of plankton in the water) is valuable in fish production. On the other hand, extreme turbidity is a serious limiting factor in the production of aquatic plants and consequently fish. This is true because plants depend upon the penetration of light in order to carry out their life processes. Turbidity reduces the effective sunlight in some instances so severely that no plants can survive.

Temperature and chemical data taken during the survey (8/21/40) are summarized in the following table.

Depth in feet	Water temp. of S.D.	N.D.	Oxygen p.p.m. S.D.	N.D.	CO_2 p.p.m. S.D.	N.D.	Methyl orange alk. p.p.m. S.D.	N.D.	pH S.D.	N.D.
0	74	73	6.8	6.5	0.0	0.0	-	-	-	-
12	73	-	-	-	-	-	91	97	8.2	8.2
15	-	73	-	-	-	-	-	-	-	-
18	72	-	-	-	-	-	-	-	-	-
21	71	-	-	-	-	-	-	-	-	-
24	70	71	5.6	-	0.2	-	106	-	7.8	-
27	-	68	-	4.3	-	0.3	-	105	-	7.8
30	61	66	-	-	-	-	-	-	-	-
32	60	-	0.0	-	1.7	-	137	-	7.3	-
36	-	59	-	-	-	-	-	-	-	-
42	-	53	-	-	-	-	-	-	-	-
45	-	51	-	-	-	-	-	-	-	-
48	-	50	-	0.0	-	1.2	-	122	-	7.0
60	-	49	-	0.0	-	1.3	-	142	-	7.3
65	-	48	-	-	-	-	-	-	-	-

Surface temperatures were practically uniform at 73 - 74° F, with little change down to the twenty foot level. A strong thermocline (zone of rapid change in temperature) was present in each of the two depressions. In the south depression this zone extended from the 21 ft. level down to the 30 ft. contour and in the north depression it was located between 24 and 42 feet. Bottom temperatures were 60° F. (32 ft.) in the south depression and 48° F. (65 ft.) in the north.

While a considerable amount of the deeper water maintains a temperature low enough to support cold water fish, this region in Whitmore Lake is not suitable for any fish because of the lack of dissolved oxygen. As the above table shows, there is a considerable reduction in oxygen even at the top of the thermocline. This decreases very rapidly to a point of disappearance somewhere above the bottom. The lower zone of water is without oxygen sufficient to support fish and during these periods of oxygen deficiency all of the fish find it necessary to move nearer the surface.

Whitmore Lake is distinctly alkaline (pH range from bottom to top - 7.0-8.2). The water is moderately hard with a methyl orange alkalinity range of 97 - 142 p.p.m. This is conducive to high productivity. It is known that moderately hard water is more productive than either soft or extremely hard water. On the whole, the temperature and chemical conditions in Whitmore Lake are excellent for high production. The small amount of domestic pollution occurring here very probably has no harmful effect on the fish or fish food organisms.

Whitmore Lake has an abundance of aquatic vegetation. The entire shoal is almost one continuous bed of plants. A summary of the kind of plants, their abundance, range of depth and bottom types is given in the table below.

The bushy pond weed, pickerel weed, Robbins pond weed and bulrush were the most abundant species although duck weed and cattails were very abundant in certain areas. Many of the other species were common and their beds extensive.

The presence of large quantities of vegetation in lakes is usually responsible for a high fish production because it offers adequate cover and

Common name	Species	Abundance	Range of depth in feet	Bottom type
Coontail	(Ceratophyllum demersum)	few	0-12	fibrous peat, marl
Water milfoil	(Myriophyllum sp.)	rare	2-10	fibrous peat
Bushy pondweed	(Najas flexilis)	abundant	0-12	sand, marl, pulpy peat, fibrous peat
White water lily	(Nymphaea tuberosa)	common	2-5	fibrous peat
Yellow water lily	(Nuphar variegatum)	rare	2-4	fibrous peat
Pickerel weed	(Pontederia cordata)	abundant	0-3	fibrous peat
Pondweed	(Potamogeton americanus)	rare	0-10	fibrous peat
Large leaf pondweed	(Potamogeton amplifolius)	few	0-10	fibrous peat, marl
Pondweed	(Potamogeton Friesii)	common	1-12	fibrous peat
Variable pondweed	(Potamogeton gramineus v. graminifolius)	rare	0-10	fibrous peat
Pondweed	(Potamogeton gramineus f. myriophyllus)	rare	0-6	fibrous peat, sand, rubble
Floating leaf pondweed	(Potamogeton natans)	rare	2-10	fibrous peat, marl
Sago pondweed	(Potamogeton pectinatus)	few	0-10	fibrous peat
White stem pondweed	(Potamogeton praelongus)	rare	2-8	fibrous peat
Clasping leaf pondweed	(Potamogeton Richardsonii)	common	0-10	fibrous peat
Robbins pondweed	(Potamogeton Robbinsii)	abundant	3-6	fibrous peat
Flat stem pondweed	(Potamogeton zosteriformis)	common	2-10	fibrous peat, pulpy peat, marl
Three square bulrush	(Scirpus americanus)	abundant	0-1	rubble, sand, fibrous peat
Soft stem bulrush	(Scirpus validus)	rare	0-2	fibrous peat, rubble
Big duckweed	(Spirodela polyrhiza)	abundant	0	fibrous peat, rubble
Common cattail	(Typha latifolia)	abundant	0-2	fibrous peat
Wild celery	(Vallisneria spiralis)	common	0-12	fibrous peat, pulpy peat, marl
Musk grass	(Chara sp.)	common	0-12	fibrous peat, sand, marl, rubble

supports a majority of the fish-food organisms. There is little doubt but that water plants can become too abundant, particularly in small, shallow lakes. Here they may, under extreme conditions, reduce the open water to a point of actually crowding the fish and make the lake impossible to fish. In larger lakes such as Whitmore the effect of wind and wave action tends to keep the weed abundance down to a reasonable point. Without the weeds, Whitmore Lake would not serve many fishermen although it might be more beautiful and ideal for swimming and boating.

Fish food is abundant in Whitmore Lake. Plankton (microscopic free floating animals and plants) samples taken during the survey show that animal forms predominated. These small organisms are important because they are the important food of the larger fish food organisms and are as well the direct food of most small fishes. Recent studies have shown that plankton is also very important as a direct food of larger fish particularly during the winter.

The shoal areas of this lake including their vast plant beds harbor large numbers of mayflies and fresh water shrimp as well as snails and caddis flies. Midge larvae were very abundant in the bottom soils along with aquatic earthworms, clams, snails, etc.

In the light of our present knowledge we would say that Whitmore Lake has abundant fish food. This is reflected by the almost continuously good fishing on this lake even though the fishing pressure is high.

Fish collections made on this lake indicate that bluegills and largemouth bass are the two most abundant game species. However, perch, rock bass, sunfish and crappies are common, while pike are reported to be less numerous than in previous times. Crappie were not present before the connection was made with Horseshoe Lake. Presumably they came in with the water from this dredge. A summary of all fish taken and their abundance is given in the

table below. Stocking records are also included in this table.

Species	Abundance	Stocking (1936-1940)
Game fish		
Yellow perch	common	~~35,000~~ 38,500
Northern pike	few	
Mud pike	reported	
Largemouth bass	common	~~7,550~~ 8,750
Smallmouth bass	common	1,000
Rock bass	common	
Warmouth bass	few	
Bluegill	very abundant	~~74,750~~ 85,750
Pumpkinseeds	abundant	
Black Crappie	common	
Forage fish		
Black-nosed shiner	few	
Mimic shiner	abundant	
Straw colored shiner	common	
Common shiner	few	
Golden shiner	reported	
Black chin shiner	reported	
Blunt-nosed minnow	very abundant	
Menona killifish	few	
Black banded top minnow	few	
Iowa darter	few	
Least darter	few	
Johnny darter	reported	
Silversides	abundant	
Creek chub	few	
Tadpole cat	reported	
Lake chub sucker	reported	
Coarse fish		
Yellow bullhead	common	
Brown bullhead	few	
Dogfish	few	

Eleven species of forage fish were collected in Whitmore Lake. Of these, the blunt-nosed minnow, mimic shiner and silversides minnow were the most abundant. The straw-colored shiner was common and the remainder of the species were only taken in small numbers.

Coarse fish included the yellow bullhead which was fairly common and the brown bullhead of which only one specimen was taken. Dogfish were reported

as common although none were captured during the survey.

Studies were made on the growth rate of the game fish taken from Whitmore Lake. Too few specimens were taken to give accurate averages of the growth rate for each species but the following table does show that on the whole the game fish reach legal length in about average time except the perch which apparently slow down in growth after a good initial start. Since all specimens were collected late in the summer, they have actually spent one more growing season than the age column shows.

Species	Age Group*	No. of Specimens	Average total length in in.	Average wt. in ounces
Perch	I	7	4.0	0.5
	II	3	5.6	1.0
	III	6	6.3	1.3
	IV	3	6.1	1.3
Great northern pike	I	1	18.2	20.4
Smallmouth bass	0	12	4.2	0.7
	I	2	6.2	2.3
Largemouth bass	0	2	2.5	0.16
	I	1	4.7	0.6
Rock bass	III	1	6.8	3.5
Black crappie	0	1	2.5	0.1
	I	1	5.8	1.4
	III	7	10.4	10.6
	IV	1	10.4	10.3
Bluegill	I	27	2.6	0.2
	II	16	3.6	0.6
	III	27	5.3	1.5
	IV	7	6.5	2.9
	V	2	6.9	3.4
	VI	1	8.3	6.7
	VII	2	7.8	4.8
Pumpkinseed	I	6	3.1	0.4
	II	12	4.2	1.0
	III	1	5.5	2.1
	IV	2	6.2	3.2
Warmouth bass	II	1	4.0	0.8
	III	1	4.7	1.4
	IV	1	5.7	2.7

*Age determinations by W. C. Beckman.

Perch reach legal length in their fourth summer as do rock bass, bluegills and pumpkinseeds. The one northern pike was 18.2 inches by September of its second summer. The large-and smallmouthed bass taken during the survey were all too young to give any reliable information on the growth rate of these species. Studies made by M. B. Trautman* indicate that largemouth bass probably reach legal length in their fourth or fifth years. The abstract of his study is quoted below and proposes explanations for certain of the fluctuations in game fish which have occurred during the years 1934-1938.

ABSTRACT**

"Largemouth black bass, bluegills, and yellow and brown bullheads were taken annually in Whitmore Lake in the same manner and with the same types of legal tackle during the summers of 1934-1938. The length-frequency curves obtained yearly for each species indicate an annual increase in average lengths from 1934 to 1937 and/or 1938. Fishes spawned in the years 1931-1933 dominated between 1934 and 1936, and largemouth black bass of the 1931-1933 year classes apparently formed the principal fish predators in 1934 and 1935. In 1934 and 1935 the fry survival of all species was low, despite good hatches. Evidence indicates that the adult largemouth black bass population was low during 1936 and 1937; during these years the survival of fry of all species was high, although the hatches were seemingly no better than in previous years. The largemouth black bass hatched in 1936 and 1937 were exceedingly abundant in 1938, and unless a great reduction in their numbers occurred they might be sufficiently numerous to devour most of the fry produced by all species in the next few years. It is suggested that a predator-prey relationship may exist, and that a relationship of this type may be the source of cyclic fluctuations in abundance."

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* See bottom of abstract.

** Milton B. Trautman, "Fluctuations in Lengths and Numbers of Certain Species of Fishes Over a Five-year Period in Whitmore Lake, Michigan," Transactions of the American Fisheries Society, vol. 70, p. 193.

The random creel census taken by conservation officers shows that bluegills were taken by fishermen by far the most often. Yellow perch and bullheads were next in abundance.

The rather expansive sand and gravelly shoals in Whitmore Lake offer abundant spawning grounds for smallmouth bass, bluegills, sunfish and crappies. Largemouth bass likewise have great expanses of spawning grounds. The weedy sand bottom areas are most surely ideal for perch propagation. Northern pike must also find conditions suitable although somewhat limited. At the present higher water level this fish should find increased spawning grounds, however.

Management suggestions

The present status of Whitmore Lake in the "All other lakes" classification, should be maintained. Bluegills, largemouth bass and perch will probably continue to dominate the game fish population although smallmouth bass, northern pike and crappies are important in the catch.

Observations lead us to believe that natural propogation is adequate to keep the lake stocked to its carrying capacity. The tremendous numbers of small bass and bluegills produced in the lake itself certainly minimizes any plantings which would be possible. Where adequate spawning grounds prevail in the warmer waters of southern Michigan, all evidence points to a continued excess of fry produced by natural means. Stocking in waters already populated with excess bluegill and bass fry certainly cannot be justified.

Letter to Drayton Plains 8-1-41 Hatchery file

While a number of predatory birds and turtles and dog-fish were observed to be present at Whitmore Lake, no control seems wise. Studies have shown that so-called predators do little damage to the fish and may be of importance in the reduction of diseased or disabled individuals and in controlling over-population.

Almost all of the bluegill population of Whitmore Lake is parasitized

with Neascus (black spot) or some other closely related worm. These parasite infestations seem in no way to impair the well-being of the fish, however, and certainly have no effect on the eating qualities of the flesh. Control of parasites of this kind is not practical, if not practically impossible.

The fish in Whitmore Lake find abundant cover in the vast weed beds covering the lake shoal bottoms. Additional shelter does not seem to be needed.

The present higher water level should be maintained. Fluctuations in water level does damage to the weed beds and consequently to the feeding and spawning grounds of the fish.

INSTITUTE FOR FISHERIES RESEARCH

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