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DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
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REPORT NO. 529

SURVEY OF DUCK LAKE, CALHOUN COUNTY, MICHIGAN

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Duck Lake in Calhoun County was surveyed by the Institute for Fisheries Research* during the first week of August, 1938. It was found to have a surface area of about 630 acres and a maximum depth of 51 feet. About 50 per cent of the lake is shoal (water less than 20 feet in depth) and the entire bottom is covered with marl except for a few patches of sand on the east side.

This lake has no tributaries and the outlet, which is the headwater of Battle Creek, is intermittent and small. The shore development is confined almost exclusively to the east side, which at the present time supports about 170 cottages and two resorts. The west shore is marshy and with only a few cottages.

The surface temperature on August 6 averaged 82°F. This is probably near the annual maximum. The temperature at the bottom in the deep water was 58°F. There was a definite thermocline (zone in which the water temperature changes very rapdily) between 19 and 35 feet. This layer of water (thermocline) acts as a blanket and prevents the mixing of the surface with the bottom water. As a result, the dissolved oxygen supply

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* The survey party was as follows: Robert C. Ball, leader; Walter Crowe, Paul Eschmeyer, and Arthur Whiteley, assistants.

may be partially or completely removed from the deeper colder waters and the fish inhabiting these areas either have to move up into the warmer water or die.

The oxygen supply at the surface averaged 8 parts per million. At 35 feet this was reduced to 2.8 ppm. and at 50 feet there was no trace of oxygen at all. The cause for this reduction is obvious. Decaying organic substances on the bottom and the existing population of organisms use up the oxygen present and with no circulation of surface and bottom water this cannot be replenished. This condition is not serious, however, because warm water fish usually prefer the surface zone in that most of the food is to be found there. It might be added that thermoclines are temporary things. Often hard winds break them up and they always disappear when the surface water cools in the autumn since it then becomes heavier than the bottom water and settles down initiating a thorough circulation. Thermoclines are characteristic of most of the deeper lakes in Michigan.

The water of Duck Lake is distinctly alkaline (average pH 8.2). The methyl orange alkalinity, which indicates the presence of hydroxides, carbonates and bicarbonates, ranged from 102 to 172 ppm. This is about average for the lakes of southern Michigan.

There is little cover for the fish except the abundant beds of bulrush (Scirpus) and Chara on the shoals. These beds of vegetation harbor large numbers of fresh water shrimp, snails and caddis larvae and the bottom mud contains large numbers of insect larvae. The fish food conditions in this lake are considered good and above the average for the southern Michigan lakes studied.

A rather large number of predatory birds were seen around this lake. It is not likely, however, that these are of any serious menace to the fish population.

Some of the fish taken contained parasites. These were most common in the bass but probably have little effect on their growth and certainly do not decrease the edibility of fish harboring them.

There is a total of 23 species of fish collected and reported for Duck Lake. Almost half of these are game fish. Samples taken during the survey indicate a rather large population of legal sized fish.

Species of Fish From Duck Lake

Game Fish	Forage Fish	Coarse Fish	Obnoxious Fish
Bluegill	Black-nosed shiner	Brown bullhead	Dog fish
Largemouth Bass	Black-chin shiner	Yellow Bullhead	Gar pike*
Small Mouth Bass	Spot-tail shiner		Mud pickerel
Northern Pike	Golden Shiner		
Walleye Pike	Blunt-nose minnow		
Perch	Killifish		
Pumpkinseed	Tadpole cat		
Rock Bass	Iowa darter		
Black Crappie			
Warmouth Bass			

* Reported, not collected.

Forage fish are abundant. There seems to be adequate food for both the fish and insect eating species.

Stocking during the past 5 years has included all of the important game fish found at present in the lake with the exception of northern pike and black crappie. These two species seem to have been quite capable of maintaining a good population by natural propagation. The crappie was one of the most abundant game fish a year or two ago even though no plantings were made of this species.

The records of fish planted are given below:

Name of fish	1934	1935	1936	1937
Walleye pike fry	600,000	540,000	300,000	375,000
Perch fingerlings		8,000		
Largemouth bass	1,000			
Smallmouth bass			3,000	
Bluegills	5,000	375,000	4,000	80,000

The scales taken from game fish at the time of the survey have been studied and some interesting information has been obtained.

Bluegills, largemouth bass, northern pike, walleye pike and crappie all reach legal length during their third summer of life in Duck Lake. This is better than average growth in lakes of the region.

An average of the perch and pumpkinseeds collected showed that these fish do not reach six inches until their fourth and fifth summer respectively. This poor growth is in rather striking contrast to the other game species.

An examination of some of the older fish show that bluegills reached 10 inches in their sixth year; smallmouth bass reached 18 inches in their fifth year, and four-year-old northern and walleye pike averaged 21 inches. The $13\frac{1}{2}$ inch black crappies taken in the sample were six years old.

Conditions are suitable for natural propagation of all species present with the possible exception of walleye pike. If walleye fishing is to be maintained, annual fry plantings may be necessary.

INSTITUTE FOR FISHERIES RESEARCH

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