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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April 20, 1942

REPORT NO. 775

A FISHERY SURVEY OF SAND LAKE, LENAWEE COUNTY

by

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Sand Lake is one of a group of several pit lakes near the northern boundary of Lenawee County in the Raisin River drainage basin. It is about one mile south of Wampler's Lake and lies on the line between Franklin and Cambridge Townships (T. 5 S., R. 2, 3 E., Sec. 12, 13, 7 and 18). It is easily reached, 8 miles west of Clinton, on highway U.S. 112 which passes near the north side. Township and county roads follow most of the shoreline. Access has been assured through recent purchase of frontage for a public fishing site by the Conservation Department.

The lake was mapped in March, 1941, and given a biological inventory in September, 1941, by parties of the Institute for Fisheries Research.*

Sand Lake has been considered one of the best fishing lakes in this region; however, in recent years it is reported that fishing has been less successful and the fish are smaller. The bluegill has been the most important species.

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* The biological survey party consisted of Fred Locke, leader; B. P. Hunt, B. W. Walker and S. Lievense, assistants.

The shores have been extensively developed for summer recreation and permanent dwellings. There are about 150 cottages, one resort and two boat liveries around the lake. Swimming and boating are popular sports. In general, the lake is a good recreation center and fishing is one of its important attributes. In the fall, the lake is much used for duck hunting.

Physical Characteristics

Sand Lake has a surface area of 440 acres and a maximum depth of 53 feet. It is more or less diamond-shaped with the greatest length extending in a northeast-southwest direction. The shoreline has few irregularities, the most prominent being a sand bar about 1,500 feet long extending out from the east shore. The surrounding terrain is a wooded, sand and gravel plain of slightly rolling nature. The immediate shore is fairly steep; however, there are areas along the north and west shores that are marshy.

The geological origin of the lake is that of a pit formed in the outwash plain of the Kalamazoo Morainic System.

A dredged canal connects Sand Lake with Wampler's Lake to the north. This canal was built for the purpose of tapping the overflow water from Wampler's Lake in an effort to raise the level of Sand Lake. The natural outlet from Wampler's Lake is Iron Creek which empties into the Raisin River. Sand Lake has no natural inlets or outlets. The flow of water from Wampler's Lake to Sand Lake is intermittent. The canal was dry in September when the lake was surveyed. A heavy wire screen has been installed in this channel by the local sportsmen to prevent migration of fish into Sand Lake. This is equipped with an electrical device for the purpose of preventing the movement of small fish. This has not proven to be successful because small fish stunned by electric shock were carried downstream where they revived (I. F. R. Memoranda 99 and 102).

The water level in Sand Lake dropped considerably in 1927 and has fluctuated somewhat since. At the time of the survey in 1941 the level was low. The dredged inlet has done little, if anything, to maintain or raise the level of the lake.

The productive areas of Sand Lake are extensive. About 75 per cent of the water is shallow enough to permit the growth of plants. Plants are found from the shoreline (except for wind-swept sandy areas on the west) down to a depth of 25 feet. The area below 25 feet is comparatively small and consists of an oval-shaped depression near the middle of the lake.

Most of the bottom is composed of fibrous peat rimmed on the margin by sand and gravel. The bottom of the depression is covered with pulpy peat.

The water is slightly brown in color and quite transparent. A white, disc (Secchi disc) was visible down to a depth of thirteen feet. This transparency is somewhat greater than for the average of southern Michigan lakes and permits the extension of plant beds into deeper water.

Temperature and Chemical Characteristics

A series of temperature and chemical analyses of the water were made near the deepest point in the lake. The information collected is given in the following table.

September 3, 1941

Depth in feet	Temperature °F.	Oxygen, parts per million	Methyl Orange Alkalinity	pH
0	74	8.3	115	8.6
3	74	...	...	...
6	74	...	...	...
9	74	...	...	...
12	74	...	...	...
15	74	...	...	...
18	72	...	...	...
21	71	...	...	...
24	70	...	...	...
27	67	4.8	98	8.1
30	65	...	...	...
33	55	...	...	...
36	55	0.7	120	7.2
39	54	...	...	...
42	53	...	...	...
45	53	...	...	...
48	52	0.9	129	7.1

The temperature was found to be approximately uniform from the surface (74°F.) down to a depth of 24 feet. It then dropped rapidly to a depth of 33 feet (70° to 55°F.) and then slowly from there to near the bottom at 48 feet (55° to 52°F.). The region of rapid change in temperature from 24 feet to 33 feet is called the thermocline and has an important effect on the lake in general. During the summer it acts as a partition between the warm surface water and the cold bottom water. Mixture of these waters is prevented and stagnation of the bottom water during the summer is the usual thing. In the fall when the surface waters cool, circulation throughout the lake is again possible.

Decomposition of the organic bottom matter depletes the oxygen supply below the thermocline so that in September when analyses were made the oxygen was less than one part per million parts of water. This is not sufficient to maintain fish life and fish either have to abandon this region or die. However, this situation is not as critical as it might seem because the volume of water below the thermocline is small compared with that in the rest of the lake. Since all of the fish in Sand Lake

are warm-water species, they do not require the cold temperature found below the thermocline.

The water in Sand Lake was found to be moderately hard (Methyl Orange Alkalinity 98-129 p.p.m.) and alkaline (pH 7.1-8.6). The alkalinity and hardness of this lake are favorable to high productivity.

Aquatic Vegetation

A list of the plants collected by the survey party is given below:

Name	Abundance
Waterweed (Anacharis canadensis)	Few
Coontail (Ceratophyllum demersum)	Few
Three-way sedge (Dulichium arundinaceum)	Few
Water marigold (Megalodonta Beckii)	Few
Water milfoil (Myriophyllum sp.)	Rare
Bushy pondweed (Najas flexilis)	Abundant
White water lily (Nymphaea odorata)	Few
Large-leaf pondweed (Potamogeton amplifolius)	Common
Pondweed (Potamogeton Friesii)	Few
Variable pondweed (Potamogeton gramineus var. graminifolius forma myriophyllus)	Few
Sago pondweed (Potamogeton pectinatus)	Few
Whitestem pondweed (Potamogeton praelongus)	Rare
Robbins' pondweed (Potamogeton Robbinsii)	Common
Flat-stemmed pondweed (Potamogeton zosteriformis)	Few
Wapato (Sagittaria latifolia var. gracilis)	Few
Stiff wapato (Sagittaria rigida)	Few
Hardstem bulrush (Scirpus acutus)	Few
Three-square (Scirpus americanus)	Few
Bulrush (Scirpus Smithii)	Few
Common cattail (Typha latifolia)	Few
Wild celery (Vallisneria americana)	Few
Musk grass (Nitella sp.)	Abundant

Musk grass, true pondweeds and bushy pondweeds are the most abundant submergent plants. Emergent and floating forms, e.g., bulrushes, cattails and water lilies, are found practically all around the lake in the shallower water.

Fish Foods

The abundance of vegetation in Sand Lake is an indication of its high productivity. Aquatic plants are an important asset to fish in

supplying food (usually indirectly), shelter and spawning facilities. They harbor an abundant source of fish food organisms among which snails, fresh-water shrimps (Amphipoda), mayfly and damsel fly nymphs were the most common in Sand Lake.

Numerous other important food organisms were found in the fibrous peat bottom. The most common were snails, damsel fly nymphs, aquatic earthworms and midge larvae.

Plankton, the very small, free floating plants and animals, was not very abundant at the time of the survey; however, sampling at one time of the year is probably not representative of annual abundance. Animal forms were more common than plant in the plankton collected.

Fish Collected

The fish population was sampled with nets. A list of the species, their relative abundance and the stocking records of game fish are given in the table below.

Species	Abundance	Stocking (1934-1940)
GAME FISH		
Smallmouth bass	Few	...
Largemouth bass	Common	7,000 fingerlings.
Perch	Common	60,000 fingerlings.
Bluegills	Abundant	108,050 fingerlings.
Northern pike	Few	...
Mud pickerel	Few	...
Pumpkinseed	Common	...
Warmouth bass	Common	...
FORAGE FISH		
Black-nosed shiner	Few	...
Mimic shiner	Common	...
Blunt-nosed minnow	Common	...
Mudminnow	Rare	...
Menona killifish	Abundant	...
Johnny darter	Rare	...
Iowa darter	Common	...
Least darter	Common	...
Silversides	Few	...
Spot-finned shiner	Few	...
COARSE FISH		
Common sucker	Few	...
Lake chub-sucker	Common	...
Yellow bullhead	Common	...
Carp	Reported	...
OBNOXIOUS FISH		
Gar	Reported	...

The bluegill is the most abundant game fish in the lake. Large- and smallmouth bass, perch, pumpkinseed, warmouth bass and northern pike complete the list. Forage fish are abundant. Several species are very common and probably utilize most of the available food and shelter provided by the vegetation. Two species of sucker and one bullhead were caught, also the carp and gar have been reported from the lake.

Creel census reports, which are consistently more numerous than usual, show important catches of bluegills, largemouth bass, perch and pumpkinseeds over a period of eleven years (1928-1939). Some decline in the catch per hour is noted since 1933; however, the ratio of the different species in the total catch has changed little.

Growth Rate

The sizes and ages of the game fish collected are given in the following table:

Species	Age*	Number of specimens	Total length in inches	Weight Pounds	Weight Ounces
Largemouth bass	0	2	2.2	...	0.12
	I	3	6.2	...	1.6
	II	7	9.6	...	5.7
	III	8	11.0	...	9.5
	IV	1	13.4	1	0.2
Smallmouth bass	0	1	3.4	...	0.3
	II	1	12.1	...	10.9
Perch	III	7	5.9	...	1.5
	IV	3	10.6	...	8.3
	V	3	10.3	...	7.5
	VI	1	10.9	...	7.9
	VIII	1	17.8	...	9.7
Bluegill	0	4	1.5	...	0.03
	I	8	2.6	...	0.2
	II	7	3.7	...	0.4
	III	9	4.3	...	0.9
	IV	1	7.9	...	5.5
	V	1	8.8	...	7.9
	VI	2	9.2	...	8.2
	VII	1	9.8	...	10.0
Pumpkinseed	0	3	1.7	...	0.05
	I	1	2.3	...	0.2
	II	1	3.8	...	0.8
	III	5	4.8	...	1.2
	IV	1	6.7	...	3.6
	VI	1	8.3	...	7.2
	VII	1	8.5	...	8.3
Northern pike	?	1	18.0	1	5.0
	?	1	24.7	3	6.0
Warmouth bass	III	3	4.2	...	0.8
	IV	3	5.6	...	2.3
	V	1	5.9	...	2.6
	VI	3	5.8	...	2.1
	VII	1	6.2	...	2.9

*Age determinations by W. C. Beckman.

Although the figures presented will serve to give an idea of the growth of game fish in Sand Lake, it must be pointed out that such data are incomplete and may not give a true picture of the growth of each species.

The growth of both largemouth and smallmouth bass is about equal to the tentative average for the state, as reported by W. C. Beckman. They reach legal size (10 inches) during their third summer. The growth of perch, bluegill and pumpkinseed is one year slower than the state average. These three species reach legal length (6 inches) during their fourth summer. The growth of the warmouth bass is probably no slower than in most Michigan lakes. It was not possible to accurately determine the age of the northern pike that were caught. On the average they attain a legal size (14 inches) in Michigan during their second summer.

Spawning Facilities

The spawning facilities are apparently adequate for the species of fish found in the lake with the possible exception of the northern pike. Gravel areas, especially on the east side, are suitable for the large- and smallmouth bass, bluegills and pumpkinseed, and abundant rooted vegetation is available for largemouth and warmouth bass. A few areas of marshy shore might be suitable for the spawning of northern pike; however, the fluctuating lake level must certainly restrict the use of such shallow areas. The absence of creel census records for pike even during years of higher and reportedly more constant levels indicates that conditions in this lake are not well suited to northern pike.

Management Suggestions

Sand Lake is at present in the "all other lakes" classification and the recent survey gives further support for the continuance of this classification.

This lake seems to be most suitable for largemouth bass and bluegills, and these species should be encouraged. The physical and chemical conditions found in this lake are certainly favorable for these species and the

extensive plant beds furnish adequate food and cover. Spawning facilities are adequate and no stocking should be necessary to maintain a good population.

Predators are uncommon and parasitism is slight. The bass tapeworm was found in a few specimens of smallmouth bass which is unfortunate, but no practical control is known. This parasite is not dangerous to man.

At present there seems to be little that can be done to regulate the water level of Sand Lake. The attempt at supplying water from Wampler's Lake was apparently unsuccessful. The maintenance of a higher constant level would undoubtedly favor fish production; however, the lake is still very suitable for bass and bluegills even at its present low level. In the light of this investigation there seems to be little need for the maintenance of a screen in the dredged inlet from Wampler's Lake. The passage of fish from one lake to the other is not likely under present arrangements and if free access is afforded, the exchange of fish would probably be inconsequential. The chance of introducing an undesirable species such as carp or gar from one lake to the other is possible. We are not certain what species of fish exist in Wampler's Lake but both gar and carp are reported to be already present.

INSTITUTE FOR FISHERIES RESEARCH

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