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FISHERIES SURVEY OF SILVER LAKE, CHEBOYGAN COUNTY

by

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Introduction

Location and Drainage

Silver Lake is located in Cheboygan County, Wilmot Township (T. 33 N., R. 3 W., Sections 11 and 12). The lake is landlocked and easily reached by a gravel and black-top road from Wolverine, which lies one mile to the east.

Acknowledgments

The outline contour map of the lake was made by the Michigan Civilian Conservation Corps (Camp Pigeon River 62-S) in the winter of 1938-39. The biological inventory and bottom typing was done in 1942 and 1943.*

Past and Present Use

There is no evidence that the lake has ever served any commercial purpose. Development is only moderate with about 15 cottages and one boat livery. At the present time the lake is semi-private, nearly the whole shoreline being owned by Mr. Donner, the proprietor of the one resort. There is some 300 feet of State owned land on the west shore, but there is no public access to this land.

* Personnel of survey party, August 14, 1942: James T. Wilkinson and Walter R. Crowe; September 14, 1943: Walter R. Crowe.

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Little reliable information on the lake's past fishing history was obtained. Apparently it has been fished frequently but never very heavily. In common with many lakes, the fishing is reported to have been very good years ago. At present the fishing is fair judging from reports and the writer's own experience. Introduction of desirable species and improved fishing would undoubtedly increase the fishing pressure on this body of water. Accommodations are good, and good swimming and boating are also available.

Physical Characteristics

Geological Origin

The lake is undoubtedly of glacial origin and appears to be a "pit" lake formed from a melting block of ice trapped in glacial material.

Size and Shape of Basin and Extent of Drainage

The lake basin is roughly circular or rectangular and has an area of 73 acres. The average diameter is about 2,000 feet. The drainage area is small and is composed of rolling, rather sparsely wooded farm land.

Water Fluctuations

Water fluctuations are only slight and cannot be controlled since the lake is landlocked. Fluctuations depend upon the water table of the immediate vicinity. Physical characteristics are summarized in the following table (Table 1).

Table 1

Physical Characteristics of Silver Lake, Cheboygan County

Area in acres	73
Maximum depth	90 feet
Shore development	1.04
Dominant bottom types	
Shallow (0-15 ft.)	Sand, marl
Depths (over 15 ft.)	Marl, pulpy peat
Color of water	Clear, colorless
Transparency (Secchi disc)	21-22 feet

Physical Factors and Fisheries

The physical characteristics of a lake determine to a great extent its basic productivity. Generally speaking, the larger lakes produce more fish than do smaller lakes, although usually not in proportion to their size. Generally deep lakes are colder than shallow lakes, and to a considerable extent the type of fish present is dependent upon depth. The shore development of Silver Lake is only 1.04. This means that the lake is nearly circular. Lakes with such regular shore lines are generally not as productive as those with irregular shore lines because the latter usually have protected bays favorable to plant growth, which add much to the lake's food supply.

The bottom in Silver Lake is composed mostly of marl with some sand and pulpy peat. Plant growth is dependent in part upon the type of bottom soil. As a rule, marl bottom lakes are not rich in vegetation. Bass and bluegills seek out a firm bottom for spawning. Gravel and sand bottoms are more favorable for this purpose. The clear water in Silver Lake is favorable for extensive growth of vegetation.

As a whole, the physical characteristics of Silver Lake favor moderate productivity. Perhaps the chief limiting factor is that the productive area is limited in extent because of the relatively great amount of deep water and the limited shallow area.

Temperature and Chemical Characteristics

Temperature

A vertical temperature series taken in Silver Lake showed the lake to be thermally stratified. A thermally stratified lake has a thermocline which is a layer of water in which the temperature drops one degree Centigrade with each meter of depth (0.55 degrees F. per foot). The presence or absence of a thermocline is important because it isolates

the cold bottom water which may or may not be suitable for cold-water fish depending upon the oxygen supply.

Chemical Conditions

Oxygen

In Silver Lake the oxygen supply is not depleted to a dangerous degree in and immediately below the thermocline even during the critical summer period. This lake therefore remains suitable for cold-water species such as trout throughout the year even though surface temperatures are too high in mid-summer.

Alkalinity and pH

Moderately hard, alkaline waters are usually more productive than soft, acid waters. Silver Lake was found to be a moderately hard alkaline lake (methyl-orange alkalinity 110-129; pH 7.1-8.1). These chemical factors are favorable to fish production.

Pollution

No pollution was observed in Silver Lake. Chemical conditions are summarized in the following table (Table 2).

Table 2

Temperatures and Chemical Characteristics of Silver Lake,
Cheboygan County, Michigan, August 14, 1942.

Depth in Feet ↕	Temperature Degrees F.	Dissolved O ₂ p.p.m.	Dissolved CO ₂ p.p.m.	ph-th alk. p.p.m.	M.O. alk. p.p.m.	pH
0	71.2	8.9	0.0	3.5	110	7.9
6	71.2					
12	71.2					
15	71.1					
17	70.7					
22	70.5					
27		8.8	0.0	5.0	113	8.1
28	68.5					
33	62.4					
36	53.6	13.0				
42	52.2					
45	51.1					
48	48.9	14.3				
51		15.6	0.0	11.0	123	8.3
54	46.4					
60	44.8	2.9				
66	44.0					
72	43.7	0.2				
76	43.5					
84		0.0	9.7	0.0	129	7.1
88	43.5					

↕ Limits of thermocline denoted by dotted line in above table.

Temperature and Chemical Factors in Relation to Fisheries

As shown above, the temperature and chemical conditions in Silver Lake are suited to cold-water species. The cold water in the thermocline is well supplied with oxygen, and even the surface waters were found to be rather cool for mid-summer. The narrow shoal around the lake and the relatively large amount of deep cold water make it appear that the lake is better suited to cold-water species than it is to warm-water species such as bass and bluegills.

Biological Characteristics

Vegetation

A plant collection secured from Silver Lake showed ten species. The following table (Table 3) lists the plants found.

Table 3

List of Plants Collected in Silver Lake, Cheboygan County, Michigan

Hardstem bulrush	<u>Scirpus acutus</u>	Abundant
Bushy pondweed	<u>Najas flexilis</u>	Common
Musk grass	<u>Chara sp.</u>	Common
Floating-leaf pondweed	<u>Potamogeton natans</u>	Common
Smartweed	<u>Polygonum coccineum</u>	Common
Common cattail	<u>Typha latifolia</u>	Sparse
Bulrush	<u>Scirpus sp.</u>	Sparse
Scouring rush	<u>Equisetum fluviatile</u>	Common
Sedge	<u>Carex sp.</u>	Sparse
Sedge	<u>Carex sp.</u>	Sparse

The vegetation present in a lake is of primary importance to its productivity. Many fish foods are found amongst and on the vegetation. It serves as shelter, and certain fish use it as spawning grounds. Silver Lake is adequately supplied with vegetation, although its extent is limited by the rather sharp drop-off. However, there are two or three rather extensive weed beds.

Fish Foods

A plankton collection made on September 14, 1943 showed considerable zooplankton in a 30 foot vertical haul. Since plankton varies greatly throughout the season and even from day to day, the significance of one sample is questionable. However, Silver Lake probably has at least an average supply. This plankton is an important source of food for minnows and young fish, and also for certain adult fish such as lake herring. Three bottom food samples were taken from marl at 7 feet, from marl at 21 feet, and from peat at 70 feet. In these three samples of 1/2-square foot each, the only organisms found were one mayfly nymph, one dragonfly nymph, and one midge larva. This is to be expected. Marl and soft peaty lake bottoms seldom produce many food organisms. Even though samples were not taken, there can be little doubt that most of the fish-food organisms were confined to the weed beds.

Forage fish were observed to be fairly numerous.

Species of Fish Present

The number of species represented in the lake is about average for the lakes in the northern part of the state. The kinds and relative abundance are tabulated below (Table 4).

Table 4

Kinds and Relative Abundance of Fish in Silver Lake, Cheboygan County

Type	Species	Abundance	Stocking 1939-1943 †
Game fish	Bluegills	Abundant	12,700 (f)
	Rock bass	Abundant	None
	Perch	Common	71,900 (f)
	Smallmouth bass	Common	403 (a)
	Walleye	Few (reported)	150,000 (fr)
	Northern pike	Few (reported)	None
	Lake trout	No information	320 (a)
Forage fish	Blunt-nosed minnow	Abundant	None
	Black-nosed shiner	Common	None
	Iowa darter	Few	None
	Menona killifish	Few	None
Coarse fish	None	None	None
Obnoxious fish	Carp	Few (reported)	None

† In above table (f) = fingerlings; (a) = adults; (fr) = fry.

Creel Census

No creel census records were available, but fishing is reported by Mr. Donner to have been fair, particularly in the summer of 1943.

Growth Rate of Game Species

The growth rate study of fish from Silver Lake is tabulated below.

Table 5

Age and Growth Rate of Game Species from Silver Lake, Cheboygan County

Species	Age	Number of Specimens	Average Length Inches	Average Weight Ounces
Bluegill	III	8	4.3	1.0
	IV	1	5.4	1.5
Rock bass	III	11	5.6	2.0
	V	1	7.4	4.9

Age determinations (Table 5) indicate that bluegills are growing slowly and that the rock bass are growing at about an average rate. This might be expected in view of the rock bass's ability to utilize larger food items such as minnows and crayfish. Stomachs from the 12 rock bass captured were examined and were found to be empty for the most part, except that two contained crayfish remains and one contained a minnow. The bluegill stomachs were all empty.

Natural Propagation

Smallmouth bass, perch, bluegills, and rock bass are apparently able to spawn successfully. Young-of-the-year of all these species were observed. Also there are firm areas of gravel and sand for spawning of bass and sunfish. Perch^{spawn} in open water or over the vegetation. No information on the spawning of the walleye and northern pike was obtained but it is not likely that they reproduce successfully within the lake.

Management Proposals

Designation

At present the lake is in the "all other lakes" classification and should remain in this category for the time being. If rainbow plantings succeed, the lake should be opened by the Legislature to fall fishing for this species.

Stocking

The object of management of the sport fishing in a lake must be considered as an effort to maintain the fishing in the lake through stocking, betterment of natural conditions, or through the encouragement of those species otherwise which are best suited to the body of water under consideration. In the past stocking has been considered as the best answer to the ever increasing fishing pressure, but in the light of recent investigations by fisheries workers, ideas on the effectiveness of stocking have been modified. In respect to warm-water species (bass and bluegills)

stocking for maintenance does not appear to be worthwhile, particularly when it is known that these species are reproducing in the lake. As has been pointed out bass, bluegills and perch are able to spawn successfully in Silver Lake. Competition for food on the narrow shelf surrounding the lake is probably great, and it is believed that the lake's population of these species will be maintained at a high level through ~~the~~ natural reproduction. It is particularly important that there be no further plantings of bluegills for, as has already been pointed out, this species is not growing well. From reports on the size of perch captured, the same is true of this species. The rock bass has demonstrated its ability to grow to a fair size and to maintain its numbers in the face of rather severe competition. Little information is available on the success of the smallmouth, but young have been observed, and Mr. Donner reports that good sized smallmouth are caught frequently. We have no information on the walleye or northern pike, but what few are caught are reported to have reached a good size, but there are apparently very few in the lake.

Physical and chemical conditions indicate that the lake is better suited to cold-water species, such as trout. If trout were introduced it is believed that the fishing in the lake would be improved without greatly affecting the present fishing for other species. It is understood that the food supply is not overly abundant, but since much of the lake remains cool throughout the summer, trout should be able to obtain an adequate food supply from the fairly abundant minnow population. Consequently, it is recommended that 350 adult rainbow trout be introduced as soon as the matter of public access can be cleared up. At present the lake is semi-private, and although there is State-owned frontage, access is available only over private property. If trout thrive, this lake should be included in the list of waters open to fall fishing for rainbow trout. This would require action by the Legislature.

Predators and Parasites

No predators were observed. All fish captured appeared to be free of parasites.

Shelter

Shelter appears to be adequate in the form of vegetation and dead-heads.

Regulation of Water Level

The lake is landlocked and maintains a relatively constant level.

Improvement of Spawning Facilities

Spawning facilities are suitable at present for bass, bluegills, rock bass and perch.

Other Suggestions

Public access by a road or trail to the State-owned property should be secured at the earliest possible opportunity. ^{secured,} When/the success of the initial planting of trout should be followed through creel census and investigation by the biologist in the district.

INSTITUTE FOR FISHERIES RESEARCH

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