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FISHERIES SURVEY OF SILVER LAKE, GREEN OAK TOWNSHIP, LIVINGSTON COUNTY

by

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Silver Lake lies near the extreme southeast corner of Livingston County in Green Oak township (T. 1 N., R. 6 E., Sec. 22). It is only about three miles northeast from Whitmore Lake village and may be reached via the Silver Lake road, 1½ miles from U. S. Highway 23. The lake lies within the Huron River drainage. Its intermittent outlet flows southward through three small lakes to form one branch of a small tributary, which in turn enters the Huron River proper at a point about one mile west of Silver Lake.

A map of this lake was prepared during February of 1940 by an Institute mapping party*. This was used as a base for plotting certain of the information taken by the fisheries survey party** which made the biological studies August 28-30, 1940.

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*The personnel of the mapping party was as follows: G. F. Perry, leader; Oscar Jasmin and Clifford Long, assistants.

**The personnel of the fisheries survey party was as follows: John Funk, leader; David Anderson, William Reavley and Michael Meyer, assistants.

So far as is known, Silver Lake has never been put to any industrial use. There are about one hundred cottages, two resorts and three boat liveries on its shores. A small number of the residences are occupied the year around.

Not much is known about the history of the early fishing on this lake, although reports indicate good to fair fishing in the past. Bass fishing is reported to have greatly declined in recent years. At present, the fishing is heavy both winter and summer, and the lake's potential value as a public fishing water is high.

There is no doubt but that Silver Lake had a glacial origin, but no study has been made to determine its exact geological history. The present lake level is probably much lower than in previous times. High morainic banks (10-15 ft. above present lake level) surround the lake. These are covered with a fairly rich, sandy loam and are partially wooded. The surrounding country has very irregular topography, the soil is good and most of it has been cleared for agricultural purposes.

Silver Lake has no inlets. Numerous small springs and seepages, along with surface run-off constitute its water supply.

A small dam about one foot high is present in the outlet near the lake margin, presumably for the purpose of maintaining a constant level. The water fluctuation in the lake is negligible.

The lake basin proper is fairly irregular, although there is only one depression. The surface area is 152 acres and the deepest point (42 ft.) is located a little southeast of the center of the lake. The slope of the bottom is rather gradual, thus producing an extensive shoal. About 40 per cent of the total area is less than ten feet in depth. The shore line is quite regular, with a development of 1.13. This means that the actual length of the

shore line is only 1.13 times greater than it would be if the lake were perfectly round.

The bottom of the shoal areas is composed of sand and marl with considerable gravel along the south and east sides. The bottom between the 10 and 30 foot contours is marl with a few patches of fibrous peat. At depths beyond 35 feet the bottom is wholly of pulpy peat.

The water is colorless and moderately clear. A Secchi disc was visible to a depth of nine feet. This is about average for the small southern lakes in the state.

Most of the physical factors found operating in Silver Lake are favorable to high fish productivity. The extensive shoal areas, abundant spawning grounds, fertility of bottom deposits and protection from wind and wave action are a few of the many favorable circumstances which allow a lake to produce fish foods and, consequently, fish.

A preliminary study was made, August 28, 1940, of the summer temperature and chemical conditions found in Silver Lake. A summary of the results is given in the following table.

Depth in feet	Water temperature °F.	Oxygen, p.p.m.	Carbon dioxide p.p.m.	Methyl orange alkalinity, p.p.m.	pH
0	68	7.5	0.0	122	8.2
15	67	...	...	...	...
18	66	...	...	...	...
21	66	...	...	...	...
24	66	...	...	...	...
27	65	4.9	0.0	128	8.0
30	59	3.4	0.2	143	7.8
32	58	...	...	...	...
33	57	...	...	...	...
39	56	0.0	1.0	170	7.4

As is indicated above, there was a definite thermocline (zone of rapid change in temperature) between 27 and 33 feet. Between these depths the temperature dropped 8° F., or about 1.3° F. per foot of depth.

Dissolved oxygen in the surface water was 7.5 p.p.m. This decreased to 4.9 p.p.m. at 27 feet, and completely disappeared somewhere between 33 and 39 feet. This means that the water below the 30-foot contour is not suitable for fish during the late summer and probably during the late winter. This is of no great significance, however, since only a very small percentage of the total lake's volume falls within this zone.

Carbon dioxide concentrations are very low even in oxygen-free water. The water itself is moderately hard (methyl orange alkalinity range, 122-170). The pH range of 7.4-8.2 shows the water to be distinctly alkaline, although not excessively so. Moderately hard water lakes are known to be more productive than soft water ones, and by comparison with previously studied lakes, Silver Lake seems to have favorable chemical conditions in this respect for high productivity.

There is a small amount of pollution resulting from the cottages surrounding the lake. This, however, is not of any great consequence.

Aquatic vegetation is moderately abundant. A summary of the aquatic plants collected in Silver Lake is given in the following table.

Species*	Abundance	Depth range (ft.)	Bottom type
Needle rush (Eleocharis acicularis)	rare	0-10'	marl and sand
Blue flag (Iris versicolor)	common	0-½'	marl and sand
Bushy pondweed (Najas flexilis)	abundant	0-15'	marl and sand
White water lily (Nymphaea tuberosa)	rare	2-3'	sand
Pondweed (Potamogeton gramineus var. graminifolius f. myriophyllus)	rare	0-15'	sand and marl
Floating brownleaf (Potamogeton natans)	rare	0-15'	sand and marl
Sago pondweed (Potamogeton pectinatus)	rare	0-5'	sand
Pondweed (Potamogeton Friesii)	rare	1-2'	marl
Whitestem pondweed (Potamogeton praelongus)	common	15-20'	marl
Arrowhead (Sagittaria graminea)	common	0-3'	marl
Arrowhead (Sagittaria latifolia)	rare	0-1'	sand
Hardstem bulrush (Scirpus acutus)	common	0-3'	sand and marl
Bulrush (Scirpus americanus)	rare	0-2'	sand
Musk grass (Chara)	abundant	0-20'	sand and marl
Stonewort (Nitella)	rare	0-5'	sand and gravel

*Plant determinations by Betty Robertson and John Funk.

Of the fifteen species of plants found, the bushy pondweed and musk grass were the most abundant. Bulrushes and pondweeds were common.

Fish food studies made during the survey showed the plankton (free-floating microscopic plants and animals) to be rather scarce. Animal plankton was dominant. However, samples taken at one time of the year may not represent a true picture of conditions for other times. It is known that plankton populations vary from day to day and place to place within individual lakes.

Qualitative bottom and vegetation samples were taken to ascertain the abundance of food organisms. A summary of the dominant organisms found in these samples is given in the following table.

Species	Abundance	Depth range (ft.)	Bottom type
Aquatic worms (Oligochaeta)	few	2-10	sand, trash
Snails (Gastropoda)	abundant	2-12	sand, marl and trash
Clams (Pelecypoda)	rare	2-10	sand, marl
Freshwater shrimp (Amphipoda)	common	2-12	sand, trash and plants
Mayflies (Ephemeraptera)	abundant	2-12	sand, marl and plants
Dragonflies (Anisoptera)	rare	2-10	sand and marl
Caddis flies (Trichoptera)	common	2-15	sand, marl, plants
Midges (Chironomidae)	common	2-35	sand, marl, peat, plants

Snails and mayflies were the most abundant forms found on the shoals. Freshwater shrimp, midge larvae and caddis fly larvae were common in the shallower water, while midges were the most abundant organism found in the deeper water.

In comparing the fish food conditions in Silver Lake with those of other southern lakes, we would say it represents about average conditions. Food does not seem to be very abundant, but only moderately so. Those food organisms present are known to be important as part of the fish food supply.

Fish samples were taken by means of nets and angling, for the purpose of determining the species and their relative abundance. A summary is given below.

	Abundance	Stocking 1934-1939 incl.
Game fish:		
Bluegill (Lepomis macrochirus)	abundant	27,100
Green sunfish (Lepomis cyanellus)	common	...
Pumpkinseed (Lepomis gibbosus)	common	...
Largemouth bass (Huro salmoides)	common	750
Black crappie (Pomoxis nigro-maculatus)	common to rare	...
Smallmouth bass (Micropterus dolomieu)	reported common to rare	500
Northern pike (Esox lucius)	common to rare	...
Rock bass (Ambloplites rupestris)	reported	...
Warmouth bass (Chaenobryttus gulosis)	rare	...
Perch (Perca flavescens)	reported	8,000

(Table continued)

	Abundance	Stocking 1934-1939 incl.
Forage fish:		
Silversides (Labidesthes s. sicculus)	abundant	...
Blunt-nose minnow (Hyborhynchus notatus)	abundant	...
Straw-colored shiner (Notropis d. stramineus)	common	...
Black-nose shiner (Notropis h. heterolepis)	common to rare	...
Iowa darter (Poecilichthys exilis)	rare	...
Coarse fish:		
Yellow bullhead (Ameiurus natalis)	common	...
Obnoxious fish:		
Long-nose gar (Lepisosteus osseus)	reported common	...

Bluegills are certainly the most abundant game fish in the lake at the present time. The black crappie is reported to be increasing. Largemouth bass are common and some very nice catches of this species have been taken in previous years. Northern pike are rare, as are smallmouth bass. It is rather peculiar that no perch were taken in netting operations. This species made up a considerable part of the angler's catch back in the early thirties, according to creel census records submitted by Conservation Officers. At least two plantings have been made in the lake since that time, with no apparent results. The yellow bullhead was the only coarse fish taken and the long-nose gar is the only obnoxious species reported to be present.

Five forage fishes were collected. Of these, the silverside and blunt-nose minnow were very abundant.

A study has been made of the growth rate of those game fish taken by the survey party. The series of fish was too small to give conclusive evidence of just how fast the fish are growing in Silver Lake, but it does give an indication of the rate of growth for several species.

A summary of the age determinations along with average lengths and weights is given in the table below.

Species	Age group*	Number of specimens	Av. total length in inches	Average ~~total~~ weight in oz.
Northern pike	I	1	18.2	17.6
Largemouth bass	II	2	5.8	1.5
Black crappie	II	1	6.8	2.5
	III	1	8.0	4.4
Bluegill	II	5	3.2	0.3
	III	2	5.8	1.8
	IV	2	5.8	2.0
	V	8	6.3	2.6
	VI	10	6.8	2.7
	VII	8	6.8	3.5
Pumpkinseed	II	3	3.3	0.4
	III	8	4.7	1.3
	IV	1	4.8	1.2
Green sunfish	III	10	3.7	0.5
	IV	2	4.3	0.9
	V	1	5.0	1.4

*Age determinations by W. C. Beckman.

The only northern pike taken (18 inches, total length) was late in its second summer of life. Largemouth bass probably reach legal length late in their fourth summer. The only specimens collected were nearly three summers old and were only six inches in total length. Black crappie reach legal length in their second summer, while bluegills, on the other hand, require four to six years to reach this same size. Pumpkinseeds and green sunfish were all sublegal, even though some of them were five to six years old.

In summary, these data seem to show very good growth for northern pike

and black crappies, slower than average growth for largemouth bass and bluegills, and very poor growth for the sunfishes.

The natural spawning facilities in Silver Lake seem to be wholly adequate for bass, bluegills, sunfish, crappies and perch. The areas where northern pike might spawn are certainly limited. It is suspected that the pike present in the lake may have migrated from the outlet stream. Conditions for pike spawning seem very good in some of the little tributaries of the Huron River. What effect the dam might have on preventing the young and adult pike from entering the lake is not definitely known.

Management Suggestions

Silver Lake is at present in the "all other lakes" classification and there is no reason, in the light of this fisheries survey, which would warrant any change in designation. Northern pike do well in small numbers in a number of the lakes in the region, and it might be possible to increase the species by making the outlet stream more accessible.

The introduction of black crappies into Silver Lake may have added an important species. This fish seems to grow well and has no apparent bad effect on the other game fishes. As previously stated, its rate of growth is very good, possibly because of its recent introduction. Because of the suitable spawning conditions, no further plantings of black crappie seem necessary.

Largemouth bass are undoubtedly more suited to Silver Lake than the smallmouth, since soft bottom dominates, although there is some suitable spawning ground for the latter in the gravelly shoals. It is believed that natural reproduction will adequately take care of the supply of largemouth bass in this lake.

Bluegills and sunfish should not be planted. These fish have abundant spawning grounds, and will maintain themselves to the carrying capacity of the lake. There are indications of overpopulation for bluegills and certainly for the sunfish. Their large numbers and slow growth rate are evidence of this.

Perch plantings should be discontinued. The failure of this species to maintain itself proves that Silver Lake is not suitable for it.

No predator control is suggested, even though there are reportedly many long-nose gar present in the lake. The large number of small pan fish is evidence that predation is of no serious consequence.

A considerable number of the bluegills and sunfish showed parasitic infestations, but this was of no serious proportion and in no way impaired the edibility of these fish.

Silver Lake has a fair amount of cover in the weed beds, deadheads, trash, docks, etc. However, there are considerable areas of the shoal without good permanent cover. The addition of a limited number of brush shelters in water between 6 and 18 feet deep would probably be a worthwhile improvement.

It is important to maintain the water level on this lake, since a large area of the bottom would be exposed even with a fluctuation of a few inches. The low dam at the outlet serves this purpose and prevents any serious fluctuation. It seems desirable to maintain this structure. However, some consideration might be given the possibility of developing the outlet for a pike spawning ground.

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