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FISHERIES SURVEY OF SWAINS LAKE, JACKSON COUNTY

by  
C. J. D. Brown

Swains Lake is located in the north-central part of Pulaski Township, Jackson County (T. 4 S., R. 3 W., Sec. 3 and 4). It is about one mile south of the village of Concord and twelve miles southwest of Jackson. The lake has no substantial inlets and only a small outlet which is tributary to the south branch of the Kalamazoo River.

An outline, contour, bottom type map was prepared by an Institute party during the late winter of 1940, and a regular fisheries inventory was made on the lake in early September of the same year. Previous observations had been made on the cisco in this lake (December, 1939) by Dr. James Moffett and myself. Some of the data taken on the cisco at that time will be presented in this report. We are grateful to Assistant Regional Supervisor of the Division of Field Administration, Frank McClellan, for facilities and aid given us in this study.

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

\* The fisheries survey party was as follows: Fred Locke, leader; Irving Cantrall and Burton Hunt, assistants.

In so far as is known, Swains Lake has never been the site of any industrial development. Early fishing records are few, but reports are in accord that yellow perch fishing in early times (40 years ago) was excellent. At present, bluegills, perch and largemouth bass are the most important game fish present. Cisco are abundant in the lake, but only a few are taken each fall (during the spawning season) by spearing.

The lake is an important fishing water and is used extensively by the people of Jackson County. A county park occupies about one-third of the southeast shore, offering facilities for boating, swimming, camping, etc. There are fourteen private cottages on the lake, mostly confined to the south side.

Swains Lake undoubtedly originated at the time of the Kalamazoo glacial morainic system and is a pit lake formed on the outwash between the Erie and Saginaw lobes. What changes have occurred since glacial times are not known, but are presumed to be slight, since there is no appreciable evidence of filling or drastic change of shore line. The surrounding country is slightly rolling and the soil is predominantly sand which supports scattered hardwood growths and a limited amount of agriculture.

The lake is roughly S-shaped with the long axis running in a southwest-northeast direction. It has two major depressions: one in the east arm which has a maximum depth of 38 feet and one in the central region which has a maximum depth of 64 feet. The point of greatest depth occurs almost directly west of the south boundary of the county park, midway between the shores. A smaller depression is partially cut off from the deep basin by a bar extending across the lake in the region of the public dock. This latter pit has a maximum depth of about 30 feet.

Swains Lake has an area of 69.5 acres. The water fluctuation seems to be negligible. Run-off and springs are the source of supply. The entire lake drainage probably does not exceed more than one to two square miles. The shore line development is 1.6, which means that the length of its shore line is 1.6 times as long as it would be if the lake were perfectly round and of the same area. Approximately 60 per cent of its area is shoal (water less than 15 feet in depth). The bottom of this region is composed of sand and marl, and the deep bottom deposits are predominantly finely divided pulpy peat and muck.

The water is colorless and the turbidity is about average for the small lakes of the region (Secchi disc visible down to 14 feet).

The physical characteristics of this lake seem to be favorable for high productivity. Its small size and orientation prevent any destructive wave action. The great expanse of shoal offers adequate feeding and spawning grounds for a reasonable fish population.

Temperature and chemical conditions found in this lake at the time of the survey (September 13, 1940) are summarized in the following table.

Temperature and Chemical Conditions in Swains Lake,  
Jackson County, on September 13, 1940

Depth (ft.)	Water temp.		Oxygen		CO <sub>2</sub>		Methyl orange		pH	
	°F.		p.p.m.		p.p.m.		alkalinity, ppm.			
	E.D. <sup>▼</sup>	W.D. <sup>▼*</sup>	E.D.	W.D.	E.D.	W.D.	E.D.	W.E.	E.D.	W.D.
0	65	65	8.7	8.5	0.0	0.0	125	123	8.4	8.4
3	64	65	...	...	...	...	...	...	...	...
6	64	65	...	...	...	...	...	...	...	...
9	63	65	...	...	...	...	...	...	...	...
12	62	65	...	...	...	...	...	...	...	...
15	62	65	...	...	...	...	...	...	...	...
18	61	64	...	...	...	...	...	...	...	...
21	60	63	...	7.9	...	0.0	...	128	...	8.4
24	55	59	1.0	...	6.0	...	176	...	7.4	...
27	51	53	...	...	...	...	...	...	...	...
30	49	51	...	4.1	...	6.0	...	152	...	7.6
33 (bottom)	49	49	0.1	...	35.0	...	206	...	6.8	...
36		48		...		...		...		...
39		47		...		...		...		...
42		46		...		...		...		...
45		46		...		...		...		...
48		45		...		...		...		...
51		45		...		...		...		...
56		45		...		...		...		...
57		44		...		...		...		...
60	(bottom)	44		0.1		32.0		186		7.2

▼ = East depression.

▼\* = West depression.

The temperature series given above shows marked thermal stratification. The thermocline (zone of rapid change in temperature) is located near the bottom in the east depression (between 24 and 30 feet), and in the west depression this zone is located between 24 and 33 feet. The oxygen supply becomes deficient below the twenty-foot level in the east depression and below the thirty-foot level in the west basin. This means that fish are not able to use the water

below these depths during the stagnation period of late summer and very probably during late winter. The cisco, which require cold water, are probably confined to the narrow thermocline of the west basin in late summer and early fall, the only place where temperature and oxygen conditions remain suitable. Temperature and oxygen conditions probably remain satisfactory in the upper 20 feet for the warm water species throughout most of the year.

The water in this lake is rather hard (M.O. alkalinity, 123-206 p.p.m.), and distinctly alkaline (pH 7.2-8.4) except on the bottom of the east depression where it was slightly acid -- very probably a temporary condition due to rather large quantities of carbon dioxide. The fairly extensive deposition of marl in this lake is indicative of the alkaline conditions. As a rule, lakes with moderately hard water are much more productive than those with soft water. Chemical conditions are favorable in Swains Lake for high fish productivity.

No pollution of any kind was observed.

Fifteen species of aquatic plants were found to be present in the lake. Several of these were abundant and a number were quite common. A detailed list is given below.

Plants in Swains Lake

Species	Scientific name	Abundance
Water shield	<u>Brasenia Schreberi</u>	common
Spike rush	<u>Eleocharis sp.</u>	abundant
Water milfoil	<u>Myriophyllum</u>	abundant
Bushy pondweed	<u>Najas flexilis</u>	abundant
Water lily	<u>Nymphaea odorata</u>	rare
Yellow water lily	<u>Nuphar variegatum</u>	abundant
Pickereel weed	<u>Pontederia cordata</u>	common
Pondweed	<u>Potamogeton angustifolius</u>	abundant
Floating brownleaf	<u>Potamogeton natans</u>	common
Sago pondweed	<u>Potamogeton pectinatus</u>	common
Pondweed	<u>Potamogeton pusillus</u>	common
Flat-stemmed pondweed	<u>Potamogeton zosteriformis</u>	abundant
Softstem bulrush	<u>Scirpus validus</u>	abundant
Stoneworts	<u>Chara</u>	abundant
Muskgrass	<u>Nitella flexilis</u>	abundant

Both the weed beds and the lake bottom supported an abundant population of fish-food organisms. Snails were very abundant on the plants, along with large numbers of scuds, mayflies, dragonflies, caddis flies and midge larvae. On the marl and sand shoals, midges were common, as well as scuds, mayflies, dragonflies, caddis flies and damsel flies. Water mites were numerous in all samples. Midges were the predominant organism on the muck and peat bottoms.

Plankton (small microscopic organisms, plants and animals) samples contained mostly animal forms in moderate abundance. Samples of this kind, however, are not reliable because of the variation from day to day. On the whole, the fish growth studies indicate better than average conditions for southern lakes and lead us to believe that food is abundant.

The rich, extensive plant beds support excellent food and offer good cover for the game fish in the lake. They also serve as a place for perch to spawn. A drastic reduction in plants would very probably be responsible for a reduction in fish.

Fish collections were made by the survey party in order to determine their kinds and abundance, and also the growth rate of the game species present. A summary of the fish collections and stocking is given below.

Summary of Fish Collections and Stocking  
in Swains Lake, Jackson County

Species	Abundance	Stocking in past six years, 1934 - 1939
<u>Game fish:</u>		
Bluegills	abundant	21,000
Pumpkinseed	abundant	400
Green sunfish	few	...
Yellow perch	common	700
Rock bass	common	...
Largemouth bass	common	1,200
Smallmouth bass	none taken or reported	125
Cisco	abundant	...
<u>Forage fish:</u>		
Black-nosed shiner	abundant	...
Black-chinned shiner	abundant	...
Pug-nosed shiner	common	...
Blunt-nosed minnow	common	...
Menona killifish	common	...
Iowa darter	few	...
Least darter	rare	...
Silversides	rare	...
<u>Coarse fish:</u>		
Common sucker	few	...
Yellow bullhead	common	...

The stocking of bluegills and largemouth bass may have been effective, although it is likely these species were present before any stocking was done by the survey party and seining, shows that they are reproducing very successfully at present. Smallmouth bass plantings during 1939 have not as yet shown any returns. Forage fish are fairly abundant and the coarse fish are represented by only a few common suckers and a fairly large number of yellow bullheads.

Age and growth analyses were made on the game fish collected during the investigation. A summary is given below. All of the fish were collected during the regular survey, except the cisco, which were taken during December of the previous year.

Age and Growth Analyses of Game Fish  
from Swains Lake, Jackson County

Species	Age group <sup>✶</sup>	Number of specimens	Av. total length in inches	Av. weight in ounces
Perch	I	3	5.9	1.2
	II	3	8.9	5.0
	III	3	9.0	5.1
Largemouth bass	0	4	3.0	0.1
	I	5	5.1	0.8
	III	2	9.8	6.8
Rock bass	III	1	6.1	2.6
Bluegill	I	4	2.5	0.1
	II	7	4.4	0.8
	III	2	7.2	4.5
	VII	1	7.5	6.0
	VIII	1	7.9	7.8
Pumpkinseed	I	1	4.0	0.8
	II	8	4.8	1.3
	III	1	6.7	3.9
	IV	1	3.9	0.7
	V	1	7.1	5.2
Warmouth bass	II	2	4.5	1.4
	III	3	5.1	1.5
	IV	4	5.9	2.7
	V	2	6.4	3.2
Cisco	IV	5	15.4	21.3
	V	22	15.6	25.0
	VI	25	15.7	25.4
	VII	28	15.8	28.2
	VIII	1	16.2	28.7
	IX	3	16.2	25.4
	X	1	16.8	28.2

<sup>✶</sup>Age determinations, exclusive of the cisco, were made by W. C. Beckman.



Yellow perch reach legal length late in their second or early in their third growing season, which is very fine growth and above average for this species. Largemouth bass very probably do not reach ten inches until late in their fourth summer. We had too few specimens, however, to be certain about this. Rock bass and pumpkinseeds reached legal length in their fourth summer and bluegills late in their third year. This is good growth for the bluegills and fair for the other two just mentioned. Warmouth bass, which are usually slow growers, did not reach legal length until their fifth or sixth year.

All of the cisco collected were in the older age group, as might be suspected, since they were collected during the breeding season. Five-year-old fish were about 15 inches long, and one ten-year-old specimen was 16.8 inches in total length. Studies of other workers have shown that this species grows very rapidly at first and then slows up drastically after four or five years. The adult specimens taken were unusually large and fine when compared to those from other small southern Michigan lakes. Conditions must be very favorable for the cisco in Swains Lake.

As has already been pointed out, largemouth bass, bluegills and pumpkinseeds have been present in Swains Lake for a long time. It is not known what part stocking has played in the production and maintenance of the present population. Conditions are excellent for the natural propagation of all the game species present and it is very probable that most of the present population resulted from natural reproduction. The extensive weed beds are ideal for perch spawning and this species has maintained itself during the past forty years without any appreciable outside aid. The cisco have proven their

capacity to maintain themselves by natural propagation, since no artificial plantings have been made.

#### Management Suggestions

Swains Lake is in the "all other lakes" classification at the present time and there is no good reason why this classification should be changed.

Future stocking in this lake should be kept to a minimum. The facilities for the natural propagation of largemouth bass, bluegills and perch are excellent and there is no reason to believe that additional plantings should be necessary. The planting of sunfish and introduction of crappies does not seem advisable, since sunfish seldom grow as rapidly as bluegills and often cross with them to produce unfertile individuals. Crappies would greatly reduce the forage fish population and undoubtedly cause a reduction in perch growth. Fish foods are abundant, but not inexhaustible, and overstocking may contribute to a reduction in the average size of individual fish in the population.

No predators were seen or reported in this investigation, and therefore no control measures are suggested.

Very little parasitism was noted in the fish collected. A few of the bluegills had an unimportant incidence of black spot (Neascus), and one bass had copepod parasites in its mouth. There should be no concern over the small parasite incidence evident there.

Cover is fairly adequate in Swains Lake when the vegetation is at its peak; however, no year around shelters are present. The placement of a reasonable number of brush shelters in water between 6 and 15 feet in depth might be a good supplement to the weed beds. Shelters should be well scattered

and in deep enough water not to interfere with boating or other recreational activities. Naturally, no such devices should be placed in the region of diving docks and boat paths.

There seems to be no reason for water level regulation. Reports indicate that the level is stable without damming or man-made regulation.

We do not believe it advisable to open Swains Lake to cisco netting. Spearing and angling for these fish should be encouraged, however. Since the studies made here indicate a limited part of this lake as being suitable for trout, it would seem reasonable to try an experimental planting of 1,000 legal rainbow trout next fall just before the freeze-up. Rainbow trout will probably not be able to reproduce successfully in Swains Lake, but limited trout fishing might result from regular plantings of legal-sized fish, as it has in Birch Lake, Cass County.

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