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Dr. Brown
J.L. Brass 12-31-40

INSTITUTE FOR FISHERIES RESEARCH
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ALBERT S. HAZZARD, PH.D.
DIRECTOR

ADDRESS
UNIVERSITY MUSEUMS
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FISHERIES SURVEY OF FINE LAKE, BARRY COUNTY

by

C. J. D. Brown and John Funk

Fine Lake is located in the south-central part of Barry County, near the western boundary of Johnston township (T. 1 N., R. 8 W., Sec. 19, 20, 29, 30). It is at the extreme upper end of a chain of small lakes, which form the headwaters of High Bank Creek. High Bank Creek drains into Thornapple Lake, which empties into the Grand River through Thornapple River. The Grand River enters Lake Michigan at Grand Haven. This lake is only about ten miles north of Battle Creek and 13½ miles south of Hastings. It is near state highway 37.

An outline-contour map* was prepared during the latter part of March, 1940. This was used as a base for plotting certain information collected by the fisheries survey party** at the time of the biological inventory, August 13, 17, 1940.

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*Mapping party personnel as follows: Lyle Newton, leader; Royal Howe and Mr. Wilson, assistants.

**Fisheries survey party personnel as follows: John Funk, leader; David Anderson, William Reavley and Michael Meyer, assistants.

We wish to thank George Dorman, Gavin Ritchie and Howard Raymer for the assistance they gave the fisheries survey party.

Fine Lake has served as a popular resort lake for at least forty years. There are no reports of its having been used in lumbering or other industry. It has the reputation of being a very good fishing lake. Fair catches are made at the present time, but the fish taken are reported to be of small size.

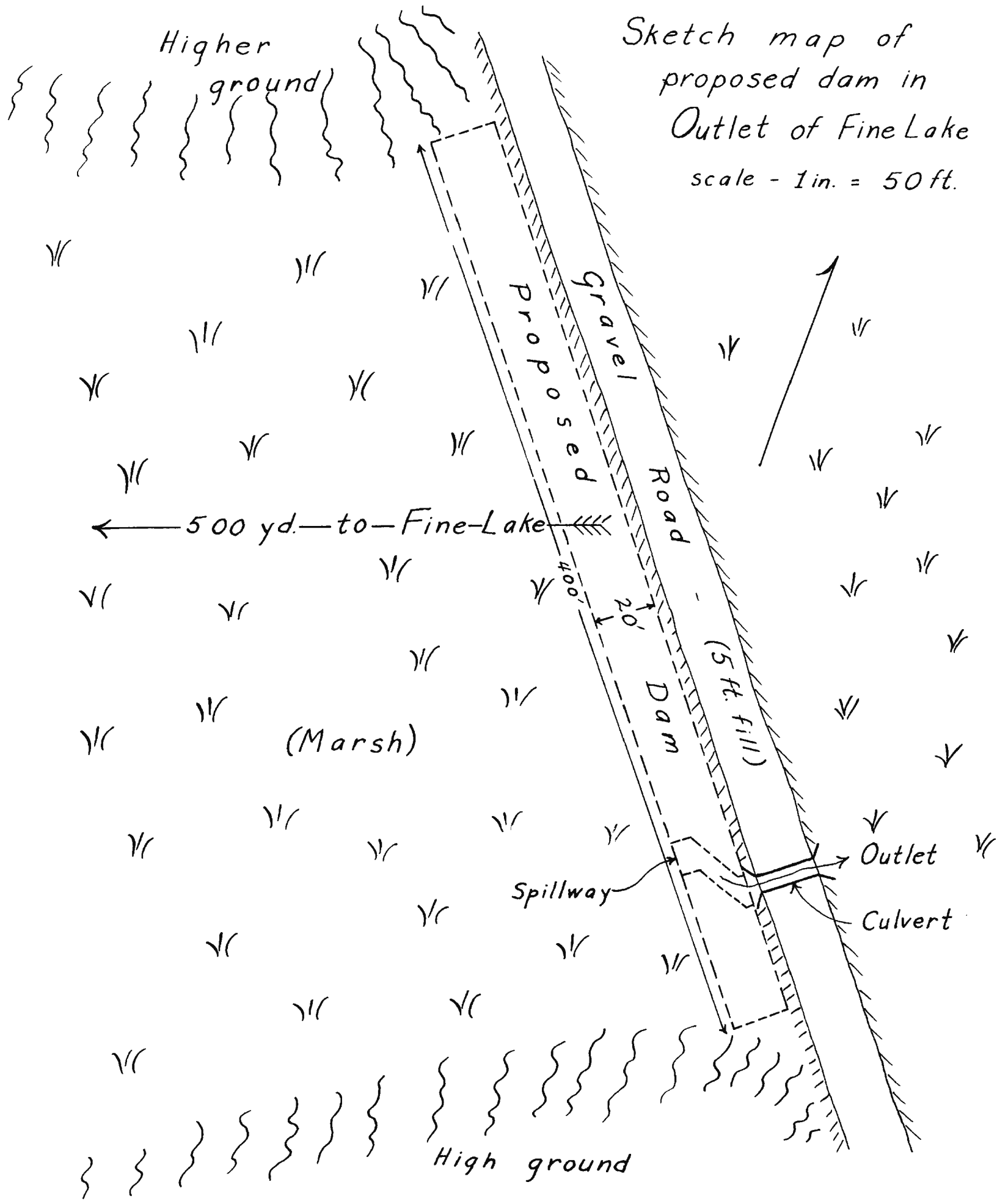
There are approximately 130 cottages and residences on the lake. One resort, where camping is permitted, and three boat liveries are also present. The lake is very heavily fished. An estimated daily average of ten to twelve boats on week days was reported by the survey party, with this number usually doubled in the early mornings and evenings. On weekends and holidays 80-100 boats per day were reported. The nearness of this lake to large centers of population probably accounts for the concentration of fishermen. At any rate, it is important as a public fishing water.

Fine Lake is somewhat oblong in its general outline. This is obscured, however, by the irregularity of the shore line. It has a surface area of 320 acres, a maximum length of about one mile, a maximum width of 0.8 of a mile, and a maximum depth of 47 feet. The long axis lies due east and west. The lake basin very probably had a glacial origin, although no study has been made regarding its past history. The surrounding country is morainic in character with very irregular topography, and the contour of the lake basin is not essentially different, being also very irregular. It has two major depressions: one in the west end which has a maximum depth of 34 feet, and one in the east end which has a depth of 48 feet. The deepest point is

located one-fourth mile directly northwest of the Poplar Resort. The margins of the lake are, for the most part, high (5-20 feet) above the water level and are bordered by solid sand or sand and marl beach. Only a very limited part of the shore is low and marshy.

The drainage of this lake is small. There is no important inlet; the water level is maintained from springs and run-off. The outlet into Mill Lake is through the prominent shallow bay at the northeast end. There is no definite channel, but simply a marshy area about 3/4 mile long between the two lakes. This is blocked by a road near Fine Lake, except for a culvert about 26 inches in diameter.

The annual water fluctuation is usually one to two feet. In order to control this fluctuation, residents of the vicinity of the lake have undertaken the construction of a dam at the point where the road crosses the outlet. The contract for this work has been let and work was to be started before September 1, to be completed within 60 days. We have no report regarding the present status of this project. An earth fill 20 feet wide, approximately 400 feet long, and high enough to bring the water level up to the legal level for the lake was proposed. A plank and galvanized iron spillway 12 feet wide, one foot high and 20-25 feet long was to be constructed across the dam to carry the water over and through the culvert under the road. The water level of the lake will be raised approximately one foot above what it was at the time of the survey. The accompanying sketch represents the proposed dam as nearly as could be determined from the reports of local people. The presence of a dam to control this fluctuation is especially important in Fine Lake as a drop of even a few inches exposes a rather large expanse of shoal.


Higher ground
Sketch map of proposed dam in Outlet of Fine Lake
scale - 1 in. = 50 ft.
Proposed Dam
Gravel Road
(5 ft. fill)
500 yd. — to — Fine Lake
400'
20'
(Marsh)
Outlet
Spillway
Culvert
High ground

Approximately 65 per cent of the surface area in Fine Lake is shoal (water less than ten feet in depth). The bottom of this zone is composed of sand overlaid with marl and spotted with a few small patches of fibrous peat and gravel. The bottom in the depressions is pulpy peat and muck.

The water is colorless and a Secchi disc was visible to a depth of ten feet. This is about average for small lakes in southern Michigan. The wave action on this lake is reduced by the irregularity of the shore line and the expanse of shallow water covered by emergent vegetation. Weed beds have become established all around the lake and this has contributed to the high productivity of this water. On the whole, the physical factors operating in Fine Lake are favorable to high fish production.

Temperature and chemical information taken on Fine Lake during the fisheries survey is summarized in the following table.

Station	1		2	
Location	East depression		West depression	
Date	8-15-40		8-15-40	
	Temperature (°F.)	Depth (ft.)	Temperature (°F.)	Depth (ft.)
Surface	79	0	82	0
Bottom	59	47	65	30
Thermocline				
Top	76	18	78	15
Bottom	62	36	67	24
	Oxygen, p.p.m.	Depth (ft.)	Oxygen, p.p.m.	Depth (ft.)
Surface	8.5	0	8.8	0
Bottom	0.0	47	0.0	30
Thermocline				
Top	7.7	18	5.0	15
Bottom	0.0	36	0.0	24
CO_2 Range	0.0-15.0 p.p.m.		0.0-17.0 p.p.m.	
M. O. Alkalinity Range	70.0-110.0 p.p.m.		72.0-120.0 p.p.m.	
pH Range	7.3-8.3		7.4-8.2	

The temperature varied from 82° F. at the surface on August 15, 1940, to 59° F. at the bottom in the deepest place. A thermocline (zone of rapid changing temperature) was present in the east depression between 18 and 36 feet and in the west depression between 15 and 24 feet. This zone results from lack of circulation and has a blanketing effect on the lower waters so that they only warm up very slowly.

The lower zone of water (below the thermocline) in both depressions was absolutely devoid of dissolved oxygen and contained considerable carbon dioxide (9-17 p.p.m.). This means that the water, below approximately 25 feet in the east end and 20 feet in the west end, can not be inhabited by fish and most other forms of life because of the lack of oxygen. The period in which oxygen is greatly reduced or absent is known as stagnation. Oxygen is restored to this zone usually late in the fall when lower surface temperatures and increased wind mix the water from top to bottom. Fish that would normally inhabit this part of the lake are forced into the surface zone, where they must compete with the fishes inhabiting these waters.

The water in this lake is moderately hard (70-120 p.p.m. methyl orange alkalinity) and distinctly alkaline (pH 7.4-8.3). Both of these factors are important and favorable for the production of aquatic plants.

Fine Lake has an abundance of aquatic vegetation. In general, two habitat groups were distinguishable. The plant associations were quite different in areas of solid or soft bottoms. The most characteristic plants on the solid bottom areas (stations 2 and 4) were bulrushes (Scirpus). The great bulrush (S. occidentalis) occurred in three to four feet of water and the three-angled bulrush (S. americanus) at depths of a few inches and on shore. A limited growth of Naiad (Najas) and some wild celery (Vallisneria)

were found in the shallower water. These were very luxuriant at depths between four and ten feet. The pondweed Potamogeton alpinus was also abundant in this deeper water. Musk grass (Chara) was abundant in a few limited areas of the solid bottom, but entirely absent in other places with approximately the same type of bottom.

In areas of soft bottom and encroaching shores (Stations 1 and 3), a more luxuriant and varied population of plants was found. The margins in most cases were bordered by a dense bed of water willow (Decodon), which was in full bloom at the time of the survey. In some places great beds of cattail (Typha) and pickerelweed (Pontederia) were observed. Water lilies (Nymphaea) and spatterdock (Nuphar) were abundant in the shallow water, and among them was a remarkable growth of water shield (Brasenia). The bushy pondweed (Najas) was dominant on the bottom. Milfoil (Myriophyllum) and the pondweed (Potamogeton alpinus) were the most important tall-growing submergents. A complete summary of the plants taken, their abundance and place of growth is given in the following table.

Plant Chart

Fine Lake, Barry County

Species*	Abundance	Depth range (ft.)	Bottom type
Stonewort (Chara fragilis)	abundant - common	0-10'	marl
Cattail (Typha latifolia)	abundant	0-1'	marl
Floating brownleaf (Potamogeton natans)	common	1-5'	marl and sand
Sago pondweed (Potamogeton pectinatus)	rare	2-6'	marl
Large-leaf pondweed (Potamogeton amplifolius)	abundant	3-6'	marl
Clasping-leaf pondweed (Potamogeton Richardsonii)	few	2-5'	marl
Pondweed (Potamogeton gramineus var. graminifolius f. myriophyllus	rare	1-5'	marl and sand
Robbin's pondweed (Potamogeton Robbinsii)	abundant	3-4'	marl
Flat-stemmed pondweed(Potamogeton zosteriformis)	rare	2-10'	marl
Pondweed (Potamogeton sp.)	few	2-4'	marl
Bushy pondweed (Najas flexilis)	abundant	0-10'	marl and sand
Wild celery (Vallisneria americana)	common	2-3'	marl
Bulrush (Scirpus acutus)	common	1-4'	marl and sand
Bulrush (Scirpus americanus)	abundant	0-1'	marl and sand
Arrow arum (Peltandra virginica)	rare	0-2'	marl
Big duckweed (Spirodela polyrhiza)	common	0'	marl
Pickerelweed (Pontederia cordata)	abundant	0-3'	marl
Coontail (Ceratophyllum demersum)	abundant	2-6'	marl
Water lily (Nymphaea odorata)	abundant	2-4'	marl
Yellow water lily (Nuphar advenum)	abundant	1-4'	marl
Water shield (Brasenia Schreberi)	common	2-3'	marl
Swamp loosestrife (Decodon verticellatus)	abundant	0-2'	marl and sand
Water milfoil (Myriophyllum exalbescens)	abundant	2-5'	marl
Bladderwort (Utricularia vulgaris var.amer.)	common	0-2'	marl

*Plant determinations by Betty Robertson and John Funk.

Fine Lake undoubtedly produces much fish food. Samples were taken of the plankton (small mostly microscopic plants and animals). The average for three stations was 2.7 c.c. of plankton per cubic meter of water. Phyto- or plant plankton was predominant in these collections. However, not very great significance can be attached to so few samples. It is known that plankton abundance varies from day to day and at different depths.

The most abundant forms of bottom food taken in the sampling were fresh-water shrimp and midge larvae. Mayflies were also quite abundant and snails, water mites and caddis fly larvae were common. Crayfish and mussels were observed to be common on the sandy shoals. The pulpy peat bottom in the depths was almost devoid of life.

Fish samples were taken in order to get an estimate of the abundance of each species and to study their general condition and growth rate. The most abundant game fish taken and reported for the lake was the bluegill (Lepomis macrochirus). Black crappie (Pomoxis nigro-maculatus) and large-mouth bass (Huro salmoides) were abundant to common, and pumpkinseed sun-fish (Lepomis gibbosus) and warmouth bass (Chaenobryttus gulosis) were common. The blunt-nose minnow (Hyborhynchus notatus) was the most abundant forage fish. The black-nosed shiner (Notropis h. heterolepis), black-chin shiner (Notropis heterodon), golden shiner (Notemigonus crysoleucas auratus), common shiner (Notropis cornutus frontalis) and the Menona killifish (Fundalus diaphanus menona) were all common. Brown bullheads (Ameiurus n. nebulosus) were abundant. No obnoxious fish were taken, observed or reported. A complete list of species present or reliably reported is given below.

Fish	Abundance	Size range Standard length (inches)	Stocking 1934-39, inclusive
Game Fish:			
Yellow perch	few	3.0-8.4	8,500
Northern pike	few	13.0-13.5	...
Mud pickerel	rare	2.5	...
Largemouth bass	common	1.6-4.5	4,900
Smallmouth bass	not taken or reported	...	588
Warmouth bass	common	1.8-4.0	...
Rock bass	reported rare	...	...
Green sunfish	rare	2.8-4.2	...
Bluegill	abundant	0.7-5.8	64,000
Pumpkinseed sunfish	common	0.7-5.1	...
Black crappie	abundant	4.0-7.2	...
Forage fish:			
Black-nosed shiner	common	...	...
Black-chin shiner	abundant	...	...
Spot-tail shiner	few	...	...
Common shiner	few	...	...
Golden shiner	rare	...	...
Blunt-nosed minnow	abundant	...	...
Menona killifish	abundant	...	...
Iowa darter	common	...	...
Least darter	few	...	...
Coarse fish:			
Common sucker	few	0.7-1.0	...
Yellow bullhead	common	5.5-7.1	...
Brown bullhead	abundant	4.2-10.6	...

The rather incomplete creel census (general census) taken on Fine Lake seems to indicate that bluegills have been the predominant fish taken since 1928. Largemouth bass and pumpkinseeds were frequently taken, while northern pike and yellow perch were less commonly caught. Crappies were first reported in 1932.

A growth rate study was made on the game fish collected. A summary of the data obtained is given in the following table.

Species	Age group*	Number of specimens	Ave. total length in inches	Ave. weight in ounces
Yellow perch	I	2	4.5	0.6
	II	1	6.3	1.4
	IV	1	8.2	3.8
	VII	1	10.1	7.0
Great northern pike	I	2	15.6	12.1
Largemouth bass	I	5	4.9	0.8
	II	3	7.8	3.0
	VII	1	17.1	45.0
	VIII	1	17.3	50.0
Black crappie	II	12	5.5	1.1
	III	1	7.8	3.3
	VII	1	9.4	6.3
Bluegill	I	4	2.2	0.1
	II	15	3.5	0.4
	III	17	5.3	1.6
	IV	12	5.8	2.1
	V	4	6.6	2.8
	VI	3	7.0	3.5
	VII	2	6.6	2.6
Pumpkinseed sunfish	II	6	3.7	0.6
	III	18	4.8	1.4
	IV	4	5.5	2.2
	V	3	5.5	1.8
	VII	1	5.5	1.9
Green sunfish	III	1	5.1	1.8
Warmouth bass	II	4	3.3	0.5
	IV	1	5.3	1.7
	V	1	4.9	1.5

*Age determinations by W. C. Beckman

Yellow perch reach legal length in their third summer of life; northern pike in their second summer; largemouth bass in their fourth summer; and black crappie in their third growing season. Bluegills do not reach legal length until their fifth or sixth year, and none of the common sunfish, green sunfish or warmouth bass taken were of legal length even though some of them were as much as seven years old.

Although the series of fish examined from this lake is not large, we believe it is representative. Yellow perch and northern pike showed good growth, while largemouth bass and black crappies showed fair growth. The bluegills grow very slowly. Instead of reaching legal length in their third summer as would be expected under average growing conditions, this species does not reach a catchable size until their fifth or sixth year. Very few of the sunfishes and warmouth bass ever attain legal length.

Spawning facilities for all the game fish present in Fine Lake seem to be good. About three-fourths of the shoal area of the lake has a solid sand or marl bottom spotted with some gravel patches, which is relatively free from weeds and should provide ideal spawning facilities for fish requiring these types. The prominent weedy bay and its surrounding marsh at the northeast of the lake should be entirely suitable for pike, especially if the marsh is kept flooded during the spring. The extensive weed beds and trash should provide abundant spawning ground for perch as well as some of the forage fish.

Management suggestions

Fine Lake is at present in the "all other lakes" classification and there is no reason to believe that a change in designation would improve fishing conditions there. The growth rate data indicate fair to good growth

for the fish-eating species and very poor growth for the bluegills and sunfish.

All stocking of bluegills and sunfish should be discontinued. The adding of outside fish to the already crowded (stunted) population will only aggravate conditions. Large plantings of bass and possibly perch should help to reduce the bluegill and sunfish populations to a point where these fish can grow up. Previous plantings of smallmouth bass appear to have been unsuccessful in this lake, although conditions seem to be favorable for growth and natural reproduction of this species. A more substantial planting of this species might establish it in the lake. The largemouth bass has proven its ability to get along in Fine Lake and so it should be definitely encouraged by stocking until a balance between bass and bluegills is established.

The crappie will probably be able to maintain itself without further stocking.

The cause for stunting or slow growth in certain species of fish (particularly pan fish) in a number of our southern Michigan lakes is not very well understood. It seems to be a condition of overcrowding in which the "bug-eating" species get out of balance or porportion to the "fish-eating" kinds. It is logical to suppose that any corrective measure should include the reduction of the stunted species. This may come about by natural means, such as the increase in the piscivorous fishes or by natural reductions due to disease or predation. We have no good experimental evidence to show us which methods are most effective and generally beneficial. A natural check on "overpopulation" is a fundamental process in nature. It is our belief that under most circumstances lakes will recover from overpopulation themselves if left alone. How long it takes for this natural recovery we do not know, but

the time is probably variable depending upon the conditions present.

It is believed that artificial means might hurry up things and bring about a balance much sooner than if left alone. However, no specific suggestions can be given until further investigation is made on the subject. Such things as removal of part of the stunted population by netting, partial poisoning and destruction of nests are proposed methods, but only careful experimentation will tell us which is the most effective and desirable.

Herons, kingfishers, terns, and turtles were observed on the lake and, no doubt, water snakes are present. However, the number of these predators was not great and the good they do in removing diseased or overabundant fish more than offsets any damage resulting from them. No control measures are suggested. Parasite infestations were only slight. A few minor cases of black spot were observed and some bass and bluegills had small infestations of cysts on the fins. These were apparently of no harm to the fish and of no consequence to man. No control measures are known or would be justified.

Plant beds are abundant on the lake and furnish most of the cover available. Some trash is present, but cover in the form of deadheads seems to be lacking. Some stump or log shelters placed on the more barren shoals might be beneficial by improving the habitat for bass, which in turn might reduce the pan fish numbers.

The fluctuation in water level has been a problem on this lake, but as was indicated above, a dam was to be constructed in the outlet, which would maintain a higher and more constant level. Spawning facilities seem to be entirely adequate, with the possible exception of pike, and no improvements are suggested. The higher level maintained by a dam will undoubtedly increase

"Outlet control dam has been installed and is functioning at this time"
J. L. Evans
1-3-41

the area of spawning ground for pike. An increase in pike should aid in reduction of the pan fish population.

INSTITUTE FOR FISHERIES RESEARCH

C. J. D. Brown and John Funk

Typed by: Alma Hartrick

Approved by: A. S. Hazzard