

Original: Fish Division

cc: Education-Game

Institute for Fisheries Research

Mr. E. R. Widmyer

Major Franklin

G. P. Cooper

INSTITUTE FOR FISHERIES RESEARCH

DIVISION OF FISHERIES

MICHIGAN DEPARTMENT OF CONSERVATION

COOPERATING WITH THE

UNIVERSITY OF MICHIGAN

ALBERT S. HAZZARD, PH.D.
DIRECTOR

ADDRESS
UNIVERSITY MUSEUMS ANNEX
ANN ARBOR, MICHIGAN

December 31, 1945

REPORT NO. 1029

FISHERIES SURVEY OF HART AND EAGLE LAKES

ON THE FORT CUSTER RESERVATION

by

G. P. Cooper

The Fort Custer Reservation in Calhoun and Kalamazoo counties encloses several lakes, of which Hart Lake and Eagle Lake are the largest in size and of the greatest interest to resident fishermen at the Reservation. Correspondence during 1944 and 1945 between Messrs. Widmyer and Culler of the United States Fish and Wildlife Service and Messrs. Westerman and Hazzard, has indicated a definite interest in providing better fishing in Fort Custer waters primarily for the benefit of the large number of service men there. In this correspondence, emphasis has been on the question of fish plantings in Hart and Eagle lakes, and it was suggested that this Institute make an examination of these waters to determine what plantings might be advisable and specifically whether or not the lakes would support trout.

The examination of Hart and Eagle lakes was made by Mr. I. A. Rodeheffer and the writer on August 3 to 6, 1945. Our personal contacts at Fort Custer were with Major W. H. Franklin, Purchasing and Contracting Officer, Sixth Service Command, Percy Jones Hospital Center. Major Franklin took

us on a preliminary tour of inspection of the waters on the reservation, provided us with a topographic map of the area, and was also very generous in obtaining living ^{accommodations} ~~arrangements~~ for us at the post.

An earlier examination of Fort Custer waters was made by an Institute party on May 12, 1933 (Institute Report No. 212). This examination in 1933 was concerned largely with the trout-carrying capacity of the main inlet and the outlet of Eagle Lake, and to a lesser extent with the features of Eagle and Hart lakes; and recommendations were made for stocking brook and rainbow trout in the inlet to Eagle Lake and for the installation of improvement devices in Eagle Lake.

Fish plantings in these Fort Custer waters since 1933 have been as follows:

Hart Lake - 375 smallmouth bass fingerlings in 1939
1,700 largemouth bass fingerlings in 1945
1,400 bluegill fingerlings in 1945
Eagle Lake - 375 smallmouth bass fingerlings in 1939
1,750 bluegill fingerlings in 1939

Inlets and outlet of Eagle Lake - no plantings

The above planting records are in part on file in our Ann Arbor office, and in part were obtained by direct communication from Mr. E. R. Widmyer. All plantings were made of fish from the United States Bureau of Fisheries (U. S. Fish and Wildlife Service).

The present study of Fort Custer waters was concerned primarily with Hart and Eagle lakes, because we were informed by Major Franklin that these two waters were the principal interest of fishermen among the personnel at the Post. The two lakes are considered separately in the remainder of this report.

Eagle Lake

(T. 2S., R. 9W., Sec. 1 and 2, Charleston Twp., Kalamazoo Co.)

Eagle Lake is readily accessible to the inhabitants of Fort Custer. It is less than a mile from much of the settlement, and a portion of the settlement, including a Station Hospital, is located directly on the north side of the lake. A good road runs along part of the north shore. The lake is used extensively for beach parties, bathing, boating, and fishing by Post personnel. The swimming beach along 200 yards of the northwest shore has been made by an extensive sand fill; otherwise the lake bottom in shallow water is mostly marl. During the four days (August 3 to 6, 1945) that we spent on the lake we noted an average amount of fishing and about 15 available boats on the lake. Two Army Life Guards on duty reported that the average amount of fishing could be represented by approximately six fishermen per day. The catch is mostly bluegills, perch and calicoes, a few largemouth bass, and a very few northern pike (up to 4 to 6 pounds). Returns in fishing were described as "slow," and we were assured that there would be a much greater interest in fishing if the results were better.

The lake outlet runs northwest for 1 1/2 miles to the Kalamazoo River. There are one large and two small inlet streams. The lake area is 70 acres according to Institute records, or 80 acres according to the "Lake and Stream Directory." It has not been mapped by this Institute. During our examination we made 23 depth and bottom soil soundings spaced fairly uniformly over the area of the lake. The greatest depth found was 32 feet near the center of the lake, and about 50 per cent of the lake was found to be over 25 feet deep. Except for the artificial sand beach along the northwest shore, the lake bottom was predominantly marl in shallow water (out to 15 feet) and marl and muck in deeper water. The

lake water was bluish-green in color and quite clear (S.D. = 8 ft.) at the time of our study.

A vertical series of temperatures and chemical analyses was made at a station near the center of the lake at a water depth of 31 feet on August 4, 1945 (Results are given in Table 1). A very light breeze was causing almost no disturbance of the surface of the lake. The surface temperature was 77°F.; at a depth of 5 feet it was also 77°F.; at 10 feet, 75°F.; at 14 feet, 71°F.; at 15 feet, 68.5°F.; at 20 feet, 59.5°F. etc. A pronounced thermocline existed between depth of 15 and 25 feet. Below a depth of 14 feet the water was sufficiently cold (below 70°F.) to be suitable for trout. The dissolved oxygen was near saturation at depths of surface, 13 and 15 feet, was somewhat reduced at 20 feet, and was definitely too low for trout at 25 feet. Combining temperature and oxygen requirements, a zone of suitable trout water was present approximately between the depths of 14 and 22 feet on August 4. It could be expected that this zone of trout water would be restricted somewhat further during the latter part of August. But on the basis of our experience with lakes in general, it is believed that sufficiently favorable conditions for trout would be retained throughout the remainder of the summer so that the lake could be regarded as potential trout water. Other lakes in Michigan with similar conditions of temperature and chemistry have proven to be good rainbow trout water.

The water was moderately hard (M.O. = 172 and 183) and quite alkaline (pH = 8.2 to 7.6), and should be productive of fish food organisms.

A moderately dense growth of aquatic vegetation was found over most of the shoal areas and on the slope of the drop-off. It consisted mostly of submerged types, and to a small extent of floating and emergent types.

The amount of aquatic vegetation was sufficient to furnish at least fair cover for small fish.

Fish netting operations included over-night sets of three gill nets and some seining. Two 125-foot experimental gill nets (mesh sizes of 1 1/2 to 4 inches) and a 150-foot net of 2 1/2-inch mesh were fished at separate stations at depth of 8 to 15 feet. Two of the nest were near large beds of submerged vegetation. The total gill net catch was three fish: a five-inch pumpkinseed sunfish, a four-inch bluegill, and a twelve-inch white sucker. A 25-foot bag seine operated for 1 1/2 hours along the southeast shore took approximately a dozen young game fish (few bluegills, few largemouth bass, and one perch) and very few minnows. Very few young game fish were seen during the seining operations, but small minnows were observed to be fairly abundant. Our conclusion from the results of the netting is that game fish are generally scarce in the lake, --both adults and young. The scarcity, if real, could not be attributed to lack of spawning grounds for the species present, with the possible exception of the northern pike. Since it is proposed to recommend the planting of rainbow trout in Eagle Lake, the apparent scarcity of warm-water game fish, and especially the reported scarcity of bass and rarity of the northern pike, may prove to be a definite asset in allowing better survival of planted trout.

The main inlet to Eagle Lake is about three miles long, and enters from the south. It was examined at 8:00 P.M. on August 6 at a point 1/2 mile above the lake, where the water temperature was 66°F., the air 77°F., the flow approximately 4 c.f.s. The stream has been cleaned of obstructions and the channel straightened, reportedly as a mosquito control measure. The stream bottom is mostly gravel and good spawning grounds for trout, but there is almost no protective cover for fish. The smaller inlet

which enters at the southeast corner of the lake, examined at 5:00 P.M. on August 4, had a water temperature of 62°F., with the air at 78°F., and a flow of 80 g.p.m. It has some gravel, and might be of limited value as a trout breeding stream.

On the basis of the present study it is believed that rainbow trout will survive in Eagle Lake, and that some natural reproduction of the species in the inlets might follow. It is proposed that the lake be managed as potential rainbow trout water, and the following recommendations are made:

1. Annual plantings of 3,500 legal-sized (7 to 10 inches) rainbow trout during early April of 1946 and 1947, and similar annual plantings if good fishing returns result from the initial plantings.
2. That Eagle Lake be designated by the Conservation Commission as a "trout lake" (allowing fishing from the last Saturday in April to Labor Day), with a daily bag limit of 5 trout per person.
3. That opening the lake to fall (September, October and November) rainbow fishing be proposed to the next Michigan legislature, unless the trout plantings fail.
4. That records of the number and size of all trout caught on the lake during the fishing season be obtained by personnel at Fort Custer. It is assumed that life guards or other Post personnel are continuously on duty, and that catch records of trout could be obtained with little effort by individuals charged with that responsibility. The records would be of considerable value in indicating whether or not continued trout plantings would be justified, and would serve as a guide as to the number to be planted in the future.

Hart (Harts) Lake

(T. 2S., R. 8W., Sec. 7 and 18, Battle Creek Twp., Calhoun Co.)

Hart Lake is located about 2 miles south of the center of the Fort Custer Settlement. It is readily accessible by an improved gravel road along the east shore. We noted two cabins on the lake, and about 6 boats. Use of the lake by Post personnel is primarily for fishing. We observed four fishermen on the lake during the portions of the three days spent there. A service man fishing on the lake reported that fishing produces mostly yellow perch, bluegills, and calicoes, and a few largemouth bass and northern pike; the fishing was described as "good" Major Franklin also informed us that fishing in Hart Lake was good.

The outlet of Hart Lake runs northeast approximately 3 miles to the Kalamazoo River. The lake area is 50 acres according to Institute records (area calculated from lake outline on county map), but the "Lake and Stream Directory" gives the area as 70 acres. The lake has not been mapped by this Institute. The report on "Examination of Waters" by the Michigan Fish Commission for 1888 shows an outline map of Hart Lake and several depth soundings, with the maximum depth of 45 feet near the north end of the lake. During our examination of the lake in 1945, several depth soundings were made at scattered points on the lake, in an effort to locate the deepest water. Our maximum depth record was 44 feet, in the north half of the lake. The shoal areas are narrow, and much of the lake is over 25 feet deep. The bottom is mostly marl and muck. Practically the entire shoreline is encroaching, and has a wide zone of marsh vegetation including cattail, bulrush, and arrowhead. Aquatic vegetation is dense on the narrow shoals and drop-off, especially Chara. The lake water was light brown in color, and quite clear (S.D. = 9 feet) at the time of our study.

Analyses of the vertical distribution of temperature, oxygen, etc., were made on August 6, 1945 at a station just north of the central island in water 41 feet deep (Data given in Table 2). The surface temperature was 76.6°F. and the warm surface layer extended to 13 feet (70.0°F.); there was a well defined thermocline between 13 and 20 feet, below which the temperature ranged in the low fifties. Thus the considerable portion of the lake volume below a depth of 13 feet had suitable temperature for cold-water fishes. But the dissolved oxygen was low below a depth of 16 feet. What might be regarded as potentially good trout water was confined on August 6 to the thin layer between depths of 14 and 16 feet, and it is a safe assumption that this 3-foot "trout zone" would be considerably reduced, if not completely obliterated, during the latter part of August. The difference between an 8-foot trout zone in Eagle Lake and a 3-foot zone in Hart Lake is probably significant. The water in Hart Lake tested moderately hard (M.O. = 114 and 162), and quite alkaline (pH = 8.4 to 7.5).

On the basis of the temperature and oxygen tests it is believed that Hart Lake would not support a trout population. The present population of warm-water game species further minimizes the possibility that trout would survive.

An over-night set, August 5 to 6, of three gill nets (same as used on Eagle Lake), took 8 yellow perch, 3 bluegills, 1 warmouth bass, 1 yellow bullhead, and 2 white suckers. The perch were large, in good condition, and fairly free from parasites. The addition of crappies, largemouth bass, and northern pike (all reported to be present) to the above list gives an adequate variety of game species of types well adapted to the lake.

In a comparison with the Institute data on the age-length relationship of bluegills and perch throughout the state, the Hart Lake bluegills in our samples had made about average growth, and the growth of the perch from Hart Lake was considerably better than average. Data on length and age of fish from Hart Lake are given in Table 3.

Our survey data for Hart Lake, together with comments on possible management recommendations, might be summarized as follows: The lake already has an adequate variety of warm-water game species, including just about all of the more desirable species for which the lake is well adapted, and consequently no further game-fish introductions are needed. The lake is not potential trout water, nor is it the type of lake in which smallmouth bass or walleyes do well. Furthermore, judging from the results of our netting and the reports of good fishing, these warm-water species are sufficiently abundant to provide good fishing. Since there has been very little stocking in Hart Lake during the past 6 to 10 years (see a preceding paragraph), it must be concluded that the present population is largely the result of natural reproduction. Therefore, stocking for maintenance of the warm-water species is not warranted on the basis of the data available. The present abundant population of aquatic plants along the marshy shores and on the shoals and drop-off provide good cover for small fish; and because of the small size of the lake there is little justification for the installation of brush shelters for the purpose of concentrating catchable fish for the benefit of anglers. Other possible fish management practices, such as fertilization, have not been tested sufficiently in Michigan lakes to allow their recommendation, except on an experimental basis.

For Hart Lake the present fishing is regarded by the writer as probably satisfactory, and no management recommendations for positive action are given.

INSTITUTE FOR FISHERIES RESEARCH

Report approved by A. S. Hazzard

Report typed by E. F. Livingston

Table 1

Water analyses on Eagle Lake, Kalamazoo County,
August 4, 1945, 11:30 A.M. - 4:00 P.M.

Depth: ft.	Temp.: °F.	O ₂ : p.p.m.	CO ₂ : p.p.m.	ph-th alkalinity p.p.m.	M.O. alkalinity p.p.m.	pH
Surface	77	8.5	0.0	0.0	172	8.2
5	77	...	...	...	...	...
10	75	...	...	...	...	...
13	73	9.5	...	...	...	8.2
14	71	...	...	...	...	...
15	68.5	10.2	...	...	...	...
16	66.0	...	...	...	...	...
18	62.5	...	...	...	...	...
20	59.5	6.2	...	...	...	...
22	56.7	...	...	...	...	...
25	54.3	2.0	7.0	0.0	183	7.6
27	52.6	1.8	...	...	...	...
30	51.5	...	...	...	...	...
31	50.8	...	...	...	...	...

Water depth, 31 feet. Secchi disc reading, 8 feet.

Table 2

Water analyses on Hart Lake, Calhoun County,
August 6, 1945, 2:00 P.M. - 3:30 P.M.

Depth: ft.	Temp.: °F.	O ₂ : p.p.m.	CO ₂ : p.p.m.	ph-th alkalinity p.p.m.	M.O. alkalinity p.p.m.	pH
Surface	76.6	8.2	0.0	0.0	114	8.4
5	75.5	...	...	...	...	...
10	75.0	...	...	...	...	...
12	72.6	7.9	...	...	...	...
13	70.4	...	...	...	...	...
14	64.5	...	...	...	...	...
15	62.5	5.9	...	...	...	8.0
17	59.0	2.2	...	...	...	...
18	57.4	...	...	...	...	...
20	54.8	0.4	8.5	0.0	162	7.5
22	53.7	...	...	...	...	...
25	52.5	0.1	...	...	...	...
28	51.8	...	...	...	...	...
30	51.5	...	...	...	...	...
35	50.8	0.0	...	...	...	...
38	50.5	...	...	...	...	...
40	50.5	...	...	...	...	...

Water depth, 41 feet. Secchi disc reading, 9 feet.

Table 3

Age and size of game fish collected by gill nets
from Hart Lake, August 6, 1945

Species	Sex	Length: inches	Weight: ounces	Age: summers of life (incl. 1945)
Yellow perch	Female	9.2	4.9	4
" "	"	9.4	5.4	4
" "	"	11.1	10.2	6
" "	"	10.5	8.1	7
" "	Male	9.5	7.5	7
" "	"	9.8	7.4	7
" "	"	9.8	6.9	7
" "	"	10.1	7.7	8
Bluegill	Female	4.1	0.6	3
"	"	6.6	2.8	5
"	"	8.4	5.4	6
Warmouth bass	Male	6.3	3.3	6