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October 7, 1943

REPORT NO. 888

A PARTIAL FISHERIES SURVEY OF ESAU LAKE, PRESQUE ISLE COUNTY

by

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Introduction

Location and Drainage

Esau Lake is located in Presque Isle County (T. 34 N., R. 8 E., Sections 21, 27, 28). It lies midway between Grand Lake on the west and Lake Huron on the east, but has no direct connection with either. The small village of Birch Hill, a summer community, lies about one mile to the west. The lake is readily accessible from a gravel raod (Presque Isle County Road No. 405). Several trails from this road lead to the shores of Lake Esau.

Acknowledgments

At present the lake is unmapped. I am indebted to Conservation Commissioner Robert Rayburn, who requested the study, for his advice and cooperation in connection with this brief investigation. The lake was examined on August 1, 1943 by the writer.

Past and Present Use

The lake has never been used extensively as a lumbering site or for any other commercial purpose. Resort development is negligible. Five or six cottages are present on the west shore, and an Episcopal Boys Camp

(Camp Chicagami) is located at the north end of the lake. The latter is not in use at present. At this time there is no publicly owned land on the lake. Discussion with Mr. Rayburn indicated that public access can be assured in the event of the introduction of desirable fish. No information relative to the lake's past fishing history was obtained. Fishing pressure is now very light. It is probable that in the event of improved fishing the lake would be considerably frequented.

Physical Characteristics

The lake is undoubtedly of glacial origin. The basin is oval in shape with a high, bold shore, except at the south end where the slope is more moderate. Woods entirely surround the lake. Water fluctuations are dependent upon the water table of the immediate vicinity, no inlet nor outlet being present. The physical characteristics of the lake are summarized in the following table (Table I).

Table I

Physical Characteristics of Esau Lake, Presque Isle County

Area in acres (estimate)	250-300
Maximum depth	30 to 35 feet
Bottom types	
0-15 ft.	Sand, gravel, rubble, marl
Over 15 ft.	Marl, pulpy peat
Color of water	Colorless
Transparency (Secchi disc)	15 feet

The physical characteristics of a lake have much importance in connection with its fisheries. Plant growth, and hence much of the food supply, is dependent in part on various physical factors, such as wind, wave, and ice action. Plants will not be found growing abundantly upon wave-swept shoals. The type of bottom soils determines, at least in part, the growth of plants. A lake having an irregular shore with protected bays and indentations will usually be more productive than one without

such a shoreline. The depth to which plants can grow is dependent in part upon the transparency of the water. Much of the shoreline of Esau Lake is rather barren with very little vegetation growing. The shoreline of the lake is very regular and there are no protected areas. These factors, along with an unsuitable bottom, make the productivity of vegetation, and thus food, low.

Temperature and Chemical Characteristics

Temperature

A vertical temperature series was secured, and results of this series showed the lake to be thermally unstratified. In a thermally unstratified lake no thermocline is formed. A thermocline is defined as that layer of water where the temperature drops one degree Centigrade with each meter of depth. The presence or absence of a thermocline is of great importance in fisheries management. In many lakes the water below the thermocline and in the lower limits of the thermocline itself is very cold. This water stays cold throughout the season because of the presence of the thermocline which prevents the warm surface waters from being mixed by wind and waves with the cool bottom waters. Thus the dissolved oxygen content of the bottom waters in a thermally stratified lake is dependent upon the amount of oxygen taken on in the early spring when the temperature of the water in the lake is uniform throughout, and thus becomes readily mixed. In some lakes this supply of oxygen may become used up through the decomposition of bottom materials and by the organisms inhabiting the bottom colder parts of the lake. If the bottom waters are sufficiently cold, and are able to hold an adequate supply of oxygen throughout the summer, the lake may be suitable for cold-water species of fish such as trout. Lake Esau was neither chemically nor thermally stratified. The change in temperature from top to bottom was only slight.

Temperature also plays an important part in the growth of fish. Generally speaking, fish will grow better in warmer water than in cold. Thus trout will grow better in water which is 60°F. than they will in water which is only 50°F. Bass make better growth in relatively warm water than they do in cold.

Chemical Conditions

The significance of oxygen has already been mentioned in the above discussion of temperatures. Lake Esau was found to have an adequate supply of oxygen at all depths, and since the analysis was made in mid-summer, it is certain that there is an adequate supply of oxygen at all times. The fact that there is no thermal stratification allows for water circulation throughout the summer.

The water in Esau Lake was found to be quite alkaline, and moderately hard. Waters of this type are generally more productive than soft acid waters, but in this instance there are other inhibiting factors--wind and wave action, and a scarcity of food caused at least in part by the sparsity of vegetation.

Pollution

There is no pollution in Esau Lake. Chemical conditions and temperatures are summarized in the following table (Table II).

Table II

Chemical Characteristics of Esau Lake, Presque Isle County, August 1, 1943; 10:00 A.M.; Air 73°F.; Weather - fair; Wind - S.W.

Depth Ft.	Temp. F.	Dissolved oxygen ppm.	Dissolved CO_2 ppm	ph.-th. alk.	M.O. alk.	pH
0	75	8.3	0.0	7.0	115	8.2
16	74					
19	73					
22	73					
25	73	9.6	0.0	7.0	115	8.2

Biological Characteristics

Vegetation

Time did not permit a complete biological inventory. That the biological productivity of a lake is dependent to a very large extent upon plant growth is quite generally accepted. Very little vegetation was observed in Esau Lake and this consisted almost entirely of bulrushes (Scirpus sp.). A very small amount of muskgrass (Chara sp.) was also seen. The sparsity of vegetation in this lake is probably caused by several factors. Among these factors are wind and wave action, which prevent aquatic plants from becoming rooted, and the marl bottom which is not well suited to plant growth.

Fish Foods

Both direct and indirect observations indicate that fish foods are not abundant. No collections were made. Some bottom food organisms were found in the gravel along shore (immature aquatic insects, snails, and crayfish). No observations relative to the abundance of plankton (microscopic free-swimming or free-floating plants and animals, e.g. water bloom and water fleas) were made, but judging from the clarity of the water, plant or phyto-plankton was not abundant at this time of year. This plankton is an important source of food for small fish. Forage fish make a third type of fish food. Two rather large schools of minnows were seen in the vicinity of the dock at the Boys Camp.

Fish Present, Growth, and Natural Propagation

Game fish known to be present are rock bass, perch, and smallmouth bass. Each of these species was seen. Smallmouth bass are not abundant but are reported to reach good size in the lake. Rock bass and perch are fairly numerous and give every appearance of being dwarfed. About 10 rock bass and 5 perch were captured with hook and line. None were of legal size.

No scale samples were taken. No other species of game fish were reported. The only forage fish observed was the bluntnosed minnow. During the past five years the lake has been stocked with 40,000 4-month-old bluegill fingerlings, 1,000 4-month-old smallmouth fingerlings, and 289 adult smallmouth bass. From the lake's present fishing reputation and the abundance of perch and rock bass, it is apparent that these stockings have not met with marked success. The presence of the bass tapeworm (observed in the rock bass) may limit the reproduction of smallmouth bass, for the lake appears well suited to their spawning habits. However, a number of young-of-the-year smallmouth were observed, so there is at least some natural reproduction. Other factors, such as the lack of food and shelter probably also tend to limit the production of smallmouth. (Letter from A. S. Hazzard, Sept. 7, 1943). The relatively poor success of these past plantings, and the fact that the lake is suited to the spawning of members of the bass and sunfish family make the value of further stocking with bass or bluegills, except for adults, questionable. Also, the food supply is none too abundant. Stocking with adult bass, if economically feasible, would make immediate although probably temporary fishing, as indicated by past results in this and other lakes.

Management Proposals

Designation

The lake is at present in the "all other lakes" classification and should remain there until such a time as it has been demonstrated that walleyes have become established. The examination of the lake was made primarily to determine its suitability for trout. However, the water temperature proved to be too warm for the successful introduction of trout. It is of course possible that a small depression, where the water would be colder, might have been missed although it is not considered likely.

Even in the event that the very deepest water was not located, the depression could hardly be extensive enough to make any significant difference. Therefore the introduction of trout cannot be recommended.

Stocking

The most attractive possibility for the improvement of fishing in this lake is the introduction of a fish-eating species, the walleyed pike. We now know that the walleye can reproduce to some extent at least in lakes with firm rubble or gravel bottom. Much of Lake Esau appears to be good walleye spawning habitat. The walleye should find a good food supply in the apparently stunted perch and rock bass. However, the walleyes should be introduced at a size of not less than 6 inches if possible, so as to avoid predation by perch, rock bass, and smallmouth bass. If walleyes of this size or larger can be obtained, it is believe that the fishing in the lake might be considerably improved. Therefore, it is recommended that from 2,000 to 3,000 walleyes* of 6 inches or more in length be introduced at the earliest opportunity. If planted late in the fall (November), fingerling walleyes of a smaller size might escape predation by smallmouth bass.

Predators and parasites

No predators were observed, and no control measures are suggested. As before mentioned, the bass tapeworm was found to be present in the rock bass, and this bass tapeworm may have some effect on the production of smallmouth bass. No practical methods of control are known.

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* It is understood that at the present time adults of either smallmouth or walleyes are not readily available, and the former is expensive. Certain experiments being conducted at the present time may make it possible to rear walleyes to a larger size, and thus materially improve the percentage of successful introductions of this species.

Shelter

The very sparse vegetation and small amount of cover makes the introduction of fry and fingerlings almost futile, for they would fall easy prey to perch, rock bass, etc. Also, small fish naturally spawned in the lake are probably rapidly decimated. It is therefore recommended that about 200 brush shelters be installed in water from 10 to 15 feet deep. These shelters could be either of the hollow square or ladder type. (See The Improvement of Lakes for Fishing, Michigan Department of Conservation, 1938). The installation of these brush shelters would afford protection to young fish, and through encouraging the growth of vegetation, might build up the supply of food in the lake.

Other Suggestions

If the introduction of walleyes should prove to be unsuccessful, there is the possibility that further plantings of adult smallmouth might be warranted. It is understood that past plantings have not met with marked success, and at the present time adult smallmouth are hard to obtain and are expensive. Also, it is probable that the smallmouth would have to be planted periodically in order to furnish fishing.

Secondly, the lake should be mapped and completely inventoried at the earliest opportunity.

INSTITUTE FOR FISHERIES RESEARCH

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