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FISHERIES SURVEY OF CLEAR LAKE, MONTMORENCY COUNTY

by

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Clear Lake is located in the north central part of Montmorency County (T. 32 N., R. 2 E., Sec. 27, 33, 34). It is near the headwaters of Canada Creek, and while it lies within the Black River drainage, it has neither inlet nor outlet. Atlanta is the nearest village, and this is located about 10 miles to the south on highway M33.

The marginal survey and soundings on this lake were made by the E.C.W. during the winter of 1935-36. This was of material aid in the fisheries survey carried out by the Institute for Fisheries Research* during early September of 1937.

At no time in the past has this lake been considered a good fish lake. Early reports indicate a rather large number of small perch but practically no legal sized game fish. Dr. Metzelaar in 1925 made the statement that this lake was "unfit for big game fish." It has been recognized for some time, however, that it had certain requirements for trout, and some plantings were made as early as 1928 and again in 1934.

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* The Institute for Fisheries Research party included Dr. D. C. Chandler, leader, E. L. Cheatum and Walter Crowe, assistants.

While these were not wholly successful, a few fish have been caught since that time.

Clear Lake has not been used very extensively for boating and swimming although it has rather fine beaches. Lakes which lie some distance from large population centers are seldom used extensively for boating and swimming unless the fishing is of some attraction. This probably means that the average vacationing family has at least one member whose choice of recreation is fishing. There are only a few cottages on this lake's shores. The old Presque Isle CCC camp is situated on the south shore. This camp is now being utilized for a biology summer school base by Michigan State College.

Clear Lake is roughly triangular in shape with the apex of the triangle pointing due north. There are no very pronounced bays and the most extensive shallow area is in the north end of the lake. Its greatest length is approximately one-half mile and the width about one-quarter mile. The surrounding soil is sandy; the country is rolling and wooded.

It had a surface area of 133 acres and a maximum depth of 97 feet at the time the map was made. The deepest point is approximately in the center of the lake. The basin is fairly regular with a moderately abrupt drop-off on all sides. The shore line development is 1.2, which means that the shoreline is only 1.2 times longer than if the circumference were a perfect circle. Other conditions being favorable, it is true that those lakes with the higher shoreline development are more productive. A long shore line means an irregular one, and this almost always ensures suitable bays for the development of plant and fish food. This figure of 1.2 is low when compared with many other lakes in the state.

Approximately 20 per cent of the lake bottom is shoal (water less than 20 feet in depth). This varies in width from approximately 75 feet to 475 feet. The bottom is composed of sand, strewn with gravel and rubble. This extends out to about the 10 foot contour and then the sand is overlaid with marl. The marl extends from the 10 foot contour down to the 50 foot level. The bottom beyond the 50 foot contour is composed exclusively of pulpy peat.

There are no inlets or outlets in Clear Lake. Its water supply is confined to springs and surface drainage. The extent of the springs is not known because they all enter through the lake bottom. The surface drainage is very small and probably of little importance.

The water is exceptionally clear, making it appear bluish. It has no actual color however. A secchi disc was visible at a depth of 50 feet, which is a record for all the lakes studied to date. In more productive lakes, a disc is not often visible beyond 12-15 feet. Clear water is not often very productive since it generally is associated with lack of vegetation, plankton and other organic items. On the other hand, if other conditions are suitable, vegetation will grow in much deeper water when the water is clear than when its transparency is reduced by suspended matter and color. High fertility naturally reduces water transparency. No appreciable amount of sediment is contributed from the surrounding country so that/~~it~~ present is almost sure to have had its origin within the lake.

The temperatures taken during the survey (September 1, 1937) showed the water to be 75°F. at the surface when the air was 80°F. There was a gradual drop from the surface to 72°F. at 36 feet. Then there was a sudden decline (thermocline). At 39 feet the temperature was 69°F.; at 42 feet, 65°F.; and at 48 feet, 58°F. The temperature at 90 feet was 48°F.

The formation of an insulating layer of water where the temperature drops very rapidly (one degree Centigrade or more per meter depth) is characteristic of the deeper lakes in the state. There is no mixing of the upper and lower waters due to a difference in density, and thus there are ~~prevailing~~ colder temperatures prevailing in the deeper zones. Often lakes of this sort are suitable for cold water species even though their surface temperatures are above the range of toleration. In the autumn there is a turnover in the waters brought about by the cooling of the surface water. The whole lake usually has an almost uniform temperature at this time.

The reduction of dissolved oxygen in the deeper water usually results from thermal stratification. By the blanketing or insulating effect, the lower water is not able to get dissolved oxygen from the surface. When the supply is used up by organisms and the decomposition of organic deposits, this deeper water becomes untenantable for fish until the overturn in the fall of the year. In Clear Lake the oxygen was more abundant at 45 feet (11.4 ppm.) than at the surface (8.2 ppm.). At 75 feet the oxygen was reduced to 1.0 ppm. and at 90 feet to 0.4 ppm.

The zone or layer of water between 40 and 70 feet has suitable temperature and oxygen conditions for cold water fishes. Even the shallower water has suitable temperatures for the greater part of the summer, but may get too warm late in the season.

The water of Clear Lake is moderately hard. Methyl orange alkalinity was 114 ppm. at the surface and 142 ppm. at the bottom. The pH was 8.4 at the surface and 7.6 at 90 feet. The rather extensive deposits of marl on the slopes is evidence of this. Other conditions being favorable, moderately hard waters are more productive than soft waters due to the calcium requirements of many aquatic plants and animals.

Aquatic vegetation is extremely scarce in this lake. Only six species of plants were collected. These were as follows:

Plant	Abundance	Depth
Bushy pondweed (Najas flexilis)	Scarce	3 ft.
Pondweed (Potamogeton amplifolius)	Scarce	6 inches
Pondweed (P. gramineus)	Scarce	3 ft.
Pondweed (P. natans)	Scarce	3 ft.
Bulrush (Scirpus acutus)	Scarce	1 ft.
Muskgrass (Chara)	Common	3-50 ft.

The vegetation was mostly confined to the bays except Chara, which was found widely scattered. One old report indicated its growing down to a depth of 50 feet in a few places. This is not surprising because of the transparency of the water. This sparse vegetation offers very little cover for fish, and its limitation is an important factor in the scarcity of fish food organisms, which depend upon weed beds for cover and food. The poor fertility and unsuitableness of the substratum in this lake are probably responsible for the almost complete absence of plant beds.

As might be expected, the fish food organisms are also very limited in this lake. The plankton organisms (small free floating animals and plants such as waterfleas and algae) were moderately abundant at the time of the survey. A collection made in only one place and at one time of the year is probably not representative since plankton populations are known to vary greatly from season to season and even from day to day.

Midge larvae were found to be the most abundant organisms on the bottom from 1 1/2 - 50 feet in depth.

Snail, clams and mayflies also appeared to be common in the samples taken. However, when compared with the more productive lakes in this region, Clear Lake is poor in fish food organisms. This is an inherent condition not brought about by any man-made changes and in order to increase the food supply, it would be necessary to increase the fertility of the lake.

Fish collections made during the survey show perch, smallmouth bass and rock bass to be the only important game fish present. The common sucker was the only coarse fish reported. It is said to be rather abundant in deeper water. The only forage fishes reported (July 13, 1925) were the black-nosed dace and blunt-nosed minnow. The former was reported as numerous and the latter scarce.

The game fish population was predominated by a relatively large number of sublegal yellow perch. These are said to have a very greenish color and it has been claimed by sportsmen that they are not the same species as the yellow perch of the Great Lakes. Careful identification, however, show them to be of the same species even though their color does not conform. Habitat differences often influence the color of fishes. Rainbow trout living in lakes are almost always more silvery than those taken from streams.

The condition of "stunting" in Clear Lake seems to have been more prevalent prior to 1934 or the time when lake improvements were installed.

No obnoxious species of fish have ever been reported from this lake.

The only stocking in the past five years was 200,000 walleye fry in 1937. There is no evidence that any of these fish survived. Some of the earlier plantings were as follows. Small-mouth bass were planted in 1927-1931; largemouth bass in 1933; bluegills in 1933; 800 seven-month-old brook trout and 40,000 grayling fry in 1928. According to our present records, smallmouth bass and bluegills are the only species which have become established out of all these plantings and bluegills are not very abundant.

Winter creel census on this lake for 1933-34 is summarized in Institute Report No. 271. A quotation from that report follows: "Fishing was all line fishing. Bait was largely pieces of beef. A total of 28 fishermen fished with a total of 45 lines for a total of 113 hours. They took 164 perch of an average size of 7.4 inches and caught and returned 74 undersized perch. One twenty-inch brown trout was also taken. An average of 6 fish per fisherman were taken at an average rate of about 1.5 fish per hour. The undersized fish are not included in these figures."

Another creel census representing about 50 per cent of the fishing in this lake was conducted between July 10, 1934 and July 9, 1935. The results of this are given in Institute Report No. 327. During this period, smallmouth bass, sunfish, rock bass, perch, brook trout, rainbow trout, and suckers were taken. A summary of the fishing for this year follows: Number of fishermen, 280; number getting no fish, 123; number of hours fished, 746 3/4; number of legal sized fish caught, 671; fish per fisherman, 2.4; fish per hour, 0.9; average size of legal fish, 9.3; number of undersized fish reported, 870. According to Dr. R. W. Eschmeyer's analysis of these data, the catch per hour in Clear Lake was only slightly below the average for the county for non-trout waters. The fish appeared to be in excellent condition and fishing in general seemed to be very much improved over previous years.

Creel census conducted in 1936-37 has been covered by R. W. Eschmeyer in Institute Report No. 476. Brown trout, smallmouth bass, bluegills, sunfish, yellow perch, rock bass and bullheads were taken. The following summary is quoted from his report. There is some question whether the brown trout referred to in these reports were not actually brook trout misidentified by census takers.

"In 1936 the creel census started a few days late and no information is available for June 25th to 30th. During the remainder of the summer 1,199 legal-size fish are recorded for 346 fisherman-days. The fish had an average length of 8 inches and were taken at the rate of 1.5 fish per hour. The smallmouth bass had increased in the catch over the previous year in both number and size. Rock bass and perch were smaller than in the previous season, but many more were taken in 1936. Fishing had definitely improved, for the perch catch per hour had increased from 0.9 to 1.5.

"In the summer of 1937, 292 fisherman-days accounted for 2,233 fish. These fish, taken at the rate of 2.5 per hour, had an average length of 8.7 inches. The catch included 161 bass having a slightly larger size than the size for bass the previous year, 1,788 perch of an average length of $8\frac{1}{2}$ inches and 237 rock bass. In 1937 fishing in this formerly unproductive lake was considerably better, in terms of fish per hour, than in lakes in general.

"It is believed that the shelters gave more protection to young bass and that perch fishing decidedly improved because the bass received this added protection. The perch were apparently too abundant for the food supply and needed to be reduced in numbers if their growth was to be reasonably rapid and if they were to reach catchable size. This reduction was apparently accomplished by an increase in the number of bass. The bass very probably consumed a considerable number of small perch. Improvement in the fishing (from 0.9 to 2.5 fish per hour) apparently was the result of an increase in predators, brought about by supplying young bass with more adequate shelter. An examination of shelters in this lake indicated that the shelters were used more extensively by bass and rock bass than by perch, adding greatly to the protection of these two species but relatively little to the perch which apparently preferred the more open water."

Another creel census conducted in June, July, August and September, 1938 reports the following fish and the number of species taken by anglers: smallmouth bass, 229; bluegills, 7; sunfish, 11; yellow perch, 2300; rock bass, 440; horned dace, 3; and bullheads, 1. The average catch per hour for all species was 1.3 fish. A total of 791 fishermen were reported and of these 224 or 28 per cent took no fish. There were 2,991 legal fish caught as compared to 1,961 sublegal. The legal game fish taken averaged 7.9 inches in total length. It is interesting to note that even though yellow perch have not been stocked recently in this lake, about 80 per cent of the legal fish taken are of this species.

No very conclusive growth rate study could be made because of the small number of scale samples available. Yellow perch reached legal length in their third summer and were about nine inches in total length in their fifth summer. One 4-summer-old smallmouth bass was 11.6 inches in total length and weighed 11.6 ounces. Rock bass reached legal length in their 4th summer. One fish in its 5th summer was 7.4 inches in total length. The following table gives a summary of these studies.*

Species of fish	Age**	No. Specimens	Total Length in Inches	Weight in Ounces
Perch	2	7	7.0	1.8
	3	6	6.7	1.6
	4	2	9.8	5.8
	5	3	9.1	4.5
Smallmouth bass	3	1	11.6	11.6
	4	1	15.0	33.6
Rock bass	2	7	4.8	1.2
	3	9	6.4	2.8
	4	1	7.4	4.2

Management Suggestions

Clear Lake is now in the all other lakes classification. Due to the fact that conditions here are more suitable for trout than warm water species, we recommend a change in designation to a trout lake.

Under trout designation it would be necessary to stock the lake regularly with reasonably large fish (brook and rainbow). Since perch and bass are present, plantings of small fish would very probably be a total loss. Perch and smallmouth bass have proven their ability to reproduce naturally and will probably remain there in the limited number which the lake can support.

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* All age determinations were made by W. C. Beckman.

** Add one year to this number to get actual growing seasons since collections were made in September.

There are no fish predators of consequence around this lake and the fish seemed to be almost wholly free from parasites.

Lake improvements in the form of cover devices and spawning slabs for minnows have been generously applied by the CCC organization. According to reports, this improvement has produced better fishing in this lake. It is not known, however, whether this has resulted in an increase in the fish population or simply the concentration of those present, making them more available to the angler. The previous stocking of aquatic plants was a complete failure. No further lake improvement is suggested at this time.

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