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May 19, 1955

Report No. 1447

# SUMMARY OF INVENTORY RESULTS AND MANAGEMENT PLANS FOR NINE UPPER PENINSULA LAKES[1]



By

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## Introduction

This report concerns biological inventories made on nine Upper Peninsula lakes during the summer of 1953 by a crew from the Institute for Fisheries Research. Members of the crew were Merle G. Galbraith, Jr., leader, and Richard G. Bjorklund and Karl E. Menzel, assistants. The lakes are Au Train and Beaver in Alger County, Bass and Beaufort in Baraga County, Loon and Lost in Iron County, and Belle One, Belle Two, and Belle Three in Luce County. The Cleveland-Cliffs Iron Company owns frontage on all of the lakes except Loon; this firm allows the public to have access to the lakes over its property.

Comments on the growth of game fish are included in the discussions of the lakes. Comparisons are made between growth of the fish collected and averages that have been determined from large numbers of fish from various lakes throughout the State. These averages are available for the principal game species, excepting the northern pike and walleye. In the tables on growth, sizes of the various age classes are given as average lengths in inches

[1] The inventories, analysis of data, and preparation of the report were largely financed with Federal Aid to Fish Restoration funds under Dingell-Johnson Project Number F-2-R-2 and Number F-2-R-3.

and tenths of inches; figures in parentheses indicate the number of fish in each sample; Roman numerals denote age in years. A margin of 0.5 inch both above and below the State average figure is allowed for average growth for all species except largemouth and smallmouth bass; the margin for bass is 1.0 inch above and below the average figure.

Au Train Lake, Alger County, T. 46 N., R. 20 W., Secs. 4, 5, 6, 7, 8, 17, 18

The biological survey of Au Train Lake was made during August 4-11, 1953. The U. S. Forest Service mapped the lake some years ago. The area is 830 acres, and the maximum depth is around 30 feet. Approximately 60 percent of the lake is less than 15 feet deep. The bottom soil in the deeper places is mainly pulpy peat, whereas detritus, fibrous peat, sand, and gravel are the bottom types on the shoal. The Au Train River, Buck Creek, Cole Creek, Paulson Creek, and an unnamed stream are the inlets. The Au Train River also serves as the outlet and flows into Lake Superior. An electro-mechanical sea lamprey weir, installed and maintained by the U. S. Fish and Wildlife Service, was in operation in the outlet in 1953 and 1954.

There are about 100 cottages and 9 resorts on the lake. There is no public fishing site, but state-owned land fronts on the east and southeast shores. The Cleveland-Cliffs Iron Company owns all of the frontage in Section 4 and the frontage in the S. E. 1/4 of the S. E. 1/4 of Section 5.

The water is hard. The methyl orange alkalinity test showed 111-120 parts per million of dissolved mineral salts (mainly lime). The water is light brown in color. Temperatures were fairly uniform (70° - 66° F.) from surface to bottom. At the time of examination, there was sufficient dissolved oxygen for fish life to a depth of 25 feet.

Au Train Lake supports a moderate amount of aquatic vegetation, especially of the submergent type. Emergent plants are less common, while plants of the floating type are sparse.

The catch from twenty-six 24-hour gill net sets, each net 125 feet long, consisted of the following fish (size range--total lengths in inches--in parentheses): 66 northern pike (14.2-25.9), 135 yellow perch (4.7-14.1), 10 walleye (8.0-20.3), 2 rock bass (6.9-7.3), 16 cisco (9.2-16.3), and 17 white sucker (6.5-19.3). Taken in a 30-foot bag seine were perch, smallmouth bass, numerous young largemouth bass, and young suckers. Forage species caught with the seine were the sand shiner, bluntnose minnow, logperch, and Johnny darter.

Shortly after the survey (from August 22 through September 3), commercial fishermen, with assistance from Department of Conservation personnel, operated shallow trap nets at five locations in Au Train Lake. This netting was done specifically for harvesting white suckers and was a continuation of the program commenced several years before. Game fish captured were released after counts and measurements were gotten. The total catch comprised 5 northern pike, 10 perch, 56 walleyes, 4 smallmouth bass, 15 rock bass, and 70 suckers.

Examination of scale samples showed that rock bass and perch of Au Train Lake were growing at rates above average for the state. Too few smallmouth bass were collected for reliable evaluation of growth rate; the fish taken ranged from average to above average. Growth of northern pike and walleyes compared favorably with rates for these species in other Michigan lakes.

Age and growth of Au Train Lake fish

| Age-group | I | II | III | IV | V | VI | VII | VIII | IX | X |
|---|---|---|---|---|---|---|---|---|---|---|
| Rock bass | | | | 7.3 | 8.2 | 9.7 | | 10.2 | | 11.2 |
| | | | | (10) | (3) | (1) | | (2) | | (1) |
| State avg. | | | | 6.2 | 7.3 | 7.9 | | 9.0 | | 10.5 |
| Smallmouth bass | | | | 14.8 | 14.7 | 17.6 | | | | |
| | | | | (2) | (1) | (1) | | | | |
| State avg. | | | | 13.3 | 15.0 | 15.3 | | | | |
| Yellow perch | 4.9 | 6.3 | 8.3 | 9.4 | 11.0 | | 14.5 | | | 14.1 |
| | (11) | (131) | (1) | (14) | (1) | | (1) | | | (1) |
| State avg. | 4.1 | 5.8 | 6.4 | 7.5 | 8.5 | | 10.4 | | | 12.0 |
| Walleye | 8.2 | 12.3 | 14.5 | 16.4 | 16.2 | 18.8 | 19.5 | 21.4 | 19.1 | |
| | (2) | (9) | (5) | (25) | (4) | (9) | (7) | (5) | (1) | |
| Northern pike | 16.7 | 20.6 | 21.7 | 23.6 | | | | | | |
| | (30) | (21) | (16) | (4) | | | | | | |
| White sucker | 6.5 | 14.0 | | 16.7 | 17.0 | 18.5 | | | | |
| | (1) | (2) | | (7) | (3) | (4) | | | | |

A point of some interest is the large number of 2-year-old perch that were netted. This occurrence indicates particularly good spawning success of perch in Au Train Lake in 1951. If this year-class had a good survival rate, it should have contributed to good fishing for perch in 1954, with promise of a carry-over of such fishing into 1955.

Commercial fishermen removed 556 suckers (1,326 pounds) in the fall of 1953 and 10,063 suckers (24,072 pounds) in the spring of 1954. Following the trap netting done in 1954, it was recommended by District Fisheries Supervisor Clifford Long that this program be discontinued and that the lake be kept under observation for results from the netting.

Beaver Lake, Alger County, T. 48 N., R. 16 W., Secs. 7, 8, 9, 17, 18

The biological investigation of Beaver Lake took place during June 22-28, 1953. The Civilian Conservation Corps (CCC) prepared a map of the lake in the winter of 1941. Beaver Lake's area is 765 acres, and its maximum depth, 39 feet. About 30 percent of the lake consists of shoal (water less than 15 feet deep). Bottom soils are pulpy peat in the deeper places and sand in the shallows; one area has a rock and gravel bottom. Inlet streams are Lowney Creek and the outlet of Little Beaver Lake. Numerous small springs flow into the lake. The outlet discharges into Lake Superior. There was an electro-mechanical sea lamprey weir in operation in the outlet at the time of this study and also in 1954.

Six cottages, one resort, and one boat livery are situated on the shores of this lake. There is no public fishing site. The state owns some frontage on Little Beaver Lake. The Cleveland-Cliffs Company owns most of the frontage on Beaver Lake.

The water of Beaver Lake is moderately hard (methyl orange alkalinity values of 78.5-80 p.p.m.) and is light brown in color. In June a thermocline (zone of rapid temperature change) existed between 27 and 30 feet where the maximum depth was 30-1/2 feet. There was a sharp drop in dissolved oxygen (7.8 to 2.7 p.p.m.) between 25 and 28 feet.

There is an abundance of submerged vegetation, consisting mostly of musk grasses (Chara and Nitella).

Twenty-two gill net sets, each net fishing one day, caught the following fish (size range--total lengths in inches--in parentheses): 3 brook trout (9.7-12.1), 3 northern pike (14.3-16.6), 101 yellow perch (5.2-11.7), 24 rock bass (4.8-7.6), and 31 white sucker (6.7-17.1). A rainbow trout (15.0) and two smallmouth bass (6.2-18.6) were caught with hook and line. A 30-foot bag

seine captured 3 young-of-the-year rainbow trout, yellow perch, redbelly dace, blacknose dace, sand shiner, bluntnose minnow, logperch, Johnny darter, and brook stickleback.

Sufficient numbers of fish for dependable evaluation of growth rates were obtained only of rock bass and perch in Beaver Lake. Both species were below average in growth as compared with the statewide averages. It is quite apparent that spawning success and survival rates of rock bass and perch are high. Encouragement of predatory fish to reduce abundance of rock bass and perch seems desirable, although just what can be done to achieve this goal is not clear at the present time. The lake is lightly fished, and possibly heavier fishing pressure (especially if applied to rock bass and perch) would be of some benefit.

Age and growth of Beaver Lake fish

| Age-group | I | II | III | IV | V | VI | VII | VIII | IX |
|---|---|---|---|---|---|---|---|---|---|
| Rock bass | | | | 5.1 | 6.4 | 6.9 | 7.0 | | |
| | | | | (4) | (11) | (6) | (3) | | |
| State avg. | | | | 6.2 | 7.3 | 7.9 | 8.8 | | |
| Smallmouth bass | | 6.2 | | | | | | | 18.6 |
| | | (1) | | | | | | | (1) |
| State avg. | | 9.0 | | | | | | | ... |
| Yellow perch | | 5.2 | 5.8 | 6.3 | 7.5 | 9.0 | 9.6 | 11.4 | |
| | | (1) | (7) | (55) | (12) | (6) | (9) | (5) | |
| State avg. | | 5.8 | 6.4 | 7.5 | 8.5 | 9.5 | 10.4 | 10.8 | |
| Northern pike | 15.3 | | | | | | | | |
| | (3) | | | | | | | | |

Except for acquisition of land for a public fishing site, no recommendations have been made for Beaver Lake. Since this lake provides fairly satisfactory fishing now, and also because it is only lightly fished, new management practices do not appear to be in order at this time. While the lake is capable of

supporting trout and does produce some trout, planting of trout is not advised because of a large population of slow-growing warm-water fish. Experience has been that planted trout do not thrive in a situation like this.

Bass Lake, Baraga County, T. 48 N., R. 31 W., Sec. 26

Biological collections and data were taken on Bass Lake from August 18 to 23, 1953. The Institute for Fisheries Research mapped the lake in February of 1946. The area is 18 acres. A maximum depth of 29 feet was found at the time of mapping. Approximately 60 percent of the lake is less than 15 feet deep. The predominant bottom soil is pulpy peat; a band of sand parallels the eastern shoreline, and some boulders and rubble are associated with the sand. There is one permanent inlet and one intermittent inlet. The outlet is a tributary of the Spurr River, a part of the Menominee River drainage.

There are no cottages or resort developments on this lake, nor a public fishing site, although state land borders the northwest shore. The Cleveland-Cliffs Iron Company owns one-half interest in the property that fronts on the lake in the S. E. 1/4 of the N. E. 1/4 of Section 26.

The water is light brown in color and relatively soft (methyl orange alkalinity, 13-28 p.p.m.). In late August, oxygen of an amount adequate to supply the need of fish existed down to only around 8 feet.

Vegetation is moderate in abundance. Deadheads are common and also afford some cover for fish.

Eleven 24-hour gill net sets produced the following: 5 yellow perch (6.0-7.4), 15 largemouth bass (5.1-10.3), 93 bluegill (4.3-7.6), and 1 white sucker (11.7). A common sense (minnow) seine captured small perch, largemouth bass, and bluegills. No forage fish were collected.

The outstanding feature of the fish collecting done on Bass Lake was the large number of bluegills captured. Gill nets ordinarily are inefficient gear for taking this species, so the catch of 93 bluegills in 11 net sets is definitely unusual. There apparently also was a good sized population of largemouth bass, but perch appeared to be scarce.

Growth of bluegills and bass was found to be slow, especially for bluegills. In the other extreme, the growth rate of perch in the small sample obtained was above average.

Age and growth of Bass Lake fish

| Age-group | I | II | III | IV | V | VI | VII | VIII |
|---|---|---|---|---|---|---|---|---|
| Largemouth bass | 5.3 | | 8.6 | 10.1 | 9.7 | | | |
| | (5) | | (6) | (4) | (1) | | | |
| State avg. | 6.1 | | 10.0 | 12.1 | 13.7 | | | |
| Bluegill | | | | 4.7 | 6.0 | 6.5 | 7.0 | 9.5 |
| | | | | (7) | (29) | (50) | (7) | (1) |
| State avg. | | | | 6.6 | 7.3 | 7.7 | 8.2 | 8.4 |
| Yellow perch | 6.3 | 7.0 | 7.4 | | | | | |
| | (1) | (1) | (1) | | | | | |
| State avg. | 4.1 | 5.8 | 6.4 | | | | | |

Apparently the bluegill crop of Bass Lake is utilized only to a small extent because the lake is lightly fished. While the fish are not large, many of them are of a size that should make them of interest to anglers. Any additional cropping that can be done may be of value in encouraging better growth. This lake might be considered for experimentation on population control with the aim of improving the growth rate of bluegills and bass.

Installation of brush shelters was recommended, and 50 shelters were placed in the lake in the fall of 1954.

Beaufort Lake, Baraga County, T. 48 N., R. 31 W., Secs. 20, 21, 22, 27, 28

The biological study of Beaufort Lake was made during August 12-24, 1953. Institute personnel mapped the lake during January and February of 1946. This lake has an area of 425 acres, about half of which is less than 15 feet in depth. The maximum depth is 35 feet. The bottom soils are sand and pulpy peat. There also are considerable quantities of gravel and rubble and some boulders. The outlet of George Lake flows into Beaufort, and there are a couple of intermittent inlets as well as springs. Spurr River, a part of the Menominee River drainage system, serves as the outlet.

At the time of the inventory there were 9 cottages on the lake, but no boat livery or resort development. A public fishing site is located on the north shore. The Cleveland-Cliffs Company possesses most of the lake frontage in Section 28.

The water of Beaufort Lake is light brown and relatively soft (methyl orange alkalinity, 11-20 p.p.m.). In late August a thermocline occurred between the levels of 24 and 30 feet. Good supply of oxygen was found from the surface to 25 feet.

Aquatic plants range from sparse to common in abundance, although the kinds that are of most value as cover for fish are sparse. Deadheads are common and boulders are plentiful.

Fish taken in 20 gill net sets were comprised of the following species: 22 northern pike (15.5-22.0), 53 yellow perch (5.1-13.7), 11 walleye (8.3-19.3), 1 smallmouth bass, 3 rock bass (10.0-11.1), and 22 white sucker (14.4-20.1). Small perch, walleyes, smallmouth and largemouth bass, and rock bass were caught in a seine. As for forage species, only the golden shiner and sculpin appeared in the collections.

Netting results indicated good sized populations of perch, northern pike, and walleyes in Beaufort Lake. No doubt rubble bottom is an important factor for success of walleyes here by providing suitable spawning sites.

Significant numbers of scale samples for age and growth study were obtained only from perch, pike, and walleyes. The growth rate of Beaufort Lake perch was found to be considerably above the state average, while development of pike and walleyes compared favorably with that of these species in other lakes. While the sample of rock bass was extremely small, the available material suggests above-average growth for this species also.

Age and growth of Beaufort Lake fish

| Age-group | I | II | III | IV | V | VI | VII | VIII | IX |
|---|---|---|---|---|---|---|---|---|---|
| Rock bass | | | | 10.0 (1) | 10.0 (1) | 11.1 (1) | | | |
| State avg. | | | | 6.2 | 7.3 | 7.9 | | | |
| Smallmouth bass | | 8.9 (1) | | | | | | | |
| State avg. | | 9.0 | | | | | | | |
| Yellow perch | 5.4 (10) | 8.2 (1) | 8.7 (4) | 10.3 (21) | 10.7 (1) | 11.3 (7) | 12.5 (4) | | 12.8 (1) |
| State avg. | 4.1 | 5.8 | 6.4 | 7.5 | 8.5 | 9.5 | 10.4 | | 11.3 |
| Northern pike | 15.6 (1) | 17.9 (13) | 19.2 (6) | 21.3 (2) | | | | | |
| Walleye | 8.5 (1) | 13.4 (4) | 14.1 (10) | 14.3 (7) | 16.5 (12) | 17.5 (10) | 18.5 (2) | | |

In view of the scarcity of natural cover in Beaufort Lake, installation of brush shelters has been recommended. This recommendation is based more on the desirability of having such cover for concentrating fish for anglers rather than to provide protection for the fish.

Loon Lake, Iron County, T. 46 N., R. 37 W., Sec. 28

Loon Lake was inventoried on September 10 and 11, 1953. It was mapped by the U. S. Forest Service in 1940. The area is 38.5 acres, and the maximum depth is around 10 feet. The bottom soils are detritus, fibrous peat, and pulpy peat. There are no inlets. The outlet flows into Lake 33, from which drainage is to the Paint River, thence to the Menominee River. The water level of Loon Lake was high in September of 1953 because of heavy rainfall during the summer and a beaver dam in the outlet.

There were no cottages, resorts, or boat liveries on this lake in 1953. Federal forest land borders the greater part of the shoreline.

The water analysis revealed a sharp drop in the dissolved oxygen supply between the depths of one-half foot (5.9 p.p.m.) and five feet (2.9 p.p.m.). There was only 0.4 p.p.m. of oxygen at eight feet. The water is relatively soft (methyl orange alkalinity, 21 p.p.m.) and brown in color. There was an abundance of plankton (both plant and animal forms) at the time of inventory.

Rooted vegetation is sparse in Loon Lake. The color of the water and plankton abundance may both be limiting factors for aquatic plants by shutting out sunlight that is required for plant growth. A considerable number of dead-heads are strewn over the bottom.

Three over-night sets of 125-foot gill nets took: 195 yellow perch (5.1-10.7), 29 white sucker (8.9-18.0), and 47 black bullhead (4.5-7.6). Sixty (31 percent) of the perch were over 8 inches long. No seining was done here because of the extreme softness of the lake bottom.

The growth rate of perch from Loon Lake was considerably above average. While the time of year the collecting was done insured maximum growth for that season and no doubt was a factor that influenced the size of the fish, it also is evident that conditions in the lake favor good growth because the average length for each age-group even exceeded the state average figure for the next higher age-group.

Age and growth of Loon Lake perch

| Age-group | 0 | I | II | III |
|---|---|---|---|---|
| Yellow perch | 2.6<br>(2) | 6.0<br>(79) | 8.2<br>(80) | 9.1<br>(16) |
| State avg. | ... | 4.1 | 5.8 | 6.4 |

The good growth of perch in this lake is especially remarkable in view of the obvious abundance of this species. The catch taken by the gill nets was exceptionally large. The perch should provide excellent fishing, but the lake is only lightly fished.

Introduction of northern pike was recommended following the inventory. Forty pike that averaged 19 inches in length were planted in the lake in 1954.

Loon Lake appears to be subject to winterkill. Its shallow depth, water stagnation a short distance below the surface in summer, and lack of variety in the fish fauna all are indications that die-off of fish occurs at least some winters due to oxygen depletion. A population of perch and pike should be a good combination for this lake because both species can exist under conditions of low oxygen that many other species cannot tolerate.

Lost Lake, Iron County, T. 44 N., R. 32 W., Sec. 20

The inventory of Lost Lake was made during September 8 and 9, 1953. The Institute mapped this lake in the winter of 1952-53. Its area is 43.5 acres and the maximum depth is 12 feet. Less than half of the lake is over five feet deep. The predominant bottom soil is pulpy peat; fibrous peat occurs in some places, and sand in several other areas immediately out from shore. There is neither inlet nor outlet.

In 1953 there were three cottages on the lake. There was no boat livery or publicly owned frontage. The frontage on the north and west shores is owned by the Cleveland-Cliffs Iron Company.

The water is colorless. There was a good supply of dissolved oxygen from surface to bottom in September. A methyl orange alkalinity reading of 67 p.p.m. showed the water to be moderately hard.

Rooted plants are scarce. Scarcity of rooted vegetation may largely be due to heavy concentrations of algae; a heavy concentration of algae was noted at the time of this investigation. Abundance of algae may well be an important factor in the scarcity of higher plants by shutting out sunlight that they require for survival and growth. Deadheads are numerous.

Five gill net sets produced 122 yellow perch (5.3-10.6), 55 black bullhead (4.5-8.1), and 26 golden shiner (5.5-6.0). Forty-four (36 percent) of the perch exceeded 8 inches in length. Taken with a seine were young bluegill and perch, pearl and finescale dace, fathead minnow, and Iowa darter.

Like the perch of Loon Lake, the perch collected from Lost Lake showed above-average growth, although their growth rate was not so good as that of the Loon Lake population.

Age and growth of Lost Lake perch

| Age-group | II | III | IV | V | VI |
|---|---|---|---|---|---|
| Yellow perch | 6.5<br>(62) | 7.8<br>(15) | 8.9<br>(38) | 9.5<br>(6) | 10.4<br>(1) |
| State avg. | 5.8 | 6.4 | 7.5 | 8.5 | 9.5 |

Also like Loon Lake, Lost Lake evidently is subject to winterkill. Occasional die-off of fish during the winter season has been reported. The extreme shallowness of the basin and predominance of species that can tolerate low oxygen

values (perch, bullheads, golden shiner) strongly suggest that winterkill sometimes occurs here.

A local resident reported having planted 60-some 5-inch bluegills in Lost Lake in 1952 and he said young bluegills were seen in 1953. However, if the lake is subject to winterkill, as it evidently is, it is highly questionable whether bluegills can be established here.

Belle Lake One, Luce County, T. 47 N., R. 12 W., Sec. 9

This lake, the largest of the three Belle lakes, was studied during the period of June 29-July 4, 1953. It was mapped by the CCC in the winter of 1938-39. Its area is 107 acres and the maximum depth is around 78 feet. About 30 percent of the lake is less than 15 feet deep. The bottom soils on the shoal are sand and fibrous peat, whereas pulpy peat underlies the deeper water. There is no inlet other than springs. Outflow is into Belle Lake Two. This group of lakes lies in the Tahquamenon River drainage system.

A single cottage was noted. All the land surrounding the lake is owned by the Cleveland-Cliffs Iron Company.

The water is colorless and moderately hard (methyl orange alkalinity, 71-86 p.p.m.). On July 4 there was a thermocline between the depths of 17 and 33 feet. A good supply of oxygen was present from the surface down to 40 feet.

While some plants are fairly plentiful in certain locations, there are relatively few species, and the amount of cover they afford fish is limited. There are a few deadheads.

The catch taken in 14 gill net sets consisted of: 55 yellow perch (5.7-11.8), 14 rock bass (3.7-7.1), and 42 white sucker. Other kinds of fish that seining revealed were smallmouth bass, pumpkinseed, bluntnose minnow, and Iowa darter. Several good-sized smallmouth bass were caught by hook-and-line fishing;

evidently this lake contains a fair-sized population of smallmouths despite the fact that none of this species were taken in gill nets.

The growth rate of rock bass collected from Belle Lake One in 1953 was sub-average. The same condition applied to perch, except for 3-year-old fish that were average and a single 7-year-old fish that was above average. The limited number of smallmouth bass obtained revealed average growth.

Age and growth of Belle Lake One fish

| Age-group | I | II | III | IV | V | VI | VII | IX | X |
|---|---|---|---|---|---|---|---|---|---|
| Rock bass | | 3.9 | | 5.2 | 5.9 | 6.7 | | 9.4 | 10.7 |
| | | (4) | | (2) | (4) | (4) | | (1) | (1) |
| State avg. | | 4.3 | | 6.2 | 7.3 | 7.9 | | 9.9 | 10.5 |
| Smallmouth bass | | | | 12.0 | | 16.1 | 16.9 | | |
| | | | | (2) | | (1) | (1) | | |
| State avg. | | | | 13.3 | | 15.3 | 16.4 | | |
| Yellow perch | | | 6.2 | 6.3 | 6.6 | 8.9 | 11.8 | | |
| | | | (22) | (21) | (8) | (2) | (1) | | |
| State avg. | | | 6.4 | 7.5 | 8.5 | 9.5 | 10.4 | | |

Because of the scarcity of cover in Belle Lake One, provision of brush shelters was recommended. In the fall of 1954, 184 of such structures were installed. Temperature and chemical conditions in this lake were found suitable for trout, and a program of stocking with rainbow trout has been proposed. However, before stocking of rainbows is undertaken, the fish now present in Belle Lake One should be eradicated with a fish poison because of the slow growth of perch and rock bass; trout do not do well when planted where there is an excessive population of fish. A barrier dam in the connection between Belle Lake One and Belle Lake Two would also be required before treatment with poison to prevent reintroduction of undesirable warm-water fish from Belle Lake Two. On the other hand, because Belle Lake One now contains a desirable population of smallmouth bass and probably can support this species as well as trout, smallmouths should be reintroduced after the present population of fish has been eliminated.

Stocking of trout in Belle Lake One depends on agreement of the Cleveland-Cliffs Iron Company with the various conditions of this proposal.

Belle Lake Two, Luce County, T. 47 N., R. 12 W., Sec. 9

The investigation of Belle Lake Two was carried out from June 29 through July 4, 1953. This lake was mapped by the CCC in the winter of 1938-39, and was remapped with the aid of an echo sounder by an Institute crew during the summer of 1953 because errors were found in the original map. The area of the lake is 25 acres, and its maximum depth is 17 feet. Approximately 85 percent of the lake has depths of less than 15 feet. There is a narrow border of sand out from the shoreline nearly all the way around the lake; the bottom soil in the rest of the basin is pulpy peat. An inlet enters from Belle Lake One. The outlet flows into Belle Lake Three. There was a beaver dam in the outlet in 1953.

There is no real estate development of any kind. The Cleveland-Cliffs Iron Company owns all the frontage.

The water is tinged lightly brown and is moderately hard (methyl orange alkalinity, 57-64 p.p.m.). Because the lake is shallow, temperature and chemistry conditions are much the same from the surface to bottom.

Vegetation is fairly plentiful in some locations. Plant growth is generally light for the lake as a whole, but there is more here than in Belle Lake One.

Nine gill nets set for one day took these fish: 30 yellow perch (5.9-13.8), 1 smallmouth bass (14.1), 1 pumpkinseed (3.5), 2 rock bass (5.4-5.5), and 11 white sucker. Additional fish were caught with hook and line.

Scale samples of significant quantity for age and growth analysis were obtained only from perch. These showed average growth. The few samples from other species indicated an above-average growth rate for pumpkinseeds, average growth for smallmouth bass, and sub-average growth for rock bass.

Age and growth of Belle Lake Two fish

| Age-group | I | II | III | IV | V | VI | VII |
|---|---|---|---|---|---|---|---|
| Rock bass | | | | 5.4 | | 6.5 | 8.1 |
| | | | | (2) | | (1) | (1) |
| State avg. | | | | 6.2 | | 7.9 | 8.8 |
| Smallmouth bass | | | | 12.2 | 14.1 | 14.6 | |
| | | | | (2) | (1) | (1) | |
| State avg. | | | | 13.3 | 15.0 | 15.3 | |
| Pumpkinseed | 3.5 | | | 6.7 | | | |
| | (1) | | | (1) | | | |
| State avg. | 2.9 | | | 5.7 | | | |
| Yellow perch | | 6.0 | 6.2 | 6.4 | 11.4 | | 13.8 |
| | | (3) | (22) | (1) | (1) | | (1) |
| State avg. | | 5.8 | 6.4 | 7.5 | 8.5 | | 10.4 |

Since this lake apparently contains a fair sized population of fish that are growing at a fairly good rate (excepting rock bass), no management recommendation has been proposed.

Belle Lake Three, Luce County, T. 47 N., R. 12 W., Secs. 9, 16

Belle Lake Three was briefly examined on July 2, 1953. This shallow, 12.4-acre lake has little value for fishing. It had a maximum depth of around five feet in 1953; the far greater part of the basin was less than two feet deep when mapped by the CCC during the winter of 1938-39. The bottom soil near shore is sand, while that farther out is pulpy peat. There is an inlet from Belle Lake Two; there is no outlet stream.

There has been no real estate development. The lake frontage is entirely owned by the Cleveland-Cliffs Iron Company.

The water is colored brown. The surface water temperature was 79° F. on July 2. No chemistry tests were run.

The only fish collecting done was with a 30-foot bag seine. The species captured, together with the number and size range of the game fish taken, were: 38 yellow perch (4.5-6.8), 4 pumpkinseed (3.8-4.1), 3 rock bass (3.7-4.9), golden shiner, and bluntnose minnow.

No management recommendations are proposed for this lake because of its low value for fishing. Winterkill quite likely occurs most years.

INSTITUTE FOR FISHERIES RESEARCH

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