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THE FISHES AND THE PHYSICAL ASPECTS OF  
LAKE OF THE CLOUDS, MIRROR LAKE, BIG CARP RIVER,  
AND LITTLE CARP RIVER, OF THE PORCUPINE MOUNTAINS STATE PARK

By

C. M. Taube

Lake of the Clouds, Mirror Lake, Big Carp River, and Little Carp River are located in the Porcupine Mountains State Park, Ontonagon and Gogebic counties, on the west end of Michigan's Northern Peninsula. These related waters lie in one of the most primitive areas of the state. Only one improved road approaches these lakes and streams, and in the past they were frequented only by the more adventurous fishermen and sight-seers who have mostly traveled the final distance afoot. Recently the Porcupine Mountains area has undergone some development that promises to encourage increased use of the park's recreational resources by the public. Either already built or now under construction are seven cabin shelters closely associated with the Carp drainage system, including two cabins on the shore of Mirror Lake and one each on Lake of the Clouds, Lily Pond Lake, Little Carp River (between the mouth and Lily Pond Lake), and near the mouths of the Little Carp and Big Carp rivers. Some of these cabins were in use during 1947 and 1948 and the remainder are expected to be ready by the spring of 1949. In addition, foot trails have been provided along the greater length of the Carp rivers.

Two intensive fisheries surveys and a number of briefer investigations have been made of these waters, and findings resulting from the studies are given in this report. Lake of the Clouds was inventoried in the summer of 1938. The findings are included in Institute Report No. 630, dated November 14, 1940, "A Fisheries Survey and Management Suggestions for Some Lakes of the Ottawa National Forest, Michigan" by James W. Moffet. An inventory of Mirror Lake was made during the summer of 1941, and the results are given in Institute Report No. 724, dated January 6, 1942, "A Fisheries Survey of Mirror Lake, Ontonagon County" by Paul Eschmeyer. The following information concerning the lakes was largely taken from the above reports.

Intensive fisheries surveys have not been made on either of the Carp rivers. Information on these streams was obtained mostly from several partial examinations.

#### Lake of the Clouds

Lake of the Clouds until a few years ago was known as Big Carp Lake. There is no available evidence that the carp ever was represented among the fish fauna of this lake or the other waters of this region which bear, or have borne, the name. Several suggestions on the origin of the name have been advanced; the most logical of these is that it is a contraction of "escarpment," a geological formation occurring near the lakes.

Lake of the Clouds is located in Section 22 of Township 51 North, Range 43 West, Ontonagon County. It is about 10 miles west of Silver City and lies off highway M-107 about a half mile as the crow flies. A field party of fisheries workers recently checked its elevation as being 1,092 feet above sea level.

This body of water has an area of 133 acres and a maximum depth of 12 feet. Set in a narrow valley between two ridges, the basin is long

and narrow and very regular. High, wooded cliffs border the north shore of the lake and high, wooded ground forms the south shore.

The inlets are Big Carp River, which enters as a sluggish stream at the northeast end, and Spring Creek. The latter enters the lake near the river inlet and its flow is intermittent. Carp River, at the southwest end, is the outlet. The bottom types of the lake near shore include boulders, gravel, and sand. The soil of the deeper portions is muck. A map of the lake showing the marginal outline and depths was prepared some years ago by the United States Forest Service, and this map has since been made more complete by the Institute for Fisheries Research by indicating the vegetation and bottom soil types.<sup>1/</sup>

The water of this lake is light brown in color. A secchi disc<sup>2/</sup> disappeared from sight 5 1/2 feet below the surface, at the time of the fisheries survey. In most Michigan lakes visibility of the disc ranges within a 20-foot limit. The productivity of lakes usually varies inversely with the degree of transparency of the water.

On June 28, 1938, a difference of 6° Fahrenheit was found between the water at the surface and bottom. The temperature of the surface water was 72° F., while that of the air was 75° F. Probably the water of this lake warms up considerably from top to bottom during the peak of summer.

The water was found virtually neutral in regard to acidity and alkalinity. The pH (hydrogen ion concentration) range was 7.2-7.0. A

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<sup>1/</sup> Available at cost from the Institute for Fisheries Research, University Museums Annex, Ann Arbor, Michigan; contour maps also can be obtained from the Regional Forester, U. S. Forest Service, Milwaukee, Wisconsin.

<sup>2/</sup> A thin metal, circular plate eight inches in diameter, painted black and white, and used to test transparency of water.

reading of 7.0 is neutral, while anything below this is acid; readings above 7 indicate alkalinity. The water is quite soft, having been found to contain only 24-26 parts per million of calcium carbonate (the chief mineral salt contributing to water hardness) as shown by the methyl orange alkalinity test. A considerable number of Michigan lakes give readings of over 100 p.p.m. of calcium carbonate (CaCO<sub>3</sub>) by this test. Classification of lake waters as to hardness was attempted by Dr. C. J. D. Brown, formerly of the Institute staff. Similar classifications have been noted by Welch (1935), Limnology, p. 96 and by Wilson (1935), Ecological Monographs, Vol. 5, No. 2. The latter is the scale employed by the Wisconsin Geological and Natural History Survey. Though somewhat arbitrary, such classifications are nonetheless convenient for general comparison. The three classifications, differing somewhat, are:

	<u>Brown Classification</u>		<u>Welch Classification</u>		<u>Wisconsin Classification</u>	
	p.p.m. CaCO <sub>3</sub>		cc./liter CO <sub>2</sub>	p.p.m. CaCO <sub>3</sub>	p.p.m. CO <sub>2</sub>	p.p.m. CaCO <sub>3</sub>
Very soft	0 - 25		Soft 0 - 5	0 - 22	Soft 0 - 10	0 - 23
Soft	26 - 50		Medium 5 - 22	22 - 98	Medium hard 10 - 30	23 - 68
Moderately soft	51 - 100		Hard 22 - 50	98 - 223	Hard over 30	over 68
Moderately hard	101 - 150					
Hard	151 - 250					
Very hard	251 - ...					

An abundance of vegetation occurs in Lake of the Clouds. Twenty-four species of aquatic plants were found here by the survey party. The predominating forms were three-way sedge, spike rush, yellow water lily, and a pond weed (Potamogeton angustifolius).

Perch, smallmouth bass, and brook trout are the game fish known to occur in this lake. A total of 3,000 fingerling smallmouth bass and 30,000 fingerling bluegills were introduced into Lake of the Clouds,

the stocking being done in 1935 and 1936. Fish collections taken in succeeding years indicated that the bluegills had not become established. General creel census records show that brook trout have been caught there in the spring, but it seems likely that the trout migrate into the river with the advent of warm weather.

The perch collected from Lake of the Clouds in 1938 showed a generally favorable growth rate but were infested heavily with yellow grubs (Clinostomum). Smallmouth bass taken in subsequent collections also were heavily parasitized, mainly by "black spot" (Neascus), and to some extent by yellow grubs. Although infestation with these parasites causes the fish to be less attractive, it does not make them unfit as food.

Of forage fishes, the common sucker and seven species of minnows have been found in the lake. The latter were, in order of decreasing abundance, blacknose shiner, fathead minnow, redbelly dace, blacknose dace, creek chub, spottail shiner, and northern dace.

The value of Lake of the Clouds for fishing seems rather limited. Perch have been abundant, but the extensive degree of parasitism in these and the bass decrease their value to fishermen. The smallmouth bass have been reported as providing good sport at times. On the whole, however, probably the scenic value of Lake of the Clouds will continue to surpass its fishery resources.

#### Mirror Lake

Mirror (Little Carp, Muriel) Lake is located in Section 2 of Township 50 North, Range 44 West, Ontonagon County. It is about 2 1/2 miles south of Lake of the Clouds, being separated from the latter by a narrow, steep divide. It is one of the least accessible of Michigan's many lakes. By land, the easiest means of access is a foot trail 4 1/2

miles long which begins at the western extremity of highway M-107. A wagon trail nine miles long leads to the southeast shore from the abandoned Nonesuch Mine, situated east and slightly south of the lake. A field party of fisheries workers recently checked the elevation of Mirror Lake as being 1,602 feet above sea level.

The area of this lake is 83 acres. The basin has two major depressions. The deeper depression is in the southeast portion of the lake, having a maximum depth of 40 feet; the other depression, in the west end, reaches 30 feet.

The lake has six inlets, only one of which is of appreciable size. This is the Little Carp River, which enters by way of the northeast shore. The outlet stream also is known as Little Carp River and flows out of the lake at the southwest end, finally entering Lake Superior. A map of Mirror Lake showing the marginal outline and depths was originally prepared by the United States Forest Service, and the vegetation and bottom soil types have since been added by the Institute for Fisheries Research.<sup>3/</sup>

The slope of the bottom from the shallows to the depths is quite gradual in much of Mirror Lake, although a few steep "drop-offs" occur. The shoals range from about 20 to 600 feet wide in the main part of the lake; the narrow south bay may be considered almost entirely shoal. About 20 percent of the total area of the lake consists of shoal.

Sand, interspersed with small amounts of fine gravel, occurs close to the shoreline of the lake. Silt and muck encroach to the shoreline

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<sup>3/</sup> Available at cost from the Institute for Fisheries Research, University Museums Annex, Ann Arbor, Michigan; contour maps also can be obtained from the Regional Forester, U. S. Forest Service, Milwaukee, Wisconsin.

at some points. Pulpy peat is the principal soil of the depths.

The water is colored light brown. A secchi disc disappeared from sight 7 feet below the surface, when the fisheries survey was made in 1941.

Temperatures taken at Mirror Lake on August 29, 1941, gave the following readings:

Air - 64.8° F.

Water - surface, 62.8° F.

Water - bottom, (33 feet), 42° F.

A thermocline (an area in which the temperature decreases at least 1/2 degree Fahrenheit per foot increase in depth) was found, extending from 12 to 24 feet. Occurrence of a thermocline in a lake indicates a division of the water into three different horizontal strata during the summer months. The uppermost of these strata is the epilimnion, a warm, circulating surface layer of water over the thermocline (described above). The hypolimnion is a layer of cold, non-circulating water below the thermocline. If the oxygen and temperatures are adequate in the hypolimnion or thermocline, a lake will ordinarily support cold-water species, such as trout. If a given lake has no thermocline, or if the thermocline has less than 4 parts per million of oxygen, such a lake usually will not be suited for cold-water fish, and ordinarily can be managed only for warm-water species. Lake of the Clouds is an example of a shallow, warm-water lake, although brook trout have been known to occur in it at least a part of the year. The surface temperatures (about 63° F.) of Mirror Lake at the time of the survey were well below the toleration limit of brook trout

(about 70° F.), but there may be some periods in summer when waters above the thermocline are too warm for trout.

The oxygen supply was found adequate for trout in the upper portions of the thermocline of Mirror Lake. Near the top of the thermocline, at 15 feet, a value of 6.8 parts per million was found. The area above this depth would logically be expected to have about as much or more of the dissolved gas. At 21 feet, near the bottom of the thermocline, 2.4 p.p.m. were found, and at the bottom only 0.1 p.p.m. It is quite possible that the brook trout of Mirror Lake during critical periods of high temperatures frequent areas close to the spring-fed inlet streams as well as the colder water of the depths having adequate oxygen.

The pH (hydrogen ion concentration) of the water in Mirror Lake was found to range from 6.0 to 6.8, or from quite acid to slightly acid. Ordinarily, lakes which are slightly alkaline are more productive than are neutral or acid waters. This seems to apply mostly to warm-water fishes, however, since many of the state's good trout lakes have hydrogen ion concentrations similar to that of Mirror Lake.

The water of Mirror Lake has a degree of softness almost identical to that of Lake of the Clouds. Methyl orange alkalinity tests that were run on the former gave readings of 21 parts per million of dissolved calcium carbonate both at the surface and bottom; the range for Lake of the Clouds was 24-26 p.p.m. Ordinarily, waters with a considerably higher methyl orange alkalinity (from about 100 to 200 p.p.m.) are more productive than are soft waters like the two lakes just mentioned. However, many Michigan lakes with equally soft water produce good growth in trout. As a matter of fact, many of the trout lakes have soft water, and they are characterized by low general productivity.



The entire lake has a narrow fringe of vegetation near the shoreline, and on the shallower shoals rather large areas are covered with plant growth. The survey party found 17 species of aquatic plants; water shield, spike rush, white and yellow water lilies, and musk grass predominated.

Plankton (microscopic free-floating plants and animals that serve as the main source of food for small fishes and many fish-food organisms) was found in average abundance in Mirror Lake. Of the food organisms living on the bottom, midge larvae predominated in the deeper portions of the basin. These and dragonfly nymphs were present on the shoals. On the whole, the bottom foods were quantitatively and qualitatively sparse, but for the existing population of trout and chubs the amount of food appeared adequate. At the time of the survey, the brook trout were feeding more on forage fishes (sticklebacks and chubs) than on insects.

The only game fish that has been found in Mirror Lake is the brook trout. This species occurs in considerable number and has provided good fishing, although anglers report much interference from creek chubs which are especially abundant. Other species that occur in the lake are the common sucker, cisco, fathead minnow, blacknose dace, brook stickleback, and ninespine stickleback.

General creel census records for the fishing on Mirror Lake are given in Table 1. Records of this kind have been collected by Michigan conservation officers since 1928 while routinely checking fishermen. The following summary probably represents only small parts of the total angling done on Mirror Lake in the various years, yet it gives some idea of the quality of the brook trout fishing early in the season.

Table 1. Fishing Success on Mirror Lake as Shown by General Creel

Census Records.

Year	Months records were taken	Number of days records were taken	Hours fished	Number of legal brook trout caught	Number of legal brook trout per hour
1928	May	1	12	30	2.5
1929	June & July	3	97	204	2.1
1931	May	1	4	40	10.0
1939	May	4	57 1/2	38	0.6
1941	May	1	66	21	0.3
1948	April	6	302	242	0.8

A group of fisheries workers went to Mirror Lake in November, 1947, to observe trout spawning habits there, collect fish for growth data, and check possibilities of a new sub-species of brook trout existing in this lake. Sixty-six brook trout were collected for growth data. The fish ranged from 6.8 to 12 inches long. The total length was obtained on 62 specimens and this averaged 8.8 inches. A preliminary examination of these brook trout failed to show them as representing any new sub-species. However, no critical study of the specimens has as yet been made.

Brook trout were planted some years ago in the Little Carp River and Mirror Lake systems, as follows:

<u>Year</u>	<u>Number</u>	<u>Age</u>
1926	30,000	...
1928	20,000	2 months
1928	1,500	5 months
1930	3,400	6 months
1932	8,500	8 months

It is conceivable that an introduced hatchery stock may have replaced a distinctive native stock of brook trout, but this is purely conjecture.

Growth data on Mirror Lake brook trout will be presented and interpreted in a comprehensive report on the growth of Michigan brook

trout now being prepared by Edwin L. Cooper of the Institute for Fisheries Research.

Apparently the creek chub and brook trout populations of this water are competing with each other. Even though chubs are to some extent used as food by the trout, this value may well be outweighed by such factors as reciprocal predation and competition for foods sought by both species.

Control of the chubs could be carried out by preventing reproduction and at the same time destroying as many of the adults as possible. The use of weirs in the streams connected with the lake appears the best means for doing this. However, at least five of the streams have appeared usable for spawning, and since functioning weirs require daily attention, the expense of such a program might not be repaid by the results. The idea of improving trout fishing by reducing the chub population would need to be tested by some initial experimentation, and such studies are not planned for the near future.

#### Trout and Beaver in Mirror Lake

The field party<sup>4</sup> which visited Mirror Lake and the Little Carp River in November, 1947, had an opportunity to observe something of the relationship between spawning trout and beaver ponds in the inlet and outlet of the lake. The following account has been abstracted from the field notes of G. P. Cooper, one member of the party.

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<sup>4</sup> Included W. C. Beckman, L. R. Anderson, and G. P. Cooper of the Institute and W. A. Gosline and K. F. Lagler of the University of Michigan.

The trout spawning season was in progress at the time of these observations. Brook trout taken by gill net from the lake were "ripe," and some trout were seen on their redds in the main inlet and the outlet. The three other inlets to the lake were found to be very small, had no trout, and were judged to be virtually worthless as trout feeder streams.

Little Carp River above the lake (the main inlet) was examined on November 6, when three pairs of trout were seen on redds. The following week was characterized by heavy snowfall and cold weather with lowering water temperatures. On November 12 the entire stream in Sections 1 and 2 (T. 50 N., R. 44 W.) was cruised. The headwaters in Section 1 contained two beaver dams, both judged to be barriers to upstream movement of trout, so that spawning trout from the lake could not reach this section. On the stream in Section 2 there are sites of old beaver dams, but no active dams or barriers to fish movement were present. Thus trout from Mirror Lake have access to the lower 1 mile of this inlet, but only the lower 1/4 mile has riffles for spawning and these are generally poor. In other words, the inlet is poor as a trout feeder stream for the lake, because of beaver and topography.

The river at the outlet of the lake was examined on November 6 when about 100 spawning trout were seen in the first 200 yards of stream just below the lake. One active beaver dam located 200 yards below the lake and another dam about 1/4 mile further downstream were both judged to be barriers to movement of trout either upstream or down. These beaver dams, being located so close to the lake, obviously were interfering with the spawning migration of trout from the lake. Employees of the State Parks Division stated that there had been a concentration of

spawning trout at this point for about two weeks prior to this visit.

Observations were made on November 10 on the Little Carp River from Mirror Lake to a point 1/2 mile below Lily Pond Lake, the stream being in government sections 3, 10, and the north 1/2 of 15 (T. 50 N., R. 44 W.). The water temperatures ranged from 38° F. at the outlet of Mirror Lake to 32° F. at its entrance to Lily Pond Lake, where the stream was frozen over. There were 12 inches of snow on the ground. This entire section of stream was cruised. About half of it was still water, partly impounded by beavers; the other half was rapids with gravel bottom. There are several beaver dams in the first mile below Mirror Lake, then about a mile of unobstructed rapids, followed by about 1/2 mile of deadwater to Lily Pond Lake. Lily Pond Lake is reported to have a good population of brook trout, but no trout or redds were seen in the rapids above the lake.

In the 1/4 mile of stream just below Lily Pond Lake there were two beaver dams, both barriers to upstream movement of trout.

To recapitulate:--Beavers were numerous and very active on the Little Carp River above and below both Mirror and Lily Pond lakes, and the impassable dams were interfering considerably with spawning migrations of brook trout, especially from Mirror Lake.

#### Big Carp River

The headwaters of Big Carp River are just east of Government Peak in Ontonagon County. As indicated by a Field Administration (Michigan Department of Conservation) map, the stream flows about seven miles from its source to where it enters Lake of the Clouds. After leaving the latter, the river takes a southwestward course through Ontonagon County, cuts across the northeast corner of Gogebic County, and then

briefly returns to the former county in which it enters Lake Superior. The stream flows a distance of about eight miles from Lake of the Clouds to the mouth.

Perhaps the Big Carp River is best known for the excellent fishing for large "spawner" rainbow trout that sometimes is experienced in early spring on a limited length of the stream. This stretch of stream extends from the mouth to the cascades, and covers a distance of between one and two miles. Brook trout are found above the cascades, but fish migrating upstream from Lake Superior are unable to surmount these natural barriers.

On July 19 and 20, 1945, A. S. Hazzard and G. P. Cooper of the Institute for Fisheries Research examined the Big Carp River from the mouth to the top of the cascades, a distance of about 1 1/2 miles. The spawning grounds here were found to be excellent for rainbow trout, and the section was over-populated with young rainbows.

Detailed observations were noted on that stretch of the river flowing through Gogebic County. The lower section (N.E. 1/4 of Sec. 1, T. 50 N., R. 45 W.) comprised about one-fourth the length of that part of the stream which traverses Gogebic County. Here the river was found to be 15 to 40 feet wide, averaging about 35 feet wide and 6 inches deep. The current was rapid and the water was brown in color. The volume of flow was calculated as being about 25 cubic feet per second after a rain of the previous night.

The size, type, and frequency of the pools in this section were classified as  $S^3T^3F^1$ . Under this classification a rating of 1 is good, 2 is average and 3 is poor. For example, a rating of 1 for "size" is given those pools having an average width or length greater than the average width of the stream. A rating of 1 for "type" requires that

the pools on the average be deep and, if exposed, containing a great luxuriance of aquatic plants harboring numerous fish-food organisms; or deep pools with abundant shelter (overhanging banks, logs, roots, boulders) much drift or detritus, shaded by forest cover or shrubs. A rating of 1 for "frequency" is given when pools are more or less continuous--about 75% to 25% relation of pools and riffle areas. The bottom type of the pools consisted of small boulders, while that of the riffles was rubble. The conditions of shade and cover were found to be excellent in this section, shade being provided by a mixed conifer and hardwood forest. Aquatic vegetation occurring in this portion of the stream was filamentous algae.

The upper section examined (Sec. 1, T. 50 N., R. 45 W.) comprised the upper three-fourths of the river where it occurs in Gogebic County. Along this stretch the stream varied from 15 to 40 feet in width, averaging 30 feet wide and 8 inches deep. The volume of flow was about 20 cubic feet per second.

The pools of this section were given a classification of  $S^2T^2F^2$ . The bottom types of the pools included bedrock, rubble, gravel, and sand, while the bottom of the riffle areas was bedrock. Shade of moderate density was provided by mature hemlock, birch, and maple. The aquatic vegetation consisted of moss and algae.

Fish collecting during this investigation was done from the mouth of the river to the upper cascades, a distance of about 1 1/2 miles. Fly rod tackle and a 10-foot common sense seine were used. Rainbow trout predominated in the collections, numbering 28 individuals which included 10 fry and 18 fish of larger size. The latter ranged from 129 to 222 millimeters (about 5 to 8 3/4 inches) in length. Other fish taken

included brook trout, muddler (Cottus bairdii), common sucker, creek chub, and blacknose dace. The latter two species were of common occurrence.

The ages of the rainbow trout were determined from the scales (by E. L. Cooper). Fourteen specimens, ranging from 129 to 177 millimeters, were yearling fish; four of the trout, 198 to 222 millimeters, were two-year-olds. These rainbows showed a normal growth rate.

Apparently large rainbow trout do not remain in Big Carp River during the summer months, their presence here being restricted to the spawning period in the spring, and possibly they are also present in the fall and winter months. This condition prevails in most Michigan streams used by rainbows migrating up from the Great Lakes.

#### Little Carp River

The source of Little Carp River lies between two and three miles south of Lake of the Clouds. As indicated by a Field Administration (Department of Conservation) map, this stream flows in a westerly direction from its source for about two miles to Mirror Lake. After leaving Mirror Lake, the stream continues westward for about 10 miles before entering Lake Superior by way of Gogebic County. Pond Lily Lake, a small body of water about two miles southwest of Mirror Lake, is both fed and drained by Little Carp River.

On July 20 and 21, 1945, A. S. Hazzard and G. P. Cooper examined about two miles of Little Carp River up from the mouth. The 200-yard section from the mouth of the stream to the first cascade was noted as being 20 to 35 feet wide, averaging 25 feet in width and 8 inches in depth. The current ranged from torrential to rapid. The water was light brown and at the time of examination was slightly turbid because of a



recent rain. The volume of flow was found to be about 20 cubic feet per second. Cascades and falls from 2 to 6 feet high occur in this stretch of the river but these were determined as being passable for fish.

Pools in this lower section were found to have bottom types of bedrock and rubble. Gravel composed the bottom of the riffle areas. Excellent shade was provided by a mature forest of conifers and hardwoods. There was a sparse growth of algae and moss in the stream.

At a location about 1 1/2 miles above the mouth, the river varied between 15 and 40 feet in width, averaging 35 feet wide and 5 inches deep. The current here was rapid and the volume about 20 cubic feet per second.

The pools were classified S<sup>2</sup>T<sup>1</sup>F<sup>2</sup>. Like those of the preceding section, the pools here had bottoms of bedrock and rubble; the bottom types of the riffles included bedrock, boulders, rubble, and gravel. A good quantity of shade was provided by forest trees. There was no aquatic vegetation.

One fish collection was taken with a seine from the stream, about a half mile above the mouth. Longnose dace and a muddler (Cottus cognatus) were collected.

Rainbow trout up to 10 inches and brook trout up to 8 inches were seen in the lower part of the stream. Excellent spawning grounds for trout were observed. A heavy run of spawning rainbows from Lake Superior is known to occur here in the spring. The river was evaluated as a fine, primitive trout stream.

#### MANAGEMENT SUGGESTIONS

##### Lake of the Clouds

A planting of northern pike was recommended for Lake of the Clouds in the Institute Report of 1940. Since then, however, the smallmouth

bass has proved its adaptability to this lake and now it is evident that it would be unwise to add such a vigorous competitor as the pike. The natural reproduction of smallmouth bass and perch is ample to maintain these species under present conditions in the lake.

The above-average abundance of fish parasites detracts from the value of Lake of the Clouds for angling, but to date no practicable means has been found for dealing with the problem.

#### Mirror Lake

Possibly one of the most important contributions that could be made to preserve good brook trout fishing on Mirror Lake would be to control the beavers in Little Carp River, both above and below the lake. Beaver dams in this stream near the lake affect the brook trout by preventing them from reaching favorable spawning grounds. If not corrected, this condition may soon result in a sharp decline of the trout population of the lake since the trout apparently have been largely dependent on the stream for successful spawning. Therefore it is suggested that the beavers be removed from these areas and the dams opened. The animals could be live-trapped and transported to other waters in the area. The project presumably could be handled by Park personnel.

No artificial stocking of fish is advocated for Mirror Lake. Every indication shows that the brook trout are able to maintain themselves to the carrying capacity of the lake when free access to the main inlet and the outlet stream is available. Effort should be directed toward insuring retention of as much of the primitive character of this water as possible.

A creel limit of not over five trout a day per angler is suggested for the lake. In these days of improved roads and increased fishing pressure the present limit of 10 trout per day is believed too high for lakes such as Mirror, where maintenance stocking of hatchery trout is undesirable. A reduction to two trout a day may even be advisable in the future, since the development of camping facilities in the Park and the discovery by more and more people of the excellent recreational resources of the Porcupine Mountains area are likely to result in a considerable increase in fishing pressure on this lake. The sample of trout collected in November, 1947, showed that the population is above average in size, so this should in some measure compensate for a creel limit lower than that proposed for the majority of the trout lakes.

The suckers of Mirror Lake are quite heavily infested with "black spot," but the brook trout have very few parasites.

#### Big Carp River

Only two management suggestions are offered for Big Carp River at this time. One is that no artificial stocking be done in the stream, and the other that the maximum daily limit on trout be reduced from 15 to 10.

In keeping with one of the primary purposes of setting aside the Porcupine Mountains area as a State Park (that of preserving the relict tract in a natural condition), this stream and other waters of the area ought to be allowed to retain as much of their aboriginal character as possible. Artificial stocking would be a move in the opposite direction.

Reduction of the daily limit from 15 to 10 trout is included in the plan proposed for all trout streams of the state. Often management of wildlife resources must include a means of insuring that a limited supply be available to an increasing number of sportsmen, with the added provision that the seed stock be not depleted by the harvest. This has been the basis for the general downward trend of bag limits on fish and game in this country. In regard to the species of trout that are sought mostly for sport in Michigan (brook, rainbow, and brown), a further rationing of the supply appears necessary at this time.

Little Carp River

The management suggestions made for Big Carp River are also proposed for Little Carp River. These are, no artificial stocking and a daily creel limit of 10 trout per angler.

INSTITUTE FOR FISHERIES RESEARCH

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