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Report No. 1085

Survey of the Upper Black River, Montmorency, Cheboygan, Otsego and  
Presque Isle Counties

by

Edwin L. Cooper

It has been suggested that some long-term environmental improve-  
ment on the Upper Black River might be of value to private owners and  
to the State. Known in the past as excellent brook trout water, this  
stream has reportedly declined greatly in the quality of fishing over  
a period of 15 years or more. Considerable work has been done in the  
past on portions of the stream in the form of biological surveys,  
temperature readings, installation of stream improvement devices, food  
studies and fish population counts. For details of previous work done  
on the Upper Black River see IFR Report Nos. 34, 87, 107, 137, 143, 152,  
183, 277, 337, 473, and 491. Numerous other correspondence dealing with  
fish management projects is on file.

To supplement the data acquired by former investigations, an  
Institute party consisting of C. M. Taube, J. F. Bruna and the writer  
spent approximately two weeks, from July 16, 1946 to August 1, 1946,  
on representative sections of the river. Fish collections were made

at various points using 1/4-inch mesh and common sense minnow seines. Some angling was done where seining was ineffective. Air and water temperatures were taken for as many different localities as possible during the survey. Physical data of the stream (width, depth, current velocity, type of bottom, amount of cover, etc.) were recorded for at least two different localities in each stream section. A greater share of the time was spent on portions of the river for which data were lacking and on portions which were thought capable of supporting a population of brook trout. Some work was done on privately owned sections to obtain the data necessary for a comprehensive fish management program for the river as a whole.

The river has been arbitrarily divided into several sections for ease in tabulating data. Marked changes in environmental conditions have been used to some extent in differentiating sections of the stream. These sections are as follows: Section 1: From the mouth of the Upper Black River at Black Lake (T. 36 N., R. 1 E., Sec. 28) upstream to include the mouth of Milligan or Milliken Creek (T. 35 N., R. 1 E., Sec. 29).

Section 2: From the last designated point upstream to Tower Pond Dam (T. 34 N., R. 1 E., Sec. 3, 10, 11).

Section 3: From the last designated point upstream to include the mouth of Canada Creek (T. 33 N., R. 1 E., Sec. 12).

Section 4: From the last designated point upstream to include the mouth of the East Branch of the Upper Black River (T. 32 N., R. 1 E., Sec. 8). For convenience, the East Branch has been further divided into two sections, 4a and 4b, listed below.

Upper }  
Lower } Black River Ranch  
middle }  
4  
5  
4A

Section 5: From the last designated point upstream to Boyd's Cabin. (T. 31 N., R. 1 E., Sec. 6).

Section 6: From Boyd's Cabin to the headwaters.

Section 4a: That portion of the East Branch from the mouth to a point approximately 5 miles upstream (See map).

Section 4b: The remaining portion of the East Branch from the last designated point to the headwaters.

The main objectives of the survey were to determine (1) which portions of the stream now contain a population of brook trout and (2) in the portions which do not contain brook trout, what are the limiting factors. Any attempt to explain the lack of a particular species in a stream presupposes a knowledge of the environmental conditions necessary for existence of that species. The list of necessary qualifications for bodies of water that will support a good population of brook trout usually contain the following:

(1) Naturally pure water supply, free from pollution of any appreciable amount.

(2) Dissolved oxygen content of not less than 5 p.p.m.

(3) Maximum water temperatures for long periods of time must not exceed 72° F.

(4) Food supply in the form of aquatic insects and other in-  
required  
vertebrates must be adequate. Definite statements of/abundance  
cannot be made due to the great quantitative diversity of fauna in  
streams that support good populations of brook trout.

(5) Competition with other species of fish should be at a mini-  
mum. Brook trout do not favorably compete with other species.

(6) Fishing pressure must not be too heavy. It is recognized by many fishermen that brook trout are usually easier to catch than other species of trout and this disproportionate cropping may tend to reduce brook trout populations faster than other species.

(7) Spawning conditions suitable for brook trout must be present if a natural population is to maintain itself. These conditions are usually limited to medium sized gravel in close proximity to a source of spring water.

In the Upper Black River the source of water is undoubtedly free from pollution. The headwaters of the mainstream and most of the tributaries originate in spring-fed cedar and tamarack swamps. Other tributaries drain small lakes. There is no source of industrial or domestic pollution of any consequence throughout the whole watershed.

The dissolved oxygen content in streams is intimately related to the amount of pollution present. In swiftly flowing water when pollution is not present the amount of dissolved oxygen is usually at the saturation point in respect to the temperature. At a temperature of 77° F. this is 8.4 p.p.m. It is very unlikely that the amount of dissolved oxygen in the Upper Black River ever falls below 5 p.p.m.

The amount of fish food present in the Upper Black River can hardly be considered in itself a factor limiting the trout population. Samples of bottom fauna taken in 1931 and 1934 showed a production of from 0.25 to 15.0 cc per sq. ft., the low figures being obtained from predominantly sandy sections and the high ones from gravel, rubble and muck. The relation between the amount of food and numbers of trout present is closely associated with the number of competing species of fishes with similar food habits.

Temperature Conditions

The maximum temperature which will be tolerated by brook trout is not definitely known but varies according to the length of time the fish are subjected to the temperature and other chemical and physical properties of the water. However, it is generally known that a body of water which normally exceeds 72° F. during considerable periods of time will not support a population of brook trout.

Several hundred individual temperature readings of the Upper Black River have been obtained up to the present time. For the most part these have been taken during the month of July when high temperature conditions are likely to be critical. The mean air temperatures for the Black River Area, as recorded by the United States Weather Bureau for the months of June, July and August, 1946, were 61° F., 65° F., and 62° F., respectively. In order to present the water temperature data in a comprehensive manner, the reduction of all the comparable individual readings to an average value for each section was accomplished. A theoretical value for the maximum daily water temperature for each section of the stream for each day in July was determined in the following manner. The average differences between air and water temperatures were computed from original temperature readings, and these average differences were used to determine the probable maximum water temperature of each day from the daily maximum air temperature as recorded by the United States Weather Bureau for that area. The computed maximum daily water temperatures were then averaged to obtain an average of maximum water temperatures for the month (Table 1). In addition to the theoretical average of the maximum water temperatures for each section,

a list of the highest temperature readings recorded for sections 5, 4a and the upper part of section 4 is presented in Table 2. These temperature readings are arranged, insofar as localities are known, in an upstream to downstream order for each section.

From the temperature data for the entire stream it is concluded that sections 1, 2, 3 and the lower part of section 4 are not to be considered as brook trout water, while section 5, the lower part of section 4a and the upper part of section 4 are marginal in nature. This conclusion agrees with the results of the fish collections since no brook trout were taken in sections 1, 2 and 3, but were taken in all of the other sections.

#### Competition with other fish

Thirty-nine different species of fishes have been collected or have been reported from the Upper Black River. Of these, nine species are found commonly in many sections of the river (Table 3). The common white sucker and the northern creek chub were most abundant in the collections of 1946 with the northern common shiner, western blacknose dace, central johnny darter and the common brook trout following in order of lesser abundance. All six species were collected in at least ten of the eighteen fish collections made. The relative abundance of the different species in the various sections is presented in Table 3.

The degree of competition which different species exert toward brook trout is largely unknown, and undoubtedly varies a great deal with each species and with different habitats. The northern creek chub and the common white sucker are thought by some writers to be direct competitors for food with the brook trout. Whether large populations of suckers and creek chubs as are present in the Upper Black

River will reduce the amount of food which would otherwise be available to brook trout is not definitely known. The amount of food that the chubs and suckers contribute to the brook trout in the form of small fish is negligible, since brook trout do not ordinarily consume a significant quantity of fish until they attain a size of from ten to twelve inches in length.

It has been observed generally that the cold spring headwaters of Michigan trout streams contain few species of fish in addition to brook trout and muddlers. As the water warms gradually in its downstream run, creek chubs and suckers are generally the first additional species to make their appearance, followed by common shiners, western blacknose dace and many others. If the stream warms considerably the warm-water fishes (bass, bluegills, sunfish, rock bass, etc.) inhabit the lower stretches of the stream.

This pattern was indicated in the Upper Black River. In the headwaters of the main stream only the common brook trout was taken or observed in the fish collections. As the main stream warms very quickly downstream, suckers, creek chubs and blacknose dace were present in abundance in the lower part of section 6, and these three species maintained their dominance throughout most of the watershed. In section 4b, brook trout and slimy muddlers were the only species collected, while in 4a, the slimy muddler disappeared and was replaced by an abundance of suckers, creek chubs, blacknose dace and common shiners.

It is doubtful whether temperature control by stream improvement could be effective enough to maintain headwater conditions for any

great length of stream and thus exclude the competitor species. Furthermore, the best conditions for growth of brook trout include a water temperature considerably warmer than headwater spring conditions, since previous growth studies on cold headwater streams indicate that the brook trout grow very slowly under those conditions. If it can be demonstrated that the large populations of suckers, creek chubs and other species are serious competitors to the brook trout, some means of control of these populations would be a good management practice.

#### Spawning conditions

Little is known about the spawning conditions for brook trout in the Upper Black River. Some successful reproduction of last fall was indicated by the collection of young trout in various parts of the stream during July of 1946; no young trout were planted in the river system during that time. Brook trout of a size to be considered as young-of-the year were taken in all sections of the river except sections 1, 2 and 3. Natural reproduction, therefore, does occur in the portions of stream which are presently considered brook trout water.

#### Fishing pressure and quality

A sample of fishing success of the Upper Black River was obtained through the state-wide general creel census. This represents an unknown percentage of the total fishing but it is believed to be large enough to be included for general consideration (Table 4). The records were sorted and tabulated by two groups, (1) trout stream (that portion of the river south of the upper end of Tower Pond) and (2) non-trout stream (that portion of the river from Tower Pond to



Black Lake), in conformity with the designation established by the Conservation Department for management and enforcement policies. In the portion of the stream designated as trout water, 76 fishermen each fished approximately three and one-half hours to catch one legal and 3 sub-legal brook trout apiece. No other kinds of fish were reported taken. This quality of fishing is approximately one-third as good as the state average for 1945, and corroborates to some extent the general belief that fishing is not good in that stream.

It is believed that the fishing pressure is quite high, both on public and restricted areas. This is indicated by the condition of banks and parking places in the vicinity of road bridges and trail crossings and by numerous contacts with local sportsmen. There are many private fishing clubs located on the river and these are reported to be very active during the fishing season.

The portion of the river designated as non-trout water yielded 212 fish to 34 fishermen each fishing an average of 3-1/2 hours, making the catch per hour approximately 2 fish. However, if we subtract the number of common white suckers caught from the total yield we find that the total number of game fish caught by these same 34 fishermen was only 21. This amounts to one game fish for every five hours of fishing effort.

In line with the department's policy of supplying more trout of legal size to the fishermen, 17,100 legal brook trout from 8 to 12 inches in length were planted in the Upper Black River during 1945 and the first 8 months of 1946 (Table 5). These plantings were made

just before and during the open season. No records are available as to how many of these trout were taken by fishermen, since the trout were not marked in any way.

#### Management proposals

It is recommended that no plantings of brook trout be made north of Clark's Bridge (T. 33 N., R. 1 E., Sec. 29). This portion of the stream probably does not contain a natural population of brook trout and does harbor a large population of other species of fish. Fish collections indicated that there is no natural reproduction of brook trout in this section. Temperature readings indicate that this section regularly warms up too much to maintain brook trout during the summer months. Conversations with local landowners and sportsmen revealed that fishing was limited to the spring months and that it was worthless to try fishing in July and August. Fishermen seldom if ever took a sublegal fish in this section, suggesting that the greater majority of the catch was composed of planted fish.

If it is desirable to improve or create trout fishing in this section and lower sections of the river it is suggested that a planting of rainbow trout be made. Rainbow trout are already present in the stream though in limited numbers. It is thought that this species would do better under adverse environmental conditions than brook trout and more of the planted fish would carry over to a succeeding fishing season, since rainbow trout are able to withstand somewhat higher temperatures than brook trout. In addition, rainbow trout are not so apt to "crowd out" brook trout such as the brown trout ordinarily do.

Pool improvement financed by the Department should be limited to local areas where access is assured the general public. The nature of

the stream is such that a general improvement of the watershed as a whole in the view toward improving or reclaiming trout water would benefit privately owned sections of the stream for the most part. The portions which would be improved the most would be section 5 and the upper part of section 4. It is doubtful whether stream improvement could be effective enough to transform the lower part of section 4 into brook trout water. Almost all of the land in question is privately owned, the entire upper half of section 4 being part of the Black River Ranch (Table 6 and map).

However, it is recommended that the Department furnish technical assistance in the formulation and promotion of a long-term stream improvement through soil management and reforestation projects and stream bank plantings. This would necessarily require the concerted action of a large number of private owners. Long stretches of the stream in sections 5, 6, 4a and the lower part of 4b are in need of improvement if the maximum brook trout production is to be realized. Previous studies of installation of stream improvement devices both in this stream and elsewhere in the state have indicated that this method is effective in increasing the production of trout, though it is somewhat costly.

A much more intensive survey of local areas is necessary for the planning of a stream improvement program. However, it is recommended that improvement be started in the upper sections of the river, if best results are to be expected.

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Typed by: S. E. Bommer

INSTITUTE FOR FISHERIES RESEARCH

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Table 1.--Theoretical average maximum water temperature for different sections of  
Upper Black River for the month of July, in degrees Fahrenheit.

Main stream						East Branch	
Sec. 1	Sec. 2	Sec. 3	Sec. 4	Sec. 5	Sec. 6	Sec. 4a	Sec. 4b
77	77	77	74	72	63	74	58

Table 2.--Selected temperature data from marginal brook trout waters in Upper Black River, in degrees Fahrenheit.

Date	Locality	Time	Air	Water
	<u>Section 5</u>			
July 19, 1932	Blue Lakes Ranch T32N R1E Sec. 19	12:00 N.	86	71
"	" " T32N R1E Sec. 19	3:30 p.m.	88	73
July 21, 1932	" " T32N R1E Sec. 19	5:45 p.m.	82	77
July 28, 1946	Road Crossing T32N R1E Sec. 21	3:45 p.m.	77	67
July 19, 1946	Road Crossing T32N R1E Sec. 9	4:05 p.m.	73	69
"	High Banks T32N R1E Sec. 16	4:15 p.m.	73	70
July 11, ?	Lawrence Place T32N R1E Sec. 16	8:00 p.m.	?	79
July 15, 1931	Just above junction with East Branch T32N R1E Sec. 8	5:00 p.m.	93	77
	<u>Section 4</u>			
July 15, 1931	Black River Ranch Property T32N R1E Sec. ?	5:00 p.m.	?	80
July 19, 1931	The Hoist T32N R1E Sec. 5	3:35 p.m.	73	71
July 3, 1931	The Sand Bar T33N R1E Sec. 32	5:00 p.m.	?	74
July 19, 1946	The Sand Bar T33N R1E Sec. 32	3:15 p.m.	73	70
"	Schultz Bridge T33N R1E Sec. 32	5:00 p.m.	73	70
July ?, 1931	Clarks Bridge T33N R1E Sec. 32	?	?	75
	<u>Section 4a</u>			
July 15, 1925	Road Crossing T32N R1E Sec. 22	?	?	73
July 28, 1946	" " T32N R1E Sec. 22	2:45 p.m.	75	63
"	" " T32N R1E Sec. 32	4:00 p.m.	81	67
July 15, 1931	Black River Ranch Property	4:30 p.m.	92	77
"	" " T32N R1E Sec. ?	3:00 p.m.	96	80
"	" " T32N R1E Sec. ?	4:20 p.m.	96	81
July 17, 1931	" " T32N R1E Sec. ?	1:30 p.m.	97	79
"	" " T32N R1E Sec. ?	4:30 p.m.	95	82
July 18, 1931	" " T32N R1E Sec. ?	4:30 p.m.	85	81
July 20, 1931	" " T32N R1E Sec. ?	4:00 p.m.	80	80
July 28, 1931	Between the Dams T32N R1E Sec. 11	3:00 p.m.	94	79
"	" " T32N R1E Sec. 11	4:00 p.m.	90	80
July 29, 1931	" " T32N R1E Sec. 11	3:00 p.m.	78	78
July 28, 1946	Lower Dam T32N R1E Sec. 10	4:45 p.m.	66	69
June 26, 1933	Farm T32N R1E Sec. 4	3:00 p.m.	86	76
July 19, 1946	Farm T32N R1E Sec. 4	3:50 p.m.	75	71



Table 4.--Record of fishing of Upper Black River for period April 28 to September 2, 1946, as compiled from general creel census records.

Designated Trout Stream

Number of Fishermen	Total hours fished	Average hours per fisherman	Legal brook trout taken	Catch per hour	Number of undersize trout
76	260.75	3.4	81	0.3	214

Designated Non-Trout Stream

Number of fishermen	Total hours fished	Average hours per fisherman	Brook trout	Brown trout	Walleye	Rock bass	Suckers	Total fish	Fish per hour
34	114.5	3.4	2	5	1	13	192	212	2.0

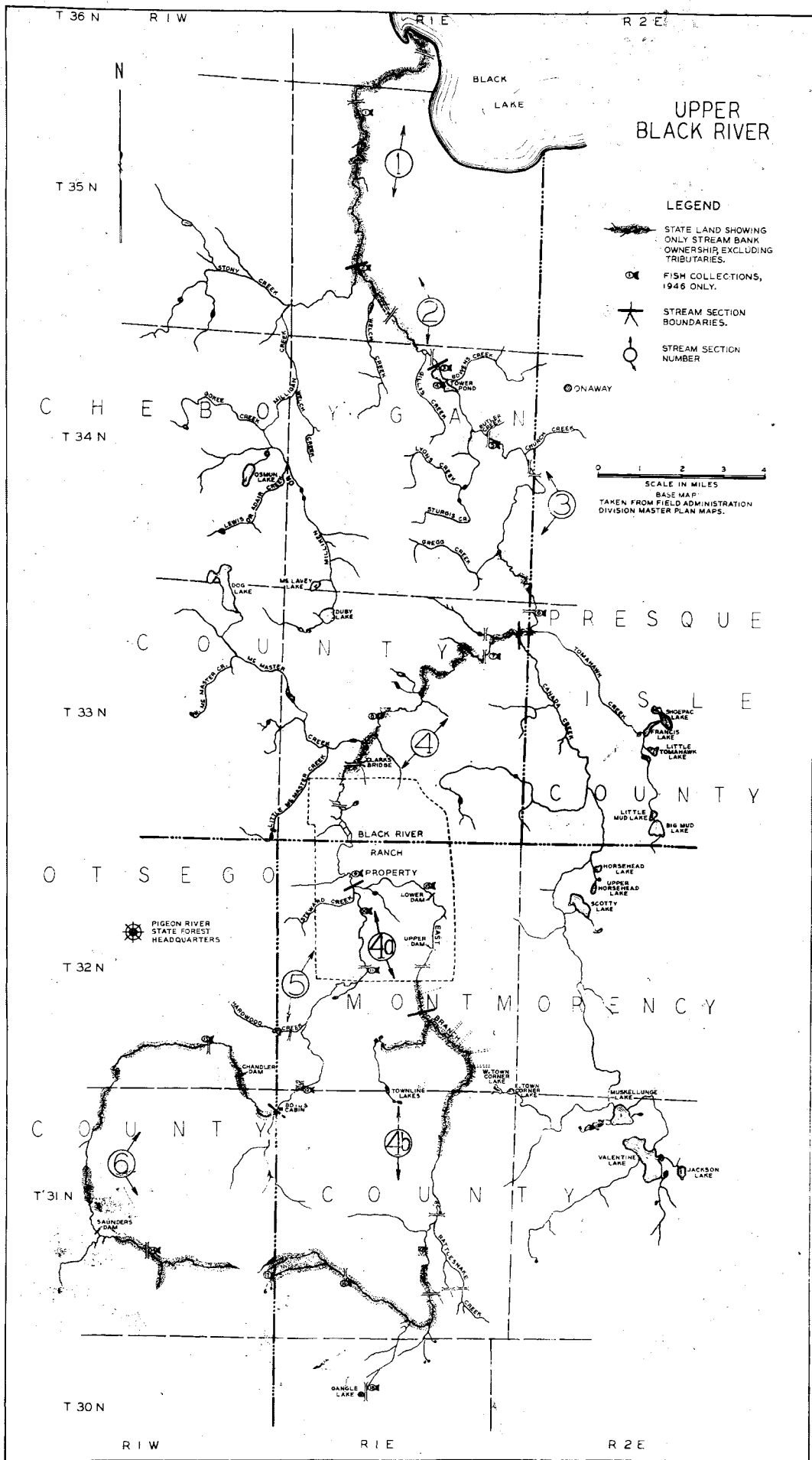
Table 5.--Legal size brook trout planted in the Upper Black River, January 1945 to August 1946.

1945									
Section	1	2	3	4	5	6	4a	4b	Total
Number	0	0	0	2500	2100	3000	2000	0	9600
Length	-	-	-	8-12"	8-1/2-10"	8-12"	8-10"	-	
January-August 1946									
Section	1	2	3	4	5	6	4a	4b	Total
Number	0	0	100	1400	1600	2100	2300	0	7500
Length	-	-	12-1/2"	8-12"	8-1/2-10"	8-12"	8-10"	-	
Total	0	0	100	3900	3700	5100	4300	0	17,100



Table 6.--Percentage of state-owned land adjacent to various sections of Upper Black River. Data were obtained by use of a planimeter from county maps of a scale of approximately 1 inch = 1 mile.

Section	Length in miles	State-owned Length in miles	Percent of state-owned
1	7.8	7.8	100
2	3.3	2.5	75
3	9.8	1.3	13
4	10.6	5.3	50
5	7.8	0.2	2
6	13.5	9.0	67
4a	11.4	4.8	42
4b	7.3	5.1	70
Totals	71.5	36.0	50



Map accompanying I.F.R. Report No. 1085