

Original: Fish Division
cc: Education-Game
Manistee National Forest 7-9-42
U. S. Forest Service, Escanaba 7-9-42
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DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

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June 26, 1942

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ANN ARBOR, MICHIGAN

REPORT NO. 799

REPORT ON THE RESULTS OF THE INTENSIVE TROUT STREAM CREEL
CENSUSES FOR THE 1940 TROUT SEASON (NORTH BRANCH AU SABLE,
WHITE RIVER, EAST BRANCH OF THE TAHQUAMENON,
AND FISHDAM RIVERS)

by

David S. Shetter

In addition to the intensive creel census conducted on the Hunt Creek experimental area by Departmental employees (see Report No. 644), intensive trout stream creel censuses were operated on parts of four other Michigan trout streams, using labor provided through state or U. S. Forest Service C.C.C. camps. These four streams were the North Branch of the Au Sable (Crawford County), White (Newaygo County), Fishdam (Delta County), and the East Branch of the Tahquamenon River (Chippewa County). The census on the latter two streams represents the first complete creel censuses on portions of Upper Peninsula trout streams to date. The location of the creel censuses, the number of men operating them, and the stream area covered by the respective projects will be found summarized in Table 1. Methods used in conducting the several censuses were essentially the same as those used in 1938 and 1939.

Angling Results

North Branch of the Au Sable River

During the 1940 trout season a total of 2,349 anglers fished the area under creel census, and 2,248 of these fishermen were contacted by census clerks (95.7 per cent of the total number fishing). The total number of hours spent in angling (by those anglers contacted) was 6,397.00. A total of 1,416 anglers caught no fish (63 per cent of those contacted). The recorded catch consisted of 1,731 legal brook trout, 350 legal brown trout, and 14 legal rainbow trout. Undersized trout caught and returned to the water were as follows: Brook trout--3,551; brown trout--133; rainbow trout--22. The catch per hour of legal trout was 0.33, made up of 0.27⁺ legal brook trout per hour and 0.05⁺ legal brown trout, and 0.00⁺ legal rainbow trout per hour of fishing.

The quality of the fishing, as measured by the catch per hour, was best in the two-week period July 6-19, when 0.52 legal trout were taken per hour of angling. For the first 10 weeks of the season, fishing was comparatively poor, as the catch per hour varied from 0.23 to 0.31 fish. From July 20th to August 30th, angling was not much better (0.27 to 0.39 legal fish per hour). There was a slight increase in the catch per hour during the Labor Day week-end when the catch per hour rose to 0.32 fish.

White River

The creel census area on the White River was fished by a total of 744 anglers, of which number 730 (98.1 per cent) were interviewed by the census clerks. Seventy-nine per cent (580 out of 730) of the anglers took no fish. The recorded anglers spent a total of 2,090.25 hours on the stream and made a total catch of 142 legal brook trout, 141 legal brown trout, and 163 legal rainbow trout. Undersized fish returned to the water

were listed as follows: Brook trout--34, brown trout--25, rainbow trout--18. The total catch per hour for the entire season was 0.22 fish, made up of 0.07 brook trout, 0.07 brown trout, and 0.08 rainbow trout taken per hour of fishing.

The best fishing on the White River was during the two-week period May 25-June 7, when the catch per hour of legal fish rose to 0.35. The most striking feature of the data from the White River creel census area was the fact that after the 5th of July, only one legal trout was captured. Although no temperature records are available for this section of the White River, water temperatures probably became too high for trout after July 5 and they sought cooler water elsewhere in the stream system. This is further borne out by the fact that only 24 undersized trout were taken after July 5. The comparative scarcity of undersized trout throughout the entire season also suggests that there is little or no natural reproduction in this particular part of the White River.

Fishdam River

On a short stretch of the Fishdam River in Delta County, a total of 299 anglers fished 589.50 hours and caught 471 legal trout (446 legal brook trout, 25 legal brown trout) for a total catch per hour of 0.80 trout. One hundred and twenty-seven fishermen (42 per cent) were unsuccessful. Undersized fish returned to the water were recorded as follows: Brook trout--190, brown trout--3.

Angling was comparatively poor during the first four weeks of the season on the Fishdam River (0.36, 0.24 fish per hour). During the period May 25-June 7, however, the catch per hour increased to 0.80 fish, and in the following two weeks (June 8-21) increased to 1.21 fish per hour. From June 22-July 5, there was a sharp slump to 0.56 fish per hour, but

from July 6 to August 16 the fishing was excellent, varying between 1.23 and 1.29 fish per hour. The percentage of successful anglers was also high, varying from 81 to 92 per cent. During the last two weeks of August (August 17-30) the quality of the fishing fell to 0.62 fish per hour, and during the last three days of the season no anglers fished in the census area.

East Branch of the Tahquamenon River

The total number of anglers using the censused area on this stream was 290, of which 259 were interviewed (89.3 per cent). The recorded anglers fished a total of 647.50 hours and caught 660 legal brook trout, and 361 sub-legal brook trout were reported as captured and returned to the water. The catch per hour of legal brook trout for the entire season was 1.02 fish. Recaptures from 250 tagged brook trout of legal size introduced on June 29, 1940, accounted for approximately 16 per cent of the total legal catch; 132, or 52.8 per cent, of the 250 tagged fish were retaken.

The East Branch of the Tahquamenon River had the best fishing (as determined by the catch per hour) of any of the five streams under intensive creel census during 1940. Fishing started out with a catch per hour of 0.58 fish for the first two-week period of the season and steadily increased to 0.97 fish per hour until the period June 8-21, when it slumped slightly to 0.88 fish per hour. From June 22 to August 16, the catch per hour varied from 1.05 to 1.82 fish per hour; the best fishing was during the period July 6-19, when 1.82 legal brook trout were captured per hour of angling. From August 17 to 30, the quality of the fishing slumped to 0.67 fish per hour of effort. No fishermen used the stream during the Labor Day week-end.

Average Size of Trout Taken by Anglers

North Branch of the Au Sable River

All three species of trout were taken by anglers on the North Branch, although the number of rainbow trout is now an insignificant portion of the catch in the stream area above the town of Lovells. The average total length of the brook trout taken in the various two-week periods ranged from 190 mm. ($7\frac{1}{2}$ inches) during July 20-August 2 to 206 mm. ($8\frac{1}{8}$ inches) during May 25-June 7. The average weight of the brook trout varied from 2.7 ounces to 3.6 ounces. The largest brook trout recorded was 482 mm. (19.0 inches) and 1,219 grams (2 pounds 10 ounces). For the entire season, the average brook trout caught was $8\frac{7}{8}$ inches long and weighed 3.2 ounces.

About one-fifth as many brown trout as brook trout were taken by the anglers. The average total length of the brown trout varied from 318 mm. ($12\frac{1}{2}$ inches) during the period August 31-September 2, to 224 mm. ($8\frac{3}{4}$ inches) during the period August 3-16. The average weight varied from 5.6 ounces to 13.1 ounces. The largest brown trout recorded was 584 mm. (23.0 inches) and weighed 2,155 grams ($4\frac{3}{4}$ pounds). The average size of all brown trout taken was 282 mm. ($11\frac{1}{8}$ inches) and weighed 10.1 ounces.

The average size of the $1\frac{1}{4}$ rainbow trout captured was 232 mm. ($9\frac{1}{3}$ inches) and 6.2 ounces. The largest rainbow trout taken was $1\frac{1}{4}$ inches (355 mm.) and it weighed one pound, three ounces.

From 75 to 100 per cent of all fish recorded were weighed and measured. For a detailed analysis of the measurements by two-week periods, the reader is referred to Table 6.

White River

The total catch on the White River was more or less evenly divided between the three species of trout, with the rainbow trout having a slight edge over brook and brown trout (see Table 7). The average total length of the brook trout recorded varied between 300 mm. (11 7/8 inches) during the period August 3-16, and 198 mm. (8 3/4 inches) during the period June 8-21. The average weight of the brook trout creel ranged from 3.6 to 11.0 ounces. The average total length and weight of brook trout over the entire season was 8 1/4 inches and 4.3 ounces. The largest brook trout recorded from the White River census area was 11 7/8 inches total length and weighed 11.0 ounces.

The average total length of the brown trout in the White River catch varied from 229 mm. (9.0 inches) during the period May 25-June 7, to 261 mm. (10 1/4 inches) during the period June 22-July 5. The average weight varied from 5.6 to 7.2 ounces. The average size for all brown trout taken during the season was 240 mm. (9 1/2 inches) and 6.1 ounces. The largest brown trout recorded were 395 mm. (15 1/2 inches) and weighed 765 grams (1 pound 10.9 ounces), and 470 mm. (18 1/2 inches), weighing 609 grams (1 pound, 5.5 ounces).

Rainbow trout from the White River varied in total length from an average of 232 mm. (9 1/8 inches) during the period April 27-May 10, to 251 mm. (9 7/8 inches) during the period June 8-21. The average weight was also least and greatest for the same time periods--4.6 ounces and 7.4 ounces. The average size of all rainbow trout taken was 241 mm. (9 1/2 inches) and 5.8 ounces. The largest rainbow trout recorded from the White River census area were 330 mm. (13.0 inches) and 340 grams (11.9 ounces), and 310 mm. (12 1/4 inches) and 397 grams (13.9 ounces).

Fishdam River

The only species of trout taken from this stream were brook and brown trout, and the 25 brown trout captured were only a minor percentage of the total catch (see Table 8). The average total length of the brook trout ranged from 221 mm. ($8 \frac{3}{4}$ inches) to 244 mm. ($9 \frac{5}{8}$ inches). The average weight varied from 4.7 ounces to 8.7 ounces. The average size of brook trout for the entire season was 231 mm. ($9 \frac{1}{8}$ inches) and 6.7 ounces. The largest brook trout reported from the creel census area of the Fishdam River was 375 mm. ($14 \frac{3}{4}$ inches) and weighed 510 grams (1 pound 2 ounces).

The average size of the brown trout varied from 230 mm. total length ($9.0+$ inches) and 5 ounces (one specimen during the first two weeks of the season) to 328 mm. ($13.0-$ inches) and 18.5 ounces (average of 2 specimens caught during the period July 20-August 2). For the entire season, brown trout from the Fishdam River creel census area averaged 279 mm. (11.0 inches) in length and 10.5 ounces in weight. The largest fish taken was a specimen measuring 330 mm. (13 inches) and weighing 539 grams (1 pound, 3 ounces).

All of the brown trout, and 97 per cent of the brook trout caught were weighed and measured.

East Branch of the Tahquamenon River

Brook trout was the only species of game fish recorded in the creel census on this stream. They varied in average total length from 210 mm. ($8 \frac{1}{4}$ inches) during July 20-August 16, to 226 mm. ($8 \frac{7}{8}$ inches) during the period May 25-June 7. The average weight ranged from 3.6 to 6.3 ounces. For the entire season, the average trout taken measured 216 mm. ($8 \frac{3}{8}$ inches) and weighed 4.0 ounces. The biggest brook trout taken measured 359 mm. ($14 \frac{1}{8}$ inches) and weighed one pound (see Table 9).

Fishing Pressures, Yields of Legal Trout and Pounds

of Legal Trout Per Acre (See Table 10)

In Table 10 will be found the areas (in acres), hours of fishing, and the total numbers and weights of the species of trout taken in the five stream areas under intensive creel census during 1940. The hours of angling and the total catch have been corrected to include the theoretical catches of fishermen not contacted by assigning average hours of fishing and average catches for the two-week periods in which they fished. Also where all fish were not weighed, average weights for that two-week period were used to obtain the total weight of trout removed from the stream. For the first time we are able to present accurate yield figures in terms of pounds of fish taken per acre of stream censused, since over 81 per cent (2,978 of 3,672) of the fish recorded were weighed during 1940. Of the 3,672 fish caught, 3,538, or 96.3 per cent, were measured. These figures do not include the estimated catches of the anglers not contacted.

On the North Branch of the Au Sable River, 54.5 acres of stream were under census, and 6,677.50 hours of fishing were expended. The angling "pressure" (man-hours of angling per acre for the season) was 122.5, which was higher than recorded in 1939, when it was 108. The anglers' total estimated take of legal fish was as follows: 1,759 brook trout weighing 347 pounds, 355 brown trout weighing 221.9 pounds, and 14 rainbow trout weighing 5.4 pounds. The total catch was 2,128 trout weighing 574.3 pounds. From these results the yield per acre of legal trout may be calculated as follows: 32.2 brook trout weighing 6.4 pounds, 6.5 brown trout weighing 4.1 pounds and 0.3 rainbow trout weighing 0.1 pounds. The total yield per acre of legal trout was 39 fish weighing 10.6 pounds. Only partially complete data on the weight of the 1939 catch is now available, but estimates

from weight-length curves, built from those specimens measured and weighed are now in the process of completion. However, the number of legal fish taken per acre by the 1939 anglers on the North Branch of the Au Sable was higher--37.3 brook trout, 7.1 brown trout, and 0.3 rainbow trout--totaling 44.7 legal trout per acre of water under census, as compared with 39 fish during the 1940 trout season.

White River

Although 1940 was the third year of operation of creel census on this stream, it was the first year in the present locality. The change in locality was made to eliminate the cost of transportation involved in operating the census on the former area north of White Cloud. As a comparison with creel census results of former years on the White River will reveal, the new locality, which is many miles downstream, is marginal trout water. Calculation of angling pressure also demonstrates that this 17.5 acre area was not fished as heavily, since the pressure was only 121.8 man-hours per acre for 1940 as compared with an average of 312 man-hours per acre per season for the portion censused 1938 and 1939. Legal fish removed by anglers were as follows: 143 brook trout weighing 37.6 pounds, 111 brown trout weighing 53.0 pounds, and 164 rainbow trout weighing 57.9 pounds. The total legal catch consisted, therefore, of 448 fish weighing 148.5 pounds. From these figures the per acre yield to the angling public may be estimated as follows: 8.2 brook trout weighing 2.2 pounds, 8.0 brown trout weighing 3.0 pounds, and 9.4 rainbow trout weighing 3.3 pounds. The total yield per acre consisted of 25.6 trout weighing 8.5 pounds. The headwater section of the White River during the 1938 and 1939 censuses yielded 183 and 174 legal trout (almost entirely brook trout) per acre under much heavier fishing pressures.

Fishdam River

A short piece of the Fishdam River (0.9 mile) with a water area of 3.0 acres was fished to the extent of 589.00 hours during 1940, which was at the rate of 196.5 man-hours per acre per season, the heaviest angling pressure recorded for any of the censused waters for the 1940 season. The total catch of legal trout was 471 which weighed 204.9 pounds, made up of 446 legal brook trout weighing 188.4 pounds, and 25 legal brown trout weighing 16.5 pounds. The yield per acre to the angler, calculated from the above figures, was 148.7 legal brook trout weighing 62.8 pounds, and 8.3 legal brown trout weighing 5.5 pounds. The total yield per acre was, therefore, 157 trout weighing 68.3 pounds, which was also the highest yield for any of the censused areas during 1940.

East Branch of the Tahquamenon River

Six and three-tenths acres of the East Branch of the Tahquamenon River were fished to the extent of 725.00 hours, or at any angling pressure of 115 man-hours per acre for the 1940 season. The total catch consisted of 689 legal brook trout weighing 172.7 pounds. The calculated per acre yield to the fisherman was 109.4 legal trout weighing 27.4 pounds.

Hunt Creek

Although the creel census conducted on the Hunt Creek experimental area has been reported on (Report No. 644), the yield per acre and pressure per acre data are included here for comparison with the other stream areas under intensive creel census. In the 1940 trout season, some 901.25 hours of fishing were expended over 4.7 acres of stream, an angling pressure of 188.9 man-hours per acre for the season. The total catch was 406 legal brook trout weighing 60.4 pounds. The yield per acre to the angler was 84 legal brook trout weighing 12.8 pounds.

On the basis of the yield per acre determined for the several stream areas intensively censused during the 1940 trout season, the Fishdam River appears to be the most productive, followed by the East Branch of the Tahquamenon, Hunt Creek, the North Branch of the Au Sable, and the White River, in the order mentioned. The angling pressure was also heaviest on the Fishdam River, followed by Hunt Creek, the North Branch of the Au Sable River, the White River, and the East Branch of the Tahquamenon River. From the author's limited angling experience in the Upper Peninsula, such angling intensity seems to be much higher than would normally be expected in that part of Michigan. The pressure recorded for the East Branch of the Tahquamenon River (115 man-hours per acre per season) appears to be more normal for the majority of Upper Peninsula trout waters. The comparatively high angling pressure on the Fishdam River may have been indirectly related to its geographical position with respect to the Cities of Manistique and Escanaba.

Numbers and Percentages of Anglers Taking Various

Numbers of Fish (See Table 11)

Table 11 lists the numbers and percentages of fishermen-days reporting various numbers of trout captured on the intensively censused stream areas of the five streams covered during the 1940 trout season. It is of interest to note that the percentage of unsuccessful anglers (taking no fish) is considerably higher on the Lower Peninsula trout streams (from 64 to 79 per cent) than on Upper Peninsula trout waters (41, 42 per cent), and possibly this reflects the accessibility of the respective waters to novice anglers and tourists. The percentage of unsuccessful anglers on the respective census areas was as follows: North Branch of the Au Sable, 64; White River, 79; Fishdam River, 42; East Branch of Tahquamenon, 41; Hunt Creek, 66.

On only two of the five areas under census were limit catches reported--the North Branch of the Au Sable and East Branch of the Tahquamenon, where five anglers on each stream filled their creel limits.

For all streams combined, representing a total of 3,991 angling days, 64 per cent of the anglers were unsuccessful, 15 per cent took one trout, 8 per cent caught 2 trout, 5 per cent captured 3 trout, 3 per cent caught 4 trout, and 2 per cent creeled 5 fish. The remaining three per cent of the anglers captured from 6 to 15 fish, but there were less than one per cent in each category who did so.

Comparisons between the 1938 and 1939 percentages with those obtained in 1940 is of doubtful validity, since three of the stream sections for 1940 appear in the records for the first time. The inclusion of the 1940 records from the White River makes the data appear to show that over 75 per cent of the anglers seeking trout come home empty-handed. Such may be the true situation on "early season" streams such as the White River, but this does represent conditions on our average trout stream. The percentage of unsuccessful anglers in 1938 and 1939 on the White River (in a section near the headwaters) was 42 and 41 respectively.

Numbers of Marked Trout in the Anglers' Catch

Marked trout were present, either through 1939 releases (or earlier) or 1940 plantings in only the North Branch of the Au Sable and the East Branch of the Tahquamenon Rivers. No marked trout were planted in the North Branch of the Au Sable River during 1940, but two tagged brook trout were recovered from the March, 1939, release of 1,000 tagged, legal-sized brook trout. One of these fish had grown approximately 1 3/4 inches in 13 months, while the other had grown approximately 4 inches in 15 months.

One fish (caught in July) was captured where it was planted, the other (caught in April) was taken about 3 miles below the locality of release. These facts are in accordance with the known movements of the brook trout in the North Branch of the Au Sable as previously described by the author (1937).

Two other marked brook trout were recorded from the North Branch during the 1940 season. These were legal fish which had had their right pectoral and adipose fins removed. This fin combination was used to mark 1,500 wild brook trout fingerlings seined up during October, 1938. At the same time, 1,500 hatchery-reared fingerling brook trout were introduced into the same area of the North Branch of the Au Sable. During 1939, a total of 4 right pectoral- (wild), and 5 left pectoral-marked (hatchery) fish were reported as legal trout. The total to date is thus 6 wild fish surviving to legal size and 5 hatchery fish surviving to legal size, a survival of 0.4 of one per cent and 0.3 of one per cent respectively.

On the censused portion of the East Branch of the Tahquamenon River, a planting of 250 legal-sized brook trout was made on June 29, 1940. All fish were measured and jaw-tagged before release. The average total length of these fish was 214 mm. ($8\frac{1}{2}$ inches) and they ranged in size from 7 $\frac{1}{4}$ to 10 inches. A sample of 25 fish averaged 4.1 ounces per fish in weight. The total weight of fish planted may therefore be estimated at 64.1 pounds.

During the remainder of the trout season (June 30-September 2), a total of 132 tagged brook trout were removed by the anglers which weighed approximately 30 pounds (127 fish which were weighed totaled 28.7 pounds). In other words, 132 tagged hatchery fish made up 20 per cent of the total catch, and 17 per cent of the total weight of fish removed by the anglers, and constituted a recovery percentage of 52.8 of the total number of fish released.

Measurements of total length appear to have been made carelessly by the creel census clerks on the tagged fish (and probably on the unmarked fish, too), as phenomenal shrinkages and increases over short periods of time appear on comparing lengths of fishes at tagging and at recovery. For this reason, no attempt has been made to analyze growth in length of the tagged fish.

However, weight measurements on 14 of the 25 fish which were weighed before release are available both at tagging and at recovery (15 were recovered, one was not weighed). These fish were free an average period of 22 days (range 10-43 days). The average total length at release of these 14 fish was 219 mm. (8 5/8 inches) and the average weight was 124 grams (4.4 ounces). The average size of these same fish on recovery by anglers was 223 mm. (8 3/4 inches) and 111 grams (3.9 ounces) in weight. Although the hatchery fish (on the basis of this small sample) appear to have increased slightly in length, they have lost approximately 10 per cent of their original weight after release in the stream (Table 12). A similar instance among marked brook trout released in East Fish Lake has previously been discussed (see Report No. 644).

Such a weight loss might have been expected among the brook trout planted in East Fish Lake, since it was known that the bottom food supply was relatively low, and that the lake had the general characteristics of a lake of comparatively low food production, and the fish were planted in late April when there was little or no insect life appearing on the lake surface. On the other hand, the tagged brook trout introduced into the East Branch of the Tahquamenon River were planted in late June when bottom-inhabiting insects and aerial forms were theoretically in considerable abundance, and such forms should have furnished considerable food to all the trout present.

Such results make it quite obvious that we have much to learn concerning the effect of transplanting fish from the hatchery to natural waters. Undoubtedly there is considerable physiological shock induced by the change in the diet from one of meat and meals to that of insects, fish, and other stream-food forms. Any surplus fat stored up before the fish is planted is undoubtedly used up in fighting the current (which will be much stronger in natural waters) and in foraging about for food items, which the trout did not have to do in its life at the hatchery. Whether or not the hatchery trout ever reach their original coefficient of condition remains to be learned.

The rate of removal of the tagged fish was as follows: by two weeks after planting, 54.5 per cent of marked fish taken were removed; at the end of four weeks after release, 79.5 per cent of the total recovery had been effected. This rate of removal of stocked brook trout was slightly slower, possibly because of a more moderate angling pressure, than previously noted to occur by Shetter and Hazzard (1940), who had found that, on the average, 92 per cent of the total recovery of stocked brook trout was removed within four weeks after planting.

The 250 tagged brook trout were available to 126 anglers after their release, and 36 of these sportsmen captured marked trout, or 28 per cent of the total anglers who had an opportunity to take marked fish. The highest percentage of anglers capturing marked fish which has been previously recorded was 20.6 per cent from the Pine River creel census of 1938. Comparatively low angling pressure on the East Branch of the Tahquamenon River also may account for the differences in these percentages. Anglers capturing tagged brook trout took an average of 3.7 marked fish, the numbers ranging from 1 to 13 each. The distribution of marked fish among

the 36 anglers was as follows: 12 anglers took one fish; 4 anglers took 2 fish; 5 anglers took 3 fish; 4 anglers took 4 fish; 3 anglers took 5, 7 and 8 fish each; and one angler took 9, and 13 fish.

Residence of the Anglers Using Areas of Censused Streams

(See Tables 13, 14)

North Branch of the Au Sable River

On this stream, 14 per cent (428 of 2,248) of the anglers recorded were non-residents, and the bulk of these came from Ohio (369). Other states which were represented were: Illinois (28), Indiana (21), Florida (3), Pennsylvania (2), and Iowa, Kentucky, Louisiana, West Virginia and Wisconsin represented by one angler from each state.

Among the resident anglers, Wayne County led (as usual) with 727 fishermen, or approximately 40 per cent of the total resident fishermen. Genesee and Crawford Counties followed with 210 and 153 fishermen. Fishermen from 44 of the 67 counties of the Lower Peninsula were represented, and one fisherman gave Schoolcraft County as his residence.

White River

On the White River, approximately 5 per cent (35 of 730) of the anglers were non-residents who gave Illinois (21), Indiana (11), and Ohio (3) as residences.

Michigan anglers using the White River were led by residents of Newaygo and Muskegon Counties, who furnished 230 and 222 fishermen respectively, followed by Kent County with 115. These three counties supplied more than 75 per cent of the resident anglers. The remainder were distributed among counties in the west and southwest region of the state.

Fishdam River

A total of 11 non-resident fishermen came to the Fishdam River during 1940, or 3.6 per cent of the total recorded in the census. Wisconsin led

with 4 anglers, followed by Minnesota with 2 sportsmen. Represented by one each were California, Colorado, Illinois, North Dakota, and Ohio.

Resident anglers seeking sport on the Fishdam were led by Schoolcraft County residents (181), followed by Delta County fishermen (38), and Kent County anglers (11).

East Branch of the Tahquamenon River

Approximately the same percentage of non-resident fishermen visited this stream as were recorded at the Fishdam River--3.4 per cent (8 of 259). The out-of-state fishermen came from Pennsylvania (4), Wisconsin (2), and Illinois and Indiana (1 each).

Resident anglers from Michigan counties were led by those giving Chippewa County as their residence (143), followed by Wayne (17), and Luce Counties (15).

Although more Upper Peninsula anglers than Lower Peninsula anglers were recorded on Upper Peninsula streams, on both the East Branch of the Tahquamenon and on the Fishdam River more counties of the Lower Peninsula were represented than were counties located in the Upper Peninsula. The angler who lives north of the Straits of Mackinac and who seeks his trout fishing in the Lower Peninsula is comparatively rare, as has been demonstrated by these and previous creel censuses.

INSTITUTE FOR FISHERIES RESEARCH

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Table 1

Location, size of crew and amount of stream
under intensive creel census,
1940 trout season.

Stream	Census operated by	Number of clerks on duty daily	Stream mileage under census	Water acreage under census	Location			
					County	T.	R.	Sec.
North Branch Au Sable	Camp Au Sable (State)	12	4.6	54.5	Crawford	28 N.	1, 2 W.	19, 1, 12, 13, 24
White River	Camp White River (U.S.F.S.)	4	2.1	17.5	Newaygo	14 N.	13 W.	30, 31
Fishdam River	Camp Cooks (U.S.F.S.)	2	0.9	3.0	Delta	42 N.	18 W.	16, 17, 21
East Branch Tahquamenon	Camp Strongs (U.S.F.S.)	4	2.3	6.3	Chippewa	45, 46	5 W.	32, 5

Table 2

Intensive Creel Census Data, N. Branch Au Sable River,
Crawford County, 1940 Trout Season

Two-week period	Number of anglers			Taking no fish		Total hours fished	Number of legal trout caught				Catch per hour of legal trout				Number of undersized fish returned			Av. number of		Anglers not contacted
	Male	Female	Total	No.	Per cent		Brook	Brown	Rainbow	Total	Brook	Brown	Rainbow	Total	Brook	Brown	Rainbow	Legal fish taken per angler	Hrs. fished per angler	
Apr. 27-May 10	206	14	220	140	64	651.25	155	18	5	178	0.24	0.03	0.01	0.28	23	...	2	0.81	2.96	3
May 11-24	245	31	276	180	65	758.75	156	35	4	195	0.21	0.05	0.01	0.27	245	6	18	0.71	2.75	11
May 25-June 7	241	29	270	181	67	839.50	184	35	1	220	0.22	0.04	Tr.	0.26	350	4	...	0.81	3.11	10
June 8-21	234	39	273	183	67	833.00	140	52	...	192	0.17	0.06	...	0.23	614	11	...	0.71	3.05	16
June 22-July 5	251	37	288	194	67	788.50	200	43	...	243	0.25	0.05	...	0.30	637	7	...	0.84	2.74	13
July 6-19	199	17	216	120	56	627.00	253	72	...	325	0.41	0.11	...	0.52	448	39	...	1.50	2.90	10
July 20-August 2	174	13	187	115	61	537.25	155	24	1	180	0.29+	0.04+	Tr.	0.34	293	7	...	0.96	2.87	13
August 3-16	187	23	210	128	61	530.00	189	18	...	207	0.36	0.03	...	0.39	328	15	...	0.99	2.52	13
August 17-30	169	21	190	134	71	462.50	115	9	3	127	0.25	0.02	0.01	0.28	249	10	...	0.67	2.43	12
Aug. 31-Sept. 2	64	4	68	35	51	166.25	59	10	...	69	0.36	0.06	...	0.42	142	10	...	1.01	2.44	...
↓ McCann's records	50	...	50	6	12	203.00	125	34	...	159	0.62	0.17	...	0.78	222	24	...	3.18	4.07	...
Totals and Averages	2,020	228	2,248	1,410	63	6,397.00	1,731	350	14	2,095	0.27+	0.05+	0.00+	0.33	3,551	133	20	0.93	2.85	101

↓ Added to tabular material after originally compiled. Mr. Howard McCann's records were from personal creel census kept by him and known to be from waters covered by creel census clerks but not reported to them.--D.S.S.

Table 3

Intensive Creel Census Data,
White River, Newaygo County
1940 Trout Season

Date by two-week periods	Number of fishermen			Taking no fish		Total no. of hours fished	Legal-sized fish			Illegal fish			Catch per hour of legal trout			Total catch per hour	Catch per fisherman- day	Av. no. of hours per fisherman-day	No. of fishermen not contacted
	Male	Female	Total	No.	Per cent		Brook	Brown	Rainbow	Brook	Brown	Rainbow	Brook	Brown	Rainbow				
Apr. 27-May 10	146	11	157	129	82	463.75	9	19	59	1	2	...	0.02	0.04	0.13	0.19	0.55	3.0	...
May 11-24	125	9	134	89	66	441.25	8	64	57	5	3	5	0.02	0.15	0.13	0.30	0.96	3.3	...
May 25-June 7	162	19	181	125	69	524.00	113	41	26	15	4	2	0.22	0.08	0.05	0.35	0.99	2.9	5
June 8-21	85	5	90	76	84	282.75	10	12	16	5	4	1	0.04	0.04	0.06	0.14	0.42	3.1	7
June 22-July 5	41	8	49	43	88	125.50	1	5	5	1	1	4	0.01	0.04	0.04	0.09	0.22	2.6	2
July 6-19	32	2	34	34	100	71.25	...	...	...	7	10	5	...	...	...	...	...	2.1	...
July 20-Aug. 2	33	3	36	36	100	73.50	...	...	...	...	...	1	...	...	...	...	...	2.0	...
Aug. 3-16	23	5	28	27	96	54.00	1	...	...	...	1	...	0.02	...	...	0.02	0.04	1.9	...
Aug. 17-30	9	1	10	10	100	21.50	...	...	...	...	...	...	...	...	...	...	...	2.2	...
Aug. 31-Sept. 2	9	2	11	11	100	32.75	...	...	...	...	...	...	...	...	...	...	...	3.0	...
Totals and Averages	665	65	730	580	79	2,090.25	142	141	163	34	25	18	0.07	0.07	0.08	0.22	0.61	2.9	14

Table 4

Intensive Creel Census Data,
Fishdam River, Delta County,
1940 Trout Season

Date by two-week periods	Number of fishermen ¹			Taking no fish		Total no. of hours fished	No. of legal-sized fish caught		Catch per hour of legal trout			Av. no. of fish per fisherman-day	Av. no. of hours per fisherman-day
	Male	Female	Total	No.	Per cent		Brook	Brown	Brook	Brown	Total catch per hour		
Apr. 27-May 10	63	4	67	41	61	94.50	33	1	0.35	0.01	0.36	0.51	1.41
May 11-24	44	1	45	30	67	77.75	19	...	0.24	...	0.24	0.42	1.73
May 25-June 7	28	1	29	11	38	58.50	47	...	0.80	...	0.80	1.62	2.02
June 8-21	37	...	37	17	46	74.50	85	5	1.14	0.07	1.21	2.43	2.01
June 22-July 5	23	1	24	10	42	50.25	25	3	0.50	0.06	0.56	1.17	2.09
July 6-19	26	...	26	5	19	57.00	71	2	1.25	0.04	1.29	2.81	2.19
July 20-Aug. 2	28	...	28	4	14	62.50	73	3	1.17	0.05	1.22	2.71	2.23
Aug. 3-16	25	...	25	2	8	53.75	57	9	1.06	0.17	1.23	2.64	2.15
Aug. 17-30	17	1	18	7	39	60.75	36	2	0.59	0.03	0.62	2.11	3.38
Aug. 31-Sept. 2	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals and Averages	291	8	299	127	42	589.50	446	25	0.76	0.04	0.80	1.58	1.97

¹All anglers reported as contacted.

Table 5

Intensive Creel Census Data
E. Branch Tahquamenon River, Chippewa County
1940 Trout Season

Two-week period	Number of anglers			Taking no fish		Total hours fished	Total legal brook trout caught	Catch per hour	Total undersized fish returned	Catch per hour	Av. no. of		No. of anglers not contacted
	Male	Female	Total	No.	Per cent						Fish per angler	Hrs. fished per angler	
Apr. 27-May 10	40	4	44	16	36	112.75	65	0.58	26	0.23	1.48	2.56	9
May 11-24	37	4	41	23	56	112.75	94	0.83	26	0.23	2.29	2.75	11
May 25-June 7	26	2	28	10	36	69.25	67	0.97	23	0.33	2.39	2.47	6
June 8-21	16	...	16	7	44	34.00	30	0.88	24	0.70	1.88	2.13	3
June 22-July 5	22	...	22	9	41	43.75	√ 46	0.09 1.05	33	0.75	2.09	1.99	2
July 6-19	35	2	37	10	27	81.50	68 148	0.83 1.82	120	1.47	4.00	2.20	...
July 20-Aug. 2	20	2	22	5	23	60.25	33 94	0.55 1.56	40	0.66	4.27	2.74	...
Aug. 3-16	20	...	20	11	55	57.25	21 65	0.37 1.14	23	0.40	3.25	2.86	...
Aug. 17-30	24	5	29	15	52	76.00	6 51	0.09 0.67	46	0.60	1.76	2.62	...
Aug. 31-Sept. 2	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals and Averages	240	19	259	106	41	647.50	132 660	0.20 1.02	361	0.56	2.55	2.50	31

√--Indicates number of tagged trout caught, or catch per hour of tagged trout.

The tagged brook trout were planted June 29, 1940.

Table 6

Average size of trout taken by anglers from the
 creel census area on the North Branch of the
 Au Sable River, Crawford County,
 1940 trout season.
 (Measurements by C.C.C. enrollees)

Time period	Brook trout			Brown trout			Rainbow trout		
	Number caught	Av. total length(mm.)	Average weight(oz.)	Number caught	Av. total length(mm.)	Average weight(oz.)	Number caught	Av. total length(mm.)	Average weight(oz.)
Apr. 27-May 10	155	202	3.3	18	293	11.0	5	222	7.6
May 11-24	156	205	3.6	35	272	10.6	4	252	4.4
May 25-June 7	184	206	3.3	35	316	12.1	1	179	2.0
June 8-21	140	204	3.4	52	287	11.7	...	...	...
June 22-July 5	200	197	3.2	43	308	11.7	...	...	...
July 6-19	253	198	2.9	72	276	7.1	...	...	...
July 20-Aug. 2	155	190	2.9	24	246	8.9	1	355	19.0
Aug. 3-16	189	192	2.8	18	224	5.6	...	...	...
Aug. 17-30	115	196	3.4	9	226	5.7	3	199	3.0
Aug. 31-Sept. 2	59	195	2.7	10	318	18.1	...	...	...
Misc. records	125	198	...	34	248	...	...	...	...
Totals or Averages	1,731	199	3.2	350	282	10.1	14	232	6.2
Number measured or weighed	...	1,659	1,312	...	337	256	...	14	12

Table 7

Average size of trout taken by anglers from the creel
 census area on the White River, Newaygo County,
 1940 trout season.
 (Measurements taken by C.C.C. enrollees).

Time period	Brook trout			Brown trout			Rainbow trout		
	Number caught	Av. total length(mm.)	Average weight(oz.)	Number caught	Av. total length(mm.)	Average weight(oz.)	Number caught	Av. total length(mm.)	Average weight(oz.)
Apr. 27-May 10	9	243	6.0	19	260	7.2	59	232	4.6
May 11-24	8	213	3.7	64	241	5.6	57	245	5.7
May 25-June 7	113	203	4.1	41	229	6.1	26	242	6.7
June 8-21	10	198	3.6	12	237	5.9	16	251	7.4
June 22-July 5	1	210	4.0	5	261	6.4	5	243	6.3
July 6-19	...	...	...	...	...	...	...	...	...
July 20-Aug. 2	...	...	...	...	...	...	...	...	...
Aug. 3-16	1	300	11.0	...	...	...	...	...	...
Aug. 17-30	...	...	...	...	...	...	...	...	...
Aug. 31-Sept. 2	...	...	...	...	...	...	...	...	...
Totals or Averages	142	208	4.3	141	240	6.1	163	241	5.8
Number measured or weighed	...	113	85	...	140	100	...	162	109

Table 8

Average size of trout taken by anglers from the creel
 census area on the Fishdam River, Delta County,
 1940 trout season.
 (Measurements by C.C.C. enrollees).

Time period	Brook trout			Brown trout		
	Number caught	Av. total length(mm.)	Average weight(oz.)	Number caught	Av. total length(mm.)	Average weight(oz.)
Apr. 27-May 10	33	235	6.3	1	230	5.0
May 11-24	19	223	4.7	...	...	...
May 25-June 7	47	230	6.2	...	...	...
June 8-21	85	221	5.5	5	247	6.6
June 22-July 5	25	231	8.5	3	261	7.7
July 6-19	71	238	8.7	2	322	18.5
July 20-Aug. 2	73	226	7.6	3	328	17.7
Aug. 3-16	57	238	6.4	9	288	10.7
Aug. 17-30	36	244	5.7	2	255	7.5
Aug. 31-Sept. 2	...	...	...	...	...	...
Totals or Averages	446	231	6.7	25	279	10.5
Number measured or weighed	...	439	435	...	25	25

Table 9

Average size of brook trout taken
by anglers from the creel census
area on the East Branch of the
Tahquamenon River, Chippewa County,
1940 trout season.
(Measurements by C.C.C. enrollees)

Time period	Brook trout		
	Number caught	Av. total length(mm.)	Average weight(oz.)
Apr. 27-May 10	65	215	3.9
May 11-24	94	220	3.9
May 25-June 7	67	226	4.3
June 8-21	30	219	6.3
June 22-July 5	46	213	3.7
July 6-19	148	215	4.1
July 20-Aug. 2	94	210	3.6
Aug. 3-16	65	210	3.7
Aug. 17-30	51	214	3.8
Aug. 31-Sept. 2	...	...	...
Totals or Averages	660	216	4.0
Number measured or weighed	...	649	644

Table 10

Comparison of angling pressures and yield of trout per acre
of stream on the trout streams under intensive census
during the 1940 trout season.
(Pounds of trout are given in parentheses).

River censused	Area censused (acres)	Total hours of fishing ¹ / _↓	Pressure per acre ² / _↘	Numbers and pounds of trout removed ¹ / _↓				Numbers and pounds of trout removed per acre ¹ / _↓				Pounds of fish caught per hour
				Brook	Brown	Rainbow	Total	Brook	Brown	Rainbow	Total	
North Branch Au Sable	54.5	6,677.50	122.5	1,759 (347.0)	355 (221.9)	14 (5.4)	2,128 (574.3)	32.2 (6.4)	6.5 (4.1)	0.3 (0.1)	39.0 (10.6)	0.09
White River	17.5	2,131.75	121.8	143 (37.6)	141 (53.0)	164 (57.9)	448 (148.5)	8.2 (2.2)	8.0 (3.0)	9.4 (3.3)	25.6 (8.5)	0.07
Fishdam River	3.0	589.50	196.5	446 (188.4)	25 (16.5)	...	471 (204.9)	148.7 (62.8)	8.3 (5.5)	...	157.0 (68.3)	0.35
East Branch Tahquamenon	6.3	725.00	115.0	689 (172.7)	...	...	689 (172.7)	109.4 (27.4)	...	...	109.4 (27.4)	0.24
Hunt Creek	4.7	901.25	188.9	406 (60.4)	...	...	406 (60.4)	84.0 (12.8)	...	...	84.0 (12.8)	0.07

¹/_↓ These figures are corrected to include anglers not contacted by
using average figures obtained from those anglers contacted (see text).

²/_↘ Pressure per acre figures are man-hours of angling per acre for the entire season.

Table 11

Number and percentage of anglers taking various numbers
of trout from streams censused in 1940, with
comparative data for 1938 and 1939.

Streams censused	Numbers and percentages (in parentheses) of anglers taking numbers of fish															Total anglers	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14		15
North Branch Au Sable	1,410 (64)	362 (16)	178 (8)	101 (5.2)	50 (2.4)	38 (1.8)	12 (0.5)	8 (0.4)	12 (0.5)	6 (0.3)	8 (0.4)	4 (0.2)	3 (0.1)	...	1 (tr.)	5 (0.2)	2,198
White River	580 (79)	54 (7)	36 (5)	14 (2)	17 (2.1)	8 (1.2)	7 (1.0)	4 (0.8)	3 (0.5)	2 (0.4)	1 (0.2)	1 (0.2)	2 (0.4)	1 (0.2)	...	...	730
Fishdam River	127 (42)	58 (19)	31 (10)	36 (12)	23 (8)	13 (5)	3 (1.2)	2 (0.7)	2 (0.7)	2 (0.7)	2 (0.7)	...	...	...	...	...	299
East Branch Tahquamenon	106 (41)	32 (12)	32 (12)	17 (7)	20 (8)	13 (5)	8 (3)	7 (3)	3 (1)	6 (2)	2 (0.7)	4 (1.4)	1 (0.3)	...	3 (1)	5 (2)	259
Hunt Creek	334 (66)	76 (15)	35 (7)	25 (5)	11 (2)	10 (2)	5 (0.9)	3 (0.6)	5 (0.9)	1 (0.2)	...	...	...	...	...	...	505
Totals and percentages for 1940	2,557 (64)	582 (15)	312 (8)	193 (5)	121 (3)	82 (2)	35 (0.8)	24 (0.5)	25 (0.5)	17 (0.3)	13 (0.3)	9 (0.2)	6 (0.1)	1 (tr.)	4 (0.1)	10 (0.2)	3,991
Percentages, 1939 (7 streams)	50	14	10	7	5	4	2	2	1	1	1	1	1	...	...	1	11,179
Percentages, 1938 (6 streams)	45	17	11	7	5	4	4	2	1	1	1	1	...	...	...	1	9,532

Table 12

Comparison of 14 tagged brook trout weighed at tagging and at recovery from the East Branch of the Tahquamenon River, 1940 creel census.

(Measurements in millimeters, weights in grams taken by C.C.C. enrollees).

Tag number	Size at tagging		Days free	Size at recovery	
	Total length	Weight		Total length	Weight
15636	185	71	15	180	57
15663	230	146	36	230	107
15666	210	102	36	210	79
15681	232	133	16	300	113
15728	225	137	17	222	113
15735	237	141	19	225	142
15763	202	91	10	190	85
15781	215	106	12	212	85
15799	209	104	16	210	113
15815	193	85	35	198	57
15816	205	104	16	212	99
15831	220	117	16	220	113
15835	251	198	43	254	198
15836	256	208	16	260	198
Totals (14)	3,070	1,743	303	3,123	1,559
Averages (14)	219.3	124.5	22	223.1	111.4

Table 13

Residences of non-resident anglers on streams
under intensive creel census,
1940 trout season

State	Numbers of non-resident anglers using the				Totals
	N. Branch		E. Branch		
	Au Sable	White	Tahquamenon	Fishdam	
Ohio	369	3	...	1	373
Indiana	21	11	1	...	33
Illinois	28	21	1	1	51
Iowa	1	...	...	...	1
Kentucky	1	...	...	...	1
Louisiana	1	...	...	...	1
Florida	3	...	...	...	3
Pennsylvania	2	...	4	...	6
W. Virginia	1	...	...	...	1
California	...	...	...	1	1
Wisconsin	1	...	2	4	7
Colorado	...	...	...	1	1
Minnesota	...	...	...	2	2
North Dakota	...	...	...	1	1
Totals	428	35	8	11	482
Total resident (Table 14)	1,766	687	251	270	2,974
Total unknown (Table 14)	54	8	...	18	80
Grand totals	2,248	730	259	299	3,536

Table 14

Residence of Michigan anglers on streams
under intensive creel census,
1940 trout season.

County	Number of resident anglers using the				Totals
	N. Branch		E. Branch		
	Au Sable	White	Tahquamenon	Fishdam	
Alger	...	...	2	3	5
Allegan	...	1	4	...	5
Alpena	28	...	...	...	28
Antrim	...	...	1	...	1
Arenac	1	...	...	...	1
Baraga	...	...	1	...	1
Barry	1	1	1	...	3
Bay	27	7	2	1	37
Berrien	...	5	...	...	5
Branch	2	...	...	...	2
Calhoun	4	9	4	...	17
Cheboygan	2	...	...	...	2
Chippewa	...	...	143	...	143
Clare	2	...	...	...	2
Clinton	1	...	...	...	1
Crawford	153	...	...	...	153
Delta	...	...	...	38	38
Eaton	6	...	...	...	6
Emmet	...	...	4	...	4
Genesee	10	2	11	4	27
Gratiot	6	...	...	...	6
Hillsdale	5	...	...	...	5
Huron	1	...	...	...	1
Ingham	28	14	2	4	48
Ionia	2	1	...	...	3
Iosco	1	...	...	...	1
Isabella	...	1	...	2	3
Jackson	58	2	...	4	64
Kalamazoo	1	...	...	...	1
Kent	3	158	4	11	176
Lapeer	38	...	...	...	38
Lenawee	2	4	...	...	6
Livingston	2	...	...	...	2
Luce	...	...	15	...	15
Macomb	58	...	11	...	69
Manistee	...	...	1	...	1
Marquette	...	...	3	5	8
Mecosta	...	6	...	...	6
Midland	85	...	...	...	85
Monroe	2	...	...	...	2
Montcalm	5	...	7	...	12
Montmorency	23	...	...	...	23
Muskegon	6	222	1	...	229
Newaygo	...	230	...	...	230
Oakland	76	1	2	2	81
Oceana	...	2	...	...	2
Ogemaw	6	...	...	...	6
Oscoda	1	...	...	...	1
Ottawa	...	6	...	...	6
Otsego	26	...	...	...	26
Presque Isle	3	...	...	...	3
Roscommon	3	...	2	...	5
Saginaw	123	...	4	3	130
Sanilac	3	...	...	...	3
Schoolcraft	1	...	...	181	182
Shiawassee	8	...	...	...	8
St. Clair	6	...	8	...	14
Tuscola	4	...	...	...	4
Washtenaw	14	1	1	2	18
Wayne	727	14	17	10	768
Wexford	2	...	...	...	2
Unknown	54	8	...	18	80
Total	1,820	695	251	288	3,054