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INSTITUTE FOR FISHERIES RESEARCH
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

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ANN ARBOR, MICHIGAN

May 2, 1940

REPORT NO. 599

RESULTS OF THE INTENSIVE TROUT STREAM CREEL CENSUSES ON THE PINE, PIGEON, NORTH BRANCH OF THE AU SABLE, LITTLE MANISTEE, CANADA CREEK, AND WHITE RIVERS FOR THE 1939 TROUT SEASON

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Intensive creel censuses have now been completed for the third consecutive trout season on sections of five Michigan trout streams--the Pine River (Lake County), the Little Manistee River, the North Branch of the Au Sable River, the Pigeon River, and Canada Creek. A section of the White River has also been censused for the past two seasons. With the exception of the Little Manistee River, these censuses have covered the same stream areas during two or three consecutive trout seasons. This report will present the statistics on the fishing during the 1939 trout season in the above-mentioned streams and discuss the results obtained from planting marked trout of legal size in the fall of the year preceding the open season, in the spring just before the open season, and during the open trout season, in certain of these intensively censused trout streams. Hunt Creek creel census for 1939 has already been discussed (Report No. 555).

Table of Contents

and the planting program was in charge of Robert Fortney, District Supervisor of Fisheries Operations.

Pine River Creel Census, 1939

Area Covered

Five creel census stations were maintained by the Fish Division on the state-owned land along the Pine River during the 1939 trout season. These stations, located at Walker Bridge, Lincoln Bridge, Canfield Rollway, Elm Creek, and Poplar Grove Creek, effectively covered 9½ miles of the river (Walker Bridge to the Wexford-Lake County line), approximately 58 acres of fishing water. In addition to records from the above-mentioned area, records were obtained from anglers wading up into the Ne-Bo-Shone Club waters, or fishing from boats drifting through the Ne-Bo-Shone property. Angling statistics were also taken from as many fishermen as could be conveniently contacted on Poplar Grove Creek, and on the Pine River outside the intensive census area at the following locations:

(1) State Forty,

(2) Thorp's Bridge,

(3) Peterson's Bridge.

Working Personnel

The creel census crew on the Pine River was in charge of Richard Bohland, under the supervision of O. H. Clark and the writer. The following men were under his direction: Fred McNamara of Howell, Gerald McCrimmon of Luther, Clarence Taube of St. Joseph, Clifford Smith of Tustin, Gerald N. Fellows of Mason, and W. Harry Jones-Burdick of Ann Arbor.

Results[1]

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[1] The results discussed here are for that portion of the Pine River (Walker Bridge to Wexford-Lake County line) which was effectively and almost completely covered by the census clerks. More fishermen and a higher catch

per hour will be noted with the inclusion of the Ne-Bo-Shone and miscellaneous records (Table 2).

A recorded total of 3,965 anglers fished in the state-owned waters of the Pine River during the 1939 trout season. Records were obtained from 3,933 of these fishermen, or 99 per cent. Of this total, 1,878, or 47.9 per cent, took no fish. A total of 15,104.75 hours of fishing were expended, during which time 1,434 brook trout, 5,953 rainbow trout, and 13 brown trout of legal size were taken. These totals include the recoveries of tagged legal trout released before or during the season. The number of undersized trout caught and released was as follows: 2,509 brook trout, 5,780 rainbow trout, and 8 brown trout.

The average catch per hour for this 9½ mile portion of the stream was 0.49, made up of 0.10 brook trout per hour, 0.39 rainbow trout per hour, and a trace of brown trout per hour. The pertinent data, assembled by two-week periods, will be found in Table 1.

The quality of fishing, as measured by the catch per hour, began below the season's average, and dropped even lower in the succeeding month. From June 10th to July 7th the catch per hour doubled over the low/the preceding six weeks, but dropped slightly from July 8th to 21st. The highest catches per hour were made during the period from July 22nd to August 4th (0.74 fish per hour). Following this the quality decreased slowly till the last three days of the season, when it fell slightly below the season's average (0.44). It will be noted from Table 1 that with the exception of the first two-week period, the number of rainbow trout taken was the determining factor in raising or lowering the catch per hour. Over three times as many brook trout were taken during the first two weeks as during any other similar period. More anglers used the stream in the first two weeks of the season than during any other like period.

Average Length of Trout Taken By Anglers

A new procedure during the 1939 trout stream censuses was the measuring and weighing of as many of the anglers' catches as was physically possible. The average total length, calculated by two-week periods, is presented in Table 3. These averages have been computed from measurements of 1,180 brook trout, 4,552 rainbow trout and 12 brown trout, which represent 83 per cent, 76 per cent, and 92 per cent, respectively, of the total catch of those species. Measurements on the tagged trout recovered are included in these figures.

The average total length of the trout over the entire season, as determined by these measurements, was found to be as follows: brook trout -- 7.9 inches; rainbow trout -- 8.3 inches; brown trout -- 8.9 inches.

The average length of both brook and rainbow trout was greatest during the first two weeks of the season (8.2 inches for brook trout and 9.3 inches for rainbow trout). The lowest average length for brook trout was 7.6 inches during the period June 24th to July 7th, for rainbow trout during the same period it was 7.9 inches. From that time on till the end of the season the average size of brook trout fluctuated around 7.9 inches or slightly below, while the average size of the rainbow trout increased more or less steadily to 8.3 inches.

Percentage of Marked Legal Trout in the Catch, and Percentage of Plantings Taken by Anglers

The releases of marked trout of legal size which were most likely to be readily available to the angler during the 1939 season are listed in Table 4. These releases contributed to the total catch from the censused water as follows: November 1938 planting of legal brook trout, 16 fish, or 1.1 per cent; April 4, 1939 planting of legal brook trout, 280 fish, or 19.6 per cent; June 1939 planting of legal brook trout,

114 fish, or 7.9 per cent; July 1939 planting of legal brook trout, 146 fish, or 10.2 per cent, 15 marked brook trout (tag number or mark not properly described), 1.1 per cent. In other words, of a total of 1,434 legal brook trout taken, 570, or 39.75 per cent, were from the experimental plantings of adult brook trout.

From the June 1939 release of tagged rainbow trout of legal size, 154, or 2.6 per cent of the total catch of rainbow trout, were retaken. One hundred and fifty (150) tagged rainbow, or 2.5 per cent of the total catch, were captured from the July 1939 release. Therefore 307 (3 tags reported without numbers) hatchery rainbow trout were included in the total catch of 5,953, or 5.2 per cent of the total catch.

Of the total trout catch in the intensively censused area, 877 of 7,400 trout, or 12 per cent, were of marked hatchery-reared fish.

The same table (Table 4) summarizes the percentage of recovery of the various plantings of marked fish by the Pine River anglers. The tabulation demonstrates conclusively that fall plantings of legal-sized brook trout do not make a contribution to the following season's catch comparable to similar plantings released in the spring before the opening of the season or during the season. This confirms results secured in other states by fisheries investigators.

As in previous years, hatchery brook trout were removed from the stream at a more rapid rate than were hatchery rainbow trout. Usually 75 per cent or more marked brook trout recovered were taken within the first month of freedom. Occasionally 50 per cent of the rainbow trout recaptured by the fishermen were taken within the first month after released (Table 4). Marked rainbow trout were again noted to contribute to the total catch for a much longer period of time than did the marked brook trout.

A return to the angler of only 3.3 per cent of the total number of marked brook trout planted leads to the inevitable and usual conclusion of a high mortality during the winter following planting. A clue as to the cause of at least part of this mortality is found in the correspondence with Mr. B. V. Booth, president of the Ne-Bo-Shone Association (March 20, 1939). Mr. Booth therein described the stomach contents of several American mergansers shot over Ne-Bo-Shone waters, one of which had in its stomach tag No. 2071, which had been placed on a 11½ inch brook trout and was one of those released at Lincoln Bridge on November 5, 1938. This is the third instance of tag recovery from the stomach contents of American mergansers in Michigan waters, and demonstrates the need for control measures during winter months when any concentration of these predators occurs on our trout waters.

Migrations of Planted Trout

The movements of marked fish in the Pine River have been analyzed as closely as possible, taking into consideration the number of marked trout available during each two-week period, the number of hours fished and the number of marked trout recovered during the two-week period in the vicinity of each creel census station.

A simple example will show the necessity for considering the above-mentioned factors. Assume 1,000 tagged brook trout to be planted at point T on a stream before the opening day. Before the opening day 500 of these fish move into area U upstream and 500 of these fish migrate into area D downstream. During the first week of the trout season, 400 tagged trout are removed from area U in 200 hours of fishing, and 100 marked fish are recaptured from area D by 50 hours of angling effort.

Judged solely on the basis of the number of recoveries made in the respective areas, one might conclude that there was a distinct tendency toward upstream movement in the approximate ratio of 4 fish moving upstream to 1 fish moving downstream. If the number of marked trout recovered per unit of fishing effort expended is calculated for areas U and D, they will be found to be identical. In this assumed example the migration index or index of availability would be 2.0 for both areas U and D.

Calculations of a similar nature were made from the creel census data obtained in 1939, where the hours of fishing on given stream areas, the numbers of marked trout captured in those areas, and the location and numbers of marked trout planted all were known quantities recorded in the creel census. The following formula was used:

$$M = \frac{1{,}000\ A}{B \times C}$$

Where M = Migration index from any given area of release, T, to any given area of recovery R.

A = number of marked fish recovered in area R.

B = number of units of fishing effort in area R.

C = number of marked fish available in area T.

The factor 1,000 was used in order to produce an index figure of convenient magnitude.

The migration indices for the various plantings will be found in Tables 5 to 8. In studying them, it should be remembered that higher index figures represent greater trends of migration, except where the high indices are found at localities of planting, which demonstrates that the planted fish have tended to remain where released. In Tables 5 to 8 the data have been arranged by two-week periods to show the seasonal trends. The actual number of marked fish captured at various distances from the points of release are listed, and under them the calculated migration indices.

Where recoveries on any planting of marked fish were made in more than one time period, the number of marked trout available was considered to be the total number planted less the total marked trout that had been recovered before that period. A similar index has been used previously by Thompson and Herrington (1930) in their halibut-marking studies on the Pacific coast.

Migration indices have been calculated on all plantings of marked fish wherever the fish were recovered at relatively well dispersed points along the stream in question and wherever there was an adequate number of recoveries for analysis.

The fall planting of brook trout was made on November 5, 1938, at Lincoln Bridge Camp Ground. Some 798 adult brook trout (499 tagged, 399 fin-clipped) were released along 3/8 mile of stream. A total of 26 fish from this planting was recovered, all but one during the first two weeks of fishing. Five were taken approximately where they were released, nine were captured from one to five miles upstream, while six were captured from one to five miles downstream, and six were taken at points over five miles downstream. Calculation of migration indices demonstrated that there was a greater tendency for downstream movement for a distance of over five miles (Table 5).

Especial mention should be made of the fact that the six fish listed as taken at points five or more miles downstream were all captured in Poplar Grove Creek, one at a distance of 7 miles upstream from the Pine River.

The movements of the 800 marked legal-sized brook trout which were released at Lincoln Bridge Camp on April 4, 1939, are tabulated in Table 6. From a study of the migration indices computed for the various portions of the stream, it may be conoluded that during the first two weeks of the 1939 season the center of abundance of this planting was

downstream between one and three miles (Just below Canfield Rollways), since the index figure is slightly higher for this part of the stream than at the point where the trout were released. During the period May 13-26, marked brook trout of the April 1939 planting were in more or less equal abundance at Lincoln Bridge Camp (point of release), at Elm Creek Camp, and at Poplar Grove Creek Camp, although some marked brook trout were recaptured in the lower part of the Ne-Bo-Shone waters and at Walker Bridge Camp and at Canfield Rollways. From the fourth to the sixth week of the season (May 27-June 9) migration indices were highest for the Elm Creek Camp area (3 to 5 miles downstream), closely followed by Poplar Grove Creek (over 5 miles downstream) and the Ne-Bo-Shone waters (3 to 5 miles upstream). Since some marked fish were taken at all camp grounds, it may be concluded that brook trout of the April release were then scattered from the Ne-Bo-Shone to Poplar Grove Creek with the greatest centers of abundance at the specific localities just mentioned. Scattered returns in succeeding weeks were twice as numerous from points downstream as from the locality of release. In general, it appears that marked brook trout of the April 1939 release were present in larger numbers in that portion of the stream from one to five miles below Lincoln Bridge Camp. Of the 26 marked trout of the April planting taken over five miles from the point of release, 19 were captured in Poplar Grove Creek. From these returns it is evident that a tributary stream such as Poplar Grove Creek attracts brook trout planted during the preceding fall or during early spring.

On June 16, 1939, four hundred and ninety-eight tagged brook trout of legal size were planted in the Pine River; 125 were released over about 1/4 mile of stream at Walker Bridge Camp Ground, Lincoln Bridge Camp, Canfield Rollways Camp Ground, and Elm Creek Camp Ground. Of 114 tagged brook trout of this release which were later recovered, only one had shown

movement of more than a mile. This particular fish was an individual released at Lincoln Bridge and recovered at the Walker Bridge Camp Ground.

At the same time and at the same camp grounds, 62 tagged rainbow trout of legal size were released. Of 154 tagged rainbows subsequently recovered from the June, 1939 distribution, 139 or 90 per cent were captured within one mile of where they had been released. The remaining 16 fish demonstrated a slight tendency toward upstream movement between one to three miles. One fish was taken in Ne-Bo-Shone waters and one fish was reported from Poplar Grove Creek Camp (recaptured in Pine River, however). None were taken in Poplar Grove Creek. Because recoveries from the June plantings were for the most part made at or near points of release, no migration indices were calculated.

Tagged brook and rainbow trout of legal size were also released in the Pine River on July 19, 1939 at the following camp grounds in the following numbers:

Walker Bridge Camp
Brook - 63
Rainbow - 62

Lincoln Bridge Camp
Brook - 62
Rainbow - 63

Elm Creek Camp
Brook - 62
Rainbow - 63

Poplar Grove Creek Camp
Brook - 63
Rainbow - 62

From July 19 to 21, all tagged brook trout in the anglers' catch were reported caught in the immediate vicinity of release. During the next two-week period (July 22-August 4), tagged brook trout were still most numerous around the points of release, but there was a slight movement upstream from one to three miles. One fish was reported from the upper end of the Ne-Bo-Shone waters. From August 5 to 18 there was an increased

tendency toward downstream migration over 5 miles, although there were a greater number of fish still being retaken at the planting localities.

During the last 18 days of the 1939 season (August 19-September 4), a more pronounced shift in an upstream direction of 1 to 3 miles evidently occurred, with a few fish being taken still farther upstream (3-5 miles). However, there were still more marked brook trout being taken at the point of release (Table 7).

The 10 tagged rainbow trout recovered during the period July 19-21 were all taken where they were planted. From July 22 to August 4 there was still a greater abundance of these fish at the various localities of release (camp grounds), but recoveries were also made both up and downstream from the various points of planting. During the period August 5-18 a greater number of these fish were still present at the planting localities than in any other parts of the stream. This more or less static condition held true for the last 18 days of the season (Table 8).

Possible Value of Temporarily Closing Waters Planted With Legal-sized Trout

In certain states where adult trout are planted during the open season (New Jersey, for example), streams so stocked are closed to angling for a week or two after the fish are released. Several interested sportsmen of Michigan have advocated that such a procedure be used when stocking trout waters of the state. The majority of recoveries from the Pine River of tagged adult brook trout which were planted in June and July came from the immediate vicinity of the point of release regardless of whether they were caught 2 days or two weeks after release. Adult tagged rainbow trout planted in June and July appeared to disperse along the stream to a greater degree than did the tagged brook trout, but the majority of recoveries on the tagged rainbow trout were also made relatively close to the planted area no matter how soon they were captured.

Nor would closing stocked sections for several weeks make the trout wilder and less easily caught judging by the rate of removal and the ease with which spring plantings made several weeks prior to the season were taken. Most of the fish were in the same pools where they were planted and were caught as fast as the fishermen could locate them. No skill at all was required to induce them to bite.

Such closing regulations might be of a beneficial nature if 1,000 or more adult trout were dumped in a very short section of stream (1/4 mile or less). Under such circumstances, competition for food and living space apparently forces a large percentage of the planted fish to migrate in search of food and shelter. As a general rule, most Michigan trout streams are readily accessible during the late spring and summer months, and plantings of legal-sized trout can be distributed over a considerable stream area, also seldom more than 50 fish are introduced in any one pool.

In view of the results obtained on the Pine River with tagged adult trout (and to a certain degree on other streams), it is very doubtful if closing an area recently planted would increase the yield or make the trout harder to catch. A regulation of this type would also be difficult to administer, and would undoubtedly lead to a certain amount of discontent among the anglers if sections of their favorite streams were to be closed even for a short time during the trout season.

Analysis of the Recoveries During the 1939 Season of Marked Trout Released Previous to November 5, 1938

A total of 18 tagged trout of the plantings during 1937 and 1938 were recovered during the 1939 trout season. Of this number, 17 were from 1938 plantings and 1 from 1937 releases. The number of recoveries, and the plantings from which they originated ~~from~~ are presented in Table 9. The largest number of recoveries was made of fish released in May and July of 1938 respectively. From the April planting of 1938, one brook trout and

three rainbow trout were recovered. On the basis of the 1939 percentage of recovery for the several plantings, the total number of 1938-planted fish theoretically available in 1939 has been calculated. These calculations are tabulated in Table 10, and indicate an extremely low survival of legal-sized fish from one season to the next, i.e. from 0.15 to 0.48 per cent of brook trout and from 1.63 to 4.17 per cent of rainbow. Thirteen of these fish were caught approximately where they were planted. Two of the brook trout were captured upstream from planting localities in the Ne-Bo-Shone, and one of the rainbows was taken above the Ne-Bo-Shone. One rainbow was reported in the "Little Pine River," but this locality has not been definitely located (correspondence not answered).

The one brook trout which was free from July 13, 1937 to April 30, 1939 had apparently not moved, or if it did, had returned to the part of the stream where it had been released.

Residence of Anglers

The residential pattern of the Pine River anglers was much the same as in previous years. As usual, Kent County led with 1,059, followed by Wexford (456) and Wayne (451). Out-of-state anglers were led by Indiana (55), closely followed by Ohio (43). Other states represented were Illinois (25), Missouri (10), Oklahoma and Colorado (2), and Kentucky, New York, Tennessee, West Virginia, South Carolina and South Dakota (1 each). The distribution of the anglers' residences is shown on the accompanying map (Fig. 1).

Pigeon River Creel Census, 1939

Area Covered and Personnel

The Pigeon River was also under intensive creel census for the third consecutive summer through the course of the 1939 trout season. Five creel census stations were operated by the Pigeon River CCC Camp; the stations were located at the Vanderbilt Road Bridge, Old Headquarters Bridge, the Tin Bridge, Pine Grove Camp, and the Wolverine Bridge. Approximately 12.2 miles of stream were under census, a water acreage of 65 acres.

Plantings of tagged legal-sized brown and rainbow trout were also made in the Pigeon River. Fall (1938) and spring (1939) releases were of 500 tagged fish of each species, while the implantations during the season in June, 1939, and July, 1939, were of 250 tagged fish of each species.

Assistance in the planting operations was furnished by Hans Peterson and James Wilkinson, and also by former District Supervisor Guy Lincoln.

Results of Fishing

Throughout the 1939 trout season, the Pigeon River was fished by at least 2,302 anglers, of which 2,213 (96 per cent) were contacted by the census clerks. These fishermen expended 6,496½ hours on the stream and captured 2,245 brook trout, 623 rainbow trout, and 219 brown trout of legal size. They caught and threw back a reported total of undersized fish as follows: 2,502 brook trout, 345 rainbow trout, and 157 brown trout. The total catch per hour (all species included, and including recoveries of tagged legal-sized brown and rainbow trout) was 0.48, and was made up as follows:

Brook trout - 0.34+ fish per hour

Brown trout - 0.03+ " " "

Rainbow trout - 0.10 " " "

Of the 2,213 fishermen contacted, 1,249, or 56 per cent, caught no fish.

As on the Pine River, the quality of the fishing (as measured by the catch per hour) for the first two weeks was below the average for the season (0.36 fish per hour). However, during the succeeding month (May 13-June 9) fishing was at the peak for the season with the catch per hour standing at close to 0.80 fish. From June 10 to 23, the quality of the fishing was average (0.47 fish per hour), but from that time on (June 23-September 1), fishing might be classed as poor, as it dropped sharply and consistently to a low of 0.15 fish per hour during the period August 5-18. Fishing did pick up slightly during the Labor Day week end, a catch per hour of 0.43 fish being recorded.

Brook trout led all species in numbers taken, outclassing the rainbow and brown trout in a ratio of 11:4:1. The period May 27-June 9 saw the greatest number of anglers use the stream (375), closely followed by the periods June 10-23 (326), and June 24-July 7 (340). The largest number of trout of all three species was taken in the period May 27-June 9, and also the most undersized fish.

The data on the fishing for the 1939 season on the censused area of the Pigeon River will be found in Table 11.

Average Length of Trout Taken by the Anglers

The average total length of the trout taken by the anglers has been computed from measurements of 2,072 brook trout, 181 brown trout, and 605 rainbow trout, which represent 92 per cent, 83 per cent, and 97 per cent respectively of the total catch of those species recorded for the Pigeon River.

The average total length, over the entire season, was found to be as follows:

Brook trout - 8 1/8 inches

Brown trout - 9 1/8 inches

Rainbow trout - 9 inches

The average total length of the brook trout compiled by two-week periods varied from 202 millimeters (slightly less than 8.0 inches) to 224 millimeters (8 7/8 inches), of brown trout from 213 millimeters (8 3/8 inches) to 289 millimeters (11 3/8 inches), of rainbow trout from 202 millimeters (slightly less than 8.0 inches) to 253 millimeters (slightly less than 10 inches). With the exception of the brook trout, the average total length varied considerably from period to period, but not in an orderly manner. The data on the average total length of the trout taken by anglers from the Pigeon River creel census area during 1939 are presented in Table 12.

Percentage of Marked Legal Trout in the Catch, Percentage of Plantings Recovered, Movements of Marked Trout.

No marked brook trout of legal size have been planted in the Pigeon River recently, so it may be assumed that the total brook trout catch is a result of a combination of hatchery plantings and natural reproduction.

Fall, spring, and summer plantings of jaw-tagged brown and rainbow trout of legal size were released in the Pigeon River. On November 4, 1938, 500 tagged brown trout and 500 tagged rainbow trout were distributed in the creel census area. A similar number of tagged brown and rainbow trout were planted at the same localities on April 1, 1939. Distribution of 250 tagged brown and 250 tagged rainbow trout on June 22, and July 21 was also carried out; all trout were legal at the time of planting.

The percentage of tagged brown trout of hatchery origin in the total brown trout catch was 45.2 per cent, and the various plantings contributed as follows:

November, 1938	- 7.3 per cent	(3.2)
April, 1939	-15.5 " "	(6.8)
June, 1939	-20.1 " "	(17.6)
July, 1939	- 2.3 " "	(2.0)
Total	45.2 per cent	

The percentage of tagged rainbow trout in the season's catch was 20.7 per cent, of which the several releases were to be found in the following proportions:

November, 1938	- 0.5 per cent	(0.6)
April, 1939	- 8.0 " "	(10.0)
June, 1939	- 9.0 " "	(22.4)
July, 1939	- 3.2 " "	(8.0)
Total	20.7 per cent	

Table 13 presents the data on the number of tagged trout recovered from the various plantings and is compiled by two-week periods.

Also listed at the bottom of Table 13 will be found the percentage of recovery from the four liberations of hatchery trout. These percentages will also be found listed for the reader's convenience immediately following the percentages of the total catch which are made up by the recoveries from the various plantings.

The release of legal trout in the spring some time prior to the open season was again demonstrated to be a more efficient management procedure than fall planting so far as legal trout in the anglers' creel are concerned.

Over twice as many brown trout were retaken from the April, 1939 planting as from the November, 1938 planting, and 17 times as many tagged rainbow trout were recorded from the April, 1939 planting as from the November, 1938 planting.

The highest percentage of recaptures on tagged trout resulted from fish released in June, 1939, namely 17.6 per cent of the tagged brown trout and 22.4 per cent of the tagged rainbow trout.

Comparatively poor results (in terms of fish caught by angling) were obtained from the July, 1939 planting, when only 2.0 per cent of the tagged brown trout and 8.0 per cent of the tagged rainbow trout subsequently were recaptured by fishermen. Some obvious mortality occurred among the tagged brown trout introduced in this month, as 12 of the 17 fish on which information is available were listed as picked up dead or dying during the period July 22-August 4. No such mortality was noted to have taken place among the tagged rainbow trout, yet the percentage of recovery is correspondingly low.

Since only three tagged rainbows were retaken from the November 3, 1938 release, there is little information on their movements. All three were caught during the period May 13th to 26th, two of them at or near where they were planted, while the third was recovered at least 8 miles downstream from the locality of introduction.

Tagged brown trout released at the same time as the rainbows were recaptured in the same section of stream as where they were planted, with the exception of four fish. Of these four fish, two were taken during the opening two weeks at the Lansing Club dam, a movement of at least one mile above the highest locality of release. Two were also taken in the vicinity of the Tin Bridge, a migration of at least two miles downstream from the lowest point of introduction, during the period June 19th-23rd.

Both returns from the Lansing Club dam were received by mail, and as the creel census did not cover that area, the hours of fishing are not known, and migration indices cannot be calculated. It may be concluded from the distribution of the recoveries in time and space that, up until June 10-23, the hatchery brown trout distributed in November 1938, were for the most part in that area of the stream and to some extent upstream from where they were released. A change in the center of abundance must have occurred after June 10th, however, since the only two fish to be recovered were taken near Tin Bridge, which would indicate a downstream movement.

Of the tagged trout planted on April 1, 1939, it may be said in general that the legal sized brown trout tended to remain where planted and to disperse slightly both up and downstream for short distances (Table 14). The rainbow trout, on the other hand, were not recorded from any points above the localities of release, and were taken in relatively large numbers from portions of the stream lying downstream from the lower points of planting; six of 50 recoveries were made at least 15 miles downstream from the lowest point of release in the Pigeon River (Table 15).

Calculation of the migration indices has been undertaken and these indices demonstrate clearly (for those parts of the stream where fishing hours were known) that there was a definite shift in position of the tagged rainbow trout from the time of their release on April 1 until about the 7th of July. During this extended period the center of abundance of the marked fish may be estimated to have been somewhere between the Tin Bridge and the Wolverine Bridge (5 to 15 miles downstream from point of release), and possibly further downstream (if the fishing effort on the six fish taken below the Wolverine Bridge were accurately known).

Recoveries from tagged brown and rainbow trout released on June 21, 1939 demonstrate that there were no noticeable migrations during the fishing season from the localities of release for either species. The relatively few recaptures from the planting of July 21, 1939, also showed no migration to have taken place in either species.

No recoveries were reported from the tagged and fin-clipped (dorsal and adipose fins removed) legal-sized rainbow trout released in the Pigeon River in August, 1937, during the 1938 or 1939 creel censuses on this stream.

Residence of Anglers

As in previous years, the Pigeon River was fished more by anglers residing in the eastern half of the Lower Peninsula. Wayne County sportsmen were in greatest numbers (585), followed by Genesee County anglers (155). Cheboygan, Otsego, and Alpena County fishermen were closely bunched with 152, 152, and 151 using the Pigeon River.

Out-of-state anglers trying their luck on the Pigeon River were led by Ohio (146), followed in order by Indiana (47), Illinois (15), Pennsylvania (10), California and Kentucky (4), Missouri, New York and Oklahoma and Connecticut (2). Foreign anglers were represented by one fisherman claiming Germany as his residence, and three Canadians (Figure 2).

North Branch of the Au Sable
Creel Census, 1939

Area Covered, Personnel

Six creel census stations were maintained on the North Branch of the Au Sable River throughout the 1939 trout season. The stations were located at the Lovells Bridge, the Gravel Pit, the Twin Bridges, the Ranch Hole, Halstead's Ford, and the Black Hole Camp Ground. Census clerks posted at

these stations covered 4.6 miles of stream, or about 54.5 acres of water (as determined from CCC map of the North Branch of the Au Sable River above Lovells).

Fall and spring plantings of tagged and fin-clipped brook trout of legal size were also made in the North Branch. One thousand brook trout, 500 tagged, and 500 with the adipose and right pelvic fin removed were planted in the fall in the vicinity of the Twin Bridges. In the spring a like number were planted in the same locality; one half were tagged and one half had their adipose and left pelvic fins removed. Hans Peterson was in charge of the planting operations.

Results

The census crew recorded a total of 2,556 fishermen using the censused portion of the North Branch, of which 2,134 or 83.5 per cent were interviewed for catch records. The interviewed fishermen spent a total of 5,910.50 hours on the stream and removed a legal catch of 2,031 brook trout, 388 brown trout, and 17 rainbow trout for a seasonal average catch per hour of 0.41 trout. The total catch per hour was made up of 0.34 brook trout and 0.07 brown trout with a bare trace of rainbow trout. Undersized trout caught and returned to the water were reported by the anglers as follows: 2,392 brook trout, 2 rainbow trout, 83 brown trout. Sixty-three per cent of the anglers contacted took no fish.

The quality of the fishing on the North Branch was somewhat below the 1938 figure (0.41 fish per hour as compared with 0.50 fish per hour). However, during the first two weeks of 1939, the catch per hour was slightly above the season's average. A noticeable decline in the catch occurred during the next four weeks of fishing, followed by an eight week period of catches above the seasonal average. During the last four weeks of the season, the catch per hour was either at the season's average or below it. The highest catch per hour (0.57 fish) was noted during the

period July 8-21, while the lowest (0.21 fish) occurred during the period May 27-June 9.

The greatest number of fishermen used the stream during the period June 24-July 7 (319), and this was closely followed by the opening two-week period, when 307 anglers were on the censused area of the North Branch. Detailed data on the angling on the North Branch will be found in Table 16.

Average Length of Trout Taken by Anglers

The average total lengths of the three species of trout taken by the anglers have been obtained from measurements on 1,824 brook trout, 353 brown trout and 14 rainbow trout, which represent respectively 88 per cent, 90 per cent, and 83 per cent of the recorded catch of these species from the census area on the North Branch of the Au Sable River. The data on average total length, grouped by two-week periods, is presented in Table 17.

The average size of the brook trout was greatest during the first four weeks of the 1937 season, when this species averaged 8 1/8 inches in total length. The average size of the brook trout was smallest during the period August 5-18, when the average total length was slightly under 7 1/2 inches. Over the entire season the average total length was 7 3/4 inches. It will be noted in Table 17 that there was a steady decline in the average size of the brook trout from the beginning to the end of the season. This decline in the average size of brook trout might possibly indicate that the sport fishery was prosecuted to, if not past, the fullest extent which the species might withstand in this stream. It also might explain why so few relatively large brook trout have been taken from this stream in recent years--the brook trout simply are caught out before they have a chance to reach a larger size.

The average size of the brown trout taken was considerably larger than that of the brook trout. The average length of this species varied from a high of 11.9 inches during the period May 27-June 9 to a low of 9.4 inches during the period August 5-18. The average size of brown trout taken during the entire season was 10 1/2 inches. The average size of brown trout taken fluctuated considerably from week to week.

Very few rainbow trout were taken in any one week. The average size of the 14 fish measured was 9 1/2 inches.

Percentage of Marked Legal Trout in the Catch, Percentage of Plantings Recovered, Movements of Marked Trout

No marked brown trout or rainbow trout of legal size have been stocked above Dam 4 in recent years. The only introductions of either species in the North Branch have been as follows: 150 adult rainbows planted at Hannah Anderson's (10 miles below the creel census area) in 1937, and 20,000 brown trout fingerlings listed as planted in Lovells Township in 1936. The anglers' catch of brown and rainbow trout in the creel census area may be assumed to be mainly the result of natural reproduction.

Both tagged and fin-clipped brook trout of legal size were available to the 1939 anglers of the North Branch; also fin-clipped fingerlings in equal numbers of both hatchery and wild parentage were released in October, 1938. Tagged and fin-clipped legal brook trout were planted in lots of 1,000 each (500 tagged, 500 fin-clipped) on November 2, 1938, and March 29, 1939 in the Akron Club-Twin Bridge area. The recovery data, arranged by two-week periods, are presented in Table 18.

Of the 2,031 legal brook trout caught by the fishermen, 246, or 12.1 per cent, were either jaw-tagged or fin-clipped. The remainder of the legal brook trout catch resulted either from fingerling releases or natural reproduction.

Again, in the North Branch of the Au Sable, as in the Pine and Pigeon rivers, releases of legal trout in the spring of the year gave the fishermen more fish than did the legal trout planted in the fall season. Subjected to the same fishing effort, fall stocking in the North Branch gave only a 4.4 per cent recovery, while spring introduction of marked fish showed a recovery percentage of 14.0 per cent. Both of these percentages quoted would be slightly higher if the distribution of the "unknown" fin-clipped fish listed in Table 18 were known.

The movements of the November planting of 1938 and the March release of 1939 appear to have been quite similar in extent (Tables 19 and 20). Migration indices demonstrate a shift in the center of abundance from the Twin Bridge-Akron Club area of the stream (where both plantings were made) to that part of the North Branch from the region of the Gravel Pit to the Lovells Road Bridge, a distance of about 2 miles by river. Marked brook trout from the November, 1938, planting were taken during the first eight weeks of the season, and migration indices were consistently higher for some point downstream than for the locality of planting. The same condition holds true for the March, 1939 release, except the marked fish from this release were found in the catch until 12 weeks of the season had passed by.

The extreme wanderings reported from these plantings were: one fish reported by mail to have been taken about 1/2 mile above Dam 4 (a movement of about 10 miles downstream from point of release), and two fin-clipped fish retaken at Halstead's Ford (a movement of about 1 1/2 miles upstream). The movements of the marked brook trout are in general agreement with

previous marking and recovery results in the North Branch of the Au Sable (Shetter, 1937).

Residence of Anglers

Wayne County anglers led the fishing parade on the North Branch of the Au Sable with 681, followed by 150 fishermen from Genesee County and 122 anglers who gave Saginaw County as their residence. The residential pattern of Michigan fishermen frequenting the North Branch was about the same as in the previous two years; the majority of them came from the southeastern quarter of the Lower Peninsula (Figre 3).

Non-residents who preferred the North Branch were led by Ohio (358), followed by Illinois (19), Indiana (14), Pennsylvania (12), Florida (6), Kentucky, Massachusetts and Texas (2), Oklahoma and California (1). Foreign sportsmen were represented by one Canadian angler (Figure 3).

Little Manistee River Creel Census, 1939 Trout Season

Area Covered, Personnel

A 3.6 mile portion of the Little Manistee River was sampled through the trout season just concluded by CCC enrollees from Camp Irons under the supervision of the U. S. Forest Service. Two stations were operated; one clerk was located at the M-63 bridge, while another was placed at Johnson's Bridge north of Peacock. The water acreage of this census area was about 17.7, as determined from width measurements and a map of the censused section of the stream prepared by the U. S. Forest Service.

Results

A total of 608 fishermen were observed to fish on the censused portion of the Little Manistee River, and of this number 491, or 80.6 per cent, were contacted and their catches examined. Of the 491 anglers interviewed, 280, or 59 per cent, took no fish. The 491 anglers spent 1,935.75 hours on the stream and removed a catch of 220 legal brook trout, 270 rainbow trout, and 205 brown trout, or an average catch per hour over the season of 0.37 trout. The total catch per hour was made up as follows:

Brook trout	0.12
Rainbow trout	0.14
Brown trout	0.11

Undersized fish caught and returned were as follows:

Brook trout	123
Rainbow trout	629
Brown trout	152

The quality of the fishing in the Little Manistee was distinctly inferior to that experienced in 1938, as the catch per hour dropped from 0.55 to 0.37. During the 1939 season, the first six weeks of fishing were below the season's average of 0.36. In the period June 10-23 the anglers began to experience more success and from then on to the end of the season the catch per hour was usually above 0.67 fish per hour. The highest catch per hour (0.74 fish) was found to be in the period July 8-21, the lowest (0.17 fish) in the period May 27-June 9. The greatest number of fishermen were in the censused area during the first two weeks of the season (173). The largest number of brook trout (63) taken in any two-week period were also taken during that time, and also the largest number of brown trout (60). The largest number of rainbow trout were taken during the period June 10-23 (49). (See Table 21.)

Average Total Length of Trout Taken by Anglers

The average size of the angler's legal trout catch has been computed from measurements of 162 brook trout, 189 brown trout and 239 rainbow trout, which represent respectively 73, 95, and 89 per cent of the legal catch recorded for those species from the censused portion of the Little Manistee River in the 1939 trout season.

The average total length of the three species for the entire season was as follows: brook trout 8.75 inches; brown trout 9.5 inches; rainbow trout 8.2 inches (Table 22).

The average length of the brook trout was greatest during the period May 13-26 (9.7 inches), and least in the period June 24-July 7 (7.25 inches). The average size of the brown trout was largest between May 27 and June 9 (11.1 inches), and least during the period July 22-August 4 (8.4 inches). Rainbow trout were found to average the largest during the first two weeks of the season (10.25 inches), and were smallest during the period August 5-18 (7.75 inches).

The average size of all three species was observed to fluctuate noticeably from period to period and in an irregular manner. The average size of the rainbow trout was greatest, however, in the opening two-week period of the 1939 season.

Percentage of Tagged Trout in the Catch, Percentage of Tagged Trout Recovered, Movements of Tagged Trout

There were no releases of marked trout of legal size in the Little Manistee River during the early spring or fall preceding the 1939 season. Plantings were made, however, of 250 tagged brown trout on June 20, 1939, and 250 tagged brown and 250 tagged brook trout on July 19, 1939 (for results, see Table 23). The planting of these fish was also in charge of Robert Fortney, District Supervisor of Fisheries Operations.

Of the 220 legal brook trout recorded in the anglers' catch, 67, or 30.4 per cent of the catch, were tagged fish of hatchery origin, coming from the July 19 introduction.

From 250 legal brown trout tagged and released on June 20, 1939, a total of 35 fish were reported as recaptured. Fish from this planting made up 17.2 per cent of the total catch of brown trout. Out of 250 tagged brown trout of legal size planted in the censused area of the Little Manistee on July 19, 1939, a total of 29 were reported from the census. Recoveries from this release comprised 14.2 per cent of the total brown trout catch. Recoveries from the June and July, 1939 plantings of legal brown trout carrying tags together made up 31.2 per cent of the total catch of brown trout for the census area. The figures on which these percentages have been calculated were obtained by using only recoveries from the census area with which a known amount of fishing effort is also listed.

The percentage of recovery from the various plantings was as follows (including all recoveries whether by mail or from census clerks):

Date	Species	No. planted	No. recovered	Percentage of recovery
June 20, 1939	Brown trout	250	41	16.4
July 19, 1939	Brook trout	250	81	32.4
July 19, 1939	Brown trout	250	38	15.2

It should be pointed out here that these are minimum figures, inasmuch as the highway patterns in and about the census area do not make a complete census possible. Undoubtedly fishermen capturing both unmarked and marked fish escaped the notice of the census clerks.

Examination of the recoveries for locality of recapture indicate that of those reported, little movement of the tagged trout of either species had taken place. Almost all were recaptured at or within one mile of the points of release. None of the tagged rainbow or brook trout planted in 1938 within or near the census area were recovered during the 1939 creel census.

Residence of Anglers

Kent County anglers were most numerous on the Little Manistee River census area (132), followed by Wayne (33), and Lake (32) counties. The majority of the fishermen using this stream came from southwestern Michigan, as in previous years.

Out-of-state fishermen were represented as follows: Indiana 22, Ohio 18, Illinois 14; Pennsylvania and South Dakota, one each (Figure 4).

Canada Creek Creel Census, 1939

Area Covered

Five creel census stations were maintained by the Pigeon River CCC Camp along Canada Creek in the Presque Isle State Forest. These stations covered approximately 5 miles of stream and about 21 acres of water, as computed from random width measurements of the stream within the censused area.

Results

During 1939, a recorded total of 290 anglers fished 841 hours on the censused portion of Canada Creek and caught 256 brook trout, 10 rainbow trout and 2 brown trout, or an average catch per hour for the entire season of 0.32 fish. Undersized trout caught and released were reported as follows: brook trout, 274; brown trout, 1. In addition to the recorded total of 290 anglers, 11 others were seen but not contacted, so the

efficiency of the coverage was probably better than 90 per cent. One hundred and sixty five (165) fishermen, or 56.9 per cent of the recorded total, were listed as taking no fish.

Canada Creek was more heavily fished during the opening two-week period than any other time, but the fishing was slightly below (0.29 fish per hour) the average catch per hour for the season. From May 13 to June 9, however, the catches were much better, and the catch per hour was 0.45 fish. From June 10 to July 21 a noticeable decline in the catches occurred, and the catch per hour dropped to 0.25 and 0.22 fish. The quality of the fishing increased to 0.36 fish per hour, somewhat above the season's average, in the period July 22-August 4, but dropped to around 0.20 fish per hour as the season closed (Table 24).

Both the fishing intensity and the catch per hour declined very markedly from 1938 results. Undoubtedly the severe forest fire of May 5-8 in the Presque Isle State Forest influenced many anglers from visiting the stream who would otherwise have done so. The fire burned a great amount of bank cover and shade along the stream and also destroyed two of the creel census shelter houses. This severe fire may have indirectly affected the fishing adversely, since it might be reasoned that with fewer fishermen using the stream the individual success would be greater, but this was not so according to the records.

Average Size of Trout Taken

The average size of the trout (Table 25) has been assembled by two-week periods, and the averages obtained from a sample of 242 brook trout, 2 brown trout and 7 rainbow trout, which represent respectively 94 per cent, 100 per cent, and 70 per cent of the recorded legal catch of those species for the 1939 trout season.

The average size of the brook trout varied from a low of 7.8 inches in the period July 22-August 4 to 9.3 inches during the period May 13-26. Brown and rainbow trout were not taken after May 26, and the average size of these species was 7.2 and 7.3 inches respectively.

No marked trout were reported in the Canada Creek census or by mail, although 500 tagged brook trout of legal size were released in Canada Creek in March, 1938. This adds another bit of evidence for the tentative conclusion that there is a severe mortality on adult fish from one trout season to the next.

Residence of the Anglers

Presque Isle County fishermen far outnumbered the sportsmen from other localities with 105 anglers, followed by 63 trout fishermen from Wayne County, and 39 anglers who gave Genesee County as their residence. The majority of the remaining fishermen were from counties in the eastern half of the Lower Peninsula. Only four non-residents, all from Ohio, were recorded (Figure 5).

White River Creel Census, 1939

Area Covered, Personnel

The intensive creel census on the White River was conducted over the same length of stream as in 1938, when 3 miles of the White River north of the town of White Cloud were covered by three census stations manned by enrollees of Camp White Cloud under the supervision of the Manistee Purchase Unit of the U. S. Forest Service. The same camp operated this creel census in 1938. The water acreage under census was 10.4, as determined by a map of the stream course and 100 measurements of the width in the censused area.

Results

A total of 922 anglers fished the censused area of the White River in 1939, and the catches of 899 were recorded, an efficiency of 97 per cent. The recorded anglers spent a total of 3,004 hours on the stream and took 1,807 legal brook trout, or an average catch per hour over the entire season of 0.60 fish. The anglers also reported the capture and release of 8,798 undersized brook trout and one undersized brown trout. The percentage of anglers taking no fish was 41.1.

Although the greatest number of fishermen (263) were on the stream during the first two weeks of the season and the greatest number (419) of brook trout were taken at that time, the quality of the fishing was considerably below the season's average catch per hour, and remained consistently low through the periods May 13-26 and May 27-June 9. The catches increased in number during the next month and reached the seasonal high of 1.10 fish per hour during June 24-July 7.

From July 8 till August 18 the catch per hour stayed at the seasonal average of 0.60 fish per hour or slightly above. In contrast to the 1938 season, the last 18 days of 1939 had poor fishing, catches per hour running less than 0.50 fish. Details of the general angling results for 1939 will be found in Table 26.

Average Size of Trout Taken

The average total length of the brook trout taken by anglers from the White River census area has been determined from 1,794 of 1,805 specimens, or on 99.4 per cent of the total catch. The average size varied only slightly from any two-week period to the next; in the lowest period (May 13-26) the average size of the fish taken was 7.5 inches, whilest the period which produced fish of the greatest average length--8.5 inches--was August 19-September 4 (Table 27).

Residence of the Anglers

As in 1938, Kent County anglers outnumbered resident fishermen from all other counties on the White River with 383, followed in order by Newaygo County with 199, Muskegon County with 69, and Wayne County with 29 anglers.

Out-of-state anglers from the following states also fished on the censused area of the White River: Illinois, 21; Ohio, 20; Indiana, 19; Texas, 3; Kentucky, 2; Pennsylvania, 1. (See Figure 6.)

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Percentage of Female Anglers

The percentage of women fishing the censused areas of the several trout streams has again been tabulated, and it may still be said that trout fishing was followed chiefly by the male sex in 1939. Only 794 out of 10,398 angling-days were recorded for females, or 7.6 per cent, a ratio of more than 12 men to 1 woman. The percentage of female anglers observed on the censused streams during 1939 varied from 5.6 per cent on the Hunt Creek to 8.8 per cent on the North Branch of the Au Sable River.

The percentage of women has remained relatively constant for the three-year period, during which the majority of these streams have been under intensive creel census. In 1937 and 1938 the percentage of ladies was 7.7 and 6.9, respectively. The 1939 data for the respective streams are presented in Table 28.

Percentage of Fishermen Catching Various Numbers of Fish

In these tabulations, all the creel census blanks were separated by streams into sixteen categories, according to the number of legal trout captured (0 to 15 trout). Results are presented for both the 1939 and the 1938 trout seasons in Table 29.

From a study of this table it is obvious that at best only slightly more than one-half of the total fisherman-days are productive of any trout at all. Strangely enough, the percentage of fishermen recorded as catching one fish was only approximately one-third of the percentage that took no fish--17 per cent in 1938, and 14 per cent in 1939.

The percentage of fishermen recorded as taking five trout was 4 in 1938, and 3 in 1939. The percentage of fishermen who took 7, 8, 9, 10 and 11 trout in both 1938 and 1939 was approximately 1 per cent for each numerical category. The percentage of fishermen who took 12, 13, or 14 trout was less than 0.5 for each category for both years, with the exception of the 12-fish category in 1939.

The percentage of fishermen recorded as capturing 15 trout, the legal limit, was 1 in both 1938 and 1939. Apparently, anglers who have 12, 13, or 14 trout in their baskets are subject to the psychological push to go on to the limit, since the percentage of fishermen who took the limit of 15 trout was usually twice the percentage of fishermen who caught 12, 13, or 14 trout.

For all general purposes, the results of the tabulations for both 1938 and 1939 may be termed identical.

O. H. Clark in "Report on the Expert Volunteer Creel Census for 1938" (Report No. 539), concluded that during 1938 the "expert" trout fisherman was about three times as skillful as the average trout fisherman.

This conclusion is further borne out by the comparison of the percentage of "expert" fisherman-days taking no fish (14), with the percentage of the "average" fisherman-days taking no fish (45), during the 1938 trout season.

It is evident from this analysis that reducing the daily limit on trout to 10 or even 5 would not "save" many trout. The chief value in the lower limit might be psychological, that is, some fishermen who complain now if they catch five legal trout in a day's fishing might be satisfied if this were the top number they could take. Also, a limit of five per day would discourage "meat" fishermen for on many streams when the average size runs low they would not consider catching five trout worth while.

Tabular Summary of 1939 Results

The statistics presented in Table 30 give a concise summary of the more important results of the intensive trout stream censuses of 1939. The total catch per hour figures for each stream have been broken down into the catch per hour made up by each species of trout taken. Except for the Pine River (Lake County) and the Little Manistee River, brook trout dominate the catch. In these latter two streams, rainbow trout outnumber all other species, although brown trout are well represented in the total take on the Little Manistee River.

The catch per acre of legal trout has been computed, also by species. These figures compare the yields of the censused areas of these streams in terms of legal fish per acre of stream surface. The order of the censused areas in terms of yield per acre of legal fish was: White River, Pine River, Hunt Creek, Pigeon River, North Branch of the Au Sable River, Little Manistee River, and Canada Creek. The yield per acre of legal trout varied from 174 in the White River to 13 in Canada Creek.

So that some idea might be obtained regarding the fishing pressure on the various streams under creel census, the fishing intensity has been compared between censused areas by using the man-hours of fishing per acre censused per season. Such figures were obtained by dividing the total hours of fishing for the season by the acreage of water under creel census (Table 31).

From these calculations it is obvious that the White River experienced the greatest fishing pressure during the 1939 season (289 hours per acre), followed by the Pine River (263 hours per acre) and Hunt Creek (182 hours per acre). The stream with the least angling pressure during 1939 of those under census was Canada Creek (40 hours per acre), and this can probably be accounted for by the forest fire of early May.

Man-hours of fishing per acre per season has been also computed for previous trout stream creel censuses (1937 and 1938). In general, the trend seems to be toward an increase in the number of fishermen, but the figures from the limited census areas may not be representative of the state as a whole.

Comparison With Censuses of Previous Years

In Table 32 the reader will find a comparison of the more important statistical items for the past three years of intensive trout stream creel censuses. In general, the number of fisherman-days has increased slightly over the three year period. Although approximately 1,000 more fisherman-days were recorded for 1939, some 2,000 less hours were fished.

The total trout catch in the censused waters has varied from about 13,800 in 1937 to about 17,500 in 1938. The catch per hour for all streams has been 0.54 fish (1937), 0.49 fish (1938), 0.47 fish (1939). If the data for all streams are combined the average catch per hour has been 0.50 fish, which figure may be regarded as average quality for trout

fishing. On this basis, fishing during 1939 remained about average or improved on the Pine, Pigeon, and White rivers but deteriorated on the North Branch of the Au Sable, the Little Manistee River, and Canada Creek.

The catch per fisherman-day is to a certain extent dependent on the average length of time spent in fishing by the anglers as well as on the quality of the fishing. All of the censused streams exhibited a decrease in the catch per fisherman-day. This decrease, as might be expected, was greatest in those streams where the catch per hour was also noted to have fallen greatly (Canada Creek, Little Manistee River).

Average Length of Trout Taken in Censused Areas

The average total lengths of the trout taken by the 1939 anglers on censused streams are tabulated in the last column of Table 32. The grand averages (last line, last column) are based on measurements of 90.8 per cent of the total brook trout catch, 90.0 per cent of the total brown trout catch, and 80.7 per cent of the total rainbow trout catch. For 1939, the average brook trout caught in censused water was 7.9 inches long, the average brown trout was 9.9 inches long, and the average rainbow was 8.4 inches long. The average size of all trout caught was 8.2 inches.

The estimated total lengths of the three species of trout are also shown for the two previous years, when the lengths of the fish were estimated by the census clerks. If it is assumed that the average size of the trout catch is more or less constant, which appears to hold true for the general creel census (Report No. 575, Table XVII, page 23), estimated lengths may vary from the measured lengths as follows:

Brook trout, -0.3 inch to +1.1 inches

Brown trout, -1.2 to +0.9 inches

Rainbow trout, -0.1 to +1.4 inches.

In general, lengths are probably over-estimated by about one-half inch.

Largest Trout Caught in Censused Waters

The largest trout captured in the censused waters have been tabulated for each stream under census in Table 33. The average size of these "largest" fish is as follows:

Brook trout - 14.1 inches (11.3 inches from Hunt Creek, 16.5 inches from Pigeon River),

Brown trout - 16.6 inches (7.2 inches on Canada Creek, 24.1 inches on North Branch Au Sable),

Rainbow trout - 20.1 inches (9.5 inches on Canada Creek, 25.0 inches on the Pine River).

The average size would have been greater for both brown and rainbow trout if those records had been excluded where only a small number of brown and rainbow are taken, such as the brown trout in the Pine River and Canada Creek, and the rainbow trout from Canada Creek.

Table 1. Intensive Creel Census Data, 1939 Trout Season,
For the Pine River (Walker Bridge to Lake-Wexford County Line)

Date	Total No. of Fishermen	No. Taking No Fish	No. of Hours Fished	Legal-sized Fish Caught				Catch Per Hour	Illegal-sized Fish Caught*				No. of Fishermen Seen But Not Contacted
				Brook	Rainbow	Brown	Total		Brook	Rainbow	Brown	Total	
April 29-May 12	669	345	2,924.75	467	629	8	1,104	0.38	419	145	3	567	2
May 13-26	415	238	1,771.25	133	394	1	528	0.30	733	807	1	1,541	...
May 27-June 9	431	262	1,566.50	91	396	...	487	0.31	441	1,252	1	1,694	...
June 10-23	293	133	988.50	120	401	...	521	0.53	118	551	1	670	...
June 24-July 7	458	218	1,604.75	158	830	1	989	0.62	181	1,192	...	1,373	...
July 8-21	362	165	1,266.50	86	623	...	709	0.56	164	642	1	807	6
July 22-Aug. 4	350	121	1,293.00	172	783	...	955	0.74	105	321	1	427	4
Aug. 5-18	421	171	1,663.50	99	877	3	979	0.59	107	371	...	478	7
Aug. 19-Sept. 1	299	123	1,032.75	49	640	...	689	0.67	108	227	...	335	4
Sept. 2-4	235	102	993.25	59	380	...	439	0.44	133	272	...	405	9
Totals	3,933	1,878	15,104.75	1,434	5,953	13	7,400	0.49	2,509	5,780	8	8,297	32

* Figures only approximate as are based on reports of anglers. This statement applies to all records of illegal fish reported on all censused streams.

Table 2. Intensive Creel Census Data, 1939 Trout Season, For the Pine River, Including Ne-Bo-Shone Area and Miscellaneous Records Taken At the Several Bridges Below Poplar Grove Creek

Date	Total No. of Fishermen	No. Taking No Fish	Total Hours Fished	Legal-sized Fish Caught				Catch Per Hour	Illegal-sized Fish Caught			
				Brook	Rainbow	Brown	Total		Brook	Rainbow	Brown	Total
April 29-May 12	809	375	3,884.50	697	1,124	9	1,830	0.47	606	195	3	804
May 13-26	500	251	2,354.75	278	649	1	928	0.39	1,387	1,037	1	2,425
May 27-June 9	545	292	2,299.25	241	650	...	891	0.39	1,296	2,112	1	3,409
June 10-23	344	140	1,306.75	192	625	...	817	0.63	421	926	1	1,348
June 24-July 7	544	227	2,207.75	385	1,285	1	1,671	0.76	521	1,748	...	2,269
July 8-21	419	174	1,579.50	136	846	...	982	0.62	265	784	1	1,050
July 22-Aug. 4	443	126	1,857.25	344	1,306	...	1,650	0.88	275	578	1	854
Aug. 5-18	509	182	2,178.50	226	1,266	4	1,496	0.69	264	501	...	765
Aug. 19-Sept. 1	367	136	1,483.50	128	937	...	1,065	0.72	177	367	...	544
Sept. 2-4	275	114	1,294.25	91	521	...	612	0.47	194	328	...	522
Total	4,755	2,017	20,446.00	2,718	9,209	15	11,942	0.58	5,406	8,576	8	13,990

Table 3. Average Total Length in Inches of Trout in 1939 Census From the Pine River Area As Measured By Census Clerks

Two-week Period	Brook Trout		Rainbow Trout		Brown Trout	
	Number	Average Length	Number	Average Length	Number	Average Length
April 29-May 12	370	8.2	476	9.3	7	9.1
May 13-26	105	7.8	299	8.4	2	10.3
May 27-June 9	62	7.6	327	8.0	...	...
June 10-23	113	8.0	328	8.0	...	...
June 24-July 7	131	7.6	549	7.9	1	7.7
July 8-21	73	7.8	493	8.0	...	...
July 22-Aug. 4	149	7.9	636	8.2	...	...
Aug. 5-18	76	7.9	660	8.2	...	...
Aug. 19-Sept. 4	101	7.8	784	8.1	2	7.5
Total and averages	1,180	7.9	4,552	8.3	12	8.9

Table 4. Distribution of Recoveries of Marked Legal-sized Trout Throughout the 1939 Trout Season In the Creel Census Area of the Pine River. (Periods When Plantings Were Made During the Season Are Underlined.)

Two-week Period	Nov., 1938 brook trout releases		April 4, 1939 brook trout releases		June, 1939 releases of tagged trout		July, 1939 releases of tagged trout		Fin-clipped, but fin not recorded
	Tagged	Fin-clipped	Tagged	Fin-clipped	Brook	Rainbow	Brook	Rainbow	
April 29-May 12	4	11	169	65	...	...	...	...	8
May 13-26	...	...	22	4	...	...	...	...	1
May 27-June 9	...	...	10	...	...	...	...	...	...
June 10-23	...	...	3	...	72	19	...	...	...
June 24-July 7	1	...	2	1	35	44	...	...	...
July 8-21	...	...	...	3	4	31	10	10	...
July 22-Aug. 4	...	...	1	...	2	19	88	69	...
Aug. 5-18	...	...	...	...	...	25	31	35	1
Aug. 19-Sept. 1	...	...	...	...	...	11	12	26	...
Sept. 2-4	...	...	...	...	1	5	5	10	...
Totals[1]	5	11	207	73	114	154	146	150	10
Total planted	499	299	500	300	488	249	250	250	600
Percentage recovered	1.00	3.68	41.20	24.33	23.2	61.85	58.40	60.00	1.6

[1] 3 tagged rainbow, 5 tagged brook trout whose numbers are not known not herein included.

Table 5. Numbers of Marked Brook Trout of Legal Size Recovered by Anglers During 1939 At Various Distances From Lincoln Bridge Camp Ground, Pine River

(Planting was made on November 5, 1938. Figures in parentheses are migration indices.)

Two-week Period	Distance in miles upstream from locality of release			Distance in miles downstream from locality of release			
	Over 5	3 to 5	1 to 3	0 to 1	1 to 3	3 to 5	Over 5
April 29-May 12	...	4 (0.009)	4 (0.005)	5 (0.009)	2 (0.009)	4 (0.009)	2/ 6 (0.025)
May 13-26	...	...	...	...	...	...	...
May 27-June 9	...	...	...	...	...	...	...
June 10-23	...	...	...	...	...	...	...
June 24-July 7	...	1/ 1	...	...	...	...	...
July 8-Sept. 4	No fish from this planting taken in this length of time						

1/ All from Ne-Bo-Shone property; no fishing hours on last recovery

2/ All from Poplar Grove Creek

Table 6. Numbers of Marked Brook of Legal Size Recovered By Anglers During 1939 at Various Distances From Point of Planting (Lincoln Bridge Camp Ground, Pine River)

Planting was made on April 4, 1939. Figures in parentheses are migration indices.

Two-week Period	Distance in miles upstream from locality of release				Distance in miles downstream from locality of release		
	Over 5	3 to 5	1 to 3	0 to 1	1 to 3	3 to 5	Over 5
April 21-May 12	...	10 (0.024)	72 (0.089)	74 (0.126)	33 (0.141)	52 (0.119)	14 (0.027)
May 13-26	...	2 (0.008)	8 (0.020)	8 (0.044)	1 (0.009)	7 (0.040)	6 (0.053)
May 27-June 9	...	5 (0.019)	1 (0.005)	2 (0.013)	2 (0.011)	5 (0.036)	3 (0.024)
June 10-23	...	1 (0.010)	...	...	2 (0.033)	...	2 (0.230)
June 24-July 7	...	...	1 (0.004)	...	...	2 (0.010)	...
July 8-21	...	...	2 (0.014)	...	1 (0.016)	...	...
July 22-Aug. 4	...	...	...	...	...	...	1/ 1
Aug. 5-18	...	...	...	...	...	...	...
Aug. 19-Sept. 4	...	...	...	...	...	...	...

1/ Recaptured at an unknown point between Poplar Grove Creek and Thorp's Bridge, which water was not covered by the creel census.

Table 7. Numbers of Marked Brook Trout of Legal Size Recovered at Various Distances From Planting Localities on the Pine River From the Release of July 19, 1939

(Figures in parentheses are migration indices.)

Locality of Planting	Two-week Period	Distance upstream from point of release				Distance downstream from point of release		
		Over 5	3 to 5	1 to 3	0 to 1	1 to 3	3 to 5	Over 5
Lincoln Bridge Camp Ground	July 8-21	...	...	...	8 (0.350)	...	...	...
	July 22-Aug. 4	1/ 1	...	...	23 (1.016)	...	...	...
	Aug. 5-18	...	1 (0.093)	...	1 (0.079)	...	1 (0.072)	1 (0.194)
	Aug. 19-Sept. 4	...	1 (0.051)	...	...	...	...	...
Elm Creek Camp Ground	July 8-21	...	...	...	...	...	...	...
	July 22-Aug. 4	1 (0.042)	...	1 (0.200)	27 (1.446)	...	...	...
	Aug. 5-18	...	...	...	9 (0.591)	...	...	...
	Aug. 19-Sept. 4	...	...	...	6 (0.442)	...	...	...
Poplar Grove Creek Camp Ground	July 8-21	...	...	...	1 (0.126)	...	...	...
	July 22-Aug. 4	...	...	2 (1.072)	11 (1.569)	...	...	...
	Aug. 5-18	...	...	...	4 (0.476)	1/ 1	...	...
	Aug. 19-Sept. 4	...	...	1 (0.039)	11 (1.156)	...	...	...

1/ These fish recovered in waters not completely checked by creel census.

Table 8. Numbers of Marked Rainbow Trout of Legal Size Recovered at Various Distances From Planting Localities on the Pine River From the Release of July 19, 1939.

(Figures in parentheses are migration indices.)

Locality of Planting	Two-week Period	Distance in miles upstream from locality of release				Distance in miles downstream from locality of release		
		Over 5	3 to 5	1 to 3	0 to 1	1 to 3	3 to 5	Over 5
Walker Bridge Camp Ground	July 8-21	...	...	...	...	...	...	...
	July 22-Aug. 4	...	1 (0.054)	...	18 (0.904)	3 (0.114)	...	...
	Aug. 5-18	...	...	1 (0.068)	7 (0.349)	1 (0.058)	...	1/ 1
	Aug. 19-Sept. 4	...	...	...	6 (0.339)	1 (0.084)	...	...
Lincoln Bridge Camp Ground	July 8-21	...	...	...	2 (0.087)	...	...	...
	July 22-Aug. 4	...	...	1 (0.043)	22 (0.861)	...	...	1 (0.145)
	Aug. 5-18	...	...	...	4 (0.256)	...	...	...
	Aug. 19-Sept. 4	...	...	1 (0.053)	5 (0.395)	...	...	...
Elm Creek Camp Ground	July 8-21	...	...	...	...	...	...	...
	July 22-Aug. 4	1 (0.042)	1 (0.038)	1 (0.200)	7 (0.375)	1 (0.076)	...	...
	Aug. 5-18	...	...	1 (0.163)	12 (0.509)	1 (0.114)	...	...
	Aug. 19-Sept. 4	...	...	...	13 (0.622)	...	...	...
Poplar Grove Camp Ground	July 8-21	...	...	...	7 (0.914)	...	...	...
	July 22-Aug. 4	2 (0.088)	...	...	11 (1.802)	...	...	...
	Aug. 5-18	1 (0.057)	...	...	8 (1.137)	...	...	...
	Aug. 19-Sept. 4	...	...	1 (0.055)	9 (0.132)	...	...	...

1/ This fish was recovered from a part of the stream on which data on hours of fishing were not available.

Table 9. Recoveries Of Marked Fish From 1938 Releases Taken During the 1939 Trout Season, Pine River

Two-week Period	April 1, 1938 Release		May 25, 1938 Release		July 15, 1938 Release
	Brook	Rainbow	Brook	Rainbow	Rainbow
April 29-May 12	1	1	1	2	5
May 13-26	...	1	...	...	2
May 27-June 9	...	...	...	...	...
June 10-23	...	...	...	1	...
June 24-July 7	...	...	...	1	...
July 8-21	...	...	...	1	...
July 22-Aug. 4	...	...	...	...	...
Aug. 5-18	...	...	...	...	...
Aug. 19-Sept. 4	...	1	...	...	...
Total recoveries - 1939	1	3	1	5	7
Total recoveries - 1938	349	192	516	441	236
Total recoveries to date	350	195	517	446	243
Total planted - 1938	1,000	500	1,000	1,000	500
Recovery percentage to date	35.0	39.0	51.7	44.6	48.6

Table 10. Calculated Number of Marked Trout Released in 1938 in the Pine River Surviving to the 1939 Trout Season

(Based on the assumption that the percentages of recovery on both 1938 and 1939 plantings are the same.)

Item	Month of release in 1938 and species of trout				
	April Brook [1]	April Rainbow [1]	May Brook [1]	May Rainbow	July Rainbow
Percentage of fish of 1939 planting recovered in same season	39.6	61.6	41.3	61.6	61.6
Number of fish planted in 1938 and recovered in 1939	1	3	1	5	7
Calculated number of fish planted in 1938 and surviving to the 1939 season	3	5	2	8	11
Number of fish in 1938 planting not captured in 1938	651	307	484	559	264
Percentage of survival to 1939	0.15	1.63	0.48	1.43	4.17

[1] Since plantings of these species were not made in these months in 1939, recovery percentages quoted for 1939 are seasonal averages for the 1939 season.

Table 11. Intensive Creel Census Data, 1939 Trout Season, For the Pigeon River

Date	Total No. of Fishermen	No. Taking No Fish	No. of Hours Fished	Legal-sized Fish Caught				Catch Per Hour	Illegal-fish Caught				No. of Fishermen Seen But Not Contacted
				Brook	Rainbow	Brown	Total		Brook	Rainbow	Brown	Total	
April 29-May 12	215	150	534.75	145	27	20	192	0.36	30	2	...	32	...
May 13-26	210	85	673.00	388	62	30	480	0.74	205	9	6	220	...
May 27-June 9	375	143	1,254.50	861	161	69	1,091	0.87	713	93	45	851	6
June 10-23	331	175	1,027.00	425	65	12	502	0.47	386	23	8	417	10
June 24-July 7	340	205	1,046.75	183	108	30	321	0.31	350	57	56	463	19
July 8-21	182	128	430.75	54	29	15	98	0.23	242	77	7	326	13
July 22-Aug. 4	200	118	533.50	60	80	19	159	0.30	211	37	11	259	34
Aug. 5-18	140	106	333.75	24	21	6	51	0.15	134	13	7	154	7
Aug. 19-Sept. 1	181	120	545.50	78	51	14	143	0.26	225	30	12	267	...
Sept. 2-4	39	19	117.00	27	19	4	50	0.43	6	4	5	15	...
Total	2,213	1,249	6,496.50	2,245	623	219	3,087	0.48	2,502	345	157	3,004	89

Table 12. Average Total Length in Inches of Trout in 1939 Census From the Pigeon River As Measured By Census Clerks

Two-week Period	Brook Trout		Rainbow Trout		Brown Trout	
	Number	Average Length	Number	Average Length	Number	Average Length
April 29-May 12	100	8.1	26	8.0	8	9.0
May 13-26	350	8.0	66	9.5	28	8.8
May 27-June 9	832	8.1	163	8.7	64	8.6
June 10-23	382	8.0	59	8.8	13	10.6
June 24-July 7	184	8.0	105	9.0	27	8.9
July 8-21	54	8.4	32	9.9	9	11.4
July 22-Aug. 4	60	8.1	73	9.4	17	9.8
Aug. 5-18	22	8.8	23	9.2	6	9.3
Aug. 19-Sept. 4	88	8.0	58	8.6	9	8.4
Totals and averages	2,072	8.1	605	9.0	181	9.1

Table 13. Recovery of 1938-1939 Plantings of Tagged Brown and Rainbow Trout of Legal Size From Pigeon River, 1939 Trout Season

Period of Recovery	November, 1938		April, 1939		June, 1939		July, 1939	
	Brown	Rainbow	Brown	Rainbow	Brown	Rainbow	Brown	Rainbow
April 29-May 12	3	...	5	3	...	...	...	...
May 13-26	4	[1] 3	8	20	...	...	...	...
May 27-June 9	6	...	12	15	...	...	...	...
June 10-23	...	...	3	4	4	5	...	...
June 24-July 7	[1] 1	...	2	3	17	26	...	...
July 8-21	...	...	1	1	6	15	...	1
July 22-Aug. 4	...	...	2	1	5	9	5	[1] 5
Aug. 5-18	...	...	...	...	5	4	...	...
Aug. 19-Sept. 1	2	...	1	...	...	2	...	11
Sept. 2-4	...	...	...	...	2	...	...	3
Total recovered [3]	16	3	34	[2] 50	39	61	5	20
Total number planted	500	500	500	500	250	250	250	250
Percentage of recovery	3.2	0.6	6.8	10.0	17.6	22.4	2.0	8.0
Percentage of total catch	7.3	0.5	15.5	8.0	20.1	9.0	2.3	3.2

[1] One tag number uncertain

[2] Added 3 tagged rainbow, numbers known, but not date of recovery.

[3] Tag number lost from 1 rainbow, add to total.

Table 14. Numbers of Tagged Brown Trout of Legal Size Recovered By Anglers From The Pigeon River During the 1939 Trout Season at Various Distances From the Localities of Planting

(The tagged fish were released at Vanderbilt Bridge, New Headquarters and Old Headquarters Bridge April 1, 1939. Figures in parentheses are migration indices.)

Two-week Period	Distance in miles upstream from locality of release		Distance in miles downstream from locality of release		
	3 to 5	1 to 3	0 to 1	1 to 3	3 to 5
April 29-May 12	...	...	4 (0.024)	1 (0.002)	...
May 13-26	...	...	6 (0.054)	2 (0.019)	...
May 27-June 9	...	1/ 1	9 (0.043)	2 (0.009)	...
June 10-23	...	...	3 (0.014)	...	...
June 24-July 7	...	1/ 1	1 (0.007)	...	...
July 8-21	...	...	1 (0.012)	...	...
July 22-Aug. 4	...	...	2 (0.020)	...	...
Aug. 5-18	...	...	...	...	...
Aug. 19-Sept. 4	...	...	1 (0.006)	...	...

1/ Recovered at Lansing Club dam or between Lansing Club dam and Vanderbilt Road Bridge, where no data are available on fishing effort.

Table 15. Numbers of Tagged Rainbow Trout of Legal Size Recovered by Anglers From the Pigeon River During the 1939 Trout Season at Various Distances From the Localities of Planting

(The tagged fish were released on April 1, 1939 at the Vanderbilt Bridge, New Headquarters, and Old Headquarters Bridge. Figures in parentheses are migration indices.)

Two-week Period	Distance in miles upstream from locality of planting		Distance in miles downstream from locality of planting			
	3 to 5	1 to 3	0 to 1	1 to 3	3 to 5	5 to 15
April 29-May 12	...	...	1 (0.006)	1 (0.007)	...	1/ 1
May 13-26	...	...	12 (0.107)	4 (0.038)	1 (0.028)	1/ 3
May 27-June 9	...	...	6 (0.029)	6 (0.029)	1 (0.007)	1/ 1
June 10-23	...	...	3 (0.014)	1 (0.006)	1 (0.018)	...
June 24-July 7	...	...	1 (0.008)	1 (0.006)	...	1/ 1
July 8-21	...	...	1 (0.012)	...	...	...
July 22-Aug. 4	...	...	1 (0.010)	...	...	...
Aug. 5-18	...	...	...	...	...	...
Aug. 19-Sept. 4	...	...	...	...	...	...

1/ No data on fishing hours available on these recoveries, as they were taken outside census area.

Table 16. Intensive Creel Census Data, 1939 Trout Season, For the North Branch of the Au Sable River

Date	Total No. of Fishermen	No. Taking No Fish	Total Hours Fished	Legal-sized Fish Caught				Catch Per Hour	Illegal-sized Fish Caught				No. of Fishermen Seen But Not Contacted
				Brook	Rainbow	Brown	Total		Brook	Rainbow	Brown	Total	
April 29-May 12	291	164	889.25	373	1	22	396	0.45	246	...	9	255	16
May 13-26	214	126	591.00	164	3	18	185	0.31	400	...	13	413	29
May 27-June 9	240	175	670.25	123	1	17	141	0.21	426	1	4	431	25
June 10-23	249	145	669.50	276	3	77	356	0.53	347	...	1	348	17
June 24-July 7	284	177	813.00	259	3	74	336	0.41	248	1	1	250	35
July 8-21	212	132	562.50	250	4	69	323	0.57	213	...	12	225	19
July 22-Aug. 4	203	128	543.25	235	...	59	294	0.54	274	...	27	301	64
Aug. 5-18	161	107	428.00	124	...	25	149	0.35	97	...	11	108	108
Aug. 19-Sept. 1	218	136	552.00	206	1	19	226	0.41	128	...	...	128	88
Sept. 2-4	62	46	191.75	21	1	8	30	0.16	13	...	5	18	21
Total	2,134	1,336	5,910.50	2,031	17	388	2,436	0.41	2,392	2	83	2,477	422

Table 17. Average Total Length in Inches of Trout in 1939 Census From the North Branch of the Au Sable River Area As Measured By Census Clerks

Two-week Periods	Brook Trout		Rainbow Trout		Brown Trout	
	Number	Average Length	Number	Average Length	Number	Average Length
April 29-May 12	348	8.1	1	7.0	19	11.8
May 13-26	153	8.1	3	9.2	24	10.5
May 27-June 9	117	8.0	1	7.0	16	11.9
June 10-23	265	7.6	3	7.4	71	9.3
June 24-July 7	240	7.6	3	11.3	70	11.8
July 8-21	192	7.5	2	7.5	47	10.7
July 22-Aug. 4	184	7.5	...	...	56	10.4
Aug. 5-18	91	7.4	...	...	24	9.4
Aug. 19-Sept. 4	234	7.5	1	18.8	25	10.2
Totals and averages	1,824	7.8	14	9.5	353	10.5

Table 18. Number of Recoveries From the 1938-1939 Plantings of Marked Brook Trout of Legal Size in the North Branch of the Au Sable River During the 1939 Trout Season

Two-week Period	1938 Fall Planting		1939 Spring Planting		1938 Fingerling Fall Release		Fin Clipped, Fin Not Recorded	Totals
	Tagged	Fin-clipped	Tagged	Fin-clipped	Wild	Hatchery		
April 29-May 12	26	7	81	18	4	3	40	179
May 13-26	4	5	19	7	...	...	7	42
May 27-June 9	1	...	10	1	...	1	...	13
June 10-23	1	...	5	...	...	...	1	7
June 24-July 7	...	...	3	1	...	1	1	6
July 8-21	...	...	1	1	...	...	1	3
July 22-Aug. 4	...	...	...	...	...	...	...	...
Aug. 5-18	...	...	...	...	...	...	...	...
Aug. 19-Sept. 4	...	...	...	...	...	...	...	...
Total recoveries	32	12	119	28	4	5	50	250
Number planted	500	500	500	500	1,500	1,500	1,000	
Percentage recovered	6.4	2.4	23.8	5.6	0.2	0.3	5.0	
Percentage of total catch	2.2		7.2		0.2	0.2	2.4	12.3

Table 19. Numbers of Marked Brook Trout of Legal Size Recovered by Anglers From the North Branch of the Au Sable River During 1939 Trout Season at Various Distances From the Locality of Planting

(Planting made on November 1, 1938 at Twin Bridges. Figures in parentheses are migration indices.)

Two-week Period	Distance in miles downstream from locality of release			Distance in miles upstream from locality of release		
	Over 2	1 1/2 to 2	1/4 to 1 1/2	0 to 1/4	1/4 to 3/4	3/4 to 1 3/4
April 29-May 12	3[1]	19 (0.070)	2 (0.020)	7 (0.038)	2 (0.064)	...
May 13-26	...	5 (0.031)	3 (0.056)	...	1 (0.030)	...
May 27-June 9	...	...	...	1 (0.013)	...	...
June 10-23	...	...	...	1 (0.009)	...	...
June 24-July 7	...	...	...	...	...	...
July 8-21	...	...	...	...	...	...
July 22-Aug. 4	...	...	...	...	...	...
Aug. 5-18	...	...	...	...	...	...
Aug. 19-Sept. 4	...	...	...	...	...	...

[1] These fish were recovered below Lovells where no data were available on fishing hours.

Table 20. Numbers of Marked Brook Trout of Legal Size Recovered by Anglers From the North Branch of the Au Sable River During the 1939 Trout Season at Various Distances From the Locality of Planting

(Planting made on March 29, 1939 at Twin Bridge. Figures in parentheses are migration indices.)

Two-week Period	Distance in miles downstream from locality of release			Distance in miles upstream from locality of release		
	Over 2	1 1/2 to 2	1/4 to 1 1/2	0 to 1/4	1/4 to 3/4	3/4 to 1 3/4
April 29-May 12	...	73 (0.267)	4 (0.041)	20 (0.097)	...	2 (0.017)
May 13-26	...	14 (0.094)	5 (0.040)	6 (0.050)	1 (0.032)	...
May 27-June 9	1/ 1	6 (0.034)	3 (0.022)	1 (0.013)	...	...
June 10-23	1/ 1	1 (0.006)	1 (0.008)	2 (0.020)	...	...
June 24-July 7	...	2 (0.011)	1 (0.005)	1 (0.011)	...	...
July 8-21	...	1 (0.009)	...	1 (0.012)	...	...
July 22-Aug. 4	...	...	...	...	...	...
Aug. 5-18	...	...	...	...	...	...
Aug. 19-Sept. 4	...	...	...	...	...	...

1/ These fish recovered below Lovells where no data were available on the fishing hours.

Table 21. Intensive Creel Census Data, 1939 Trout Season, For the Little Manistee River

Date	Total No. of Fishermen	No. Taking No Fish	No. of Hours Fished	Legal-sized Fish Caught				Catch Per Hour	Illegal-sized Fish Caught				No. of Fishermen Seen But Not Contacted
				Brook	Rainbow	Brown	Total		Brook	Rainbow	Brown	Total	
April 29-May 12	137	88	562.75	63	40	60	163	0.29	33	9	7	49	36
May 13-26	67	45	273.50	24	9	15	48	0.18	22	57	56	135	22
May 27-June 9	80	63	330.50	31	16	10	57	0.17	40	127	31	198	21
June 10-23	39	17	206.75	15	49	29	93	0.45	21	111	37	169	2
June 24-July 7	31	14	95.25	6	17	18	41	0.43	4	123	16	143	8
July 8-21	31	13	91.50	25	27	16	68	0.74	...	71	1	72	7
July 22-Aug. 4	18	3	76.00	15	21	15	51	0.67	...	36	4	40	7
Aug. 5-18	46	18	137.50	26	46	23	95	0.69	3	61	...	64	14
Aug. 19-Sept. 1	38	17	109.00	14	45	17	76	0.70	...	34	...	34	...
Sept. 2-4	4	2	10.00	1	...	2	3	0.30	...	...	...	...	...
Total	491	280	1,892.75	220	270	205	695	0.37	123	629	152	904	117

Table 22. Average Total Length in Inches of Trout in 1939 Census From the Little Manistee River, Area, As Measured By Census Clerks

Two-week Periods	Brook Trout		Rainbow Trout		Brown Trout	
	Number	Average Length	Number	Average Length	Number	Average Length
April 29-May 12	22	8.9	38	10.2	58	9.8
May 13-26	19	9.7	9	9.6	15	9.5
May 27-June 9	22	8.3	15	8.4	8	11.1
June 10-23	15	8.5	23	8.0	27	8.9
June 24-July 7	4	7.2	16	10.0	17	8.5
July 8-21	1/ 24	8.1	22	8.0	15	9.7
July 22-Aug. 4	1/ 15	8.8	20	8.5	15	8.4
Aug. 5-18	26	9.0	40	7.7	23	9.8
Aug. 19-Sept. 4	15	9.0	36	8.1	19	9.7
Totals and average	162	8.7	219	8.2	197	9.5

1/ All of these fish were tagged trout planted shortly before.

Table 23. Numbers of Tagged Trout of Legal Size Recovered By Anglers From Plantings During the 1939 Trout Season From the Little Manistee River

Two-week Period	Date of Planting, Species of Trout		
	June, 1939	July, 1939	
	Brown	Brown	Brook
April 29-May 12	...	...	...
May 13-26	...	...	...
May 27-June 9	...	...	...
June 10-23	8	...	...
June 24-July 7	5	...	...
July 8-21	17	11	29
July 22-Aug. 4	4	2	19
Aug. 5-18	2	12	22
Aug. 19-Sept. 1	5	11	10
Sept. 2-4	...	2	1
All recoveries	41	38	81
Recovered in census area	35	29	67
Total planted	250	250	250
Percentage recovery in census area	14.0	11.6	26.8
Percentage of total catch in census area	17.2	14.2	30.4

Table 24. Intensive Creel Census Data, 1939 Trout Season, for Canada Creek

Date	Total No. of Fishermen	No. Taking No Fish	No. of Hours Fished	Legal-sized Fish Caught				Catch Per Hour	Illegal-sized Fish Caught				No. of Fishermen Seen But Not Contacted
				Brook	Rainbow	Brown	Total		Brook	Rainbow	Brown	Total	
April 29-May 12	59	37	135.00	34	5	...	39	0.29	4	...	1	5	...
May 13-26	40	20	102.50	41	3	2	46	0.45	19	...	...	19	...
May 27-June 9	55	27	165.50	77	...	...	77	0.45	14	...	...	14	...
June 10-23	33	21	87.75	22	...	...	22	0.25	54	...	...	54	...
June 24-July 7	43	21	190.00	40	2	...	42	0.22	104	...	...	104	6
July 8-21	19	12	50.25	11	...	...	11	0.22	20	...	...	20	3
July 22-Aug. 4	19	12	55.50	20	...	...	20	0.36	49	...	...	49	1
Aug. 5-18	12	8	31.50	6	...	...	6	0.19	10	...	...	10	...
Aug. 19-Sept. 1	7	5	13.00	2	...	...	2	0.15	...	...	...	...	1
Sept. 2-4	3	2	10.00	3	...	...	3	0.30	...	...	...	...	...
Total	290	165	841.00	256	10	2	268	0.32	274	...	1	275	11

Table 25. Average Total Length in Inches of Trout in the 1939 Census From Canada Creek, As Measured by Census Clerks

Two-week Periods	Brook Trout		Brown Trout		Rainbow Trout	
	Number	Average Length	Number	Average Length	Number	Average Length
April 29-May 12	27	8.0	...	...	4	7.2
May 13-26	36	9.3	2	7.2	3	7.5
May 27-June 9	77	8.3	...	...	...	...
June 10-23	22	8.4	...	...	...	...
June 24-July 7	39	8.7	...	...	...	...
July 8-21	11	8.0	...	...	...	...
July 22-Aug. 4	19	7.8	...	...	...	...
Aug. 5-18	6	8.4	...	...	...	...
Aug. 19-Sept. 4	5	8.5	...	...	...	...
Totals and averages	242	8.4	2	7.2	7	7.3

Table 26. Intensive Creel Census Data, 1939 Trout Season, For White River

Date	Total No. of Fishermen	No. Taking No Fish	No. of Hours Fished	Legal-sized Fish Caught				Catch Per Hour	Illegal-sized Fish Caught				No. of Fishermen Seen But Not Contacted
				Brook	Rainbow	Brown	Total		Brook	Rainbow	Brown	Total	
April 29-May 12	249	125	907.50	419	...	...	419	0.46	3,647	...	...	3,647	14
May 13-26	116	58	349.25	156	...	...	156	0.45	1,265	...	1	1,266	7
May 27-June 9	124	55	424.25	207	...	...	207	0.49	1,440	...	...	1,440	2
June 10-23	111	31	400.50	358	...	...	358	0.89	1,387	...	...	1,387	...
June 24-July 7	67	15	222.50	244	...	...	244	1.10	445	...	...	445	...
July 8-21	52	15	156.50	109	...	...	109	0.70	174	...	...	174	...
July 22-Aug. 4	76	30	232.00	152	...	...	152	0.66	235	...	...	235	...
Aug. 5-18	50	21	136.00	82	...	...	82	0.60	98	...	...	98	...
Aug. 19-Sept. 1	50	18	158.50	75	...	...	75	0.47	90	...	...	90	...
Sept. 2-4	4	2	17.00	5	...	...	5	0.29	16	...	...	16	...
Total	899	370	3,004.00	1,807	...	...	1,807	0.60	8,797	...	1	8,798	23

Table 27. Average Total Length in Inches of Trout[1] Taken in White River Creel Census Area During the 1939 Trout Season, As Measured By Creel Census Clerks.

Two-week Period	Brook Trout	
	Number	Average Length
April 29-May 12	417	7.8
May 13-26	154	7.5
May 27-June 9	207	7.7
June 10-23	357	7.7
June 24-July 7	243	7.7
July 8-21	106	7.8
July 22-Aug. 4	148	8.1
Aug. 5-18	82	7.8
Aug. 19-Sept. 4	80	8.5
Total or Average	1,794	7.75

[1] Only brook trout were taken in White River creel census area.

Table 28. Percentage of Total Fishermen-Days Made Up Of Female Anglers From the Trout Streams Under Intensive Creel Census During 1939

Stream	Number of Female Anglers	Total Fishermen-Days	Percentage Female Anglers
Pine River [1]	319	3,933	8.1
Pigeon River	153	2,213	6.9
North Branch Au Sable River	188	2,134	8.8
Little Manistee River	28	491	5.7
White River	63	899	7.0
Canada Creek	19	290	6.6
Hunt Creek [2]	24	438	5.5
Totals	794	10,398	7.6

[1] Data from Walker Bridge to Wexford-Lake County line only.

[2] Data from Sections A, B, C, and D of Hunt Creek only.

Table 29. Percentage of Fishermen-days For Which the Number of Trout Taken Varied From 0 to 15. Data From Areas Under Intensive Creel Census, ~~Seasons~~ Seasons of 1938 and 1939

(Where dashes (---) are placed, it indicates that there was less than 0.5 per cent in that category.)

Stream	Number of fish taken by percentage of fishermen																Total Fishermen Days
1938	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Pine River [2]	42	17	11	6	5	4	3	2	2	1	1	1	1	1	1	2	4,638
Pigeon River	51	14	12	7	6	3	2	1	1	1	1	---	---	0	0	---	1,139
North Branch Au Sable River	52	15	10	8	5	4	2	1	1	---	1	---	---	---	---	---	1,622
Little Manistee River	41	16	11	9	5	4	3	2	3	2	1	1	---	---	---	1	769
Canada Creek	49	17	10	5	7	4	3	2	1	1	0	---	---	---	---	0	494
White River	42	18	9	7	6	4	4	3	2	1	1	1	---	---	---	1	870
All streams (1938)	45	17	11	7	5	4	3	2	1	1	1	1	---	---	---	1	9,532
1939																	
Pine River [2]	42	15	11	7	5	4	3	2	2	2	1	1	1	1	1	2	4,751
Pigeon River	56	14	11	6	3	2	1	1	1	1	1	1	---	---	---	1	2,213
North Branch Au Sable River	63	13	9	5	3	2	1	1	1	---	---	---	---	---	---	---	2,107
Little Manistee River	57	12	9	7	5	3	1	1	1	1	1	---	0	---	---	1	491
Canada Creek	57	21	11	6	2	1	1	---	1	---	0	---	0	0	0	0	290
White River	41	14	13	11	8	4	3	2	1	1	---	---	---	---	---	1	899
Hunt Creek [3]	56	15	13	6	3	2	2	1	1	---	0	0	0	0	---	0	428
All streams (1939)	50	14	10	7	5	3	2	2	1	1	1	1	1	---	---	1	11,179

[2] All data from Pine River used here (State Camp Grounds, Ne-Bok-Shone, and miscellaneous records.)

[3] Data used from Sections A, B, C, and D of Hunt Creek only.

Table 30. Summary of the Catch Per Hour by Species and the Catch Per Acre by Species on Intensively Censused Trout Streams During the 1939 Trout Season

River	Acreage Under Census	Total Hours of Fishing	Legal Trout Taken By Anglers				Catch Per Hour of Legal Trout				Catch Per Acre of Legal Trout			
			Brook	Brown	Rainbow	Totals	Brook	Brown	Rainbow	Total	Brook	Brown	Rainbow	Total
North Branch Au Sable	54.5	5,910.50	2,031	388	17	2,436	0.34	0.07	0.0+	0.41	37.3	7.1	0.3	44.7
Pigeon	65.4	6,496.50	2,245	219	623	3,087	0.35	0.03	0.10	0.48	34.3	3.3	9.5	47.2
Pine (Lake County)	57.5	15,104.75	1,434	13	5,953	7,400	0.10	0.0+	0.39	0.49	24.9	0.4	103.5	128.8
Little Manistee	17.7	1,892.75	220	205	270	695	0.12	0.11	0.14	0.37	12.4	11.7	15.3	39.2
Canada Creek	21.2	841.00	256	2	10	268	0.30+	0.0+	0.01+	0.32	12.1	0.1	0.5	12.7
White	10.4	3,004.00	1,807	...	...	1,807	0.60	...	...	0.60	173.8	...	...	173.8
Hunt Creek	4.3	780.50	492	...	...	492	0.63	...	...	0.63	114.4	...	...	114.4
Total or Average	231.0	34,030.00	8,485	827	6,873	16,185	0.25	0.02	0.20	0.47	36.7	3.6	29.7	71.0

Table 31. Calculated Fishing Intensities

Stream	Man-hours of fishing per acre per season 1937	1938	1939	Average
Pine [1]	147	293	263	234
Pigeon River	62	59	99	73
North Branch Au Sable	122	97	108	109
Little Manistee	146	180	107	144
Canada Creek	67	89	40	65
White River	...	335	289	312
Hunt Creek	...	...	182	182
Average	109	175	155	[2] 149

[1] Census incomplete

[2] Grand average of all data combined

Table 32. Comparison of Three Seasons of Intensive Creel Census on Certain Michigan Trout Waters

Streams Under Creel Census	Total Fisherman-Days			Total Hours Fished			Total Trout Taken			Catch Per Hour			Catch Per Fisherman-Day		
	1937	1938	1939	1937	1938	1939	1937	1938	1939	1937	1938	1939	1937	1938	1939
Pine River (Lake)	2,010	4,109	3,933	8,459	16,849	15,105	6,504	8,480	7,400	0.77	0.50	0.49	3.2	2.1	1.9
Pigeon River	1,153	1,139	2,213	4,031	3,831	6,497	1,912	1,735	3,087	0.50	0.45	0.48	1.7	1.5	1.4
North Branch Au Sable	1,904	1,622	2,134	6,664	5,308	5,911	3,143	2,539	2,436	0.50	0.48	0.41	1.7	1.6	1.1
Little Manistee	659	769	491	2,584	3,194	1,893	1,036	1,761	695	0.40	0.55	0.37	1.6	2.3	1.4
Canada Creek	455	494	290	1,411	1,891	841	673	769	268	0.50	0.41	0.32	1.5	1.6	0.9
White River	...	870	899	...	3,487	3,004	...	1,905	1,807	...	0.55	0.60	...	2.2	2.0
Hunt Creek	...	...	438	...	...	781	...	...	492	...	...	0.63	...	...	1.1
South Branch Pine (Alcona)	728	339	...	2,184	1,470	...	517	391	...	0.20	0.26	...	0.7	1.2	...
Total or Average	6,909	9,342	10,398	25,333	36,030	34,030	13,785	17,580	16,185	0.54	0.49	0.47	2.0	1.9	1.6

Table 33. Average Total Lengths of Trout Taken in Creel Censused Areas 1937 to 1939, Inclusive

(Figures in parentheses indicate number of specimens.)

Stream	Estimated Total Lengths 1937			Estimated Total Lengths 1938			Measured Total Lengths 1939 [1]		
	Brook Trout	Brown Trout	Rainbow Trout	Brook Trout	Brown Trout	Rainbow Trout	Brook Trout	Brown Trout	Rainbow Trout
Pine River (Lake)	9.0 (3,175)	...	9.7 (3,306)	8.1 (2,074)	9.2 (6)	8.2 (5,912)	7.9 (1,180)	8.9 (12)	8.3 (4,707)
Pigeon River	8.2 (1,202)	7.9 (144)	9.1 (566)	8.4 (1,132)	9.5 (124)	10.4 (479)	8.1 (2,072)	9.1 (181)	9.0 (605)
North Branch Au Sable	8.1 (2,525)	9.9 (542)	8.3 (76)	8.2 (2,063)	9.6 (393)	10.3 (82)	7.8 (1,824)	10.5 (353)	9.5 (14)
Little Manistee	8.3 (155)	8.7 (413)	8.5 (468)	8.4 (260)	9.6 (755)	8.8 (746)	8.7 (162)	9.5 (197)	8.2 (219)
Canada Creek	8.4 (665)	10.0 (3)	9.0 (5)	8.4 (767)	11.0 (2)	...	8.4 (242)	7.2 (2)	7.6 (8)
White River	No creel census			8.3 (1,903)	8.5 (2)	...	7.8 (1,796)	...	...
Hunt Creek	No creel census			No creel census			7.6 (434)	...	...
South Branch (Alcona)	7.8 (441)	9.1 (17)	7.9 (59)	8.1 (280)	9.0 (106)	7.9 (5)	No creel census		
Totals and averages	8.5 (8,163)	9.2 (1,119)	9.5 (4,480)	8.2 (8,479)	9.5 (1,388)	8.4 (7,224)	7.9 (7,708)	9.9 (745)	8.4 (5,553)

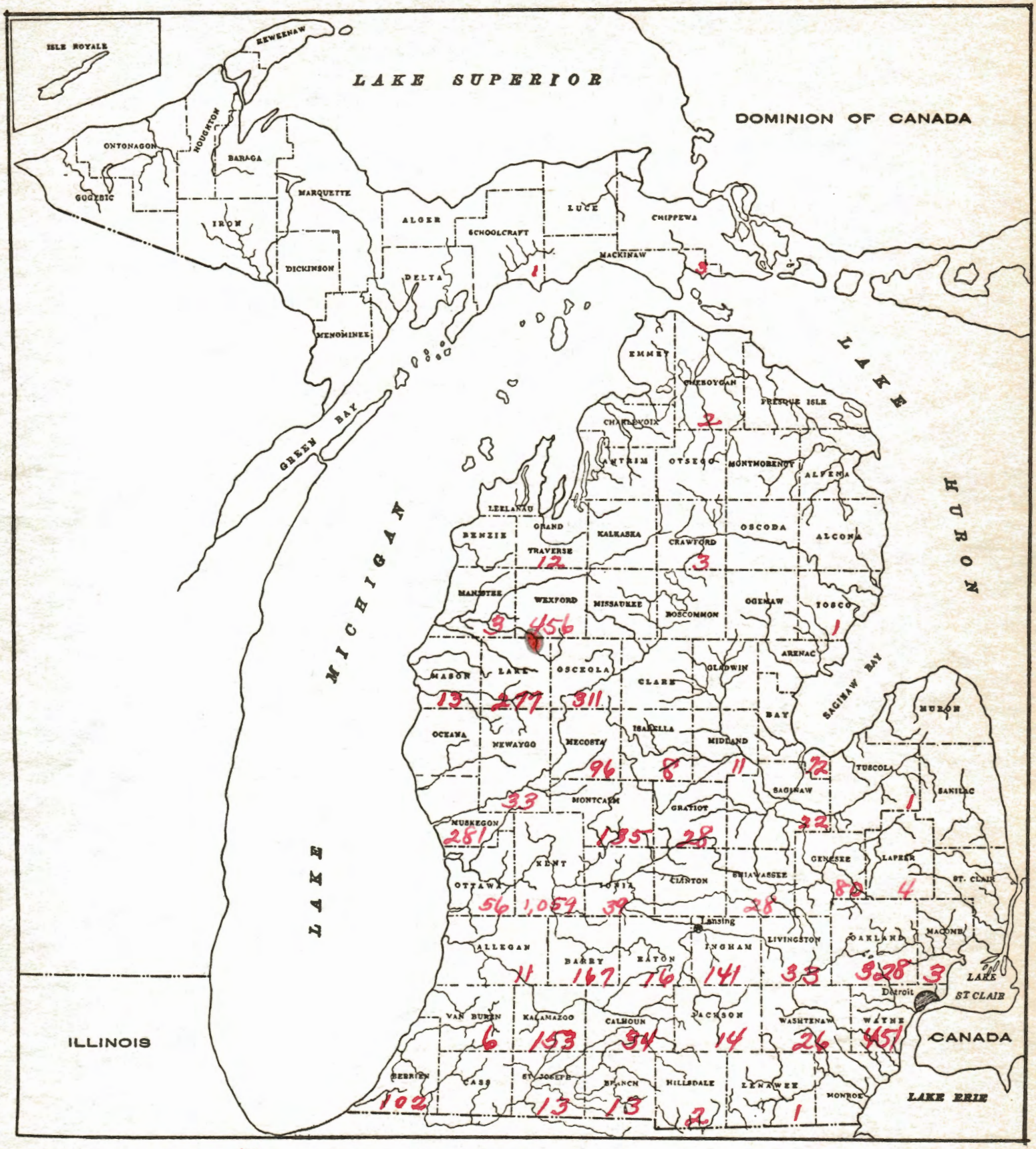
[1] 1939 averages are based on measurements of 90.8 per cent of the total brook trout catch, 90.0 per cent of the total brown trout catch and 80.7 per cent of the total rainbow trout catch.

Table 34. Total Lengths in Inches of Largest Trout Caught of Each Species on the Censused Trout Waters in 1939. (Measurements by creel census clerks.)

Stream	Brook Trout	Brown Trout	Rainbow Trout
Pine River	15.0	12.0	25.0
Pigeon River	16.5	22.0	23.0
North Branch Au Sable	12.0	24.1	18.8
Little Manistee River	16.0	17.9	24.0
Canada Creek	13.0	7.2	9.5
White River	15.2	...	...
Hunt Creek	11.3	...	...
Averages	14.1 (7)	16.6 (5)	20.1 (5)

Figure 1

Pine River - Residence - Summer 1939



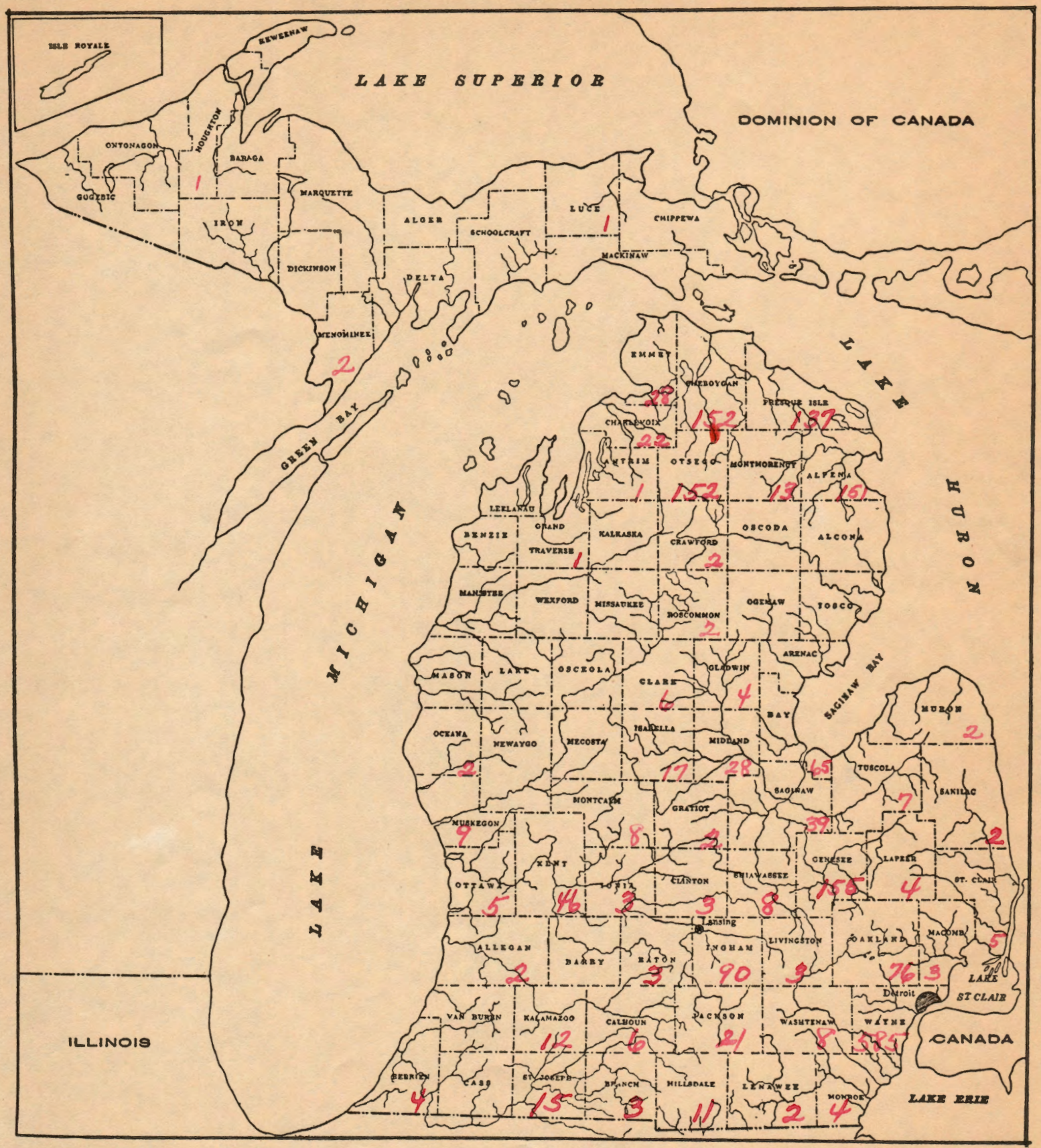
Unknown residence - 37

Out-of-state Fishermen

Colorado - 2	Missouri - 10	South Carolina - 1
Illinois - 28	New York - 1	South Dakota - 1
Indiana - 55	Oklahoma - 2	Tennessee - 1
Kentucky - 1	Ohio - 66	West Virginia - 1

Figure 2

Pigeon River - Residence - Summer 1939



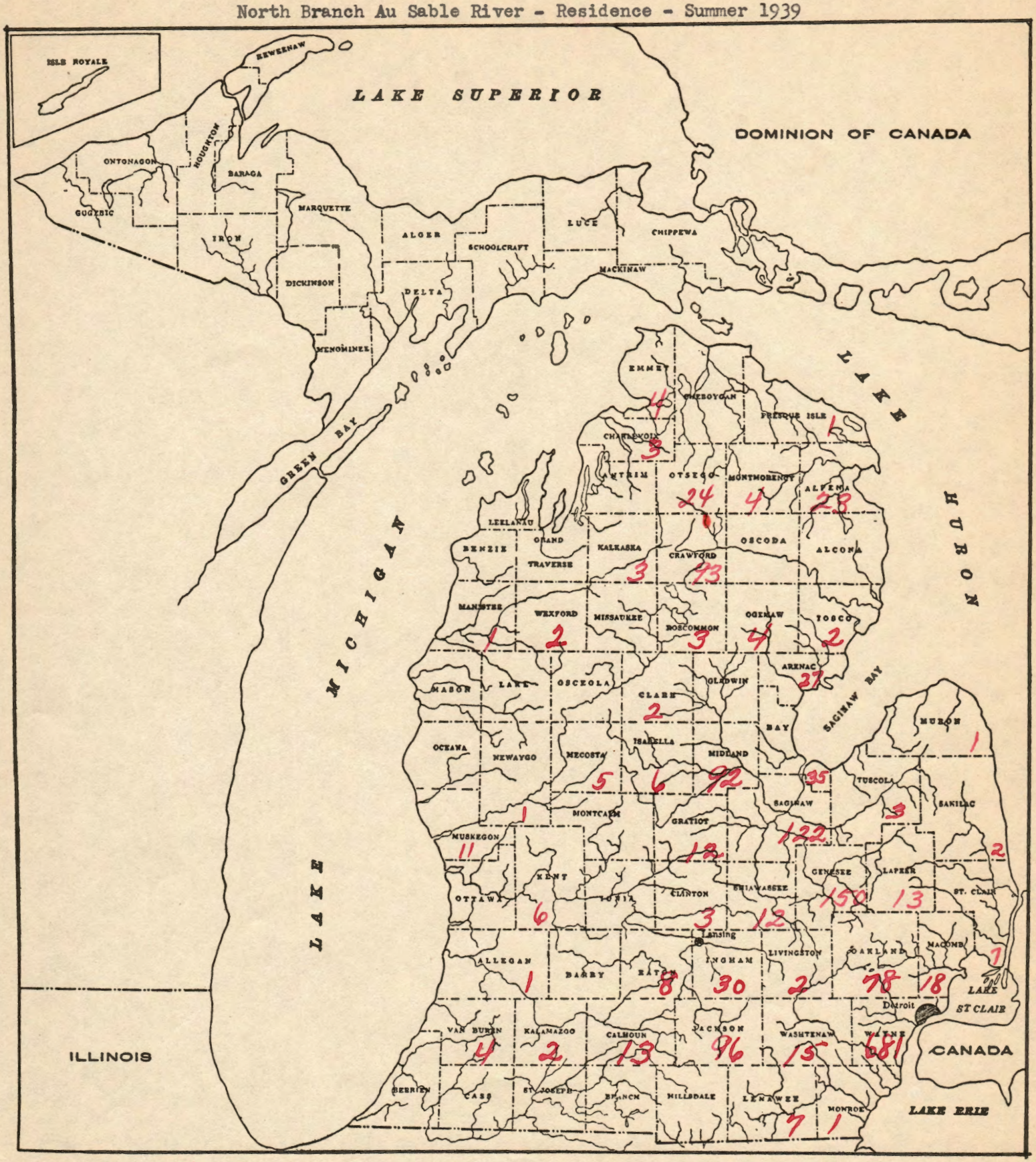
Unknown residence - 41

Out-of-state Fishermen

California - 4	Illinois - 15	New York - 2
Canada - 3	Indiana - 47	Ohio - 146
Connecticut - 2	Kentucky - 4	Pennsylvania - 10
Germany - 1	Missouri - 1	Oklahoma - 2

Figure 3

North Branch Au Sable River - Residence - Summer 1939



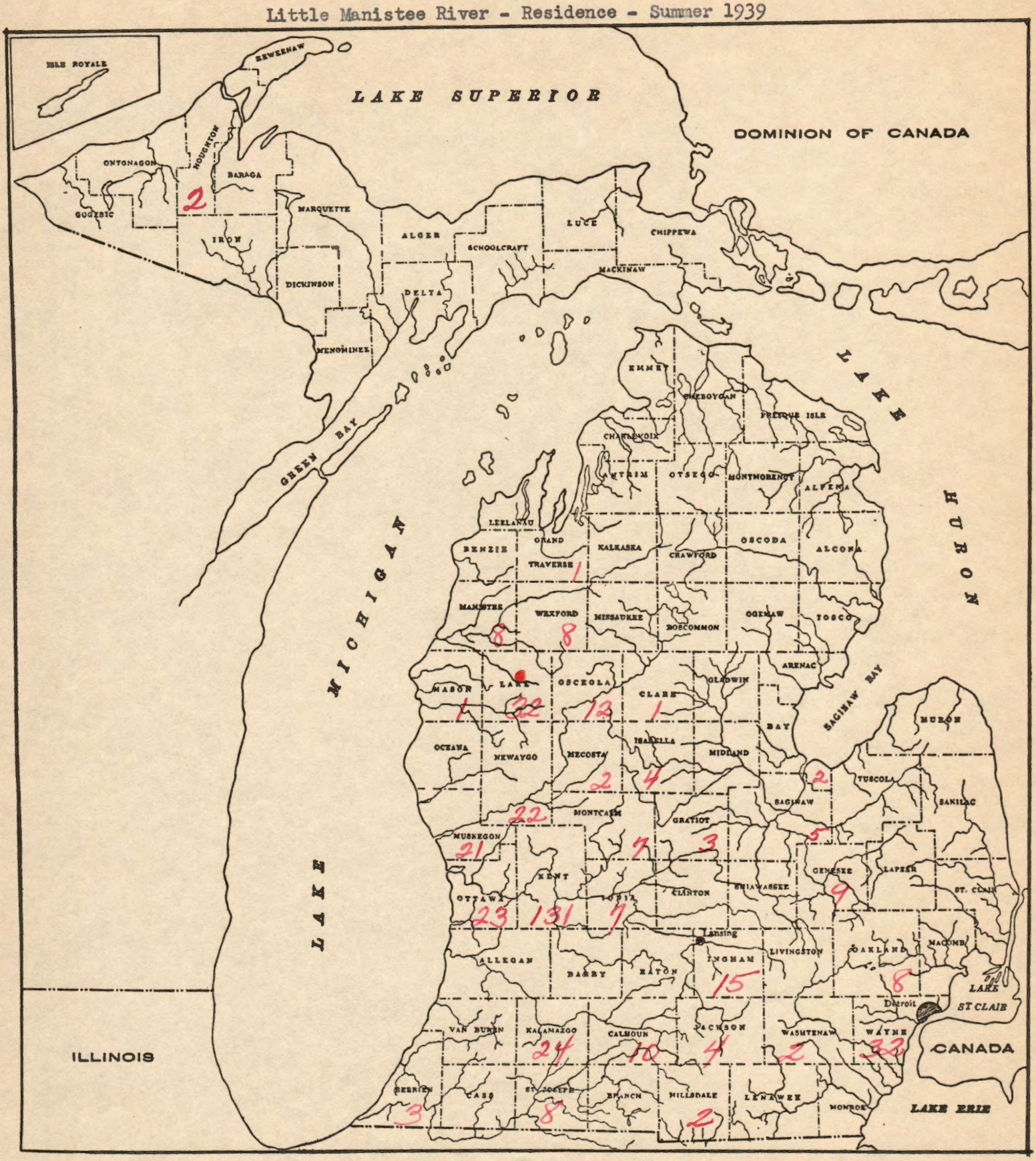
Unknown - 56

Out-of-state fishermen

California -	1	Indiana -	14	Oklahoma -	1
Canada -	1	Kentucky -	2	Pennsylvania -	12
Florida -	6	Massachusetts -	2	Texas -	2
Illinois -	19	Ohio -	358		

Figure 4

Little Manistee River - Residence - Summer 1939



Unknown residence - 26

Out-of-state Fishermen

Illinois -	14
Indiana -	22
Ohio -	18
Pennsylvania -	1
South Dakota -	1

Figure 5

Canada Creek - Residence - Summer 1939

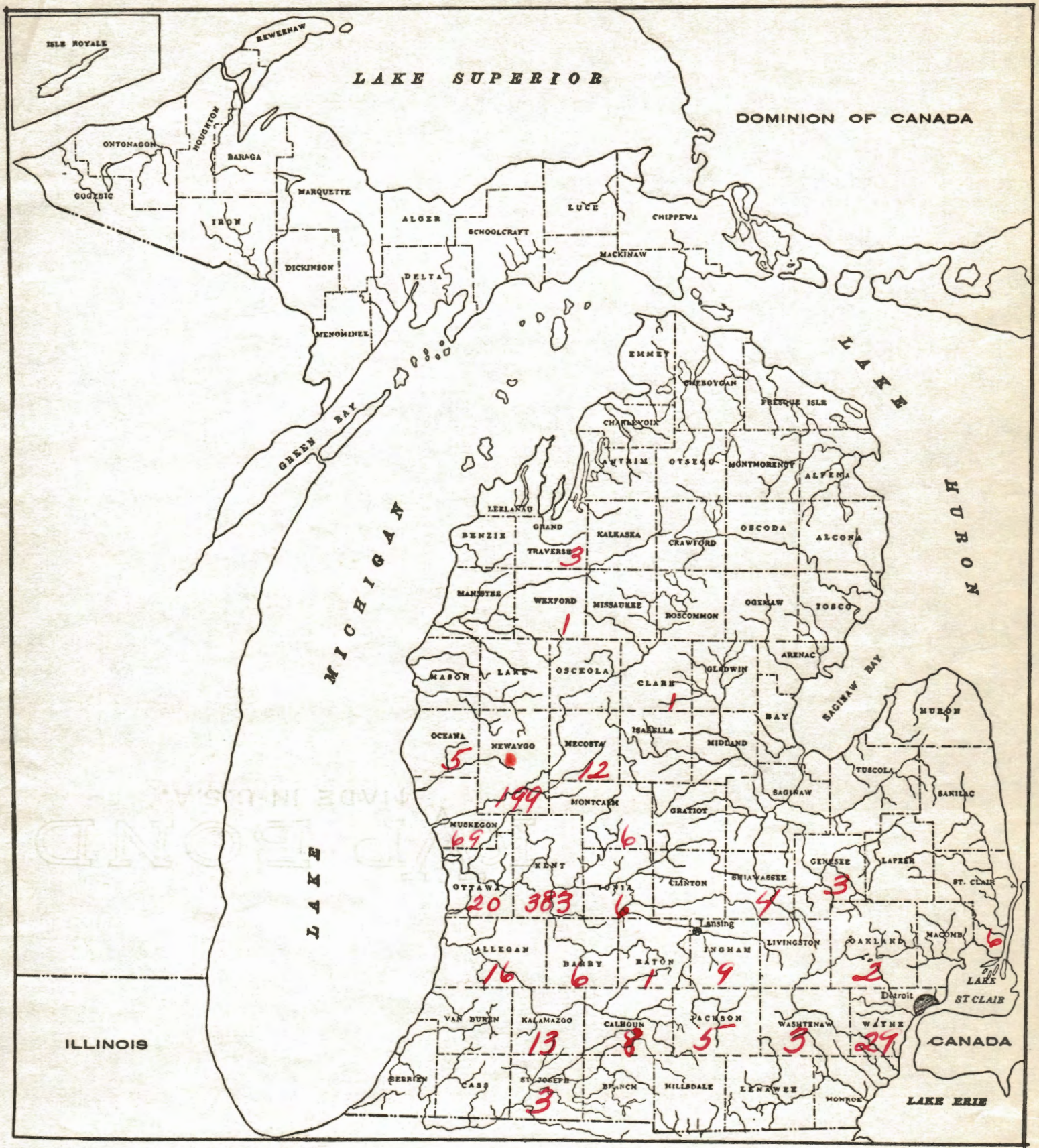
Unknown Residence - 6

Out-of-state Fishermen

Ohio - 4

Figure 6

White River - Residence - Summer 1939



Unknown Residence - 19

Out-of-State Fishermen

Illinois -	21	Pennsylvania -	1
Indiana -	19	Texas -	3
Kentucky -	2		
Ohio -	20		

Literature Cited

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