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September 30, 1952

Report No. 1349

THE INTENSIVE CREEL CENSUS OF THE EXPERIMENTAL WATERS OF THE HUNT CREEK DRAINAGE, 1951 SEASON

by

Karl E. Proshek and David S. Shetter

Abstract

The experimental waters of the Hunt Creek drainage in south-central Montmorency County were under intensive creel census for the thirteenth consecutive season during 1951. Under terms of a Conservation Commission order, all angling was again by free daily permit, which enabled the staff to obtain complete catch records with a minimum of travel and interference with other duties.

A total of 803 permits were issued for 512 different individuals. Of the applicants, 76.4 percent were license holders, 11.1 percent were wives, and 12.5 percent were anglers under the age of 17.

The experimental sections on Hunt Creek proper all were under a 15-fish, 7-inch minimum size limit in 1951. The total acreage covered by creel census was 7.02. This water was subjected to 681 trips involving 1,388 hours of fishing. The catch of legal brook trout amounted to 555 fish weighing 93.89 pounds. The average size of the fish captured was 7.8 inches and 0.17 pound. The quality indices thus were 0.40 fish per hour, and 0.068 pound per hour. The angling pressure

amounted to 197.72 hours per acre, and with the addition of 7 sublegal fish weighing 0.67 pound, the per-acre yield totalled 80 trout weighing 13.47 pounds.

Section D, containing several beaver ponds, again was the most heavily fished (over 500 hours), and yielded the most fish (206) and the largest fish (average size, 8.4 inches, 0.21 pound). Nevertheless, it was noted that the yield in this section has declined appreciably in comparison with the yields of 1948, 1949 and 1950 (334, 342, 247 legal brook trout, respectively).

Fuller Creek and East Fish Lake Outlet, also under a 15-fish, 7-inch minimum size limit, furnished 110 fishing trips involving 246.25 hours during which time 59 legal brook trout weighing 9.27 pounds were creeled. The average quality indices for the season were 0.24 fish per hour, 0.038 pound per hour, and the average size of the fish was 7.6 inches and 0.16 pound.

Hatchery-reared brook trout, survivors of the hooking experiments, were tagged and released in the experimental water to determine their effect on the angling. Only fish which appeared to be in good condition were used, and a total of 296 (208 of which were larger than 7 inches) were marked, and were classified as to prior hooking history. Thirty-three (15.87 percent) were later taken by anglers. Chi-square tests demonstrated no significant difference in the vulnerability to the anglers among non-hooked, bait-hooked or fly-hooked fish. Previously hooked fish moved downstream in significantly greater numbers than did the non-hooked fish. Known mortalities (aside from angling) to hooked trout exceeded the known mortalities to non-hooked fish, although not significantly.

East Fish Lake angling regulations were changed in 1951 to a 10-inch minimum size limit and a 5-fish-per-day creel limit. In 200 angling trips a total of 732.00 hours of fishing were recorded. This effort yielded 56 brook trout weighing 36.09 pounds, or on a per acre basis under a pressure of 45.75 hours, 3.5 brook trout and 2.26 pounds of trout were taken. Quality indices were 0.08 fish per hour and 0.049 pound per hour. The average size during 1951 was 11.9 inches, 0.64 pound. Common suckers continued to appear in the catch; 9 suckers weighing 7.70 pounds were removed by anglers

The 14.58-acre Fuller Creek Pond was lightly fished under the 5-fish, 10-inch minimum size limit initiated in 1951. Only 22 brook trout larger than 10 inches were creeled in 165.25 hours of angling on 65 trips. Quality indices were 0.13 trout per hour, 0.071 pound per hour.

The distribution of the trout catch among individual anglers again was studied by sorting the stream, lake, and beaver pond creel census records by individual anglers for the entire season. During 1951, over 62 percent of the individuals caught no fish from the streams, while 3.3 percent (13 individuals) who caught from 14 to 52 trout during the season removed 48.4 percent of the total stream catch. On East Fish Lake, 82.9 percent of the individuals were unsuccessful, and 5.7 percent (8 individuals) took home 69.6 percent of the total catch. From the Fuller Creek Pond, 75 percent of the anglers went home fishless, while 6.8 percent of the individuals captured 54.6 percent of the season's catch.

The fate of the legal trout population enclosed in 3.91 acres of Hunt Creek between the upper and lower bulkhead traps was followed

through creel census, weir records, mortality records, and the annual fall population study. During the period September, 1950 to September, 1951, it was estimated that the enclosed area had an increase of 511 legal trout, of which 209 remained at the end of the season (59 percent exploitation).

Comparison of the estimated legal trout populations of East Fish Lake and of Fuller Creek Beaver Pond with the anglers' catches during the past three years suggest that, since the inception of the 10-inch size limit in 1951, angling is removing only from 25.4 to 37.1 percent of the available legal trout in East Fish Lake, and about 26.8 percent from Fuller Creek Pond.

The resident anglers who fished the experimental waters in 1951 originated mainly from Wayne, Oakland, Montmorency, Genesee, Macomb, and Bay counties (315 out of 467 individuals), followed by residents from 28 other counties in the lower peninsula. Of the 45 non-residents using these waters, 27 were from Ohio, while the remainder came from 11 other states scattered across the continent.

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The creel census operations during the 1951 trout season marked the thirteenth consecutive year of this activity. Angling records were obtained from 2.31 miles of Hunt Creek (7.02 acres), 1.87 miles of Fuller Creek (3.57 acres), East Fish Lake (16 acres), and from the re-established Fuller Creek Beaver Pond (14.58 acres).

Method of collecting creel census data

As in 1949 and 1950, the experimental waters were posted with appropriate departmental signs. Angling was by daily permit issued free to all persons bearing a fishing license with a properly attached and endorsed trout stamp, or to minors under age 17 and wives of licensed anglers. Under the terms of the permit all anglers returned to the checking station at the conclusion of their fishing each day. Here the length, weight and a scale sample of each fish in the catch were taken, and the time and locality of fishing were recorded. Also numerous stomach samples were obtained from fish taken in Fuller Creek Pond and from brook trout from Fuller Creek, for a comparative study of the feeding habits and growth of fish living in these differing habitats (to be reported on by A. K. Adams).

Angling results, 1951

Eight hundred and three (803) angling permits were written for 512 different individuals for the various experimental waters during the 1951 trout season. These totals are very similar to those recorded in the previous two years under the permit system. The 1949 totals were 876 permits for 522 individuals and the 1950 totals were 875 permits for 519 individuals. Of the 803 permits, 614 (76.4 percent) were for licensed trout fishermen, 89 (11.1 percent) were for wives of licensed anglers, and 100 (12.5 percent) were for minors under 17 years of age. During the 1951 season 23.6 percent of the permit holders were wives and minors who could fish free-of-charge. In 1949 22.5 percent of all anglers were exempt from license fees, and in 1950 this figure was 20.6 percent.

Of the total number of permits issued, all anglers reported their angling. As far as is known all anglers who used the area secured permits.

Angling results experimental sections of Hunt Creek (2.31 miles, 7.02 acres)

The dimensions of the various sections, along with the angling regulations in force, are given in Table 1.

In Section Z, 129 angling trips were made, involving 322.00 hours, during which time 124 legal brook trout were caught which weighed 17.54 pounds.[1] (Table 2). The catch-per-hour and pounds-per-hour indices for 1951 were 0.39 fish and 0.054 pound, respectively. The average size of the brook trout creeled was 7.5 inches and 0.14 pound. On a per-acre basis anglers fished Section Z at the rate of 287.50 hours per acre and removed 111 legal trout weighing 15.66 pounds. Successful angling trips amounted to 49, or 38 percent of the total.

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[1] In Table 2, marked hatchery fish entering the catch have been excluded from computations. The totals concerning hatchery fish are given in parentheses in each table.

Table 1. Dimensions of the various experimental waters on the Hunt Creek drainage, with the angling regulations in force, 1951 trout season (Mileage is given in parentheses)

Experimental water	Dimensions		Area (acres)	1951 angling regulations
	Length (feet)	Average width (feet)		
Section Z	2,397 (0.45)	20.3	1.12	7 inches minimum size, 15 per day
Section A	2,577 (0.49)	24.3	1.44	7 inches minimum size, 15 per day
Section B	1,605 (0.30)	17.5	0.64	7 inches minimum size, 15 per day
Section C	2,700 # (0.51)	11.8	0.71 #	7 inches minimum size, 15 per day
Section D	2,896 (0.55)	50.0	3.11 *	7 inches minimum size, 15 per day
Totals experimental sections, Hunt Creek	12,175 (2.31)	25.1	7.02	7 inches minimum size, 15 per day
Fuller Creek below Fuller Creek Pond, including East Fish Lake outlet	9,875 (1.87)	15.7	3.57	7 inches minimum size, 15 per day
Fuller Creek Pond	...	...	14.58	10 inches minimum size, 5 per day
East Fish Lake	...	...	16.00	10 inches minimum size, 5 per day

Excluding 1,270 feet of Section C around experimental diversions which is closed to fishing. The figures given for acreage was determined from plane table maps.

* The area given is from a plane table map made in 1949, increased beaver activity undoubtably has increased the acreage slightly.

Table 2. Summary of angling statistics, experimental waters of the Hunt Creek drainage, 1951 trout season

Experimental water	Total angler-days [1]	Total hours of angling	Brook trout catch		Angling quality		Average size of brook trout	
			number	total pounds	catch per hour	pounds per hour	length (inches)	weight (pounds)
Hunt Creek	129 (80)	322.00	124	17.54	0.39	0.054	7.5	0.14
Section Z			(3)	(0.45)			(7.7)	(0.15)
Section A	87 (53)	187.75	83	11.38	0.44	0.061	7.4	0.14
			(8)	(1.22)			(7.9)	(0.15)
Section B	65 (45)	79.00	38	5.63	0.48	0.071	7.5	0.15
			(4)	(0.54)			(7.4)	(0.14)
Section C	167 (110)	299.00	104	16.11	0.35	0.054	7.6	0.15
			(10)	(1.60)			(7.9)	(0.16)
Section D	233 (153)	500.25	206	43.23	0.41	0.086	8.4	0.21
			(1)	(0.11)			(7.2)	(0.11)
Totals, averages, Hunt Creek	681 (441)	1,388.00	555	93.89	0.40	0.068	7.8	0.17
			(26)	(3.92)			(7.8)	(0.15)
Fuller Creek	110 (77)	246.25	59	9.27	0.24	0.038	7.6	0.16
			(20)	(2.86)			(7.6)	(0.15)
Fuller Creek Pond	65 (51)	165.25	22	11.77	0.13	0.071	11.0	0.53
East Fish Lake	200 (167)	732.00	56	36.09	0.08	0.049	11.9	0.64

[1] Figures in parentheses under "Total angler-days represent the numbers of unsuccessful angler-days. All other data in parentheses refer to the catch of marked hatchery-reared brook trout released during 1952.

In Section A, 87 angling trips were made, involving 187.75 hours of fishing, during which 83 legal brook trout were caught (Table 2). The total weight of the catch was 11.38 pounds. The average size of the 1951 catch was 7.4 inches and 0.14 pound. Angling quality indices were 0.44 trout per hour and 0.061 pound of trout per hour. The per-acre rate for Section A during 1951 was 130.38 hours of angling pressure with a catch of 58 trout weighing 7.90 pounds. Successful angling trips made up 39 percent of the total trips.

In Section B, 65 angling trips were made, involving 79.00 hours of angling, during which 38 legal trout were caught (Table 2). The total weight of the catch was 5.63 pounds. The average size of the 1951 catch was 7.5 inches and 0.15 pound. Angling quality indices were 0.48 trout per hour and 0.078 pound of trout per hour. On a per-acre basis, Section B was subjected to angling pressure at a rate of 123.44 hours and yielded 59 trout weighing 8.80 pounds. Successful angling trips comprised 31 percent of the total.

For the 5 years prior to the 1951 season, Section C was subjected to special angling, during which 6- to 7-inch trout were legal. This (1951) is the first angling season following the special regulation. The minimum size limit in Section C is again 7 inches. A total of 167 angling trips, involving 299.00 hours of angling effort, resulted in a catch of 104 legal brook trout weighing 16.11 pounds. The average size of these trout was 7.6 inches, and the average weight, 0.15 pound. The quality indices for Section C were 0.35 trout per hour weighing 0.059 pound per hour. On a per-acre basis, Section C was fished at a rate of 421.13 hours yielding 146 trout weighing 22.69 pounds. Successful angling trips made up 34 percent of the total.

Section D was subjected to several major changes during the 1951 season due to beaver activities. The season opened with 4 beaver dams

present. On May 1, 1951, the largest dam developed a leak at the deepest point (7 feet), so the pond lost nearly all of its water. It stayed in that condition until around July 16, 1951, when it was noted that a new dam about 1 foot high had been built about 30 feet below the leaky dam. In addition this large dam had been repaired and had regained all but about 2 feet of its former head. Another new dam, 18 inches high was located about 300 feet above the larger dam. Section D made a net gain of two small dams during the season, but lost the use of its largest dam for over two months during the season.

During 1951 Section D was the scene of 233 angling trips of which 80, or 34 percent were successful (Table 2). In 500.25 hours of angling 206 brook trout larger than 7 inches were creeled whose total weight was 43.23 pounds. As in Section C, special trout (6 to 6.9 inches), which had been legal during 1946-1950, were not legal during 1951. The angling quality indices were 0.41 trout per hour and 0.087 pound per hour.

In 1951, the 3.11 acres[2] of Section D supported an angling pressure of 160.85 hours per acre. The yield per acre was 66 legal trout weighing 13.90 pounds.

Angling returns continued to decline from the peak of 1948 and 1949 when Section D yielded 318 and 342 legal trout, respectively, plus 149 and 218 special (6.0 to 6.9 inch) trout, respectively.

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[2] This acreage figure has been used, although the water area was obviously fluctuating throughout the season due to beaver activity. It is the best figure available based on a plane table survey in 1949 by A. K. Adams

The combined records for the experimental sections of Hunt Creek (Sections Z, A, B, C and D) in 1951 are summarized in Table 3. This tabulation records the angling from 2.31 miles of stream with a water area of 7.02 acres. A total of 681 angling trips were made, of which 240 (35.2 percent) were successful. A total of 1,388.00 hours of angling (by coincidence the same as in 1950) resulted in a catch of 555 legal trout with a total weight of 93.89 pounds. The average size of the trout was 7.8 inches and 0.17 pound. The quality indices indicated an average catch per hour of 0.40 trout or 0.068 pound.

For the 1951 season, the angling pressure per acre for the experimental stream sections of Hunt Creek was 197.72 hours. This area yielded legal trout at a rate of 79 trout or 13.37 pounds per acre.

In addition to the legal take described above, the census clerks found a total of 7 sublegal trout in the creels. These trout averaged 6.6 inches and 0.10 pound. The total weight was 0.67 pound. The known sublegal take represents 1.25 percent of the total number caught in Hunt Creek.

The total trout take, legal and sublegal, by anglers amounted to 562 trout weighing 94.56 pounds. The average yield of legal and sublegal trout was 80 trout weighing 13.47 pounds per acre.

Angling results, Fuller Creek and East Fish Lake Outlet

During 1951 Fuller Creek was under a 7-inch minimum legal size limit. During the 5 years prior to 1951, all but the lowermost 0.22 mile was under the special regulation mentioned previously, which allowed 6- to 6.9-inch trout in the anglers catch. In Fuller Creek a total 110 angling trips were made involving 246.25 hours of angling, during which 59 legal trout were caught (Table 2). The total weight of

Table 3. Angling statistics, all experimental sections combined, Hunt Creek, 1951 trout season. Data in parentheses indicate the number of angling-days on which no legal trout were taken.

Date	Total angling days	Total hours of angling	Brook trout catch		Angling quality		Average weight pounds	Average length inches
			Number	Total pounds	Catch per hour	Pounds per hour		
April 28 to May 11	205 (143)	433.75	143	25.22	0.33	0.058	0.18	7.9
May 12 to 25	35 (23)	80.75	39	7.07	0.48	0.088	0.18	8.0
May 26 to June 8	35 (10)	79.25	61	9.49	0.77	0.120	0.16	7.6
June 9 to 22	39 (25)	88.75	25	4.10	0.28	0.046	0.16	7.7
June 23 to July 6	58 (33)	127.75	71	12.03	0.56	0.094	0.17	7.8
July 7 to 20	55 (30)	103.25	59	9.84	0.57	0.095	0.17	7.8
July 21 to August 3	51 (33)	110.25	32	5.61	0.29	0.051	0.18	7.8
August 4 to 17	80 (53)	143.25	47	7.61	0.33	0.053	0.16	7.8
August 18 to 31	65 (50)	108.50	40	7.24	0.37	0.067	0.18	8.0
September 1 to 4	58 (41)	112.50	38	5.68	0.34	0.050	0.15	7.6
Totals wild trout only	681 (441)	1,388.00	555	93.89	0.40	0.068	0.17	7.8
Hatchery trout	...	...	26	3.92	...	...	...	...

the catch was 9.27 pounds. The average size was 7.6 inches and 0.16 pound. Angling quality indices were 0.24 trout per hour or 0.038 pound per hour. On a per acre basis Fuller Creek received an angling pressure of 68.98 hours and yielded 17 trout weighing 2.60 pounds. Successful angling trips comprised 30 percent of the total.

Hatchery releases in the experimental waters

The hatchery trout planted in the experimental waters during 1951 had all been previously used in the hooking experiments.

During the 1951 angling season, a series of hooking experiments were conducted in two of the screened diversions of Section C. The purpose of these experiments was to compare mortalities resulting from hooking with baited hooks of several sizes with deaths resulting from hooking with Number 12 size artificial fly.

The planted trout had all been subjected to considerable handling prior to release in the stream. As a part of the hooking experiment, all were etherized and measured prior to release in the screened diversions. They were then subjected to a heavy angling pressure. In addition, the hooked trout suffered hooking injury and possible injury from the handling necessary to remove the hook and clip a fin. After the period of experimental angling, all trout were removed from the screened diversions using the electric shocker and were placed in a holding tank. Immediately before final release in the stream, they were etherized, measured and tagged.

A summary of the releases made in the enclosed waters of Hunt Creek is contained in Table 4. This table is a compilation of four plantings released in May and July. The data are classified so that comparisons

Table 4. A summary of data on hatchery brook trout released in the enclosed waters of Hunt Creek during the 1951 angling season. Figures in parentheses give data on legal trout only.

Item	Total plant	Angler caught		Known mortality		Moved out of Z bulkhead		Found during 1951 fall population study		Total known fate		Total unknown fate	
		Number	Percent of legal plant	Number	Percent of plant	Number	Percent of plant	Number	Percent of plant	Number	Percent of plant	Number	Percent of plant
Total not previously hooked	130 (74)	(9)	(12.16)	11 (5)	8.46	14 (9)	10.77	6 (1)	4.62	40 (24)	20.77	90 (50)	69.23
Total hooked by bait	72 (58)	(9)	(15.52)	15 (12)	20.83	13 (11)	18.06	1 (1)	1.39	38 (33)	52.78	34 (25)	47.22
Total hooked by fly	94 (76)	(15)	(19.74)	11 (10)	11.70	19 (15)	20.21	0	0.00	45 (40)	47.88	49 (36)	52.12
Total planted	296 (208)	(33)#	(15.87)	37 (27)	12.50	46 (35)	15.54	7 (2)	2.36	123 (97)	41.55	173 (111)	58.45

This total does not agree with the sum of the totals given for hatchery fish taken by angling in the various sections and in Fuller Creek because the other tables included hatchery fish from Fuller Creek whose hooking history was not recorded.

may be made on the basis of hooking history. All trout from the hooking experiment (i.e., those which were hooked and those which were not) received the same treatment (transportation, etherization, measuring, shocking) prior to release for public fishing except that resulting from the hooking and fin clipping of certain fish during the hooking experiments. The data are classified as (a) not hooked, (b) bait-hooked and (c) fly-hooked. The "not hooked" are those trout that evaded capture during the hooking experiments.

Neither the bait-hooked nor the fly-hooked trout differed significantly, in availability to the angler, from non-hooked trout (Chi-squares 0.09 and 1.09, respectively). There was no significant difference in availability between all hooked fish and all non-hooked fish (Chi-square, 0.79), or between fly-hooked and bait-hooked fish (Chi-square, 0.013).

The data indicate that previously hooked trout were more inclined to migrate, as both bait-hooked and fly-hooked trout moved through Section Z Bulkhead (which is 1 to 1 3/4 miles below the points of release) at a greater rate than not-hooked trout (Chi-square 4.08).

More hooked trout were found dead than not-hooked (Chi-square 2.83), although this difference was not highly significant. Nearly all of the dead trout were found in the traps at Section Z Bulkhead. Since not-hooked trout were more inclined to migrate the probability of collecting not-hooked trout both dead and alive at the lower bulkhead was greater.

Few hatchery trout remained in the stream the following fall. Electric shocker studies located only 7 individuals. In less than 4 months, up to 173 of the total plant of 296 tagged hatchery trout had disappeared.

In addition to the above-mentioned fish, 100 other trout from the hooking experiments were planted in Fuller Creek. Of these, 13 were caught by anglers, 11 migrated through Section Z Bulkhead and 1 was found dead. No record was made of their hooking history.

Angling results, East Fish Lake
(Table 2)

During 1951, the angling regulations allowed a daily creel limit of 5 fish with a 10-inch minimum size limit. Angling with live minnows was prohibited. A total of 732.00 hours of angling or 200 angling trips were expended. Only 33 or 14.3 percent, of the trips were successful. The seasons' catch amounted to 56 trout weighing 36.09 pounds. The average size of the 1951 catch was 11.9 inches, 0.64 pound. Quality indices were 0.08 fish per hour and 0.049 pound per hour. Expressed on a per acre basis the lake was subjected to 45.75 hours of angling and produced 3.5 trout weighing 2.26 pounds.

Characteristically, the lake received very heavy angling during the opening week end. In comparison to the 1950 season, the angling which followed the opening 2-week period was better. In 1950, 15 trout averaging 8.0 inches were caught after the opening 2-week period. In 1951, 30 trout averaging 12.0 inches were caught after the opening period.

Common suckers continue to appear in the catch. During 1951, a total of 9 suckers were caught; these had a total weight of 7.70 pounds and an average length of 13.2 inches.

Angling results, Fuller Creek Pond
(Table 2)

Angling success on Fuller Creek Pond during 1951 was much lower than in 1950. The pond was recreated in 1949, by constructing an

earthen dam on the site of the abandoned beaver dam. In 1949, the pond was lightly fished, but in 1950, angling success was very high and anglers' interest was growing. The pond was under a 6-inch size limit and a 15-fish creel limit during 1950. In 1951, the size limit was increased to 10 inches, the creel limit reduced to 5 fish, and the use of live minnows was prohibited.

If 1950 and 1951 angling statistics for Fuller Creek Pond are compared, the difference in angling is very evident. During 1950, 136 angling trips, of which 77 or 56.6 percent were successful, produced 347 legal trout with a total weight of 109.43 pounds and an average size of 9.3 inches; in addition, 10 special (6.0 to 6.9 inch) trout were caught. Further, the figures for 1950 include 429.75 hours of angling which produced at an average rate of 0.81 trout or 0.255 pound per hour.

In marked contrast, during 1951, a total of 65 angling trips, of which 14 or 21.5 percent were successful, produced 22 legal (10-inch plus) trout with a total weight of 11.77 pounds and an average size of 11.0 inches. In 1951, the 165.25 hours of angling produced at an average rate of 0.13 trout or 0.071 pound per hour.

During the fall of 1951, a plane-table map of Fuller Creek Pond was made and it was determined that the present pond covers 14.58 acres. It is now possible to express angling data on a per-acre basis. During 1950, the pond was fished at a rate of 29.48 hours per acre and yielded 24 trout weighing 7.51 pounds per acre. During 1951, it was given an average angling pressure of 11.33 hours per acre and yielded 1.5 trout weighing 0.81 pound per acre.

Number of individual anglers catching various numbers of legal brook trout during the 1951 season

The creel census data were sorted by listing the seasons' results for individual anglers. Separate tabulations were made for stream fishing (Hunt and Fuller creeks), trout lake fishing (East Fish Lake), and pond fishing (Fuller Creek Pond).

On Hunt and Fuller creeks (Table 5), 392 different anglers made 791 trips and caught 660 legal brook trout. A total of 246 unsuccessful anglers, or 62.7 percent of the total individuals, made 353 angling trips (44.6 percent). The anglers who caught 1 to 5 trout numbered 123 individuals (31.4 percent), made 277 angling trips (35.0 percent), and caught 261 legal trout (39.5 percent). The anglers in the 6- to 10-trout range numbered 10 individuals (2.6 percent), made 32 angling trips (4.1 percent), and caught 80 legal trout (12.1 percent). The most successful anglers, who caught more than 10 trout each during the season, totaled 13 individuals (3.3 percent), made 129 angling trips (16.3 percent), and went home with 319 legal trout (48.4 percent).

Angling success on East Fish Lake was slightly higher in 1951 than in the previous year. In 1950, 85.7 percent of the individual anglers caught no fish. In 1951, 82.9 percent (116 of 140) were unsuccessful (Table 6). Season catches for the 24 successful anglers (17.1 percent) ranged from 1 to 9 trout. The 3 most successful anglers (2.1 percent) caught 35.7 percent of the total catch. Five other anglers (3.6 percent) caught 33.9 percent of the total catch. The 16 anglers (11.4 percent) catching 1 to 2 trout creeled the remaining 30.4 percent of the total catch.

Table 5. Number of legal brook trout caught and number of angling trips made by individual anglers, 1951 trout season Hunt and Fuller creeks.

Number of brook trout caught	Number of individuals catching them	Number of angling trips	Total trout caught	Percent of total		
				individuals	angling trips	catch
0	246	353	0	62.7	44.6	0.00
1	56	103	56			
2	29	72	58			
3	15	20	45	31.4	35.0	39.5
4	13	47	52			
5	10	35	50			
6	1	2	6			
7	3	8	21			
8	2	11	16	2.6	4.1	12.1
9	3	6	27			
10	1	5	10			
14	1	3	14			
19	1	15	19			
20	3	35	60			
21	2	9	42			
22	1	9	22			
24	1	9	24	3.3	16.3	48.4
25	1	8	25			
28	1	14	28			
33	1	15	33			
52	1	12	52			
Total	392	791	660	100.0	100.0	100.0

Table 6. Number of legal (10.0+) brook trout and number of angling trips made by individual anglers 1951 season East Fish Lake

Number of legal trout caught	Number of individuals catching them	Number of angling trips	Total trout caught	Percent of total		
				individuals	angling trips	catch
0	116	148	0	82.9	74.0	...
1	15	26	15	10.7	13.0	26.8
2	1	3	2	0.7	1.5	3.6
3	2	9	6			
4	2	6	8	3.6	8.5	33.9
5	1	2	5			
6	2	4	12	2.1	3.0	35.7
8	1	2	8			
Total	140	200	56	100.0	100.0	100.0

Forty-four individuals fished on Fuller Creek Pond (Table 7). The 11 successful anglers (25.0 percent) made season catches of from 1 to 6 trout.

These data on success of anglers during 1951 agree with the 1950 data in that less than 10 percent (in 1951 it was about 5 percent) of the individual trout fishermen remove at least 50 percent of the total season catch.

Comparison of the 1951 anglers' catch with the estimated legal brook trout population

Hunt Creek

The trout population enclosed between the Section D and Section Z bulkheads of Hunt Creek has been estimated each fall since 1949. The weirs at each end of the area now enable us to record the movement of fish into or out of the enclosed waters. These structures are in operation year around, and while they are occasionally over-topped by high water or anchor ice, indications are that few trout are lost during these short periods of weir failure. The population estimates were made by the customary mark-and-recapture method (Petersen) involving two collecting trips with the A.C. shocker over the 2 miles of enclosed stream.

The data concerning legal brook trout are presented in Table 8.[3] The estimated total legal trout population in the fall of 1950 was 236, of which 120 were tagged and therefore positively identified. The table

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[3] The estimates in this table include estimates on the population of the portion of Section C closed to fishing inasmuch as it is not blocked to migration in either direction, even though it was not fished.

Table 7. Number of legal (10.0+) brook trout and number of angling trips made by individual anglers 1951 season Fuller Creek Pond.

Number of legal trout caught	Number of individuals catching them	Number of angling trips	Total trout caught	Percent of total		
				individuals	angling trips	catch
0	33	39	0	75.0	60.0	...
1	6	12	6	13.7	18.5	27.3
2	2	6	4	4.5	9.2	18.1
3	2	5	6	4.5	7.7	27.3
6	1	3	6	2.3	4.6	27.3
Total	44	65	22	100.0	100.0	100.0

presents the known losses and gains of this population through the year.

The 120 tagged legal trout recorded in the fall of 1950 dwindled throughout the year. Only 2 survivors were found during the 1951 fall population study, when 77.5 percent of the total estimated legal population was taken. Probably not more than 3 of the 120 tagged fish marked in the fall of 1950 actually remained in the enclosed water. It may be assumed that the major portion of the 82 tagged legal trout, which were unaccounted for, were unknown mortalities.

The total trout population made a gain of 350 individuals from September 1950 to September, 1951. The figure 350 is not the entire recruitment by growth from smaller size classes. We know that 82 tagged trout of the estimated 1950 fall population disappeared from the stream. If the rate of disappearance of normal trout was the same as that of tagged trout, then total recruitment from smaller size classes may be estimated as follows: $82/120 = \frac{X}{236}$ or X = 161 in which X represents the portion of the total legal 1950 fall population that disappeared during the year. The estimated total recruitment during 1951 would then be 350 plus 161 or 511.

The influence of recruitment on the anglers catch may be estimated as follows: $120/236 = \frac{24}{X}$ or X = 47 in which X equals the total trout in the anglers' catch both tagged and normal which were of legal size in the fall of 1950. Since the anglers creeled 349 trout the difference or 302 must have grown into legal size after the 1950 fall population study.

Of the 747 individuals that were present at sometime in the 1950-51 legal population in the enclosed waters (the sum of 236 and 511), 14 or 1.9 percent were lost thru migration, (the difference between 46 and 32)

Table 8. Annual record of legal trout[#] for the 3.91 acres of experimental waters confined between the upper and lower bulkhead traps (Sections Z, A, B and C) on Hunt Creek, Fall of 1950 to Fall of 1951.

Item	Legal tagged trout known to be present Fall 1950	Total legal trout
1. Population, Fall 1950	120	236
2. Migration into enclosed waters	0	32
3. Migration from the enclosed waters	5	46
4. Observed mortality in enclosed waters	7	14
5. Caught by anglers during 1951 season	24	349
6. Population, Fall 1951	2[*]	209
7. Unaccounted trout [difference between (1 + 2) and (3 + 4 + 5 + 6)]	82 Loss	350 Gain

[#] Planted trout are not included

[*] These trout were actually handled and known to be present, however, we estimate that only 77.5 percent of the legal population was taken during the population study, so an additional one or two tagged trout from the fall of 1950 may actually be in this 1951 population.

14 or 1.9 percent were known to have died thru natural mortality or hooking loss, 349 or 46.7 percent were taken by the angler, 209 or 27.9 percent survived to the 1951 fall population study, and 161 or 21.6 percent disappeared. Calculated on a per-acre basis, under angling pressure of 227.04 hours per acre, on a fluctuating population involving 191 individual legal trout per acre, anglers removed legal brook trout at a rate of 89 per acre or 46.7 percent of the available stock during the 1951 angling season.

East Fish Lake

Since 1948, a population study has been made on East Fish Lake in the fall of the year. Trout were collected with fyke nets, tagged, and released. The method used to estimate the population is modification of the Schnabel method used by Schumacher and Eschmeyer.[4] Operations were continued until the daily population estimates remained approximately constant. The final estimate is considered the population available to capture with the gear used.

Table 9 presents a summary of data collected from 1948 to 1951. The netting studies indicate a decline in the legal population from 1949 to 1951. This was in part due to the increased minimum legal size limit initiated in 1951. Trout 7 inches and larger were estimated to number 205 in the fall of 1951. Another factor to be considered is the appearance of adipose-marked trout ranging from 4.8 to 10.4 inches, but predominantly 8 to 10 inches, which appeared in the 1951 study. These trout originated from a plant of 500 wild fingerlings (2.5 to 3.9 inches) collected from Hunt Creek and planted in East Fish Lake during the

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[4] Schumacher, F. X., and R. W. Eschmeyer. 1943. The estimate of fish population in lakes or ponds. Journ. Tenn. Acad. Sci., Vol. XVIII, No. 3, July, pp. 228-249.

Table 9. Data on the legal[#] trout population and anglers catch 1948 to 1951 in East Fish Lake.

Item	1948 (7"+)	1949 (7"+)	1950 (7"+)	1951 (7"-10")	1951 (10"+)
1. Anglers catch	113	93	47	0	56
2. Fall population estimate	175	191	138	105	95
3. Total estimated trout available to angler (line 1 + line 2)	288	284	185	0	151
4. Percent of available trout taken by angling	39.2	32.7	25.4	0	37.1

[#] 7-inch trout were legal during 1948 to 1950 inclusive. The minimum size limit was 10 inches during 1951.

fall of 1950. If the estimated numbers of the adipose-clipped planted trout (89) are deducted from the estimated population, 7 inches and larger (205) the estimated native population 7 inches and larger continued to decline during 1951, to 116.

Coincident with the decline in population is a decline in the anglers' catch. A study of the fate of tagged fish indicates that the year-to-year survival of tagged trout was greatly reduced following 1949. At the same time, anglers removed fewer tagged trout. The loss of tagged trout to unknown causes greatly increased following 1949. The cause of this general decline in yield to the angler and what appears to be a general decline of total population is not yet apparent.

Fuller Creek Pond

Population studies, conducted by means of netting, have also been operated on this re-impounded beaver dam since the fall of 1949. The pond was re-established in May of 1949, and was only lightly fished in that year, despite the fact that a catchable population of brook trout became available almost immediately. A comparison of the annual catch and the fall population estimate is given in Table 10 for each year since 1949. Comparisons between the catch by angling and the fall population studies are somewhat confused by the changes in minimum size regulations which took place in the years involved (from 6 inches in 1949 and 1950 to 10 inches during 1951); also the gear used in the population studies in 1949 and 1950 did not catch brook trout smaller than 8 inches. In addition, there is some evidence that there has been migration of marked fish from the pond during the course of the population studies which would tend to yield estimates higher than the true values. In

Table 10. Data on the legal[#] trout population and anglers catch 1949 to 1951 in Fuller Creek Pond.

Item	1949 (6"+)	1950 (6"+)	1951 (6"-10")	1951 (10"+)
1. Anglers catch	5	253	0	22
2. Fall population estimate[*]	258	347	394	109
3. Total trout available to angler (line 1 + line 2)	263	700	0	131
4. Percent of available trout taken by angling	1.9	50.4	0	26.8

[#] 6-inch trout were legal in 1949 and 1950 and 10 inches was the minimum size during 1951.

[*] During 1949 and 1950 these estimates are probably too low as trout under 8 inches could escape from the nets.

Table 11. Residence of individual anglers using the experimental waters, Hunt Creek drainage, 1952 trout season. Residence tabulated by angling days.

County of residence	Number of individuals from county or state	East Fish Lake	Fuller Creek	Fuller Creek Pond	Hunt Creek (exp. sec.)	Totals
Alpena	3	...	...	...	3	3
Bay	22	19	3	...	22	44
Berrien	1	...	...	...	1	1
Calhoun	6	5	...	7	...	12
Cheboygan	1	...	...	...	1	1
Genesee	24	23	7	...	21	51
Grand Traverse	1	...	...	...	2	2
Gratiot	6	...	...	1	5	6
Hillsdale	4	4	...	...	...	4
Huron	1	...	1	...	...	1
Ingham	11	5	1	4	9	19
Ionia	3	5	...	...	...	5
Isabella	2	...	...	...	4	4
Jackson	8	1	...	...	7	8
Kalamazoo	1	...	1	...	2	3
Kent	2	...	...	...	2	2
Lapeer	5	...	1	...	4	5
Lenawee	8	5	2	...	9	16
Macomb	23	4	5	...	27	36
Midland	6	...	...	...	14	14
Monroe	7	...	6	...	21	27
Montmorency	44	33	13	14	94	154
Muskegon	2	4	...	...	3	7
Oakland	73	24	17	4	71	116
Oscoda	8	3	1	...	9	13
Otsego	3	...	...	...	5	5
Roscommon	2	2	...	...	...	2
Saginaw	19	2	9	9	22	42
Sanilac	1	...	...	...	1	1
Shiawassee	9	...	2	...	10	12
St. Clair	17	...	4	...	74	78
Tuscola	3	...	2	...	2	4
Washtenaw	12	6	...	1	13	20
Wayne	129	36	26	16	160	238
Total residents	467	181	101	56	618	956
California	1	...	1	...	1	2
Conneticut	1	...	...	...	1	1
Indiana	4	3	1	...	5	9
Illinois	1	...	...	...	2	2
Iowa	1	2	1	...	...	3
Kansas	1	1	2	...	...	3
Kentucky	3	...	...	...	3	3
Missouri	3	3	...	2	...	5
New York	1	...	...	...	1	1
Ohio	27	10	4	7	46	67
Pennsylvania	1	...	...	...	3	3
Virginia	1	...	...	...	1	1
Total non-residents	45	19	9	9	63	100
Grand totals	512	200	110	65	681	1,056

general the data suggest that the anglers are not over-exploiting the population under the present regulations.

Residence of anglers
(Table 11)

During 1951, a total of 467 individual Michigan residents from 34 counties in the lower peninsula (mostly eastern and southeastern counties) angled over the experimental waters; non-resident anglers from 12 states fished the test waters. Among the residents, Wayne County sportsmen were most numerous (129 individuals), followed by Oakland (73 individuals) and Montmorency County (44 individuals). Ohio anglers (27), were the most numerous of the outstaters, followed by Indiana (4), Kentucky and Missouri (3 each), and one each from California, Connecticut, Illinois, Iowa, Kansas, New York, Pennsylvania and Virginia.

The tabulation of residence by angling days on the various waters closely paralleled the tabulation by individuals except for the Montmorency County (the location of the Hunt Creek drainage). Apparently, the local anglers made over three trips per individual, while those from Wayne and Oakland counties slightly less than two per individual.

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MICHIGAN DEPARTMENT OF CONSERVATION

TO Dr. Leonard

FROM Fish Div.

DATE 10-30-52

SUBJECT Institute Report #1349

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