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DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
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THE TWENTY-SECOND ANNUAL INTENSIVE CREEL CENSUS, HUNT CREEK TROUT RESEARCH STATION, 1960 TROUT SEASON

By

Gaylord R. Alexander and David S. Shetter

The experimental waters of the Hunt Creek Trout Research Station (Fig. 1) are located on the headwaters of Hunt Creek in south-central Montmorency County. Hunt Creek is a major tributary of the Thunder Bay River, is about 10 miles long, and is regarded as good trout water.

Angling on the experimental stream sections and ponds was intensively censused for the twenty-second consecutive year. Waters included in the census were: Hunt Creek, Fuller Creek, Fuller Creek Pond, and East Fish Lake. The morphometry and fishing regulations applying to the various experimental subdivisions are given in Table 1.

Creel census methods

Each angler fishing the posted waters is required, by Conservation Commission order, to obtain a free daily permit from the centrally-located Department office. Upon completion of an angling trip he must return to the checking station and allow inspection of his catch.

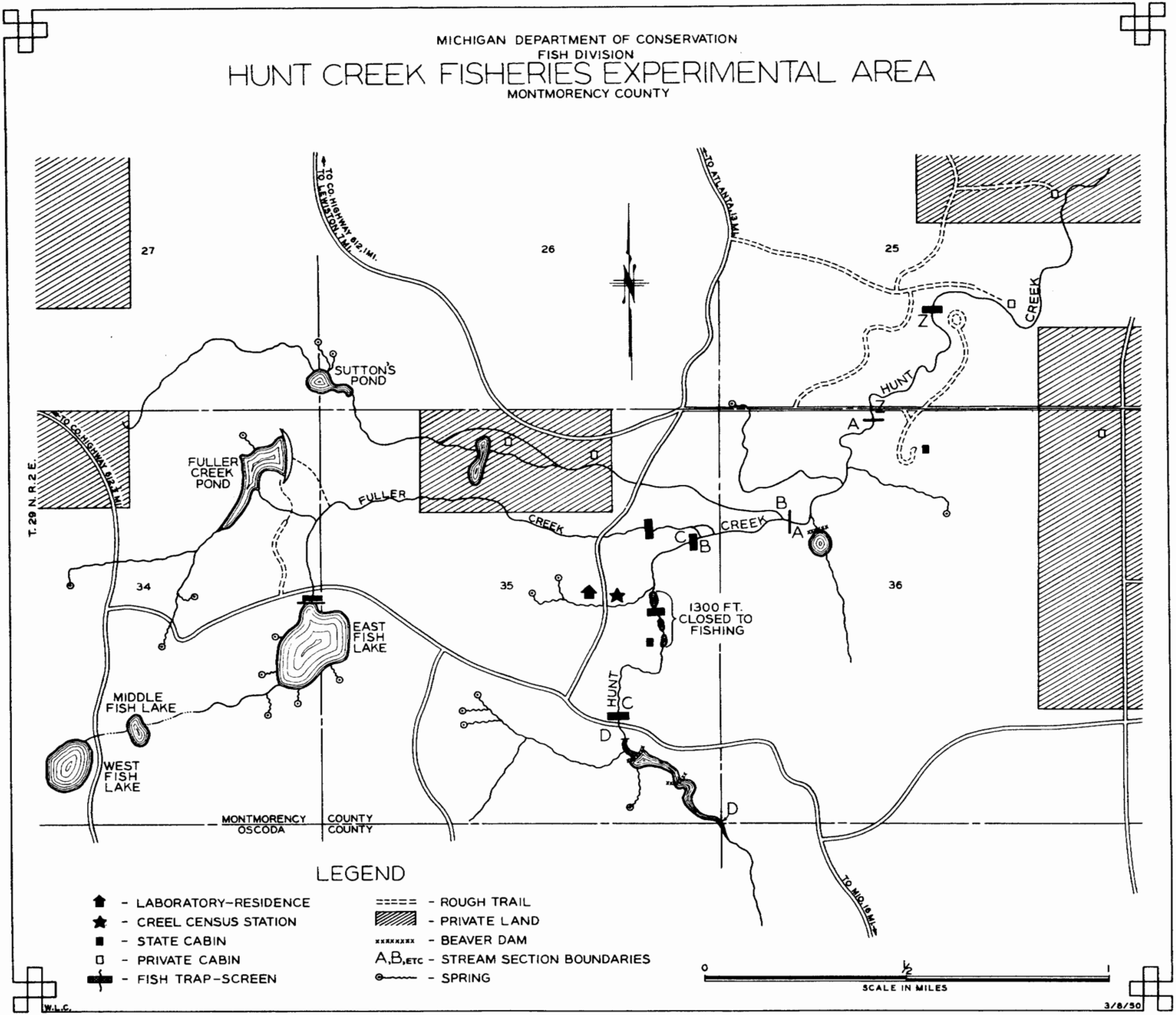
MICHIGAN DEPARTMENT OF CONSERVATION
FISH DIVISION
HUNT CREEK FISHERIES EXPERIMENTAL AREA
MONTMORENCY COUNTY
TO CO. HIGHWAY 612, 1 MI.
TO LEWISTON 1 MI.
TO ATLANTA 13 MI.
27
26
25
SUTTON'S POND
FULLER CREEK POND
FULLER CREEK
CREEK
HUNT CREEK
HUNT
A
B
C
D
Z
T. 29 N. R. 2 E.
TO CO. HIGHWAY 612, 3 MI.
34
35
36
EAST FISH LAKE
MIDDLE FISH LAKE
WEST FISH LAKE
1300 FT. CLOSED TO FISHING
MONTMORENCY COUNTY
OSCODA COUNTY
TO MIO 16 MI.
LEGEND
- LABORATORY-RESIDENCE
- CREEL CENSUS STATION
- STATE CABIN
- PRIVATE CABIN
- FISH TRAP-SCREEN
- ROUGH TRAIL
- PRIVATE LAND
- BEAVER DAM
A,B, ETC - STREAM SECTION BOUNDARIES
- SPRING
0
½
1
SCALE IN MILES
W.L.C.
3/8/30

Figure 1

HUNT CREEK FISHERIES EXPERIMENTAL AREA

OBJECTIVE -- The Hunt Creek Fisheries Experiment Station was established in 1939 as a year-round testing ground and outdoor research laboratory where trained biologists might study brook trout and the effects of angling on a typical brook trout stream. The Hunt Creek drainage was chosen because of availability of state-owned stream frontage and also because of the variety of brook trout habitats present in the area.

State ownership has made possible various experimental restrictions and management procedures not otherwise feasible.

The purpose of the investigations is to find out by observation or by controlled experiments what methods of stream management will increase the quality of the brook trout angling and also preserve the species for the enjoyment of future anglers.

THE ANGLERS' PART IN OUR RESEARCH -- The best measure of an experimental procedure in trout stream management is how it affects the anglers' catch. Therefore, registration of anglers and collection of creel census records constitute an important part of the work each year. Such records provide a measure of the effects of changes in size and creel limits, and, in connection with marking experiments and year-round population estimates, reveal origin and movements of trout within the system. Creel census records compared with population estimates correspond to sales records compared with production schedules in industry.

RESEARCH HERE DURING THE LAST TEN YEARS -- has indicated that:

(1) Natural reproduction is more than adequate in Hunt Creek;
(2) Fall plantings of hatchery-reared brook trout fingerlings contribute less than 3% to the anglers' catches in subsequent years;
(3) Stream improvement, properly carried out, can improve the quality of angling.
(4) Tributary streams are not an important source of adult fish for main stream angling;
(5) In the proper type of lake good brook trout fishing can be created by the elimination of rough fish populations.

Some of the other accomplishments of the station include detailed food studies of the brook trout by Dr. J. W. Leonard, who also identified new species of trout stream insects not previously described; an exhaustive study of the use of brook trout scales in age and growth studies of Michigan brook trout by Dr. E. L. Cooper; and the development by the past and present staff of the electric shocker as a substitute for seines in trout population investigations.

CURRENT INVESTIGATIONS -- include further study of brook trout movements in the main stream through the use of the recently-installed upper and lower screens, detailed year-round population studies on the brook trout population between these traps, trout lake and beaver pond population studies by means of netting, marking and recovery, and investigations of the effect of beaver dams on the fishing in dammed portions of trout streams.

REGULATIONS -- Except for about 1,300 feet of stream in Section C of Hunt Creek, all the waters on the map on the reverse of this sheet are open to angling. The posted waters, marked by Departmental signs, are open to angling under the following restrictions set by the Conservation Commission:

(1) Each angler must first obtain at the checking station a daily free-use permit before fishing.
(2) Each angler must report the results of his fishing at the checking station on conclusion of his angling.
(3) Special regulations are to be observed in certain waters and such waters will be posted with appropriate signs. Otherwise the usual regulations for other waters of the state are in effect on the Hunt Creek Area.

SUMMARY, ANGLING STATISTICS, EXPERIMENTAL SECTIONS, HUNT CREEK, 1939-1949

	YEAR										
	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
TOTAL ANGLER-DAYS.....	438	505	1,015	800	311	340	375	753	607	504	593
TOTAL HOURS FISHED.....	780	901	1,546	1,267	540	640	637	1,206	872	869	1,415
LEGAL BROOK TROUT TAKEN.	492	406	722	543	378	364	315	439	187	492	698
TOTAL POUNDS REMOVED....	67	60	116	83	59	53	52	68	26	78	115
CATCH PER HOUR.....	0.63	0.45	0.47	0.43	0.70	0.57	0.49	0.36	0.21	0.57	0.49
AVERAGE TOTAL LENGTH....	7.5	7.6	7.7	7.6	7.5	7.7	7.9	7.7	7.6	7.7	7.8

SUMMARY, ANGLING STATISTICS, EAST FISH LAKE, 1939-1949

	YEAR										
	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
TOTAL ANGLER-DAYS.....	63	111	155	159	121	311	436	430	344	287	283
TOTAL HOURS FISHED.....	126	308	386	289	200	651	928	935	711	853	1,024
LEGAL BROOK TROUT TAKEN.	51	172	242	367	69	108	169	93	89	117	91
TOTAL POUNDS REMOVED....	--	28	47	97	26	79	131	69	54	55	70
CATCH PER HOUR.....	0.41	0.56	0.63	1.26	0.29	0.17	0.18	0.10	0.13	0.14	0.09
AVERAGE TOTAL LENGTH....	--	8.0	8.5	9.0	9.3	11.2	11.9	11.5	11.1	10.4	11.6

Table 1. --Morphometry (mileage in parentheses) of experimental waters of Hunt Creek drainage, with angling regulations for 1960

Experimental water	Dimensions			1960 regulations		
	Length (feet)	Average width (feet)	Area (acres)	Lure	Minimum length (inches)	Daily creel limit
Section of Hunt Creek						
Z	2,397 (0.45)	20.3	1.12	Any	7	10
A	2,577 (0.49)	24.3	1.44	Any	7	10
B	1,605 (0.30)	17.5	0.64	Any	7	10
C[1/]	2,700 (0.51)	11.8	0.71	Any	7	10
D	2,896 (0.55)	100.0	6.65	Any	7	10
Total, Hunt Creek	12,175 (2.30)	37.8	10.56			
Fuller Creek	9,875 (1.87)	15.7	3.57	Any	7	10
Fuller Creek Pond	...	...	14.58	No live fish	10	5
East Fish Lake	...	...	16.0	No minnows	10	5

[1/] Excludes 1,270 feet of Section C which are experimental diversions closed to fishing.

During the 1960 trout season, 1,105 permits were issued to persons who made 1,482 angling trips. An angler trip resulted whenever an angler fished one of the designated stream sections or ponds on the Area; one angler was listed as making more than one trip on any date when he fished on more than one stream section or pond. Twelve percent more permits were issued in 1960 than during 1959.

Male licensees made 74.6 percent of the angler trips; female licensees, 1.0 percent; wives, 5.0 percent; minor males, 17.3 percent; and minor females, 2.1 percent.

Acknowledgments

A. M. Schiffman, G. D. Betts and T. H. Turppa assisted in the collection and tabulation of the creel census records. K. G. Fukano handled the processing of data for IBM tabulation. The Accounting Section of the Conservation Department did the card punching, verifying, and tabulating on IBM equipment.

Recovery of planted trout

Table 2 summarizes the results from plantings in 1958 and 1959 of hatchery trout in East Fish Lake, Fuller Creek Pond, and Section D Pond, and two groups of wild fingerling brook trout transferred to Section D Pond in 1958. By the end of the 1960 trout season 850 of the trout planted in 1958 and 1959 had been creeled by anglers; 822 were of hatchery origin and 28 were transfers.

On October 28, 1958, 300 hatchery-reared rainbow trout weighing 69.0 pounds, and averaging 8.9 inches in total length were released in East Fish Lake. During the 1959 season anglers caught 197 rainbow trout weighing

Table 2. --Angler harvest of trout released in the experimental waters of Hunt Creek during 1958 and 1959

Area and date of planting	Trout planted				Legal trout creeled[2]			Total legal trout creeled to date			
								Number		Pounds	
	Species	Number and origin[1]	Pounds	Range in length (inches)	1958	1959	1960	Total	Percentage	Total	Percentage
E. Fish Lake											
Oct., 1958	Brook	300 H	75	8.5-9.5	0	88 (49.7)	0	88	29.3	49.7	66.3
Oct., 1959	Brook	300 H	78	8.5-9.5	0	0	68 (33.7)	68	22.7	33.7	43.2
Oct., 1958	Rainbow	300 H	69	8.5-9.5	0	197 (187.6)	34 (76.8)	231	77.0	264.4	383.2
Oct., 1959	Rainbow	300 H	75	8.5-9.5	0	0	210 (129.5)	210	70.0	129.5	172.7
Fuller Cr. Pond											
Oct., 1959	Brook	300 H	78	8.5-9.5	0	0	43 (17.0)	43	14.3	17.0	21.8
Oct., 1959	Rainbow	300 H	75	8.5-9.5	0	0	69 (23.4)	69	23.0	23.4	31.2
Section D Pond											
April, 1958	Brook	110 W	1.3	2.6-3.6	1 (0.1)	14 (4.3)	1 (0.7)	16	14.5	5.1	392.3
Oct., 1958	Brook	200 W	2.8	2.5-4.0	0	3 (0.7)	9 (2.4)	12	6.0	3.1	110.7
Sept., 1959	Brook	500 H	20	3.0-6.9	0	0	113 (28.7)	113	22.6	28.7	143.5
Total		2,610	474.1		1 (0.1)	302 (242.3)	547 (312.2)	850	32.6	554.6	117.0

[1] H = hatchery; W = wild.

[2] Weight in parentheses.

187.6 pounds. During the 1960 trout season 34 additional fish weighing 76.8 pounds were creeled from this planting. These brought the total recovery at the end of the 1960 trout season to 231 fish (77.0 percent) with a total weight of 264.4 pounds (383.2 percent of the weight at release).

A second planting, consisting of 300 hatchery-reared rainbow trout weighing 75.0 pounds, was made in East Fish Lake on October 15, 1959. These trout averaged 8.9 inches long. During the 1960 trout season anglers creeled 210 (70 percent) legal-length trout (under a ten-inch minimum size limit) which weighed 129.5 pounds (172.7 percent of the weight at planting). In addition, 6 sublegal length fish with a total weight of 2.0 pounds were brought in.[1]

In both years, 1958 and 1959, the plants of rainbow trout in East Fish Lake were matched with plants of hatchery-reared brook trout (Table 2). Of the brook trout planted in 1958, anglers in 1959 caught 88 (29.3 percent) which had a combined weight of 49.7 pounds (66.3 percent of the total weight of the planting); no fish from this release were caught in 1960. Of the brook trout released in 1959, 68 (22.7 percent)[2] with a total weight of 33.7 pounds (43.2 percent of the weight of the planting) were caught by anglers in 1960.

Fuller Creek Pond was stocked on October 15, 1959 with 600 hatchery trout (300 brook trout and 300 rainbow trout) that averaged 8.9 inches in length. This planting was identical to that made in East Fish Lake in 1959. In 1960, anglers on Fuller Creek Pond recovered 43 of the planted brook trout that

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[1] Not included in totals in Table 2.

[2] One additional sublegal caught in 1960, not included in totals, Table 2.

weighed 17.0 pounds. Two[3] additional sublegal brook trout were creeled weighing 0.6 pound. The return through 1960 was 14.3 percent of the number and 21.8 percent of the weight planted. Of the planted rainbows anglers caught 69 weighing 23.4 pounds for a numerical return of 23.0 percent and a poundage return of 31.2 percent of the plant. For both species the rate of return was much lower in Fuller Pond than in East Fish Lake. One of the 43 brook trout and 6 of the 69 rainbow trout were recovered below Fuller Creek Pond in Fuller Creek or Hunt Creek. These fish were all shorter than 10.0 inches, but since they were caught in the "7-inch" water they were included as part of the harvest of "legal" trout.

On September 21, 1959, five hundred (500) hatchery brook trout ranging from 3.0-6.9 inches in length were planted in Section D Pond of Hunt Creek. To date (1960) 113 trout weighing 28.7 pounds have been caught. This amounts to 22.6 percent of the number and 143.5 percent of the weight at planting. Twelve (10.6 percent) of these fish were recovered from stream sections below the Section D Pond. In addition 2[3] sublegal trout were caught.

In addition to the hatchery trout released in the experimental waters of the Area, two groups of wild fingerling brook trout were transferred to Section D Pond. The first group of 110 (size range 2.6-3.6 inches; weight 1.3 pounds) was released in April, 1958. From this group 16 (1 in 1958, 14 in 1959, 1 in 1960) have been creeled for a recovery percentage of 14.5. These trout weighed a total of 5.1 pounds for a recovery of 392.3 percent by weight. The second group of 200 brook trout fingerlings (size range 2.5-4.0

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[3] Not included in totals, Table 2.

inches; weight 2.8 pounds) was released in October, 1958. Through 1960, 12 (3 in 1959, 9 in 1960) have been creeled. These recoveries weighed 3.1 pounds; percentage of recovery to date is 6.0 percent of the number and 110.7 percent of the weight at transfer. Three of the 12 were caught downstream in Hunt Creek.

Of the 2,610 trout (474.1 pounds) "planted" in the experimental waters in 1958 and 1959, 850 trout weighing 554.6 pounds were caught by anglers by the end of the 1960 trout season. This represents a return of 32.6 percent of the number planted and a 117.0 percent return on the weight of trout planted.

Angling results

The main statistics for the various waters of the Hunt Creek Trout Research Station are given in Table 3. Physical characteristics of the experimental waters were described in earlier reports. In general, Sections Z and A, the lowermost stream sections, are wider, deeper, and more open than B, C, and Fuller Creek. Section D consists of a short stream channel about 200 yards long, above which is a beaver pond of approximately 7 acres. Fuller Creek Pond on the headwaters of Fuller Creek is maintained by an earthen dam on the site of a former beaver dam. East Fish Lake, also in the Fuller Creek drainage, is a 16.0-acre trout lake whose outlet is blocked by a low earthen dam in which a Wolf-type fish trap effectively blocks fish migration.

Hunt Creek

The 1960 trout season was the first one since that of 1954 in which Sections Z and A were fished under the usual Michigan trout fishing regulations. During the period 1955-1959 these two lower sections were fished under a "flies-only"

Table 3. --Summary of angling data, experimental waters of Hunt Creek drainage, 1960

Experimental water	Total fishing			Trout caught					
	Trips	% trips successful	Hours	Species	Origin[1]	Number	Pounds	Average length (inches)	Trout per hour
Section of Hunt Creek				Brook	Wild	509	90.55	8.0	..
				Brook	Hat.	1	0.16	7.7	..
Z	227	57	541	Rainbow	Hat.	4	1.20	9.9	..
				All		514	91.91	8.0	.95
A	172	52	359	Brook	Wild	337	57.62	7.9	..
				Brook	Hat.	2	0.27	7.6	..
				All		339	57.89	7.9	.94
B	74	57	124	Brook	Wild	108	18.67	7.9	..
				Rainbow	Hat.	1	0.25	9.0	..
				All		109	18.92	7.9	.88
C	171	36	318	Brook	Wild	133	21.72	7.7	..
				Brook	Hat.	5	1.17	8.5	..
				Rainbow	Wild	1	0.88	13.2	..
				All		139	23.77	7.8	.44
D stream	80	23	102	Brook	Wild	25	4.53	8.0	..
				Brook	Hat.	4	0.93	8.5	..
				All		29	5.46	8.1	.28
D pond	144	41	275	Brook	Wild	71	19.72	8.9	..
				Brook	Hat.	101	26.14	8.8	..
				All		172	45.86	8.8	.63
Total Hunt Creek	868	46	1,719	Brook	Wild	1,183	212.81	8.0	..
				Brook	Hat.	113	28.67	8.8	..
				Rainbow	Wild	1	0.88	13.2	..
				Rainbow	Hat.	5	1.45	9.7	..
				All		1,302	243.81	8.0	.76
Fuller Creek	134	31	222	Brook	Wild	98	15.05	7.6	..
				Brook	Hat.	1	0.20	9.4	..
				Rainbow	Hat.	1	0.21	9.1	..
				All		100	15.46	7.7	.45
Fuller Creek Pond	104	61	288	Brook	Wild	47	18.70	10.6	..
				Brook	Hat.	42	16.76	10.4	..
				Rainbow	Hat.	63	21.70	10.4	..
				All		152	57.16	10.4	.53
East Fish Lake	376	40	1,205	Brook	Wild	9	4.45	10.9	..
				Brook	Hat.	68	33.72	10.8	..
				Rainbow	Hat.	244	206.29	12.6	..
				All		321	244.46	12.2	.27
All waters	1,482	44	3,434	Brook	Wild	1,337	251.01	8.0	..
				Brook	Hat.	224	79.35	9.7	..
				Rainbow	Wild	1	0.88	13.2	..
				Rainbow	Hat.	313	229.65	12.1	..
				All		1,875	560.89	8.9	.55

[1] Hat. = hatchery.

regulation. A separate report summarizing the results of the flies-only study will be available shortly.

In 1960 anglers fishing in Section Z creeled 514 legal-size trout (92 pounds) in 227 trips, at an average rate of 0.95 trout per hour. The trout averaged 8.0 inches in total length. Records for 1960 show a 332 percent increase in the number of trout creeled, a 134 percent increase in fishing trips, and a 58 percent increase in the rate of catch over 1959. Further, the trout averaged one-half inch longer than in 1959. Fifty-seven percent of the anglers were successful in taking one or more legal fish per trip compared to 41 percent in 1959. Six[4] sublegal trout were creeled, and 1,271 sublegal fish were reported caught and returned to the water.

A population study[5] made in October, 1960, indicated that approximately 105 legal and 1,481 sublegal brook trout were present in Section Z at the close of the 1960 trout season. Although the residual population was less than one-half that present in the fall of 1959, it was the third highest on record. The sublegal population was up slightly from 1959 but was a little below the 11-year average (Table 4).

In Section A anglers creeled 339 trout (58 pounds) in 172 trips for an average catch per hour of 0.94 trout. Success was achieved on 52 percent of

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[4] Not included in totals, Table 3.

[5] Population studies are made each year in September or early October. Fish are collected by electrofishing, and estimates are based on mark-and-recapture ratios.

Table 4. --The fall populations of legal (7.0+ inches) and sublegal (1.5-6.9 inches) wild brook trout in Sections Z, A, B, and C, Hunt Creek, 1949-1960

Year	Section Z		Section A		Section B		Section C	
	Sublegal	Legal	Sublegal	Legal	Sublegal	Legal	Sublegal	Legal
1949	1,413	95	2,156	41	1,040	15	1,437	19
1950	1,989	89	1,687	70	1,231	29	1,351	41
1951	1,210	71	1,940	41	896	23	2,159	34
1952	1,130	75	2,472	44	1,109	28	2,126	21
1953	1,641	42	2,957	35	1,157	19	1,305	16
1954	1,545	40	3,203	47	1,407	9	2,328	27
1955	1,276	88	2,563	105	1,147	30	1,638	44
1956	904	109	2,403	158	1,003	29	2,212	30
1957	1,527	67	3,015	68	1,257	35	2,632	31
1958	1,455	54	2,459	72	1,288	44	2,555	35
1959	1,190	263	2,331	280	1,349	99	1,682	32
1960	1,481	105	2,689	157	1,444	66	1,884	34

the angler-trips. As in Section Z, the catch, fishing pressure, and success rate were up considerably from 1959. Four[6] sublegal trout were creeled and 1,186 were reported as hooked and released.

An estimated population of 157 legal and 2,689 sublegal brook trout remained in Section A at the close of the season. The legal population remaining was 44 percent lower and the sublegal was 15 percent higher than in 1959. Compared to the 11-year averages, the residual population was the third highest on record and was 80 percent higher than the average.

Section B, upstream from Section A, yielded 108 wild legal brook trout and one hatchery rainbow trout to anglers in 74 trips. Trout were caught at the rate of 0.88 fish per hour and they averaged 7.9 inches long. Anglers creeled five[6] sublegal trout and reported catching and releasing 769 sublegal fish.

The post-season population estimates indicated that 66 legal and 1,444 sublegal brook trout remained in Section B after the season closed. This amounts to a 33 percent decrease in legal fish but a slight increase in the sublegal population in comparison with 1959. The remaining population of legal trout, however, was the second highest recorded for Section B and double the 11-year average.

Anglers harvested 139 trout (24 pounds) in 171 angler trips from Section C. The average catch per hour was 0.44 trout; fish averaged 7.8 inches in length. Thirty-six percent of the trips were successful. Two[6] sublegal trout were creeled and anglers reported catching 1,093 sublegal trout and returning them

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[6] Not included in totals, Table 3.

to the stream. The fall population estimates indicated that 34 legal and 1,884 sublegal brook trout remained in the open waters of Section C after the season's close. In general, the catch was down 19 percent and fishing pressure (trips) was 24 percent lower. Compared to the 11-year average the catch increased and the fishing pressure decreased.

Section D, the uppermost experimental section of Hunt Creek, has both stream and beaver pond habitat. In 1960 anglers made 80 trips and caught 29 legal brook trout from the short stream portion (about 200 yards). Anglers caught 0.28 brook trout per hour and were successful on 23 percent of their trips. The fish creeled were of an average length of 8.5 inches.

In the beaver pond portion of Section D (area about 7 acres), anglers made 144 trips (41 percent successful) and caught 172 trout (71 wild brook trout, 101 hatchery brook trout) that averaged 8.8 inches long; the average catch per hour was 0.62. Both fishing pressure and catch were considerably higher than in 1959, and much of the increase is attributed to the planting of sublegal hatchery brook trout in September, 1959.

For Hunt Creek as a whole, 1,183 wild brook trout were creeled in 1960, an increase of 632 (115 percent) from 1959. The total weight of wild brook trout was 213 pounds. In addition 113 hatchery brook trout, 5 hatchery rainbow trout, and one wild rainbow trout were taken. Population estimates indicated that 3 adult rainbow trout were present in Hunt Creek (Section C) in the spring of 1960. It is of interest to note that these fish were responsible for the population of 130 fingerling rainbow trout found in Sections C and B of Hunt Creek during the 1960 fall population studies. The total catch was 1,302

trout (244 pounds) which is the highest recorded catch for Hunt Creek since the establishment of the experimental area in 1939. The greatest increases came in the lower sections of Hunt Creek, but significant positive changes were noted also for the upstream sections and in Fuller Creek. The factors responsible for these changes are presently conjecture, but it appears that they resulted from a combination of biological and sociological factors.

Angling results during the ten two-week periods of the 1960 trout season at Hunt Creek are summarized in Table 5. In general the first period had the highest fishing pressure, catch, and rate of catch. The size of the trout creeled varied between 7.6 inches during the fourth period and 8.1 inches during the fifth and sixth periods.

An analysis of variance was performed on the catch per hour data, by two-week periods, that has been accumulated during the past 22 years on Hunt Creek. There was a statistically significant difference in the catch per hour between years, but no difference of statistical significance between the two-week periods over these years. It is concluded that the average fishing quality does not change much during the trout season on Hunt Creek.

Many anglers believe that they have better fishing during certain portions of the season. It may be that there is a "real difference" between periods, but it is probable that the considerable number of novice (unsuccessful) anglers who fish during "good fishing" periods tend to obscure any "real differences" which may exist. To answer this question fully a selected group of anglers would have to fish for an equal amount of time during all two-week periods; much of the variability would be removed if the effect of anglers' skill were eliminated.

Table 5. --Biweekly angling statistics for wild brook trout, Sections Z, A, B, C and D of Hunt Creek (combined), 1960

Period	Date	Total fishing		Wild trout		Catch per hour		Average total length (inches)	Average weight (pound)
		Trips[1]	Hours	Number	Pounds	Number	Pound		
1	April 30-May 13	187 (104)	415.5	421	75.74	1.01	0.18	8.0	0.180
2	May 14-May 27	74 (31)	122.0	89	15.76	0.73	0.13	7.9	0.177
3	May 28-June 10	112 (44)	199.5	130	23.71	0.65	0.12	8.0	0.182
4	June 11-June 24	54 (25)	96.5	64	10.36	0.66	0.10	7.6	0.161
5	June 25-July 8	84 (43)	204.5	138	26.74	0.67	0.13	8.1	0.194
6	July 9-July 22	70 (39)	169.0	64	11.86	0.38	0.07	8.1	0.185
7	July 23-Aug. 5	72 (13)	129.0	43	7.37	0.33	0.06	7.8	0.171
8	Aug. 6-Aug. 19	77 (38)	125.5	85	14.95	0.68	0.12	7.9	0.176
9	Aug. 20-Sept. 2	67 (32)	107.0	71	12.08	0.66	0.11	7.8	0.170
10	Sept. 3-Sept. 11	71 (28)	152.0	78	14.24	0.51	0.09	7.9	0.183
Total or average		868 (397)	1,720.5	1,183	212.81	0.69	0.12	8.0	0.180

[1] Number of successful trips in parentheses.

A second analysis of variance was carried out to determine whether fishing pressure (in hours) differed between years (1949 through 1960) and between the two-week periods. This investigation demonstrated that angling pressure varied significantly between years and between periods.

Fuller Creek

In 134 trips to Fuller Creek anglers creeled 98 wild brook trout, one hatchery brook trout and one hatchery rainbow trout. These trout weighed a total of 15 pounds. They averaged 7.7 inches long and were caught at the rate of 0.45 fish per hour. Anglers were successful on 31 percent of their trips. Records go back to 1940 and this year's (1960) catch of wild brook trout is the second highest catch recorded and is 40 trout greater than the 1959 catch. Fishing pressure was about the same as the previous season.

Fuller Creek Pond

An earthen dam maintains this impoundment on the site of an old beaver dam. In the fall of 1956 this pond was treated chemically to remove the fish population (mostly minnows and suckers) and has been stocked twice (October, 1957 and October, 1959) since. Returns from these plantings have been poor; 13.3 percent for those planted as legal-size fish and 17.7 percent for sub-legal size. The yield of wild trout to the angler also has been equally poor during the past few years. The removal of competing species and one year of dry fallowing did not result in noticeably improved angling, nor did growth rate of the trout improve. Trout apparently suffer extremely high mortality rates, or migrate out of the pond before any substantial portion of them reach

the present minimum legal size of 10 inches. Studies are in progress to determine the causes of mortality among the resident trout. Plans also have been formulated to "improve" the pond as trout habitat by installing a spillway through the earthen dam to enable water to flow through the entire length of the impoundment. At present the outlet is midway down the pond (Fig. 1) and water in the lower portion of the pond becomes stagnant. Satisfactory water temperatures and oxygen levels for trout exist in this lower portion only during the spring and fall months.

East Fish Lake

During the 1960 trout season anglers spent 1,205 hours (identical with 1959) fishing here which equaled the highest pressure yet recorded. The catch amounted to 321 trout weighing 244.5 pounds. Nine of the trout were wild fish that averaged 10.9 inches and 0.49 pound in weight. The 68 legal hatchery brook trout caught averaged 10.8 inches in length (0.50 pound). In addition, one[7] 9.8-inch (0.33 pound) sublegal length hatchery brook trout was creeled. Rainbow trout from plantings made in October of 1958 and 1959 were represented in the catch. The 34 trout from the 1958 planting averaged 18.0 inches in length (average, 2.26 pounds). The 210 legal and 6[7] sublegal length rainbow trout creeled from the 1959 release averaged 11.7 inches (0.62 pound) and 9.6 inches (0.33 pound) respectively. The average size of rainbow trout in 1959 was 13.2 inches and 0.95 pound. The smaller average size in 1960 is attributed partly to a higher catch early in the season and the smaller average size at the beginning of the trout season. The 1960-61 winter population studies indicate that the rainbows remaining from the October

[7] Not included in totals, Table 3.

1959 release average about 17.5 inches--comparable to those from the 1958 release at the same time in their life. Rainbow trout in both plantings averaged 8.9 inches at release.

The catch of brook trout, as usual, was made mostly during the first two weeks of the 1960 season. Few brook trout are caught later in the season--apparently because few survive. After the initial 14 days when 144 rainbow trout were caught, the remainder of the catch was spread out over the entire season, averaging about 10 fish per period. In comparison with 1959, the rainbows were exploited much more heavily early in 1960, probably as a result of the 50 percent increase in angling pressure, a later opening date, and higher water temperatures during the first two weeks of the season.

All waters

From all experimental waters of the Area, anglers creeled 1,875 trout (total weight, 561 pounds) in 1,482 angler trips involving 3,436 hours of angling (Table 3). The catch, fishing pressure, and rate of catch were the highest ever recorded since the founding of the station in 1939. The average size of the trout creeled was the second highest on record, exceeded only during 1959. The largest increases came in the lower sections of Hunt Creek which were fished under "any-lure" regulations in 1960, whereas they were fished under a "flies-only" restriction during the previous five seasons. Substantial increases, however, occurred in other waters.

Table 6 summarizes the 1939-1960 fishing statistics on Hunt Creek. Table 7 is a tabulation of Fuller Creek angling data for the 1940-1960 period.

Table 6. --Legal wild brook trout caught in Hunt Creek, 1939-1960

Section and year	Total fishing		Total catch		Catch per hour		Average size	
	Trips	Hours	Number	Pounds	Number	Pounds	Length (inches)	Weight (pound)
A, B, C and D								
1939	438	780	461	67	0.59	0.09	7.5	0.15
1940	505	901	406	60	0.45	0.07	7.6	0.15
1941	1,015	1,546	706	113	0.46	0.07	7.7	0.16
1942	808	1,267	532	83	0.42	0.07	7.6	0.16
1943	311	540	372	59	0.69	0.11	7.5	0.16
1944	340	640	337	53	0.53	0.08	7.7	0.16
1945	375	637	312	52	0.49	0.08	7.9	0.17
1946	753	1,206	434	68	0.36	0.06	7.6	0.16
1947	607	872	184	26	0.21	0.03	7.6	0.14
1948	504	869	476	78	0.55	0.09	7.7	0.16
1949	432	1,063	517	87	0.49	0.08	7.8	0.17
1950	369	915	415	75	0.45	0.08	8.0	0.18
1951	552	1,066	431	76	0.40	0.07	8.0	0.18
1952	488	1,195	556	103	0.47	0.09	8.0	0.19
1953	656	1,587	572	118	0.36	0.07	8.4	0.21
1954	748	1,649	483	88	0.29	0.05	8.0	0.19
1955	702	1,522	508	94	0.33	0.06	8.0	0.19
1956	704	1,245	585	104	0.47	0,08	7.8	0.19
1957	668	1,307	630	123	0.48	0.09	8.1	0.20
1958	701	1,257	583	121	0.46	0.10	8.2	0.21
1959	590	1,060	433	81	0.41	0.08	7.9	0.19
1960	641	1,179	674	122	0.57	0.10	8.0	0.18
Z								
1949	165	375	186	28	0.50	0.07	7.6	0.15
1950	165	473	160	21	0.34	0.04	7.4	0.13
1951	129	322	124	18	0.39	0.06	7.5	0.14
1952	188	570	222	34	0.39	0.06	7.7	0.15
1953	225	566	183	27	0.32	0.05	7.6	0.15
1954	363	838	143	22	0.17	0.03	7.7	0.16
1955	139	293	198	29	0.68	0.10	7.6	0.15
1956	176	354	197	32	0.56	0.09	7.6	0.16
1957	113	218	127	22	0.58	0.10	7.9	0.17
1958	84	175	101	15	0.58	0.09	7.6	0.15
1959	97	197	118	17	0.60	0.09	7.5	0.14
1960	227	141	509	91	0.94	0.17	8.0	0.18

Table 7. --Legal wild brook trout caught in Fuller Creek, 1940-1960

Year	Total fishing		Total catch		Catch per hour		Average size	
	Trips	Hours	Number	Pounds	Number	Pound	Length (inches)	Weight (pound)
1940	20	36	16	3	0.44	0.08	...	0.19
1941	59	97	21	3	0.22	0.03	...	0.15
1942	31	39	11	2	0.28	0.05	8.3	0.18
1943	19	25	19	3	0.76	0.12	7.6	0.14
1944	96	145	61	8	0.42	0.06	7.6	0.15
1945	102	159	64	9	0.40	0.06	7.5	0.14
1946	223	278	56	8	0.20	0.03	7.4	0.14
1947	212	219	27	4	0.12	0.02	7.5	0.14
1948	190	196	31	5	0.16	0.03	7.7	0.16
1949	115	296	43	6	0.15	0.02	7.4	0.13
1950	107	185	12	2	0.06	0.01	7.6	0.16
1951	110	246	59	9	0.24	0.04	7.6	0.16
1952	85	221	64	10	0.29	0.05	7.6	0.15
1953	86	212	84	14	0.40	0.07	7.8	0.16
1954	99	201	68	11	0.34	0.05	7.7	0.16
1955	110	214	68	10	0.32	0.05	7.6	0.14
1956	230	476	192	35	0.40	0.07	8.0	0.18
1957	179	377	76	12	0.20	0.03	7.6	0.15
1958	159	332	71	11	0.21	0.03	7.7	0.16
1959	126	234	70	11	0.30	0.05	7.6	0.16
1960	134	222	98	15	0.44	0.07	7.6	0.15

Summary by lures used

The 1960 catch is summarized in Table 8 according to the lures on which these trout were captured. Waters of the area were grouped into two categories, according to habitat.

On streams (Sections Z, A, B, C, D Stream, Fuller Creek) anglers used worms or worms and spinners on 76 percent of their trips. These lures accounted for 70 percent of the trout caught in stream sections. Fishermen using other live bait or a combination of lures made 8 percent of the trips and accounted for 9 percent of the catch. Fly fishermen made 15 percent of the trips and took 21 percent of the catch from streams. Anglers using artificial lures made only 1 percent of the trips and caught no fish.

On pond waters (Section D, Fuller Creek Pond, East Fish Lake) anglers used worms or worms and spinners on 60 percent of the trips and these lures accounted for 52 percent of the catch. Anglers who used other baits made only 1 percent of the trips and caught 2 percent of the fish. Artificial lures (other than flies) were used on 8 percent of the trips, and accounted for 10 percent of the catch. Anglers fishing a combination of lures made 21 percent of the trips and creeled 26 percent of the fish. Fly fishermen made 9 percent of the trips and caught 11 percent of the fish.

In general, effort with, and catch by, particular lures were proportional. There did not appear to be any striking differences between lures in view of the high variability in skill that exists between anglers using the same lures. These data point up the fact that worms only or worms in combination with

Table 8. --A comparison of different fishing lures showing frequency of use, numbers of trout caught, and catch per hour, Hunt Creek Trout Research Station, 1960

Water	Lure	Number of angler trips	Percentage of total trips	Number of trout caught	Percentage of total catch	Number of hours fished	Average catch per hour
Streams							
(Sections Z, A, B, C, D stream and Fuller Creek)	Worms	600	69.9	786	63.9	1,148.0	0.68
	Worms and spinners	54	6.3	77	6.3	84.0	0.92
	Flies	128	15.0	258	21.0	289.5	0.89
	Minnows	22	2.6	43	3.5	52.0	0.83
	Insects	15	1.7	35	2.8	18.5	1.89
	Artificial lure	7	0.8	0	0.0	11.5	0.00
	Natural	1	0.1	8	0.6	1.5	5.33
	Combination	30	3.5	21	1.7	57.0	0.37
	Unknown	1	0.1	2	0.2	5.0	0.40
	Totals	858	100.0	1,230	100.0	1,667.0	0.74
Ponds							
(Section D Pond, Fuller Pond and East Fish Lake)	Worms	329	52.7	307	47.6	1,057.5	0.29
	Worms and spinners	47	7.5	27	4.2	123.0	0.22
	Flies	58	9.3	69	10.7	110.5	0.62
	Minnows	4	0.6	4	0.6	5.5	0.73
	Insects	3	0.5	10	1.5	6.0	1.67
	Artificial lure	49	7.9	61	9.5	92.5	0.66
	Natural	1	0.2	0	0.0	3.5	0.00
	Combination	133	21.3	167	25.9	370.0	0.45
	Totals	624	100.0	645	100.0	1,768.5	0.36

various types of spinners are used by the great majority of anglers who fish the streams and the ponds on the Area. It is also interesting to note that fly fishermen were more numerous than anglers using other artificial lures.

Number of trout caught per trip (Table 9)

On waters with a daily creel limit of 10 trout and a minimum size of 7 inches, anglers creeled 6 or more trout on 7.2 percent of the trips; these trips accounted for 58.5 percent of the season's catch from these waters (Hunt Creek and Fuller Creek). This three-fold increase in catches of more than 5 trout per trip reflects the superior quality of fishing during the 1960 trout season. Fifty-six percent of the angling trips were unsuccessful.

From waters with a daily creel limit of 5 trout and a minimum size limit of 10 inches, anglers made limit catches on 4.4 percent of the trips. These trips accounted for 22 percent of the catch; the remaining 78 percent of the catch was made by those anglers who caught 1 to 4 trout per trip. No trout were caught on 58 percent of the trips. The successful trips increased 29 percent over 1959 while fishing pressure remained the same. Stocked hatchery trout composed about 88 percent of the catch from these waters.

Age composition of wild trout in the catch

The age composition of the wild brook trout taken from the area waters is summarized in Table 10. Separate tabulations were made for trout creeled in Sections Z and A, Sections B, C, D and Fuller Creek, and the Section D Beaver Pond.

Table 9. --Number and percentage of fishing trips on which different numbers of trout were caught, Hunt Creek Trout Research Station, 1960

Number of trout caught per trip	Daily creel limit[1] 10 trout, 7 inches		Daily creel limit[2] 5 trout, 10 inches	
	Number of trips	Percentage of trips	Number of trips	Percentage of trips
0	564	56.2	267	55.6
1	147	14.7	85	17.7
2	91	9.1	59	12.3
3	50	5.0	27	5.6
4	53	5.3	21	4.4
5	25	2.5	21	4.4
6	21	2.1	...	...
7	9	0.9	...	...
8	8	0.8	...	...
9	7	0.7	...	...
10	27	2.7	...	...
Totals	1,002	100.0	480	100.0

[1] Experimental sections of Hunt Creek, also Fuller Creek.

[2] East Fish Lake, Fuller Pond.

Table 10. --The age distribution of wild brook trout caught by anglers in Hunt and Fuller creeks, 1960

Stream section	Age group	Number of fish	Average length (inches)	Percentage of total catch
Z, A	I	70	7.4	8.3
	II	565	7.8	66.8
	III	198	8.4	23.4
	IV	12	8.9	1.4
	V	1	12.8	0.1
	Total	846		100.0
B, C, D stream and Fuller Creek	I	17	7.3	4.7
	II	291	7.7	79.9
	III	53	8.4	14.6
	IV	3	9.4	0.8
	Total	364		100.0
Sec. D Pond	I	33	8.3	46.5
	II	34	9.2	47.9
	III	4	12.0	5.6
	Total	71		100.0
All waters	I	120		9.3
	II	890		69.5
	III	255		19.9
	IV	15		1.2
	V	1		0.1
	Total	1,281		100.0

The age composition (percentage of catch in various age groups) from Sections Z and A, fished under an any-lure regulation for the first time in five seasons, was: I's--8.3; II's--66.8; III's--23.4; IV's--1.4; and V's--0.1. Age-group II made up a lesser percentage of the catch than usual, but twice as many trout of this age group were caught in 1960 as in 1959. More trout, by number and percentage, from age-groups I, III, IV and V were evident than in recent seasons.

From Sections B, C, D and Fuller Creek, age-groups II and IV were present in about the same proportions as in earlier seasons; the percentage of age-group I fish was somewhat higher and age-group III fish somewhat lower than in 1959.

The age distribution (percentage) of brook trout from the Section D beaver pond was: I's--46; II's--48; and III's--6. This composition was similar to that observed in earlier seasons except that age-group I contributed greatly to the catch, in comparison with the 1959 season, when it contributed only 14 percent.

Residence of anglers

The residence of the anglers making the 1,482 trips to the area is summarized by county and by state in Table 11. Thirty-six counties of the Lower Peninsula, two Upper Peninsula counties and six states were represented. As in previous seasons the single county best represented by anglers fishing the Area was Montmorency County. Wayne County residents were the next most numerous group of fishermen, followed by residents of Genesee, Oakland, Bay, Ingham and Macomb counties. Ohio residents led the out-of-state fishermen

Table 11. --Residence of anglers fishing experimental waters of Hunt Creek Trout Research Station, 1960

Residence (County)	Number of trips	Residence (County or state)	Number of trips
Montmorency	341	Shiawassee	6
Wayne	213	Berrien	5
Genesee	130	Clinton	4
Oakland	120	Alpena	3
Bay	112	Montcalm	3
Ingham	56	Muskegon	3
Macomb	54	Calhoun	2
Midland	49	Leelanau	2
Washtenaw	47	Manistee	2
Saginaw	37	Marquette	2
St. Clair	30	Gladwin	1
Oscoda	19	Houghton	1
Presque Isle	17	Ionia	1
Tuscola	17	Kalamazoo	1
Huron	16	Total	1,385
Ogemaw	16		
Otsego	12	Ohio	72
Lapeer	11	Indiana	16
Alcona	10	Pennsylvania	4
Jackson	10	Maine	3
Lenawee	9	Minnesota	1
Arenac	8	West Virginia	1
Livingston	8	Total	97
Iosco	7		
		Grand total	1,482

Table 12. --Type of fishing gear used in the experimental waters of Hunt Creek Area, 1960

Experimental water	Trips using type of gear						Total trips
	Fly	Spinning	Casting	Cane pole	Combination	Unknown	
Streams (Sections A, B, C, D, Z stream and Fuller Creek)	574	190	70	10	3	11	858
Ponds (Section D Pond, Fuller Pond and East Fish Lake)	161	319	101	1	40	2	624
Totals	735	509	171	11	43	13	1,482

(72 of 97 trips), followed by non-resident anglers from Indiana, Pennsylvania, Maine, Minnesota and West Virginia.

Types of fishing gear used

The various types of gear used on the Hunt Creek experimental waters during the 1960 trout season are listed in Table 12. The categories are based primarily on the type of reel used in conjunction with various rods. For example, a fly rod used with a spinning reel was classed as spinning gear; a spinning rod with a single-action fly reel was listed as fly-fishing gear. In general, the majority of anglers fishing stream sections used fly-fishing tackle, whereas more anglers used spinning gear on pond waters. The proportions of rod types used in the various waters was very similar to those recorded for the 1959 trout season. The cane-pole addict is rare; on only 11 trips out of the 1,482 observed was this traditional rod utilized.

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