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REPORT NO. 992

SUMMARY OF 1943 AND 1944 ACTIVITIES

by

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Activities for 1943 were opened by attendance at the Fisheries Supervisors' Conference at the Higgins Lake Training School, where I discussed the operations, objectives and results obtained at the Guiley Pond and Platte River Weir Projects. The results of the experimental plantings of tagged legal trout in lakes and streams for the 1942 trout season were also presented.

On my return to Ann Arbor, I completed the report on the results of the 1941 and 1942 trout seasons on East Fish Lake.

On January 27, Carbine and I drove to Norway Lake in Lapeer county to investigate this lake for possibilities as an experimental lake, and continued on to Hunt Creek where we spent the remainder of January conducting a population study of Diversions II-A and III-A, assisted by Leonard, Halberg and Allison.

Carbine and I returned to Ann Arbor on February 1. On Feb. 2, 1943, I was notified that I was to replace Dr. J. W. Leonard as resident biologist at the Hunt Creek Fisheries Experiment Station. The next ten days were taken up in preparing to move my library and personal belongings to

Hunt Creek, and in completing files to be left behind, and working on uncompleted reports. This was a period of considerable change in the Station personnel, all the result of demands for war man-power.

Dr. J. W. Leonard, in charge, left to accept a 1st. Lieutenancy in the Sanitary Corps.

Lawrence Bush, Technician A, left to join the Merchant Marine,

Henry Halberg, Construction foreman, left to take up war work in industry.

Since March 1, 1943, the personnel of the Hunt Creek Fisheries Experiment Station has varied as follows:

David S. Shetter, temporarily in charge, --March 1, 1943 to present.

Pat Galvin, Aquatic Biologist I, Sept. 1, 1943 to present.

Mrs. Jane Galvin, Technician C, January 1, 1944 to present.

Basil V. Hughes, Technician A, --March 15 - June 1, Nov. 8 - December 15, 1943, March 1 - June 1, 1944, October 1 - December 15, 1944.

Donald Pynnönen, Fish Culture Aid C, April 24 to Sept. 6, 1943.

Fred Kekko, Technician C, June 10 to Sept. 15, 1943.

Thomas C. Kuebrich, Technician C, June 1 to July 27, 1943 (Until called up for service in the Air Corps).

George W. Jennelle, Technician C, July 28 to Aug. 30, 1943.

O. M. Corbett, Technician C, May 15, to Dec. 22, 1944.

Henry Vondett, Technician C, June 1, 1944 to present.

Since coming to Hunt Creek it has been the primary objective of the present director to keep the fundamental research projects operating, and where possible to initiate new research that might be undertaken with the personnel and time available. The projects which have been carried on as usual were as follows:

1. Intensive creel census of the experimental sections of Hunt Creek and East Fish Lake.

In the 1943 trout season, gasoline rationing, the increased tempo of industrial war work, and the calls of military service sharply reduced angling pressure on the waters of the area. A total of 149 anglers spent 313 angling days and 542 hours on the experimental sections of Hunt Creek and caught 380 legal trout at the rate of 0.70 legal fish per hour. This is the highest catch per hour recorded in the five years of census. On East Fish Lake, anglers expended 121 fishing days and 199.50 hours, and caught 69 legal brook trout at the rate of 0.29 fish per hour.

For the 1944 trout season, the number of angling days increased approximately 8 per cent over 1943 on the experimental sections of Hunt Creek. A total of 164 anglers spent 340 angling days and 640 hours in catching 362 legal brook trout, a catch per hour of 0.57 legal fish. On East Fish Lake, the number of angling days increased 157 per cent over those registered in 1943. This increase was directly associated with the development of exceptional fishing for large brook trout (2 pounds and larger). A total of 108 legal brook trout were removed from East Fish Lake in 1944 by 150 anglers who expended 311 angling days and 651 hours, a catch per hour of 0.17 legal brook trout. Out of the total catch of 108 fish four weighed 2 pounds or more, and 31 weighed 1 pound or more. The number of angling hours expended in 1944 was more than double the time spent during the 1942 season, when comparatively large numbers of legal-sized hatchery reared brook trout were released in the preceding fall and in the early spring of 1942. The reaction of the fishermen to the situation here, together with similar information available from the Guiley Pond (Iosco County) creel censuses (where the chief drawing card

is the chance of hooking a large rainbow trout), and the favorable public reaction noted toward the Portage Creek Trout Pond (Jackson county), all indicate that a large number of our trout fishermen are willing to take fewer fish if there is a chance of hooking a "big one".

It is important that the intensive creel census be kept in efficient operation during these periods of low angling pressure, since knowledge of the eventual effects of comparatively low angling pressure on the local brook trout populations thus will be available.

2. Continuation studies on fish movements in the experimental area.

All fish traps on the area are examined throughout the year, snow conditions and pressure of other work permitting. Traps located on Trib 2, 3, 4 and 5 have been inspected daily since their installation. The East Fish Lake traps are inspected at least once each week after the road becomes snowed in. Air and water temperatures, weather conditions, and water level changes are recorded at the time of each inspection. In 1943, all brook trout entering the traps which were larger than 4 inches were measured and jaw tagged, and a scale sample obtained. Lengths and scale samples are taken from any tagged brook trout recovered in the traps. The fish are released in the direction they were moving at the time of capture.

Present practice (in operation since Feb. 15, 1944) now calls for the marking of all brook trout moving through the weirs. All fish less than four inches long are fin-clipped (a different fin combination is used for each tributary); all larger than four inches are jaw-tagged.

Because very few fish used the Trib 5 weir, this trap was discontinued early in 1944, and was installed in the midcourse of Trib 3 near the road bridge in March, 1944. This transfer was made in an attempt to gain further information on how far up this stream brook trout might migrate from Hunt Creek. The inlet of East Fish Lake was blocked off by a new weir installed just above the lake. This was constructed under the direction of Pat Galvin, Junior Aquatic Biologist assigned to the Station, and began operation in late September, 1944.

A brief summary of the numbers of fish handled in each of the weirs for the calendar years 1943 and 1944 is presented in Table 1. The table lists the numbers of fish of each size group moving up or down stream through the various traps in operation. The brook trout are classified ^{arbitrarily} ~~arbitrarily~~ into 4 size groups: fry, 0-70 millimeters; fingerlings, 70-100 millimeters; sub-

legals, 101-176 millimeters; legals, 177 millimeters or larger.

The reader will note from these tabulations that comparatively few legal fish (7 inches or larger) move through the traps (23 in 1943, 11 in 1944), but that what movement there is, is dominantly downstream. In general, many more fish of each size group move downstream into Hunt Creek than move up out of the main stream.

In 1943, a total of 1,450 brook trout were handled in the weirs. The great majority of these fish were fingerling- and sub-legal - brook trout. A total of 552 of these fish were tagged.

In 1944, a total of 1,284 brook trout passed through the various weirs in operation. Again the majority of fish were from 3 to 6 1/2 inches in size. A total of 1,110 brook trout were either fin-clipped or jaw-tagged, depending on their size.

The number of dead fish found in the traps is indicated in the table. In both 1943 and 1944, a total of 82 dead fish were noted in the operation of the traps. Part of this mortality is incurred in the traps (obviously the case in the mortalities in the upstream traps), but an unestimatable amount of natural mortality in the stream above the traps is represented by that recorded for the fish taken in the downstream boxes.

At the earliest opportunity the catch records for the weirs and the temperature and water level notes will be analyzed in detail and reported on, since the data has considerable bearing on the proper management of the so-called "feeder" streams.

During the summer of 1944, Mr. Galvin completed a master file of all tagging data recorded at the weirs since their inception here. The data are being added to as more fish are marked.

3. Continued observations of the value of stream improvement devices to improve angling.

After the close of the 1941 trout season, Section B of the experimental stream was changed by the installation of 24 devices designed to create deeper pools and to create more underwater cover. Detailed bottom food studies were made before the placement of the stream improvement devices, and have been made yearly since, and will be continued at least until 1946 to determine what changes take place in the trout food production. Population studies were, have been and will be conducted along similar lines so that the effect of the habitat changes on the fish population may be measured. The yield of Section B to the angler is followed closely through the creel census studies.

The summary of the angling results in Section B for the six-year period is presented below. The reader will note that there has been considerable improvement in the quality of the fishing in 1942, 1943, and 1944 since the installation of the improvement devices.

The population estimates of Section B have been computed from results obtained by blocking off five representative areas within the section in August of each year and counting, weighing and measuring all fish found in the sample areas. In 1941, the method of removal was intensive seining, and each year since the fish have been obtained by means of the "shocker". Both the total area of Section B and the area of the sample sections is known, and the per acre population of Section B may be calculated by direct proportion (Table 3).

In August, 1941, before the installation of the stream improvement devices, it was estimated that there were approximately 2,621 brook trout per acre of all sizes present in Section B weighing 38.91 pounds. During the season, 32 legal brook trout (or 50 per acre weighing 8.1 pounds) were removed by angling, so the total standing crop of brook trout per acre for

Section B for 1941 may be set at 47.01 pounds.

Similar calculations for August samplings in 1942, 1943, and 1944 indicate a gradual increase in the per acre trout number of all size groups, and a noticeable increase in the pounds per acre of all trout produced (47.01 pounds per acre in 1941 to 69.07 pounds per acre in 1944).

Although legal fish have been poorly represented in the population study samples, this may be explained by the date of sampling (late August, after the majority of the angling has taken place) . The presence of legal fish in Section B can be well-demonstrated by their presence in the anglers' creels.

Bottom food studies showed there was a slight decrease in available food between 1941 and 1942, but despite the small drop in total production, certain food items known to be favored by the brook trout were found to have increased. The 1943 and 1944 bottom samples have been collected and sorted, but have not yet been analyzed in detail because of the absence of Dr. J. W. Leonard with the Armed Forces.

Depth measurements before and after the installation of the improvement devices are available, but have not been analyzed in detail. However, it can be said that the devices have more than trebled the number of pools present and have maintained adequate depths for a period of three years. The structures themselves have held up well with a minimum of maintenance.

4. Population study of Diversion I-A

Since June 1942, the fish population of Diversion I-A of Section C has been enclosed by screens. It was removed and counted at that time. The following population was present in June, 1942:

1 legal brook trout-----60 grams,
 42 sub-legal brook trout-----815 grams,
 4 fingerling brook trout----- 27 grams,
 335 fry[✓] (29 died in collection)----389 grams,
 6 muddlers----- 31 grams,
 or a total of 1,322 grams of fish.

To the above there were added 306 hatchery-reared brook trout fry. Hatchery fish were marked by clipping the right pectoral fin, and wild fish were marked by removal of the left pectoral fin, or the left pectoral and adipose fins.

In June 1943, Diversion I-A was drawn down and the fish removed with the aid of the electric shocker. The following population was found:

No legal brook trout

15 sublegal fish from the 1942 marking-----334 grams
 (all had been sublegal in 1942),

13 sublegal fish not marked-----136 grams,

46 wild marked 1942 fry-----356 grams
 These fish bore the left pectoral mark used on wild fry in the preceding year and were distributed as follows: - Sublegals, 20 fish; fingerlings 26 fish.

11 hatchery marked 1942 fry----- 104 grams
 These fish bore the right pectoral mark given the hatchery-reared fry in 1942 before release in I-A. Nine had grown to sublegal size, and two were of fingerling size.

31 wild fry of the 1943 hatch----- 29 grams
 (unmarked),

or a total of 959 grams of fish.

[✓]Term applied to fish under 70 m.m. in length.

As 6 of the 1943 wild fry died during collection and handling, a total of 25 hatchery fingerlings were measured, weighed, and added to the population in June, 1943.

This population was examined in June, 1944, the following survivors and additions were encountered:

From the 1942 markings.

Left pectoral and adipose (legal and sublegal in 1942)	
	1 legal fish -----51 gr.;
Left pectoral (1942 wild fry)	2 legal fish -----105 gr.;
	14 sublegal fish ----427 gr.;
Right pectoral (1942 hatchery fry)	
	2 legal fish -----113 gr.;
	1 sublegal fish ---- 55 gr.;

From the 1943 markings.

Left pelvic (all sizes, wild)	1 legal fish -----60 gr.;
	16 sublegal fish----397 gr.;
Right pelvic (1943 hatchery fry)	2 sublegal fish---- 36 gr.;

From 1943 spawning.

Unmarked fry	36 fish ----- 54 gr.;
(marked by clipping adipose and left pelvic fin);	

Previously escaped capture or jumped in.

Unmarked sublegals	19 fish -----300 gr.;
Unmarked fingerlings	2 fish ----- 13 gr.;
(these 21 fish were marked by clipping dorsal and adipose and left pelvic fins).	

The total brook trout population present in June 1944, was 96 brook trout weighing 1,611 grams. To this population, 26 hatchery-reared fry were added in 1944 (weight 34 grams) after clipping the right pelvic and adipose fins.

The object of this continued experiment will be to obtain comparative data on the survival and growth of wild and hatchery-reared brook trout fry in this presence of a known number of larger fish, and also to learn more concerning the ratio of age and size groups that become established in an unfished population of brook trout.

During 1943 two research projects were brought to a successful termination. These were as follow:

1. Comparison of growth, mortality, and retention of marks among brook trout fingerlings marked by jaw-tagging, fin-clipping and injection with thorium dioxide (Thorotrast).

This was a cooperative undertaking between Dr. J. W. Leonard and Dr. Arthur Hasler of the University of Wisconsin. The latter individual provided the thorotrast for marking and the X-Ray analysis of the recovered fish. Approximately 50 fish were marked by each method of marking, and 50 control (unmarked fish) were confined to Diversion III-B in September and October of 1942. They were removed and examined and the experiment concluded in June and July of 1943. The results of the experiment are shown in the Table 4.

None of the groups of marked fingerlings had as low a mortality rate as did the unmarked controls, nor did any of the groups of marked fish grow as much in either length or weight. However, the tagged fish and the fin-clipped fish were confined after measurement approximately 40 days less. This latter fact makes interpretation of the results somewhat difficult. The control fish and the thorotrast-marked fish showed the greatest gains. However, the average gains in weight noted for the tagged and fin-clipped fish were only slightly less than those noted for the control fish and the thorotrast-marked fish. Had the tagged and fin-clipped fish been measured and confined 40 days earlier, it is likely that there would have been little difference among the average gains in length and weight between any of the groups of fish.

Judged on the basis of average gain per day of confinement the thorotrast-injected fish showed greater increases in length, but the tagged and fin-clipped fish made greater increases in weight.

All groups retained their marks well, and there was no difficulty in distinguishing their marks.

Although the method of marking by the injection of thorotrast might be said to be a better method for small-scale experiments where it is necessary to preserve the natural external features of the normal fish, it would be difficult and expensive to apply it to large-scale experiments where one would have to X-Ray the total catch from a stream area to obtain recoveries.

2. Population study of an unfished section of stream at different seasons of the year.

The population of Diversions II-A - III-A (580.5 feet of stream, 0.131 acres) at the conclusion of the 1940 fishing season has been discussed previously (Shetter and Leonard, 1943). With the completion of the diversions, it was desirable to close this general area to public use so that any experimental work carried on in the diversions would not be interfered with in any way. As the normal stream channel was provided with screen bulkheads, it is a relatively simple matter to block off the stream, divert the water, and remove the fish population found there. The general object of the experiment was to determine the seasonal fluctuations of the fish in the natural stream channel at different seasons of the year where removal of adults by angling was not permitted. Accordingly, population studies of the area discussed were made in September, 1942 (two years after the last fishing had been allowed in that portion of the stream), January, 1943, May, 1943, and September, 1943. The general results are presented in the table below. (Table 5) Considerable analysis of the numerical data, and the scale-samples remains to be done, however.

As will be noted in the table, there was considerable fluctuation in all size groups of fish at the different seasons of the year, both in numbers of fish and weight of fish found. Since removal by angling was not allowed, fluctuations in the stock must be ascribed to natural mortality, replacement by reproduction, and migrations into and out of the area, or growth of fish from one size group into the next.

3. Lake surveys completed.

(a) Schoolhouse lake, a small, shallow lake about 1 mile north and west of the laboratory, was mapped in the winter of 1943, and surveyed in August of 1943. It is fed by a small spring inlet and has no outlet. The physical-chemical conditions noted here in August, plus the fact that only limited population of yellow perch was found, suggest, that the lake might support a small population of brook trout. An experimental planting of 588 fingerling brook trout was made in September, 1943. The lake is also being utilized for an experimental planting of Gambusia to determine whether this species of fish, which feeds on mosquito larvae, will survive the winters of Northern Michigan.

(b) Lake survey of the Spectacle Lakes

At the request of F. A. Westerman, the five Spectacle Lake basins east of the Meridian Line in southwest Montmorency County, were surveyed in July, 1944. The survey was made after local residents showed interest in a proposal to build a dam at the Meridian Line. A good series of temperature and chemical data were obtained and net samples of the fish present in each lake were taken also. These lakes are dominantly pike and bass water.

(c) Lake Survey of the Sage Lakes.

The inspection of these lakes, of which there are four true basins, completes the surveys of the lakes in the Hunt Creek drainage. They lie about 3 miles north of the station on the border of the Lundeen Refuge, and form the headwaters of Sage Creek, the only large tributary in the mid-course of Hunt Creek.

These lakes are "pike" lakes, although hook-and-line fishing for pike would not be called very good. Also present are rock bass, yellow perch, and brook trout. Chemical and temperature studies indicate that conditions are not unsuitable for brook trout in three of the four basins. An

experimental planting of marked adult brook trout was made in November, 1944 in order to determine if there can be a satisfactory survival of planted fish in the presence of a population of northern pike. Two hundred and fifty legal brook trout were placed in Middle Sage, 150 in Southwest Sage, and 100 in Northwest Sage Lakes.

In addition to maintaining or completing the research already listed, the following new lines of research have been undertaken.

1. Further study on the comparative survival and growth of hatchery-reared and wild fingerling brook trout in the absence of competition and predation from larger trout was started in Diversion III-B, with 100 fish of each type being measured, marked distinctively, and weighed (completed June, 1944, but data not analyzed as yet).

2. Studies on the survival, growth and migration of hatchery-reared fry and fingerlings as compared with wild fry and fingerlings in Fuller Creek were started. Small fingerlings of each type were marked in June by fin-clipping, and fingerlings of each type were marked in the fall by jaw-tagging. All marking and planting was done in Fuller Creek above the counting weir in the hope that some information might be obtained also regarding the time of year that downstream migration commences. Very little downstream migration has been observed as yet.

3. Installation of accurate stream gages and recording of flow.

In late October, 1943, through cooperation of the Geology Division, three stream-gaging stations were established on the area. These are located at East Fish Lake, the Fuller Creek weir, and approximately 1/4 mile north of Halberg's Bridge on Hunt Creek. Stream elevations are noted daily. After several flow readings are taken at different stream elevations, a curve can be constructed from which the flow can be read knowing the stream elevation.

The resulting information will be of considerable value to both fisheries and geological workers. After a cloudburst dropped approximately 6 inches of rain in 4 hours, on May 31, 1944, Hunt Creek was noted to rise 14 inches above the normal level.

4. During November, 1943, an experiment to determine the number of small fingerlings resulting from the spawning of a known number of adult trout was set up in Diversion II B. Five females and ten males were confined here, and were allowed to spawn. All but two adults were removed before the fry emerged. The fish succeeded in spawning, and the resulting fingerlings were collected, counted and examined in July, 1944. In connection with this experiment, a series of ovaries were preserved from brook trout taken by angling in the late summer and early fall to determine the possible fecundity of females of various sizes. The general purpose of this line of research is to learn more details about the life history of the brook trout so that we may evaluate the efficiency of natural reproduction in maintaining the fishing for the species.

By July, 1944, the fingerlings in II-B were large enough to be collected with the electric "shocker". A total of 173 brook trout fingerlings were found to be present. One hundred of these fish were marked by clipping the dorsal and adipose fins and released in Section C of Hunt Creek to determine the survival from fry size to legal size.

From the data collected on egg contents of female fish of various sizes (See #5 below) it was estimated that we might expect a hatch of 3100 to 4300 fry if all eggs were deposited and hatched and there was no mortality. The 173 fingerlings collected represent a hatch and survival to the small fingerling stage of 4.02 to 5.58 per cent of the estimated egg capacity of the female fish present.

Factors which may have led to a decrease in the size of the hatch are:

1. All the adults were not captured. Two fish over 6 inches long were taken at the time of removal in July, 1944.

2. Some of the eggs in the redds may have been injured in the process of attempting to remove the adults, as we had to capture them by means of funnel nets and scap nets. Although we knew approximately where the redds were located, walking on the bottom may have assisted in silting over some of the redds or may have killed some of the eggs in the nests.

This experiment was repeated during the fall of 1944, with the placement of 7 females and 10 males in Section III-B.

5. During the winter, Mr. Galvin worked up the collections of brook trout ovaries at the Station, also previous data collected on this subject. This consists of ovary counts on 55 female brook trout ranging from about 6 $\frac{3}{8}$ inches to 16 $\frac{3}{8}$ inches in size. The results are summarized in Table 6.

It will be noted that there is a progressive increase in number of eggs with increase in body size. Were more specimens available in the larger size groups the trend probably would have been more regular than it appears.

6. During the spawning season of 1943, a number of sites were marked which appeared to have been used as spawning redds. Lack of time and personnel prevented more detailed observation during the spawning season of 1943.

In midwinter, a number of redds were examined in an effort to determine the average number of eggs deposited and the numbers of redds actually used for egg deposition. The available information is too scant as yet to permit if any conclusions, but it may be pointed out that not all redds fanned out are used for egg deposition.

In the fall operations of 1944, almost daily examinations of the entire stream length in the experimental area were conducted during the course of

the brook trout spawning season. The spawning extended from about Oct. 12 to Nov. 13. Data on the numbers of redds fanned and the areas which were utilized are now available. Numerous nests were marked and later dug up to determine the number of eggs deposited and the percentage of fertilization and mortality. These data remain to be studied in more detail as soon as time permits.

Meetings attended

During 1943 I attended the meeting of the Fisheries Supervisors at the Higgins Lake Training School (5 days), the Michigan Academy of Science, Arts, and Letters at Ann Arbor (2 days), and a meeting of the representatives of the Fish Division and Field Administration Division at the Atlanta District (1/2 days).

During 1944, a total of 8 days were spent away from the Station at various meetings. At the request of R. J. Martin, In Charge, Higgins Lake Training School, I gave a lecture on the history of fish culture and fisheries research in Michigan to science teachers and 4-H club leaders in attendance there. Two days were spent with the advisory committee of the Rogers City sportsmen discussing and visiting the sites of various fisheries problems of mutual interest. Early in the winter three days were spent attending the 1944 meetings of the Michigan Academy of Science, Arts and Letters in Ann Arbor.

Maintenance and upkeep of the physical plant

During the summer months, of 1943 and 1944 the laboratory residence, the three-room cabin, and the one-room cabin were given two coats of log preservative. All weirs were repaired and given a coat of creosote. Scrap lumber from the old construction-crew bunkhouse was buzzed up for kindling and piled. Numbered markers were erected at the sites of the original map stations along the experimental sections, and a number of photographic stations were established for future work. A standard departmental sign was received from the Field Administration Division and erected in the driveway semi-circle. A small shelter house to hold extra bulkhead screens and protect them from the weather was constructed. To help thwart the meat shortage, a rough but serviceable chicken coop and yard were constructed. After the arrival of Mr. Galvin, he constructed a wood-shed and fruitcellar in the rear of the diversion cabin.

In the spring of 1944, two additional directional signs were received and erected, one on Montmorency County Highway #612.

A 32-foot spruce flag-pole, complete with direction marker and wind vane, was erected in April, 1944.

A two-way fish trap was constructed and installed in the inlet of East Fish Lake under the supervision of Mr. Galvin. The trap was in operation in late September of 1944.

Reports Completed

1. Report # 848. Results of the Intensive Creel Census on East Fish Lake during the 1941 and 1942 Trout Seasons.

This report summarized the results of the 1941 and 1942 trout seasons on East Fish Lake and compared the difference in the anglers' catch of brook trout before and after the poisoning of this lake in the late summer of 1941. From the data available it can be demonstrated, that, through an intelligent program of management, the quality of the angling can be increased about three-fold in a four-year period (the average number of fish caught per hour of angling increased from 0.41 fish in 1939 to 1.27 fish in 1942). In 1941, hatchery reared fish made up 72 per cent of the total catch, and in 1942, hatchery fish made up 90 per cent of the total catch (the poison apparently did not get all of the wild brook trout present in the fall of 1941).

It was brought out in this study that a small percentage (seldom more than 20 per cent) of the total number of anglers using these small brook trout lakes take from 40 to 80 per cent of the total catch, particularly in the early-season fishing. A reduction in the daily limit on all trout lakes from 15 to 5 trout was recommended.

2. Report # 860. The Anglers' Catch From Portions of Certain Michigan Trout Streams in 1939 and 1940, with a Discussion of Indices to Angling Quality. (the Papers of the Michigan Academy of Science, Arts and Letters, Vol. **XXIX**, 1943, publ. 1944, pp 305 - 312.)

The angling pressure, total catch, and weights and measurements of trout caught in sections of seven streams in 1939 and sections of five streams in 1940 are presented. The method utilized to estimate the total weight of fish removed from known stream acreages is given. From the statistics at hand it may be calculated that the average yield per acre of stream under observation

in 1939 was 15.7 pounds of trout; in 1940 the average yield per acre for the five stream sections under creel census was 15.3 pounds of trout. Per acre yield during these two years varied from 3.2 pound to 68.3 pounds among the several streams. Comparison with similar studies in New Mexico and Virginia indicates the average yield per acre to be greater than that listed for Virginia, but not as high as that listed for New Mexico.

Through the presence of marked hatchery fish in many of the stream sections under census, or based on data previously obtained, it was estimated that from 80.5 to 96.4 per cent of the yield consisted of wild trout.

The number of pounds of legal trout caught per hour of angling appears to be the most accurate index to the quality of the fishing, since it includes both the number and size of fish caught per unit of effort. Both of these factors are generally considered to be of equal importance in determining angling quality.

3. Report # 898 The Operation of the Platte River Weir, November 1, 1941 - June 20, 1943

This report describes the reasons for the installation of the Platte River, weir, gives details of its construction, and summarizes the information collected there over a 20 month period.

Because many anglers claimed the mouth of the Platte River where it enters Lake Michigan was too shallow to allow fish to enter the river, there was agitation for dredging or other forms of river mouth improvement. Before entering into any such expensive construction, it was decided to first learn just what proportions the run of fish into and out of the river attained. Accordingly, a two-way fish trap with moveable boat gates was installed and placed in operations by November 1, 1941. Except for short periods during blizzard and sub-zero weather (when severe sluch ice conditions made it necessary to raise the

boat gates) migrating fish were forced to enter the traps for counting and observation. All fish were counted and weighed in 1941 and 1942, and were marked either by fin-clipping or jaw-tagging, and an adequate series of measurements and weights on individual fish were obtained. Scale samples were obtained from almost all rainbow trout handled during those years. Temperature and water level records were also noted daily. Numerous depth measurements were taken at the river mouth throughout the course of the investigation.

Fourteen species of fish were taken in the traps (all adult fish, since the bar spacing in the weir and traps was 1 1/2 inches). The four most numerous species were the suckers (common and fine-scaled combined), rainbow trout, and smelt. In the 20 months of operation, ten times as many rainbow trout moved upstream as moved downstream, and approximately 25 times as many suckers moved upstream as moved downstream. The spring spawning run of rainbow trout was about 3 1/2 times greater in 1943 than in 1942 (756 to 196). Weather conditions extant in the spring of 1942 held back the upstream run of all species for about three weeks. Observations below the weir in both 1941 and 1942 led to the conclusion that extremely heavy angling pressure near the mouth of the river in 1943 was a contributing factor in lowering the upstream run in 1943, frightening many fish back into Lake Michigan which normally might have ran past the weir.

Based on the data collected in 1942, the average weight of the rainbow trout passing the weir was 9 pounds, and the average length was 27 5/8 inches. They ranged in weight from 2 to 18 pounds. The suckers averaged about 2 1/2 pounds in weight. During 1943 all suckers coming into the traps were distributed free to the public, and an estimated total of 6,143 pounds of fish was made available at the weir to help combat the current meat shortage.

In the course of weir operations, 772 rainbow trout were either fin-clipped or jaw-tagged to learn more of their movements and growth. Eighty-eight (88) or 11.4 per cent have been later recaptured, chiefly in the Platte River drainage.

Observation on the channel depths at the river mouth during the period of operation indicated that the depth varied between 17 and 36 inches depending on the season. There was always adequate water for passage of fish either into or out of the stream.

At the request of local sportsmen, the weir was left in place and operated on the following schedule during 1944:

Leave boat gates up and allow free passage of fish during the early part of the year.

April 1 - June 15 - lower boat gates and completely block off stream. Dip spawning run of rainbows and place above weir so that they may proceed to the spawning grounds but will not be allowed to return to Lake Michigan before the trout season opens.

After June 15 the boat gates are to be lifted and the fish allowed to move back to Lake Michigan if they choose to do so.

No formal report has been prepared yet on the 1944 operations. The weir was operated as outlined above. Mr. Scholma began observations after lowering the boat gates on March 16, 1944. The first rainbow trout entered the traps moving upstream on March 19, and they ran until June 3. The peak of the run occurred during the week of April 21 - 28, when 68 males and 301 females were lifted over. The total rainbow trout run was 832 fish (188 males, 644 females). In addition to the rainbow trout, 2,245 common suckers and 365 fine-scaled suckers were captured as they moved upstream. The majority of the latter two species were sold to the local people for canning and smok-

ing at 5 cents or ten cents each for small (1-2 pounds) and large (over 2 pounds) specimens.

Other species taken in comparatively small numbers at the weir in 1944 were, northern brown bullhead, yellow perch, rock bass, large-mouth black bass, walleye, bowfin, ciscoe, long-nosed gar pike, carp, northern pike, and sea lamprey.

A creel census conducted by Scholma in the immediate vicinity of the weir indicated that 56 rainbow trout were taken in 1,552.75 hours of fishing above the weir and 2 rainbow trout were captured in 123.75 hours of angling below the weir.

4. Report # 901 Further Results from Spring and Fall Plantings of Legal-sized, Hatchery reared Trout in Streams and Lakes of Michigan (re-edited for publication in the 1944 Volume of the American Fisheries Society)

In advance of the 1942 trout season, six streams, located in all sections of the state, and several lakes, were planted with marked or unmarked trout as the occasion demanded. Recoveries from these plantings, obtained from the stream and some of the lakes through voluntary angler-cooperation, and from intensive creel censuses in certain instances yielded additional information concerning the comparative survival of fall and spring plantings of hatchery trout of legal size.

These experiments confirmed the conclusion that spring release of adult or near-adult hatchery-reared brook trout and rainbow trout is superior to fall plantings of fish of a similar size. Fall stocking of brown trout may furnish as good fishing in the following season as does spring planting of brown trout in some instances.

Survival of planted fish past the first season of availability ranged from 0.0 to 2.5 per cent to the second season; to the third season, 0.0 to 0.5 per cent.

In either spring or fall planting of legal fish, no advantage was gained in scattering the fish widely over the stream areas stocked.

Eighty-five or more per cent of the planted trout were caught within 10 miles of the point of release, regardless of the season or method of planting. Brown trout moved the least, followed by brook trout, and rainbow trout. About one-fourth of the brook trout tended to move 3 to 10 miles downstream, and the majority of the remainder were caught within 3 miles of the locality of release. More rainbow trout than any other species were recaptured 10 or more miles from the point of release.

Fall plantings of adult brook trout in lakes were found to have an average survival of 56.7 per cent (range 13.0 to 88.1 per cent). Unfortunately, a small percentage of the anglers removes an average of 89.4 per cent of the survivors during the opening weeks of trout season. The average survival from two spring plantings of brook trout in East Fish Lake in Michigan was 68.5 per cent.

A brief review of the literature substantiates the conclusions reached as a result of the Michigan experiments. Differences in experimental procedure are pointed out, and some reasons for the failure of fall plantings in streams to survive the winter season are offered.

5. Report 889. Creel Census on the Hunt Creek Fisheries Experimental Area, 1942 Trout season.

During 1942, a total of 808 angling days were spent on the five experimental sections of Hunt Creek by 486 different individuals. These fishermen spent 1,280 hours in fishing and caught 548 brook trout for a catch per hour of 0.43 fish. The total weight of the catch of legal fish was found to be 83.77 pounds, or 19.2 pounds per acre of stream (the area of the experimental waters is 4.33 acres).

The best fishing was found in Sections A and B. The fishing was quite uniformly good from the start of the season to mid-August, and dropped off after that.

Identification of marked fish in the catch demonstrated that only 2.2 per cent of the total catch came from fingerling plantings of hatchery trout two and three years earlier.

Complete catch records from two specially marked pools and an old beaver dam demonstrate that a small percentage of the total stream area may contribute a large percentage of the total yield of a piece of water where conditions are favorable for brook trout.

A study of the relationship of the angling pressure to the yield from year to year leads to the general conclusion that the experimental area as a whole has not been overfished, but that perhaps certain sections have been overfished in certain years.

Catch statistics are also presented for adjacent waters in Hunt Creek and in some of the tributaries where it was not possible to obtain complete data.

6. Report # 932. Creel Census of Kinne Creek, Wingleton Club, for the 1943 Trout Season.

This report summarized the results of the 1943 trout season on Kinne Creek, a private trout stream in Lake County. The 1943 catch was 28 per cent lower than in 1942 (373 trout as compared with 516 trout). The decrease in the catch appeared to be related to a decrease in the fishing pressure observed everywhere in that year. This was the sixth consecutive season for the Kinne Creek creel census.

7. Report # 933. Results of the 1943 Fishing Season on Little Long Lake, on Buckhorn Ranch, a Private Lake in Osceola County.

As on Kinne Creek, the owners and privileged anglers recorded their

catches and fishing results, at this location for the fourth consecutive year.

One hundred and fifty anglers, (32 less than the previous year) of whom only nine were unsuccessful, fished Little Long Lake for 442 hours and removed 1,061 bluegills, 56 largemouthed bass, 270 yellow perch and 13 bullheads. The catch per hour was 3.16 fish, considerably higher than the average for the vicinity.

Increased angling pressure (although still not very heavy) has increased the number of bluegills and yellow perch captured, and has possibly caused a decrease in the average size of the bluegills in the catch.

8. Report #943 Intensive Creel Census Results on the Hunt Creek Fisheries Experiment Area, 1943 Trout Season (with Pat Galvin)

During 1943, a total of 313 angling days were spent on the five experimental sections of Hunt Creek by 149 individuals. These anglers spent 542 hours in fishing and caught 380 legal fish for a catch per hour of 0.70 brook trout. The total catch was found to weigh 59.61 pounds, or a per acre production of 13.7 pounds of legal brook trout.

The quality of the angling was generally above average except for three two week periods; - the periods Apr. 24 - May 7, July 3 - 16, and Aug. 28 - Sept. 6. At all other times the catch per hour varied between 0.51 and 1.19 fish.

No hatchery fish entered the 1943 catch.

The average size of the brook trout captured was 7.5 inches and 2.6 ounces.

A study of the relationship between angling pressure, angling quality and yield leads to the conclusion that these three items have a direct affect on each other. It appears possible that a high total yield under heavy angling pressure, which may be a sound management practice, is often produced under conditions of poor angling quality.

From recoveries of tagged trout marked in the tributary weirs, it was determined that 0.7 per cent of the 1942 catch in the experimental waters came from tributary streams, while in 1943, the percentage was 2.9.

On East Fish Lake, 121 anglers fished 199.50 hours and caught 69 legal brook trout at the rate of 0.69 fish per hour. These fish weighed 26.04 pounds, a yield per acre of 1.63 pounds for this 16 acre lake. The average size of fish captured was 9.3 inches and 5.99 ounces, an increase over the previous year, when they averaged only 8.9 inches and 4.7 ounces. The entire catch consisted of wild fish, and for the first time brook trout weighing more than a pound were captured.

9. Report #950. Results of Investigations at Guiley Pond, Iosco County; including a summary of the Intensive Creel Census, and a summary of the marking activities for the year 1942 and 1943.

On the 1942 spawning run, 158 male and 152 female rainbow trout came to Guiley Pond. Their total weight was 1,233.29 pounds. All were jaw-tagged at that time or had been previously tagged. Of the 310 fish in the run, 71 or 22.9 per cent were fish from the 1941 operations.

From the data available from these 71 tag recoveries, it can be demonstrated that, depending on the size at tagging in 1941 and the length of the period of freedom, thereafter, changes in weight varying from losses of 6 ounces to gains of 49 ounces took place.

In 1942, a total of 1,369 anglers fished 3,839 hours on Guiley Pond (1 1/4 acres) and captured 195 rainbow trout and 166 brook trout. The rainbow trout weighed 490.5 pounds, the brook trout weighed 42 pounds, 7 3/4 ounces. The catch per hour was 0.09 fish, and the number of pounds of fish caught per angling hour was 0.14 pounds.

Recoveries of tagged fish in all months of the trout season of 1942 furnished data which led to the conclusion that fish placed in the pond close to their time of spawning lost the greatest amount of weight. Spawning

activity rather than length of confinement in the pond, appeared to be the cause for weight loss from which these fish never recover until they return to Great Lakes waters. In general, the smaller, younger fish grow rapidly between spawning seasons, but lose a greater percentage of their weight at spawning, while the older, larger fish gain less weight and lose a smaller percentage of their weight in reproductive activities. In 1942, the average percentage loss in weight of males was 16.9 per cent, of females, 19.2 per cent.

Recovery of 36 tagged brook trout in 1942 indicated that about one-fourth of these species scattered to remote parts of the Au Gres Drainage. The brook trout showed gains in length from about 0.6 inches to almost 2 3/4 inches, and gains in weight from 2.3 to 6.5 ounces in approximately one year of freedom.

In 1943, the spawning run of rainbow trout was made up of 195 males (446.71 pounds) and 134 females (515.12 pounds). Lack of help made it impossible to mark or measure any fish except recoveries of marked trout.

Angling pressure in 1943 was less than half that of 1942. A total of 786 anglers fished 1,765.50 hours and caught 195 rainbow trout and 180 brook trout. The rainbow trout weighed 460.44 pounds, the brook trout weighed 47.52 pounds. The catch per hour and the pounds of fish caught per hour were more than double those of 1942 - 0.21 fish and 0.29 pounds.

Of considerable interest is the fact that three fish tagged at Guiley Pond have been recovered in the Canadian waters of Lake Erie, and another in the St. Clair River.

At present it appears that the maintenance of this pond under the present fisheries management practices has not operated to the detriment of either brook or rainbow trout in the Au Gres Drainage. The confinement of the rainbow trout in the pond has provided an increased amount of sport

which might not have been obtained had these large fish been permitted to return to Lake Huron on the completion of spawning.

Research at Guiley Pond for the calendar year 1944 has not yet been formally reported on, but some marking work was continued, and the creel census on the pond was conducted as usual. The pond was enlarged and deepened before the opening of the season by means of a power scoop shovel. The expense for this operation were born by the Sportsmen's Improvement Association. The pond was mapped by O. M. Corbett after dredging, and was found to have a water area of 1.7 acres.

The run of mature rainbow trout consisted of 119 males weighing 404.1 pounds and 75 females weighing 400.6 pounds. In addition, 655 immature rainbow trout were handled. The latter were either jaw-tagged or fin-clipped to gain further information on the growth and movements of the smaller rainbow trout. The run started March 24 and continued until May 31, with the peak of activity during the week of April 9 - 15.

During the 1944 trout season, a total of 1,916.25 hours were expended in 866 angling days (77 per cent of which were unsuccessful). This is a slight increase in pressure over 1943 (1,765.50 hours). A total of 138 rainbow trout and 215 brook trout were captured - a decrease in the rainbow trout catch, but an increase in the brook trout take. The catch per hour was only slightly lower (from 0.21 fish to 0.18 fish) than for 1943, and the pounds of fish caught per hour dropped only slightly from 1943 (from 0.29 pounds to 0.22 pounds).

The continued use of the pond by many of the original proponents of the fishing plan in operation there gives evidence that the presence of big fish will always attract and interest many of our trout fishermen.

10. Report # 951. A Partial Lake Survey of the Spectacle Lake Basins Numbers 1, 2, 3, 4, and 5, Montmorncy County.

This will be found summarized briefly under Lake Surveys completed.

11. Report # 976. Observation on Brown Trout and Brown Trout spawning areas in the Au Sable River System, October - November, 1944.

During the brown trout spawning season of 1944, a total of 41 $3/4$ miles of the Au Sable River system was cruised by boat and counts made of the number of redds seen, and also of the numbers of spawning fish observed. The sections cruised were on the more heavily-fished portions of the Main Au Sable, the South Branch, and the North Branch.

The largest number of redds observed per mile of stream cruised was in the Stephan Bridge - Wakeley Bridge section of the Main Stream (44.5 per mile), followed by the Dam 4 - Kellogg's Bridge section of the North Branch (40.2 per - mile). The largest concentrations of trout also were observed in those two localities.

There appeared to be an ample amount of spawning gravel on all the streams cruised.

Conflicting reports from anglers and guides on the trend of the fishing in recent years accents the need for some type of creel census on the waters of the Au Sable system.

12. A summary of the objectives of the research at the Hunt Creek Fisheries Experiment Station, and some of the results obtained up to April 1942, was drafted at the request of Commissioner Harold Titus.

During 1943 and 1944 considerable time was also spent in drawing up projects and estimates of their cost for post-war work of a desirable nature to facilitate research and angling opportunities in the general area. The objectives of the station have been scrutinized carefully also, and a program

of research was outlined to assist in the attainment of these objectives.

Cooperation in activities outside Hunt Creek

From April to December, 1943, the director of the laboratory spent from 1 to 3 days each month working on research projects elsewhere in the Lower Peninsula. A total of 20 days were thus spent. This includes such time as necessary to supervise the Guiley Pond and Platte River Weir Projects and inspect them occasionally; to cooperate with Dr. Allison, District Fisheries Biologist for the Grayling Hatchery District, in marking rainbow trout fingerlings for the Rifle River, assist in netting operations on Higgins, Avalon, and McCormick Lakes; assist Dr. Hazzard in research on Churchhill and Crystal Lakes, Twin, and O'Brien Lakes; and perform requested investigations on the Flint Club and Liljac trout ponds (the latter private waters) on the Hunt Creek drainage.

During 1944, 58 days were taken up with departmental duties away from the laboratory. Supervision of the Platte River Weir and the Guiley Pond Project was continued. Four monthly samples of brook trout from wild streams were obtained for the organoleptic examinations by the Home Economics Department of Michigan State College. On two different days, assistance was given in inspecting state-owned water frontage or proposed purchases. During the pike-spearing season, a series of about 75 weights, measurements, scales and stomach samples were obtained from northern pike speared at the Fletcher Floodwater on the South Branch of the Thunder Bay River on three different days.

In September, direction of and assistance in marking 100,000 lake trout fingerlings for release in Lake Michigan, and also the marking of 5,000 rainbow trout fingerlings, 1,100 legal brook trout and 1,200 legal rainbow trout required the absence of the author from the Station for 14 days.

Cooperation with the Ann Arbor staff in attempting to determine the trout

population of the Portage trout pond required the further absence of 4 days.

During October and November, a total of 17 days was spent away from the station by the director of the station, 10 of which were devoted to a fisheries survey of the newly-purchased Grousehaven estate and seven to cruising the Au Sable River System to determine the extent of brown trout spawning.

Use of the Station by other members of the Department, 1943 and 1944 .

Because of war-time travel conditions the facilities of the station have not been used as much during 1943 as in past years. A total of 90 man-days were spent here by members of the Ann Arbor and Lansing Staffs, and 148 extra meals were served during 1943.

During 1944, the station facilities were used to the extent of 72 man-days by Department members and 135 extra meals were served.

Institute for Fisheries Research

By David S. Shetter

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Report approved by A. S. Hazzard

Report typed by Jane Galvin

Table 1

Weir Record Summary, Hunt Creek Fisheries

Experimental Area, for the calendar years

1943 and 1944

(↓ - Number in caret indicates number of dead fish found in trap)

Locality or Totals	Number moving upstream				Number moving downstream				Total handled in stream	Total marked in stream
	Fry	Fingerlings	Sub-legals	Legals	Fry	Fingerlings	Sub-legals	Legals		
	1943									
Trib 2	3	6 ↓	4	1	44 ↓	86 ↓	23 ↓	4 ↓	171 ↓	25
Trib 3- Lower	---	---	---	---	20 ↓	214 ↓	395 ↓	7	636 ↓	308
Trib 4 (Fuller Cr.)	3	32 ↓	65 ↓	2	15	85 ↓	240 ↓	9 ↓	451 ↓	232
Trib 5	2	3	2	---	2	4	2	---	15	2
Total out of Hunt Creek	8	41 ↓	71 ↓	3	---	---	---	---	123 ↓	---
Total in- to Hunt Creek	---	---	---	---	81 ↓	389 ↓	660 ↓	20 ↓	1150 ↓	---
East Fish Lake Outlet	13	60	83	2	3	8	1	7	177	85
	1944									
Trib 2	33 ↓	19 ↓	28 ↓	---	11	82 ↓	51 ↓	1	225 ↓	188
Trib 3 Lower	---	3	1	---	6	139 ↓	51 ↓	1	201 ↓	185
Trib 4 (Fuller Cr.)	33	66 ↓	77 ↓	4	42	81 ↓	209 ↓	5 ↓	517 ↓	496
Total out of Hunt Creek	66 ↓	88 ↓	106 ↓	4	---	---	---	---	264 ↓	---
Total in- to Hunt Creek	---	---	---	---	59	302 ↓	311 ↓	7 ↓	679 ↓	---
East Fish Lake Outlet	16 ↓	83	94	3	2	6	6 ↓	12	222 ↓	217
East Fish Lake Inlet	1	---	3	19	---	2 ↓	---	---	25 ↓	24
Trib 3 Upper	---	10	9	---	---	17 ↓	55 ↓	3	94 ↓	87

Table 2

Comparison of angling results for three years preceding stream improvement installations and three years after the devices were installed, Section B, Hunt Creek.

Year	Angling hours	No. of legal brook trout taken	Catch per hour	Lbs. of legal fish removed	Lbs. of fish caught per hour	Average size		% of unsuccessful Angling-days	Item
						Length (in.)	Weight (oz.)		
1939	33.50	15 [✓]	0.45	1.11	0.033	7.4	2.47	70 (16/23)	Before Stream Improvement
1940	86.50	41	0.47	6.69	0.077	8.0	2.84	62 (29/47)	
1941	74.75	32	0.43	5.23	0.069	7.7	2.68	64 (37/58)	
Averages	64.91	29.3 [✓]	0.45	4.34	0.067	7.8	2.74	64	
1942	126.50	65	0.51	11.04	0.087	7.8	2.85	54 (41/76)	After Stream Improvement
1943	73.25	67 [✓]	0.91	10.96	0.149	7.6	2.70	38 (19/50)	
1944	123.50	77 [✓]	0.62	11.81	0.096	7.6	2.57	43 (29/68)	
Averages.	107.75	69.7 [✓]	0.65	11.27	0.105	7.7	2.70	46	
Percentage change after improvement	+66	+138	+44	+160	+57	-1.5	-1.5	-28	- - -

Table 3.

Comparative brook trout population of Section B, Hunt Creek, in August of 1941 (before stream improvement), and 1942, 1943 and 1944 (after stream improvement).

Year	Estimated number of trout per acre			Estimated pounds of trout/acre	Pounds/acre removed by angling	Total trout production, pounds/acre	
	Legal	Sub-legal	Fingerlings				
1941	---	497	2,124	2,621	38.91	8.1	47.01
			STREAM IMPROVEMENT DEVICES INSTALLED				
1942	---	444	2,681	3,125	39.32	17.3	56.62
1943	6	619	2,700	3,325	47.04	17.3	64.34
1944	25	831	2,631	3,488	51.47	17.6	69.07

Table 4.

Summary of comparative growth and survival between tagged, fin-clipped, thorotrast-injected and unmarked wild brook trout fingerlings held in Diversion III-B of Sec. C, Hunt Creek.

Lengths are given in millimeters, weights in grams

(Numbers of fish present are indicated in parentheses)

Date	Thorotrast-Injected Fish		Tagged Fish		Fin-clipped Fish		Unmarked Controls	
	Av. Len.	Av. Wt.	Av. Len.	Av. Wt.	Av. Len.	Av. Wt.	Av. Len.	Av. Wt.
Sept-Oct. 1942	82.7 (51)	4.8	89.2 (50)	5.6	86.8 (50)	5.4	81.5 (51)	4.6
June 1943	104.6 (19)	12.6	106.0 (20)	13.3	103.8 (24)	12.5	108.7 (31)	13.6
Average Gain	21.9	7.8	16.4	7.4 ³	17.0	7.1	27.2	9.0
Average \downarrow Gain / day	0.092	0.027	0.067	0.030	0.069	0.029	0.096	0.032
Percent Surviving	(56) ²		(40)		(48)		(61)	

1 - The thorotrast-injected fish and the unmarked controls were confined 283 days, the others 245 days.

2 - 19 out of 34 survived the entire period. A total of 17 were removed at two different times for X-Ray analysis by Hasler.

3 - Gains for the tagged fish calculated on the original lengths of the 20 survivors.

Table 5

Fluctuation in numbers and total weight of fish present in 580.5 feet of unfished stream Sec. C Hunt Creek in different months of the year

Fish	Sept. 1942		Jan. 1943		May 1943		Sept. 1943	
	Number	Grams	Number	Grams	Number	Grams	Number	Grams
Legal	24	1,929	11	631	10	686	15	1,208
Sublegal	93	2,211	77	1,648	118	2,533	96	2,324
Fingerlings	285	1,572	141	651	63	514	234	1,159
Young of Year	--	--	--	--	126	59	--	--
Cottus	19	112	8	33	11	37	64	94
Others	--	--	4	95	8	27	3	34
Total Trout	402	5,702	229	2,970	319	3,792	345	4,691
Total Fish	421	5,814	241	3,058	336	3,856	412	4,819

Table 6

Summary of Egg Contents of Brook
Trout Ovaries collected from the
Hunt Creek Drainage, 1939, - 1943

Size range (inches)	Number	Av. Length (inches)	Av. Weight (ounces)	Av. Number of eggs.
6 - 7	8	6.9	1.6	343
7 - 8	9	7.7	2.5	402
8 - 9	9	8.8	3.7	564
9 - 10	2	9.9	5.5	733
10 - 11	6	10.7	7.6	1,063
11 - 12	9	11.9	9.9	1,440
12 - 13	6	12.9	13.4	1,885
13 - 14	2	13.9	16.6	2,207
14 - 15	3	14.9	21.3	2,137
15 - 16	--	---	---	---
16 - 17	1	16.4	30.0	3,119