

Original: Fish Division ✓  
cc: Education - Game  
Institute for Fisheries  
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INSTITUTE FOR FISHERIES RESEARCH  
DIVISION OF FISHERIES  
MICHIGAN DEPARTMENT OF CONSERVATION  
COOPERATING WITH THE  
UNIVERSITY OF MICHIGAN

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June 22, 1950

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ANN ARBOR, MICHIGAN

Report No. 1260

SUMMARY OF CREEL CENSUS AND NET RECORDS  
FOR PIGEON RIVER POT HOLE LAKES FOR 1949.\* ✓

By

Howard A. Tanner

ABSTRACT

The following paper is a report on some of the results of a work program intended to be the basis of a doctorate thesis and, as such, should be withheld from publication.

A preliminary examination of the creel census records and netting records of six of the trout lakes included in the Pigeon River Trout Research Area brought to light several points of interest.

During the season of 1949 the lakes produced 345 trout, mostly browns. South Twin Lake was the most popular and accounted for over 50 percent of the catch. Trout were caught at the rate of 0.442 per hour or at a rate slightly better than from the Pigeon River included in the research area. The majority of the fishing occurred early in the season. The quality of the fishing was poor during July and August. However, a distinct improvement was noted during the last days of the season.

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\* A preliminary report of a doctoral study on an I. F. R. fellowship established at Michigan State College. Prof. Robert C. Ball is chairman of Mr. Tanner's committee. Dr. E. L. Cooper, in charge of the Pigeon River Trout Research Area, represents the I. F. R. in their project.

(W)

From creel census data and from netting records indications were that the trout were making good growth gains. In an attempt to show a correlation between growth and amount of fertilizer added it was possible to show statistically that the samples from South Twin and Section 4 had made the best growth. These two lakes received the most fertilizer. Beyond that it was not possible to show any correlation between growth increment and fertilizer added on the basis of the samples available.

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Presented here are certain preliminary results garnered from creel census forms and from my own netting records. Since it is hoped to eventually evaluate the results of fertilization of trout lakes largely by measuring its effect on the trout population, such a preliminary examination is of value in pointing out weaknesses of data and areas wherein further data should be collected.

Existing Populations: During the summer of 1948 all fish were removed by poison from South Twin, North Twin, Section 4 and West Lost lakes. In Lost Lake and Hemlock Lake there remained populations consisting of small numbers of brook trout in combination with several species of forage fish.

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Planting Records: Following the closing of the trout season in September of 1948 all the lakes received plantings of brown trout yearlings at the rate of 500 to the acre:

Hemlock	2,600
North Twin	2,850
Lost Lake	2,300
South Twin	2,150
West Lost	2,000
Section 4	1,650
	<u>13,550</u>

These trout were 5.64 inches in average length and their average weight was 34.43 grams. In addition to the browns, equal numbers of brook trout averaging approximately 3.5 inches were planted at the same time in all the lakes except Hemlock and Section 4. These plantings with small existing populations in Hemlock and Lost Lakes made up the populations of the lakes.

Fertilization: South Twin Lake was fertilized throughout the summers of 1946 and 1947, receiving 10-6-4 at the rate of 2 p.p.m. every three weeks. This was discontinued when an incomplete winterkill occurred during the winter of 1947-48. The program called for fertilizing four of the other lakes for two summers, applications being made every three weeks but in smaller amounts on a p.p.m. basis: Section 4 receiving 80 percent as much as South Twin, Lost Lake 60 percent, Hemlock 40 percent, West Lost 20 percent as much, and North Twin kept as a control receiving none at all. Further applications were discontinued when quite spectacular plankton blooms occurred which might have led to a winterkill such as occurred in South Twin. Fertilizer will be added during the summer of 1950 on a similar schedule and at the same rates.

Sources of Data: The two sources of data for the trout in the lakes are: (1) The creel census forms which each fisherman was required to complete (not a voluntary census) and (2) the results of my netting carried on for the lakes in September of 1949.

Fishing Pressure: It appears that the popularity of the lakes for fishing in 1949 represented a very sizeable increase over 1948. Since no complete creel census record was available for 1948 this increase cannot be indicated exactly but from personal observations and from what voluntary creel census records were obtained an increase was evident. The reason for this increase probably was the publicity received by the Trout Research Station set up during the interval between seasons.

The fishing pressure was heaviest and the results the best early in the season, that is, up to about the first of June when both effort and return dropped sharply for the rest of the season (as shown by data on four graphs which are included only with the author's copy of this report).

Several points of information are revealed by the graphs: (1) The lakes receive most of their fishing pressure early, that is, the latter part of April and the month of May. Both the fishing pressure and the fishing quality drop rapidly beyond the latter part of May. (2) The fishermen tended to concentrate on South Twin once its reputation of producing larger trout became known, and the other lakes received very little fishing effort for the remainder of the season.

A Summary of the Creel Census Data  
for the 1949 Season

Lake	Number of angler days	Number of hours fished	Fish caught	Brown trout	Brook trout	Catch per hour
South Twin	143	368	200	167 Averages: 8.68 in. 98.72 gms.	33 Averages: 7.72 in. 72.67 gms.	.543
Lost	84	224.5	78	52 Averages: 7.48 in. 51.20 gms.	26 Averages: 7.41 in. 50.80 gms.	.348
Hemlock	30	104	39	26 Averages: 7.37 in. 54.35 gms.	12 Averages: 6.9 in. 48.5 gms.	.375
Section 4	19	51	28	28 Averages: 7.57 in. 58.10 gms.	--	.548
W. Lost	9	27.5	--	--	--	--
N. Twin	4	5.5	--	--	--	--
Totals	289	780.5	345	--	--	.442

Taking the lakes as a whole, it will be seen that they provided fishing for a considerable number of fishermen -- particularly early in the season when the pressure on the streams is most severe. The catch per hour of .442 is better by several hundredths than any of the four sections of the Pigeon River included in the research area.

Growth Rates: Since the data collected for the brown trout are more complete than for the brook trout, it is possible to better determine the average gain in length and weight made by the brown trout through the winter of 1948-49. These figures indicate little effect of the fertilization because most of the trout were caught before the first application was made on June 16, 1949 (except in the case of South Twin which was fertilized during the summers of 1946 and 1947).

Brown Trout Growth Rates

Lake	Average size at planting	Average size at capture*	Average gain
S. Twin	5.64 in. 34.43 gms.	8.68 in. 98.72 gms.	3.04 in. 64.29 gms.
Lost	5.64 in. 34.43 gms.	7.48 in. 51.20 gms.	1.48 in. 16.77 gms.
Hemlock	5.64 in. 34.43 gms.	7.37 in. 54.35 gms.	1.73 in. 19.92 gms.
Section 4	5.64 in. 34.43 gms.	7.57 in. 58.10 gms.	1.93 in. 23.67 gms.

\*Anglers' catch.

A much higher rate of biological productivity is clearly indicated for South Twin Lake as shown in the above account.

Except in the case of South Twin, the small numbers of fishermen utilizing the lakes during the latter part of the summer make impossible any comparison

of the average size of trout being caught by fishermen early in the season to those caught late. However, an adequate sample for comparison was available for South Twin.

Brown Trout Growth Rates  
for South Twin Lake

Dates	Number caught	Average length	Average weight
September 1948	Planted	5.64 in.	34.43 gms.
May 1949	100	8.47 in.	91.22 gms.
Average net gain for fall, winter, spring. (8 months)		2.83 in.	56.79 gms.
September 1949	33	9.12 in.	115.63 gms.
Average net gain for summer. (4 months)		.65 in.	24.41 gms.

A comparison of the gain in average length for the period of September 1948 to May 31, 1949 to the average gain for the period of June 1, 1949 to September 12, 1949 clearly indicates that, at least in South Twin Lake, the period when trout achieve their most rapid growth is not during the summer. Why this should be is open to speculation.

Net Records: During the early part of September 1949 samples were taken with gill nets from all the lakes. It was felt that such a sample would give a more accurate picture of the lake populations, since the 7-inch limit observed by fishermen eliminated the smaller fish and produced a screened sample. The nets which were used had mesh sizes of 3/4", 1" and 1 1/8" bar.

An interesting comparison is possible for Section 4 Lake, between the fish the fishermen caught in May and the fish netted in September. This

lake received the heaviest application of fertilizer of the current program. Observations throughout the summer of 1949 indicated a heavy bloom of zooplankton and a spectacular increase in aquatic insects.

Brown Trout Growth Rates  
for Section 4 Lake

Method	Number caught	Average length	Average weight
May 1949 Anglers' catch	27	** 7.57 in. <del>5.57 in.</del>	58.10 gms.
September 1949 Netted catch	26	9.50 in.	136.46 gms.
Total gain		1.93 in.	78.36 gms.

Using analysis of variance (Snedecor, G. W.) a statistical comparison was made of the average lengths of the trout in the spring and fall samples. The results of the analysis shown below clearly show a highly significant difference between the samples.

Analysis of Variance

Source of variance	Degrees of freedom	Sum of squares	Mean square	"F" value
Total	52	56.34		
Between samples	1	49.34	49.34	
				347.46**
Within samples (error term)	51	7.00	.142	

\*\* Highly significant.

Reference to tables of "F" will indicate this value (347.46) to be highly significant (above .01 percent).

\*\* "Institute" 7-27-50 to F. Westerman from J. Wood re error.



These gains of the fish in Section 4 Lake were exceptional and should such growth continue very fine fishing should soon result.

Results of Netting (Brown Trout)

Lake	Number taken	Average length	Average weight
South Twin	56	9.00 in.	112.28 gms.
Section 4	26	9.50 in. x	140.31 gms.
Lost Lake	22	7.24 in.	53.52 gms.
Hemlock	26	8.03 in.	75.32 gms.
West Lost	12	8.56 in.	96.10 gms.
North Twin	8	8.08 in.	79.50 gms.

The above table presents the average length and weight of the brown trout in each of the six lakes under study. The lakes are listed according to the amount of fertilizer being applied. South Twin at the top received the most and each succeeding lake received less until finally North Twin, the control lake, received none at all.

The average lengths have again been used as the basis of an analysis of variance to determine if there was any real difference in the size of the fish in the samples from the six lakes.

Analysis of Variance

Source of variance	Degrees of freedom	Sum of squares	Mean square	"F" value
Total	149	124.03		
Between lakes	5	81.86	16.37	
				56.06**
Within lakes (error term)	144	42.17	.292	

\*\* Highly significant.

In this analysis, where more than two samples are included, the significance of "F" indicates only that there is a real difference between two of the samples. It does not indicate which samples. A further test using twice the standard error to establish limits of confidence indicates that: (1) The sample from Section 4 Lake has significantly (.01 percent level) greater average length than any of the samples of the other five lakes. (2) The average length of the sample from South Twin is significantly (.01 percent level) greater than all the other samples with the exception of the Section 4 and West Lost lakes samples. (3) The Lost Lake sample significantly is smaller than all other samples.

Conclusions: On the basis of the data examined so far, the two lakes (Section 4 and South Twin) receiving the most fertilizer have brown trout populations that are growing faster than similar populations in the other four lakes. Beyond that the samples are inadequate to show any correlation between amount of fertilizer added and rate of growth of the fish populations present.

The data collected by gill netting are adequate to determine the average sizes of the trout, but it offers no assistance in determining the numbers of trout in the lake and this is necessary to calculate the productivity. For example, by examining the preceding data it would seem that the production of Section 4 Lake was better than that of South Twin. Of a certainty this is not the case. True, the fish are slightly larger and in better condition; however, plenty of other evidence indicates that the population is much smaller and hence production in pounds per acre is less than that of South Twin Lake.

A very excellent opportunity for determining accurately the production on a pounds-of-fish-per-acre basis presents itself should it be possible to poison the lakes and recover the entire population. Then the production of trout per acre would become:

$$\frac{(W_2 - W_1 F_1) + (W_3 - W_1 F_2)}{A} = \text{Pounds of trout per acre}$$

Where

$W_2$  = Weight in pounds of fish recovered

$F_1$  = Number of fish recovered

$W_1$  = Average weight of fish at planting

$A$  = Area of the lake in acres

$W_3$  = Weight of fish removed during season by anglers and nets

$F_2$  = Number of fish removed during season by anglers and nets

1949 Plantings: Since there was now an existing trout population in each lake, the plantings for 1949 were put in at half the rate for 1948:

South Twin	1,075
North Twin	1,425
Hemlock	1,300
Lost Lake	1,150
West Lost	1,000
Section 4	825
	<u>6,725</u>

These fish were larger, averaging 6.995 inches and 56.73 grams. They were marked by clipping the left pectoral. No more brook trout were added. Present plans call for the same rate of planting for 1950 with right pectoral fin clipped.

Proposed Changes 1950:

(Netting) An attempt should be made to standardize the net efficiency in each lake. This can best be done by setting the nets at the surface, perhaps as "spokes" from the center of the lake. A much larger sample should be taken to assure a valid statistical analyses of results. More nets should be employed to speed the netting program with a size range that will guarantee the sampling of the whole population.

(Fishing) Every effort should be made to increase the fishing pressure on the lakes. Aside from the early season "crush" records, the data are inadequate on which to base any conclusions. Further information would be available if fishermen could be induced to fish other lakes besides South Twin and Lost.

It is unfortunate that without a boat the fish are inaccessible to the bulk of the fishermen. The exception being the early season fishermen and the expert fly fishermen fishing in late evening.

Further possible information that can be extracted from the creel census data would be:

1. Time of day most popular
2. Time of day most productive
3. Evaluation of fishing skill with comparisons between male and female anglers and comparisons between local anglers and tourists
4. Success of baits used -- worms vs. flies
5. Advantage of boat in terms of angling success
6. Angling success in lake vs. stream

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