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February 17, 1953

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Report No. 1358

FALL FIELD STUDIES OF 1951 ON HOUGHTON, GAMBLE, AND
KLACKING CREEKS IN THE RIFLE RIVER WATERSHED

By

Howard Gowing

MAR 9 1953

FISH DIVISION

Abstract

Fall population estimates of brown trout from an "upper" station on Houghton Creek remained at approximately the same level in 1951 as was found in 1950. Samples of brown trout from Klacking Creek and Gamble Creek were composed of the same relative proportion of legal-length and young-of-the-year fish. To check calculated growth from known-age trout, 571 young-of-the-year native trout from Houghton Creek were fin-clipped. The condition (C) of brown trout in this stream was unchanged for the years 1950 and 1951, and was significantly superior to that of brown trout from Klacking and Gamble creeks. While the condition (C) of fish in the latter two streams was similar, brown trout from Klacking Creek showed an increase in average C value over that of the previous year. Observations on brown trout spawning activity in Houghton Creek indicated that fewer redds were constructed during 1951 than during 1950. The peak period of spawning began about the same time in both years, but extended a week longer in 1951.

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This report concerns a brief follow-up of a biological investigation of streams in the Rifle River Watershed begun in the fall of 1950. Field work in the fall of 1951 was limited to the following activities: (1) population studies at "upper" and "middle" Houghton Creek stations, (2) fish sampling at an additional station on Klacking Creek, (3) fin-clipping in an experiment on native young-of-the-year brown trout in Houghton Creek; (4) fish-sampling at a station on Gamble Creek, and (5) observations on spawning of brown trout in Houghton Creek.

With the fall population study on "upper" Houghton Creek completed, population estimates of brown trout are now available for two consecutive years, 1950 and 1951. Estimates are summarized in Table 1. For both years, the A.C. shocker showed a similar pattern of efficiency in capturing trout. This is best expressed in terms of the percentage recovery of marked trout by one-inch classes as shown in Figure 1 and Table 2. Lengths of the brown trout ranged from 2 to 20 inches in total length in 1950, and from 2 to 19 inches in 1951. For both years, brown trout in their first year of life (2 to 4 inches) made up the major segment of the

population--approximately 71 percent of the total estimated population in 1950, and 66 percent in 1951. There were few brown trout in the samples longer than 13 inches, and such fish were not included in Figure 1. Based upon the total sample of marked trout for each year, the average total length of brown trout in 1950 was 5.2 inches, and in 1951, 6.2 inches. The difference was found to be significant at a 95 percent level, determined by the t test. The 1951 population study was conducted October 2 to 3, approximately one week later than in 1950. This difference in dates might account for the difference in size since there are indications of an upstream migration of trout during October.

From the estimates (Table 1), it appears that the brown trout population remained numerically stable over the two years.

As a check against the 1950 population study at "middle" Houghton Creek, a similar study was attempted at this same area of stream in 1951. However, stream conditions were so altered at this station by work of stream improvement crews during late summer and early fall of 1951 that a population study, though begun, was not completed. As reported earlier, Gowing (I.F.R. Report No. 1335), the stream banks at this location are deeply eroded and undercut by the large volume of water carried during the spring flood stage. This condition was further aggravated by diversionary currents and eddies set up by numerous obstructions in the water, even at more normal stream levels (see Figure 2). To confine more of the water to the center of the stream bed and away from the banks, all the logs, tree stumps, roots, etc. in the stream were removed to the banks and anchored (Figure 3). Other measures to alleviate bank erosion included rip-rapping of banks, construction of jetties, and removal of a badly eroded bank at a sharp bend pool (Figures 4 and 5). These alterations by

Table 1. Fall Population Estimates of Brown Trout in "upper" Houghton Creek for the Years 1950 and 1951.

Stream	Length group	Percent recovery	Population estimates	
			Number	95% confidence limits ¹
"Upper" Houghton Creek 1950	2-4.9	20.2	1,213	1,013-1,520
	5-9.9	54.0	434	395-485
	10-over	59.3	52	40-73
Total	...	...	1,699	...
"Upper" Houghton Creek 1951	2-4.9	17.9	1,140	890-1,780
	5-9.9	48.6	479	426-551
	10-over	58.9	92	64-122
Total	...	...	1,711	...

¹ Confidence limits for binomial distribution were determined from Table 1.1, Statistical Methods, by Snedecor (1950)

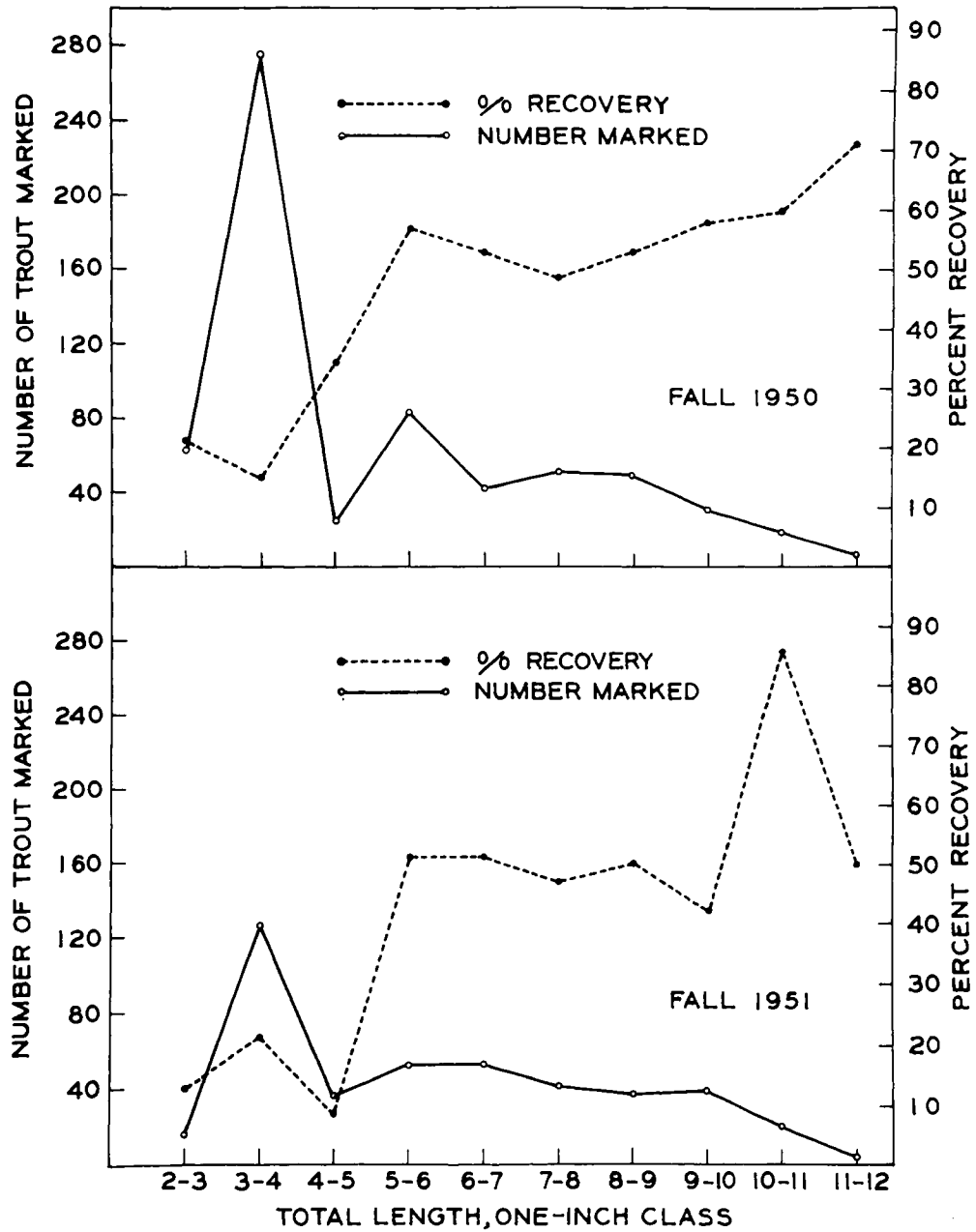


Figure 1. Relationship between percentage recovery of marked trout and total length by one-inch intervals at "upper" Houghton Creek Station for the years 1950 and 1951 (data from Table 2).

Table 2. The relative rates of recoveries of marked brown trout from the "upper" Houghton Creek population study area for 1950 and 1951.

Length of fish, in inches	Number marked		Number recovered		Percent recovery	
	1950	1951	1950	1951	1950	1951
2-2.9	64	16	14	2	21.8	12.5
3-3.9	275	126	51	27	15.0	21.4
4-4.9	26	36	9	3	34.6	8.3
5-5.9	84	53	48	27	57.1	50.9
6-6.9	42	53	22	27	52.3	50.9
7-7.9	51	42	25	20	49.0	47.6
8-8.9	49	38	26	19	53.0	50.0
9-9.9	31	40	18	17	58.0	42.5
10-10.9	20	21	12	18	60.0	85.7
11-11.9	7	4	5	2	71.4	50.0
12-12.9	1	7	1	1	100.0	14.2
13-13.9	2	3	1	0	50.0	...
14-14.9	1	1	0	1	...	100.0
16-16.9	0	1	0	0	...	...
17-17.9	0	1	0	0	...	...
18-18.9	0	1	0	1	...	100.0
20-20.9	1	0	0	0	...	...
Totals	654	443	232	165	35.4	37.2



Figure 2. "Middle" Houghton Creek in Section 5, T. 23 N., R. 3 E. showing the undercut bank and obstructions (logs etc.) in the stream (winter of 1950-51).



Figure 3. Same section of stream as shown above after it had been "cleaned out" (fall of 1951).



Figure 4. "Middle" Houghton Creek in Section 5, T. 23 N., R. 3 E.
Stabilizing bank by filling in with rubble.



Figure 5. "Middle" Houghton Creek in Section 5, T. 23 N., R. 3 E.
A series of jetties on the far bank to prevent undercutting by the
current.

crews of the Lake and Stream Improvement Section, Fish Division, tended to decrease the width of the stream, increase the depth, and step up the velocity of the current. These factors, along with the discharge of turbid water from Sandbach Creek, made operation of the A.C. shocker impractical. However, those trout captured before the population study was discontinued, were scale-sampled, and weights and lengths were recorded. For the age distribution of this sample, see Table 3. In addition to those listed in the table, one large brown trout was captured. This trout measured 27.9 inches in length and weighed eight pounds and four ounces. Deeply embedded scales are characteristic of large male brown trout at that time of the year. Scales were extremely difficult to remove from this fish and those that were finally secured, upon later examination, turned out to be regenerated scales; thus its age could not be determined.

Klacking Creek

To add to the 1950 fall sample of trout collected for growth studies, and to determine the species and numbers of fish present, the shocker was operated in approximately 400 yards (measured by pacing) of Klacking Creek upstream from the bridge in Section 1 of T. 22 N., R. 2 E. The stream is bordered by a few scattered trees and flows through open pasture land. In the early part of the fall a stream improvement crew had completed fencing off the creek from the adjoining land and had installed some stream improvement devices. Heavy fishing pressure is reported in this area of Klacking Creek. On October 5, a sample of 152 brown trout was taken; five of these fish were recognizable as hatchery brown trout. Thirty one, or 21 percent, of the total sample of native fish were seven inches in length or longer. Approximately 59 percent were young-of-the-year trout. Five hatchery brook trout (fin-clipped) were also taken, plus one unmarked brook trout measuring 7.7 inches in length.

Table 3. Age and growth of trout taken from three streams in the Rifle River Watershed during the fall of 1951.

	Age group	Number of fish	Range in length in inches	Empirical Average total length
Brown trout:				
Houghton Creek	0	11	3.6-5.3	4.6
	I	12	7.1-10.0	8.3
	II	8	7.2-12.2	10.1
	III	1	15.7	15.7
	IV	1	19.1	19.1
Klacking Creek	0	86 [✓]	2.6-5.1	3.8
	I	38	3.0-8.0	6.3
	II	18	5.4-11.9	9.0
	III	4	10.8-11.3	11.1
Gamble Creek	0	82 ^{**}	2.7-4.4	3.5
	I	35	4.5-8.3	6.1
	II	13	6.0-10.5	9.0
	III	6	9.9-12.5	11.0
Brook trout:				
Gamble Creek	0	10	2.8-4.3	3.4
	I	7	4.8-7.1	5.6
Klacking Creek	I	1	7.7	7.7

[✓]* A series of 48 trout from 3.0 to 5.1 inches were aged and all but 3 fish were of age group 0. Forty one fish from 2.6 to 4.0 inches, included in this figure (86), were not aged, but it was assumed that practically all of them belonged to age group 0.

^{**} All trout in excess of 4 inches were scale sampled to determine the upper limits of age group 0. Seventy one trout from 2.6 to 4.0 inches, included in this figure (82), were not aged, but it can be assumed that virtually all of these fish were of age group 0.

Gamble Creek

A sample of trout was taken from approximately one quarter mile of Gamble Creek above the bridge in Section 36 of T. 24 N., R. 3 E., in an area reported to be a spawning site for brown trout. The creek flows through "low ground" where the bank cover is tag alder and cedar. Sand, rather than gravel, is the prevalent bottom type. On October 5, when the sampling was done, a stream improvement crew was installing improvement structures. The total sample of trout consisted of 136 brown trout and 17 brook trout (See Table 3). The size of the samples of brown trout from Gamble Creek and Klacking Creek were approximately the same magnitude, and there were similar proportions of legal to young-of-the-year trout:

Klacking Creek

Age group 0approx. 60%

Legal lengthapprox. 17%

Gamble Creek

Age group 0approx. 59%

Legal lengthapprox. 21%

There was no evidence of any spawning movement of mature brown trout into this area of stream at this time.

In the 1950 fall sampling on Houghton Creek, young-of-the-year brown trout were found to range in length from 2.6 to 4.9 inches. In order to obtain information later on growth from known-age brown trout and to learn something of trout migration, this fall 571 native trout from Houghton Creek ranging in size from 2.1 to 4.6 inches were marked by removal of the adipose and left pectoral fins. The trout were captured, marked, and released in Houghton Creek between the mouths of Sandbach Creek and Bixby Creek. For this collecting a D.C. shocker was employed because it is a more efficient piece of equipment than the A.C. shocker, particularly

in capturing small trout. The mean length of the young-of-the-year trout was 3.5 inches. For the size distribution of this marked sample, see Figure 6.

Condition

Based on the coefficient of condition (C), the sample of brown trout from Houghton Creek in 1951 did not differ significantly (95% level) in condition from those taken in 1950 at about the same date (Table 4). However, in 1951 the condition of brown trout from Klacking Creek showed a marked improvement over those sampled in 1950. The 1951 sample was taken 15- to 17 days later than in 1950 and at a slightly different location. The respective condition factors for Klacking Creek and Gamble Creek were 37.09 and 36.08, and statistically the difference was not significant. Houghton Creek brown trout were in better condition than either Klacking or Gamble Creek trout.

Spawning

Spawning observations on Houghton Creek in the fall of 1950 revealed the following information:

- (1) By October 2, there was some evidence that an upstream migration of spawning brown trout had begun.
- (2) On October 12, the first brown trout redd was observed.
- (3) With few exceptions, spawning was completed by November 14.
- (4) On November 13 and 14, a spawning check of the entire stream revealed 144 brown trout redds, with the area of heaviest spawning in the middle reaches of the stream, and none in the lower.
- (5) The peak period of spawning activity occurred between October 26 and November 6.

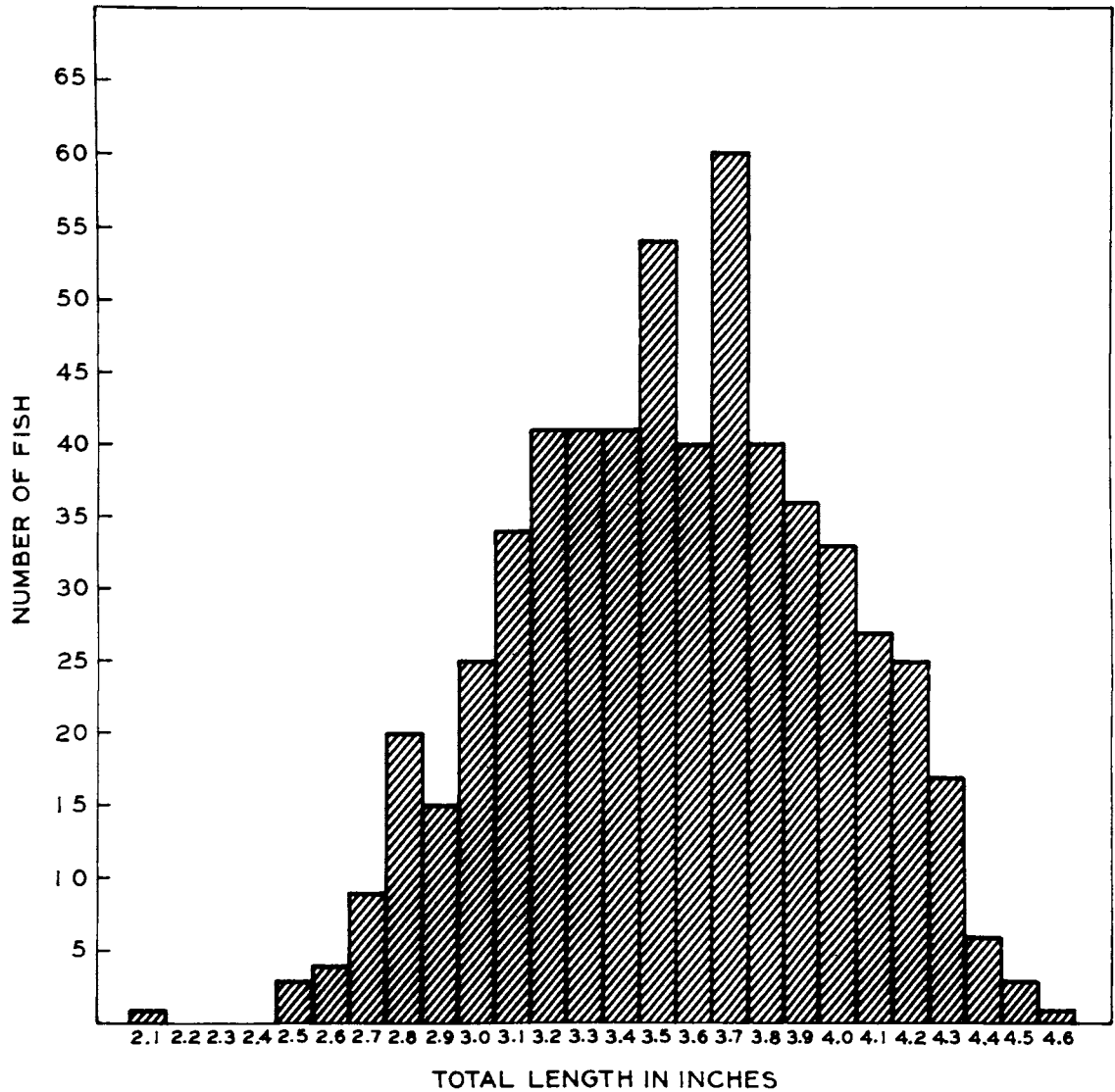


Figure 6. Histogram of total lengths in inches for 571 young-of-the-year brown trout from Houghton Creek in the fall of 1951. Fish were marked by removal of adipose and left pectoral fins.

Table 4. Coefficient of condition of brown trout from three streams in the Rifle River Watershed collected during the fall of 1950 and 1951.

	<u>Houghton Creek</u>		<u>Klacking Creek</u>		<u>Gamble Creek</u>	
	1950	1951	1950	1951	1950	1951
Date of sample	10/2-3	10/4	9/18-20	10/5	...	10/5
Number of fish	176	32	110	88	...	65
Range in length (inches)	4.0-23.2	4.0-27.9	4.0-17.8	4.0-11.9	...	4.0-12.5
Condition (C) Average	39.11	39.63	35.47	37.09	...	36.08
Standard deviation	4.06	4.61	5.37	4.33	...	3.89
Standard error	0.305	0.841	0.511	0.461	...	0.482

Brown trout spawning activities were observed again on Houghton Creek in 1951 as in 1950. The population study at "upper" Houghton Creek indicated that an upstream movement of mature brown trout began about the first of October. By October 23 to 24, there was a large number of mature trout in Section 31 of T. 24 N., R. 3 E. One female brown trout measuring 24 inches was shocked above the mouth of Sandbach Creek. Also at this time many redds were in the early stages of construction. From November 9 through the 11th, a spawning check was made. During these three days, 73 brown trout redds were recorded and it was noted that numerous trout were still active in the stream. One female brown trout was seen just beginning to dig a redd. In order to record late spawners, nine days later, on November 20, Houghton Creek was again checked, but by this time redds were so obliterated ("colored up") that identification was impossible.

Although the 1951 spawning check was incomplete, due primarily to weather conditions, the following comparisons are drawn:

- (1) There were fewer redds constructed in 1951 than in 1950.
- (2) In 1951, there was less spawning in section 31 of T. 24 N., R. 3 E., and a small increase in the number of redds in Section 30 of T. 24 N., R. 3 E.
- (3) In 1951, fewer redds were found downstream from the bridge east of Rose City than in the previous year.
- (4) An upstream movement of mature brown trout occurred about the same time in both years.
- (5) The peak of spawning activity in 1950 occurred during the period between October 26 and November 6, while in 1951 the period extended from approximately October 26 to November 14.

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