MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECT

State of Montana

Project No. F-12-R-7 Name Western Montana Fishery Study

Job No. II Title Population Survey of Rattlesnake Creek, Flower Creek, and O'Brien Creek

Period Covered May 1, 1960 - April 30, 1961

Abstract:

Rattlesnake Creek was surveyed by electro-fishing twice, and Flower Creek and O'Brien Creek were surveyed once during the report period. Results of these surveys, in addition to age and growth data, are presented in tabular form. Recommendations for the continuation of this study are presented.

Objectives:

Rattlesnake Creek, Flower Creek and O'Brien Creek are respectively sources of domestic water for the towns of Missoula, Libby and Troy, Montana. As such, these streams have been closed to angling above the water intakes for at least the past twenty years. It has been assumed from this fact that these three streams should represent a stream fishery in a near "virgin" condition.

Long-term objectives of this study include sampling of the stream populations in their present state for several years. After this information has been gathered, it is planned that the streams will be opened to angling. The effects of harvesting upon the fish populations along with harvest data will be collected. These data should help to give an insight into the proper management of game species for sport fishing. Of special interest are the problems conductive to the management of a cutthroat trout (Salmo clarki) fishery.

Objectives during the report period were to start the population sampling under the closed-to-angling situation. Data were collected concerning population levels, species composition, age and growth structure of the populations, and some physical and chemical factors of the environments.

Techniques Used:

Rattlesnake Creek is a tributary of the Clark Fork of the Columbia River and joins this river on the eastern outskirts of Missoula, Montana.

Rattlesnake Creek, above the Montana Power Company's dam (domestic water intake), has been closed to fishing for many years. The stream below this dam has at times been closed to fishing, open for children only, and is now open to general fishing.

The fish population of this stream was sampled twice during the report period; once during August and once during March. A 300-foot sampling section was picked about every two miles along the accessible parts of the stream. Eight sections were selected above the domestic water intake and one section was selected below this water intake. All of these sections were sampled during August, while, due to ice and snow, only four were sampled in March. Figure 1 shows the locations of the sampling sites.

For all sampling the following procedures were used: Each section was blocked off from the stream, above and below, by placing an electrical seine across the upper end and a block net across the lower end. For the winter-time sampling, a 220-volt a.c. shocker was used. In August, all sections except one were sampled by electro-fishing with a 1000-volt d.c. unit as the power source. The one section was electro-fished with the 220-volt a.c. unit, since it was impossible to get the d.c. unit into the stream bank.

Each section was worked until all or nearly all fish were captured. All fish were recorded by species, length, and weight. Scale samples from fish collected above the water intake were taken for age and growth analysis. No scales were taken from fish collected below the water intake. Fish scales were read and growth calculated by the project leader. Some stream flow measurements, temperatures, and one total dissolved solids sample were taken by project personnel.

Findings:

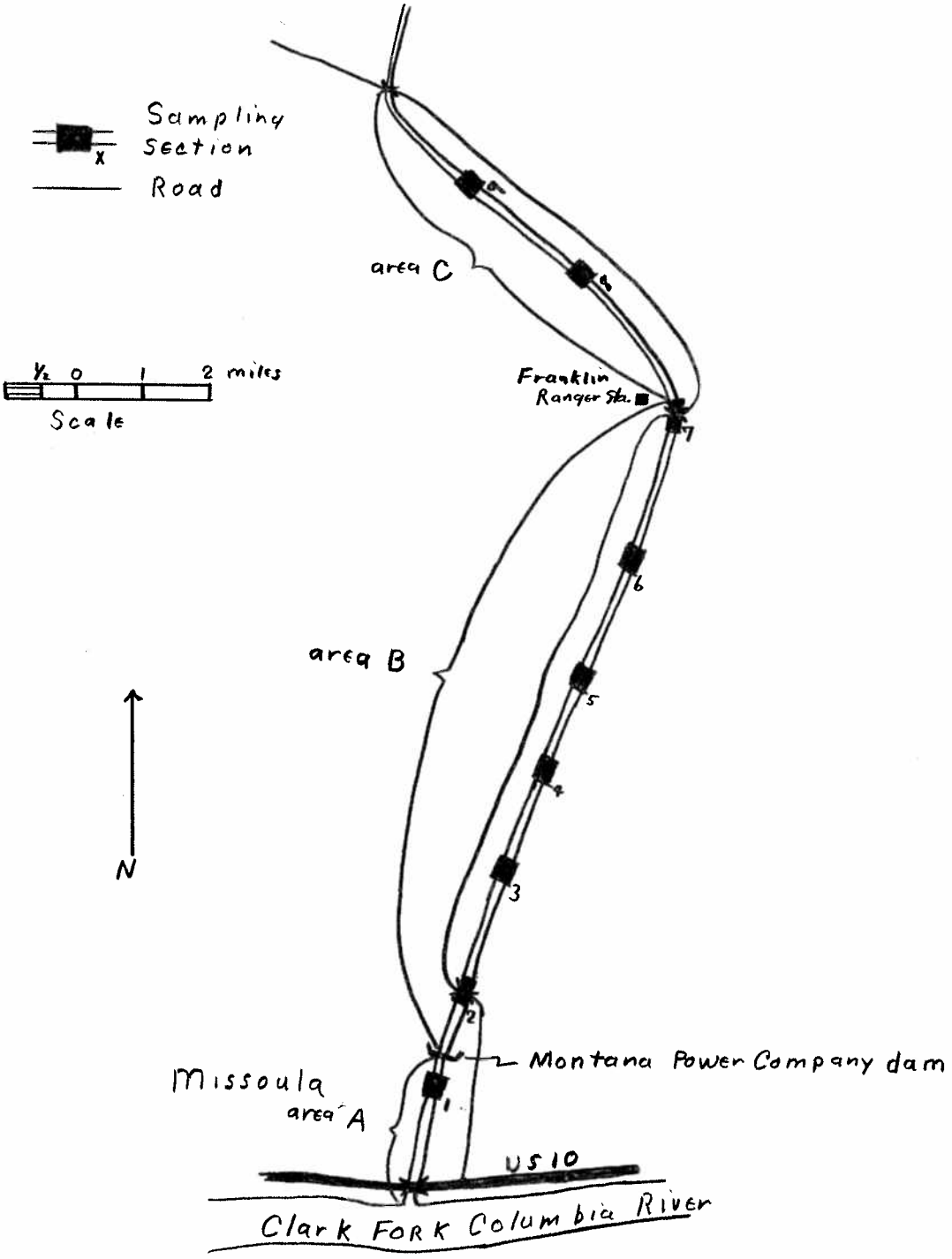
Rattlesnake Creek

For the presentation of data in this report, and for future studies, Rattlesnake Creek will be divided into three areas. Area A will include the stream below the Montana Power Company dam (open to angling and including section 1). Area B will include the portion of the stream from the Montana Power Company dam upstream to the Franklin Ranger Station (closed to fishing and including sections 2 through 7). Area C will include the stream above the Franklin Ranger Station to where the present road leaves the stream bottom (closed to angling and including sections 8 and 9).

Rattlesnake Creek above the Montana Power Company dam has an average flow of 35-40 c.f.s.with a range of from 20-150 cfs. Stream gradient averages about 80 feet of drop per mile. The stream has excellent cover and shade and the bottom is composed of mainly rubble and boulders; with very little sand and gravel. Total dissolved solids taken in April, 1960, was 13 p.p.m. Temperatures vary from the low 30's to the middle 60 degrees farenheit.

The flow of Rattlesnake Creek below the Montana Power dam varies with the water demand of Missoula. During periods of heavy water use, area A may only flow about 5 c.f.s. Maximum flows are over 100 c.f.s. The stream

Figure 1. Areas and sampling stations, Rattlesnake Creek, 1960-61.



gradient is considerably less than that of the upper areas. Some channel changes have been made on the lower mile, where the stream flows through Missoula's suburbs. Fish habitat is generally poor, due to the extreme de-watering, some industrial pollution, and channel realignment.

Species of fish present in Rattlesnake Creek include the mountain whitefish (Prosopium williamsoni), rainbow trout (Salmo gairdneri), cutthroat trout (Salmo clarki), brook trout (Salvelinus fontinalis), Dolly Varden (Salvelinus malma), and sculpins (Cottus spp).

The cutthroat trout was the predominate game fish taken in areas B and C. In area B cutthroat were followed by brook trout, Dolly Varden, and rainbow trout followed cutthroat in abundance. In area A the brook trout was dominate, followed by the cutthroat, rainbow, Dolly Varden, and whitefish.

Sculpins were found in areas A and B, but not in C. These fish were very abundant in area A, but decreased in abundance in area B from section 2 through section 7. The sculpins are not considered in any of the following catch data. This fish's small size and bottom-dwelling habits make its capture difficult with our standard stream-sampling techniques. Thus, field notations of rough abundance estimates are more indicative of cottus populations than are numbers of these fish captured per section.

Nine 300-foot long sections were electro-fished in August, 1960. Four sections were electro-fished in March, 1961, and in February, 1960. The latter sampling does not fall into the report period, but will be included in this report. Both winter-time samplings covered the same four sections, while the August sampling covered these sections in addition to five others. The catch by area, by section, by date, and by species is given in Table 1.

Table 1. Catch by area, section, date and species - Rattlesnake Creek.

Date	Area	Section	Whitefish No.	Whitefish Lb.	Cutthroat No.	Cutthroat Lb.	Brook No.	Brook Lb.	D. Varden No.	D. Varden Lb.	Rainbow No.	Rainbow Lb.
Aug. 1960	A	1	2	0.14	8	0.81	12	0.63	4	0.21	6	0.39
Feb. 1960	B	2			25	13.16	5	1.48	3	0.94	4	0.49
Aug. 1960	B	2			50	11.38	11	1.36	8	1.22	23	5.24
Mar. 1961	B	2			20	4.81	2	0.28	7	1.32	8	0.31
Feb. 1960	B	3			21	9.15	4	0.24	1	0.18	1	0.50
Aug. 1960	B	3			23	10.91	18	1.11	5	1.02	3	1.05
Mar. 1961	B	3			18	6.12	11	0.80	9	0.41	2	0.71
Feb. 1960	B	4			18	4.74	34	3.09	5	2.03	1	0.54
Aug. 1960	B	4			22	5.46	41	3.50	4	0.54	2	0.61
Mar. 1961	B	4			11	1.73	20	1.28	3	0.07		
Aug. 1960	B	5			48	15.57	13	1.01	12	4.95		
Aug. 1960	B	6			21	7.83	16	1.64	10	1.44		

Table 1 (Continued)

Date	Area	Section	Whitefish No.	Whitefish Lb.	Cutthroat No.	Cutthroat Lb.	Brook No.	Brook Lb.	D. Varden No.	D. Varden Lb.	Rainbow No.	Rainbow Lb.
Feb. 1960	B	7			9	3.10	7	1.12	6	1.30		
Aug. 1960	B	7			7	2.29	5	0.78	7	1.31	3	0.93
Mar. 1961	B	7			14	3.06	1	0.26	1	0.16		
Aug. 1960	C	8			14	4.25			21	2.41	1	0.25
Aug. 1960	C	9			32	5.58			8	2.37	3	0.31

The combined catch for sections 2, 3, 4, and 7 for each sampling period is given in Table 2. These data show that there were no great differences in the weight of trout (all species combined) taken between the February and August sampling, but that a very marked reduction was apparent from the August sampling to the March sampling. The total number of trout taken increased from the February to the August sampling, then decreased below the February level during the March sampling.

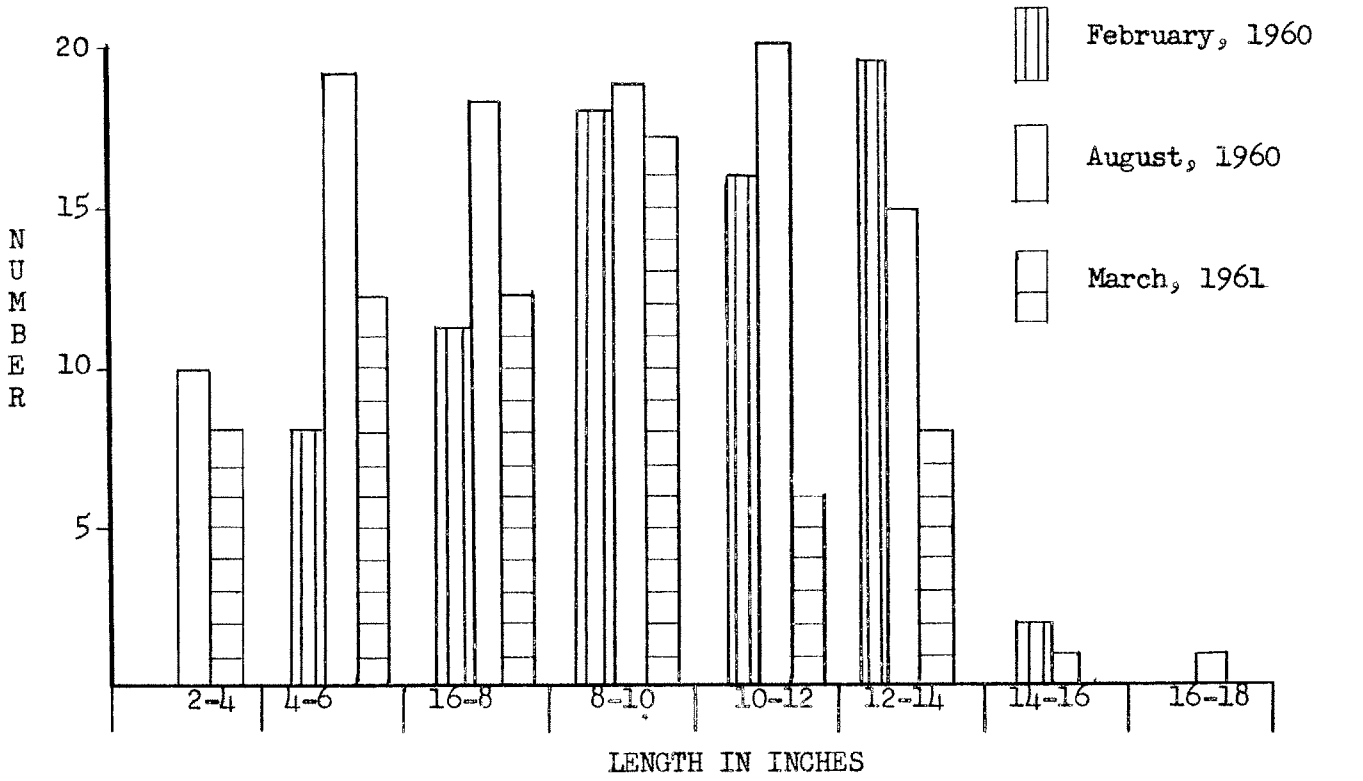
Table 2. Catch data for trout taken in sections 2, 3, 4, and 7, area B, February, 1960; August, 1960; and March, 1961.

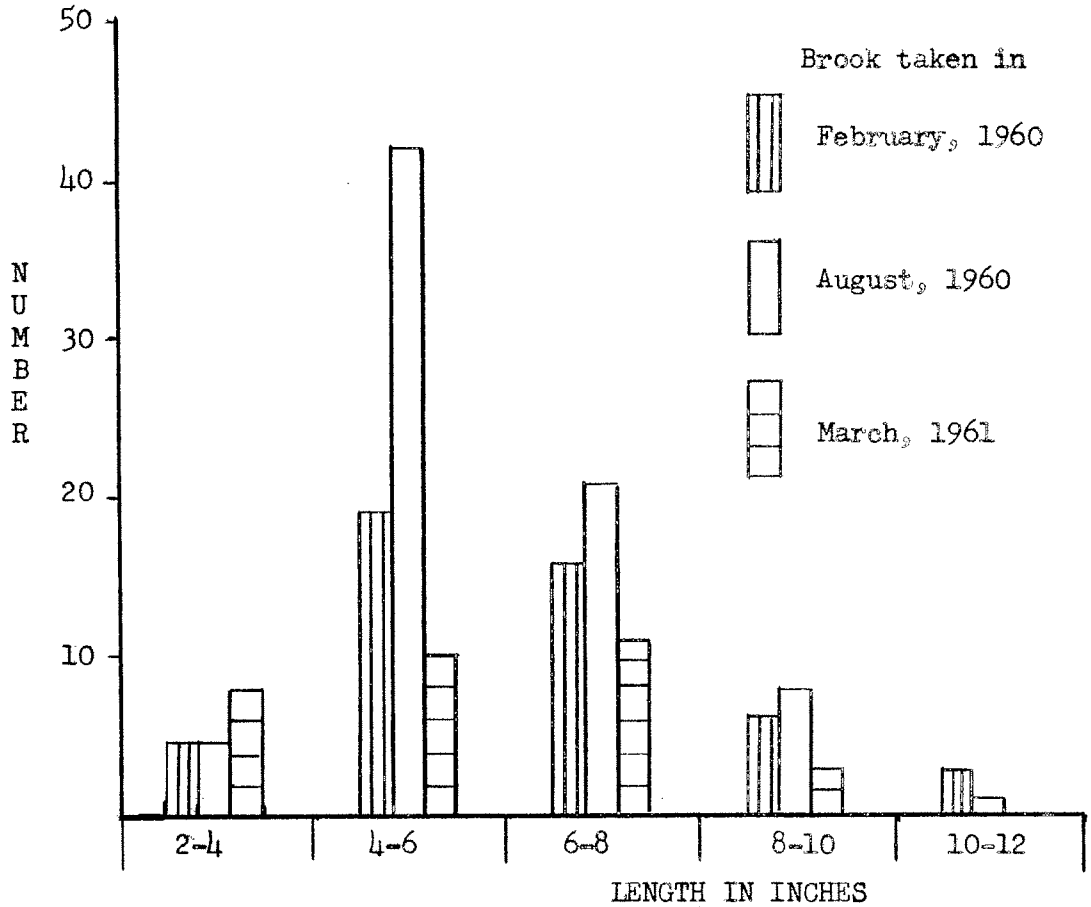
Date	Cutthroat No.	Cutthroat Lb.	Brook No.	Brook Lb.	D. Varden No.	D. Varden Lb.	Rainbow No.	Rainbow Lb.	Total No.	Total Lb.
Feb. 1960	73	30.15	50	5.93	15	4.45	6	1.53	144	42.06
Aug. 1960	102	30.04	75	6.75	24	4.09	31	7.83	232	48.71
Mar. 1961	63	15.72	34	2.62	20	1.96	10	1.02	127	21.32

The length-frequency of brook trout and cutthroat trout is given in Figure 2. From this figure it can be seen that the increase in numbers of fish from the February to the August sampling was due largely to an increase of fish less than eight inches in total length. Of note is the fact that no cutthroat less than four inches were taken in the February sampling. This increase in small trout may be, in part, due to the greater electrofishing efficiency of d.c. current, as compared to a.c. current. Another factor may be the greater availability of small fish during the summer and fall months. Both the brook and cutthroat trout reach the 4- to 6-inch class during their second and early third year of life (Table 5).

The comparison of the length-frequency data for trout collected during August and March show that there was a decline in the numbers taken in each two-inch class, except for 2- to 4-inch brook, from the August to the March sampling. The decrease in numbers of trout of all, except one size-class, during the March sampling accounts for the great changes occurring in numbers and total weight taken during this sampling as compared to the February and August sampling.

Figure 2. Length-frequency distribution of cutthroat trout and brook trout collected from sections 2, 3, 4, and 7, area B, Rattlesnake Creek in February and August, 1960, and March, 1961





It is thought that a population peak was sampled in February and August and that a severe natural mortality occurred before the March sampling. Additional year-to-year sampling will test this hypothesis.

Although a length-frequency distribution for rainbow trout and Dolly Varden has not been given, figures show that a decline in numbers of most size-classes occurred between August and March. Another note of interest is that much of the variation in numbers and weight of rainbow trout occurred in one sampling section, section 2 (Table 1).

Total production per acre of water by weight and numbers for all game species is given in Table 3. The catch data from the August sampling has been used for this estimate. The numbers of catchable-size fish (seven inches or longer in total length) is given in Table 4.

Table 3. Total production and production by species per acre of water - Rattlesnake Creek, August sampling.

Area		Cutthroat	Brook	Rainbow	D. Varden	Whitefish	Total
A	No.	77	115	58	38	19	307
	Per cent	25.0	37.5	18.9	12.4	6.2	
	Weight	7.78	6.05	3.74	2.02	1.34	20.93
	Per cent	37.2	28.9	17.9	9.6	6.4	
B	No.	116	69	19	33		237
	Per cent	48.9	29.1	8.1	13.9		
	Weight	36.71	6.31	4.92	7.64		55.58
	Per cent	66.0	11.4	8.9	13.7		
C	No.	121		10	81		212
	Per cent	57.1		4.7	38.2		
	Weight	26.26		1.50	12.91		40.67
	Per cent	64.6		3.7	31.7		

Table 4. Numbers of catchable-size fish (7" or longer) per acre of water - Rattlesnake Creek, August sampling.

Area		Cutthroat	Brook	Rainbow	D. Varden	Whitefish	Total
A	No.	9	9	9	9	9	45
	Per cent*	11.7	7.8	15.5	23.7	47.4	14.7
B	No.	79	17	12	14		122
	Per cent	68.1	24.6	63.2	42.4		51.5
C	No.	67		5	31		103
	Per cent	55.4		50.0	38.1		48.2

* Per cent of numbers produced as given in Table 3.

The data in Table 3 show that area A contains more fish per acre of water than either area B or C, but that these fish weigh considerable less than the fish of either B or C. Area C produced slightly less numbers and weight of fish than area B. In area B and C the cutthroat trout contributed the most numbers and weight of fish. In area A the brook trout were the most numerous while the cutthroat trout weighed slightly more than the brook trout.

In area B and C the largest number of catchable-size trout were cutthroat (Table 4). Table 4 also shows that all species found in area A contributed the same number of catchable-size fish. In Area A, 45 out of 307 were of a catchable-size; in area B, 122 of 237 were of a catchable-size; and in area C, 103 of 212 were of a catchable-size.

Scale samples for age and growth analysis were collected from a representative sample of all trout species taken in areas B and C. No scales were taken from fish collected in area A. These data are presented in Table 5. This age and growth data point out that, in general, the growth of all species is slow. Work by a Montana fishery biologist indicates that in productive waters trout should reach seven inches in total length by the end of the second year of life. Trout from Rattlesnake Creek average between 5.0 and 5.4 inches in total length at the end of the second year of life.

In area B the cutthroat trout and Dolly Varden attained a longer length and lived to an older age than the same species in area C. The growth rate for these species from both areas was similar during the first four years of life. Factors contributing to the greater age and growth of the Dolly Varden and cutthroat trout from area B may be the greater volume of water, apparent greater fertility, and the presence of sculpins. Sculpins were not found in area C. Although no food analysis was undertaken during this study, it is thought that the presence of a forage fish in area B may contribute to the growth of a larger fish.

Table 5. Age and growth of trout from Rattlesnake Creek.

Species	Area	Length in Inches at Annulus I	II	III	IV	V	VI
Cutthroat	B	2.8(82)*	5.4(65)	8.3(40)	10.5(21)	12.6(3)	14.1(1)
Cutthroat	C	3.1(36)	5.4(25)	7.4(13)	10.2(2)		
Dolly Varden	B	2.8(29)	5.1(20)	7.8(10)	11.3(5)	15.0(2)	
Dolly Varden	C	2.8(19)	5.1(13)	7.8(10)	10.0(7)		
Rainbow	B	3.0(4)	5.4(4)	9.0(2)			
Rainbow	C	3.5(4)	5.3(3)	8.0(1)			
Brook	B	2.7(44)	5.0(23)	7.0(11)	8.3(3)	9.9(1)	

* Figure in parenthesis is number in sample.

The small sample size of rainbow trout from either area precludes any comparison of growth rates. Brook trout occurred only in area B.

Techniques Used:

O'Brien Creek and Flower Creek

O'Brien and Flower Creeks were sampled only once during the report period, in September. A shocking section was selected about every two miles throughout the accessible portion of the stream. The sections varied in length, but were all about 300 feet. Two sections in Flower Creek and four sections in O'Brien Creek were electro-fished. Figure 3 gives the locations of these electro-fishing stations.

Each section was blocked off by an electrical seine placed across the upper end and a block net across the lower end of the section. All sections were fished with a 220-volt a.c. generator as the source of electrical power. The sections were fished until all or nearly all fish had been captured.

The captured fish were recorded by species, length, and weight. Scale samples were collected for age and growth analysis. Scale reading and growth calculations were done by the project leader. One total dissolved solids sample was taken from each stream in November by a project biologist from the Northwest Montana Fishery District.

Findings:

O'Brien and Flower Creek

Both O'Brien and Flower Creek are small streams with an average summer-time flow of 20-25 c.f.s. for the former and 15-20 c.f.s. for the latter. Flower Creek is a rushing, torrential stream. It is enclosed in a deep, very narrow canyon along its entire length. O'Brien Creek, for the main part, is a meadow-type stream. Much of its flow originates from springs and seeps in a meadow directly above section 3 (Figure 3). Beaver ponds, both in the stream and to the sides, are very numerous between section 2 and three miles above section 3.

The total dissolved solids samples taken in November gave readings of 37 ppm for O'Brien Creek and 48 ppm for Flower Creek.

Species of fish collected in O'Brien Creek included rainbow trout, brook trout, Dolly Varden, cutthroat trout, and sculpins. Rainbow trout were found only in section 1 (Figure 3), and Dolly Varden were found only in section 2 (Figure 3). These Dolly Varden were observed to be spawning and it is thought that very likely they were migrants from the Kootenai River. The cutthroat trout and the brook trout were the most abundant trout found in O'Brien Creek.

Species of fish found in Flower Creek included cutthroat trout, brook trout, and Dolly Varden. Many of the cutthroat trout were rainbow-cutthroat trout hybrids, but most nearly resembled cutthroat. No fish was found that could have been identified as a rainbow trout. No sculpins were found during this sampling, although two were collected from this stream in 1959.

Figure 3. Sampling sections, Flower and O'Brien Creek, 1960.

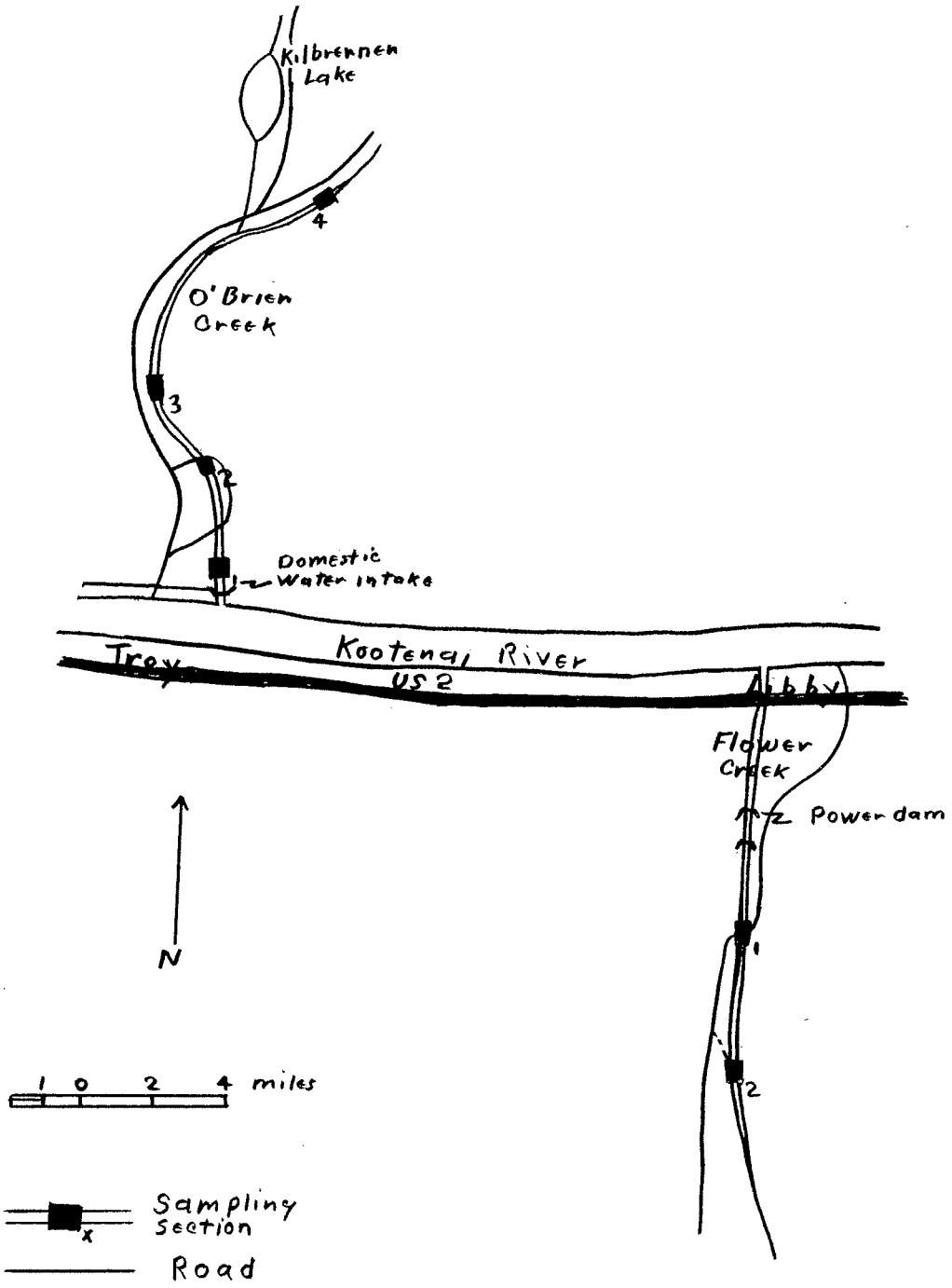


Table 6 gives the results of the electro-fishing by section for both Flower and O'Brien Creeks. The sculpins will not be included in the presentation of data.

Table 6. Catch by section, Flower Creek and O'Brien Creek.

Stream	Section	Cutthroat		Brook		Rainbow		D. Varden		Total	
		No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.
O'Brien	1	6	0.59	3	0.18	7	0.89			16	1.66
O'Brien	2	24	3.11	23	1.32			2	4.34	49	8.77
O'Brien	3	33	6.05	21	0.66					54	6.71
O'Brien	4	4	0.39	32	2.35					36	2.74
Flower	1	21	2.99	9	0.74			4	0.33	34	4.06
Flower	2	39	2.53							39	2.53

A length-frequency distribution for the catch for all sections combined is given in Figure 4. Only cutthroat trout from Flower Creek and cutthroat and brook trout from O'Brien Creek have been graphed.

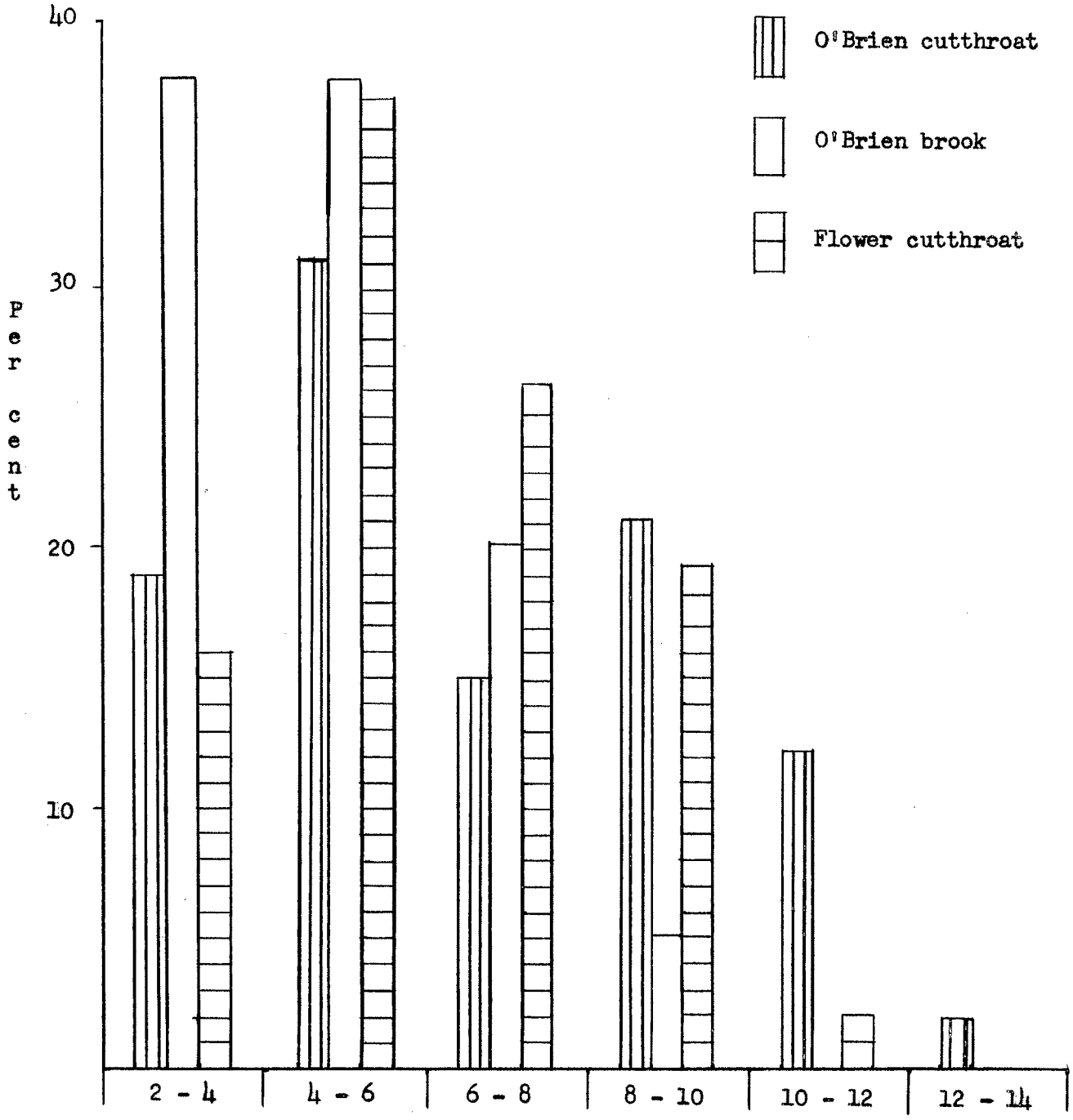
Production per acre of water for each species is given in Table 7. Since it is thought that the two Dolly Varden taken in section 2, O'Brien Creek, were spawning fish from the Kootenai River, these fish have been left out of further discussion and computations.

Table 7. Production per acre of water, O'Brien and Flower Creek.

Stream		Cutthroat	Brook	Rainbow	D. Varden	Total
O'Brien	No.	147	164	15		326
	Per cent	45.1	50.3	4.6		
	Lbs.	22.31	9.92	1.96		34.19
	Per cent	65.3	29.0	5.7		
Flower	No.	360	54		24	438
	Per cent	82.2	12.3		5.5	
	Lbs.	33.12	4.44		1.98	39.54
	Per cent	83.8	11.2		5.0	

Although the brook trout is numerically superior in O'Brien Creek (Table 7), it is apparent from Figure 4 that a majority of the fish were less than 6 inches in total length. About one-half of the cutthroat trout are 6 inches or more in total length. The largest brook taken was in the 8-10 inch class, while several cutthroat were in the next two size classes. The Flower Creek cutthroat follow the same general length-frequency pattern as the O'Brien Creek cutthroat.

Figure 4. Length-frequency distribution (per cent of total caught) of brook trout and cutthroat trout from O'Brien Creek and Flower Creek, 1960.



The number of game fish of a catchable-size (7 inches or longer) per acre of water for both creeks is given in Table 8.

From this table it will be noted that cutthroat trout make up 68.2 and 78.3 per cent of the total number of catchable-size trout from O'Brien Creek and Flower Creek. Table 6 and Table 7 show that from O'Brien Creek the brook trout was numerically superior. Weight-wise, the brook trout made up only about one-fourth of the total production.

In Flower Creek, the cutthroat trout was predominate, both numerically and by weight. There is no marked discrepancy between the total production of fish per acre and the number of catchable-size trout per acre.

Table 8. Number of catchable-size (seven inches or longer) trout per acre of water for O'Brien Creek and Flower Creek.

Stream		Cutthroat	Brook	Rainbow	D. Varden	Total
O'Brien	No.	62	20	9		91
	Per cent	68.2	22.0	9.8		
Flower	No.	108	18		12	138
	Per cent	78.3	13.0		8.7	

Scale samples were collected, read, and growth calculated from a sample of the trout collected from Flower and O'Brien Creeks. This age and growth data is presented in Table 9. These data show that, in general, the brook trout are the slowest-growing and shortest-lived fish of any trout found in either stream. No comparisons can be made from the small samples of rainbow trout taken in O'Brien Creek or from the Dolly Varden taken from Flower Creek. The cutthroat trout taken from Flower Creek were much slower growing than the cutthroat from O'Brien Creek. This difference may be due to the differences in the physical features of the two streams and possibly to the hybridization of the Flower Creek cutthroat trout. The scales of cutthroat of 10 inches or longer from O'Brien Creek were impossible to age and accounts for the lack of age and growth data of fish over 3 years old.

Table 9. Age and growth of trout from O'Brien Creek and Flower Creek.

Species	Stream	Length in Inches at Annulus I	II	III	IV	V
Cutthroat	O'Brien	3.2(48)*	5.8(25)	8.6(14)		
Brook	O'Brien	2.8(34)	4.5(15)	6.3(5)		
Rainbow	O'Brien	2.7(7)	5.2(4)	7.7(2)		
Cutthroat	Flower	2.9(36)	4.8(21)	6.8(10)	8.6(2)	10.8(1)
Brook	Flower	2.7(7)	4.9(3)			
D. Varden	Flower	3.3(3)	5.4(2)			

*Denotes sample size.

Recommendations:

Rattlesnake Creek

Since it is not possible to predict when this stream can be opened to fishing, the program carried out during this report should be repeated. Additional information on the physical and chemical characteristics of the stream should be collected. Weather, time, and available man-power permitting, additional electro-fishing should be accomplished during the winter census. An additional section should be sampled in both area A and C during the summer census.

Recommendations:

Flower and O'Brien Creek

The following recommendations are made for the Flower Creek study:

1. It is planned to open this stream to angling, starting with the fishing season of 1962. Available money and man-power will limit the amount and kind of creel census information gathered, but efforts should be made to gather information during the early part of the fishing season, when pressure will be greatest.

2. This stream is very inaccessible for electro-fishing operations. No additions should or could be made to the sampling program, but the same sections should be sampled as were sampled during this report period.

3. Data should be gathered and calculated on the relative conditions of this hybridized cutthroat population of this stream and compared to a pure cutthroat population.

The following recommendations are made for the O'Brien Creek study:

1. It is planned to open this stream to fishing starting with the fishing season of 1962. Available money and man-power will limit the extent and kind of creel census collected. Every effort should be made to obtain good data during the early part of the fishing season and on as many weekends as possible during the remainder of the fishing season.

2. Additional efforts should be made to collect fish throughout the stream area directly above and below electro-fishing section 3. This additional sampling will have to be done by hook and line or by use of a back-pack shocker.

3. The same sampling program should be followed as was done during this report period.

Prepared by Joe Huston

Approved by George D. Holton

Date April 15, 1961