MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

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

Job No. I Title Inventory of Waters of the Project Area

Period Covered May 1, 1960 - April 30, 1961

Abstract:

Twenty-four streams and nineteen lakes were surveyed during the project period. All waters covered are listed and survey methods used on each are briefly discussed. More inclusive data and discussions are presented for Georgetown Lake, Flint Creek, Clark Fork River, Rock Creek, and Ninemile Creek. Electro-fishing techniques used on Rock Creek and Clark Fork River are described. Management recommendations are discussed for Clark Fork River, Georgetown Lake and mountain lakes. Original survey data are in the district files and duplicates of the permanent record lake and stream survey cards have been sent to Helena.

Objectives:

The overall objective of this job was to catalogue some of the waters of the project area and to determine their value to the fishery management picture of the western district. Specific, additional objectives for certain waters were: (1) Clark Fork River - to assist in assessment of recent pollution damage; (2) Rock Creek and tributaries - to complete the

general survey coverage of all streams in the Rock Creek creel study area (project F-27-R) and to obtain an index to the fish population of Rock Creek itself; (3) Georgetown Lake - to obtain a second series of population indexes to better evaluate the effects of recent changes in stocking; (4) Ninemile Creek - to initiate evaluation of the experimental fish plant recommended in the F-12-R-6 completion report; (5) Flint Creek - to obtain an index to the numbers of downstream-migrant fry during a year when the spawn trap was not in operation.

Techniques Used:

Twenty-four streams and nineteen lakes were surveyed during the project period. Survey data were recorded on net set record forms, electric stream census forms, and/or field copies of Montana's standard lake and stream survey cards. Original data are in the district files and duplicates of permanent record lake and stream survey cards have been sent to Helena.

The following is a list of common names, abbreviations used, and scientific names used for all species mentioned in this report. Scientific and common names are those listed in the American Fisheries Society Special Publication No. 2, 1960.

Common Name	Abbreviation	Scientific Name
Kokanee	KOK	Oncorhynchus nerka (Walbaum)
Coho salmon	SS	Oncorhynchus kisutch (Walbaum)
Mountain whitefish	Wf	Prosopium williamsoni (Girard)
Golden trout	Gt	Salmo aquabonita Jordan
Cutthroat trout	Ct	Salmo clarki Richardson
Rainbow trout	Rb	Salmo gairdneri Richardson
Brown trout	LL	Salmo trutta Linnaeus
Brook trout	Eb	Salvelinus fontinalis Mitchill
Dolly Varden	Dv	Salvelinus malma (Walbaum)
Lake trout	Lt	Salvelinus namaycush (Walbaum)
Arctic grayling	Gr	Thymallus arcticus (Pallas)
Redside Shiner	RSS	Richardsonius balteatus (Richardson)
Longnose Sucker	F Su	Catostomus catostomus (Forster)
Largescale sucker	C Su Col.	Catostomus macrocheilus Girard
Sculpin	Cott	Cottus sp.

Rock Creek Tributaries

Twenty-one streams, tributary to the 40-mile study section of Rock Creek, were surveyed. Fish populations were sampled by electro-fishing, toxicants, or angling. Weights, total lengths and species were recorded for all fish captured. Physical features of each stream were recorded on standard stream survey forms.

Rock Creek

Seventeen, 300-foot sections of Rock Creek were sampled by electro-fishing. Fourteen of the sections were distributed throughout the length of the 40-mile study section and three were in the ten miles of Rock Creek immediately above the study area.

Water depths from one-foot riffles to ten-foot pools and velocities from 0.5 to over 2 feet per second required the use of different shockers, electrode systems and crew operations. Eight sections were sampled with the 1000-volt, D.C. machine developed under project F-9-R. Conductivity of around 200 micromohs/cm^2 permitted voltages of 800-1000 at 4-6 amperes. At seven of these stations, shore-controlled rubber boats were used for dip-net and electrode operators. Standard nylon or cotton block nets were used where depths and velocities permitted their installation. Otherwise, electric seines, energized by either a 230-volt D.C. or a 230-volt A.C. generator, were used as blocks. At the other station, it was possible for electrode and dip net operators to wade the section.

Five sections were sampled with a 230-volt Homelite model 24 HY generator, using a wiring and electrode system which put 180-cycle, 3-phase current in the water. This generator has been the project's standard shocker since 1956. However, we had previously used only

2-phase current from it because it had been assumed that 3-phase operation would require a full-length, 3-wire extension cord and three electrode operators. Discussion of this problem with the electrician in charge of the 1000-volt shocker unit resulted in the design of a 3-phase wiring system which required only 3 feet of 3-wire cord and which did not require an additional electrode operator for its use.

A 3-wire drop cord, about 3 feet long, was plugged into the generator's 3-phase receptable. At the distal end of this cord two wires were plugged in to our standard 2-wire extension cord leading to the two regular electrodes. The other wire, from the 3-wire cord, was connected to a separate extension cord leading to a third electrode. This single electrode was placed and left on the stream bottom near the center of the shocking section. The other two electrodes were operated throughout the section in a normal manner. This arrangement gave one phase between each of the two operating electrodes and the ground, as well as between each other.

Although no definite comparison tests were made, this 3-phase arrangement appeared to all crew members to be more effective in forming a barrier across the entire stream than did the standard 2-phase electrode setup. It required no more operators than did the 2-phase since the single electrode was left unattended during the entire sampling operation. At the five stations where this system was used on Rock Creek, stream size permitted operators to wade the sections in a normal manner, and standard nylon or cotton block nets were used.

Due to varying water depths and velocities within the remaining four sections, several different combinations of the shockers and methods described above were used.

At least two complete runs were made through each section, and many portions of sections (such as deep holes) were re-worked several times. All fish collected were weighed, measured and recorded by species. Scale samples were collected from a portion of the catch and have been analyzed for age and growth data at the Department fishery laboratory.

Clark Fork River

Twenty, 300-foot sections of Clark Fork River, in its 109 miles between Warm Springs and Missoula, were sampled by electro-fishing. The nine uppermost stations were sampled with a 230-volt, D.C., Homelite generator, using a 2-negative, 1-positive electrode system. River size permitted operators to wade most of each section, and standard block nets were used. The 11 lower sections were sampled with the 1000-volt, D.C. machine mentioned previously. In the greater portions of sections 10 through 19 where water depths were from 3 to 15 feet and volume of flow was from 200 to 500 cfs, both electrode and dip net operation had to be done from shore-controlled, rubber boats. Water depths and velocities also prevented the use of standard block nets in these 10 sections and electric seines were used for both upper and lower blocks. Personnel stationed along the lower block seine collected when possible, or at least enumerated, fish "turned" by the seine's field as they attempted to, or did, escape from the section. Conductivity of over 600 micromohs/cm^2 limited the large shocker to 300-400 volts at which drop the machine's maximum amperage (10) was drawn. Section 20 was on a channel of the river which contained about one-third of the river's total flow. Dip net and electrode operators waded the section. Lengths and weights were recorded for all fish captured. Scale samples were taken from all game fish

collected, but total catch was so low that age and growth data were not calculated.

Ninemile Creek

The same three sections of Ninemile Creek which had been sampled in 1959 were electro-fished again this year. The 1960 sampling occurred about four weeks after the experimental plant of 2,100, 3- to 4-inch cutthroat trout which had been recommended last year. All fish captured were weighed, measured and recorded by species.

Flint Creek

A down-migrant fry trap was constructed and installed in Flint Creek, above Georgetown Lake, on July 13, 1960. This trap was designed to capture fry from about one-half the width of the creek. Installation was at the same location as that of the trap operated in the summer of 1958. Except for its removal during the period July 26 to August 7, the trap was checked daily, the total catch counted, a portion of the catch preserved and the rest were released. The trap was removed on August 25.

Mountain Lakes

Seventeen of the lakes surveyed were not accessible to 2-wheel drive vehicles. Crews transported survey gear to one of these lakes in a 4-wheel drive vehicle, to seven others by back-packing, and to the remaining nine by the use of pack stock. All lakes were sketch mapped and sounded. Fish populations were sampled by netting in 18 lakes, by angling in one. Lengths, weights and species were recorded for all fish captured and scale samples were taken from a portion of the catches. These have been analyzed for age and growth by project personnel. Physical features were

recorded on standard lake survey forms. A ground measurement between two prominent physical features of each lake's shoreline area was made at the time of survey. Aerial photos were taken of all lakes, the scale of each photo was computed from ground measurements, and an outline map of each lake was pantographed from its photograph. Areas were determined by polar planimeter from the outline maps, sounding and net set locations were transferred from the field sketch map to the final outline maps on the lake survey cards.

Smith Lake

Smith Lake, a small, shallow, man-made impoundment near Lincoln, was surveyed. The lake was sounded and sketch mapped and two standard experimental gill nets were fished overnight. Fish captured were weighed, measured and recorded by species. Scale samples were collected and are being read by project personnel. Physical features were recorded on the standard lake survey form.

Georgetown Lake

Thirty overnight gill net sets were made in Georgetown Lake from June 19 through June 24, 1960. Location of sets approximated those of similar sets made during the 1958 survey of this lake. All fish captured were weighed and recorded by species. Scale samples are being read at the Department fishery laboratory in Bozeman. Because large numbers of game fish were captured, they were worked as rapidly as possible, iced and turned over to the local warden for delivery to the state hospital at Warm Springs.

Findings:

Rock Creek Tributaries

Table 1 lists the 43 tributaries of Rock Creek within the creel study area of Project F-27-R. Three streams remain to be sampled for fish: Alder, Dalles and Wyman creeks. Twenty-two streams were surveyed in 1959 and 21 in 1960. Twenty of the sampled streams were found to contain fish and the other 20 were found to be ephemeral and of no fishery value.

Anglers checking through the Rock Creek stations consistently report catches from only 10 of the 20 tributaries which contain fish. Undoubtedly some catches from the other 10 streams occur, and are not reported. This may be due to either unfamiliarity of some anglers with the area or simply to inaccurate reporting. However, it is safe to assume that the 10 streams from which catches are consistently reported, provide the tributaries' major contribution to the study area's catch.

Rock Creek

The catch by numbers and species from the 17 sections of Rock Creek is shown in Table 2. No detailed analysis and discussion of these data is presented since their primary usefulness will not be realized until they can be compared with similar data collected after several years of no planting in Rock Creek. Sections 1 through 14 are in the study area, which has been planted annually with catchable rainbow trout for at least 10 years. Sections 15, 16 and 17 are above the study section. The creek in this area has not been planted for the last two years. The average number of wild trout captured per section was 17.6 within the study area and 12.7 above. The average catch of whitefish per section was 70 within the study area and 111 above. These whitefish represent a greatly under-

utilized population of game fish in Rock Creek. They comprised 79 per cent of the game fish captured from our 17 shocking sections, and yet they have made up only about 25 per cent of the total angler catch from the study section for both summer and winter seasons combined. They have made up less than 10 per cent of the total game fish catch during the summer seasons only.

Age and growth data from the scale samples collected during the Rock Creek shocking are presented in Table 3. The same data for whitefish and rainbow trout are summarized for two divisions of the stream in Table 4.

Because low numbers of trout scale samples were collected during the shocking of Section II of the study area, data from these collections were combined, in Table 4, with data from the collections made in the area above the study section. Faster growth for both whitefish and rainbow trout in the larger, slightly warmer, lower section (Section I of the study area) is indicated by these data.

Clark Fork River

The total numbers of fish, both captured and observed during the Clark Fork shocking, are shown by section and species in Table 5. Of the numbers shown, only four whitefish and two suckers were observed and not collected. In addition to the numbers of fish shown in the table, large numbers of fry (mostly redside shiners and suckers) were observed at many of the stations. Their small size made them difficult to collect and no attempt was made to enumerate them. Only their presence was recorded.

The average catch per section for the total river reach sampled, and for three divisions of that reach, are summarized in Table 6. No attempt was made to compute the statistical limits of these average catch figures because of the extremely low total catch. It is unfortunate that similar shocking data from previous years are not available for comparison. However, a tributary of the upper Clark Fork, Little Blackfoot River, has been sampled in 1956, 1957 and 1959. The lower portion of this stream is somewhat similar to Clark Fork River in its location, drainage basin and gradient although it is smaller in size and has not been affected by the recent pollution of the Clark Fork. The shocking data from Little Blackfoot River, which were discussed in detail in the completion report for Project F-12-R-6, are summarized in Table 7 for comparison. They emphasize a low population in Clark Fork River.

Clark Fork River, from Garrison to Milltown Dam, was closed to angling following severe mine pollution in March, 1960. The extreme turbidity of the pollutant, combined with high water runoffs, precluded any direct observation of either fish or insect kills. During the period of pollution, however, live-cages containing rainbow trout were placed at six sites from 3 miles above Milltown Dam downstream for a distance of 87 miles. Observed fish mortalities in these live-cages substantiated the assumption that the pollution very likely reduced fish numbers to such a low level that the remaining game fish would be too few to utilize all available spawning areas. The closure was made to protect surviving fish for subsequent spawning and repopulation of the affected portion of the river.

The section of the river from its headwaters to Garrison is classified as industrial and was not closed because it may very well receive

receive lethal pollution again in the future. No successful angling is known to have taken place in this area during the summer of 1960.

Survey data collected subsequent to the closure supported the decision to close the stream section. Even considering a shocking efficiency as low as 10 per cent (and we believe it was somewhat higher than that overall) female brown trout would number less than 10 per mile for Clark Fork River upstream from Rock Creek. Based on these shocking data and information on the insect populations from the Pollution Biologist's study, management recommendations were made to keep the section of Clark Fork River from Garrison to Rock Creek closed for another year, and to open that section from Rock Creek to Milltown Dam with the general season on May 21, 1961. It is also recommended that the sampling be repeated in 1961 to evaluate recruitment from reproduction and immigration.

Ninemile Creek

The numbers of fish, by species and section, collected from Ninemile Creek in 1959 and 1960 are shown in Table 8. The total catch of cutthroat trout for each year is presented by 2-inch length intervals in Table 9. Figure 1 is a graphic presentation of the data from Table 9 for the length intervals from 2.0 to 9.9 inches. Catch of all species was somewhat better in 1960 than in 1959. The cutthroat catch increase was principally due to large numbers of fish in the 2.0 to 5.9-inch groups. This would be expected since the fish planted in the stream one month before the sampling were mostly in the 3-to 4-inch size range. It is recommended that planting and sampling continue for another two years as planned.

Flint Creek

Data obtained from fry trap operations in Flint Creek in 1958 and 1960 are presented in Table 10. All fry collected are known to be trout. Although not keyed out to species, they are assumed to be cutthroat and rainbow trout fry. No other spring-spawning salmonoids, except arctic grayling, are present in the drainage, and no key is known that will separate rainbow and cutthroat trout in the fry stage.

The Montana hatchery system operated a spawn trap at the mouth of Flint Creek in 1958, and for many years prior to that time. During normal trap operation racks were installed before the start of the run and completely blocked natural upstream movement of migrating fish. Whenever egg requirements were filled the racks were removed from the trap and whatever part of the run remained, if any, could then proceed upstream to spawn naturally. This trap was not operated in 1960.

Due to a full schedule of other field work, the fry-trapping phase of this job was limited by lack of manpower. Consequently, the trap was not installed as early nor operated as continuously as was desired.

A comparison of total or average numbers of fry captured per day would not be satisfactory. The 1958 total number of fry would be lower because the trap was operated fewer days, while the 1960 average would be lower because the trap operation continued until the migration was practically over. The average catch per hour would also give an incorrect comparison because only the 1960 operation included the relatively unproductive daylight hours.

In 1958, 814 fry were captured in the four days the trap was operated during the period five days before and five days after the day of heaviest

catch (August 3). Two thousand thirty-two fry were taken during the 11 days of operation in a comparable period around the 1960 day of maximum catch (July 19). The average catch per day for these periods was 203 fry in 1958 and 185 fry in 1960. It is unlikely that this difference is significant.

Mountain Lakes

The 17 mountain lakes surveyed during this report period are listed in Table 11. Each lake's location, size, and catch data summary are included in this table. None of the lakes' basins, with the exception of Middle Bowman and Fuse, have been altered for water level manipulations.

Middle Bowman is impounded for irrigation water storage. There are plans to raise the present dam to increase the lake's volume and drawdown. The lake was surveyed to obtain fish population data prior to further impoundment. A post-impoundment survey will be made to obtain comparative data.

The Fuse Lake outlet was lowered at an undetermined data to obtain water for sapphire mining operations. The lake has no inlet and the outlet was not flowing at the time of survey. Arctic grayling were planted in the lake in 1952 and have apparently reproduced successfully in shore areas. Scale samples obtained from 43 grayling caught during 6 hours of angling were impossible to read beyond the second annulus, so growth rates could not be computed. However, two distinct size ranges were noted in fish caught and fingerlings were observed in shore areas. Fish taken appeared to be in poor condition.

No fish were netted in four of the lakes. The game-fish population of eight lakes was composed solely of brook trout. Three lakes contained mixed rainbow and cutthroat trout populations and one lake contained only rainbow trout. The arctic grayling was the only fish taken in Fuse Lake and non-game fish were found only in Heart Lake.

Age and growth data calculated for fish obtained from the lakes surveyed are presented in Tables 12, 13 and 14. From these data it appears that the brook trout exhibits a faster growth rate than either the cutthroat or rainbow trout during its first year of growth to the time of the third annulus formation. In most of these lakes, no brook trout over three years old were taken. This condition has been reported from several other brook trout areas in the west.

Angling in most of the brook trout lakes is presently popular with only a small segment of Montana's mountain-lake anglers. Most residents desire a larger sized fish from lakes, although the average size of the brook trout in many of these lakes is larger than that of the catchable-sized fish that are stocked in Montana's streams. Quite possibly these contradictory views represent two different groups of anglers. The novice fisherman who enjoys taking hatchery fish from a road-side stream requires considerably smaller fish for his satisfaction than does the more experienced angler who expends considerable effort to reach remote mountain lakes.

Management measures which could possibly increase fish size in these lakes are: (1) removal of creel limits and seasons, (2) rehabilitation, and (3) planting of some other species which has a potential for larger growth.

It is doubtful that even complete removal of seasons and bag limits could increase angling pressure enough to improve the growth rate of these brook trout. Silver and Diamond Lakes, in the same area and both accessible by road, have been under a no-closed-season, no-bag-limit regulation since 1956. The average total length of brook trout in experimental, gill-net catches from Silver Lake was 8.5 inches in 1955 and 8.1 inches in 1958. However this measure should still be adopted for the other brook-trout lakes, if only to allow better utilization of fish.

Rehabilitation could be used to replace present brook trout populations with rainbow or cutthroat trout. However it seems an expensive tool to use, except experimentally, on relatively infertile lakes that are already producing high numbers of fish which are of a size desirable to some Montana anglers.

If some other species, such as rainbow trout, could be successfully introduced, a few of their numbers should eventually reach a size at which they could begin to utilize the brook trout as food. Better growth rates for the new species from this point on should then provide a few larger sized fish for the more particular anglers. Total production of large fish could never be expected to be high, but the brook trout would remain for those anglers interested mainly in catching large numbers of fish.

Following are management recommendations for the mountain lakes surveyed in 1960.

<u>French, Lower Trio and Lower Siamese</u>: Natural reproduction is sufficient to maintain the population. No stocking necessary, no change in regulations recommended.

Pearl and Dalton: These are suitable for fish and have no fish present. Plant 100 per acre golden trout or arctic grayling when available. Re-survey 4 to 5 years after first plant to evaluate reproduction.

Middle Trio: No fish present, lake is too shallow for management.

Upper Siamese: No fish present, lake is suitable for management but no stocking is recommended at present. Lower Siamese, which is adjacent to the trail to the upper lake is under-harvested now. Creating a fishery in the upper lake would reduce the already low pressure on the lower lake.

Heart, Upper Trio, Middle Oregon, Lower Oregon, Left Bonanza, Right Bonanza: Remove the season and bag limit on eastern brook trout and publicize the fishing quality of these lakes.

Missoula and Lost: Remove the season and bag limit on eastern brook trout and publicize the fishing quality of these lakes. Include with Silver and Diamond Lakes in the following experimental management measures:

Missoula: Rehabilitate and plant with 2-inch rainbow trout at the rate of 100 per acre.

Lost: Plant with a predator species: Dolly Varden, brown or lake trout, whichever is most readily available. Size should be from 3 to 6 inches depending on availability. Number per acre to be determined by size of fish from Montana's lake stocking table with the lake rated PPN (fertility poor, accessibility poor, reproduction nil). If none of these other species are available plant 4-inch rainbow trout at the rate of 30 per acre.

Diamond: Plant 4-inch rainbow trout at the rate of 30 per acre.

Silver: Plant 7-inch rainbow trout at the rate of 15 per acre.

Fish populations in these four lakes should be sampled by netting within 2 years after stocking. Each lake is at or near the end of a road, thus later surveys will not require the use of pack stock.

Fuse: No stocking is necessary, no change in regulations. Publicize the fishing quality of this lake.

Middle Bowman: No change in regulations, no stocking necessary. Repeat survey periodically for several years after the dam is raised.

Smith Lake

Smith Lake, near Lincoln, Montana, is an impoundment of 15-20 surface acres with a maximum depth of 7 feet. It was first planted with rainbow trout in 1930 and since that time has been operated infrequently, and with little success, as a commercial fish pond. The lake was offered for sale to the Fish and Game Department in 1960.

On October 12-13, 1960, two gill nets were fished overnight and took the following fish: 81 largescale suckers, 17 longnose suckers, 6 brook trout, 3 cutthroat trout and 2 rainbow trout. The drainage area for the lake is less than 1 square mile. A diversion from nearby Stonewall Creek supplies most of the lake's water. The diversion headgate structure and the dam's spillway are in poor condition. It was recommended that the Department not purchase this lake.

Georgetown Lake

Total numbers of fish, by species, taken from the 30 overnight gill-net sets in Georgetown Lake are presented in Table 15. Catch data obtained

from the 1958 gill net series and per cent change from 1958 to 1960 are included for comparison. Cutthroat and rainbow trout are the predominate game-fish species found in the lake and the longnose sucker is the principal non-game fish. Confidence limits at the 80 per cent level were calculated for the mean catch per set of cutthroat trout and longnose sucker for 1958 and 1960. These data are shown in Table 16. The small number of rainbow trout taken in 1958 prohibited computation of fiducial limits for this species.

The number of cutthroat trout taken in 1960 did not change significantly from the catch in 1958. There was a significant decrease in the mean catch of longnose suckers. While confidence limits were not computed for the mean catch per set of rainbow in 1958, it is obvious that the increase in 1960 has a high probability of being significant.

Apparently the longnose sucker population has decreased. The only known change that this could be attributed to would be the increase in numbers of rainbow. While the size of the rainbow planted precludes the possibility that this reduction could have been an effect of predation on suckers by the rainbow, it is possible that the rainbow has been able to utilize available food and space to the detriment of the sucker population.

The total catch of all species decreased from 3,246 fish in 1958 to 2,596 fish in 1960. This was a 20 per cent reduction. However the ratio of game fish to non-game fish increased from 17 to 83 per cent in 1958 to 30 to 70 per cent in 1960. The catch of game fish increased 41.5 per cent and the catch of non-game fish decreased 32.8 per cent. A comparison of these data indicates that the addition (in 1958 and 1959) of rainbow trout to the Georgetown Lake planting program, has been beneficial to the game fish population of the lake.

It is recommended that the present planting program (approximately 300,000 each of 3-inch or larger rainbow and cutthroat trout) be continued as long as the hatchery system needs Georgetown Lake as a source of cutthroat eggs. When this need no longer exists, the cutthroat portion of the plant should be replaced with rainbow. If the spawn traps are closed permanently, then the total plant should be reduced to 300,000, 3-inch rainbow trout.

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Date: May 15, 1961

TABLE 1. SUMMARY OF ROCK CREEK TRIBUTARIES SURVEYED, 1959-60.

Stream	Surveyed in 1959	Surveyed in 1960	Contains Fish	No Fish Found
Alder		x	NOT SAMPLED	
Basin	x			x
Bear Gulch		x		x
Big Spring		x	x	
Bobcat	x		x	
*Brewster		x	x	
Butte Cabin	x		x	
Cinnamon Bear		x	x	
*Cougar	x		x	
Dalles		x	NOT SAMPLED	
Eagle		x		x
Fiddler Gulch	x			x
*Gilbert	x		x	
Goat	x			x
Gratton Gulch		x		x
**Grizzly	x		x	
Hamm Gulch	x			x
Harry's Gulch	x		x	
*Hogback	x		x	
Howell	x			x
Hutsinpilar		x		x
*Kitchen Gulch	x		x	
Little Hogback	x		x	
Palouse Gulch		x		x
Pawnee Gulch		x		x
*Ranch	x		x	
Richard's Gulch		x		x
Sawmill		x	x	
Schively Gulch		x		x
Sheep Gulch	x			x
Solomon		x	x	
Spring	x		x	
*Stony	x		x	
Tamarack Gulch		x		x
Tekoa Gulch		x		x
Tindall Gulch	x			x
Waho	x			x
Walquist		x	x	
*Welcome		x	x	
West Gulch	x			x
Williams Gulch		x	x	
Windlass Gulch	x			x
*Wyman		x	NOT SAMPLED	
TOTAL	22	21	20	20

* - Streams known to contribute to the fishery.
** - Secondary tributary.

TABLE 2. ROCK CREEK ELECTRO-FISHING CATCH, BY SPECIES AND SECTION, 1960.

Station Number	Nat Rb	1960 Rb	1959 Rb	Dv	Ct	Eb	LL	FSu	Dace	Cottus	WF	C Su.Col.	RSS
1	7						8	23			47	10	14
2	8		1			1	7	1	16	15	17		
3	26	10		1		1	3	7	3	2	93		
4	9					1		19	19	29	75		
5	3	1		1				1	13	15	19		
6	10	4		3				8			17		
7	17	8		2			1	9		9	95		
8	13	13							3	5	64		
9	19	23		2	2			1	10	11	96		
10	13	3		2				13	1	2	95		
11	4			3	1	3		11	5	3	16		
12	15	4		2	2			32	33	23	91		
13	3			2	5				14	7	111		
14	34	6			5	7		55	10	53	141		
Sub-total	181	72	1	18	15	13	19	180	127	174	977	10	14
15	7			2	2	4		5		27	211		
16				8	12			2	5	19	40		
17	1			1	1			2			82		
Sub-total	8	--	--	11	15	4	--	9	5	46	333	--	--
Grand Total	189	72	1	29	30	17	19	189	132	220	1,310	10	14

TABLE 3. AGE AND GROWTH FOR SPECIES COLLECTED DURING ROCK CREEK ELECTRO-FISHING, 1960.

Species	Average length at annulus I	II	III	IV	V	VI	VII	VIII	IX
Whitefish	2.8 (377)*	6.2 (209)	8.8 (168)	10.6 (94)	12.4 (49)	13.5 (28)	13.9 (16)	16.7 (3)	17.4 (1)
Rainbow	2.9 (118)	6.4 (40)	10.2 (17)	12.1 (5)	14.8 (3)				
Cutthroat	2.9 (29)	5.1 (9)	10.6 (1)						
Brown	5.1 (1)	8.6 (1)	14.1 (1)						
Dolly Varden	3.1 (23)	6.2 (23)	9.0 (16)						
Brook	3.6 (10)	6.1 (6)							

TABLE 4. SUMMARIZATION, BY SECTION, OF AVERAGE LENGTH AT ANNULUS FORMATION FOR TWO SPECIES COLLECTED DURING ROCK CREEK ELECTRO-FISHING, 1960.

Species and Section	Average length at annulus I	II	III	IV	V	VI	VII	VIII	IX
Whitefish									
Lower**	3.0 (156)	6.4 (130)	9.0 (110)	11.0 (52)	12.7 (25)	14.1 (15)	15.2 (7)	16.5 (1)	17.5 (1)
Upper	2.7 (114)	5.8 (79)	8.3 (58)	10.0 (42)	12.0 (24)	12.8 (13)	14.4 (8)	16.8 (2)	
Rainbow									
Lower	2.9 (61)	6.5 (27)	10.2 (16)	12.1 (5)	14.8 (3)	19.2 (1)			
Upper	2.9 (57)	6.2 (13)	10.5 (1)						

* - Numbers in parenthesis denote sample size.

** Lower section includes Section I of Rock Creek creel census study area only. Upper section includes both Section II of study area and stream above study area.

TABLE 6. AVERAGE CATCH PER 300-FOOT SHOCKING SECTION FOR VARIOUS PORTIONS OF THE CLARK FORK RIVER, AUGUST, 1960.

LOCATION	TROUT	WHITEFISH	ROUGH FISH
Entire Section. Warm Springs to Bonner Dam Sec. 1-20, 109 mi.	1.4	3.8	8.3
Warm Springs to Garrison Sec. 1-7, 28 mi.	0.4	1.1	0.1
Garrison to Rock Creek Sec. 8-19, 63 mi.	0.8	1.8	10.0
Rock Creek to Bonner Dam Sec. 20, 18 mi.	14.0	45.0	37.0

TABLE 7. AVERAGE CATCH PER 300-FOOT SHOCKING SECTION, LITTLE BLACKFOOT RIVER, 1956, 57, 59.

YEAR	BROWN TROUT	WHITEFISH	ROUGH FISH
1956	87.4	89.0	13.7
1957	77.0	97.0	10.4
1959	33.7	46.0	8.0

TABLE 5. SUMMARY OF CATCH BY SECTION*, CLARK FORK RIVER, AUGUST, 1960.

Section No.	Brown Trout		Brook Trout		Cutthroat Trout		Whitefish		Rough Fish	
	Over 10"	Under 10"	Over 10"	Under 10"	Over 10"	Under 10"	Over 10"	Under 10"	Over 10"	Under 10"
1	1	0	0	0	0	0	0	0	0	0
3	1	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	1	0
6	0	0	1	0	0	0	0	0	0	0
7	0	0	0	0	0	0	4	4	0	0
8	0	0	0	0	0	0	0	16	0	1
9	0	2	0	0	0	0	2	0	20	0
10	4	0	0	0	2	1	0	0	1	0
12	0	0	0	0	0	0	0	1	0	0
14	1	0	0	0	0	0	0	0	93**	0
17	0	0	0	0	0	0	0	0	2	2
18	0	0	0	0	0	0	0	0	0	1
19	0	0	0	0	0	0	3	0	3	1
20	7	3	4	0	0	0	45	0	37	0
TOTAL	14	5	5	0	2	1	54	21	157	5

* - No fish captured or observed at Sections 2, 4, 11, 13, 15 or 16.

** - All 93 fish weighed 0.41 lb.

TABLE 8. NUMBERS OF FISH, BY SPECIES AND SECTION, COLLECTED DURING THE 1959 AND 1960 SAMPLING ON NINEMILE CREEK.

Section No.	Ct		Eb		Dv		Wf		F Su		Cott	
	59	60	59	60	59	60	59	60	59	60	59	60
1	20	49	6	20	0	0	13	10	0	3	30	27
2	9	46	4	3	0	0	1	7	0	0	2	6
3	20	33	4	8	1	6	0	0	0	0	5	5
TOTAL	49	128	14	31	1	6	14	17	0	3	37	38

TABLE 9. NUMBERS OF CUTTHROAT TROUT, BY 2-INCH LENGTH INTERVALS, COLLECTED FROM NINEMILE CREEK SHOCKING SECTIONS in 1959 AND 1960.

Length Intervals	Nos. of Fish	
	1959	1960
2.0 - 3.9"	19	40
4.0 - 5.9"	18	59
6.0 - 7.9"	11	19
8.0 - 9.9"	1	7
10.0 - 11.9"	0	1
12.0 - 13.9"	0	2
TOTAL	49	128

FIGURE 1. COMPARISON OF NUMBERS OF CUTTHROAT TROUT BY 2-INCH LENGTH INTERVALS FROM NINEMILE CREEK, 1959-1960.

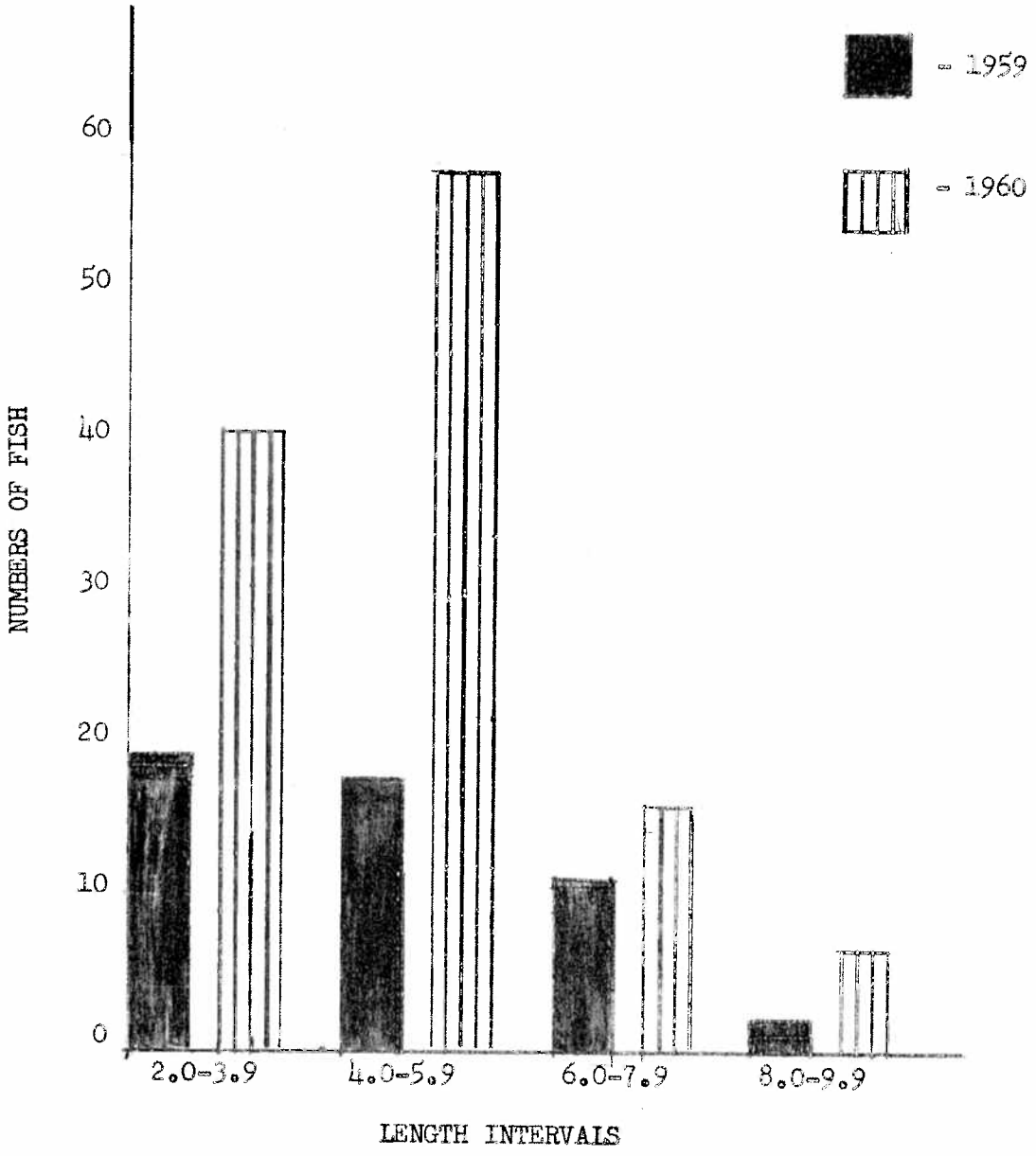

TABLE 10. DURATION OF FLINT CREEK FRY TRAP SET AND NUMBERS OF FRY CAPTURED, 1958 AND 1960.

Date		Hours fished 1958	Hours fished 1960	Number of fry captured 1958	Number of fry captured 1960
July	14		21		100
	15		22		158
	16		26		161
	17		22		351
	18		24		41
	19		25		700
	20		23		313
	21		26		131
	22		22		10
	23		24		22
	24		26		45
	25	10	24	60	26
	26				
	27	10		27	
	28-31	Trap not operated either year			
August	1	12		139	
	2	13	8	181	7
	3	11	24	380	9
	4		24		11
	5		24		0
	6		24		0
	7	14	24	114	1
	8		24		0
	9		24		1
	10		24		1
	11		24		1
	12	12	24	10	4
	13	13	24	27	1
	14		24		0
	15		24		0
	16	12	24	20	0
	17		24		0
	18		24		0
	19	12	24	25	0
	20		24		0
	21		24		0
	22		24		0
	23		24		1
	24		24		0
	25		24		0

TABLE 11. LIST OF HIGH MOUNTAIN LAKES SURVEYED, 1960.

Lake	Location	Size (acres)	Overnight Sets	Species Collected	Number Collected
Bonanza, Left	T15N R28W S3 Mineral Co.	10	2	Eb	42
Bonanza, Right	T15N R28W S3,4 Mineral Co.	19	2	Eb	42
Bowman, Middle	T7N R12W S31 Powell Co.	11	10	Rb Ct	17 90
Dalton	T14N R26W S24 Mineral Co.	6	2	No fish taken	
French	T14N R26W S18 Mineral Co.	18	2	Rb	24
Fuse	T6N R17W S27 Granite Co.		Hook and Line 6 f'man hrs.	Gr	43
Heart	T14N R27W S23,26 Mineral Co.	60	2	Eb F Su	40 3
Lost	T16N R28W S34 Mineral Co.	40	2	Eb	60
Missoula	T15N R28W S15 Mineral Co.	14	2	Eb	50
Oregon, Lower	T15N R28W S13 Mineral Co.	5	2	Eb	23
Oregon, Middle	T15N R28W S13,14,24 Mineral Co.	27	2	Eb	46
Pearl	T14N R27W S24 Mineral Co.	14	2	No fish taken	
Siamese, Lower	T13N R26W S29 Mineral Co.	34	2	Rb Ct	11 11
Siamese, Upper	T13N R26W S29 Mineral Co.	28	2	No fish taken	
Trio, Lower	T14N R27W S36 Mineral Co.	12	2	Rb Ct	5 2
Trio, Middle	T14N R26-27W S25,30, Mineral Co. 36,31	7	2	No fish taken	
Trio, Upper	T14N R26W S30,31 Mineral Co.	8	2*	Eb	8

* - Nets fished only 3 hrs. in Upper Trio Lake.

TABLE 12. AGE AND GROWTH OF BROOK TROUT FROM EIGHT MOUNTAIN LAKES, 1960

Lake	Average length in inches at annulus I	II	III	IV
Heart	3.1 (36)*	6.1 (36)	8.7 (31)	
Left Bonanza	3.1 (38)	6.0 (38)	7.3 (6)	
Lost	2.9 (47)	5.9 (47)	7.5 (1)	
Lower Oregon	2.9 (15)	5.4 (15)	7.2 (8)	
Middle Oregon	3.1 (42)	6.5 (42)	8.2 (8)	
Missoula	3.3 (51)	6.5 (51)	8.3 (14)	
Right Bonanza	3.1 (39)	6.1 (39)	7.1 (2)	
Upper Trio	2.1 (7)	4.5 (7)	6.4 (5)	8.4 (3)

TABLE 13. AGE AND GROWTH OF CUTTHROAT TROUT FROM THREE MOUNTAIN LAKES, 1960

Lake	Average length in inches at annulus I	II	III	IV	V	VI
Lower Siamese	2.3 (10)	5.4 (10)	7.6 (8)	9.6 (4)	11.1 (4)	
Lower Trio	1.7 (2)	3.5 (2)	6.5 (2)	8.8 (2)	10.8 (2)	11.2 (1)
Middle Bowman	2.7 (90)	6.2 (90)	8.3 (60)	10.8 (3)		

TABLE 14. AGE AND GROWTH OF RAINBOW TROUT FROM FOUR MOUNTAIN LAKES, 1960

Lakes	Average length in inches at annulus I	II	III	IV	V	VI
French	2.0 (24)	4.7 (24)	7.5 (23)	9.9 (7)	11.9 (4)	13.9 (2)
Lower Siamese	2.5 (12)	5.0 (12)	7.8 (12)	9.7 (8)	11.4 (7)	12.9 (5)
Lower Trio**	1.5 (7)	4.1 (5)	6.3 (5)	8.4 (4)	10.7 (3)	13.0 (2)
Middle Bowman	2.1 (17)	4.6 (17)	7.2 (14)	7.7 (8)	10.0 (5)	

* - Figures in parenthesis denote sample size.
** - Calculated lengths of one fish (TL-18.4") at annuli VII and VIII omitted.

TABLE 15. GILL NET CATCH, BY SPECIES, AND PER CENT CHANGE, GEORGETOWN LAKE, 1958 AND 1960.

Year	Species								TOTAL	
	Ct	Eb	Rb	SS	Gr	KOK	F Su	RSS	Game Fish	Non-game fish
1958	458	77	10	3	10	0	2,604	84	558	2,688
1960	443	62	279	1	3	2	1,790	16	790	1,806
Per cent Change	-3.3	-19.3	+2,690	-66.6	-70.0	+200	-31.2	-81.0	+41.5	-32.8

TABLE 16. MEAN, STANDARD DEVIATION, AND CONFIDENCE LIMITS (80%) FOR GEORGETOWN LAKE GILL NET SERIES, 1958 AND 1960

Year					Confidence Limits at 80 per cent level
		Cutthroat trout			
1958	30	458	15.26	12.59	12.25-15.26-18.27
1960	30	443	14.75	9.21	12.55-14.75-16.95
		Longnose sucker			
1958	30	2,604	86.80	45.49	75.93-86.80-97.67
1960	30	1,790	59.66	31.29	52.18-59.66-67.14