MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Project No. F-27-R-5 Name Rock Creek Creel Census

Job No. I Title Summer Census

Period Covered July 1, 1963- June 30, 1964

Abstract:

A creel census study to determine the contribution to the fishing by stocks of catchable-size rainbow trout, and the return of these trout to the Angler's creel was continued for the sixth year on a 40-mile section of Rock Creek near Missoula, Montana. Census scheduling and operations are discussed. Estimates of total angler use of the area and harvest of game fish during the 1963 general fishing season were 10,110 angler trips and 20,665 game fish. The cumulative return to the creel of trout planted during the initial three years of the study is 39.1 per cent. The average catch per-man-hour during the initial three years of the study (with fish stocking) was 0.92. The average catch per-man-hour during the past three years (without fish stocking) was 0.70.

Regression estimates of fishing pressure and harvest for the years 1960 and 1961 have been revised and are presented in this report.

Recommendations:

It is recommended that the Rock Creek census study be continued as an aid in evaluating the catchable-size trout stocking program. Planting of hatchery-reared trout should be discontinued for at least another year. If at the end of this period the data regarding the role of hatchery-reared trout on the Rock Creek fishing be inconclusive, planting should be discontinued until conclusive data are available.

Census scheduling should remain under the direction of the Department Statistician. Modifications in the methods of estimating harvest and pressure estimates by regression analysis as described in F-27-R-4 report should be continued. The mechanical aspects of the creel census operation should remain unchanged.

Individual weight and length measurements of fish should be continued for a determination in any change in the size and condition of fish. This information should be obtained at the convenience of the angler.

Should an access road planned by the U. S. Forest Service in the vicinity of the Wahlquist cable crossing become a reality in 1964, a traffic counter and census station should be installed.

Objectives:

The long range objective of the Rock Creek creel census study is to obtain the necessary harvest and pressure information for an evaluation of the catchable-size rainbow trout stocking program on Rock Creek.

The objectives of this year is to obtain estimates of total catch, total effort, species composition of the catch and the cumulative return of marked hatchery fish planted during the first three years of the study.

Techniques Used:

This report represents the sixth year the creel census study has been in operation. Approximately 30,000 catchable sized rainbow were marked and planted each year for the initial three years of the study. No fish have been planted in Rock Creek since this time.

The creel census study area includes 40 miles of Rock Creek with only one access road along the entire length. The study area is divided into two sections. Section I is the lower section and is 25 miles in length. Section II is the upper section and is 15 miles in length. The division line was chosen on the basis of type of water, and urban area from which fishing pressure is derived.

Incorporated into the Rock Creek census data are fish harvested from tributary streams within the 40-mile study area. During the 1959 census, 10 tributary streams contributed 4.1 percent of the total catch. No attempt was made to separate the catch from tributary streams in 1963.

Semi-permanent check-stations have been erected at both ends of the study area. Signs notifying anglers of area boundaries are posted the entire season and fold-down signs indicating check-stations are in operation are erected on creel-census days.

An hourly recording Streeter-Amet traffic counter was installed at each station to obtain a total automobile count entering and leaving the Rock Creek creel census area during the regular fishing season. These counters were in continuous operation from the beginning of the fishing season until stations were closed. Both checking stations remained in operation until the end of the regular fishing season.

The 1963 angling season opened on May 19 and remained open for trout and whitefish until November 30. The check stations were operated and manned independently of each other.

Since the majority of contacts are made at the lower check station, this station received greater coverage than did the upper station. Seventy-nine days or approximately 40 percent of the season was censused at the lower station. At the upper station, 58 days or approximately 30 percent of the season was censused. The days censused are shown in appendix A.

Stations were operated from 9:00 A. M. until it appeared that all anglers had departed from the study area. Previous investigations have shown that a very small percentage of the total number of anglers leave the study area prior to the station openings in the morning.

Creel census data were recorded at the time of angler interview. Completed contact data were obtained from the angler and recorded on an individual basis. These data include the number and species of fish caught (including the marked hatchery rainbow), hours fished, and the license number of the individual angler. Fish weights were obtained at the convenience of the angler. The schedule for operation of the census was formulated under the direction of the Department Statistician. The census data were compiled monthly and summations were reported in the monthly narrative summaries. Following this compilation, complete contact forms were sent to the department's I. B. M. service and information was recorded on standard I. B. M. punch cards for final summarization. Data were analyzed and estimates of harvest and pressure were made by computer at Montana State College.

Findings:

The following species of game fish were creeled in the Rock Creek study area in 1963: rainbow trout (Rb), Salmo Gardneri, cutthroat trout (Ct), Salmo Clarki, brown trout (LL), Salmo Trutta, Dolly Varden (DV), Salvelinus malma, mountain whitefish (Wt), Propsopium williamsoni, and brook trout (Eb), Salvelinus fontinalis.

During the 1963 summer census, creel census technicians interviewed 5083 anglers on 137 scheduled census days at both check stations. These anglers were successful in creeling a total of 9,986 fish in 13,952 hours of fishing effort.

The species composition for the years 1958 through 1963 is shown in Table 1. The three-year average during the initial period of study is an average of the species composition for the years catchable-sized rainbow were stocked. The latter three-average is an average of the species composition for the years following the discontinuation of stocking.

Table 1. Species composition of catch, by percent, of fish checked through upper and lower Rock Creek check stations - 1958-1963.

Year	LL	DV	Ct	Wf	Eb	Hatchery Rb.	Natural Rb.
1958	1.2	5.0	7.3	7.0	14.6	26.4	38.4
1959	1.4	4.7	5.8	11.0	13.9	24.0	39.3
1960	1.9	5.2	8.0	12.8	13.0	25.4	33.7
3 year average (years of hatchery planting)	1.5	5.0	7.0	10.0	13.0	25.4	33.7
1961	4.3	6.9	11.5	15.7	13.2	2.9	45.5
1962	4.9	5.5	8.6	15.2	11.8	1.3	52.7
1963	7.3	6.6	11.9	14.1	11.1	1.3	47.7
3 year average (after hatchery planting)	5.4	6.3	10.6	15.1	12.1	1.8	48.7

The most notable change for the species composition of the catch after stocking was discontinued was the decrease in hatchery rainbow. This group decreased an average of 23.5 percent. Meanwhile, the species composition of other species of trout and whitefish, with the exception of brook trout, showed an average percentage increase. The most significant of these increases were the natural rainbow, which gained 10.8 percent, and the brown trout, which gained 3.9 percent.

The success ratio for each year and the average length of trip since the initiation of the creel census in 1958 is presented in Table 2. Also presented is a three-year average during the period catchable rainbow were stocked and an average for a 3-year period following the termination of stocking.

Table 2. Average number of fish caught per angler, fish per angler hour, and average length of trip - Rock Creek, 1958 - 1963.

	Year	Fish per angler	Fish per angler hour	Average length of trip (hour)
Both stations:	1958	3.39	0.91	3.7
	1959	3.07	0.94	3.5
	1960	3.13	0.93	3.3
3 year average (with stocking)		3.20	0.92	3.5
	1961	2.23	0.75	2.9
	1962	2.05	0.70	3.0
	1963	2.04	0.64	3.2
3 year average (without stocking)		2.11	0.70	3.0

The combined stations showed a decrease in the catch per-man-hour from 0.93 to 0.73 from the period of 1960 to 1961. The catch per angler decreased during the same period from 3.13 to 2.23. The average 3 year mean for the initial 3 years of the study was 3.20 fish per angler and 0.92 fish per hour. This compares with an average catch of 2.11 fish per angler and 0.70 fish per hour for the latter 3 years and shows a decline in the average catch of 1.09 fish per angler or 0.22 fish per-man-hour. The average length of fishing trip decreased by 0.5 hours since stocking was discontinued.

The number and average size of fish weighed by species are shown in Table 3. No weights were obtained from hatchery planted rainbow during the 1963 season. Weights of dressed fish were converted to round-weight. The weight loss from dressed fish is reported in the F-27-R-1 completion report. The average weight of the natural rainbow has shown a considerable gain over 1962, indicating possibly, an improvement in the quality of rainbow fishing.

An estimated weight of the total catch was made by multiplying the total number of each species caught by the average weight of each species. The total estimated weight of all species of game fish caught in 1963 was 12,065 pounds. This compared with 12,582 pounds caught in 1962, 10,556 pounds harvested in 1961 and 21,516 pounds of fish harvested in 1960.

Table 3. Number of fish weighed and average weight by species, Rock Creek 1960-1963.

Species	Number weighed				Ave. round weight (lbs.)			
	1960	1961	1962	1963	1960	1961	1962	1963
Natural Rb.	988	397	863	777	0.63	0.59	0.51	0.68
1958 Planted Rb.	6	---	---	---	1.28	----	----	----
1959 Planted Rb.	24	2	---	---	0.67	1.74	----	----
1960 Planted Rb.	912	19	18	---	0.33	0.64	1.13	----
Ct.	605	64	94	179	0.28	0.26	0.34	0.25
Eb.	484	47	136	161	0.28	0.21	0.30	0.21
DV	158	29	81	80	0.71	1.00	0.66	0.72
LL	67	16	41	106	1.57	1.38	0.92	1.32
Wf.	303	81	118	204	0.37	0.52	0.52	0.38

A Street-Amet traffic counter which records hourly was installed at each checking station in an effort to obtain total automobile counts entering and leaving the Rock Creek census area during the regular fishing season. Daily counts were used to compute estimates of total fishing pressure and harvest. Regression estimates of fisherman to traffic counter data on days censused were calculated and expanded to include days which were not censused.

Total harvest and pressure estimates were determined by the regression analysis of daily traffic counter data, the ratio expansion of contact data, and by adding the known data from the days censused to these estimates. Separate estimates were determined for the upper and lower check stations and the season was stratified into two periods for the analysis of data. The first period extended from May 19 to September 8th and is considered to be the period of greatest fishing use. Estimates for this period were determined by the regression analysis of traffic counter data. Estimates for the period extending from September 9th to November 30th were derived from the ratio expansion of contact data for the lower station. Final estimates and confidence limits for the upper and lower check stations are presented in appendix B and C.

The data analysis for total estimates of harvest, hours fished, and angler trips are presented in Table 4. Confidence limits at the 95 percent level have been applied to these estimates. The estimates for the 1960 and 1961 data previously reported in the F-27-R-2 and F-27-R-3 reports are considerably lower than the estimates in this report. Previous to 1962, one regression estimate was determined for the combined data of the upper and lower check stations. Since fishing pressure was considerably heavier at the lower station, it was decided to revise data analysis procedures and run separate regression estimates for the upper and lower stations. It was felt that this modification of analysis procedure would present a more precise method of estimating harvest and pressure data. Analysis of harvest and pressure estimates in the future will be treated by stations as separate units.

Table 4. Final estimates - Rock Creek, 1960-1963.

	1960	1961	1962	1963
Harvest:				
Lower station (#1)	35,304	20,533	20,254	17,868
Upper station (#2)	10,233	4,611	5,203	2,797
T O T A L	45,537	25,144	25,457	20,665
Hours:				
Lower station (#1)	40,367	27,885	30,721	28,716
Upper station (#2)	8,737	5,482	5,729	3,462
T O T A L	49,104	33,367	36,450	32,178
Anglers:				
Lower station (#1)	11,585	9,539	10,430	9,033
Upper station (#2)	2,978	1,739	1,969	1,077
T O T A L	14,563	11,278	12,399	10,110

Since 1960, the total harvest, hours fished and number of anglers have declined in the census study area. In 1963, the game fish harvest declined to 55 percent of the number harvested in 1960. During this span of time, angling pressure decreased by 31 percent and the number of angling hours dropped by 34 percent.

A summary of the return of marked rainbow is presented in Table 5. A total of 93,877 rainbow were stocked in the upper and lower sections of Rock Creek during the initial three years of the study period.

Table 5. Cumulative percent return of hatchery rainbow stocked in Rock Creek in 1958, 1959, and 1960, (Estimated numbers of fish in parenthesis).

1958	1959	1960	1961	1962	1963
34.8	36.7	37.7	38.5	38.8	39.1
(13,305)	(10,534)	(11,566)	(729)	(305)	(269)

The cumulative percent return from the original planting is 39.1 percent. The return of hatchery planted rainbow since stocking was discontinued in 1960 has been negligible. Only 1.4 percent of hatchery planted rainbow have entered the creel since 1962.

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Date February 1, 1965

Appendix A.

Rock Creek creel census schedule, - 1963.
(Dates shown are days censused)

LOWER STATION

May

- - - - - - - - - - -- -- -- -- -- -- -- -- -- 19 -- -- 22 23 24 -- 26 27 28 -- 30 --

June

1 - 3 4 - 6 7 - 9 -- -- 12 -- -- 15 -- 17 -- 19 -- 21 -- 23 -- 25 -- 27 -- 29 --

July

1 - 3 - - - 7 - 9 -- 11 12 13 -- 15 -- 17 -- 19 -- 21 -- 23 -- 25 -- 27 -- 29 30 --

August

- - - 4 - - 7 8 9 10 -- 12 13 14 -- 16 -- 18 -- -- -- 22 -- 24 -- 26 27 -- -- 30

September

1 2 - 4 5 - 7 - - -- 11 -- -- -- 15 -- -- -- -- 20 -- -- 23 -- -- -- -- 28 -- --

October

- - 3 - - 6 - 8 - -- -- -- -- -- -- -- -- -- 19 -- -- -- -- 24 -- -- 27 -- -- 30 --

November

- - - - - 6 - - 9 -- 11 -- -- -- 15 -- 17 18 -- -- -- -- -- -- -- -- 27 -- -- 30

Appendix A. - continued

Rock Creek creel census schedule, - 1963
(Dates shown are days censused)

UPPER STATION

May

- - - - - - - - - - -- -- -- -- -- -- -- -- -- 19 -- 21 -- -- 24 -- 26 27 -- 29 30 --

June

1 - 3 - - 6 - - - - -- -- 12 13 -- -- 16 -- 18 -- -- 21 22 -- 24 25 -- -- -- -- --

July

- - 3 - 5 - 7 - - -- 11 12 13 -- 15 -- 17 -- -- -- -- -- 23 -- 25 -- -- 28 -- 30 31

August

- - 3 - 5 - - 8 - -- -- -- -- -- 15 16 -- 18 -- 20 21 -- -- 24 -- -- -- -- -- 30 --

September

- 2 - - 5 6 - 8 - -- -- -- 13 -- 15 -- -- -- -- -- -- -- -- -- 25 -- -- -- 29 --

October

- - - - - - 7 - - -- -- -- 13 -- -- -- -- -- -- -- -- -- -- -- -- -- -- 27 -- 29 -- --

November

- - - - 5 - - - - 10 -- 12 13 -- -- -- -- -- -- -- -- -- -- -- 25 -- -- -- -- --

Appendix B

Estimates of harvest, hours fished, and angler trips and confidence intervals at the 95 percent level, Rock Creek station 1, 1963

		Lower limit	Point estimate	Upper limit
Harvest:				
(May 19-Sept 8)	Regression estimate	5,106	7,036	8,966
	Known	7,706	7,706	7,706
(Sept 9-Nov 30)	Ratio estimate	2,601	3,126	3,651
T o t a l		15,413	17,868	20,323
Hours:				
(May ~~10~~ 19-Sept 8)	Regression estimate	9,088	12,270	15,472
	Known	13,802	13,802	13,802
(Sept 9-Nov 30)	Ratio estimate	2,240	2,644	3,048
T o t a l		25,130	28,716	32,322
Anglers:				
(May 19-Sept 8)	Regression estimate	2,818	3,800	4,782
	Known	4,285	4,285	4,285
(Sept 9-Nov 30)	Ratio estimate	822	948	1,070
T o t a l		7,925	9,033	10,137

Appendix C

Estimates of harvest, hours fished, and angler trips and confidence intervals at the 95 percent level, Rock Creek, station 2, 1963.

		Lower limit	Point estimate	Upper limit
Harvest:				
(May 19-Sept 8)	Regression estimate	878	1,258	1,638
	Known	1,168	1,168	1,168
(Sept 9-Nov 30)	Ratio estimate	310	371	432
T o t a l		2,356	2,797	3,238
Hours:				
(May ~~10~~ 17-Sept 8)	Regression estimate	1,109	1,587	2,065
	Known	1,613	1,613	1,613
(Sept 9-Nov 30)	Ratio estimate	216	262	308
T o t a l		2,938	3,462	3,986
Anglers:				
(May 19-Sept 8)	Regression estimate	359	477	595
	Known	496	496	496
(Sept 9-Nov 30)	Ratio estimate	35	104	173
T o t a l		890	1,077	1,264