MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Project No. F-27-R-3 Name Rock Creek Creel Census

Job No. I Title Summer Census

Period Covered May 1, 1961 - April 30, 1962

Abstract:

A creel census study to determine the contribution to the fishery by stocks of catchable-sized rainbow trout, and the return of these trout to the angler's creel, was continued for the fourth year on a 40-mile section of Rock Creek near Missoula, Montana. Census scheduling and operation are discussed. Estimates of total angler use of the area and harvest of game fish during the 1961 general fishing season were 14,355 angler trips and 30,855 game fish. The average return to the creel of trout planted during the initial three years of the study is 41.1 per cent to date. Correlation coefficients were calculated for hours fished, fish caught, the number of anglers and traffic counts on days censused. These correlations were above the 0.90 level in every case.

Recommendations:

It is recommended that the Rock Creek creel census study be continued as an aid in evaluating the catchable-sized trout stocking program. Planting of hatchery-reared trout should be discontinued for a minimum of two more years so the effect of discontinuance on fishing pressure and success can be determined.

Census methods and techniques should continue as presently practiced, with one exception. Fishing pressure becomes so light on upper Rock Creek during October and November that operation of the check-station is economically and practically unfeasible. For this reason, the upper station should be closed on October 1, for the remainder of the season.

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-sized trout stocking program on Rock Creek. This report represents the fourth year of data collected for this evaluation.

The objective of this year's study was to obtain estimates of total catch, total effort, species composition of the catch, and the return of marked hatchery fish planted from 1958 through 1960 in the 40-mile study section of Rock Creek.

In addition, this is the second year data have been collected for an evaluation of total angler use and harvest estimates based on traffic counter counts.

Techniques Used:

Study area boundaries and sub-section definitions remained the same as in previous years of the study. Creel check-stations were maintained and operated simultaneously at both ends of the 40-mile study section. Signs indicating area definitions were located on all points where the single access road crossed section boundaries. Signs requesting anglers to stop were erected during periods when stations were in operation.

Census operation:

The schedule for operation of the creel check-stations was formulated under the direction of the department statistician. Sixty-six days of the 195 day season were censused in their entirety. This schedule is reproduced

in Appendix A. For the period from May 20 to September 3, check-stations were operated 43 per cent of the time. Previous census data indicate that relatively little fishing pressure is exerted after Labor Day. For this reason, census coverage was reduced to 25 per cent for the September 4 to November 30 period. Angling pressure became so light on the upper section of the study area during October that the station was closed for the remainder of the season.

The season was stratified for sampling purposes, as follows:

I - Weekends and holidays from May 21 to September 3.
II - Weekdays from May 21 to September 3.
III - Weekends and holidays from September 4 to November 30.
IV - Weekdays from September 4 to November 30.
V - Opening day.

The first day in strata I was chosen by random selection. The remaining days were selected by systematic sampling. Every other Sunday and every third Saturday were included in the sample. Memorial day and Independence day were included in this strata.

Two weekdays from each week were chosen for strata II. Six possible combinations of two weekdays per week were assigned code numbers and these numbers were chosen, first randomly, then systematically. The two census days each week were then determined from the code number. For each of the two weeks in which holidays occurred, a weekday in addition to the holiday was censused.

Days chosen for strata III and IV were selected in the same manner as strata I and II, with the exception that every third Sunday and only one weekday per week were censused.

Check-stations were in operation from 9:00 a.m. until it appeared that all anglers had departed from the study area. Census records from previous years indicate that only an occasional angler departs from the study area before or after the hours which census check-stations were in operation.

Creel census data were therefore considered complete for scheduled census days.

Completed trip contact data were obtained from the angler and were recorded on an individual basis. The creel census contact form used was identical to that used in 1960, which is reproduced in the F-27-R-2 completion report.

Information requested by census personnel was as follows:

1. Residency of angler.
2. Section fished.
3. Flies or other type of bait used.
4. Hours fished.
5. Total catch (recorded by species and/or marked hatchery trout).

Census data were compiled monthly and were reported in monthly progress reports. Following this compilation, completed contact forms were sent to the Department's IBM service and information was recorded on standard IBM punch cards for final summarization.

Hatchery fish:

Following the long-range plans for an evaluation of planting catchable-sized trout in Rock Creek, no fish were planted in the study area during this fourth year of investigation. Fish planted during the initial three years of the study were identifiable by distinctive fin clips and were recorded as such when checked through the stations. Estimates of the number of these fish caught were added to estimates caught in previous years.

On November 10, 1960, two hundred and fifty 10 to 15-inch rainbow trout were released in Rock Creek during an efficiency test of various electrofishing gear. These fish were graded from the Arlee State Fish Hatchery and were marked with a right pectoral fin clip. None of them were checked through the station in 1960, and, only 7 were recorded in 1961. Based on this sample, an estimated 19 of these fish were caught, which is an insignificant portion of the total harvest, and indicates a return of less than

eight per cent for these fall planted fish. For this reason, no further mention will be made of these fish.

Weight of total catch:

Samples of fish from the angler's creel were weighed to obtain an estimate of the total pounds of game fish harvested from Rock Creek during the 1961 fishing season. No specific sampling plan for this procedure was followed, census personnel were instructed to obtain weights at the convenience of the angler.

Traffic counters:

At each check-station a battery-operated, hourly recording, Streeter-Amet traffic counter was installed to obtain counts of the total amount of automobile traffic utilizing the Rock Creek access road. The procedures established in 1960 were followed in 1961 to test the validity of using traffic counters to compute estimates of pressure and harvest. Briefly, these procedures included computation of correlation coefficients for catch, pressure and traffic counter data, and a regression estimate of total harvest and pressure.

Findings:

The following species of game fish contribute to sport fishing in Rock Creek: rainbow trout, (Rb), Salmo gairdneri Richardson; cutthroat trout, (Ct), Salmo clarki Richardson; brown trout, (LL), Salmo trutta Linnaeus; Dolly Varden, (DV), Salvelinus malma (Walbaum); mountain whitefish, (Wf), Propsopium williamsoni (Girard); and brook trout, (Eb), Salvelinus fontinalis (Mitchill).

The species composition of the catch for the years the study has been conducted is presented in Table 1. The 3-year average is the weighted mean of the per cent of species composition during the years catchable-sized rainbow were planted in Rock Creek.

Table 1. SPECIES COMPOSITION, BY PER CENT, OF HARVEST, ROCK CREEK, 1958-61.

Year	Species LL	DV	Ct	Wf	Eb	Rb*	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 Mean	1.4	4.9	6.9	9.7	14.0	25.3	37.8
1961	4.3	6.9	11.5	15.7	13.2	2.9	45.5

*Hatchery planted rainbow trout

Creel census personnel contacted 5,363 anglers who fished in Rock Creek during the 66 days censused. These anglers fished for 16,212 hours and caught 11,251 fish. Table 2 includes rate of success data for each year of creel census to date.

Table 2. AVERAGE NUMBER OF FISH PER ANGLER AND CPMH, ROCK CREEK, 1958-61.

	Year	Fish per angler	Fish per angler-hour
Both Stations:	1958	3.39	0.91
	1959	3.07	0.94
	1960	3.07	0.89
	1961	2.10	0.69
Station 1:	1958	3.12	0.85
	1959	2.93	0.90
	1960	3.02	0.85
	1961	2.01	0.67
Station 2:	1958	4.33	1.08
	1959	3.71	1.10
	1960	3.30	1.10
	1961	2.54	0.81

Estimates of total harvest and pressure were derived by regression analysis of traffic counter data and ratio expansion of contact data. The season was stratified into two periods for purposes of analysis. The first period extended from May 21 to October 18. On the latter date, winter conditions prevailed in the Rock Creek study area. The type of counter in use employs a pnuematic road tube, which, when covered with snow, ceases to function. Data obtained from counters following this date were therefore

incomplete and unreliable.

Estimates for the period from October 19 to November 30 were derived by ratio expansion only for the lower station. The upper station was closed on October 18, and while there was probably some angling in the area following closure of the station, it is felt that this amount would be a very minor portion of the total pressure exerted. For this reason, no attempt was made to estimate harvest and pressure for this segment of the season on upper Rock Creek.

Correlation coefficients were computed for all pairs of variables sampled for the lower and upper Rock Creek check-stations. Contact data were used for these computations. The correlation matrix obtained for fishermen (X_1), hours fished (X_2), and harvest (X_3) for lower station data was:

	X_1	X_2	X_3
X_1	1	0.9913	0.9482
X_2	0.9913	1	0.9483
X_3	0.9482	0.9483	1

; and for the upper station was:

	X_1	X_2	X_3
X_1	1	0.9005	0.9948
X_2	0.9005	1	0.9566
X_3	0.9948	0.9566	1

To further investigate the relationship between pressure and harvest variables to traffic counts, correlation coefficients were computed for each variable and traffic counts on days censused. Correlation coefficients of contact data from both stations combined and total traffic counts to October 18 were as follows: traffic counts to anglers contacted, 0.9282; to hours

fished, 0.9129; and to harvest, 0.9101. The correlation coefficients between variables and traffic counts, and between any two variables, were of sufficient magnitude to assure that a reliable estimate of any variable could be made from traffic counter data.

Final estimates and fiducial limits are presented in Table 3. These estimates were made by determining the amount of pressure and harvest on days not sampled, applying confidence limits, and adding known contact data from days censused.

Table 3. PERIODICAL AND TOTAL ESTIMATES OF HARVEST, HOURS FISHED, AND THE NUMBER OF ANGLER TRIPS, AND CONFIDENCE INTERVALS AT THE 95 PER CENT LEVEL, ROCK CREEK, 1961.

		Lower Limit	Point Estimate	Upper Limit
Harvest:				
May 21 - Oct.18	Estimate	16,073	17,743	19,413
	Known	10,733	10,733	10,733
Oct.19 - Nov.30	Estimate	936	1,881	2,826
	Known	498	498	498
Total:		28,240	30,855	33,470
Hours:				
May 21 - Oct.18	Estimate	24,623	27,127	29,631
	Known	15,981	15,981	15,981
Oct.19 - Nov.30	Estimate	480	873	1,266
	Known	231	231	231
Total:		41,315	44,212	47,109
Anglers:				
May 21 - Oct.18	Estimate	8,015	8,731	9,447
	Known	5,294	5,294	5,294
Oct.19 - Nov.30	Estimate	166	261	356
	Known	69	69	69
Total:		13,544	14,355	15,166

Hatchery fish:

As previously stated, no fish were planted in Rock Creek during 1961. The number planted in 1958 was 38,195, in 1959 was 26,765, and in 1960 was 28,872. Data obtained during the three years of planting showed that the return of planted fish to the creel, in the year of plant, was 34.3 per cent

in 1958, 39.3 per cent in 1959, and 40.1 per cent in 1960. In Table 4, the cumulative return to the creel of planted fish in successive years is presented.

Table 4. CUMULATIVE PER CENT RETURN OF HATCHERY RAINBOW, ROCK CREEK, 1958-1961.

Year of Plant	Per cent return in 1958	1959	1960	1961
1958	34.3	36.0 (436)*	36.2 (72)	36.2 (14)
1959		39.3	44.0 (1277)	44.3 (44)
			40.1	43.0 (827)

*Figures in parenthesis are numbers of planted fish caught each year following year of plant.

Weight of total catch:

The number and average size of fish weighed, by species, is presented in Table 5. The round weight of the fish is the undressed weight. Weights of dressed fish were converted to round weights using weight-loss-from-dressing factors reported in the F-27-R-1 completion report. The average round fish weight of all species combined is a weighted mean.

To obtain an estimate of the weight of total harvest, estimated totals of fish caught, by species, were multiplied by the average weight for each

Table 5. NUMBER OF FISH WEIGHED AND AVERAGE WEIGHT, BY SPECIES, ROCK CREEK, 1960-61.

Species	Number weighed 1960	1961	Average round weight (Lbs.) 1960	1961
Natural rainbow	988	397	0.63	0.59
1958 planted rainbow	6	---	1.28	----
1959 planted rainbow	24	2	0.67	1.74
1960 planted rainbow	912	19	0.33	0.64
Cutthroat trout	605	64	0.28	0.26
Brook trout	484	47	0.28	0.21
Dolly Varden trout	158	29	0.71	1.00
Brown trout	67	16	1.57	1.38
Whitefish	303	81	0.37	0.52
Total	3,547	655	0.45	0.53

species. Summation of the total weight of each species in the harvest resulted in an estimate of 17,191 pounds of game fish harvested from the study area of Rock Creek in 1961. This corresponds to 23,408 pounds of fish harvested in 1960.

Prepared by Ralph W. Boland Approved by George D. Holton

Date October 17, 1962

Appendix A

Rock Creek Creel Census Schedule, 1961
(Dates shown are days censused)

May																					21	22	--	--	--	26	27	--	29	30	--
June	1	-	-	4	5	-	7	-	-	--	--	--	--	--	14	--	16	17	18	--	20	--	--	23	--	--	--	27	--	29	--
July	-	2	-	4	5	6	-	8	-	10	--	12	--	--	--	--	16	17	--	--	--	21	--	--	--	--	26	--	28	29	30	--
Aug.	1	-	-	4	-	-	7	-	-	10	--	--	13	14	--	--	--	--	18	19	--	--	22	--	24	--	--	27	28	--	--	31
Sept.	-	-	-	4	-	-	-	8	-	10	--	12	--	--	--	--	--	--	18	--	--	--	--	23	--	--	--	27	--	--	--
Oct.	1	-	-	-	-	6	-	-	-	--	--	12	--	14	--	--	--	18	--	--	--	22	--	--	--	--	--	--	--	30	--
Nov.	-	-	-	4	-	-	-	-	9	--	--	12	--	14	--	--	--	--	--	20	--	--	23	--	--	--	--	--	--	30	