MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION
HELENA, MONTANA

JOB COMPLETION REPORT
INVESTIGATIONS PROJECTS

State of Montana

Project No. F-27-R-4 Name Rock Creek Creel Census

Job No. I Title Summer Census

Period Covered July 1, 1962- June 30, 1963

Abstract:

A creel census study to determine the contribution to the fishery by stocks of catchable-size rainbow trout, and the return of these trout to the angler's creel, was continued for the fifth 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 1962 general fishing season were 12,399 angler trips and 25,457 game fish. The cumulative return to the creel of trout planted during the initial three years of the study is 38.8 per cent to date. The average 3 year mean of the catch per-man-hour during the initial 3 years of the study was 0.92. The average 2 year mean of the catch per-man-hour during the past two years was 0.72.

Estimates of pressure and harvest for the years 1960, 1961 and 1962 have been revised and are presented in this report.

Recommendations:

It is recommended that the Rock Creek creel census study be continued as an aid in evaluating the catchable-size trout stocking program. Planting of hatchery-reared trout should be discontinued for a minimum of one more year. At this time, should data regarding the role of hatchery-reared trout in the fishery be inconclusive, planting should remain discontinued until such time that conclusive data are available.

Census scheduling should remain under the direction of the Department Statistician. The mechanical aspects of creel census operation should remain unchanged.

Age and growth data should be obtained for comparison to data obtained in 1959. Bulk weights of individual species of fish should also be continued for a determination of any change in fish size, if any. Both of the above should be obtained at the convenience of the angler.

The angler's fishing license number should be recorded with his census contact data. Data from anglers over 70, or under 15 years of age, (who are not required to purchase licenses) should be recorded with the individual's initials. These data will be used to determine the distribution of the harvest among individual anglers, and can be compared with data obtained in 1960.

Should an access road planned by the United States Forest Service in the vicinity of the Wahlquist cable crossing become a reality in 1963, a traffic counter and census station should be installed to obtain data at this point.

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 objective of this year's study is to obtain estimates of total catch, total effort, species composition of the catch and cumulative return of marked hatchery fish planted during the first three years of the study. A secondary objective of this year's study is to compare the catch rates of game fish caught during the 3 year period with the catch rate during the 2 year period following the discontinuance of stocking of hatchery rainbow.

Techniques used:

This report represents the fifth year the creel census study has been in operation. Catchable-size hatchery rainbow trout were planted in the area each year for the initial three years of the study. Approximately 30,000 were marked distinctively and planted each year. 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 water, and urban area from which fishing pressure 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% of the total catch. No attempt was made to separate the catch from the tributary streams in 1962.

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 signs indicating check-stations are in operation are erected on scheduled census days.

In conjunction with each check-station, an hourly recording, Streeter-Amet traffic counter was installed at each station to obtain total number of automobiles entering and leaving the Rock Creek creel census area during the regular fishing season. Because of the small amount of pressure on upper Rock Creek, this station was closed on September 30 and the counter removed. On lower Rock Creek, both station and traffic counter remained in operation until November 30th.

The 1962 angling season opened on May 20 and remained open for trout and whitefish until November 30. Prior to this year, check-stations were operated simultaneously on scheduled census days. This year, with the exception of opening day, separate creel census schedules were made for the upper and lower stations. The reliability of using traffic counter data for making regression estimates of harvest and pressure facilitates this change in census scheduling.

Since the majority of the contacts are made at the lower check-station, this station received greater coverage than did the upper station. Seventy days, or roughly 36 per cent of the 195 day season were censused at the lower station. At the lower station, 27 days, or about 20 per cent of the 134 days in the season to September 30 were censused. 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 at night. Previous investigation has shown that a very small percentage of the total number of anglers leave the study area prior to the station opening time in the morning. Creel census data were therefore considered complete on days censused.

At the time of angler interview, completed trip contact data were obtained from the angler and recorded on an individual basis. Fish checked were recorded by species and clip code number. Fish weights were obtained when convenient for the angler.

The creel census schedule was formulated under the direction of the Department Statistician. Every third Saturday and Sunday, and usually two weekdays per week were censused at the lower station. Equal representation was given each day of the week insofar as possible. Days chosen to be censused at the upper check station were scheduled primarily to fit into the lower station schedule, so that one census technician could commute between the two stations and effectively operate both stations.

Census data were compiled monthly and summations were reported in the monthly narrative summaries. Following this compilation, completed contact forms were sent to the Department's I B M Section 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 in Bozeman.

Findings:

The following species of game fish were creeled in the Rock Creek study area in 1962: rainbow trout, (Rb), Salmo gardneri; cutthroat trout (Ct), Salmo clarki;

brown trout, (LL), Salmo trutta; Dolly Varden, (DV), Salvelinus malma; mountain whitefish (Wf), Propsopium williamsoni; and brook trout, (Eb), Salvelinus fontinalis.

During the 1962 summer census, creel census technicians interviewed 4,421 anglers on a total of 96 scheduled census days at both check stations. These anglers were successful in catching 9,884 fish for 13,952 hours of fishing effort.

The species composition by percent of harvest for the years 1958 through 1962 is shown in Table 1. The three-year average during the initial period of the study is a weighted mean of the species composition (by percent) for the years rainbow were stocked. The latter two year average is a weighted mean of the percent of species composition for the years following the cessation of rainbow plants.

Table 1. Species composition of catch, by percent, of fish checked through upper and lower Rock Creek check stations - 1958 - 1962.

Year	LL	DV	CT	Wf	Eb	Hatchery Rb.	Natural Rb.
1958	1.2	5.0	7.3	7.0	14.7	26.4	38.4
1959	1.4	4.7	5.8	11.0	13.8	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	13.9	25.3	37.9
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
2 year average (after hatchery planting)	4.7	6.2	10.0	15.5	12.5	2.1	49.0

As would be expected, the most notable change in the species composition of the catch after stocking was discontinued was the hatchery rainbow. This group decreased an average of 23.2 percent. Meanwhile, the species composition of other species, with the exception of brook trout, showed an average percentage increase. The most significant increase in the composition of the catch was that of the natural rainbow, which gained 11.1 percent.

Table 2 shows a comparison of fishing success for each year and the average length of trip since the creel census study was initiated in 1958. Also presented is a weighted mean for a three-year period during which time catchable trout were stocked and a weighted mean for a 2 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 - 1962.

	Year	Fish Per Angler	Fish Per Angler Hour	Average Length of trip (Hours)
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
2 year average (without stocking)		2.14	0.72	2.9

The combined stations show a decrease in the catch per-man-hour from 0.93 to 0.75 from the period of 1960 to 1961. The catch per angler decreased during this 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. These compare with an average catch of 2.14 fish per angler and 0.72 fish per hour for the latter 2-year mean. This represents a decline in the average catch of 1.06 fish per angler of 0.20 catch per-man-hour. The average length of time spent fishing decreased by 0.6 hours per trip since stocking was discontinued.

The number and average size of fish weighed by species is presented in Table 3. No weights of rainbow planted in 1958 or 1959 were collected. Weights of dressed fish were converted to round weight. A weight-loss factor from dressing is reported in the F-27-R-1 completion report. The average round weight of all species combined is a weighted mean. An estimated weight of the total catch was made by multiplying the average weight of each species by the total number of each species caught. The total estimated weight of each species of game fish caught in 1962 was 12,582 pounds. This compares with 10,556 pounds of fish 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, 1960-1962.

Species	Number weighed			Average round weight (lbs)		
	1960	1961	1962	1960	1961	1962
Natural Rb.	988	397	863	0.63	0.59	0.51
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	0.28	0.26	0.34
Eb	484	47	136	0.28	0.21	0.30
DV	158	29	81	0.71	1.00	0.66
LL	67	16	41	1.57	1.38	0.92
Wt	303	81	118	0.37	0.52	0.52

Street-Amet-Traffic counter which records hourly was installed at each checking station in an effort to obtain the total automobile traffic entering and leaving the Rock Creek census area during the regular fishing season. Daily traffic counts were used to compute estimates of total fishing pressure. The ratio of fishing cars to non-fishing cars was determined and these data are expanded to cover days 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 adding the known data 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 20, to September 6, and was the period of greatest fishing use. Estimates of this period were determined by the regression analysis of traffic counter data. Estimates for the period from September 6 to November 30 were derived from the ratio expansion of contact data for the lower station. The ration expansion of contact data for the upper station was determined for the period from September 6 to September 30. Previous data has shown that fishing pressure in the upper study section is negligible after October and would not effect the overall harvest and pressure estimates. The final estimates and confidence limits for the upper and lower check stations are presented in Appendix B and C.

As was stated previously, the data analysis of harvest, pressure and the application of confidence limits for 1962 were treated separately for the upper and lower stations. Data analysis of pressure and harvest in previous years, 1960 and 1961, had been derived from the combined data of both check stations. By running separate regression estimates for both stations, it is felt that certain refinements can be made to more accurately determine harvest and pressure estimates. Therefore, the revision of data analysis were made with regard to harvest and pressure dating back to 1960. The revised data analysis for total estimates of harvest, hours fished, fishes and angler trips are presented in Table 4. These estimates are considerably lower than those that had been analyzed previously. (See completion reports F-27-R-2 and F-27-R-3). 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
Harvest:			
Lower station (#1)	35,304	20,533	20,254
Upper station (#2)	10,233	4,611	5,203
T O T A L	45,537	25,144	25,457
Hours:			
Lower station (#1)	40,367	27,885	30,721
Upper station (#2)	8,737	5,482	5,729
T O T A L	49,104	33,367	36,450
Anglers:			
Lower station (#1)	11,585	9,539	10,430
Upper station (#2)	2,978	1,739	1,969
T O T A L	14,563	11,278	12,399

Since 1960, the total harvest, hours fished and the number of anglers have declined appreciably in census study areas. In 1962, the game fish harvest dropped 42 percent of the number harvested in 1960. During the span of time, angling pressure decreased 15 percent and the number of angling hours dropped by 26 percent. However, there appears to be an upward trend in both harvest and fishing pressure when compared to the 1961 estimate.

A summary of the return of hatchery 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
34.8	36.7	37.7	38.5	38.8
(13,305)	(10,534)	(11,566)	(729)	(305)

The cumulative percent return from the original planting is 38.8 percent. Since the termination of stocking in 1960, only 1.1 percent of hatchery rainbow have entered the creel.

Prepared by ROBERT J. DOMROSE Approved by George D. Holton

Date February 15, 1965

Appendix A

Rock Creek Creel Census Schedule, 1962
(Dates shown are days censused)

May

\- - - - - - - - - - -- -- -- -- -- -- -- -- -- -- 20 -- 22 -- -- 25 -- -- 28 29 -- 31

June

- 2 - - 5 6 - 8 - 10 11 -- -- 14 -- 16 17 18 -- 20 -- -- 23 -- -- 26 -- 28 29 --

July

1 - 3 - 5 - 7 8 9 -- 11 12 -- 14 -- 16 -- 18 -- 20 -- 22 -- 24 -- 26 27 -- 29 30 --

August

1 - 3 4 - 6 7 - 9 10 -- 12 -- 14 15 -- 17 18 19 -- -- -- 23 -- 25 -- 27 -- 29 -- 31

September

- 2 - 4 - 6 - 8 9 -- 11 -- -- 14 15 -- 17 -- 19 20 -- -- 23 24 -- 26 -- 28 -- --

October

- - - 4 5 6 - - - 10 -- 12 -- 14 15 16 -- -- -- -- -- -- 23 24 -- -- 27 -- 29 -- --

November

1 - - 4 5 - 7 - - -- -- -- 13 -- 15 -- 17 -- -- 20 -- -- 23 -- 25 -- -- 28 29 -- --

Appendix B

ESTIMATES OF HARVEST, HOURS FISHED, AND ANGLER TRIPS AND CONFIDENCE INTERVALS AT THE 95 PER CENT LEVEL, ROCK CREEK, STATION 1, 1962

	Lower limit	Point estimate	Upper limit
Harvest:			
(May 21-Sept. 6 - Regression Est.	7,693	11,397	15,101
Known	6,981	6,981	6,981
(Sept. 7-Nov. 30 Ratio Est.	1,359	1,876	2,393
T O T A L	16,033	20,254	24,475
Hours:			
(May 21-Sept. 6) Regression Est.	11,995	17,769	23,543
Known	10,535	10,535	10,535
(Sept 7-Nov. 30) Ratio Est.	1,859	2,417	2,978
T O T A L	24,389	30,721	37,056
Anglers:			
(May 21-Sept. 6) Regression Est.	4,160	6,162	8,164
Known	3,484	3,484	3,484
(Sept 7-Nov.30) Ratio Est.	547	784	1,021
T O T A L	8,191	10,430	12,669

Appendix C

ESTIMATES OF HARVEST, HOURS FISHED, AND ANGLER TRIPS AND CONFIDENCE INTERVALS AT THE 95 PER CENT LEVEL, ROCK CREEK, STATION 2, 1962

		Lower limit	Point estimate	Upper limit
Harvest:				
(May 21-Sept 6)	Regression Est.	2,089	3,555	5,021
	Known	1,265	1,265	1,265
(Sept 7-Sept 30)	Ratio Est.	215	383	551
	T O T A L	3,569	5,203	6,837
Hours:				
(May 21-Sept 6)	Regression Est.	2,352	4,002	5,652
	Known	1,360	1,360	1,360
(Sept 7-Sept 30)	Ratio Est.	173	367	561
	T O T A L	3,885	5,729	7,573
Anglers:				
(May 21-Sept 6)	Regression Est.	781	1,327	1,873
	Known	446	446	446
(Sept 7-Sept 30)	Ratio Est.	39	196	353
	T O T A L	1,266	1,969	2,672