MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION

JOB COMPLETION REPORT
RESEARCH PROJECT SEGMENT

State of Montana

Project No. F-34-R-2

Name: Reservoir Investigations
Title: Hungry Horse Reservoir

Job No. 2

Period Covered July 1, 1967 - June 30, 1968

ABSTRACT:

Detailed information of work completed through April 30, 1968 is included and only general information on work done in May and June, 1968. Sampling reservoir fish populations and movement of spawning westslope cutthroat trout (Salmo clarki subsp.) both upstream and downstream requires work overlapping two fiscal years. These data will be presented in F-34-R-3 completion report. Data are presented on cutthroat trout spawning in Hungry Horse Creek for years 1963 through 1968.

High water in the spring of 1967 severely damaged the experimental fish trap in Hungry Horse Creek. Repair work done in late 1967 included replacement of 40 feet of the 48-foot long velocity barrier, replacement of 52 feet of bank between the velocity barrier and controlled flow channel headgate, enlargement of the headgate to 9 feet wide from 4 feet, and installation of gabion aprons below the headgate and velocity barrier.

Trapping of adult cutthroat trout moving upstream started May 21, 1968 and continued through June 25, 1968. Downstream trap started operating June 26, 1968 and continued through July 19, 1968. The downstream trap was operated again July 29-31 and August 20-21, 1968. An estimated 1,160 adult cutthroat trout entered Hungry Horse Creek for spawning in 1968. Of these, 900 were taken by the upstream trap. Male cutthroat trout averaged 14.7 inches total length and females 14.5 inches total length. Sex ratio was 1 male to 3.7 females. It was calculated that the average female contained 983 eggs. Downstream trapping was carried out during only part of the time spent adults and juvenile fish were leaving the creek. Catch included 241 spent adults and 2,110 juveniles. Juvenile fish averaged 5.8 inches total length and ranged from 2.2 to 9.2 inches total length.

Information on angler's harvest was collected from the reservoir and its tributary streams during spawning periods of cutthroat trout and mountain whitefish (Prosopium williamsoni). It was concluded that the small harvest of spawning fish was not detrimental to the population of these two species.

RECOMMENDATIONS:

A detailed study of the life history of mountain whitefish and west-slope cutthroat trout should be made. Information crucial to intensive management is lacking and must be acquired soon. It is recommended that a more complete study be made of these two species in the Hungry Horse Reservoir-Hungry Horse Creek complex.

Specific information about adult spawners should be collected with emphasis on their homing instincts, distribution in drainage, spawning success, quality of spawning habitat, mortality rates, and continuation of data collected in prior years' work. Information about the life of juvenile fish in the creek should be collected with emphasis on their distribution in the creek, mortality rates, growth, age, time and numbers of migrants to the reservoir. Studies should be made of the distribution, food habits, and mortality rates of juveniles in the reservoir.

OBJECTIVES:

The objectives of this job were as follows:

1. Repair and operation of the experimental fish trap on Hungry Horse Creek.

2. Collection of information about the trends of the reservoir's fish population.

3. Survey of reservoir tributaries.

4. Evaluation and construction of fish passage facilities at barrier culverts where needed.

FINDINGS:

Reservoir Population Trends: Forty overnight gill net sets were made at five netting stations distributed throughout the length of the reservoir in May, 1968. Netting sites and number of sets were similar to past years' work. This series of sets combined with a similar series made in October, 1968 comprise a year's sampling and these data will be presented in F-34-R-3 report and compared to previous years' information.

Net catches from May sampling totalled 1,259 fish of which 278 were suckers (Catostomus spp.), 355 northern squawfish (Ptychocheilus oregonensis), 405 mountain whitefish, 178 Dolly Varden (Salvelinus malma) and 43 cutthroat trout. Average catch per net was much higher than anticipated and was probably influenced by the reduction of volume with the 50-foot drawdown at time of netting.

Stream Survey - Bunker Creek: Bunker Creek drainage forms part of the boundary of the Bob Marshall Wilderness Area, and until 1967 was not accessible by road. U.S. Forest Service is building a road into the drainage and will start harvesting 31.7 million board feet of timber in the first sale. Fishery survey work has been done in Bunker Creek for two years and findings are:

1. Bunker Creek provides excellent spawning for reservoir fish from its mouth to a falls about one-half mile upstream from Gorge Creek. This is a distance of about 6 miles.

2. Bunker Creek above the falls and Gorge Creek contains excellent populations of fluvial [1/] westslope cutthroat trout.

3. Dolly Varden are the most important users of the section of Bunker Creek drainage accessible to reservoir fish.

4. Some westslope cutthroat trout and mountain whitefish also spawn in the accessible portion.

Stream Survey - Wheeler Creek: Wheeler Creek flows directly into the reservoir about 30 miles upstream from Hungry Horse Dam. A high falls is located about 5 miles upstream from its mouth and blocks all fish upstream passage. A few fluvial westslope cutthroat trout of small size are found above this fall. Below the falls excellent spawning areas are heavily used by westslope cutthroat trout, Dolly Varden, and mountain whitefish.

Evaluation of Fish Passage Structures: No fish passage facilities were built during this report period. Rock hard points were constructed to reduce streambed erosion below culverts on South Fork Logan, Murray, Hungry Horse, and Margaret Creeks. Evaluation of fish passage showed that spawning cutthroat were able to pass through all structures following construction although some runs were delayed several days by peak high water.

Monies spent in repair work were hold-over funds from a cooperative Montana Fish and Game Department-U.S. Forest Service fish passage project started in 1963.

Creel Census: Creel census data were obtained on June 16, June 22-23, and June 29-30, the first three weekends of stream fishing. The season opening occurred during the westslope cutthroat trout spawning. Creel census data were also gathered during the hunting season, October 22 through November 19, 1967, which coincided with mountain whitefish spawning. Census stations were located on the two roads by which anglers leave the reservoir. Information collected included number of anglers, hours fished, place fished, catch by species, sex and gonad condition of spawning fish.

Harvest information for these census periods is listed in table 1 and is given separately for anglers fishing the reservoir and the tributary streams.

1/ Fluvial refers to fish spending their entire life-span in a stream whereas adfluvial means fish that leave the reservoir to spawn in a stream. Salmonid species referred to in this report are adfluvial fish unless otherwise specified.

Table 1. Creel cnesus summary for Hungry Horse Reservoir area, June 16, 22, 23, 29, 30 and October 22 through November 19, 1967

Dates	Location	Number anglers	CPMH*	C/A**	Numbers caught	
					Whitefish	Cutthroat
June 16, 22, 23, 29, 30	Streams	689	0.35	1.1	3	790
	Reservoir	110	0.29	1.0		114
October 22-November 19	Streams	171	2.92	8.8	1,493	5
	Reservoir	38	0.62	2.7		103

*Catch per man hour of effort
**Catch per angler trip

Of the 790 cutthroat taken from streams in June, 740 were adfluvial spawners and the remaining 50 either fluvial fish or adfluvial juveniles. Harvest of adfluvial spawners included 496 female fish and 244 male fish. A total of 241 ripe females were caught, the remaining females were either spent or partially spent fish. Angler harvest of spawning cutthroat from Hungry Horse Creek totaled 123 fish of which 33 were males and 90 were females. Mountain whitefish taken from streams in the fall are all ripe fish with few exceptions. They are generally caught while concentrated in large pools before reaching the spawning areas.

Hungry Horse Creek Experimental Trap: The trap on Hungry Horse Creek was damaged beyond use by flood water in May, 1967. Repair of the trap was completed in November, 1967. Primary damage done to the structure included a washout of about 50 feet of bank between the control flow channel and the main channel, collapse of one velocity barrier abutment, and sagging of the velocity barrier spillway structure. Repair work included replacement of 40 feet of the 48-foot long velocity barrier and one abutment. The washed out bank between the velocity barrier channel and the control flow channel was replaced by using gabions 1 meter by 1 meter by 3 meters long stacked two gabions wide and two gabions high. A new headgate structure was built to regulate flows in a control flow channel when a 4 foot wide channel was replaced by one 9 foot wide. Aprons built of gabions 1/3 meter by 1 meter by 2 meters were added below the control flow headgate and the velocity barrier. One large log jam, numerous stumps and single logs were bulldozed out of the stream for a distance of 300 yards above the trap. An access road was built into the trap site and a vehicle barrier was installed across the road to limit its use to work vehicles only.

Trapping commenced May 21, 1968 when adult cutthroat trout were first observed around the trap site and continued through June 25, 1968. During this time 900 adults were captured, sexed, fin-clipped, measured, scale samples were taken from 400 fish, and 15 females killed for egg counts. The remaining fish were released upstream.

Male cutthroat averaged 14.7 inches total length and ranged from 9.2 to 16.5 inches. Female cutthroat averaged 14.5 inches total length and ranged from 11.2 to 16.2 inches. Sex ratio of the 900 fish trapped was 1.0 male to 3.7 females. The average female cutthroat was calculated to contain 983 eggs.

The downstream trap was placed into operation June 26, 1968 and fished continuously through July 19, then from July 29 through July 31 and August 20 and 21, 1968. This trap captured 241 spawned out fish moving out of the drainage into the reservoir. Catch included 71 males of which 56 were fin-clipped and 170 females of which 131 were fin-clipped. The remainder were not marked. The daily catch of adult cutthroat trout for the period June 26 through July 19 averaged 10.4, for July 29 through July 31 it averaged 0.67, and was zero for August 20 and 21.

The upstream trap system was not fish proof as indicated by unmarked fish taken in the downstream trap. Project personnel observed a few large male and female cutthroat swimming over the velocity barrier spillway. This spillway had a 33% grade and water velocities were maintained at about 9 feet per second. Spillway drop has been modified and increased to 42 percent in hopes velocities can be maintained at about 11 feet per second. It is possible that trapping operations did not start soon enough to capture the early part of the run. More likely the trap leads within the control flow channel developed leaks that were not corrected until some fish had escaped upstream.

Catch of juvenile cutthroat trout moving downstream totaled 2,110 fish during the 29 days of downstream trapping. Average daily catch for the period of June 26 through July 19 was 89.0 fish, for July 29 through July 31 averaged 20.3 fish, and for August 20 and 21 averaged 4.5 fish. Juvenile cutthroat trout averaged 5.8 inches total length and ranged from 2.2 inches to 9.2 inches.

Resume of 1963-1968 Trap Operations: Spawning runs of westslope cutthroat trout have been trapped entering Hungry Horse Creek drainage since 1963. Traps were operated in tributaries in 1963, 1964, and 1967 and in main-stem Hungry Horse Creek in 1965, 1966, and 1968.

Cutthroat population estimates were made each year from mark and recovery information except for 1964 and 1967. Sex ratios, average sizes and ranges of size by sex were obtained each year. Age and rate of growth from scale analysis were calculated for each year except 1963. These data are presented in tables 2, 3, and 4.

Table 2. Population estimates, sex ratios, average size and size ranges in inches of spawning westslope cutthroat trout, Hungry Horse Creek, 1963-1968

Parameter	1963	1964	1965	1966	1967	1968
Estimated size of run	1500	----	1200	1200	----	1160
Sex ratio (♂:♀)	1:1.8	1:3.1	1:3.2	1:3.3	1:3.3	1:3.7
Average length (♂)	16.0	15.4	14.5	14.6	14.5	14.7
Range (♂)	11.5-18.6	12.5-16.6	10.5-16.8	9.9-17.0	12.8-15.5	9.2-16.5
Average length (♀)	15.3	14.8	14.4	14.7	14.3	14.5
Range (♀)	12.0-17.0	12.9-16.9	12.5-16.4	11.5-18.4	12.0-15.0	11.2-16.2

The data in table 2 show that estimated size of run declined from 1963 to 1965 but has remained stable since 1965. Average size of both male and female fish declined from 1963 through 1965 but has remained stable since 1965. Size ranges of both sexes have remained about the same except for the year of 1967 when the large trout caught were not as large as in other years.

Age composition of the spawning runs for the years 1964 through 1967 yielded some information as to the possible cause for the narrower size range of fish taken in 1967. The age-class composition of the 1964 through 1967 spawning runs are given in table 3 and are divided into X_2 and X_3 migration classes. Class X_2 contains fish 3, 4, 5, 6, and 7 years old that were reared in the stream two years prior to migrating to the reservoir. Class X_3 contains fish 4, 5, 6, and 7 years old that were reared in the stream three years before moving into the reservoir. A few X_1 fish were found in the 1966 and 1967 runs but they are not included in the table. Cutthroat trout 16 inches total length or longer taken from Hungry Horse Creek generally have poor or regenerate scales and interpretation is extremely difficult. As a result, fish 7 years old or older were likely present in the 1964 and 1965 collections but could not be determined by scale analysis. Fish older than 6 years did not occur in the 1967 spawning run.

Table 3. Age composition of cutthroat trout spawning in Hungry Horse Creek, 1964, 1965, 1966, 1967

Year	Migration class	Percent of total run	Age composition of migration class				
			3_2	4_2	5_2	6_2	7_2
1964	X_2	79.1	2.3	40.2	51.7	5.8	?
1965	X_2	77.6	5.1	64.4	20.3	10.2	?
1966	X_2	66.4	2.6	59.7	29.9	6.5	1.3
1967	X_2	75.8	---	38.0	60.0	2.0	---
				4_3	5_3	6_3	7_3
1964	X_3	20.9		4.3	52.2	43.5	?
1965	X_3	22.4		11.8	52.9	35.3	?
1966	X_3	32.8		2.6	65.8	23.7	7.9
1967	X_3	22.7		6.7	73.3	20.0	---

The percent of the population made up of X_2 and X_3 fish has not varied much except in 1966 when the numbers of X_3 increased and X_2 decreased about 11 percent. No explanation for this change in structure can be given. The 1964 run of X_2's appears to be fairly even in its distribution between 4 and 5 year old fish; the 1965 and 1966 runs were dominated by 4 year old fish, and the 1967 run by 5 year old fish. No fish of age-class 3_2 were present in the 1967 run although they appeared in small numbers in previous years. Spawning cutthroat only 3 years old are generally precocious males. Fish of age 3_2 in 1967 would represent the 1964 year class; 1964 being the year of the record Flathead River flood. The fact that this year-class failed to appear in the run may have been the result of this flood. A decline in numbers of fish 6_2 years of age and absence of fish 7_2 years of age was also noted in 1967.

The most noticeable decline in range of sizes of the spawning cutthroat trout occurred in the 1967 spawning run and was probably due to decreased numbers of older cutthroat trout. Declining numbers of older fish might be related to drawdown of Hungry Horse Reservoir. Prior to 1965 drawdown averaged about 60 feet and from 1965 through 1967 about 90 feet.

Growth rates of spawning cutthroat from Hungry Horse Creek have also shown small changes. Data for fish collected in years 1964 through 1967 are listed by year-class in table 4. Growth rates were calculated assuming straight line relationship between fish body length and scale length.

Table 4. Growth rates for spawning cutthroat by year-class, Hungry Horse Creek spawning runs of 1964 through 1967

Year class	Migration class	Length in inches at annulus I	II	III	IV	V	VI	VII
1958	X_2	2.6(5)*	4.4(5)	9.6(5)	12.3(5)	14.5(5)	15.9(5)	
1959	X_2	2.7(52)	4.9(52)	9.5(52)	12.4(52)	14.5(52)	15.8(7)	17.0(1)
1960	X_2	2.6(52)	4.9(52)	10.2(52)	13.1(52)	14.8(52)	16.2(5)	
1961	X_2	2.5(64)	4.8(64)	10.0(64)	12.9(62)	14.8(24)	14.7(1)	
1962	X_2	2.7(79)	5.0(79)	10.3(79)	13.1(76)	14.3(30)		
1963	X_2	2.6(21)	5.0(21)	10.5(21)	13.2(19)			
1958	X_3	2.1(10)	3.9(10)	6.5(10)	11.0(10)	13.5(10)	15.1(10)	
1959	X_3	2.4(21)	4.2(21)	6.7(21)	11.3(21)	14.0(21)	15.1(9)	16.1(3)
1960	X_3	2.2(19)	3.9(19)	6.2(19)	10.9(19)	13.7(18)	15.3(9)	
1961	X_3	2.2(28)	4.0(28)	6.3(28)	11.3(28)	13.8(26)	14.3(1)	
1962	X_3	2.3(12)	4.1(12)	6.4(12)	11.5(12)	13.8(11)		
1963	X_3	2.3(1)	3.7(1)	5.3(1)	12.4(1)			

*Numbers in parenthesis are size of samples.

The data given in table 4 indicate that growth rate (inches) of X_2 fish during their third and fourth years of life is increasing slightly. These two years represent the first years these fish spend in the reservoir environment. The factors creating better growth rates in face of increasing yearly drawdown are not fully understood. Unpublished data concerning changes in the reservoir's fish population structure indicate that declining sucker populations may be the key.

Review of X_3 growth data reveal no apparent trends, but rather a degree of stability. The lack of knowledge about possible cutthroat trout sub-population structure in the reservoir may masked reasons why no change has occurred in X_3 growth rates while changes are apparent in X_2 rates. X_2

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Waters referred to:

08-3580
08-0980
08-7720
08-8860