1972

Drainage Kootenai

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MONTANA FISH AND GAME REPORT

In Cooperation with U. S. Army Corps of Engineers

Contract No. DACW 67-70-C-0002

Fisheries Division

Job Progress Report

Annual Progress Report

HABITAT DEVELOPMENT OF YOUNG CREEK, TRIBUTARY TO LIBBY RESERVOIR, 1969-1972

by

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July, 1972

MONTANA FISH AND GAME DEPARTMENT
FISHERIES DIVISION

JOB PROGRESS REPORT

Project Title: Habitat Development of Young Creek, Tributary to Libby Reservoir

Job Title: Stream fish population determinations and migration patterns for Young Creek, July, 1969 - July, 1972

ABSTRACT

Young Creek, a tributary to Koocanusa Reservoir, was selected as a study stream to determine if spawning runs of an adfluvial westslope cutthroat trout (Salmo clarkii subsp.) could be established. The stream originally contained brook trout (Salvenlinus fontinalis) and a good population of cutthroat, primarily resident with some fluvial fish in the lower four miles.

Development work completed from 1969-72 includes: (1) removal of possible barriers to fish migration from the junction of the North and South Forks to the mouth, approximately 11 miles, (2) suppression of resident fish populations with rotenone downstream from the junction of the North and South Fork, a distance of seven miles, and (3) imprint plantings of 50,000 adfluvial westslope cutthroat sub-fingerlings in the fall of 1970 and 1971.

Removal of barriers has facilitated movement of fluvial spawners into the drainage below the upstream trap. Data collected in July of 1971 indicate the first year's survival of the 1970 plant was quite high, approximately 30 percent. This is attributed to a lack of competition from resident fish. Out-migration of the majority of the juveniles planted in 1970 should have occurred in 1972, but it has been delayed by a high-water year. Previously, most juveniles did not migrate until flows dropped below 20 cfs. The comparatively slow growth of the planted fish may also delay their out-migration, because size appears to influence the behavioral and physiological changes which initiate migration.

Modification of the downstream trap is needed so that it can be operated at flows greater than 50 cfs which carry large amounts of debris.

BACKGROUND

Young Creek was chosen by the Montana Fish and Game Department and the Corps of Engineers to determine the feasibility of establishing spawning runs of adfluvial westslope cutthroat in suitable tributaries of Libby Reservoir. Young Creek rises on the east slopes of the Purcell Mountains and flows approximately fifteen miles to its confluence with the Kootenai River about three miles south of the Canadian border. The gradient averages 120 feet per mile below the junction of the North and South Forks. Discharges during the last three years have varied from a high of 110 cfs during spring run-off to a low of less than

10 cfs during late fall and winter. Temperatures have ranged from a minimum of 32° F. in the winter to a high of 67° F. in the summer. Soils in the watershed consist primarily of unconsolidated glacio-lacustrine silts and clays. Timber production and cattle ranching are the primary land uses in the watershed.

Initial work on the Young Creek Project consisted of a general physical and biological survey (Huston and May 1970). A fish barrier-trap was constructed to monitor fish migrating into or out of Young Creek and placed in operation in the fall of 1969. Fish population data collected in 1969-70 fiscal year indicated that Young Creek had a good population of resident cutthroat and brook trout. Operation of the upstream trap, in the spring of 1970, indicated that the run consisted of approximately 75 fish from the Kootenai River. These fish were primarily cutthroat with a few rainbow and rainbow x cutthroat hybrids. The number increased to 150 spawners in 1971. It appears that minimum water temperatures greater than 39° to 40° F. initiate the spawning runs. Data collected from the downstream trap show that approximately 529 fluvial and 234 adfluvial juvenile cutthroat migrated out of Young Creek in 1970 and 1971, respectively. Movements of juvenile cutthroat increased when flows dropped below 20-25 cfs. The large amount of debris carried by Young Creek during spring run-off make operation of the downstream trap quite difficult.

This report summarizes work done on the project from July 1969 to July 1972. Resident cutthroat trout are fish which complete their entire life cycle in Young Creek. Fluvial cutthroat trout move from a larger stream to a smaller stream to spawn, in this case, from the Kootenai River into Young Creek. Adfluvial cutthroat migrate from lentic water (lake or reservoir) into a stream to spawn.

PROCEDURES

Adult cutthroat trout collected in the upstream trap were scale sampled, measured, weighed, sexed, tagged, spawned and released downstream. Juvenile cutthroat collected in the downstream trap were scale sampled, measured, weighed, fin-clipped and released. Scales were imprinted on plastic and the images enlarged by a micro-projector for analysis. A test plotting of the body-scale data indicated that the relationship was essentially linear with an intercept of 0.5 on the abscissa. This point was used as the origin for nomographing scale data.

Methods outlined by Vincent (1969) were used during electrofishing operations and to calculate population estimates of juveniles in the streams.

Rotenone was used to suppress resident fish populations. A concentration of 2.5 ppm was maintained in the stream for 10 hours. The rotenone was detoxified with potassium permangenate maintained at a concentration of 3.2 ppm for 13 hours.

A velocity head rod and a Gurley pigmy flow meter were used to determine velocities. Discharge was calculated in terms of cubic feet per second.

A 30-day Foxboro recording thermograph was used to monitor water temperatures.

OBJECTIVES

The objectives of this project are to: (1) remove barriers to fish migration, (2) eliminate or reduce resident fish populations in areas which fluvial cutthroat do not utilize, (3) make imprint plants of adfluvial cutthroat in areas presently free from competition by resident fish, (4) evaluate growth and survival of imprint plants in streams, (5) monitor number of adult spawners entering stream and number of juvenile migrating out, (6) tag and mark migrants to determine movements and angler harvest, and (7) evaluate trapping and sorting facilities.

FINDINGS

Habitat Development

Probable barriers to fish migration were removed downstream from the junction of the North and South Forks of Young Creek to the Kootenai River, a distance of 11 miles. Following barrier removal, resident fish populations were eliminated with rotenone below the North and South Forks to Section 15 T37N R28W, a distance of seven miles. Rotenone was detoxified in Section 15 because fish population data indicated that Young Creek below this section served as a spawning and rearing area for fluvial cutthroat from the Kootenai River.

Fluvial Fish Population

The trap data for cutthroat migrating from the Kootenai River into Young Creek are summarized in Table 1. Timing of the run varied little from year to year. Spawners were generally captured from the last week of April to the first week of June with the peak of the run occurring during the middle of May. Minimum water temperatures were generally above 40° F. during the run.

The number of spawners captured has ranged from 21 for 1970 to 78 for 1972. These numbers were considered minimum because trap operation was not 100 percent efficient and some spawning occurred in Young Creek downstream from the trap. The increase in numbers for 1970 to 1972 is probably related to better access further upstream provided by removal of barriers, including a culvert, below the trap. The sex ratio has varied between 1.3 males to 1.0 females and 1.0 males to 1.6 females. The average length of females has averaged around 1 inch longer than the males. The estimated fecundity of the run approximated 50,000 eggs in 1972.

Evidence of repeat homing was indicated by the return in 1972 of five marked spawners from 1971. One fish had a jaw tag while the other four fish had definite tag holes where they had lost a jaw tag.

Table 1. Cutthroat spawning runs from the Kootenai River into Young Creek.

Parameter	Spawning year 1970	1971	1972
Number spawners	21	54	78
Sex ratio (male:female)	1.3:1.0	1.0:1.6	1.0:1.3
Average length (male)	11.1"	13.8"	12.8"
Range in length (male)	9.5-15.5"	10.0-16.2"	10.0-17.8"
Average length (female)	12.4"	13.9"	14.4"
Range in length (female)	9.1-15.5"	11.4-16.9"	10.2-17.3"
Percent of run returning to trap second year	--	9.3	--
Estimated fecundity	--	37,000 eggs	50,500 eggs

Tag returns from Kootenai River anglers indicate that returning cutthroat moved both up and downstream from the mouth of Young Creek. Three tagged fish were caught from the Kootenai River above the Canadian border, three to four miles upstream from the mouth of Young Creek. Two fish were caught 17 and 35 miles downstream from Young Creek respectively.

The growth rates of cutthroat trout collected in 1971 are summarized in Table 2.

Table 2. Growth of cutthroat trout collected from Young Creek fish trap, spring, 1971

Type of fish	Length in inches at each annulus I	II	III	IV	V	VI	Number aged
Juvenile trout	2.0	4.4	6.2	-	-	-	134
Adult trout							
XI 1/	2.6	6.8	11.0	14.1	15.0	16.2	9
X2	2.2	5.1	9.5	12.7	14.8	15.8	39
X3	1.8	4.2	7.3	11.4	13.4	15.9	6

1/ X1 fish left stream at age I as juveniles. X2 fish left stream at Age II as juveniles and X3 fish left stream at age III as juveniles.

The growth rates of both juveniles and adults is quite similar to that recorded by Huston (1969) for cutthroat from Hungry Horse Creek. Juvenile growth is comparatively slow in Young Creek, but is quite rapid the first two years after migration to the Kootenai River. For example X2 fish grew an average of 4.4 and 3.2 inches the first and second year in the Kootenai, respectively, compared to 2.2 and 2.9 inches the first two years of tributary life. The increase in weight is more marked than length increase.

Age composition data (Table 3) clearly show that Age IV and V dominate the spawning run.

Table 3. Percentage composition of Young Creek cutthroat trout in spawning run, 1971

Migration class	Number	Percent of run	Age composition III	IV	V	VI
X1	9	17	11	67	11	11
X2	39	72	10	38	36	16
X3	6	11	-	-	67	33
Total	54	100				

Migration class X2 comprises over 70 percent of the run indicating most fluvial juveniles leave Young Creek at Age II+. This agrees with the age structure of the out-migrant juveniles in 1970 and 1971 as over 70 percent of them were age II+.

The data from out-migrant juveniles from 1970 to 1972 are summarized in Table 4.

The fish in 1970 and 1971 are considered to be primarily fluvial juveniles, whereas the fish in 1972 are considered to be primarily adfluvial juveniles. Only about 20 cutthroat were passed upstream in 1970. In 1971 and 1972 none were passed through the trap as spawn was taken from the adult cutthroat for future management. The number of out-migrant juveniles trapped ranged from 529 in 1970 to 234 in 1971. The peak migration occurred when flows dropped below 20 cfs. Operation of the downstream trap is difficult during May and June because of flows over 50 cfs which carry large amounts of debris.

Table 4. Juvenile cutthroat collected in downstream trap in Young Creek during spring 1970, 1971, and 1972

	Mar.	April			May			June			July		
	1972	1970	1971	1972	1970	1971	1972	1970	1971	1972	1970	1971	1972
Average number/day	1.4	0.4	0.6	0.4	1.6	3.0	1.7	11.9	1.3	2.2	3.2	4.2	1/
Number/month	17	11	15	13	19	24	33	370	24	55	98	84	
Estimated number/ month	44	12	18	12	50	93	53	370	39	66	98	84	
Average length (inches)	3.1	2.9	3.9	3.1	4.7	4.5	3.6	6.4	6.2	6.3	5.9	5.8	
Days trap operated	12	30	25	30	18	8	20	30	16	25	31	20	

1/ Data not available at time report prepared.

Adfluvial Fish

Approximately 50,000 adfluvial cutthroat sub-fingerlings were planted in the chemically treated area of Young Creek in the fall of 1970 and 1971. Initial evaluation of the first plant was accomplished in July of 1971. A population estimate was calculated for a 1,000-foot section near the middle of the treated stream section.

Table 5. Population estimate for cutthroat trout and brook trout from Section 3, Young Creek, July 27, 1971

Age	Average Length (inches)	Average Weight	Number/ 1,000'	Pounds/ 1,000'	Confidence limits
			Cutthroat trout		
1+	3.0	.02	394	7.9	±20%
			Brook Trout		
1+ and 2+	5.0	.05	28	1.4	±33%

Prior to treatment the species composition in this section was 52 percent cutthroat and 48 percent brook trout. One year after treatment and introduction of cutthroat the species composition had changed to 93 percent cutthroat and 7 percent brook. The point estimate indicated there was an approximately 394 Age I+ adfluvial cutthroat per thousand feet of stream. Based on an average of 1,350 Age 0+ cutthroat stocked per 1,000 feet of stream in September, 1970, the first year's survival rate approaches 30 percent. This survival rate is much higher than normally recorded for sub-fingerling stocking and is likely a result of a lack of competition from resident fish.

Most of the adfluvial cutthroat planted in 1970 should migrate to the reservoir in the summer and fall of 1972 if they follow the normal life cycle. Catch of out-migrant juveniles as of July 1, 1972 is somewhat greater than in 1971, but less than in 1970, indicating that the 1970 plant had not started moveing out of the stream in large numbers. The movement of juveniles appears to be influenced by the flow pattern and total area of living space. Record 1972 snow-packs in the drainage caused an exceptional high water year and flows had not dropped below 30 cfs at the end of June. Thus, the peak out-migration of juveniles, which occurs when flows drop below 20 cfs, will probably be later in 1972 than in the two previous years. The comparatively slow growth of the planted cutthroat may also delay their out-migration, since most fish probably don't migrate until they reach smolting size. Growth influences the physiological and behavioral changes associated with migration from the parent stream. Bjornn (1971) stated that growth plays a role in iniating seaward migration of salmon and steelhead.

Trap Evaluation

Operation of the upstream trap was improved somewhat by installing trash screens in the bypass channel and removing rocks which concentrated the flow on small areas of the leads. Efficiency of the upstream trap was quite high in 1972 as only two un-marked adult spawners were caught in the downstream trap through June, 1972.

Operation of the downstream trap is quite difficult when flows exceed 50 cfs and nearly impossible when flows approach 80 cfs. Large amounts of small organic debris are the major problem clogging the screens, enabling the water to flow over the collecting troughs. Consideration should be given to increasing the mesh size of the screens from 1/4" to 1/2". The larger mesh should retain all age II and older fish but it might enable some Age I fish to pass through. Another possibility would be to install a trash rack in front of the downstream trap but this could result in more maintenance.

RECOMMENDATIONS

1. Modify downstream trap to accommodate the large amount of debris associated with flows of greater than 50 cfs.

2. Operate downstream trap on occasion throughout the year to estimate number of juveniles moving out of the drainage other than in the April to August period.

3. Conduct periodic sampling to monitor survival and growth of adfluvial juveniles in the nursery stream.

4. Similar traps, which were once recommended on other tributaries of Lake Koocanusa, are not deemed necessary at the present time.

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Date: August 24, 1972