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Final Job Report
July 1, 1969 - August 15, 1975

HABITAT DEVELOPMENT OF YOUNG CREEK, TRIBUTARY TO LAKE KOOCANUSA

By

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Reservoir Investigation Project

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ABSTRACT

The number of westslope cutthroat trout (303) in the 1975 spawning run was less than expected. This is attributed to the loss of large numbers of fish downstream out of the reservoir in the summer of 1974 and winter 1972-1973. About 30 percent of the 1975 spawning run had been marked as juveniles emigrating from Young Creek.

The number of out-migrant smolts captured in 1975 was comparable to 1973 and 1974. Nearly all of the smolts were two or three years old. The hatchery reared cutthroat planted in Young Creek appear to be following the typical adfluvial life cycle.

Tag returns from anglers in 1974 and 1975 indicate definite downstream movement of cutthroat related to reservoir drafting. Anglers returned tags from less than seven percent of the fish tagged at Young Creek in 1973 and 1974. About 60 percent of the tags returned were from fish caught in the Kootenai River below Libby Dam.

BACKGROUND

The impoundment of the Kootenai River by Libby Dam destroyed the historic spawning grounds of game fish in over 90 miles of the main-stem of the Kootenai and in approximately 25-30 miles of tributaries - thus the decision was made to manage all suitable remaining sections of the tributaries as spawning and nursery areas for migrating game fish from Lake Koocanusa.

Young Creek was selected as a test stream to determine the feasibility of establishing spawning runs of an adfluvial strain of westslope cutthroat (Salmo clarki supsp.). Adfluvial refers to fish that migrate from a lake or reservoir into a stream to spawn, whereas fluvial fish migrate from a river to spawn in a tributary stream.

Young Creek's source is on the east slopes of the Purcell Mountains in Lincoln County, Montana. The stream flows east approximately 15 miles to its confluence with Lake Koocanusa, about three miles south of the Montana-Canadian border. The gradient in the lower miles of Young Creek is moderately high, averaging 120 feet per mile. Peak annual flows have averaged over 100 cfs

and the average annual low flows have been between 5 and 10 cfs. Water temperature extremes have ranged from 32°F to 65°F with the highs in August averaging 60°F. Young Creek is a moderately productive stream with total alkalinities of over 130 ppm and standard conductivities of more than 200 micromhos per cc in the summer and fall. Fish species found in the stream include fluvial and resident westslope cutthroat, rainbow (Salmo gairdneri) and brook trout (Salvelinus fontinalis).

The Corps of Engineers designed and built an upstream-downstream fish trap immediately above full-pool elevation on Young Creek in the fall of 1969. Initial development work on the project consisted of removal or alteration of barriers to fish migration from the junction of the North and South Fork downstream to the mouth (a distance of about 11 miles) in the summer of 1970. The fish population in the upper seven miles of this section was eliminated using rotenone in August, 1970. An initial imprint plant of 50,000 adfluvial westslope cutthroat fingerlings was made in September, 1970. Annual plantings of about 50,000 fingerling cutthroat were made from 1970-1972, about 32,000 were planted in 1973; 45,000 in 1974 and 60,000 in 1975.

Adfluvial cutthroat live from one to three years in the natal stream before emigrating into the lake or reservoir. They grow and mature for one to three years in the lake before returning to spawn. The majority spend two years in the natal stream and two years in the lake before maturing and returning to spawn.

The first adfluvial cutthroat were planted in 1970 as Age 0+ fish. The majority of these fish should have emigrated in 1972 and returned to spawn for the first time in 1974. Smolting appeared to be delayed by one year. This is believed due to slow growth rates and comparatively low densities, (May and Huston, 1973). The spawning run increased to about 300 fish in 1974, from 100 or less in previous years, but few of them had been marked as juveniles emigrating from Young Creek (May and Huston, 1974). Large plants of adfluvial westslope cutthroat were made in the reservoir beginning in 1972.

PROCEDURES

From 1970 to 1973 juveniles caught in the downstream trap were fin-clipped to distinguish age group and year of emigration; beginning in 1974, adults and juvenile fish were cold branded using liquid nitrogen as the coolant. Four different brand symbols were utilized to distinguish age classes and to separate adults from juveniles. The outmigrants were branded in 1974 on the right side midway between the dorsal fin and lateral line. Brands were placed on the left side below the lateral line in 1975. Spent adults and juveniles over 7.0 inches were jaw-tagged also.

Methods outlined by Vincent (1971) were used when sampling with electrofishing gear and population parameters were calculated from the field data by the use of a computer program.

A 30 day thermograph was used to monitor water temperatures and a continuous flow recorder was installed and operated by the United States Geological survey.

FINDINGS

Habitat Development and Maintenance

Young Creek has been surveyed annually from 1970 through 1975 for potential barriers to fish migration from the junction of the mouth, a distance of 11 miles. Potential barriers were found at only two spots in 1975. Stream profile data were collected from three sections in summer 1975 and flows were recorded at a U.S.G.S. gauge station from March 1973, through November 1975. This information will be used to file for a water reservation to maintain adequate instream flows for cutthroat spawning and rearing.

Over 500 brook trout were removed from the meadow section of Young Creek in July 1975, by electrofishing. The void was filled with an imprint plant of westslope cutthroat trout fingerlings.

Spawning runs

Data for cutthroat trout entering Young Creek from Lake Koocanusa in 1973, 1974 and 1975 are listed in Table 1. No data are presented for the small spawning runs of cutthroat trout from Kootenai River. Many of the cutthroat in the 1973 spawning run were also fluvial fish, but that years' run did include some precocious adfluvial cutthroat.

In all years except 1975, the spawning run started about the first of May and continued for about one month. The 1975 spawning run did not start until May 21st and the last fish was caught July 8th. Water temperatures in Young Creek are thought not to be the reason for the late 1975 spawning run. Low reservoir pool levels coupled with later than normal spring run-off probably delayed warming of the reservoir which in turn delayed the spawning run compared to other years.

Lake Koocanusa pool elevation in mid-May 1975, was 2,295 feet msl compared to 2,326 in 1974. At the lower elevation Young Creek flows into the Kootenai River. Siltation of the lower end of Young Creek since its inundation by the reservoir, has created a severe braided channel when reservoir levels are down. This braided channel may be a physical block to fish moving up Young Creek until either the area is inundated by the reservoir or spring run-off re-cuts a primary creek channel.

The number of fish in the 1975 spawning run (303) was almost identical to the 1974 run (306), but much larger than the 1973 run (102) fish. Movement of cutthroat downstream out of the reservoir area was a major factor contributing to the 1975 run being less than expected. Over 60 percent of the 33 tags returned by anglers in 1974 and 1975 were caught in the Kootenai River below the dam.

Table 1. Parameters for cutthroat trout spawning run from Lake Koocanusa into Young Creek, 1973-1975

Parameter	Year 1973	1974	1975
Number of spawners	102	306 1/	303 1/
Sex ratio (male;female)	1.0:1.0	1.0:1.6	1.0:2.7
Average length (male) in inches	12.6	13.7	14.7
Average length (female) in inches	13.2	14.2	14.7
Number of repeat spawners from past years	2	4	2
Number of fish marked or tagged as juveniles emigrating from Young Creek	1	7	76
Estimated fecundity 2/	43,680	150,130	220,000

1/ Calculated from a modified Peterson Index

2/ Fecundity based on data collected from Hungry Horse Creek where a one pound female contained about 1,000 eggs.

There were two repeat spawners in the 1975 run, but the number of fish in the run, previously marked as juveniles emigrating from Young Creek, rose to 76 fish. Sixty-six of these fish were marked in 1973 with only eight fish coming from the 1972 and two from the 1974 smolt emigrations. The comparatively few fish from the 1972 smolt class is probably a result of a loss downstream triggered by a 230 foot drawdown of the reservoir in winter 1972-1973.

The growth of cutthroat in the new reservoir has been excellent to date. The average length of the fish in the run increased to 14.7 inches in 1975. The growth of juvenile cutthroat tagged emigrating from Young Creek in the summer of 1973 and returning to spawn in June of 1975 averaged 8.0 inches. The growth rates from the scale analysis indicated that the 1971 year class has grown faster than the 1969 or 1970 year class.

Upstream Fish Populations

Two sections have been sampled annually to determine the survival and growth of imprint plants and rate of brook trout repopulation. The Tooley Lake Section (1,150 feet long) is located in the lower four miles of Young Creek which was not chemically treated. Prior to development, this section contained resident and fluvial cutthroat with a few brook trout. Section 3 (1,500 feet long) is located in the middle of the area which was treated to

reduce resident fish populations. Prior to treatment, this section contained resident brook trout and cutthroat in about equal proportions. This section has received annual imprint plants of about 6,000 adfluvial fingerlings per mile from 1970 to 1972 and about 4,000 per mile in 1973 and 1974.

The population estimated for cutthroat in the Tooley Lake section, (Table 2.) appeared to decline in 1975. Higher than normal creek flows prevented efficient sampling in 1974 and 1975 and the overlapping of the large confidence limits indicate that the difference may not be significant. The standing crop of around 60 pounds of cutthroat per surface acre indicates that this is a productive section. The age composition of the population has remained relatively stable with age 1+ fish comprising from between 60 to 80 percent of the population (Table 3). The percent of brook trout in the population rose to about 20 percent in 1975.

Table 2. Population estimates and average condition factors for cutthroat trout in Tooley Lake Section and Section 3, Young Creek 1972-1975 The 95 percent confidence limits are in parenthesis

Tooley Lake Section				Section Three			
Number/ 1,000 feet	Pounds/ 1,000 feet	Pounds/ surface acre	Average condition factor	Number/ 1,000 feet	Pounds/ 1,000 feet	Pounds/ surface acre	Average condition factor
			July, 1972				
362(±29%)	18	64	38	648(±26%)	16	53	41
			Sept. 1973				
489(±20%)	17	58	38	724(±45%)	20	69	40
			Aug. 1974				
359(±37%)	19	64	40		NA 2/		
			July 1975				
188	-	-	-	288	-	-	-

1/ Initial estimates not run through computer

2/ Not enough fish marked to make an estimate

The populations estimated (Table 2) for westslope cutthroat in Section three were higher in 1972 and 1973 than 1975. The number of fish inhabiting this section in 1972 and 1973 was probably higher than the carrying capacity of the stream. In addition, the January, 1974, flood caused some habitat damage which probably lowered the population considerably in 1974. The population recovered in 1975 from the 1974 flood, but it probably won't reach the

levels of 1972 and 1973 again. The age composition in Section Three was similar to the Tooley Lake Section (Table 3).

Table 3. Growth rates and age composition of the cutthroat populations in Tooley Lake Section and Section Three, Young Creek, 1972-1974

Tooley Lake Section			Section Three		
Age class	Ave. length in inches at capture	Percent age composition	Age Class	Ave.length in inches at capture	Percent a compositi
		July 1972			
1+	3.4	65	1+	3.1	70
2+	5.8	21	2+	4.6	29
3+	7.3	13	3+	7.3	1
4+	1-.4	1			
		Sept.1973			
1+	3.8	81	1+	3.5	78
2+	5.4	15	2+	5.0	19
3+	7.2	3	3+	6.2	3
4+	8.5	1			
		Aug. 1974			
1+	3.9	64			
2+	5.6	26			
3+	7.1	9			
4+	9.1	1			

Table 4. Annual instream survival rates of adfluvial cutthroat planted in Young Creek - Section three

Year class	Number planted by 1,000 feet of stream	Percent annual survival rate to 1/ 1971	1972	1973
1970	1,350	29	47(14)	13(2)
1971	1,350	--	33	30(10)
1972	1,350	--	--	42

1/ Percent of original number surviving to second and third year shown in parenthesis

The annual in-stream survival rates (Table 4) of the imprint plants were excellent from 1970 to 1973. The lack of competition from large resident fish has contributed to these high survival rates. In addition, some fish leave the stream at age 1+ and most at age 2+, thus, the actual survival of each year class is higher than indicated.

The species composition of the catch from 1970 to 1975 has ranged from 90 to 97 percent cutthroat with the remainder consisting of brook trout. This indicates that the repopulation of this area by brook trout has been quite slow.

Outmigrant Juveniles

The number of outmigrant smolts (1,341) captured in 1975 was comparable to the previous two years (Table 5). The estimated number of migrants was somewhat less than in 1974, due to the fewer number of days the trap was inoperative as a result of high flows in 1975. The number of smolts is still below the estimated number of 5000 to 10,000 smolts which the stream could produce if all of the spawning and rearing habitat was utilized.

The age composition of the smolts has varied from year to year (Table 6) with age 2+ fish comprising most of the fish in all three years. Age 3+ fish were second in abundance in 1974 and 1975 with age 1+ fish second in numbers in 1973. The growth of smolts (Table 7) in the stream has been comparable to that recorded by Huston (1969) for juvenile cutthroat from Hungry Horse Creek in the Flathead drainage. Basically, the fish from the imprint plants in Young Creek appear to be following the typical life cycle of adfluvial cutthroat from Hungry Horse Creek quite closely.

Migration and Angler Harvest

The angler harvest of fish tagged at Young Creek in 1973 and 1974 has been comparatively low (Table 8). Only 4.6 and 7.0 percent of the fish tagged in 1973 and 1974, respectively, have been returned by anglers. This is likely due to low fishing pressure caused by poor access and the reservoir large annual drawdown.

The tag return data indicates that Young Creek fish migrated considerable distances with a definite tendency towards downstream movement. Twenty (61 percent) of the fish were caught below Libby Dam with the furthest downstream movement from Young Creek being 76 miles. Nine fish (27 percent) were caught in the Canadian part. The longest recorded upstream movement from Young Creek was 30 miles.

Differences in fishing pressure and the influence of the drawdown in the different areas had an effect on the tag return data. The drawdown concentrated the fish and fishing pressure in the lower 20-30 miles for as long as five to six months a year. In addition, turbidities in the upper part during the spring run-off reduce fishing pressure until late July. Thus, it is not surprising that more fish have been caught in the U.S. than the Canadian part of the reservoir as the U.S. portion is least influenced by the drawdown and turbidities. The large number of fish caught below Libby Dam clearly indicate that the downstream loss of cutthroat has been a major factor in producing a lower than expected spawning run at Young Creek in 1975.

Table 5. Downstream trap operation schedule, migratory cutthroat captured and total estimation of outmigrants 1972 through 1975

Parameter	Year 1972	1973	1974	1975
Period trap operated	March 17-Nov. 13	April 6-Sept.28	April 1-Sept.30	April 16-July 31 1/
Number days trap inoperable due to high flows	16	7	44	19
Number of smolts	352	1,408	1,558	1,341
Peak Migration period	July and October	June and September	July	June 18-July 17
Estimated number of outmigrants	500-1,000	2,000-3,000	3,000+	2,000-3,000

1/ Data collection, for report ended on this date

Table 6. Percent age composition of outmigrant juveniles from Young Creek 1972-1974

Year	Age 1	2	3
1972	35	49	16
1973	14	48	38
1974	5	54	41

Table 7. Growth of outmigrant juveniles from Young Creek 1972-1974

Year Class	Age at Migration	Back calculated growth at age 1	2	3
1970	2	1.8	4.6	-
	3	2.1	3.8	6.1
1971	1	2.1	-	-
	2	2.0	4.4	-
	3	2.0	3.1	4.5
1972	1	2.3	-	-
	2	2.2	4.5	-
1973	1	2.0	-	-

Table 8. Angler harvest and migration of cutthroat trout tagged in Young Creek in 1973 and 1974

Year Tagged	No. tagged	No. caught by angler	No. caught at these distances from Young Creek in miles					
			0-5	6-9	10-19	20-30	30-47	47+(Libby Dam Site)
1973	237	11	1	1	-	1	2	6
1974	313	22	4	-	2	-	2	14

Evaluation of Fish Trapping Facilities

Modifications made on the upstream trap since 1970 have greatly improved trap efficiency. Approximately 97 percent of the estimated upstream spawning migration was captured in 1975. Periodic inspections and maintenance of trap leads and placing baffles in the velocity barrier helped produce the high efficiency in 1975.

The major problem with the downstream trap occurs during the spring when high flows carrying large amounts of organic debris preclude efficient trap operation. The use of one-half inch screen and a modified self-cleaning screen in the bypass channel has helped somewhat, but it is still not possible to operate the trap in flows of over 70 cfs with any degree of efficiency.

The trap efficiency was checked from June 18, 1975, to July 7, 1975, by releasing tagged and marked fish upstream. Eighty-six percent of the test fish in the first lot and 70 percent of the fish in the second lot were recaptured in the downstream trap. The flows during this period ranged from 30 to 20 cfs.

The percent of smolts caught in the downstream trap varies from year to year, depending primarily on the flow curve. In high water years, where the trap is inoperable on many days and when much water must be passed through the bypass channel, the overall trap efficiency is probably less than 50 percent. In low water years, the trap efficiency can be 60 to 70 percent.

RECOMMENDATIONS

Loss of cutthroat trout out of Lake Koocanusa which was caused by reservoir operation has resulted in considerable delay in reaching an adequate spawning run into Young Creek. Montana Department of Fish and Game has had to plant an unanticipated 137,000 cutthroat to maintain maximum instream populations. Montana has also planted about three million cutthroat directly into the reservoir since 1972. Lake Koocanusa and its tributaries have been planted with cutthroat at the expense of eliminating or reducing the plants into other State waters.

The Department has decided that planting of fish into Lake Koocanusa will cease until such a time as fish are available without affecting plantings in other State waters. Additional imprint plants of cutthroat into Lake Koocanusa tributary streams will be done only where spawning runs from the reservoir are insufficient to maintain the instream populations.

Specific recommendations for Young Creek include:

1. The upstream-downstream fish trap should be operated for at least four years to determine strength of the spawning run and emigration of juvenile fish.

2. The upstream trap should be operated at least every other year after the initial four years to determine strength of the spawning run. Strength of spawning runs is direct measure of the health of the population in the reservoir.

3. Fish passage through-out the drainage should be maintained. The U.S. Forest Service may take this responsibility on Forest land but the Department would have to perform this task on State and private lands.

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