MONTANA DEPARTMENT OF FISH AND GAME
FISHERIES DIVISION

JOB PROGRESS REPORT

State Montana

Project No. F-7-R-23 Title Northwest Montana Fisheries Study

Job No. I-b Title Fish Management Surveys

Period Covered April 1, 1973 through March 31, 1974

ABSTRACT

A fish ladder at the Bigfork dam on the Swan River above Flathead Lake was evaluated. An average of 15 game fish per year utilized the fish passage facility during a five-year period of operation monitored by Montana Department of Fish and Game.

A pilot creel census was conducted on the opening weekend of fishing season to determine catch success of Dolly Varden and cutthroat trout. Fishing pressure and fishing success were low because of turbid stream conditions.

Opening day creel census data were collected for Lake Mary Ronan. The average catch per hour decreased from 1.3 fish in 1972 to 0.7 fish in 1973. Kokanee comprised 86 percent of the opening day harvest.

Stream flow and water temperature data were collected for 19 tributary streams in the Swan River Drainage above Swan Lake. Stream flows peaked higher and continued higher through the late summer in 1972 as compared to 1973. Stream temperatures reached a maximum in July and August ranging in the low 50's to upper 60's.

Brook trout was the most abundant species collected in the Swan River tributaries and occupies the lower gradient sections of the tributary streams.

Cutthroat trout were generally distributed at higher elevations and comprised more than 50 percent of fish collected from six streams. Mature Dolly Varden were present in ten streams sampled. Rainbow trout and mountain whitefish were present in small numbers in four tributary streams. Non-game species were present in small numbers in five tributary streams.

BACKGROUND

Basic data other than fish population inventories are pertinent to the needs of fisheries management. This is a continuing project designed to accumulate and update information on various other aspects of fisheries management procedures.

PROCEDURES

Procedures are discussed along with findings for each segment of the project. Abbreviations for fish species in this report are as follows: DV-Dolly Varden; Rb-Rainbow trout; Ct-Cutthroat trout; Kok-Kokanee salmon; MWf-Mountain whitefish; CSu-Largescale sucker; Sq-Squawfish; Pm-Peamouth.

FINDINGS

Evaluation of Bigfork Fish Ladder

A diversion dam on the Swan River near Bigfork was constructed in 1907 to provide power generation for the Pacific Power and Light Company. Fish passage facilities were built into the project but did not become operative to migrating trout until 1959. A retaining wall to prevent excessive flows from inundating the fish-way and offset adjustable ladders were modifications made in 1959 and 1961 to facilitate fish movement through the ladder to the upstream impoundment. Since these improvements were added, several attempts were made to evaluate the fish-way for passing migrating game fish.

A fish trap was installed in the upper compartment of the fish ladder to collect fish which were successful in reaching the upper end of the ladder. The trap was operated during the spawning migration of cutthroat and rainbow trout from April until late May or early June. Periodic adjustments to the ladder height were made according to the rise and fall of the river. The trap was examined for fish at the same time. Game fish were captured, marked and released upstream.

The fish-way was operated for five seasons between 1959 and 1973. A summary of the fish collected in the trap and fish-way is shown in Table 1. It is evident that largescale suckers had little difficulty in finding the fish-way entrance and ascending the ladder into the fish trap. However, the ladder was utilized very little by migrating cutthroat and rainbow trout.

The Bigfork Dam fish ladder has not proved to be effective for the upstream migration of game fish. Five years of monitoring the fish-way, indicated an average of 15 game fish per year have utilized the fish passage facility. During the low water period in the fall, the main flow of the river is diverted for power generation during peak loading periods, allowing only an estimated flow of less than 10 cfs to flow over the dam. In recent years, maximum use of water diverted for power combined with low fall run-off in the Swan River have failed to attract significant spawning kokanee for snag fishing.

The operation of the Pacific Power and Light Corporation plant, in effect, has cut off approximately 16 miles of spawning access from Flathead Lake to the Swan River below Swan Lake and another 59 miles of river above Swan Lake plus numerous important tributaries. It is our belief that the removal of the Bigfork Dam could significantly increase the game fish production of Flathead Lake and the Swan River and its tributaries including Swan Lake. If and when the power plant becomes economically unfeasible to operate, it is recommended that the diversion dam be removed to allow upstream fish passage.

Table 1. Fish collected at the Bigfork dam fish trap and fish ladder on Swan River for the period of 1959 through 1973

Year	DV	Rb	Ct	Kok	MWf	CSu	Sq	Pm
1959	--	27	6	2	--	--	--	--
1965	2	9	1	8	--	107	--	--
1971	--	5	--	--	7	47	--	--
1972	--	2	--	--	3	82	2	8
1973	--	1	--	--	2	6	--	--
Totals	2	44	7	10	12	242	2	8

Flathead River Opening Weekend Census

A pilot creel census on the opening weekend of the general fishing season was conducted on the North Fork, Middle Fork and mainstem of the Flathead River above Flathead Lake. The primary objective was to locate fishing access areas to the river system where fisherman contact data could be obtained for a future creel census project.

Because of high run-off and turbid stream conditions, fishing pressure was extremely light and fishing success was low. Turbidity measurements taken at three locations on May 19, 1973, were 220 JTU on the mainstem of the Flathead River, 190 JTU at the mouth of the Middle Fork and 125 JTU at the mouth of the North Fork of the Flathead River. On May 19 and 20, a total of 77 anglers interviewed fished a total of 164 hours and caught 9 fish. The combined catch per hour of Dolly Varden and cutthroat was 0.11 fish per hour. Several undersized Dolly Varden caught and released were not included in the catch.

In 1975, a systematically randomized creel census covering the general fishing season will be conducted for the Middle Fork, North Fork and mainstem of the Flathead River above Flathead Lake. A creel census technician will be employed to obtain harvest and fishing effort data.

An expansion of these data, using data provided by statewide mail fisherman use survey proposed for 1975, will provide estimates of total fishing effort and harvest of Dolly Varden and cutthroat trout above Flathead Lake.

Lake Mary Ronan - Opening Day Creel Census

A partial creel census was conducted at Lake Mary Ronan on the opening day of the 1973 fishing season to compare harvest rates of previous years. A total of 119 anglers checked caught 402 fish at a rate of 3.4 fish per angler and 0.70 fish per hour. Fishing success was considerably higher in 1973 as compared to 1972. The increase in the number of fishermen as determined by boat counts may have been a result of the change from a Sunday to a Saturday opening date. Catch composition was 86 percent kokanee, 8 percent rainbow trout and 6 percent largemouth bass. Over the past four years, 1970 through 1973, kokanee comprised an average of 85 percent of the opening day harvest. This compares to 31 percent kokanee, 60 percent rainbow trout and 9 percent largemouth bass taken over the previous four-year period 1965-1969.

Angling success showed a substantial decrease in 1973 as compared to that of 1972. A comparison of creel census data for the years 1965 through 1973 is shown in Table 2.

Swan River Drainage Inventory

In 1973, major emphasis on the Swan River Drainage inventory was directed toward the collection of stream flow data and water temperatures. The summer of 1973 was one of the driest on record for northwestern Montana. Consequently, access roads into the study area were closed by the Forest Service

Table 2. Summary of opening day creel census data collected from Lake Mary Ronan, 1965 through 1973

Year	Fishermen contacted	No. fish caught	Species Composition Percent of catch			Average catch per angler	Average catch per hour
			Rb	Kok	LMB		
1965	68	78	59	33	8	1.3	0.30
1966	65	80	79	15	6	1.2	0.32
1967	98	118	56	37	7	1.2	0.25
1968	215	348	38	51	11	1.6	0.25
1969	62	58	68	16	9	0.9	0.18
1970	100	127	13	78	9	1.3	0.35
1971	52	76	4	96	0	1.5	0.57
1972	133	622	15	80	5	4.68	1.31
1973	119	402	8	86	6	3.38	0.70

from mid-August until mid-September because of fire danger. Fish population surveys of most tributary streams scheduled during this period were postponed until 1974.

The primary use of water in the Swan River drainage is for recreation. Water from a few streams is diverted for short distances and used for private fish ponds. Because little agricultural land is available in the upper end of the Swan Valley, water diversion of streams for irrigation is not a serious problem. In late summer, sections of several streams go dry and run underground. These include the upper end of Fatty Creek, South Fork of Rumble Creek and the lower section of Lost Creek.

Stream staff gauges installed in 19 tributary streams were used to monitor stream flows throughout the spring and summer season (Figure 1). In most cases staff gauges were installed near the mouths of streams. Discharge curves were plotted from flow measurements made with a Price 622 current meter at various flow stages. Maximum discharge readings during the peak run-off period were plotted by an extension of the discharge curve. Hydrographs were constructed for 16 tributary streams to compare stream flow regimes from April through September, 1972 and 1973. Typical seasonal stream flow patterns of a larger and small tributary stream are illustrated in Figure 2. Hydrographs of these streams are on file at Region One headquarters in Kalispell.

The seasonal flow pattern is one of high spring run-off followed by late summer flows. In general, stream discharge begins to increase gradually in late April and early May, coinciding with early spring snow melt. Discharge rates increase rapidly reaching peak flows by mid-May through mid-June. Thereafter, volume flows decline rapidly through mid-July, taper off slowly and reach a minimum by September or early October.

Stream flows throughout the 1972 season were considerably higher than in 1973 contrasting extremely high and low water years (Table 3). Peak flows of many streams were more than twice as high in 1972 than in 1973. Late summer flows continued higher in 1972 and were from 1 to 16 cfs higher than the 1972 low flow period in September. Peak flows for the major west side Mission mountain tributary streams were less extreme than those for the east side Swan Range tributaries, but retained higher late summer flows.

Stream Temperatures

Stream temperatures were recorded with maximum-minimum thermometers installed at water gauging stations. Temperatures were recorded for an eight-month period extending from April through November. In most instances, thermometers were read at weekly intervals through August and then periodically through November. Stream temperatures remained cool through the summer months with maximum temperatures in the upper 60's in the small streams, and mid 60's and upper 50's in the larger streams (Table 4). Minimum temperatures recorded through July and August ranged in the upper 40's and 50's. Shading by the heavy forest canopy and cool night time temperatures have kept mid-summer water temperatures low. Maximum-minimum temperature fluctuation between weekly temperature readings varied as much as 26° F. The maximum summer temperature recorded in 1973 was 69° F. for Rumble Creek while the lowest maximum summer temperature recorded was 54° F. for Jim Creek. It would appear that

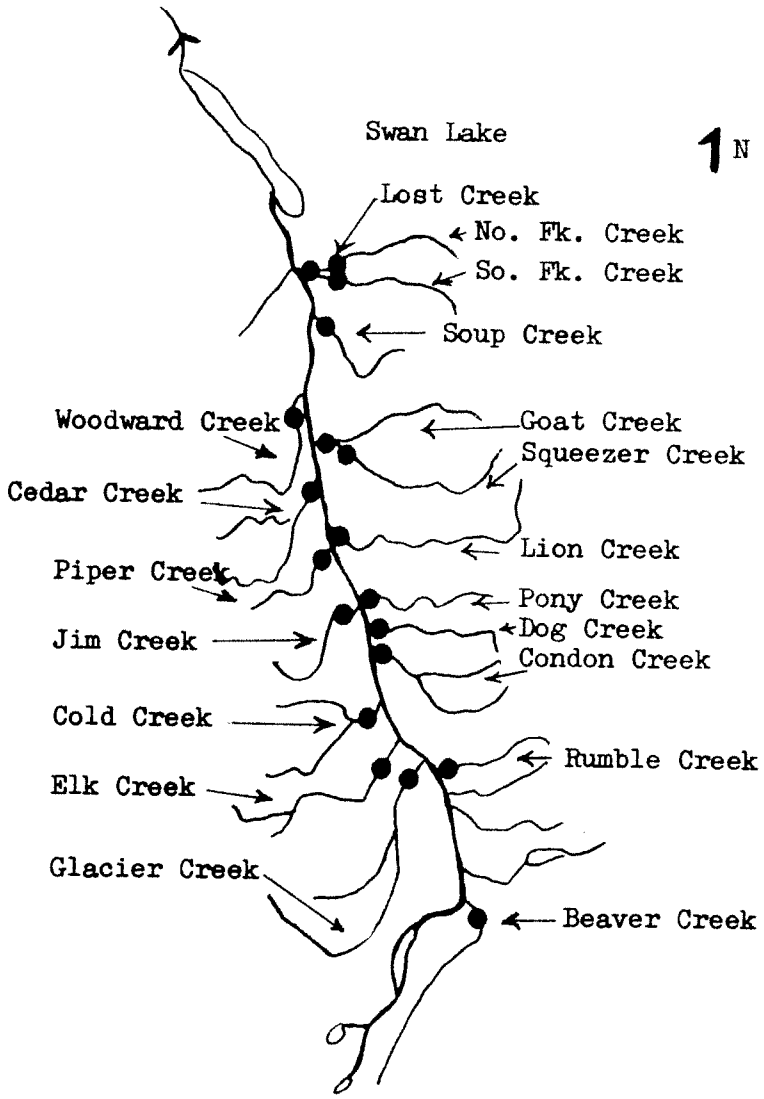

Figure 1. Location sites of stream staff gauges in Swan River tributary streams.

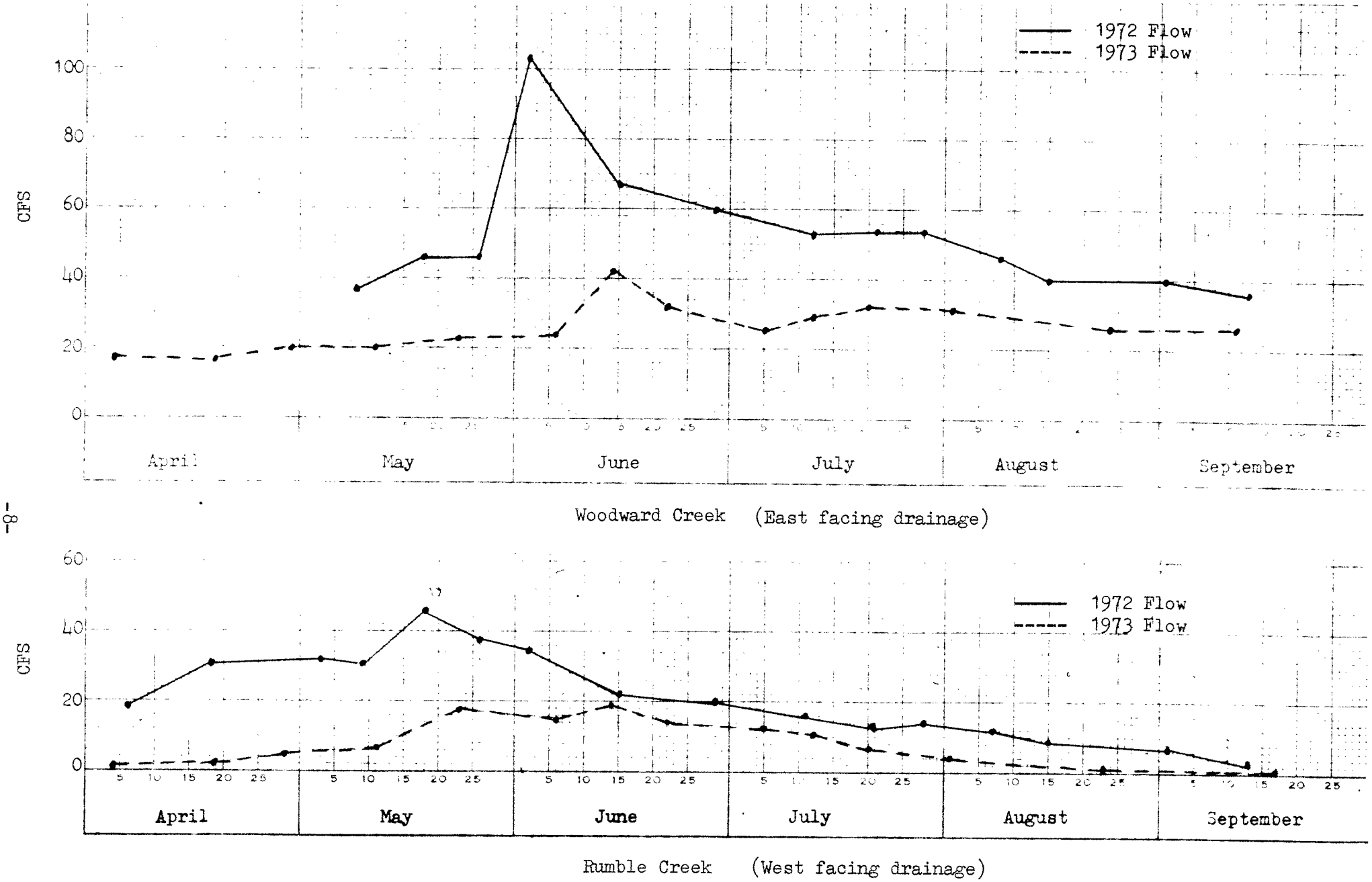

Figure 2. Seasonal discharge pattern for large (Woodward) and small (Rumble) Swan River tributary streams.

Table 3. Maximum-minimum stream flows (cfs) of major tributary streams in Swan River drainage, 1972-1973

Stream	1972 Minimum flow (Fall)	1972 Maximum flow (Spring)	1973 Minimum flow (Fall)	1973 Maximum flow (Spring)
East Side Tributaries				
Lost Creek	15	410	6	211
N. Fk. Lost Creek	10	NA	NA	NA
S. Fk. Lost Creek	14	NA	NA	NA
Soup Creek	12	89	4	42
Goat Creek	16	323	11	176
Squeezer Creek	8	206	5	97
Lion Creek	18	760	14.	290
Pony Creek	3	41	0.5	22
Dog Creek	11	120	2	60
Condon Creek	4	68	0.5	41
Rumble Creek	3	46	0.5	19
West Side Tributaries				
Woodward Creek	36	103	26	42
Cedar Creek	28	290	13	85
Piper Creek	7	128	6	105
Jim Creek	26	NA	38	NA
Cold Creek	34	205	15	149
Elk Creek	42	NA	26	214
Glacier Creek	38	NA	19	NA
Beaver Creek	9	NA	6	88

NA= Not Available
cfs= cubic feet per second

Table 4. Maximum high and maximum low temperatures (F°) for Swan River tributary streams, 1972 and 1973

Stream	1972		1973	
	Maximum high	Maximum low	Maximum high	Maximum low
East Side Tributaries				
Lost Creek	58	49	62	45
N. Fork Lost Creek	58	47	NA	NA
S. Fork Lost Creek	59	49	NA	NA
Soup Creek	63	54	60	52
Goat Creek	56	48	57	44
Squeezer Creek	57	45	55	43
Lion Creek	58	49	57	47
Pony Creek	69	58	71	52
Dog Creek	61	49	60	48
Condon Creek	68	60	NA	NA
Rumble Creek	63	47	69	51
West Side Tributaries				
Woodward Creek	55	44	58	43
Cedar Creek	63	49	63	49
Piper Creek	50	46	57	47
Jim Creek	54	45	NA	NA
Cold Creek	60	51	55	46
Elk Creek	56	48	60	43
Glacier Creek	65	57	67	58
Beaver Creek	65	55	68	54

NA= Not Available

maximum summer temperatures of the major Swan River tributary streams are within the range suitable for reproduction and survival of salmonids.

Water temperatures of the Swan River were monitored with a 30-day Taylor recording thermometer. The thermograph was installed at the Piper Creek bridge crossing approximately 24 miles above Swan Lake and has been operative since October 13, 1972. The maximum daily temperature in late July and early August of 1973 ranged between 57° and 67° F. while the daily minimum temperature ranged between 52° and 57° F. Although Swan River temperatures exceed those of the majority of tributary streams, temperatures lie within the range of trout habitat for species with colder water preferences.

The influence of extensive clear-cut logging areas along creek bottoms and beaver pond impoundments on increased water temperatures has not been evaluated. Further investigation on temperature increases related to these activities should be investigated.

Fish Populations

Electrofishing gear was used to sample fish populations of 23 streams during the late summer of 1971, 1972 and 1973, to determine fish species distribution in the tributary streams. Most sampling sections were 600 feet in length and located near the mouths of streams (Figure 3). Data collected included total length, weight and scale samples. The fish species composition of fish collected from Swan River tributary streams is shown in Figure 4.

Brook trout was the most abundant fish species and was found to occupy all but three of the streams sampled. This species comprised more than 50 percent of fish collected from 11 streams. Brook trout were associated primarily in streams with the following features: low gradient, large meanders, warmer water temperatures and bottom materials ranging in size from rubble to silt.

The first known records of brook trout in the Swan drainage were made in Cilly Creek and the North Fork and South Fork of Lost Creek prior to 1938. In the late 1940's and early 1950's, brook trout and rainbow trout were stocked in the major Swan River tributaries. The brook trout readily adapted to the low gradient reaches of these streams and foothill meadow areas.

Cutthroat trout were found to be abundant in 15 of the 23 streams sampled and comprised more than 50 percent of fish collected from 6 streams. Cutthroat trout were generally distributed at higher elevations in the drainage with a habitat preference distinctly different than that of brook trout and seeming to prefer cold, high gradient, stable streams with a rubble-boulder type bottom.

Natural stream barriers are a deterrent to the upstream distribution of brook trout in some streams. However, where natural barriers to upstream movement of brook trout do not exist, fish habitat preference previously described seem to regulate the position occupied by brook and cutthroat trout. The sections sampled on the North Fork and South Fork of Lost Creek are high-gradient streams prior to their confluence with Lost Creek. Brook trout made

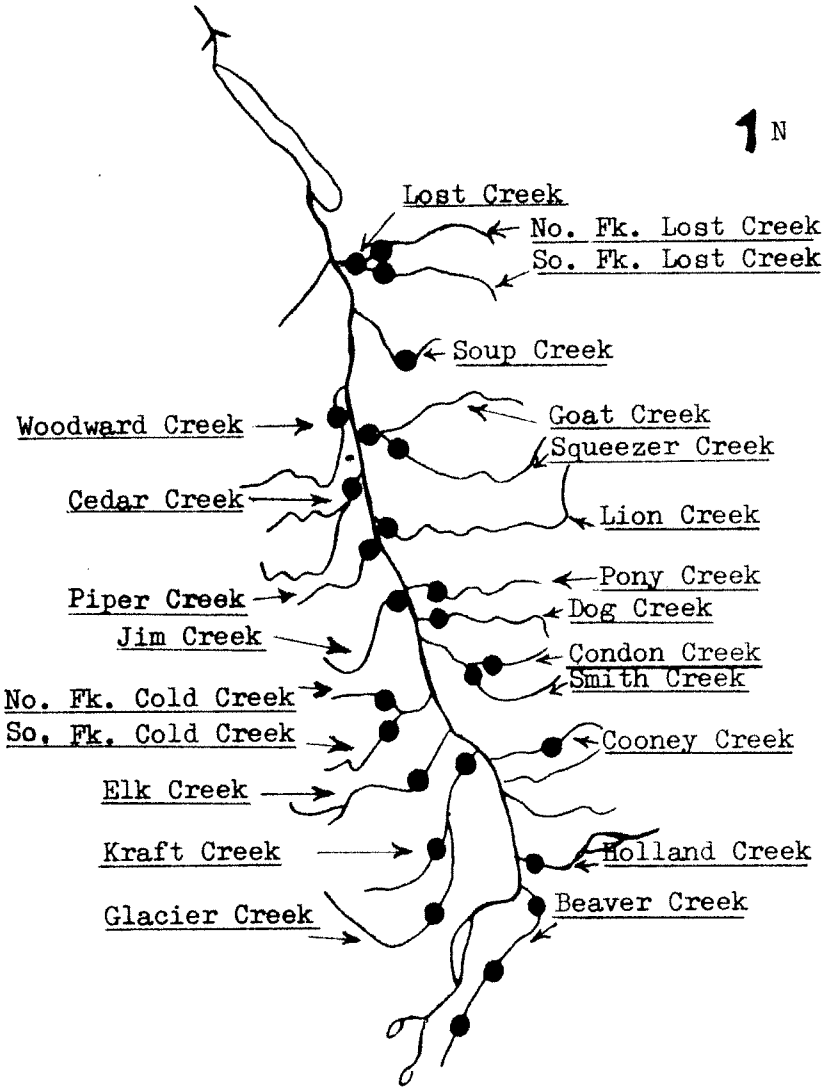

Figure 3. Location of fish population sampling sites.

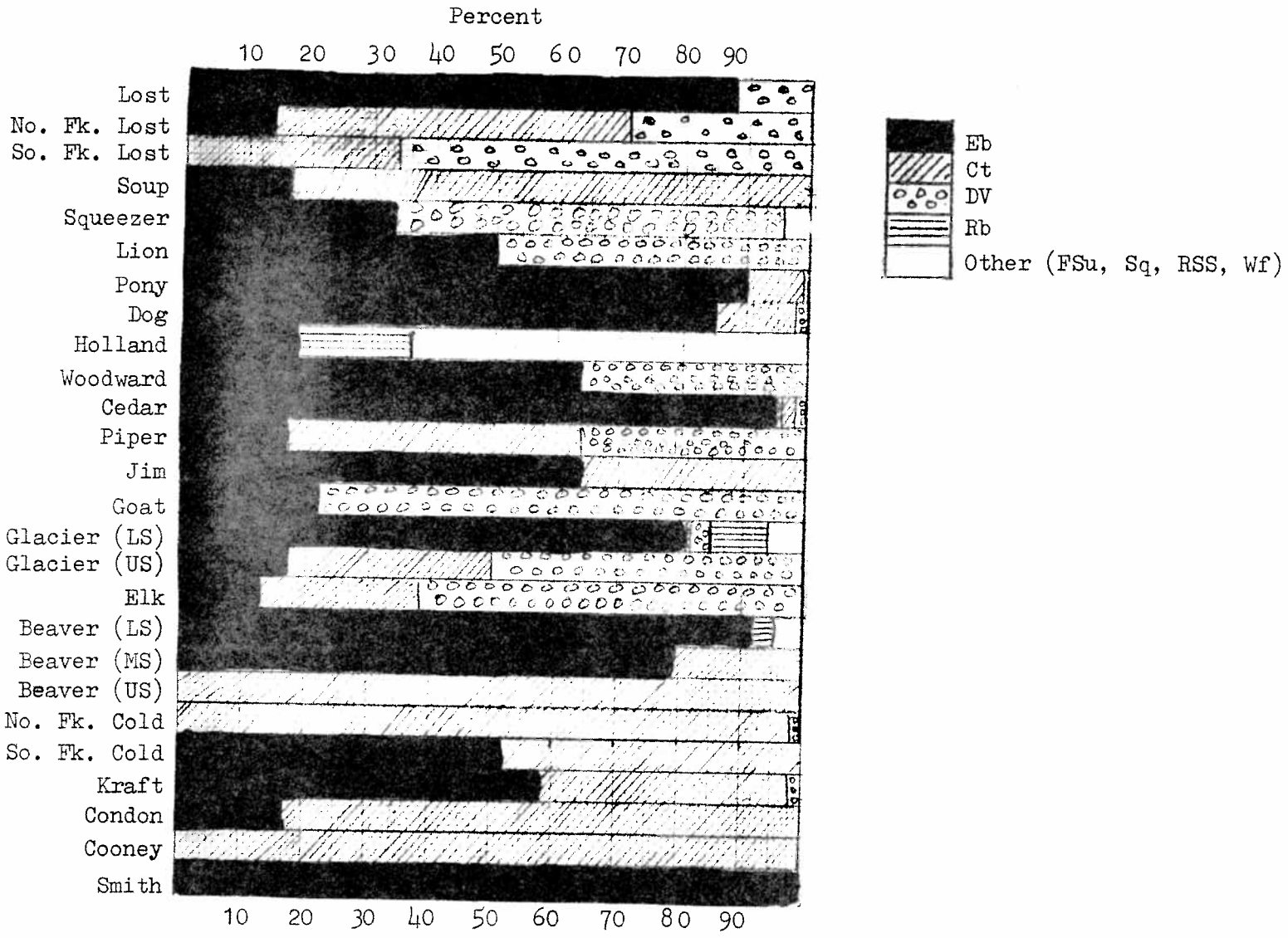

Figure 4. Species composition of Swan River tributary fish populations

up only 12 percent of the population sampled on the North Fork and were completely absent from the South Fork sample. Further studies on the relation of fish distribution to stream gradient, stream stability and stream temperature will be conducted for other streams in 1974.

Dolly Varden were found to be present in 15 streams sampled and comprised more than 50 percent of the fish collected in six streams. Mature spawning individuals were found in ten of the streams sampled. Dolly Varden were distributed in both the high and low gradient areas of the stream. Mature individuals were found in high gradient areas at elevations up to 3,900 feet in the North Fork of Lost Creek.

Rainbow trout were present in four tributary streams sampled and comprised only a small segment of the population. These streams include Holland, Beaver, Glacier and Cedar Creeks. In spite of widespread introductions of rainbow trout in the drainage, this species has not become well established in the Swan River tributary streams.

Mountain whitefish were collected from only one tributary stream, Squeezer Creek, making up 4 percent of the sample. This species probably becomes more abundant during the late fall spawning migration.

Non-game fish populations in tributary streams are rare. In only one stream, Holland Creek, non-game species (FSu, Sq and RSS) comprised the majority of fish collected. Four other streams inhabited by non-game species comprise 6 percent or less of the species composition.

Further sampling of fish populations will be conducted in 1974 in the upper tributary streams. An attempt will be made to estimate fish populations and standing crop of various fish species in the mainstem of the Swan River.

RECOMMENDATIONS

It is recommended that the project be continued to obtain information needed for evaluation of the success of various management procedures not covered by routine inventory-type surveys.

Prepared by: Robert Domrose

Date: September 18, 1974

Waters referred to:

7-4560-01 Swan River, Section 1	7-4020-01 Soup Creek
7-4580-01 Swan River, Section 2	7-4340-01 Squeezer Creek
7-1560-01 Flathead River Section 2	7-2420-01 Lion Creek
8-5100-01 N. Fk. Flathead River	7-3500-01 Pony Creek
8-4740-01 M. Fk. Flathead River	7-1200-01 Dog Creek
7-7700-03 Lake Mary Ronan	7-2120-01 Holland Creek
7-2540-01 Lost Creek	7-5100-01 Woodward Creek
7-3200-01 N. Fk. Lost Creek	7-0740-01 Cedar Creek
7-4200-01 S. Fk. Lost Creek	7-3440-01 Piper Creek

7-2240-01 Jim Creek
7-1720-01 Goat Creek
7-1700-01 Glacier Creek
7-1340-01 Elk Creek
7-0240-01 Beaver Creek
7-3160-10 N. Fk. Cold Creek
7-4080-10 S. Fk. Cold Creek
7-2340-10 Kraft Creek
7-0880-01 Condon Creek
7-0900-01 Cooney Creek
7-4000-01 Smith Creek