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**Catalogue of Selected Fraser and
Thompson River Tributaries
Important to Chinook and Coho Salmon
and a Preliminary Assessment
of their Enhancement Potential**

F.C. Berry and A.L. Kahl

Manuscript Report of
Fraser River, Northern B.C. and Yukon Division
Department of Fisheries and Oceans
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Vancouver, B.C. V6E 2P1

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Manuscript Report of Fraser River
Northern B.C. and Yukon Division

March 1982

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CATALOGUE OF SELECTED FRASER AND THOMPSON
RIVER TRIBUTARIES IMPORTANT TO CHINOOK
AND COHO SALMON AND A PRELIMINARY
ASSESSMENT OF THEIR ENHANCEMENT POTENTIAL

by

F.C. Berry and A.L. Kahl

prepared for

Fisheries and Oceans
Field Service Branch
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Vancouver, B.C.

FRASER RIVER
COLUMBIA RIVER
THOMPSON RIVER
YUKON RIVER

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ABSTRACT

Berry, F.C. and A.L. Kahl. 1982. Catalogue of Selected Fraser and Thompson River Tributaries Important to Chinook and Coho Salmon and a Preliminary Assessment of Their Enhancement Potential. Ms Rep. of Fraser River, Northern B.C. and Yukon Division 227 pp.

Field surveys of 68 Fraser and Thompson river tributaries and tributary systems were conducted by Fisheries and Oceans Canada personnel in late summer and fall of 1975, 1976, and 1978.

Information collected include the physical stream characteristics of depth, width, velocity, substrate, temperature, pH and dissolved O_2 . Salmon spawning and rearing habitat was described and the presence of barriers to upstream salmon migration noted. Chinook and coho adults were sampled at 44 of the 68 catalogued tributary systems for age, sex and length. Some juvenile sampling was also conducted. Also noted during the surveys were road access, availability of hydro power and the presence of human activity in the watershed.

The survey information was used to assess enhancement potentials for chinook and coho salmon. The information along with other published information was then summarized into a stream catalogue and includes historical flows, escapement records, spawning timings, physical and chemical characteristics and juvenile and adult biological sampling data.

Key words: Fraser River, Thompson River, salmon enhancement, chinook salmon, coho salmon.

RESUME

Berry, F.C. and A.L. Kahl. 1982. Catalogue of Selected Fraser and Thompson River Tributaries Important to Chinook and Coho Salmon and a Preliminary Assessment of Their Enhancement Potential. Ms Rep. of Fraser River, Northern B.C. and Yukon Division 227 pp.

Des études de 68 tributaires du Fraser et de la rivière Thompson et de leur bassin ont été menées sur place par le personnel du ministère des Pêches et des Océans à la fin de l'été et à l'automne de 1975, 1976, 1977 et 1978.

Les données recueillies portent sur les caractéristiques physiques du cours d'eau: profondeur, vitesse, substrat, température, pH et oxygène dissous. Les frayères et l'habitat du saumon sont décrits et on note la présence d'obstacles à la remonte du saumon. On a prélevé des échantillons de quinnats et de cohos adultes dans 44 des 68 bassins tributaires répertoriés pour en étudier l'âge, le sexe et la longueur. On a procédé également à un certain échantillonnage de juvéniles. Au cours des études, on a également relevé l'accès par la route, les centrales hydroélectriques et la présence d'activités humaines dans le bassin versant.

Les données recueillies ont été utilisées pour évaluer les possibilités de mise en valeur des saumons quinnats et cohos. Ces données ainsi que d'autres renseignements publiés ont ensuite été regroupés dans un répertoire des cours d'eau qui comprend les débits chronologiques, les relevés de remonte, les moments de la fraie, les caractéristiques physiques et chimiques et les données biologiques sur les échantillons de juvéniles et d'adultes.

Mots clés: Fraser, rivière Thompson, mise en valeur du saumon, saumon quinnats, saumon coho.

CATALOGUE OF SELECTED FRASER AND THOMPSON RIVER TRIBUTARIES
 IMPORTANT TO CHINOOK AND COHO SALMON
 AND A PRELIMINARY ASSESSMENT OF THEIR ENHANCEMENT POTENTIAL

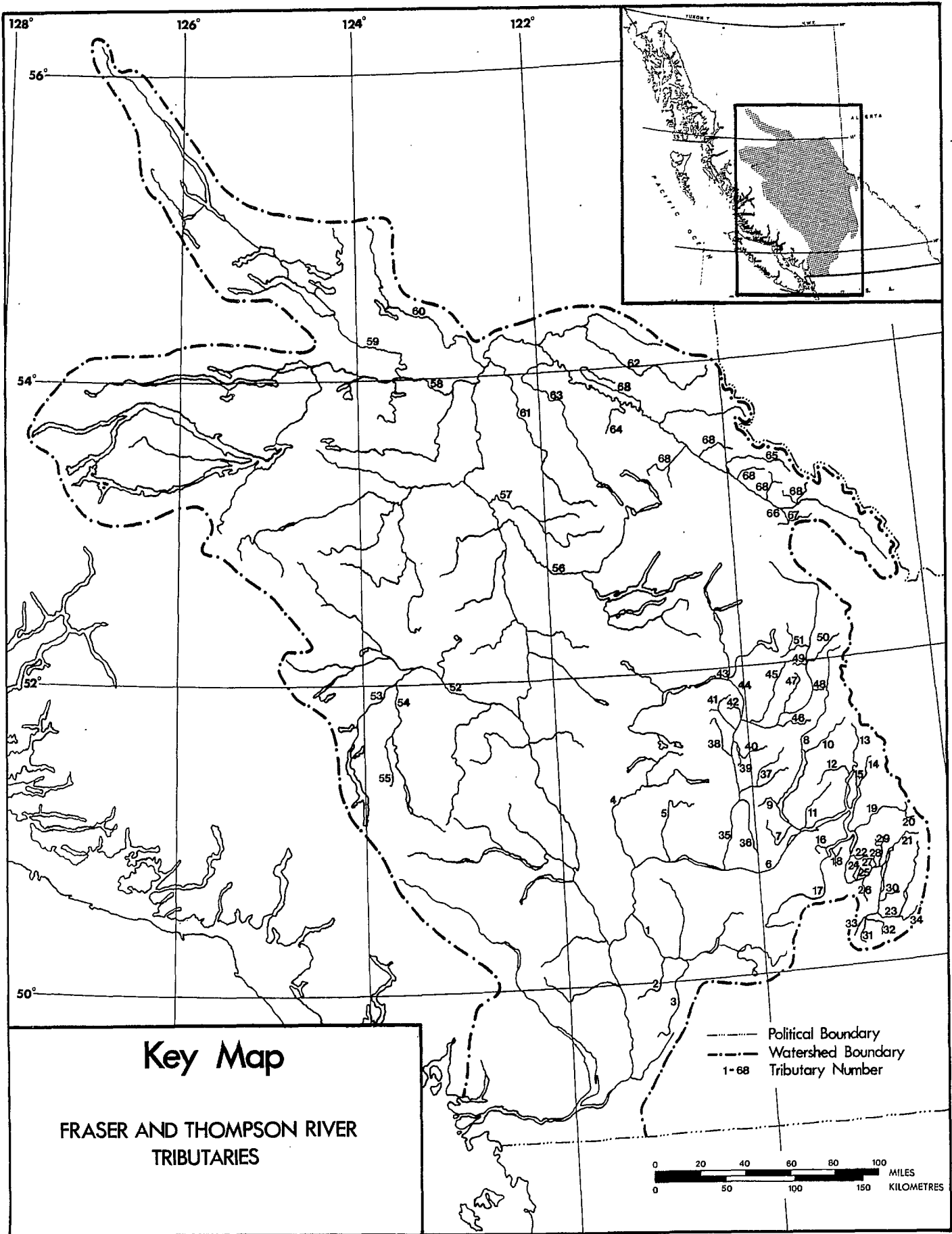
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CATALOGUE OF SELECTED FRASER AND THOMPSON RIVER TRIBUTARIES
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 AND A PRELIMINARY ASSESSMENT OF THEIR ENHANCEMENT POTENTIAL

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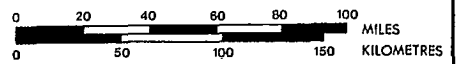
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Key Map

FRASER AND THOMPSON RIVER
TRIBUTARIES

- Political Boundary
- - - - - Watershed Boundary
- 1-68 Tributary Number



KEY MAP

1. Nicola River
2. Spius Creek
3. Coldwater River
4. Bonaparte River
5. Deadman River
6. South Thompson River
7. Hiuihill Creek
8. Adams River
9. Sinmax Creek
10. Momich River
11. Scotch Creek
12. Celista Creek
13. Seymour River
14. Anstey River
15. Hunakwa Creek
16. Tappen Creek
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61. Willow River
62. McGregor River
63. Bowron River
64. Slim Creek
65. Holmes River
66. Fraser River Mainstem at Tete Jaune Cache
67. McLennan River/Swift Creek
68. Upper Fraser River Tributaries
(Goat/Milk, Torpy, Horsey, Nevin, Swift Current, Robson)

Between 1975 and 1978 reconnaissance was carried out on a number of Fraser and Thompson river tributaries. The objectives were to collect preliminary biological and physical data and to identify potential chinook and coho enhancement opportunities. Areas investigated included all the major tributaries within the Thompson river watershed and the Fraser River area upstream of Prince George and the Chilcotin, Quesnel, Cottonwood and Nechako river systems.

The reconnaissance was carried out primarily during the late summer-early fall period and concentrated on adult chinook and to a lesser degree coho populations. Physical stream characteristics in selected areas utilized by salmon were recorded and when possible adults and juveniles were enumerated and sampled for age, size and sex.

This report summarizes the physical and biological data collected during the four study years as well as historical flow and escapement data. The report is organized into a general summary followed by 68 individual stream catalogues.

2.0 STUDY AREA

2.1 Geography

The study area is located in south central British Columbia and includes the drainage from the Monashee, Columbia, Rocky and Coast Mountains and Interior Plateau.

The Interior Plateau is one of the province's major physiographic regions. It is bounded on the east by the Monashee and Columbia mountains and on the west by the Coast Mountains. The Interior Plateau has an approximate length of 890 km and width of 380 km (Farley, 1979). The region is composed of basins plateaus and highlands. The most characteristic feature of the upland plateaus and highlands are their flat and gentle sloped surfaces. Major tributaries in this region, the headwaters of which are in the surrounding mountains, include the Chilcotin, Nechako, Quesnel, Bouron, McGregor and Thompson rivers.

The Columbia Mountains, in the southeast sector of the province, constitute a highly mountainous region 250 km wide and 610 km long (Farley, 1979). These mountains lie west of the Rocky Mountain Trench and are bordered on the east by highlands of the Interior Plateau. Included in this region are the easterly flowing tributaries of the Upper Fraser River, the McLennan and Goat rivers and Slim Creek and the headwaters of the westerly flowing North Thompson and Shuswap system tributaries.

The Rocky Mountain Trench lies between the Columbia and Rocky mountains with the upper Fraser River within. Streams flowing southwest into the upper Fraser River from the Rocky Mountains include the Robson, Torpy, Horsey, and Holmes rivers and Swift Current Creek.

The Coast Mountains forming the western boundary of the Interior Plateau contain the headwaters of the Chilcotin and Nechako rivers.

2.2 Climate

The Fraser River watershed exhibits a climate strongly influenced by topographic patterns. The annual precipitation varies from less than 50 cm in most of the Interior Plateau to over 250 cm in some of the mountainous regions.

The Interior Plateau and associated valleys represent a relatively dry area, with mean annual precipitation between 20 and 75 cm. The region between Kamloops and Ashcroft in the Thompson river drainage and the Fraser river and Chilcotin river areas between Williams Lake and Alexis Creek averages less than 20 cm precipitation per year and is one of the driest areas in Canada.

Mean annual precipitation in the Rocky and Columbia Mountains varies from 100 to 250 cm and the Rocky Mountain Trench receives mean annual precipitation from 50 to 100 cm (Farley, 1979).

Temperature variability is also affected by topography. In the Thompson River Watershed mean daily seasonal extremes in temperature range from -5° to -10°C in January to 18 to 22°C in July. The central and upper Fraser River areas range from -10 to -15°C in January to 14° to 18°C in July (Farley, 1979).

2.3 Socio Economic

Resource based industries as well as agriculture and tourism are most important economically within the study area. Mining of industrial metals, in particular copper and molybdenum, plays an important economic role in the region, in particular on the upland area south of Kamloops, the provincial centre of copper production. The drainage basin also sustains a growing forestry industry and supports many sawmills, pulp and paper mills and plywood plants, particularly in the Prince George and Quesnel areas.

An almost contiguous area of agricultural land reserve stretches along the banks of both the Fraser (north of Lillooet) and Thompson rivers. Livestock ranching, in particular beef cattle, comprises over 50% of total agricultural activity while field crops (fruits and vegetables) comprise less than 25%.

Tourism has a significant impact on the study area especially within the southern Cariboo area because of its relative access to the more heavily populated southern regions of the province. Attractive scenery and numerous provincial and commercial campgrounds, ski facilities and boat launching sites provide for a significant tourist industry.

3.0 SALMON RESOURCE

The Fraser River system provides spawning and rearing habitat for chinook, coho, sockeye, pink and chum salmon as well as for anadromous trout. Escapements for the various streams falling within the study area are summarized in Appendix 9.2.

The Thompson River drainage including the North and South Thompson drainages has several important salmon producing streams. The major sockeye-producing streams are the Adams, Eagle, Seymour, Shuswap and South Thompson rivers and Scotch Creek. All of these systems are associated with Shuswap Lake. Chinook salmon are usually associated with the larger drainages including the North Thompson, Clearwater, Shuswap, mainstem South Thompson and Nicola rivers. Coho usually utilize the smaller systems. The main coho producers are Lion and Louis creeks on the North Thompson and the Eagle and Salmon rivers in the Shuswap area. The Thompson River downstream of Kamloops Lake supports the majority of the pink spawning in this area. Pinks spawn at the mouth of smaller tributaries and in the Thompson mainstem. Although escapement estimates for steelhead trout are not as well known, major runs are known to occur in tributaries to the Thompson River downstream of Kamloops Lake.

In the central and upper Fraser drainage the major sockeye producers are the Chilko, Horsefly, and Bowron rivers and tributaries to lakes of the Upper Stuart and Nechako systems. The major chinook producers are the Quesnel, Chilko, Chilcotin, Bowron, McGregor, and Nechako rivers, the Fraser River mainstem at Tete Jaune Cache and Slim Creek. Coho at present have only been reported in the Horsefly system. Pink salmon in this region are restricted mainly to the Quesnel River with some utilization of the Chilcotin River. Steelhead have been described primarily from the Chilcotin system.

4.0 METHODS

4.1 Field Reconnaissance

In the early fall of 1975, field studies in the Fraser River watershed (Key Map) were initiated with the objective of identifying potential chinook and coho enhancement opportunities. The reconnaissance was restricted mainly to an investigation of adult chinook populations and major physical stream characteristics. Study areas included the Upper Fraser River and its tributaries as well as the Chilko, Taseko, South Thompson, and Lower and Middle Shuswap Rivers.

In the late summer and fall of 1976, field studies involved collecting additional information on streams surveyed in 1975 as well as investigating several additional systems. Sampling of juvenile and adult salmonids for size and age determination was included and some systems were examined to ascertain the feasibility of a juvenile chinook coded wire tagging program. The study areas included the McGregor, Torpy, Fraser (Tete Jaune Cache), Bowron, Willow, Stuart, Nechako, Quesnel, Chilko, North and South

Thompson, Clearwater, Lower and Middle Shuswap, Adams and Salmon rivers.

The 1977 field program, which included collecting additional information on systems previously surveyed was concentrated primarily on the central Fraser and Thompson river systems. The objectives again included identifying potential chinook enhancement opportunities, ascertaining the feasibility of juvenile chinook coded wire tagging programs, estimating adult chinook escapements, and adult and juvenile sampling for size and age determination. Study areas included the Quesnel River system, Cottonwood River, Fraser River (Tete Jaune Cache) and Swift Creek, Nechako River, Stuart River and several tributaries, North and South Thompson rivers, Lemieux Creek, Louis Creek, Seymour and Adams rivers and Lower and Middle Shuswap rivers.

The 1978 reconnaissance was conducted between late August and mid-December. During the survey, a total of 47 streams were surveyed: 17 in the North Thompson system and 30 in the South Thompson system. The objectives of the program were to collect baseline biological and physical data, identify potential chinook and coho enhancement opportunities, collect biological data on chinook and coho stocks and ascertain the feasibility of juvenile chinook and coho coded wire tagging programs.

Surveys were conducted by air, boat and ground reconnaissance. Physical characteristics were determined by measuring and estimating depths and wetted widths, measuring gradients with a clinometer and velocities by timing a floating object. Chemical parameters (dissolved oxygen, pH) were measured using HACH kits. Other characteristics measured and recorded included presence of spawning and rearing areas and side channels, substrate composition, bank stability and vegetation, obstacles to salmon migration, water temperature and adverse human influences.

4.2 Data Sources

The major sources of data include: Historical Stream Flow Summary, 1976; and catalogues of salmon streams and spawning escapement for various subdistricts within the study area (see Bibliography). Other sources used in the preparation of the catalogue are cited in the Bibliography.

The synthesis of field and other data within this report has been done for purposes of clarity and methods are largely self evident. Mean pink escapements are odd year means. Chinook and coho mean escapements are means of the years observed. Chinook and coho escapement are summarized from Fisheries Officer's spawning ground and Annual Narrative Reports and field staff observations.

4.3 Enhancement Potential

Each stream in the catalogue contains a section on potential enhancement opportunities. These potentials were based on evaluations made by field crews and on the following criteria: ease of road access,

availability of hydro power, availability of chinook and coho donor stock, potential habitat located above barriers and whether the available habitat is well utilized (both rearing and spawning), flow stability, prone to scouring or ice buildup, stream size and potential for groundwater or gravity feed systems.

Once these criterial were assessed, the streams were categorized in terms of enhancement potential and several options were recommended. These options included small and moderate-sized incubation/rearing facilities, spawning or rearing channels, egg or fry transplants, streambank stabilization including revegetation, fencing to limit livestock access and pen rearing or natural rearing in lakes. Recommendations for further study were also identified.

5.0 RESULTS AND DISCUSSION

5.1 Historical Flow

Historical flow data for each stream are summarized in the stream catalogues. Data include monthly and yearly mean discharges and extremes recorded for the period of record, both cubic meters and cubic feet per second discharges are provided. Where the scope of the data is limited, the limitations are identified. Hydrometric station numbers and their location, as well as the time frame of data collection, are provided.

5.2 Escapement and Timing

Salmon escapements for 1975 to 1978 inclusive are summarized in the stream catalogues. Means are presented for 1951 to 1960, 1961 to 1970 and 1971 to 1978. The escapement data is also summarized in Appendix 9.2.

Spawning timing information is provided for chinook, coho, pink and sockeye in each catalogue section. The approximate times of arrival, start of spawning, peak spawning, and end of spawning are presented for each species.

5.3 Physical and Chemical Characteristics

The physical and chemical characteristics recorded during ground surveys are presented in the stream catalogues and are summarized in Appendix 9.1.

The quality of these data are limited in some instances, by having to estimate some parameters and by using imprecise field analytical equipment. Data of a higher quality will be required in most instances to gain an accurate understanding of the physical and chemical nature of the streams and to assess the feasibility of various enhancement approaches.

5.4 Biological Sampling

Adult and juvenile sampling was conducted on 44 of the 68 stream systems catalogued. The sampling data are provided for each system sampled and are summarized in Appendices 9.3. For samples of four or more fish in a

category, 95% confidence intervals of length were calculated.

It was found that for chinook and coho, the predominant returning age classes were 4₁ and 3₂ respectively. Some stream specific age variations occurred. In addition, juvenile samples obtained were also aged and the length-age relationships are presented in the catalogues.

6.0 ACKNOWLEDGEMENTS

Field studies on the Fraser and Thompson river tributaries were initiated by F.J. Fraser. D. Buxton, B. Mitchell, P. Starr, P.E.I. Fee, C. White and B. Bonnell carried out the majority of the fieldwork. Many other individuals too numerous to mention also contributed to the collection of field data; their contribution is gratefully acknowledged.

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8.0 STREAM CATALOGUE

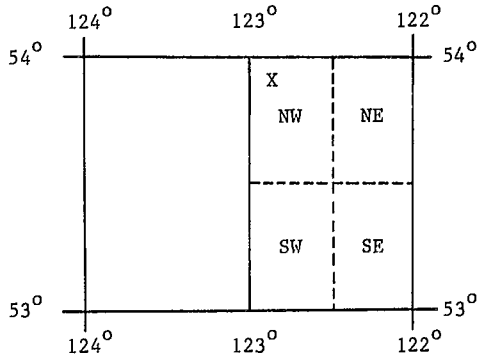
Name of Stream

Name as given in Gazetteer of Canada, British Columbia, 1966 edition.

Location and Position

Defined by quadrant indexing. Each geographical quadrilateral of the earth's surface of 1 degree in extent in latitude and longitude is divided into the SE, SW, NE and NW quarters. The southeast corner of each quadrilateral gives the initial point for the figure of reference (Gazetteer of Canada).

Example "X"
53° 122° NW



Timing

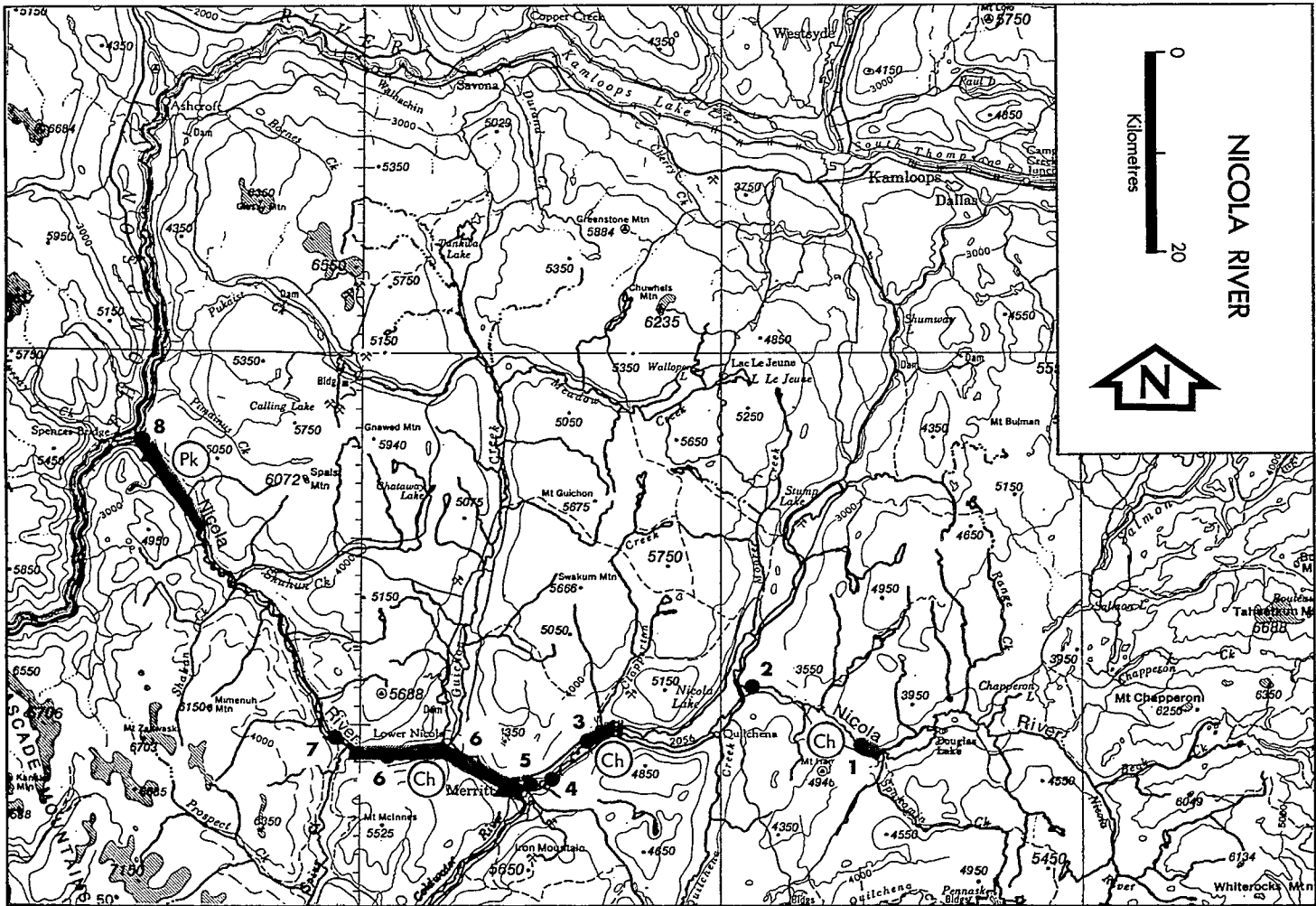
Dates which salmon arrive in the stream, begin to spawn, reach peak spawning period and finish spawning.

E = early (1st to 10th of the month)
M = mid (11th to 20th of the month)
L = late (21st to end of the month)

Map Key		Species	
Dam	#	Chinook	Ch
Falls	■	Coho	Co
Flow Station	▼	Sockeye	So
Physical Sample Site	●	Pink	Pk
Salmonid Spawning Distribution	▨		

Escapement

UNK - Evidence of fish but no estimates made.



1. NICOLA RIVER .50° 120° SE

- 7 -

LOCATION

Flows west and northwest into the Thompson River just northeast of Spences Bridge (Kamloops District).

DESCRIPTION

Nicola River was surveyed for chinook in September and October, 1976. The Nicola River system, which has three major lakes (Douglas Lake, Stump Lake, Nicola Lake), has a total length of approximately 193 km. The major tributaries are the Coldwater, with its confluence at Merritt, and the Spius which joins the Nicola at Canford. The headwater section, approximately 61.5 km above Douglas Lake, was not surveyed.

The river from Douglas Lake to Nicola Lake (21.8 km) has 2 major reaches. The upper 16.0 km is a deeply confined gully with a steep gradient, few pools and coarse bed material. Spawning and rearing habitat is limited, although adult chinook and kokanee have been sighted. In the lower 5.8 km, the river is of a moderate gradient with a cobble/pebble substrate. Chinook spawning/rearing potential is good. This section is known to be the major spawning grounds for Nicola Lake kokanee.

From a small passable retaining dam at the Nicola Lake outlet to 2.9 km downstream, the gradient is moderately steep, the substrate is predominantly cobble and there are abundant bars and side channels. Although rearing potential is limited due to lack of pools and slow water, it is an important chinook spawning ground as 146 spawners were observed in September, 1976.

From the above chinook bed to the Coldwater confluence (12.6 km), the river becomes slow moving and meandering. This section is a deposition area as evidenced by a high silt bedload and clay banks. Spawning potential is limited, except in the lower 2 to 3 km where the silt load gradually lessens. Although rearing potential is high, it appears underutilized as juvenile sampling resulted in no catch.

The main chinook spawning area lies between the Coldwater and Spius confluences (21.3 km). The Nicola in this area is wide and shallow with a cobble/pebble substrate. Chinook spawning/rearing potential is excellent. The wide valley bottom in this area supports heavy agricultural use as streambanks and vegetation are frequently altered and irrigation diversions are common.

From its confluence with Spius Creek to the Thompson River (26.1 km), the stream is characterized by a steep gradient, fast water, few pools, cobble/boulder substrate and a narrow valley bottom. Although this section has less importance for chinook or coho spawning, it is the area preferred by spawning pink salmon.

ENHANCEMENT

In the main spawning bed between Coldwater and Spius Creeks are numerous gravity feed irrigation ditches, highly utilized by juveniles. At the end of irrigation season, these ditches are closed resulting in juvenile salmonids being stranded. Enhancement options that can be used to mitigate these closures include: a requirement that ditches are properly screened to prevent juvenile entry or to reduce flows slowly, hence enabling juveniles to emigrate.

HISTORICAL FLOW. cms (cfs).

1. Mean Monthly Discharge (1911 - 1915; 1958 - 1976): Station No. 08L G007
(Nicola River near Merritt)

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
4.5 (159)	5.7 (202)	5.9 (209)	13.3 (467)	48.0 (1,690)	57.4 (2,020)	19.8 (697)	5.9 (209)	3.9 (136)	4.6 (162)	5.4 (189)	4.8 (169)

2. Mean Monthly Discharge (1911 - 1920; 1958 - 1976): Station No. 08L G006
(Nicola River near Spences Bridge)

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
8.9 (314)	11.4 (403)	12.8 (451)	27.9 (982)	100.8 (3,550)	106.8 (3,760)	35.8 (1,260)	10.2 (358)	7.0 (247)	8.4 (295)	11.0 (387)	9.1 (319)

- Mean Yearly Discharge
 - 1. 15.2 cms (535.0 cfs)
 - 2. 30.7 cms (1,080.0 cfs)
- Maximum Daily Discharge
 - 1. 160.8 cms (5,680.0cfs)
 - 2. 337.0 cms (11,900.0cfs)
- Minimum Daily Discharge
 - 1. 0.1 cms (5.0cfs)
 - 2. 2.0 cms (70.0cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	4,500	3,500	2,700	3,100	6,567	2,950	2,775
Coho	250	400	400	350	1,230 ¹	1,108	394
Pink	4,000	-	300	-	2,140	820	1,300

¹Excludes 1951, 1953, 1954, 1956, 1959.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	July	Late July	Late August	End September
Coho	September	Late September	Middle October	Middle November
Pink	September	Middle September	Late September	Middle October

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u> <u>Water</u> <u>Air</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
17/09/76	<u>Site No. 1</u> Deep gulley below Douglas Lake	13.0	0.4 - 0.5	0.56	1.0	15	20	-	-
17/09/76	<u>Site No. 2</u> Just above Nicola Lake	10.0 - 13.0	0.4 - 0.5	0.64	0.3	15	20	-	-
23/09/76	<u>Site No. 3</u> Just below Nicola Lake	11.0 - 13.0	0.5 - 0.6	1.90	0.7	16	18	-	-
23/09/76	<u>Site No. 4</u> Deposition area below Nicola Lake	12.0 - 15.0	0.6	1.50	0.2	18	21	-	-
05/10/76	<u>Site No. 5</u> Just above Coldwater Confluence	15.0	0.45	-	0.2	14	12	-	-
24/09/76	<u>Site No. 6</u> Coldwater to Spius	19.0 - 21.0	0.45	-	0.3	13	14	-	-
12/10/76	<u>Site No. 7</u> Just below Spius Confluence	15.0 - 18.0	0.50	-	0.5	11	16	-	-

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
12/10/76	Site No. 7 Just below Spius Confluence	15.0 - 18.0	0.50	-	0.5	11	16	-	-

October, 1976	Site No. 8 Above Thompson River	-	-	-	0.7	-	-	-	-
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Site No. 1

Description	Per Cent	Bottom Description	Per Cent	Streambank Vegetation Description	Per Cent	Streambank Composition	Per Cent
Riffles	75	Bedrock	2	Coniferous	5	Bedrock	2
Pools	8	Boulder	8	Deciduous	20	Boulder & Cobble	10
Runs	15	Cobble	70	Shrubs	70	Glacial Till	5
Rapids	2	Pebble	15	Grasses	5	Sand & Gravel	40
		Sand	3			Silt & Sand	3
		Silt & Clay	2			Clay & Silt	40

Site No. 2

Description	Per Cent	Bottom Description	Per Cent	Streambank Vegetation Description	Per Cent	Streambank Composition	Per Cent
Riffles	30	Bedrock	0	Not Done		Not Done	
Pools	30	Boulder	5				
Runs	40	Cobble	20				
Rapids	0	Pebble	60				
		Sand	10				
		Silt & Clay	5				

Site No. 3

Description	Per Cent	Bottom Description	Per Cent	Streambank Vegetation Description	Per Cent	Streambank Composition	Per Cent
Riffles	70	Bedrock	0	Coniferous	0	Bedrock	0
Pools	10	Boulder	10	Deciduous	10	Boulder & Cobble	0
Runs	18	Cobble	75	Shrubs	88	Glacial Till	85
Rapids	2	Pebble	10	Grasses	2	Sand & Gravel	10
		Sand	5			Silt & Sand	5
		Silt & Clay	1			Clay & Silt	1

Site No. 4

<u>Description</u>	<u>Per Cent</u>	<u>Bottom Description</u>	<u>Per Cent</u>	<u>Streambank Vegetation Description</u>	<u>Per Cent</u>	<u>Streambank Composition</u>	<u>Per Cent</u>
Riffles	30	Bedrock	0	Coniferous	0	Bedrock	0
Pools	20	Boulder	0	Deciduous	10	Boulder & Cobble	0
Runs	50	Cobble	40	Shrubs	80	Glacial Till	10
Rapids	0	Pebble	20	Grasses	10	Sand & Gravel	0
		Sand	20			Silt & Sand	10
		Silt & Clay	20			Clay & Silt	80

Site No. 5

<u>Description</u>	<u>Per Cent</u>	<u>Bottom Description</u>	<u>Per Cent</u>	<u>Streambank Vegetation Description</u>	<u>Per Cent</u>	<u>Streambank Composition</u>	<u>Per Cent</u>
Riffles	60	Bedrock	0	Coniferous	1	Bedrock	0
Pools	10	Boulder	10	Deciduous	5	Boulder & Cobble	10
Runs	30	Cobble	70	Shrubs	35	Glacial Till	0
Rapids	0	Pebble	20	Grasses	60	Sand & Gravel	70
		Sand	0			Silt & Sand	0
		Silt & Clay	0			Clay & Silt	20

Site No. 6

<u>Description</u>	<u>Per Cent</u>	<u>Bottom Description</u>	<u>Per Cent</u>	<u>Streambank Vegetation Description</u>	<u>Per Cent</u>	<u>Streambank Composition</u>	<u>Per Cent</u>
Riffles	50	Bedrock	1	Coniferous	1	Bedrock	3
Pools	10	Boulder	2	Deciduous	14	Boulder & Cobble	17
Runs	40	Cobble	60	Shrubs	35	Glacial Till	0
Rapids	0	Pebble	27	Grasses	50	Sand & Gravel	50
		Sand	7			Silt & Sand	10
		Silt & Clay	3			Clay & Silt	20

Site No. 7

<u>Description</u>	<u>Per Cent</u>	<u>Bottom Description</u>	<u>Per Cent</u>	<u>Streambank Vegetation Description</u>	<u>Per Cent</u>	<u>Streambank Composition</u>	<u>Per Cent</u>
Riffles	50	Bedrock	2	Coniferous	5	Bedrock	Less than 1
Pools	5	Boulder	35	Deciduous	45	Boulder & Cobble	45
Runs	40	Cobble	50	Shrubs	40	Glacial Till	0
Rapids	5	Pebble	8	Grasses	10	Sand & Gravel	30
		Sand	4			Silt & Sand	20
		Silt & Clay	1			Clay & Silt	5

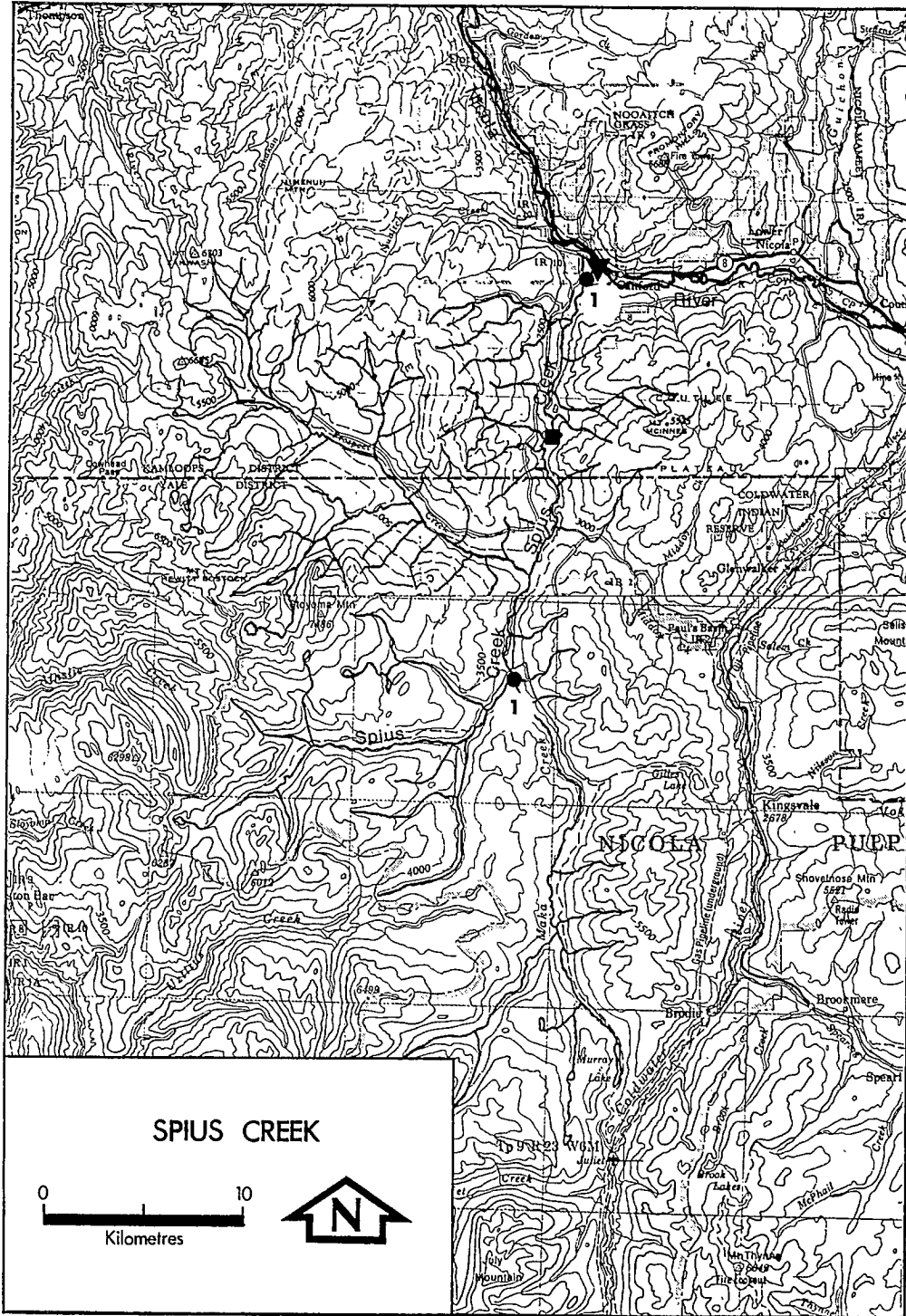
BIOLOGICAL SAMPLING DATA.

Adult Sampling

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
09/76	Chinook	3 ₁	1	58.3	-	2	55.2	-
09/76	Chinook	3 ₂	5	32.4	+ 3.5	-	-	-
09/76	Chinook	4 ₂	42	56.6	+ 1.7	49	55.9	+ 1.5
09/76	Chinook	5 ₂	-	-	-	2	64.3	-
09/76	Chinook	R	6	-	-	8	-	-

Juvenile Sampling

Date	Location (Gear)	Time		Species	Number Caught	Number Sampled	\bar{x} Nose-Fork Length (mm)	Other Fish Species
		Set	Haul					
27/08/76 09/09/76	Coop-Shulus	-	-	Ch	104	104	76.4	-
17/09/76 24, 26 09/76	Coop-Shulus	-	-	Ch	135	135	80.2	-
05/10/76	A & W - Coop	-	-	Ch	50	50	95.3	-
06, 07 20/76	Gavelin's Ditch	-	-	Ch	50	50	74.9	-
12/10/76	Downstream from Spius	-	-	Ch	50	50	85.5	-



2. SPIUS CREEK .50° 121° SE

- 13 -

LOCATION

Flows north into Nicola River near Canford (Kamloops District).

DESCRIPTION

In August and September of 1976, Spius Creek was surveyed from the Maka Creek confluence to the Nicola River confluence. This stream is fairly homogeneous throughout, confined within a narrow steep-sided valley and has a moderate to steep gradient. The substrate is predominantly large cobble and boulder with isolated patches of spawning gravel. At 10 km from the Nicola River there is a steep bedrock canyon with a small waterfall forming a partial obstruction. Chinook are known to be sparsely distributed, both above and below these falls. Spawning and rearing habitat for chinook and coho is very limited throughout.

Extensive damage by forest fires in the 1960's has contributed significantly to the sparse hillside vegetation and lack of streambank cover. In addition, runoff patterns have been seriously affected, creating problems with higher silt loads than normal.

ENHANCEMENT

Enhancement by streambed improvement would be difficult due to the general lack of good habitat and the large size of the stream. Potential enhancement techniques that could be initiated would include the construction of an incubation rearing facility with supplemental feeding, and the planting of juvenile chinook and coho in areas with a moderate rearing potential.

Road access and hydro power are readily available in the lower end, but limited in the top end. There is a groundwater upwelling about 6 km from the Nicola River, near the confluence of Richardson Creek.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1911 - 1920; 1970 - 1976): Station No. 08L G008 (Spius Creek near Canford)

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
2.8 (99.3)	3.1 (109)	3.0 (105)	13.0 (458)	43.5 (1,530)	36.6 (1,290)	13.5 (477)	3.4 (119)	2.3 (82)	2.6 (91)	4.8 (170)	3.9 (137)

- Mean Yearly Discharge 13.3 cms (468.0 cfs)
- Maximum Daily Discharge 165.4 cms (5,840.0 cfs)
- Minimum Daily Discharge 0.3 cms (11.9 cfs)

ESCAPEMENT AND TIMING.

Escapement*

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	850	200	150	80	528 ¹	118 ³	398
Coho	250	300	200	400	964 ²	222 ⁴	406

- * Steelhead were recorded from 1949 to 1963.

- ¹Excludes 1956.
- ²Excludes 1953, 1956, 1959.
- ³Excludes 1961.
- ⁴Excludes 1964.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	July	Late July	Late August	End September
Coho	September	Late September	Middle October	End November

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
15/09/76	<u>Site No. 1</u> From Nicola confluence to canyon	15.0 - 16.0	-	-	1.1	12	-	-	-

<u>Description</u>	<u>Per Cent</u>	<u>Bottom</u>		<u>Streambank Vegetation</u>		<u>Streambank Composition</u>	
		<u>Description</u>	<u>Per Cent</u>	<u>Description</u>	<u>Per Cent</u>	<u>Description</u>	<u>Per Cent</u>
Riffles	65	Bedrock	1	Coniferous	15	Bedrock	2
Pools	10	Boulder	15	Deciduous	25	Boulder & Cobble	48
Runs	20	Cobble	69	Shrubs	60	Glacial Till	0
Rapids	5	Pebble	14	Grasses	0	Sand & Gravel	50
		Sand	0			Silt & Sand	0
		Silt & Clay	1			Clay & Silt	0

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
09/76	Chinook	3 ₁	3	57.5	-	-	-	-
09/76	Chinook	3 ₂	1	43.0	-	-	-	-
09/76	Chinook	4 ₂	-	-	-	2	59.0	-
09/76	Chinook	R	2	57.0	-	1	67.2	-



3. COLDWATER RIVER .50° 120° SW - 16 -

LOCATION

Flows northeast into Nicola River at Merritt (Kamloops District).

The short section in Indian Reserve No. 1 is very wide and shallow with the bed material somewhat larger. Large boulders are also interspersed in this area with rearing and spawning areas infrequent.

DESCRIPTION

The Coldwater River flows approximately 85 km from its headwaters to the Nicola River. The lower 37.2 km from Kingsvale was surveyed for chinook in September of 1976. This lower section is very homogeneous except for a short section (6.0 km) in Indian Reserve No. 1 between Stirling Creek and Kwinshatla Creek. The river is characterized by a moderate gradient and a very wide streambed, indicating extensive springtime flooding. The bed materials are medium-sized cobble/pebble; good for chinook spawning although underutilized. Rearing areas for juvenile chinook and coho are limited as pools and deep riffles are relatively infrequent.

Approaching Merritt, agricultural activity and streambank alteration becomes more pronounced. The lower 2,500 m which flows through Merritt has been extensively rip-rapped and all streamside cover removed. Log storage on the banks releases some debris into the water.

ENHANCEMENT

The Coldwater River is not very productive due to low water temperatures and limited rearing capacity. The most feasible enhancement techniques that could be instigated would be the development of incubation/rearing facilities with supplemental feeding. Road access and hydro power are readily available in the lower reaches.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1913 - 1976; 1961 - 1976): Station No. 08L G010 (Coldwater River at Merritt)

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
3.6 (125)	3.6 (125)	4.4 (155)	10.3 (362)	32.7 (1,150)	33.0 (1,160)	11.4 (403)	2.2 (76)	1.4 (51)	3.1 (110)	3.5 (123)	3.5 (122)

- Mean Yearly Discharge 9.4 cms (331.0 cfs)
- Maximum Daily Discharge 115.0 cms (4,060.0 cfs)
- Minimum Daily Discharge 0.0 cms (0.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	1,500	500	600	750	780 ¹	251	639
Coho	200	200	300	1,500	2,400 ²	1,461 ³	619

¹Excludes 1956.

²Excludes 1953, 1956, 1958, 1959.

³Excludes 1964.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	August	Late August	Middle September	Late September
Coho	October	Late October	Middle November	End November

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
21/09/76	<u>Site No. 1</u> Nicola to Stirling Creek	11.0 - 12.0	0.35	0.25	0.6	11	14.5	-	-
22/09/76	<u>Site No. 2</u> Stirling to Kwinshatla Creek	15.0 - 18.0	0.20	0.91	0.4	13.5	-	-	-
	<u>Site No. 3</u> Kwinshatla Creek to Kingsvale	10.0 - 11.0	0.30	0.96	0.6	9.0	13.5	-	-

Site No. 1

Description	Per Cent	Bottom		Streambank Vegetation		Streambank Composition	
		Description	Per Cent	Description	Per Cent	Description	Per Cent
Riffles	50	Bedrock	0	Coniferous	5	Bedrock	0
Pools	20	Boulder	2	Deciduous	20	Boulder & Cobble	5
Runs	30	Cobble	70	Shrubs	50	Glacial Till	0
Rapids	0	Pebble	22	Grasses	25	Sand & Gravel	75
		Sand	5			Silt & Sand	10
		Silt & Clay	1			Clay & Silt	10

Site No. 2

Description	Per Cent	Bottom		Streambank Vegetation		Streambank Composition	
		Description	Per Cent	Description	Per Cent	Description	Per Cent
Riffles	90	Bedrock	0	Coniferous	0	Bedrock	0
Pools	5	Boulder	5	Deciduous	50	Boulder & Cobble	10
Runs	5	Cobble	70	Shrubs	0	Glacial Till	0
Rapids	0	Pebble	25	Grasses	50	Sand & Gravel	0
		Sand	0			Silt & Sand	90
		Silt & Clay	0			Clay & Silt	0

Site No. 2

<u>Description</u>	<u>Per Cent</u>	<u>Bottom</u>		<u>Streambank Vegetation</u>		<u>Streambank Composition</u>	
		<u>Description</u>	<u>Per Cent</u>	<u>Description</u>	<u>Per Cent</u>	<u>Description</u>	<u>Per Cent</u>
Riffles	90	Bedrock	0	Coniferous	0	Bedrock	0
Pools	5	Boulder	5	Deciduous	50	Boulder & Cobble	10
Runs	5	Cobble	70	Shrubs	0	Glacial Till	0
Rapids	0	Pebble	25	Grasses	50	Sand & Gravel	0
		Sand	0			Silt & Sand	90
		Silt & Clay	0			Clay & Silt	0

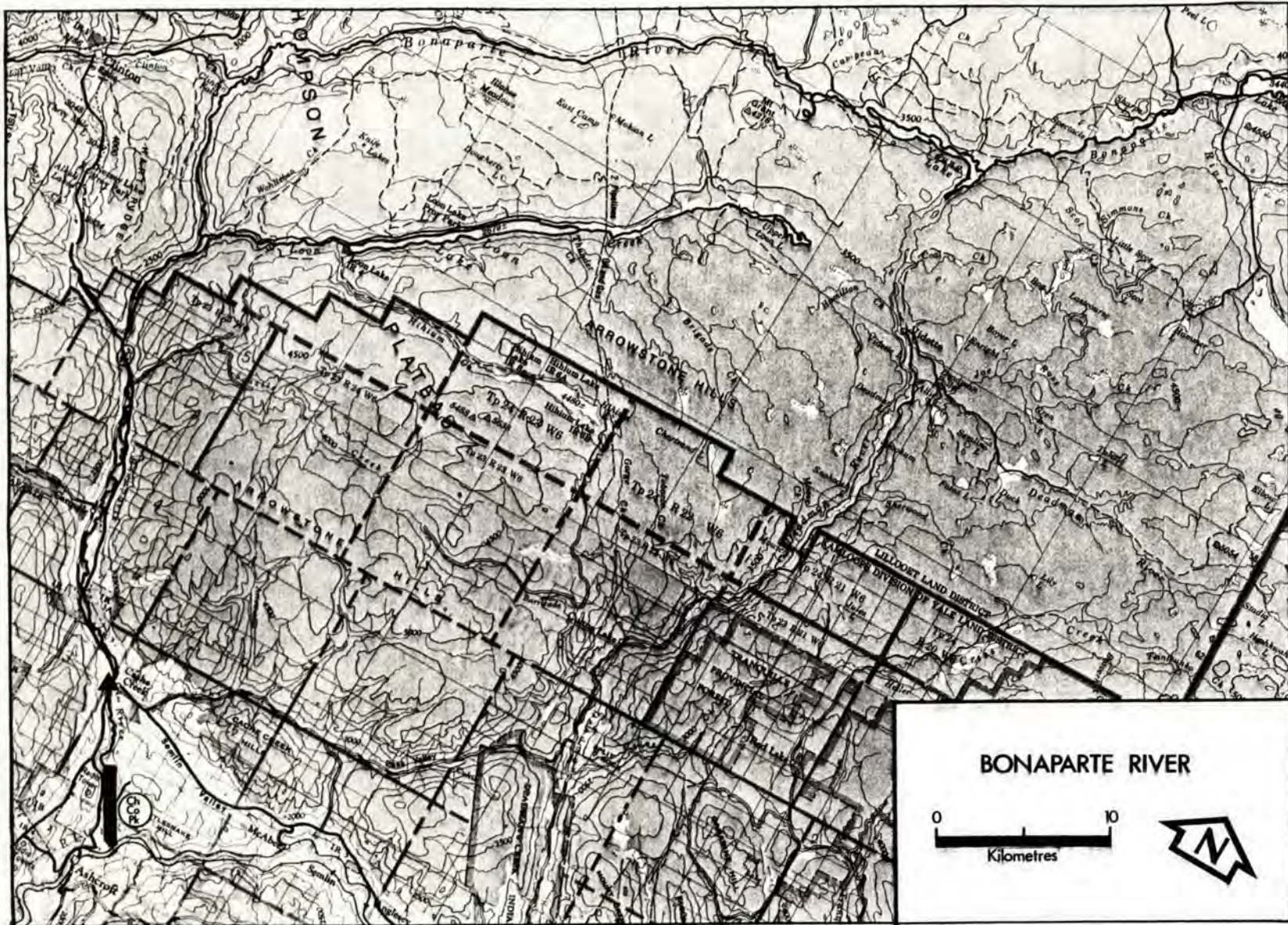
Site No. 3

<u>Description</u>	<u>Per Cent</u>	<u>Bottom</u>		<u>Streambank Vegetation</u>		<u>Streambank Composition</u>	
		<u>Description</u>	<u>Per Cent</u>	<u>Description</u>	<u>Per Cent</u>	<u>Description</u>	<u>Per Cent</u>
Riffles	40	Bedrock	2	Coniferous	5	Bedrock	0
Pools	30	Boulder	8	Deciduous	40	Boulder & Cobble	10
Runs	30	Cobble	50	Shrubs	40	Glacial Till	0
Rapids	0	Pebble	35	Grasses	15	Sand & Gravel	10
		Sand	5			Silt & Sand	80
		Silt & Clay	0			Clay & Silt	0

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
09/76	Chinook	2 ₁	1	31.0	-	-	-	-
09/76	Chinook	3 ₁	2	50.3	-	2	53.3	-
09/76	Chinook	3 ₂	3	35.4	-	-	-	-
09/76	Chinook	4 ₂	33	54.7	+ 1.4	46	52.5	+ 2.3
09/76	Chinook	5 ₂	-	-	-	3	63.9	-
09/76	Chinook	R	7	-	-	6	-	-



4. BONAPARTE RIVER, 50° 121° NE

LOCATION

Flows southerly and southeast into the Thompson River near Ashcroft (Kamloops District).

of approximately 20 km and in an area between Royfield River and Young Lake of approximately 9.0 km. Rearing potential for chinook is moderate throughout.

DESCRIPTION

The Bonaparte River was surveyed for potential steelhead and chinook production by the Fish and Wildlife Branch in September, 1979. At present, a falls located 3 km from the mouth renders approximately 140 km of mainstream and tributary habitat, up to Young Lake, inaccessible to anadromous salmonids.

Potential coho spawning habitat is found mainly in Cache Creek, Hat Creek, Scottie Creek and Royfield River with moderate potential in areas described for chinook. Rearing potential for coho is moderate to good throughout.

ENHANCEMENT

At present, the short section below the falls supports a small population of chinook, coho, pink and steelhead. The stream habitat in the initial 8.1 km, which includes the falls, is confined within a deep desert-like canyon area, and exhibits a steep gradient and a cobble/boulder substrate. Chinook and coho spawning/rearing potential is moderate.

Due to the vast amount of good quality habitat above the falls, the primary enhancement technique applicable is a modification of the barrier (e.g. blasting and/or fish ladder) to provide passage for adult salmon. To speed up colonization after alteration of this barrier, several techniques can be used: egg/fry transplants and/or the construction of incubation/rearing facilities, using groundwater or a gravity feed system. In addition, the Loon Creek Hatchery presently being renovated can be used to supply fry and smolts for enhancement of this system as well as others in the area.

In the reaches above the falls, habitat diversity is extreme, ranging from a meandering deep glide/pool environment of small gravel and fines (between Cache Creek and Maiden Creek) to a deep canyon area with steep gradient and coarse substrate (below Culloff Valley Creek). Suitable chinook spawning areas with moderate to high potential exist in a 13 km area above the falls, in a stretch between Scottie Creek and Chasm Creek

Enhancement techniques dealing with problem sites should also be considered. These include mitigating poor culverts on two highly productive tributaries (Cache Creek and Scottie Creek), monitoring effluent discharge from Cache Creek sewage treatment plant and restricting agricultural land encroachment.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1960 - 1974): Station No. 08L F060 (Near Cache Creek)

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
1.8 (64.5)	2.3 (81)	2.6 (93.3)	5.1 (180)	13.2 (466)	13.4 (474)	8.4 (297)	4.1 (147)	2.9 (204)	2.3 (80.9)	2.0 (70.2)	1.6 (58.9)

- Mean Yearly Discharge 5.0 cms (178.0 cfs)
- Maximum Daily Discharge 28.6 cms (1,010.0 cfs)
- Minimum Daily Discharge 0.2 cms (6.8 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1980</u>
Chinook	100	30	-	50	200 ¹	292	553
Coho *	10	20	-	-	1,275 ⁴	445	146
Pink	500	-	30	-	345	1,491	320

* No coho observed between 1954 and 1965. High escapements in 1953/1954 with 3,500 and 1,500.

¹Excludes 1960.

²Excludes 1965/1966.

³Excludes 1977.

⁴Mean of 1951/1952/1953/1954.

⁵Mean of 1965/1966/1969/1970.

⁶Excludes 1977/1978.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	August	End August	September	Middle September
Coho	October	Late October	End November	Middle November
Pink	September	Late September	October	Late October

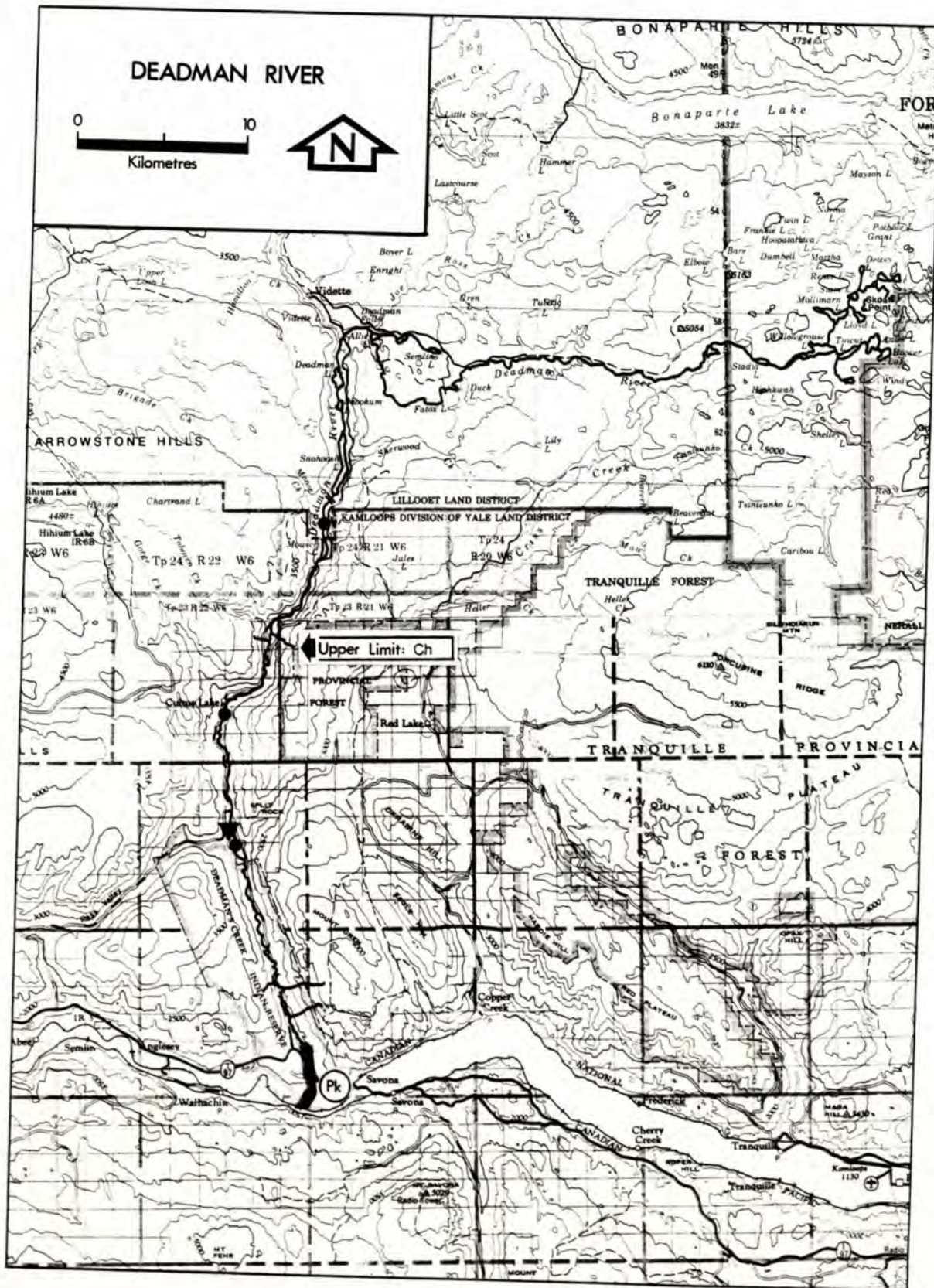
PHYSICAL AND CHEMICAL CHARACTERISTICS.

For detailed descriptions, refer to:

- Tredger, C. D., 1980, Assessment of the Bonaparte River Relevant to Anadromous Fish Production Potential. Department of Fish & Wildlife Branch, Victoria, B.C., 119 p.

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1975 to 1978 surveys.



5. DEADMAN RIVER .50° 120° NW - 23 -

LOCATION

Flows south into Thompson River, 4 km west of Kamloops Lake (Kamloops District).

DESCRIPTION

The Deadman River was surveyed by the Fish & Wildlife Branch in August of 1979 and by Fisheries and Oceans from July to September (1977 and 1978). At present, this river supports small runs of coho, chinook and pinks, as well as being a major spawning stream of the Thompson River winter steelhead.

Steelhead spawn in the first 48 km from the river mouth up to a steep reach of short waterfalls beginning about 1.5 km downstream of the first lake (Mowich Lake). Chinook salmon spawning ends about 5 km farther downstream at Tobacco Creek, which is also the uppermost limit of agriculture in the valley. It is not known how far up coho spawn, but juveniles have been captured as far as 40 km upstream from the Thompson River. In all cases, spawning is scattered, with steelhead

concentrated in the most upstream section, while chinook and coho are more abundant in the 5 to 7 km upstream from the Indian village (117 km from mouth). The section of river between Tobacco and Gorge Creeks is also good spawning habitat for chinook in some years.

Rearing is distributed throughout the system, but is especially favourable from the Indian village to Tobacco Creek (17 km to 43 km). Rearing potential in the system appears to be greatly underutilized, although the system seems to serve as a rainbow trout/steelhead nursery.

ENHANCEMENT

Enhancement strategies should include habitat improvement for spawning and rearing. A high silt load exists in potentially good spawning habitat. Enhancing present stocks can be accomplished by incubation/rearing facilities and egg/fry transplants into underutilized areas.

Road access to this system is good and hydro power available.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1913 - 1921; 1962 - 1976): Station No. 08L F027 (Above Criss Creek)

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
0.33 (11.7)	0.37 (13.0)	0.42 (14.9)	1.35 (47.6)	7.44 (262)	4.29 (151)	2.25 (79.3)	1.05 (37.0)	0.71 (24.9)	0.47 (16.4)	0.45 (15.8)	0.43 (15.2)

- Mean Yearly Discharge 1.76 cms (62.0 cfs)
- Maximum Daily Discharge 31.1 cms (1,100.0 cfs)
- Minimum Daily Discharge 0.0 cms (0.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Chinook	250	200	150	280	535	243 ¹	152
Coho	25	35	50	100	1,328 ²	441 ³	54
Pink *	500	-	50	-	-	-	-

* Erractic runs make 10-year means of no value.

- ¹Excludes 1967.
- ²Excludes 1951.
- ³Excludes 1967.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	July	Late July	Middle August	Late August
Coho	October	Middle October	Late October	Middle November
Pink	September	Late September	October	Middle October

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Refer to:

- Tredger, C. D., 1980. Assessment of Stream Carrying Capacity Relative to Steelhead Enhancement Opportunities in the Deadman River. Fish Habitat Improvement Section, Fish & Wildlife Branch, Victoria, B.C., 91 p.
- Starr, P. S., 1979. Deadman River: Biological Assessment of the Salmonid Population, July, 1977 to January, 1979, Department of Fisheries and Oceans, Unpublished MS, 155 p.

BIOLOGICAL SAMPLING DATA.

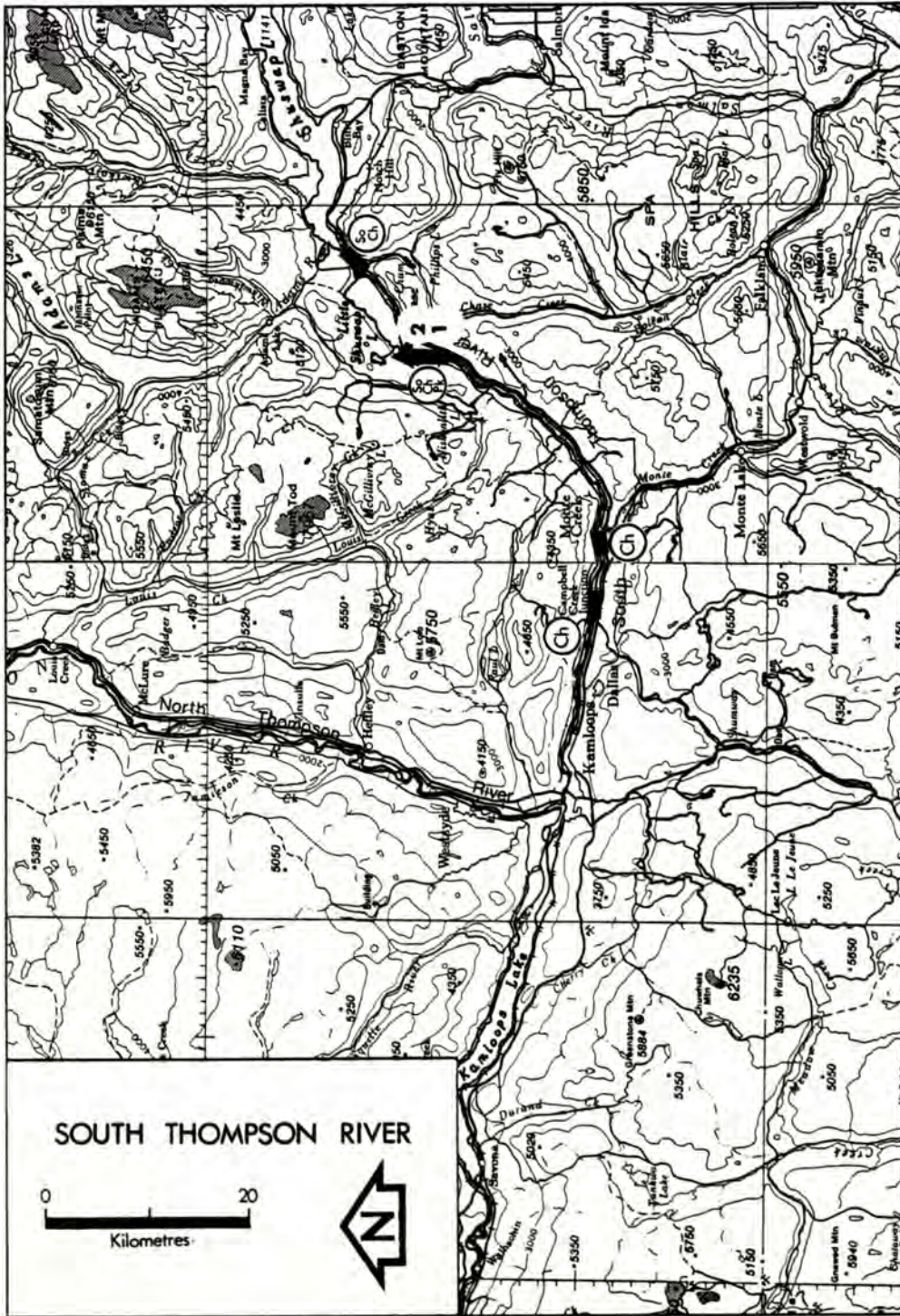
Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
Aug. to Oct./77	Chinook	3 ₁	1	38.9	-	-	-	-
		3 ₂	17	39.7	+ 5.0	1	45.4	-
		4 ₂	5	53.5	+ 5.1	27	53.7	+ 1.4
		5 ₂	-	-	-	1	65.2	-
		R	3	-	-	4	-	-
10/77	Pink	-	6	43.3	-	17	44.3	+ 0.8
10/77	Sockeye	-	3	31.6	-	-	-	-

Juvenile Sampling

Refer to:

- Starr, P. S., 1979 (above).



6. SOUTH THOMPSON RIVER,

- 26 -

LOCATION 50°120°NE

Flows southwest and west into Thompson River, east of Kamloops Lake (Kamloops District).

DESCRIPTION

The South Thompson River was surveyed for chinook in early and mid-October, 1975; early and mid-October, 1976; mid-October, 1977; and mid-October, 1978. No coho survey was done. The area surveyed extended from the outlet of Little Shuswap Lake to approximately 3.2 km downstream and Little River between Shuswap and Little Shuswap Lake.

The South Thompson is a wide, clear river of moderate to fast flows with gravel bar and side channel formation. Good spawning and moderate rearing habitat exists for chinook.

The main spawning beds are within a 3.2 km stretch below Little Shuswap Lake, in the vicinity of Campbell and Monte Creek and in Little River. The substrate in these areas is composed mainly of cobble and pebble with some fines and boulders. The remainder of the river is generally too silty for spawning.

ENHANCEMENT

The South Thompson River is identified as having good enhancement potential as access is good, hydro power is available and a good native chinook stock is available. Potentials include enhancement with major facilities such as hatcheries, spawning/rearing channels and floating pen rearing in Little Shuswap Lake. It is also advised to study the feasibility of closing the river to boat traffic during spawning season.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1911 - 1958; 1971 - 1976): Station No. 08L E031 at Chase

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
104.5	86.9	81.0	127.7	458.7	866.5	685.3	345.5	209.8	174.1	162.8	133.9
(3,690)	(3,070)	(2,860)	(4,510)	(16,200)	(30,600)	(24,200)	(12,200)	(7,410)	(6,150)	(5,750)	(4,730)

- Mean Yearly Discharge 286.0 cms (10,100.0 cfs)
- Maximum Daily Discharge 1605.6 cms (56,700.0 cfs)
- Minimum Daily Discharge 45.3 cms (1,600.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	7,000	1,500	7,000	3,500	2,769 ¹	4,350	4,450
Coho *	-	-	-	-	-	-	-
Pink **	25	-	1,000	-	-	-	275

* Coho escapement recorded only in 1968.

** Odd-year pinks with first run observed in 1965.

¹Excludes 1954.

<u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye	657	-	767	6,933

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	August	Late September	Late October	End October
Pink	September	October	Late October	End October
Sockeye	September	October	Middle October	November

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
15/10/75	<u>Site No. 1</u> Immediately down from Chase Bridge	114.0	2.4	-	-	12.5	-	-	7.8
18/10/76	<u>Site No. 1</u> Immediately down from Chase Bridge	100.0	2.0	1.0	-	14.0	-	10.5	7.1
15/10/77	<u>Site No. 2</u> Chase Bridge	-	-	-	-	11.0	-	12.0	8.1

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
10/75	Chinook	2 ₁	3	36.9	-	-	-	-
		3 ₁	3	63.4	-	3	63.7	-
		3 ₂	-	-	-	1	45.5	-
		4 ₁	19	70.4	+ 2.9	68	67.6	+ 0.7
		5 ₁	-	-	-	2	76.0	-
		R	1	34.1	-	-	-	-
10/76	Chinook	2 ₁	1	32.4	-	-	-	-
		2 ₂	1	30.2	-	-	-	-
		3 ₁	10	46.9	+ 2.9	2	46.5	-
		3 ₂	1	48.0	-	-	-	-
		4 ₁	2	58.5	-	4	65.1	+ 7.3
		5 ₁	3	77.6	-	25	72.5	+ 1.5
10/77	Chinook	2 ₁	13	31.9	+ 1.1	-	-	-
		3 ₁	3	51.6	-	2	58.0	-
		4 ₁	8	67.2	+ 2.6	53	66.9	+ 1.0
		4 ₂	-	-	-	1	62.1	-
		5 ₁	1	71.3	-	4	72.3	+ 7.1
		5 ₂	-	-	-	1	67.2	-
		R	-	-	-	2	58.9	-

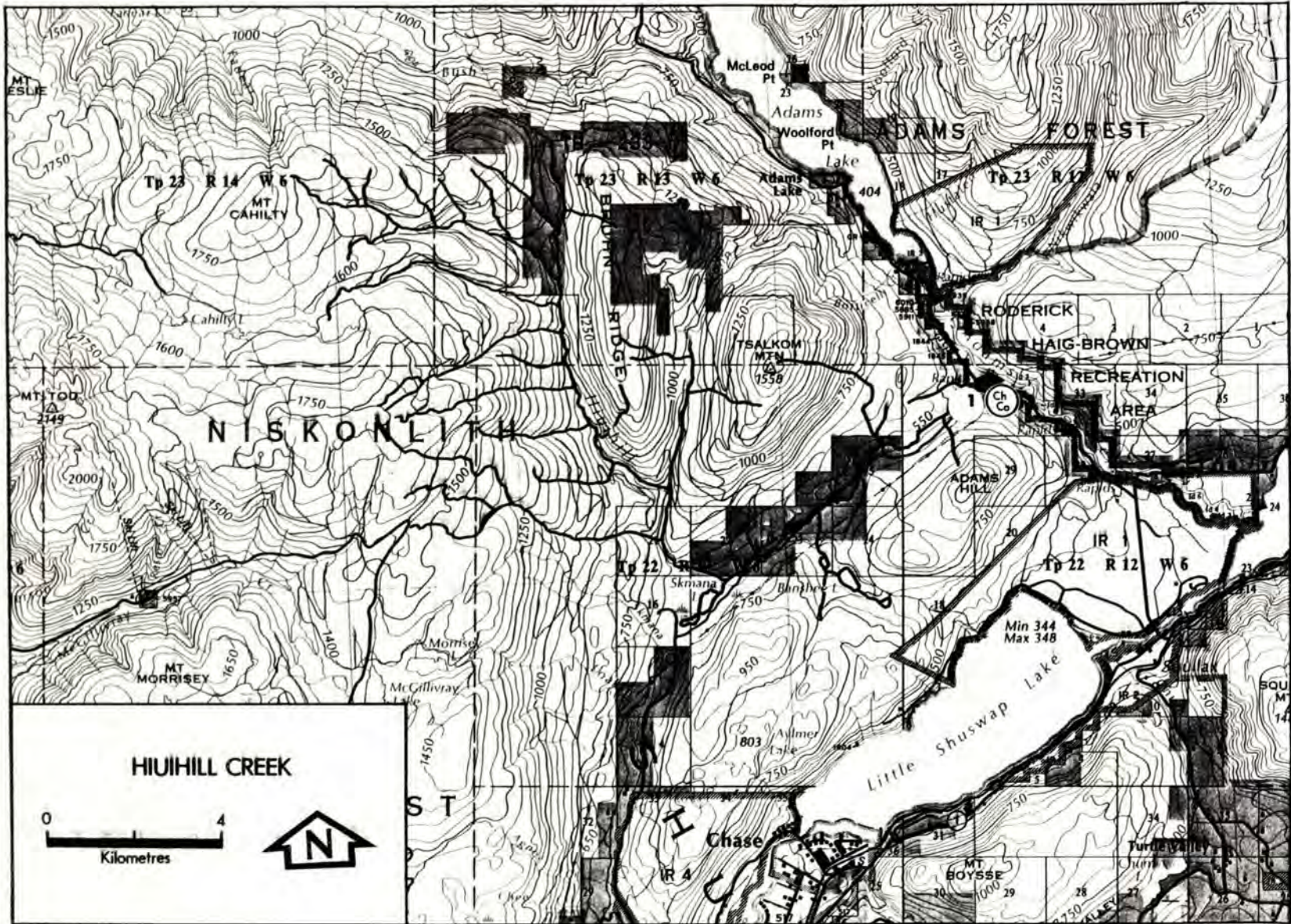
Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
10/78	Chinook	2 ₁	6	34.4	+ 5.5	-	-	-
		3 ₁	11	51.3	+ 2.8	3	61.5	-
		4 ₁	5	67.4	+ 4.4	23	66.8	+ 1.3
		4 ₂	-	-	-	3	67.2	-
		5 ₁	1	74.5	-	5	71.7	+ 4.7
		R	1	74.1	-	2	71.4	-

Little River

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
10/77	Sockeye Chinook	4 ₂	-	-	-	1	51.6	-
		2 ₁	4	32.4	+ 2.4	-	-	-
		3 ₁	3	52.4	-	-	-	-
		4 ₁	13	65.1	+ 3.6	8	65.4	+ 1.8
		4 ₂	-	-	-	1	51.6	-
		R	-	-	-	1	-	-
10/78	Chinook	2 ₁	1	28.3	-	-	-	-
		3 ₁	3	50.9	-	1	65.8	-
		4 ₁	2	69.4	-	3	68.5	-

Juvenile Sampling

Date	Location (Gear)	Time		Species	Number Caught	Number Sampled	x Nose-Fork Length (mm)	Other Fish Species
		Set	Haul					
19/10/76	South shore, 0.3 km and 1.5 km downstream from Chase Bridge (Beach seine, 6 sets)	1430	1630	-	-	-	-	1 Rainbow Trout 7 Rocky Mountain Whitefish 8 Sculpins 2 Red Side Shiners 1 Dace
15/10/77	0.5 km down from Chase Bridge	-	1700	-	-	-	-	4 Dace 14 Sculpins



7. HIUIHILL CREEK .50° 119° NW

LOCATION

Flows northeast into the Lower Adams River approximately 7.7 km from Adams River/Shuswap Lake confluence (Kamloops District).

the majority of spawning near the mouth and in a small side channel of the Adams near the Hiuihill Creek mouth. Above a steeper gradient section near the bridge, the stream assumes a low gradient nature and appears to have some potential coho habitat.

DESCRIPTION

Hiuihill Creek was surveyed for coho and chinook in mid-October and late November, 1978. The survey section extended from the Adams Lake Highway Bridge to the mouth.

This small stream is used primarily by coho, although stocks are very low. The area surveyed is mostly riffle with cobble and sand dominating the substrate. Banks are moderately stable with coniferous vegetation. Spawning and rearing potential is limited with

ENHANCEMENT

Surveys of the upper reaches should be conducted to identify salmonid utilization and the nature of any habitat.

Enhancement potential exists in the form of a small incubation/rearing facility and stream improvements for spawning and rearing. In addition, if good habitat exists in the upper reaches, fry transplants of coho and chinook could be undertaken to enhance this section of the stream.

HISTORICAL FLOW.

No record.

ESCAPEMENT AND TIMING.

No record.

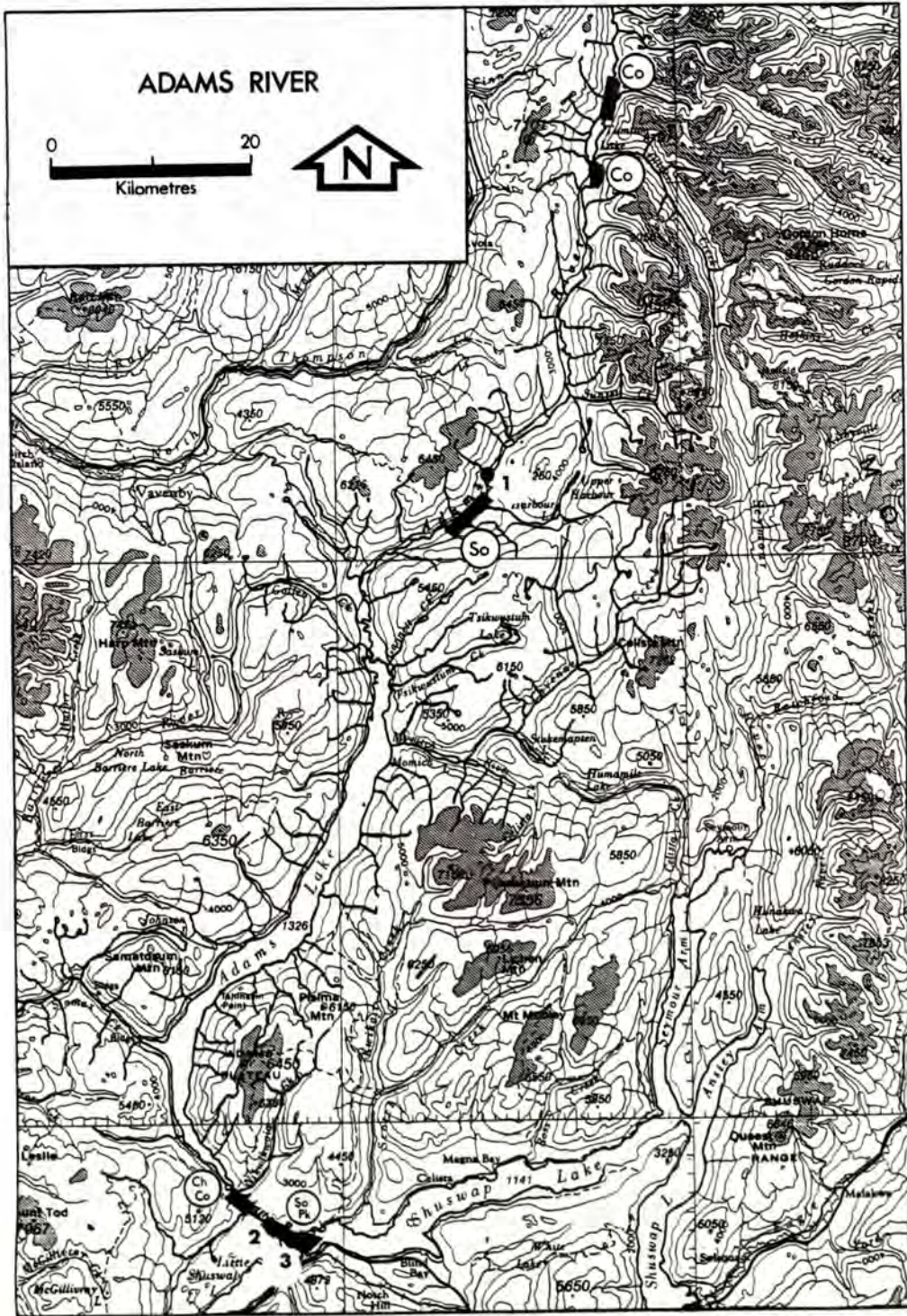
PHYSICAL AND CHEMICAL CHARACTERISTICS.

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
22/11/78	Site No. 1 Highway bridge to mouth	4.0	0.28	0.5	2	2.5	2.0	12	9.0

BIOLOGICAL SAMPLING DATA.

Adult Sampling

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
16/11/78	Chinook	4 ₁	1	55.0	-	3	66.6	-
	Coho	3 ₂	-	-	-	2	44.5	-



8. ADAMS RIVER .50° 119° NW

- 32 -

LOCATION

The Upper Adams River flows south into the north end of Adams Lake. The Lower Adams River flows southeast into the west end of Shuswap Lake (Kamloops District).

DESCRIPTION

Upper Adams River

In September of 1978, 88 km of the river from above Tumtum Lake to the mouth at Adams Lake were surveyed for coho and chinook.

The section above Tumtum Lake is predominantly slow moving and meandering with isolated riffle areas. Near the inlet to Tumtum Lake is an area of swamp and side channels ideal for juvenile rearing. The substrate in general consists of sand/pebble bars, but stretches of good spawning gravels do exist.

From Tumtum Lake to Adams Lake, approximately 78 km, the river is fairly complex and can be broken down into several reaches. These reaches vary from a confined section of rapids and chutes containing boulders and bedrock to a braided, meandering stretch with a predominantly sand substrate.

Although reports of sockeye, chinook and coho are recorded, escapements are very erratic. The main spawning beds occur just above Tumtum Lake, 8 km below Tumtum Lake and in the vicinity of Mica Lake and Harbor Creek. In general, spawning and rearing potential is moderate. This stream has 2 points of difficult passage which are: a small falls at the outlet of Tumtum Lake, and another small falls 32 km above Adams Lake.

HISTORICAL FLOW. cms (cfs).

Upper Adams River

Not available.

Lower Adams River

- Mean Monthly Discharge (1911 - 1976): Station No. 08L D001 at Squilax

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
21.4 (757)	17.4 (615)	18.0 (634)	32.8 (1160)	118.9 (4,200)	199.9 (7,060)	157.2 (5,550)	94.0 (3,320)	66.0 (2,330)	49.3 (1,740)	40.8 (1,440)	29.4 (1,040)

- Mean Yearly Discharge 70.8 cms (2,500.0 cfs)
- Maximum Daily Discharge 396.4 cms (14,000.0 cfs)
- Minimum Daily Discharge 2.4 cms (85.0 cfs)

Lower Adams River

Adams River between Adams Lake and Shuswap Lake (11.2 km) is of moderate gradient with 4 sets of rapids (1.0, 3.0, 5.5 and 7.0 km) downstream of Adams Lake. At 2.5 km above Shuswap Lake, the river divides into 2 main channels with major bar formation of cobble and gravel prevalent.

Although spawning occurs throughout, the major concentration occurs in the area of the two channels. Spawning potential is excellent and rearing potential limited. Although sockeye, chinook, coho and pink utilize this area, sockeye and chinook dominate.

ENHANCEMENT

Upper Adams River

Considering the high historical levels of coho reported, the potential for coho and chinook enhancement is very feasible. Enhancement options include incubation/rearing facilities using groundwater or gravity feed, egg and fry transplants into unused portions of the system, adult chinook transplants from the Lower Adams and the construction of spawning/rearing channels.

Logging road access is fair, but hydro power is not available.

Lower Adams River

Due to the high sockeye use, enhancement potentials are not considered of high priority. Potentials which do exist include incubation/rearing facilities using developed groundwater, juvenile rearing pens at the outlet of Adams Lake, an adult capture program directed at transplant and donor work and side channel development above Celista Road Bridge.

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Chinook - Upper *	-	-	-	-	-	-	-
Lower	1,300	400	1,750	2,200	2,025	2,140	1,481
Coho - Upper **	65	UNK	150	100	1,833 ¹	1,563 ²	142 ³
Lower	100	10	338	150	1,615	500	166
Pink - Upper ***	-	-	-	-	-	-	-
Lower	25	-	1,000	-	-	-	-

* Only report of chinook use is 25 in 1965.

** Coho data very sketchy with numerous observations, but limited estimates made. High runs of up to 3,500 in years between 1955 and 1965.

*** Odd-year pink run first observed in 1965.

¹Excludes 1951 to 1954.

²Excludes 1965 to 1971.

³Excludes 1973 to 1976.

	\bar{x} 67/71/75	\bar{x} 68/72/76	\bar{x} 69/73/77	\bar{x} 70/74/78
Three-Cycle Mean				
Sockeye - Upper	8	17	-	25
Lower	360,000	4,194	31,969	953,633

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook - Upper	-	-	-	-
Lower	September	Middle September	October	Late October
Coho - Upper	Late October	November	Middle November	Late November
Lower	Middle October	Late October	Middle November	December
Sockeye - Upper	Middle August	Late August	September	Late September
Lower	Middle September	October	Late October	November
Pink - Upper	-	-	-	-
Lower	Late September	October	October	Middle October

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Upper Adams River

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius) Water Air	Dissolved Oxygen (ppm)	pH
28/09/78	Site No. 1	-	-	-	-	9.5 15	11	7.0
	5 km above Mica Lake							

Lower Adams River

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
07/10/76	Site No. 2 2.0 km up from mouth	60.0	0.4	1.5	-	13.0	-	9.0	7.0
14/10/77	Site No. 3 At the mouth	-	-	-	-	-	-	10.0	7.7

BIOLOGICAL SAMPLING.

Adult Sampling

Upper Adams - None.

Lower Adams

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
15/10/76	Chinook	2 ₁	1	32.0	-	-	-	-
		3 ₁	3	48.5	-	-	-	-
		4 ₁	3	67.3	-	3	67.5	-
		5 ₁	4	78.2	+ 4.0	8	71.2	+ 4.4
		R	1	72.7	-	-	-	-
14/10/77	Chinook	2 ₁	1	33.9	-	-	-	-
		3 ₁	9	52.9	+ 3.5	4	58.8	+ 2.9
		4 ₁	5	68.7	+ 5.9	19	66.3	+ 1.2
		5 ₁	-	-	-	1	75.4	-
16/10/78	Chinook	4 ₁	2	65.2	-	10	68.6	+ 1.3
		5 ₁	-	-	-	2	77.3	-
27/11/78	Coho	3 ₂	1	48.8	-	-	-	-

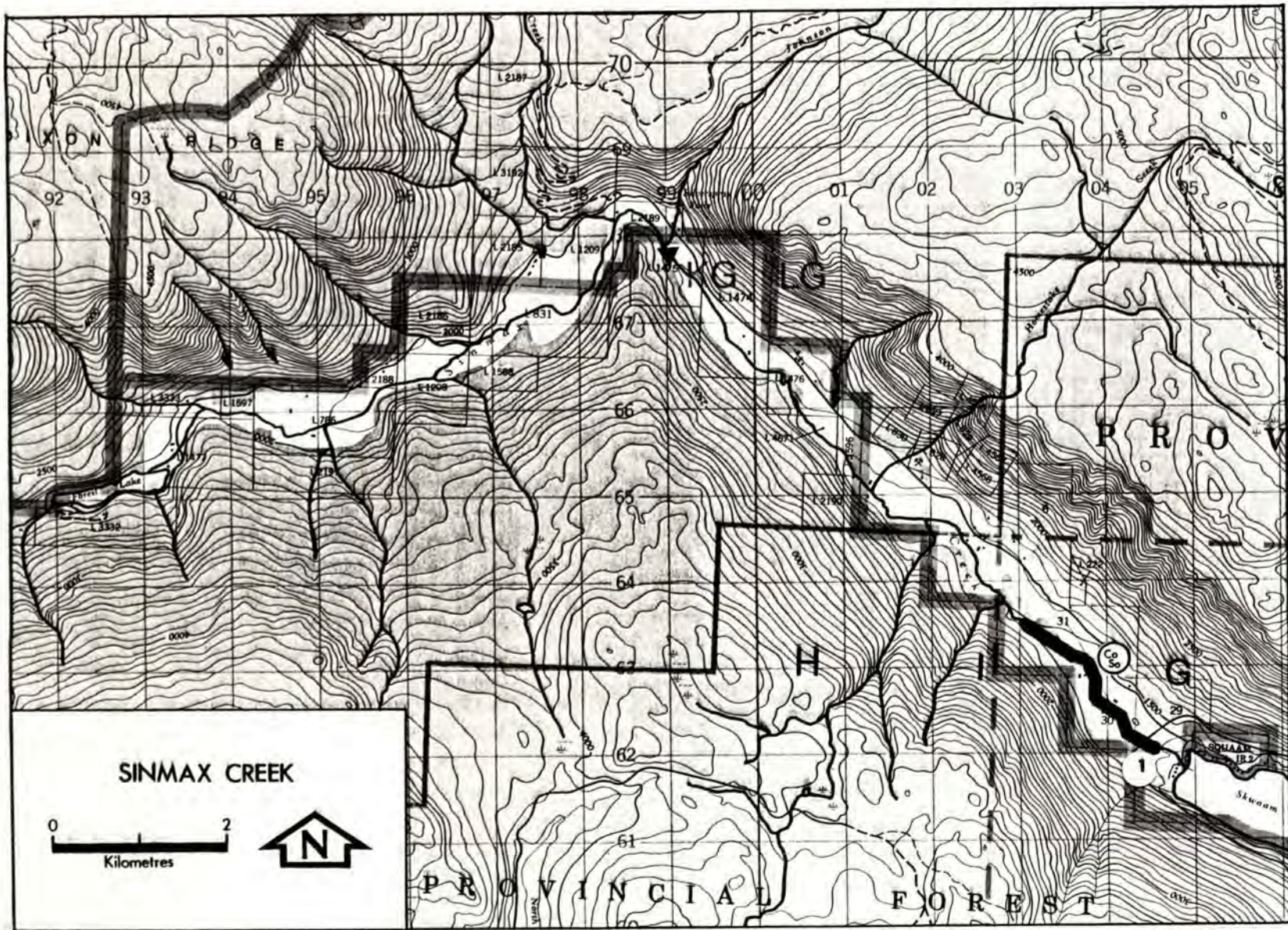
Juvenile Sampling

Upper Adams River

Date	Location (Gear)	Time		Species	Number Caught	Number Sampled	Nose-Fork Length (mm)	Other Fish Species
		Set	Haul					
28/09/78	Site No. 1 1 km above Mica Lake (2 minnow traps)	-	-	-	-	-	-	-

Lower Adams River

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x} Nose-Fork Length (mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
14/10/77	Mouth (10 minnow traps)	1530	1730	Ch	3	3	64.3	1 Dace 3 Sculpins



9. SINMAX CREEK .51° 119° SW - 37 -

LOCATION

Flows southeast into Skuaam Bay, Adams Lake (Kamloops District).

DESCRIPTION

Sinmax Creek was surveyed for coho in late November, 1978. The major area observed was from the road bridge, 0.5 km above the mouth to 4.0 km farther upstream.

Sinmax Creek is a small, quick-flowing stream characterized by slight meandering and moderate gradient. During fall the stream goes underground at 3.2 km, presenting an impassable barrier to migrating salmon. Coho spawning potential is limited to moderate due to the poor sand and pebble substrate and

limited spawning area. The streambanks, also of sand and pebble, are moderately unstable resulting in a substantial amount of instream debris. Rearing potential is limited to moderate. Although the runs of coho and sockeye are erratic and fairly small, thousands of kokanee use this stream for spawning.

ENHANCEMENT

Although enhancement potential for coho does exist in the form of small incubation/rearing facilities and stream improvements, the stream should be left alone as it appears to be a major spawning bed for resident Shuswap Lake kokanee. Access to this stream is good and hydro power is available. A source of groundwater is present in the lower reaches.

HISTORICAL FLOW. cm (cfs).

- Mean Monthly Discharge (1926 - 1928; 1965 - 1976): Station No. 08L D004

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
0.31 (10.8)	0.27 (9.5)	0.26 (9.3)	0.51 (18.1)	1.30 (47.3)	0.58 (20.5)	0.60 (21.1)	0.28 (9.9)	0.18 (6.4)	0.16 (5.5)	0.18 (6.3)	0.20 (7.0)

- Mean Yearly Discharge Insufficient Data.
- Maximum Daily Discharge (1926 - 1928, 1976) 4.8 cms (171.0 cfs)
- Minimum Daily Discharge (1926 - 1928, 1965 - 1974) 0.0 cms (0.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Coho	60	25	40	55	444 ¹	270	99

¹Includes 1957 to 1961.

<u>Three-Cycle Mean</u>	\bar{x} 67/71/75	\bar{x} 68/72/76	\bar{x} 69/73/77	\bar{x} 70/74/78
Sockeye	1	17	63	317

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	November	Middle November	Late November
Sockeye	October	Middle October	Late October	Middle November

No records prior to 1957.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
27/11/78	<u>Site No. 1</u> Road bridge 0.5 km up from mouth	4	0.2	1.0	Moderate	5.5	4.0	10	9.0

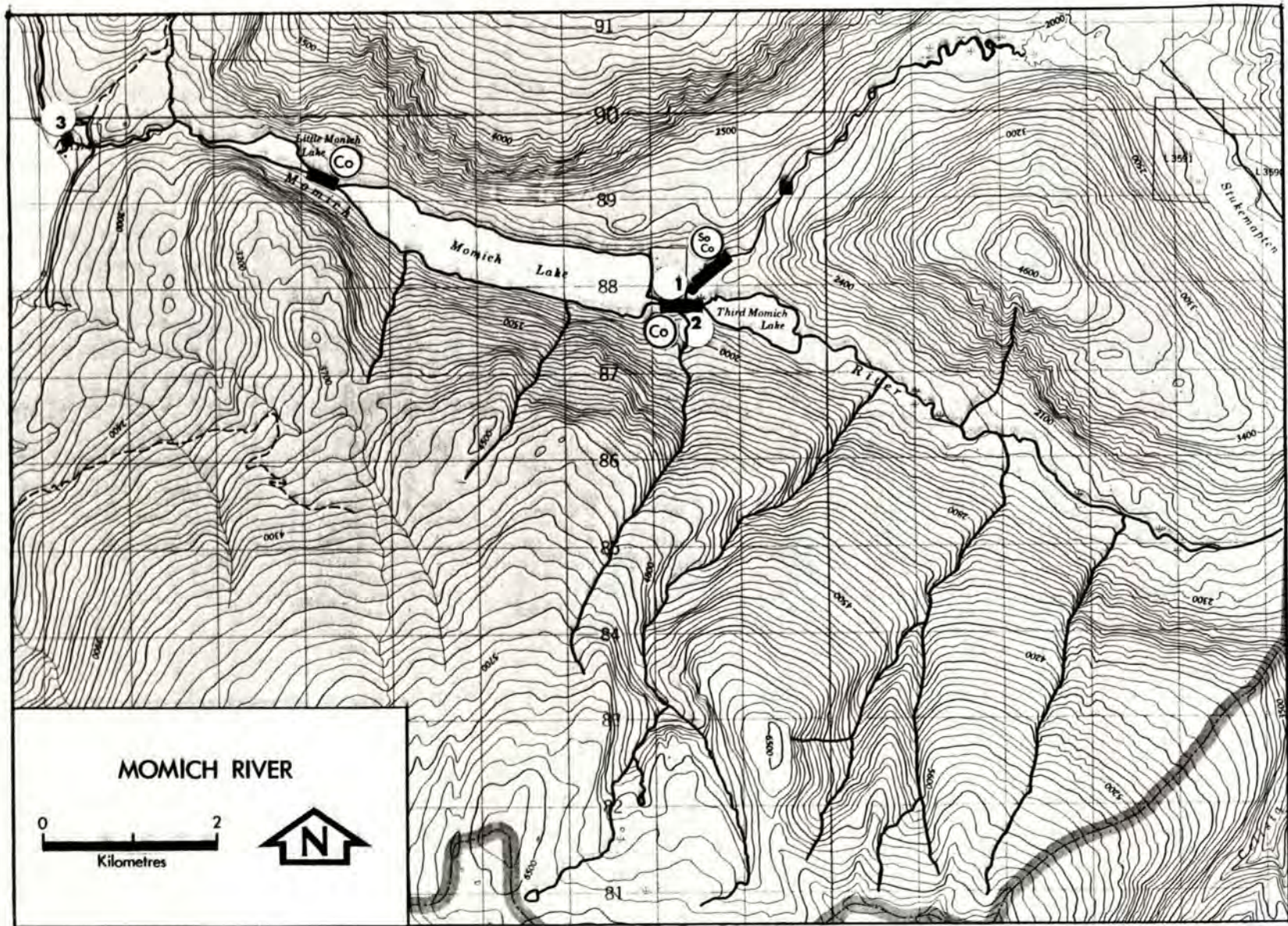
BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
27/11/78	Coho	3 ₂	3	47.3	-	4	41.6	+ 2.1
		R	1	-	-	3	-	-

Juvenile Sampling

Several juvenile coho were observed in the upper reaches of the section surveyed.



MOMICH RIVER



LOCATION

Flows west into northeast end of Adams Lake (Kamloops District).

DESCRIPTION

Momich River and Cayenne Creek were surveyed for coho in late November, 1978. No chinook survey was conducted. The streams were observed over three main sections covering a total distance of 3.0 km.

Momich River is a small to moderate sized stream having 3 small lakes along its mainstem. From Little Momich Lake to Adams Lake (1.9 km) the stream is of moderate to steep gradient with a substrate of cobble, boulder and pebble. Although some spawning occurs in this area, potential is limited.

The mainstem from Third Momich Lake to Momich Lake is approximately 0.7 km long and contains a 50 m section of spawning bed. With the exception of this spawning bed, this low gradient meandering section has a substrate of predominantly silt, sand and pebble.

At the outlet to Third Momich Lake is a large beaver dam that appeared passable, although no coho have been observed above. Coho spawning and rearing potential in this area is limited to moderate.

On Cayenne Creek, approximately 1.6 km from its confluence with Momich River, is a set of impassable falls. This meandering stream is small and of moderate gradient with a substrate of pebble and sand. Coho spawning and rearing potential is limited to moderate.

ENHANCEMENT

Although hydro power is not available and there is a low coho stock, logging road access and fair habitat allow for some feasible enhancement opportunities. An incubation facility for chinook and coho could be installed on the Lower Momich River and supplied by a gravity feed water supply from Little Momich Lake. In this way, high and low lake intakes can be used for temperature control. In addition, rearing pens can be installed on the lakes or the lakes themselves can be used as a natural rearing area. Semi-natural rearing channels and minor stream modifications are also feasible projects.

HISTORICAL FLOW.

No record.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Coho	25	-	20	40	400 ¹	304 ²	34 ³

¹Excludes 1951 to 1957.

²Excludes 1965 to 1967.

³Excludes 1970 to 1976.

	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
<u>Three-Cycle Mean</u>				
Sockeye	8	1,122	10	85

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	November	Middle November	Late November
Sockeye	October	Middle October	Late October	End November

No records prior to 1957.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
26/11/78	<u>Site No. 1</u> Cayenne Creek at its mouth	10.0	0.51	0.37	Moderate	4.5	0.5	12	7.0
26/11/78	<u>Site No. 2</u> Momich River just below Cayenne confluence	13.5	0.9	0.24	Low	4.5	1.0	12	6.9
26/11/78	<u>Site No. 3</u> Mouth of Momich River	-	-	-	-	3.0	-	-	-

BIOLOGICAL SAMPLING DATA.

No biological sampling during 1978 survey.



11. SCOTCH CREEK .50°119°NE - 43 -

LOCATION

Flows southwest into the west end of Shuswap Lake (Kamloops District).

spawning gravel do occur. Sockeye spawning is spotty and no coho use observed. Spawning and rearing potential for coho is limited.

DESCRIPTION

Scotch Creek was surveyed for late chinook and early coho in late October, 1978. The area surveyed was from 1.0 km above the highway bridge to the mouth - a total distance of approximately 8.0 km.

The main spawning area is from the bridge downstream to the mouth, with sockeye, coho and chinook runs utilizing this area. The substrate in this section is cobble/pebble and sand. Heavy debris accumulations have resulted in the formation of two major channels, the creations of flood channels and the degradation of the spawning habitat. Spawning potential for coho is moderate and rearing potential limited to moderate. Potential for chinook is limited.

Scotch Creek is a fairly large stream whose watershed has been subjected to extensive logging and road construction. As a result, poor water retention, siltation, heavy debris loads and scouring have become serious problems.

ENHANCEMENT

For enhancement potential, road access is good and hydro power available, but coho and chinook donor stocks would be needed from other areas. Potential enhancement opportunities include a small incubation/rearing facility using gravity feed or groundwater, egg and fry transplants, and the assessment of debris problems aimed at minimizing spawning bed degradation.

The accessible portion of this stream is approximately 13.0 km long after which there are impassable falls. The accessible portion can be divided into two main sections. Above the bridge and up to the falls (8 km) the stream is fairly confined with a substrate of cobble and boulder, although patches of good

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1915; 1947 - 1948): Station No. 08L E030
Scotch Creek near Sorrento

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
1.5 (55.6)	1.2 (43.3)	-	-	35.1 (1,240)	36.5 (1,290)	14.0 (494)	5.2 (183)	3.1 (108)	6.0 (212)	5.3 (186)	2.7 (94.9)

- Mean Yearly Discharge Insufficient data.
- Maximum Daily Discharge 204.4 cms (7220.0 cfs)
- Minimum Daily Discharge 0.7 cms (24.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Chinook *	-	-	-	-	-	-	-
Coho	30	5	-	-	Erratic	Erratic	20

* Only 2 chinook runs reported (1967 and 1968) with 25 in each run.

¹Excludes 1977.

<u>Three-Cycle Mean</u>	\bar{x} 67/71/75	\bar{x} 68/72/76	\bar{x} 69/73/77	\bar{x} 70/74/78
Sockeye	2,758	55	8,185	4,335

Spawning Timing

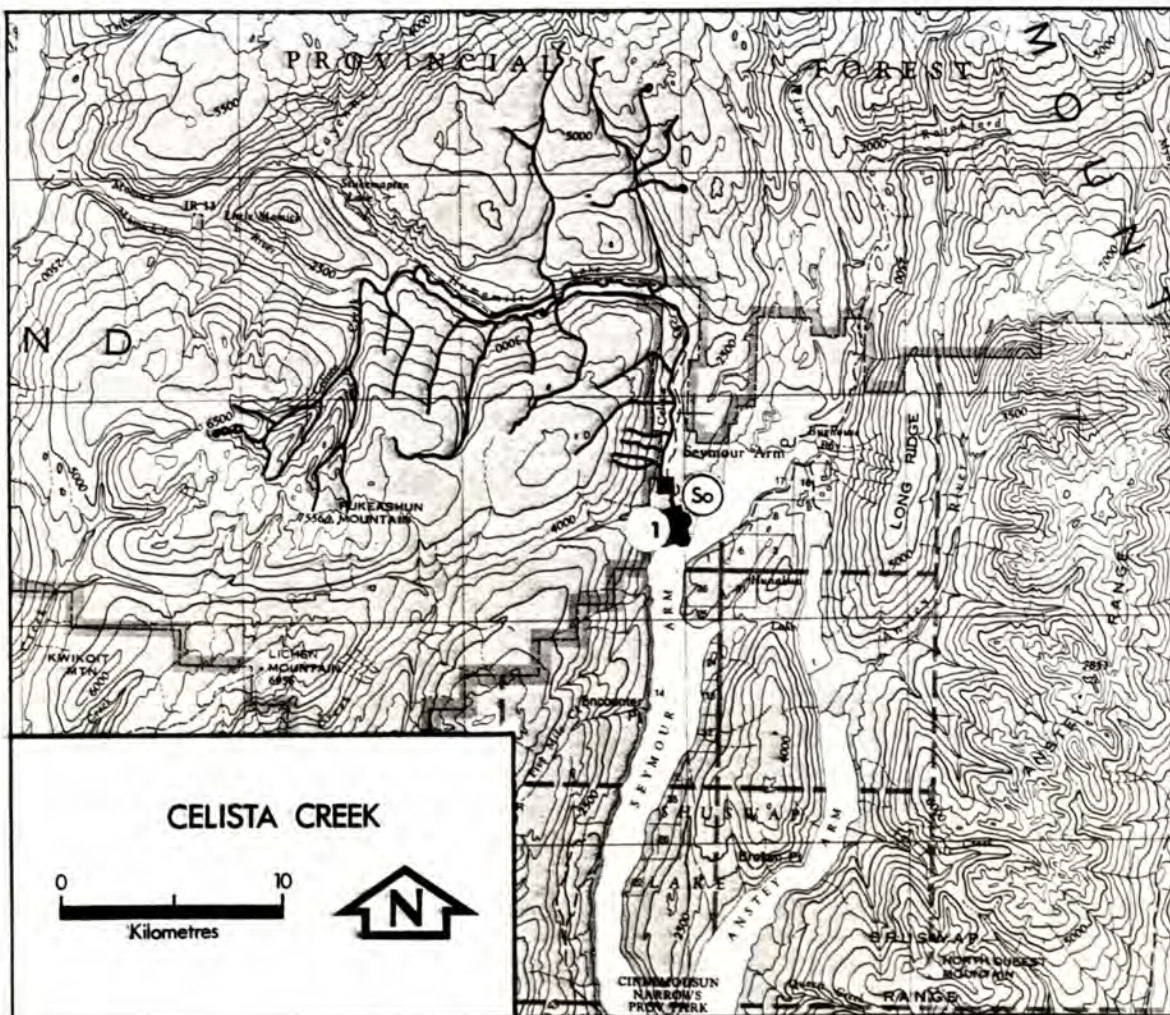
	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	Late October	Middle November	Late November
Early sockeye	Middle August	Late August	Late August	September
Late sockeye	Late September	October	Late October	November

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
29/10/78	<u>Site No. 1</u>	30.0	0.35	0.97	-	4.0	4.0	-	8.5
	Bridge upstream								

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1978 survey.



12. CELISTA CREEK, 51° 118° SW

- 46 -

LOCATION

Flows southeast into the northwest side of Shuswap Lake (Kamloops District).

utilized by sockeye with no coho or chinook observed. The stream, in the area surveyed, is entirely riffle, resulting in poor rearing habitat.

DESCRIPTION

Celista Creek was surveyed for coho in late October, 1978. The survey area extended from the mouth to 1 km upstream.

Celista Creek is a moderately sized stream of fast flow and moderate to steep gradient. Substrate is predominantly boulder and cobble, unsuitable for spawning. An impassable falls is located approximately 2.5 km from the mouth. The only spawning area observed is near the mouth and is presently

ENHANCEMENT

Although road access is available, enhancement potential is limited, due to poor habitat, no native stock and no available hydro power. If coho or chinook donor stocks are obtained, a small incubation facility could be set up near the mouth as there is potential for a gravity feed water supply. In addition, the upper reaches should be surveyed for rearing habitat with the objective of potential fry plants.

ESCAPEMENT AND TIMING.

No record.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
29/10/78	Site No. 1	13.0	0.5	0.75	2.5 - 4.0	6.5	7.5	16	7.0
	Approximately 2 km above mouth								

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1978 survey.

HISTORICAL FLOW. cms (cfs).

Mean Monthly Discharge (1914 - 1924): Station No. 08L E025
Celista Creek near Albas

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
0.9 (31.4)	0.8 (27.8)	0.8 (27.9)	3.9 (137)	19.3 (682)	21.9 (775)	6.5 (228)	1.9 (67.3)	1.0 (35.9)	1.0 (36.8)	1.4 (50.6)	1.0 (35.6)

<u>Mean Yearly Discharge</u>	5.2 cms (184.0 cfs)
<u>Mean Maximum Daily Discharge</u>	50.1 cms (1,770.0 cfs)
<u>Minimum Daily Discharge</u>	0.2 cms (6.5 cfs)



13. SEYMOUR RIVER, 51° 118° SW

LOCATION

Flows south into Seymour Arm, Shuswap Lake (Kamloops District).

DESCRIPTION

Seymour River was surveyed for chinook in late September, 1977 and late September, 1978. It was surveyed for coho in mid-November, 1978. The areas covered were from the mouth to approximately 2.0 km upstream and then to a set of impassable falls 11.9 km from the mouth.

This river is medium-sized, of moderate gradient and meandering towards the mouth. Further upstream towards the falls it becomes steeper and more confined. During the 1977/1978 surveys, no chinook or coho were observed.

The stream substrate consists of sand and cobble in the downstream area with

boulder/cobble towards the falls. Evidence of scouring and channelization is evident, possibly the result of increased logging activities in the upper watershed. Coho and chinook spawning potential is limited and restricted to the downstream area. Rearing potential for coho is limited to moderate. The main spawning bed used by sockeye is the downstream area near McNomee Creek and in McNomee Creek itself. Although runs of coho and chinook have been observed, they are generally small and inconsistent.

ENHANCEMENT

Enhancement opportunities in the form of a small incubation/rearing facility, development of a semi-natural rearing/spawning channel and egg/fry transplants are possible; however early ice could present problems. Access to this area is available via gravel roads, but hydro power is not available.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1914 - 1918; 1955 - 1956; 1969 - 1976): Station No. 08L E027
Seymour River near Seymour Arm

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
6.0 (210)	7.4 (262)	7.7 (273)	28.2 (994)	83.3 (2,940)	118.0 (4,200)	80.7 (2,850)	38.5 (1,360)	21.0 (741)	19.2 (678)	14.6 (516)	8.9 (314)

- Mean Yearly Discharge 37.2 cms (1,310.0 cfs)
- Maximum Daily Discharge 273.3 cms (9,650.0 cfs)
- Minimum Daily Discharge 3.1 cms (109.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook *	-	-	25	-	-	-	-
Coho *	-	-	25	-	-	-	-

* Due to erratic and poor escapements, a calculation of 10 year means is not feasible.

<u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye	21,120	5,290	5,615	37,175

Spawning Timing

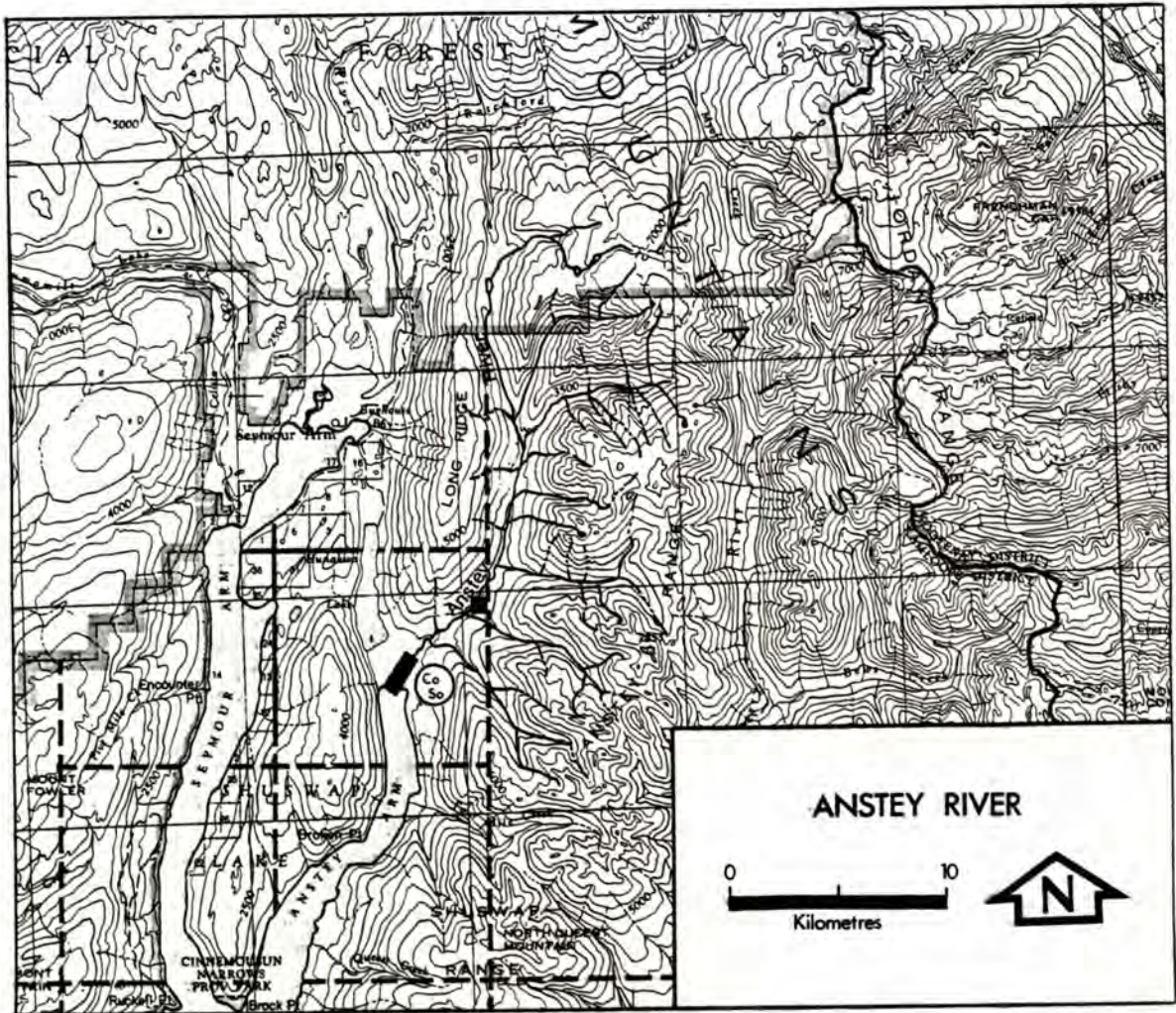
	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	September	Middle September	Middle September	End September
Coho	October	Middle October	Late October	December
Sockeye	Middle August	Middle August	End September	End September

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
27/09/77	Site No. 1 Bridge crossing at 2.0 km upstream from mouth	38.4	0.76	1.63	-	6.5	-	12.0	6.8

BIOLOGICAL SAMPLING DATA.

No biological sampling during 1977 and 1978 surveys.



14. ANSTEY RIVER, 51° 118° SW

LOCATION

Flows south into Anstey Arm, Shuswap Lake (Kamloops District).

DESCRIPTION

This moderate-sized river was surveyed for coho, by air, in mid-November, 1978. This meandering, moderate gradient stream contains a heavy debris load and during spring freshet experiences considerable scouring and bank erosion. An impassable falls at 4.8 km restricts further salmon migration. Most spawning occurs in the lower reaches and at the

mouth. The substrate is cobble/pebble in the mouth area, becoming much coarser upstream. Spawning and rearing potential is limited. No chinook have been recorded in this stream, although a very small coho run does exist. Sockeye numbers are also quite small and erratic.

ENHANCEMENT

Enhancement potential in this stream is very limited due to very poor access (by boat only), unavailable hydro power, and a small coho run. To determine enhancement potential, further reconnaissance work is needed.

HISTORICAL FLOW.

No record.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Coho	25	25	-	75	-1	117 ²	33 ³

¹ Coho recorded for 1958 and 1960 only: 750 and 25 respectively.

² Excludes 1966.

³ Excludes 1971/1977.

<u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye	92	-	-	1,109

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	Late October	Early November	December
Early sockeye	August	September	September	September
Late sockeye	September	October	Late October	Late November

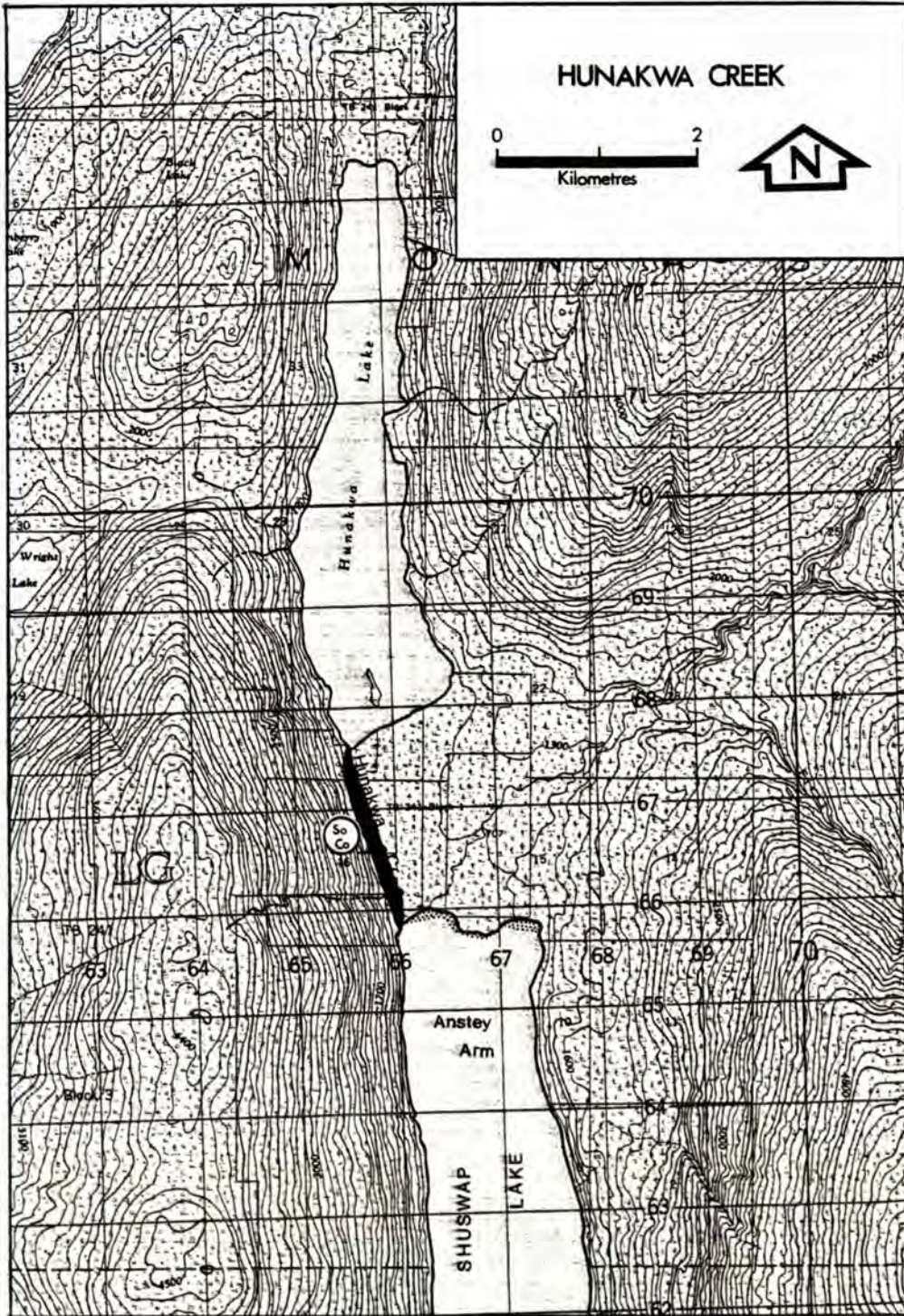
No records prior to 1958.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Not available.

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1975 to 1978 surveys.



15. HUNAKWA CREEK, 51° 118' SW - 53 -

LOCATION

Flows south from Hunakwa Lake into the north end of Anstey Arm, Shuswap Lake (Kamloops District).

this point extends into excellent spawning gravel utilized by sockeye and coho. Coho escapement is very low and sockeye escapements erratic. In addition, bear predation is heavy along this stream.

DESCRIPTION

Hunakwa Creek, approximately 2.4 km long, was surveyed for coho by air in mid-November, 1978. This low gradient stream meanders through a swampy area containing numerous beaver dams. These beaver dams create potential obstructions and are removed annually.

Potential for coho is moderate to limited and very limited for chinook. No chinook have been observed in this stream.

ENHANCEMENT

Enhancement potential in this stream is very limited due to lack of hydro power, poor access, limited habitat and a small native coho stock.

The streambed consists of silt and mud up to 150 m from the mouth. The substrate at

HISTORICAL FLOW.

No record.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Coho	30	25	-	200	-	45 ¹	64

¹Excludes 1961/1962/1963/1967.

<u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye	8	-	17	564

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	Late October	November	Late November
Early sockeye	August	Middle August	September	September
Late sockeye	September	October	Late October	Middle November

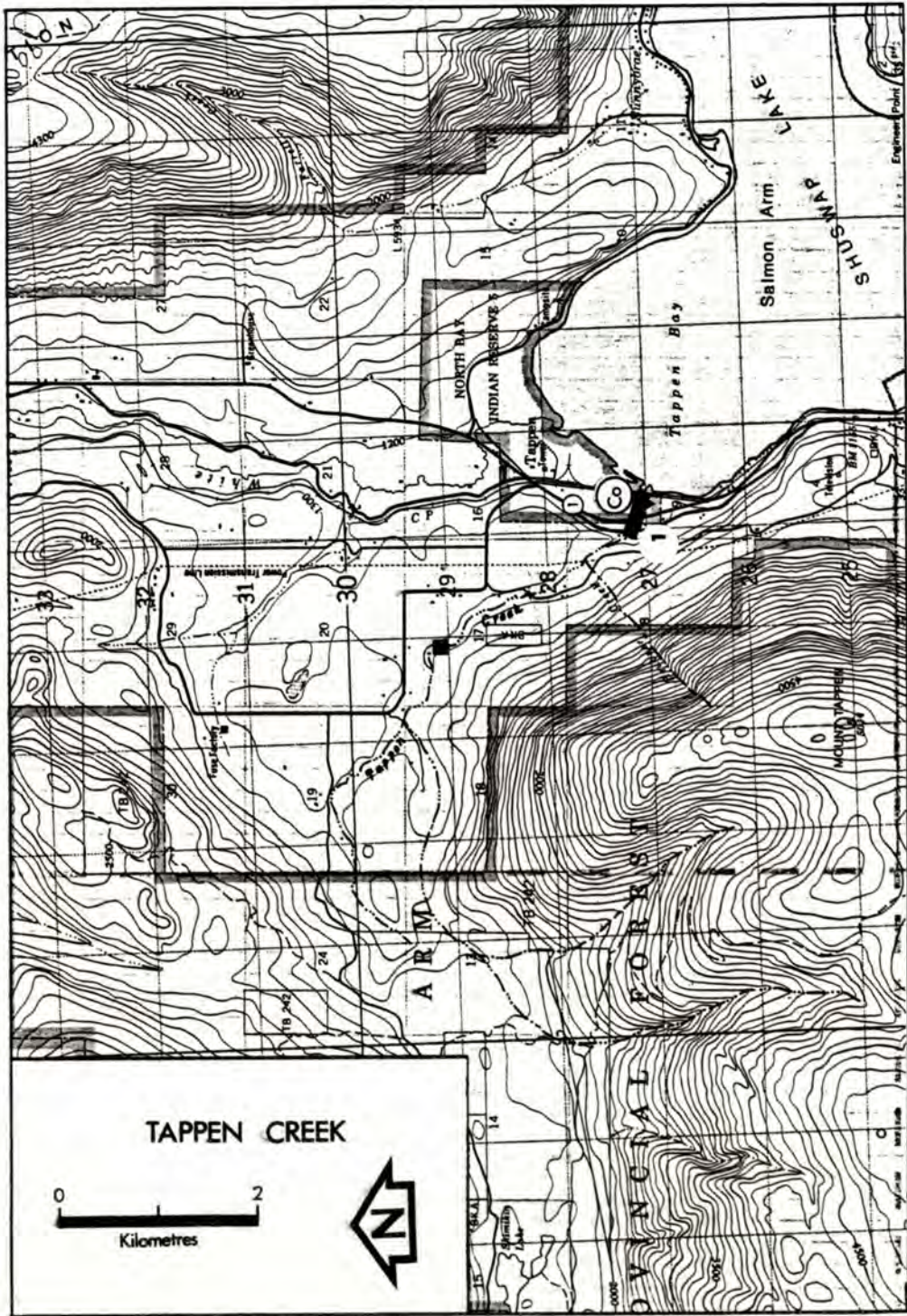
No escapement records prior to 1965.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Not available.

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1978 survey.



BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
29/10/78	Coho	3 ₂	2	54.8	-	-	-	-



17. SALMON RIVER .50°119°NE

LOCATION

Flows easterly and then north into the south end of Salmon Arm, Shuswap Lake (Kamloops District).

DESCRIPTION

The Salmon River is a moderate-sized meandering stream of low to moderate gradient. It was surveyed for coho in early December, 1978. No chinook survey was conducted. The main section surveyed extended from Falkland (approximately 48.0 km from the mouth) to the highway bridge 4.0 km upstream.

The substrate in the surveyed area consisted of sand, pebble and silt with much submerged vegetation. The banks are fairly stable with a moderate deciduous canopy in the upper reaches. Spawning potential for coho is moderate and rearing potential good.

During the summer, this stream has low flows and warm water temperatures. In addition, agricultural encroachment is introducing the adverse effects of cattle breaking down banks, higher nutrient input and

extensive water use for irrigation. Low flows and thick gravel beds cause the stream to flow underground at Westwold, 56 km from the mouth. The main spawning bed lies between Silver Creek and Falkland and is used by both chinook and coho. It also appears that sockeye are beginning to utilize this system with observed escapements in 3 out of the last 5 years.

ENHANCEMENT

Enhancement potential in this river is fair to good. Moderate to good habitat, good road access, availability of hydro power, available groundwater and a good native stock of chinook and coho contribute to this assessment. The potential for a moderate sized incubation/rearing facility and the development of semi-natural rearing channels should be considered as well as improvements to natural spawning beds. Fencing to restrict livestock access to the stream and streambank revegetation is advised in some areas.

It is also recommended that a juvenile coho tagging program be instigated as escapement is good and most spawners concentrate in a distinct section.

HISTORICAL FLOW. cms (cfs).

1. Mean Monthly Discharge (1911 - 1951; 1951 - 1976): Station No. 08L E020 at Falkland

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
0.9 (32.1)	0.9 (31.4)	1.0 (36.6)	1.9 (67.8)	10.2 (360)	8.0 (284)	3.1 (108)	1.7 (59.7)	1.4 (49.1)	1.3 (46.7)	1.3 (44.6)	1.0 (37.0)

2. Mean Monthly Discharge (1911 - 1976): Station No. 08L E021 near Salmon Arm

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
2.4 (85.7)	1.9 (65.8)	2.6 (90.8)	4.6 (164)	18.0 (632)	14.0 (494)	4.3 (152)	2.4 (84.5)	2.0 (70.8)	2.1 (72.3)	2.2 (79.2)	2.0 (68.8)

• Mean Yearly Discharge

1. 2.8 cms (98.7 cfs)
2. 6.2 cms (219.0 cfs)

• Maximum Daily Discharge

1. 49.0 cms (1,730.0 cfs)
2. 40.8 cms (1,440.0 cfs)

• Minimum Daily Discharge

1. 0.3 cms (9.9 cfs)
2. 0.6 cms (21.2 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	200	150	300	350	447 *	190	250
Coho	900	900	1,588	1,500	2,200 *	1,185	1,349

* Excludes 1954.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Middle July	September	Middle September	Late September
Coho	Middle October	Late October	November	Late November
Sockeye *	Middle September	October	Late October	November

* Only 4 runs of sockeye reported since 1947 (1952, 1974, 1977 and 1978).

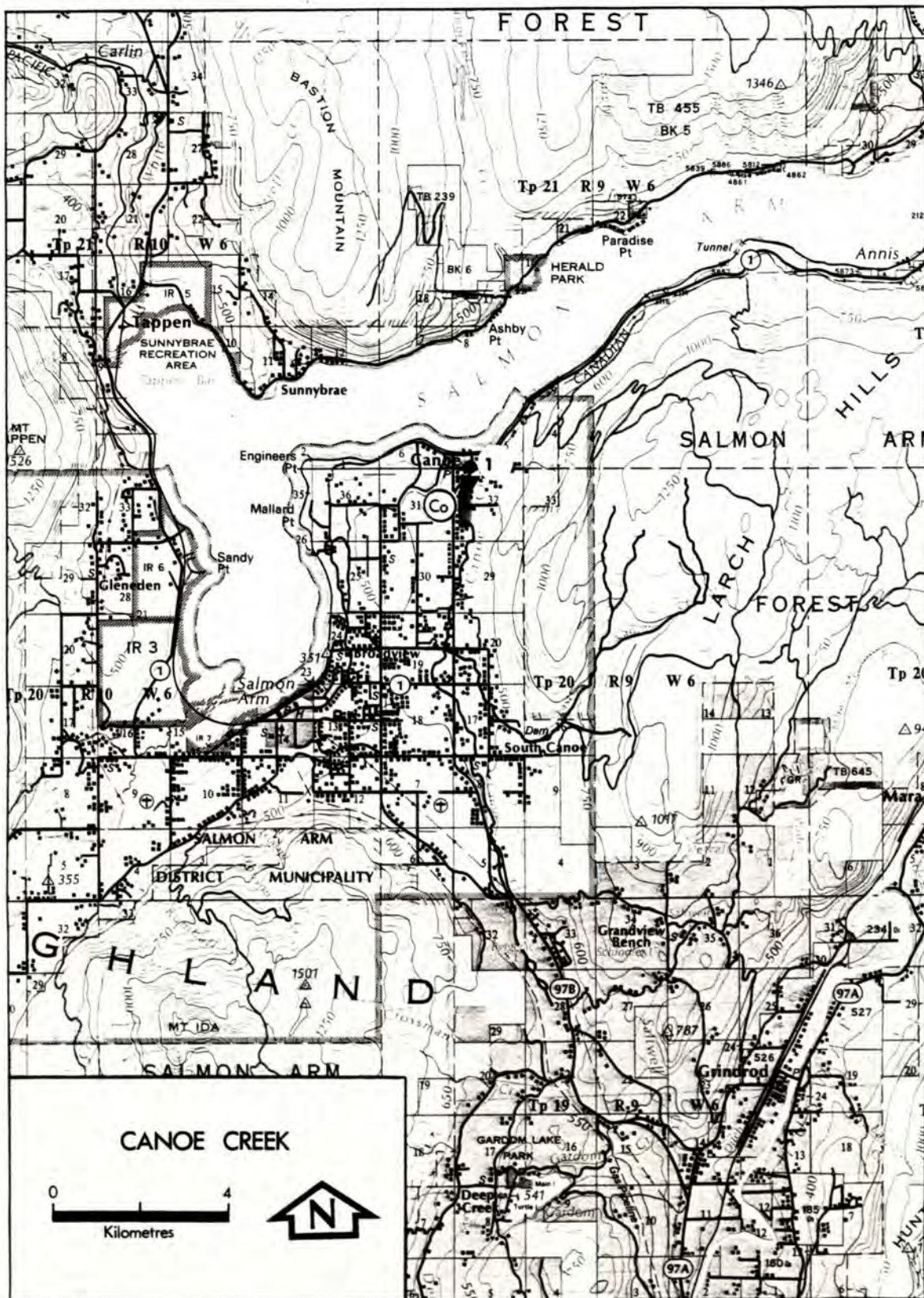
PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
07/12/78	<u>Site No. 1</u> Bridge at Falkland	14.0	0.35	0.38	1.5	0.5	-12.0	12.0	8.5

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
12/78	Coho	3 ₂	3	46.8	-	6	47.6	+ 5.1
		R	1	-	-	3	-	-



18. CANOE CREEK .50° 119° NE

LOCATION

Flows north into Salmon Arm at the town of Canoe, Shuswap Lake (Kamloops District).

of water being diverted for irrigation, flows are very low. Spawning potential for coho is limited, as evidenced by low escapements. Rearing potential is moderate.

DESCRIPTION

Canoe Creek was surveyed for coho in mid-November, 1978. The substrate over the surveyed section, approximately 5 km, was sand, silt and pebble. The banks at the top end were stable but in the lower end became subject to livestock abuse and farm vehicle intrusion. Numerous small and large log jams are present as well as one large impassable beaver dam at 2.0 km. Due to a large portion

ENHANCEMENT

Although the stream is small, enhancement potential is moderate with possible projects including a small incubation facility using pumped groundwater, stream improvements to increase spawning and rearing areas, clearance of obstructions, control of agricultural access by fencing and fry stocking above beaver dams. Road access is good and hydro power available.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1911 - 1912; 1957 - 1962): Station No. 08L E004 near Salmon Arm

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
0.08 (2.7)	0.10 (3.4)	0.09 (3.3)	0.43 (15.1)	0.62 (21.9)	0.19 (6.7)	0.08 (2.9)	0.07 (2.5)	0.09 (3.1)	0.17 (6.0)	0.16 (5.8)	0.13 (4.6)

- Mean Yearly Discharge Insufficient data
- Maximum Daily Discharge 1.02 cms (42.3 cfs)
- Minimum Daily Discharge 0.03 cms (1.1 cfs)

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Coho *	30	10	-	100	-	-	32 ¹

* No records prior to 1968.

¹Excludes 1977.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	Late October	November	Late November

PHYSICAL AND CHEMICAL CHARACTERISTICS.

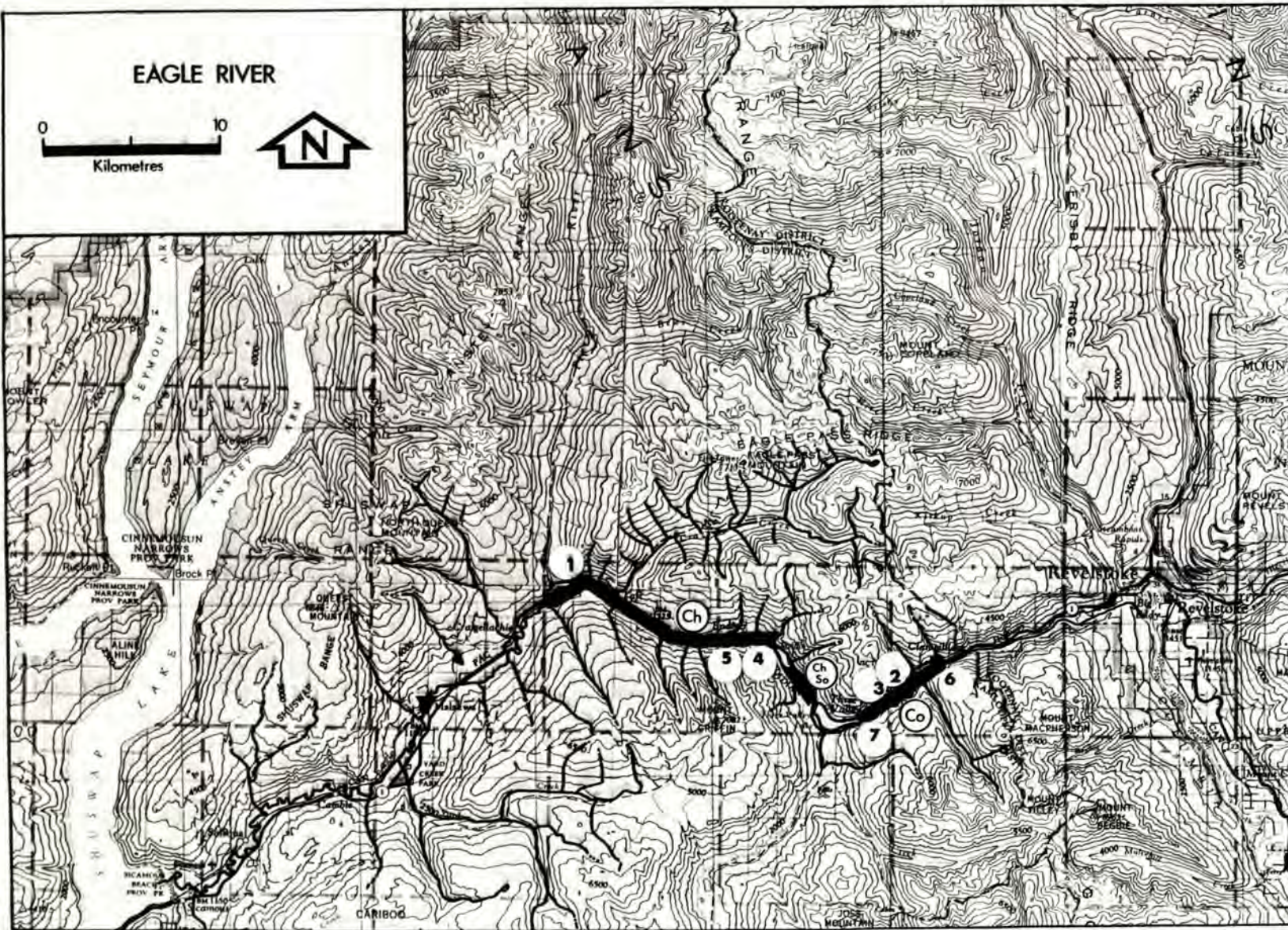
Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius) Water	Air	Dissolved Oxygen (ppm)	pH
08/11/78	Site No. 1 Immediately above Highway No. 1 bridge	2.0	0.15	0.5	-	6.0	-	10.0	9.0

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
08/11/78	Coho	32	-	-	-	1	47.2	-

EAGLE RIVER



LOCATION

Flows southwest into Shuswap Lake, near Sicomous (Kamloops District).

DESCRIPTION

Eagle River was surveyed for chinook in late September, 1978 and for coho in late October, mid-November and early December, 1978. There were five main sections surveyed together comprising the whole river - a total distance of 67.7 km.

The Eagle River originates near Revelstoke on the divide between the Columbia and Fraser River watersheds. This stream supports populations of coho, chinook, sockeye, kokanee, dolly varden and rainbow trout. Its largest tributary, the Perry River, contributes nearly one-third of the Eagle River's downstream flow. The Perry River, being glacially fed, has a high silt load and much lower temperatures than the Eagle River mainstem. Below this confluence spawning is very limited owing to siltation of the spawning gravel and reduced incubation temperatures.

The main spawning beds in the mainstem of Eagle River lie in the region between Griffin Lake and the Perry River confluence. These beds are utilized by all species with coho and chinook use heaviest between Griffin Lake and

the town of Endiver. Light coho use extends beyond Three Valley Lakes into the Lower South Pass Creek and along the mainstem to just above Victor Lake.

The substrate in the reaches above Perry Creek confluence is predominantly cobble/pebble/sand with some silt and boulder. Spawning and rearing potential for coho and chinook is moderate to good. Several log jams are present but none present barriers.

The mainstem area below Perry Creek confluence is slow moving, meandering and of low gradient. Spawning and rearing potential in this area is very limited.

ENHANCEMENT

Enhancement potential is good due to ease of road access, availability of hydro power and good native chinook and coho stocks. Projects could include a moderately sized incubation/rearing facility using gravity feed groundwater, development of semi-natural rearing channels, lake rearing in floating pens and juvenile plants in underutilized rearing areas.

Although enhancement potential is good, a detailed study of this system should be instigated prior to any projects. Due to the multiple species use of this river, improper enhancement techniques may jeopardize complex interactions and the present natural success.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1913 - 1916; 1955 - 1976): Station No. 08L E024
Located on the Eagle at Malakwa

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
8.4 (298)	8.4 (298)	11.6 (409)	32.6 (1,150)	82.2 (3,080)	129.0 (4,570)	77.9 (2,750)	35.7 (1,260)	23.2 (819)	21.0 (742)	17.7 (624)	10.8 (382)

- Mean Yearly Discharge 40.0 cms (1,410.0 cfs)
- Maximum Daily Discharge 345.5 cms (12,200.0 cfs)
- Minimum Daily Discharge 3.5 cms (123.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	300	250	756	400	1,565	930	432
Coho	1,400	1,100	2,694	2,000	2,625	1,875	1,774

<u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye	108	8	190	6,481

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Middle August	Middle September	Late September	October
Coho	October	Late October	Middle November	December
Early sockeye	Late August	September	Middle September	October
Late sockeye	Middle September	October	Late October	November

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u> <u>Water</u> <u>Air</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
30/09/78	<u>Site No. 1</u> Below Three Valley, above Perry River confluence	19.5	0.50	1.30	0.75	10.5	15	16.0	7.3
28/10/78	<u>Site No. 2</u> Victor Lake outlet	7.7	0.24	0.75	-	11.0	-	17.0	7.0
28/10/78	<u>Site No. 3</u> Upstream from Three Valley Lake	3.0	0.30	-	Low to Moderate	-	-	-	-
13/11/78	<u>Site No. 4</u> Just below Griffin Lake	18.0	0.35	1.0	1	1.0	-	-	-
13/11/78	<u>Site No. 5</u> Below Griffin Lake just below highway bridge	10.0	1.50	-	-	-	1.0	-	-
14/11/78	<u>Site No. 6</u> Below Clanwilliam Lake	1.5	0.40	-	Moderate to High	-	-	-	-
14/11/78	<u>Site No. 7</u> Below Victor above Three Valley	6.5	0.40	1.0	-	1.0	-2.0	-	-

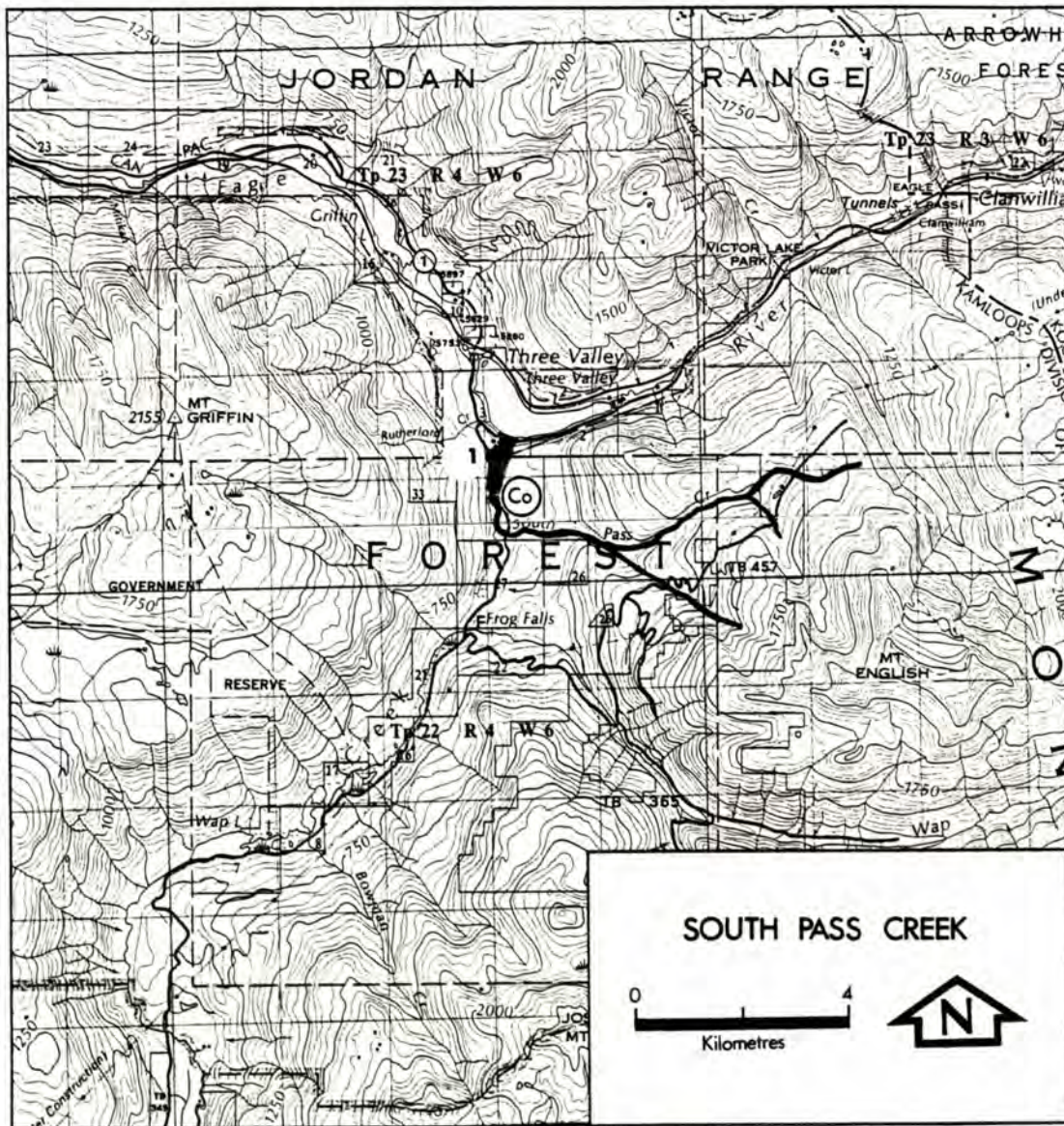
BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
30/09/78	Chinook	3 ₁	-	-	-	4	60.9	+ 12.9
		4 ₁	-	-	-	1	65.2	-
28/10/78	Coho	3 ₂	12	50.3	+ 3.6	20	49.6	+ 1.5
13, 14/11/78		4 ₃	1	42.3	-	-	-	-
		R	1	46.5	-	4	47.4	+ 3.5

Juvenile Sampling

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x} Nose-Fork Length (mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
30/09/78	At Taft Road minnow traps	0900	1300	-	-	-	-	-



20. SOUTH PASS CREEK .50° 118° NE - 68 -

LOCATION

Flows north into Three Valley Lake, Eagle River, Shuswap Lake (Kamloops District).

Rearing potential for coho is also limited due to the stream's small size and lack of pool habitat.

DESCRIPTION

South Pass Creek was surveyed for coho in mid-November, 1978. The area surveyed extended from 2 km upstream to the mouth. This small stream is very shallow and narrow with a thick canopy completely enclosing the stream. The substrate is composed mainly of sand and pebble, with coho spawning potential limited and restricted to the initial 500 m.

ENHANCEMENT

Although road access is moderate and hydro power available, enhancement potentials are limited, due to low stream flows. A potential project could include a small incubation/rearing facility using transplanted donor stock.

HISTORICAL FLOW.

No record.

ESCAPEMENT AND TIMING.

Escapement*

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Coho	20	20	40	50	-	-	-

* Prior to 1973, escapements were included with those to Eagle River.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	October	Late October	Middle November	December

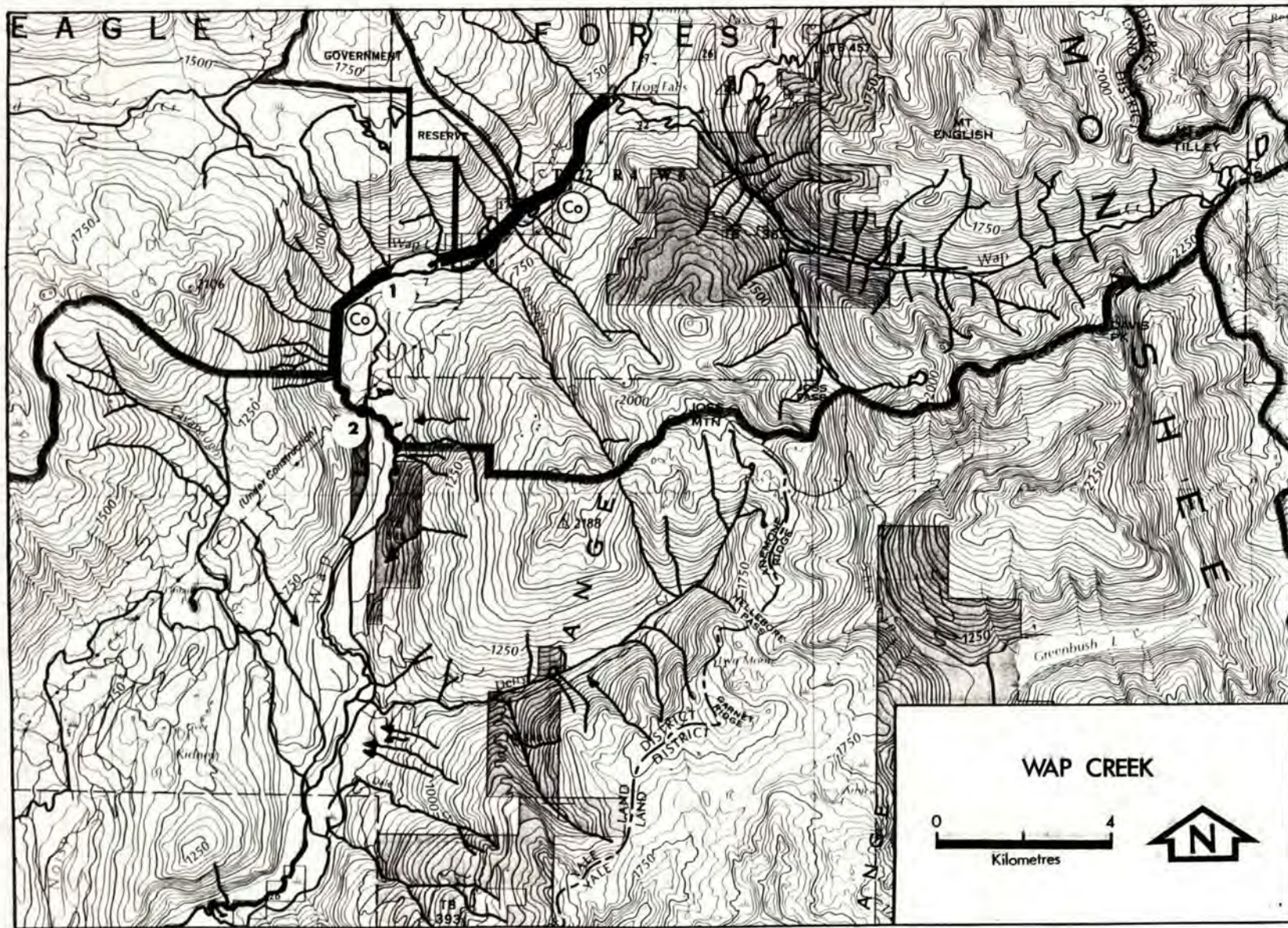
PHYSICAL AND CHEMICAL CHARACTERISTICS.

No sampling.

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
13/11/78	Coho	3 ₂	-	-	-	1	45.9	-



21. WAP CREEK .50° 118° NW

LOCATION

Flows southwest into west end of Mabel Lake (Kamloops District).

is predominantly cobble/pebble in the runs with sand and silt in the pools. Coho spawning and rearing potential is moderate to good throughout, but present use is limited to the vicinity of Wap Lake.

DESCRIPTION

Wap Creek was surveyed for coho in late October and mid-November, 1978. No chinook survey was conducted.

Although only coho presently utilize this stream, the potential for chinook is also good.

ENHANCEMENT

Wap Lake is located 23.1 km upstream from the mouth. Wap Creek was surveyed from 7.4 km above the lake to 9.4 km below the lake. Spot checks were also made on the creek further downstream.

Due to the underutilization of good spawning and rearing habitat, enhancement potentials are moderate to good. Potential projects for this stream could include a small incubation/rearing facility for coho and chinook, chinook egg or fry plants, fry stocking behind beaver dams, pen rearing in Wap Lake and development of a semi-natural spawning/rearing channel. Access to this system is moderate via logging roads. Hydro power is not available.

Wap Creek is a medium-sized stream of moderate gradient with access for salmon up to Frog Falls, approximately 29 km from the mouth. This creek exhibits extensive braiding and secondary channel formation as a result of beaver activity and log jams. The substrate

HISTORICAL FLOW.

No record.

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Coho *	175	20	516	300	-	-	189

* No records prior to 1968.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	October	November	Middle November	December

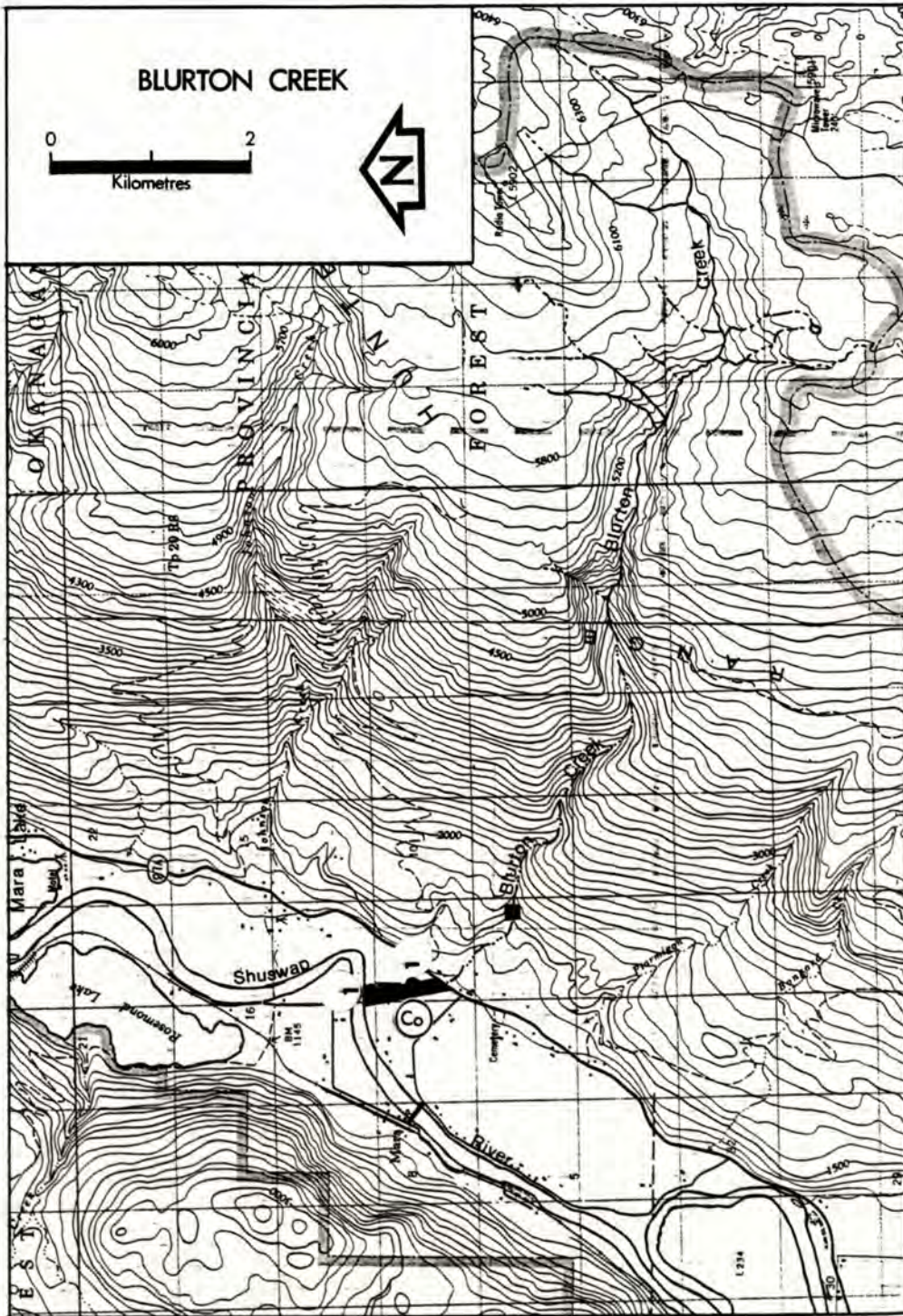
PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
12/11/78	<u>Site No. 1</u> At Wap Lake outlet	16.0	0.4	0.7	-	1.0	5.0	-	-

<u>Date</u>	<u>Location</u>	<u>Mean Wetted</u>	<u>Mean</u>	<u>Surface</u>	<u>Estimated</u>	<u>Temperature</u>		<u>Dissolved</u>	<u>pH</u>
		<u>Width (m)</u>	<u>Depth (m)</u>	<u>Velocity</u>	<u>Gradient</u>	<u>(Celsius)</u>		<u>Oxygen</u>	
				<u>(mps)</u>	<u>Per Cent</u>	<u>Water</u>	<u>Air</u>	<u>(ppm)</u>	
12/11/78	<u>Site No. 2</u>	6.0	0.5	1.25	Moderate	2.5	-1.0	12	7.25
	Second bridge outlet (13.7 km up from mouth)								

BIOLOGICAL SAMPLING DATA.

No biological sampling during 1978 survey.



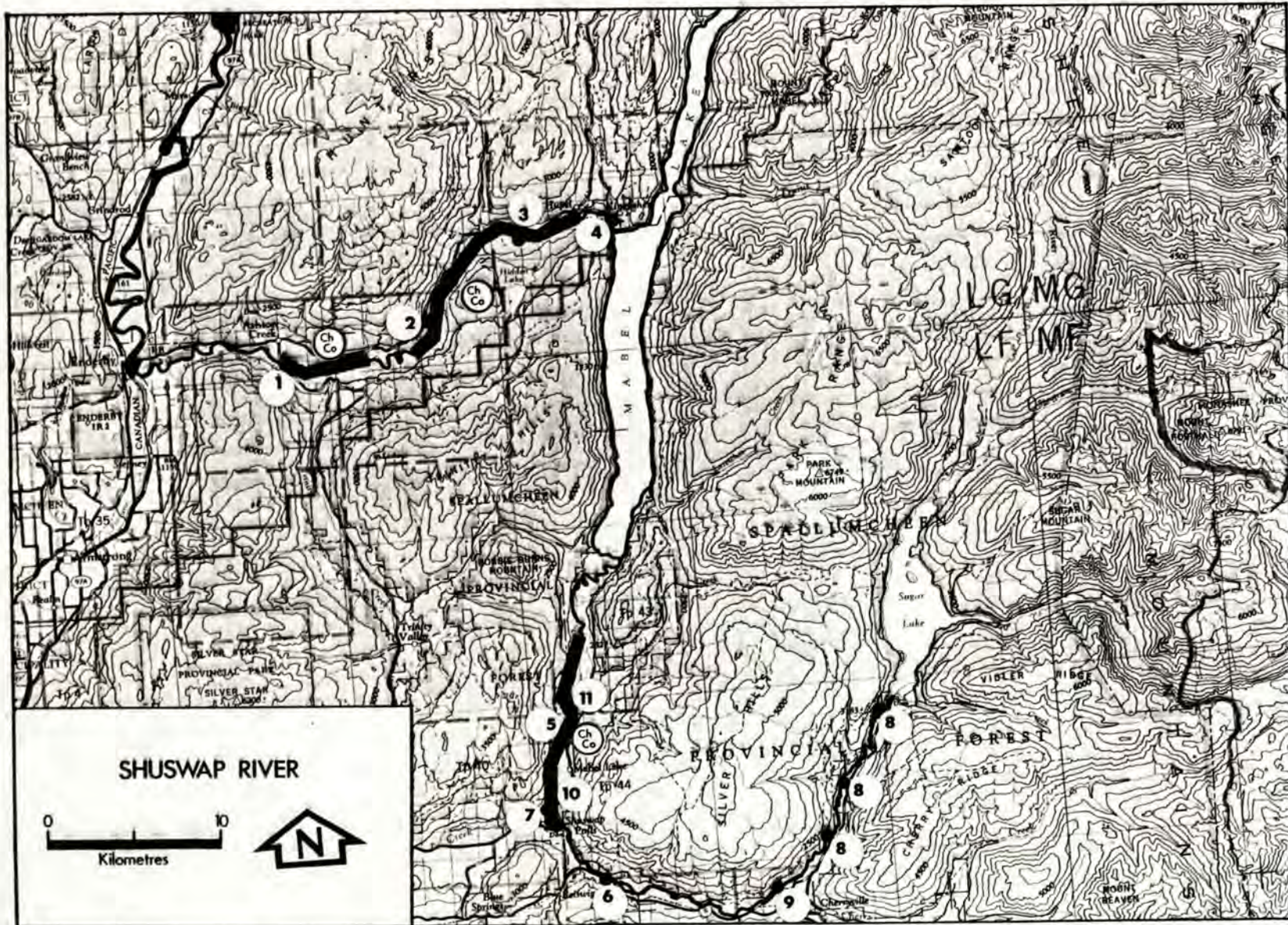
BLURTON CREEK



BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
	Coho	3 ₂	-	-	-	1	38.6	-



LOCATION

Flows through Sugar and Mabel Lakes and into the south end of Mara Lake (Kamloops District).

DESCRIPTION

Lower Shuswap River

The Lower Shuswap River from Mabel Lake to Mara Lake was surveyed for chinook in early and mid-October, 1975, early and mid-October, 1976, October, 1977 and in mid-October, 1978. There were four main sections surveyed from Mabel Lake to the Trinity Valley Road Bridge totalling 27.9 km. No coho survey was done on the mainstem proper.

The Shuswap River from Enderby to Mabel Lake is very wide and deep, of low gradient and meandering with large oxbows present. The substrate in this area is predominantly fines. Spawning potential for coho and chinook is poor and rearing potential limited.

The main spawning bed is between Ashton Creek and the town of Hupel with the heaviest concentrations near Hupel, just below Skookumchuck Rapids. The substrate in this area is predominantly cobble/pebble with some boulder and sand. Spawning and rearing potential for chinook is excellent and moderate for coho. In the area of "The Islands", bar and side channel formations are prevalent.

Middle Shuswap River

The Middle Shuswap River, between Sugar Lake and Mabel Lake, was surveyed for chinook in mid-October, 1975, in late October, 1976, in mid-October, 1977 and in mid and late October, 1978. The surveys concentrated on an area of 8.0 km downstream of Shuswap Falls Dam.

HISTORICAL FLOW. cms (cfs).

Lower Shuswap River

- Mean Monthly Discharge (1912 - 1935; 1962 - 1976): Station No. 08L C002 near Enderby

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
32.9 (1,160)	29.7 (1,050)	29.5 (1,040)	63.7 (2,250)	188.0 (6,640)	294.0 (10,400)	174.0 (6,150)	69.1 (2,440)	51.3 (1,810)	47.9 (1,690)	46.2 (1,630)	37.9 (1,340)

- Mean Yearly Discharge 88.0 cms (3,100.0 cfs)
- Maximum Daily Discharge 625.8 cms (22,100.0 cfs)
- Minimum Daily Discharge 10.6 cms (376.0 cfs)

In 1977, a survey was also conducted above Whiskey Dam to determine habitat potential.

The Middle Shuswap is similar to the lower in that the main spawning beds are located in the upper accessible reaches. The lower 6.4 km is composed mainly of deep, meandering oxbows with a substrate of fines unsuitable for spawning. The upper 16 km to the dam has a substrate composed primarily of cobble/pebble with boulder and bedrock intermixed in the upper end and more sands in the lower end. Coho and chinook spawning potential is moderate and rearing potential moderate to limited.

Above Shuswap Falls Dam to Brenda Falls at the Sugar Lake outlet approximately 32 km of moderate to excellent chinook spawning/rearing habitat is found.

Coho habitat in this area is moderate to good. Extensive braiding occurs in the central 15 to 20 km.

ENHANCEMENT

Both the Middle and Lower Shuswap Rivers have been identified as having the potential for major facilities such as hatcheries, and spawning/rearing channels. Donor stock for those projects can be obtained from both rivers. In addition, floating pens for rearing can be utilized in Mabel Lake.

In order for enhancement to succeed in the inaccessible Middle Shuswap, mitigating the severity of the dam is of prime concern. Provision of fishways for migrating adults and juveniles are seen as mitigative alternatives. A gravity feed water supply from the dam could be used for a major enhancement facility. In both these rivers, road access is good and hydro power available.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook - Lower	17,500	2,500	9,500	10,400	3,625	5,650	8,863
- Middle	600	400	550	350	1,083 ¹	770	494
Coho - Lower	100	40	100	300	2,250 ²	810	158
- Middle	250	60	594	350	1,581 ³	980	382

¹Excludes 1954.

²Excludes 1951/1952/1954.

³Excludes 1951/1952.

<u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye - Lower	9,484	102	5,500	97,000
- Middle	83	-	4	6,316

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook - Lower	Middle July	End October	End October	End November
- Middle	Middle July	Middle September	Late September	Middle October
Coho - Lower	End October	November	Middle November	Late November
- Middle	Middle October	Late October	-	Late November
Sockeye - Lower	Late September	End October	-	End November
- Middle	October	Middle October	-	November

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Lower Shuswap River

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
16/10/75	<u>Site No. 1</u> Upstream from Ashton Creek	25.5	0.8 - 0.9	-	-	12.0	-	-	7.8
08/10/76	<u>Site No. 2</u> Immediately upstream from Kingfisher Creek	50.0	0.8	1.0	-	13.0	-	10.5	7.2
18/10/77	<u>Site No. 3</u> Mabel Lake to 7.0 km down	-	1.5	0.3 - 2.0	-	10.5	-	11.0	7.8
14/10/78	<u>Site No. 4</u> Near Poitre Road	-	-	-	-	11.5	8.5	15.0	8.4

Middle Shuswap River

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
16/10/75	<u>Site No. 5</u> 7.2 km down from Shuswap Falls	30.0	1.1	-	-	9.0	-	-	7.6
16/10/75	<u>Site No. 6</u> 3.0 km up from Shuswap Falls	26.0	1.0	-	-	9.0	-	-	8.0
11/10/77	<u>Site No. 6</u> 3.0 upstream from Shuswap Falls	15.0	6.0	0.65	-	9.0	5.0	-	-
08/10/76	<u>Site No. 7</u> 1 km down from Shuswap Falls	35.0	1.0	-	-	10.0	-	10.5	7.8
07/10/77	<u>Site No 8</u> From Brenda Falls to 10 km down	23.0	-	0.65	1.0 (0.50)	8.5	6.0	-	-
08/10/77	<u>Site No. 9</u> Near Cherry Creek	23.0	0.65	0.65	0.3 (0.20)	8.5	7.0	-	-
19/10/77	<u>Site No. 10</u> Downstream from Shuswap Falls	25.0	1 to 2	0.3 (pool) 2.0 (rapid)	-	10.0	-	11.0	8.2
12/10/78	<u>Site No. 11</u> 8.0 km down from Shuswap Falls	-	-	1.1	-	9.0	9.0	16.0	7.8

BIOLOGICAL SAMPLING DATA.

Adult Sampling

Lower Shuswap River

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
10/75	Chinook	2 ₁	7	33.2	+ 1.2	-	-	-
		3 ₁	3	60.0	-	4	56.5	+ 9.9
		4 ₁	24	72.2	+ 1.6	57	67.0	+ 0.8
		4 ₂	2	68.7	-	-	-	-
		R	1	31.2	-	2	69.8	-

Lower Shuswap River - Continued

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
10/76	Chinook	2 ₁	7	33.0	+ 4.9	-	-	-
		3 ₁	9	50.9	+ 4.2	3	55.0	-
		3 ₂	1	49.5	-	-	-	-
		4 ₁	5	69.6	+ 7.4	11	66.9	+ 4.1
		4 ₂	-	-	-	1	65.5	-
		5 ₁	2	82.1	-	5	71.8	+ 7.0
		5 ₂	1	80.5	-	1	72.6	-
		R	1	28.5	-	-	-	-
10/77	Chinook	2 ₁	6	38.3	+ 8.0	-	-	-
		3 ₁	14	57.8	+ 5.8	20	63.4	+ 2.8
		4 ₁	17	68.8	+ 3.8	35	67.6	+ 1.1
		4 ₂	1	66.0	-	-	-	-
		5 ₁	2	77.0	-	1	72.0	-
		R	-	-	-	4	66.8	+ 4.9

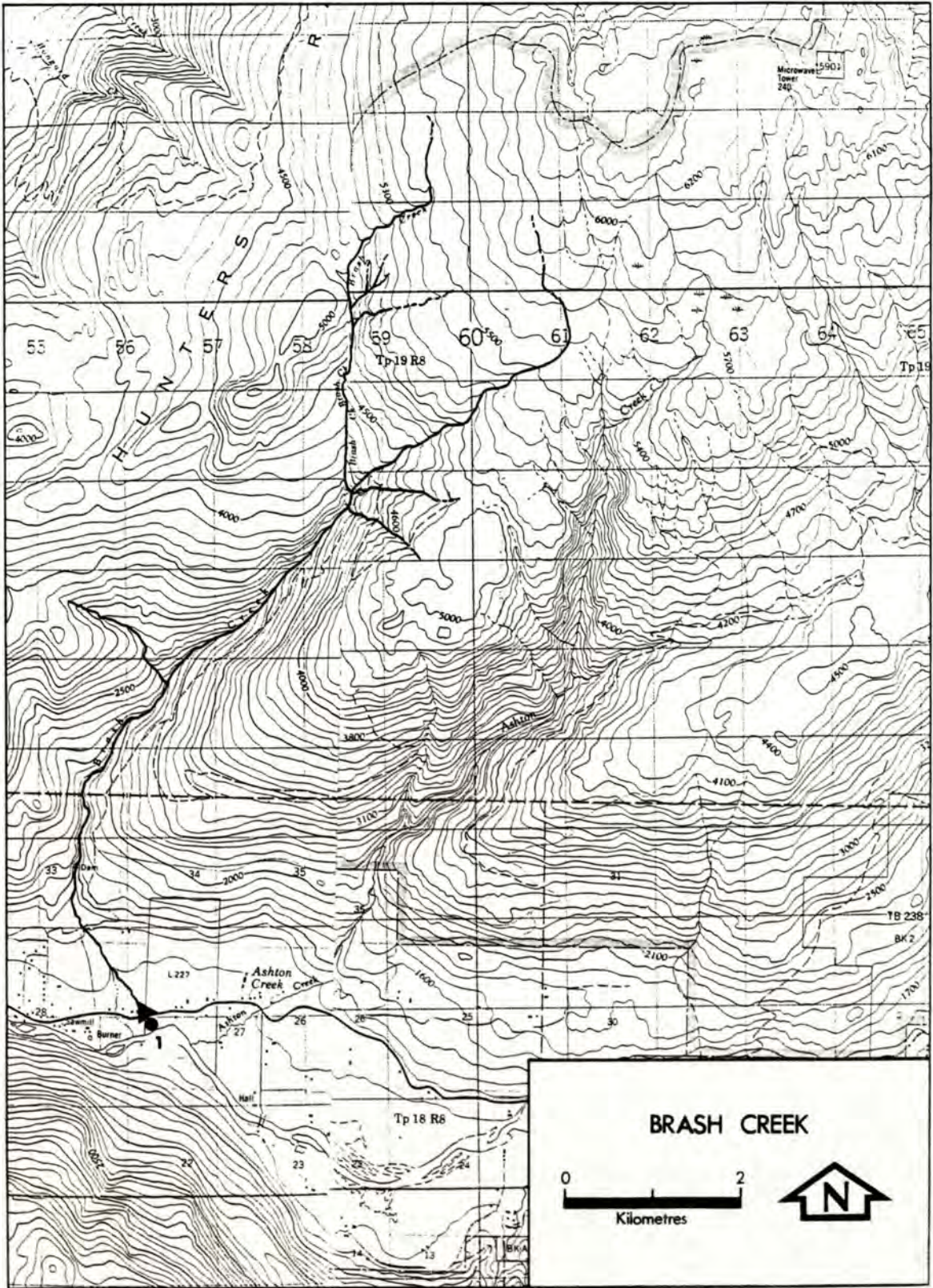
Middle Shuswap River

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
10/76	Chinook	3 ₁	1	58.8	-	2	60.2	-
		4 ₁	5	72.0	+ 4.5	11	69.6	+ 1.4
		4 ₂	1	56.3	-	2	59.2	-
		5 ₂	2	72.5	-	1	73.9	-
		R	1	72.0	-	1	66.8	-
10/77	Chinook	2 ₁	1	41.0	-	-	-	-
		3 ₁	4	56.7	+ 7.2	27	58.7	+ 1.4
		3 ₂	1	31.2	-	1	53.0	-
		4 ₁	7	71.8	+ 4.9	32	67.3	+ 1.3
		4 ₂	3	68.8	-	9	61.2	+ 3.1
		R	3	-	-	-	-	-
10/78	Chinook	3 ₁	-	-	-	8	64.0	+ 5.6
		4 ₁	-	-	-	1	77.1	-

Juvenile Sampling

Lower Shuswap River

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x} Nose-Fork Length (mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
18/10/77	0.5 km up from Fall Creek (minnow traps)	1130	1500	Ch	1	-	-	1 Sculpin 2 Squawfish 9 Shiners
14/10/78	At Poitre Road (minnow traps)	1000	1600	-	-	-	-	4 Dace 3 Long Nose Suckers
19/10/77	8.0 km down from Shuswap Falls (minnow traps)	1130	1430	-	-	-	-	2 Squawfish 6 Suckers 1 Sculpin 2 Red-Sided Shiners



24. BRASH CREEK .50°119°NE - 82 -

LOCATION

Brash Creek flows southeast into Lower Shuswap River near the town of Ashton Creek (Kamloops District).

Stream banks are barren with isolated patches of deciduous growth. The stream character is predominantly shallow riffle with isolated pools. Coho spawning and rearing potential is limited.

DESCRIPTION

This small low gradient stream was surveyed for coho in late October, 1978. The area surveyed extended from the Enderby-Mabel Lake Highway to the mouth, a distance of 0.7 km. This stream has very limited potential due to its small size. The streambed is composed mainly of pebble with some cobble and sand.

ENHANCEMENT

Hydro power and road access to this stream are good, but enhancement potential is limited. Possible projects could include placing stop logs in the stream to augment pools and the construction of a small incubation facility, although low flows and ice could present problems.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1915 - 1917; 1959 - 1967): Station No. 08L C004
Brash Creek near Enderby

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
0.07 (2.5)	0.07 (2.5)	0.15 (5.4)	0.74 (26.2)	1.44 (49.8)	1.46 (51.5)	0.49 (17.2)	0.16 (5.5)	0.18 (6.5)	0.20 (7.1)	(0.10) (3.7)	0.08 (2.7)

- Mean Yearly Discharge 0.43 cms (15.00 cfs)
- Maximum Daily Discharge 6.1 cms (214.0 cfs)
- Minimum Daily Discharge 0.01 cms (0.4 cfs)

ESCAPEMENT AND TIMING.

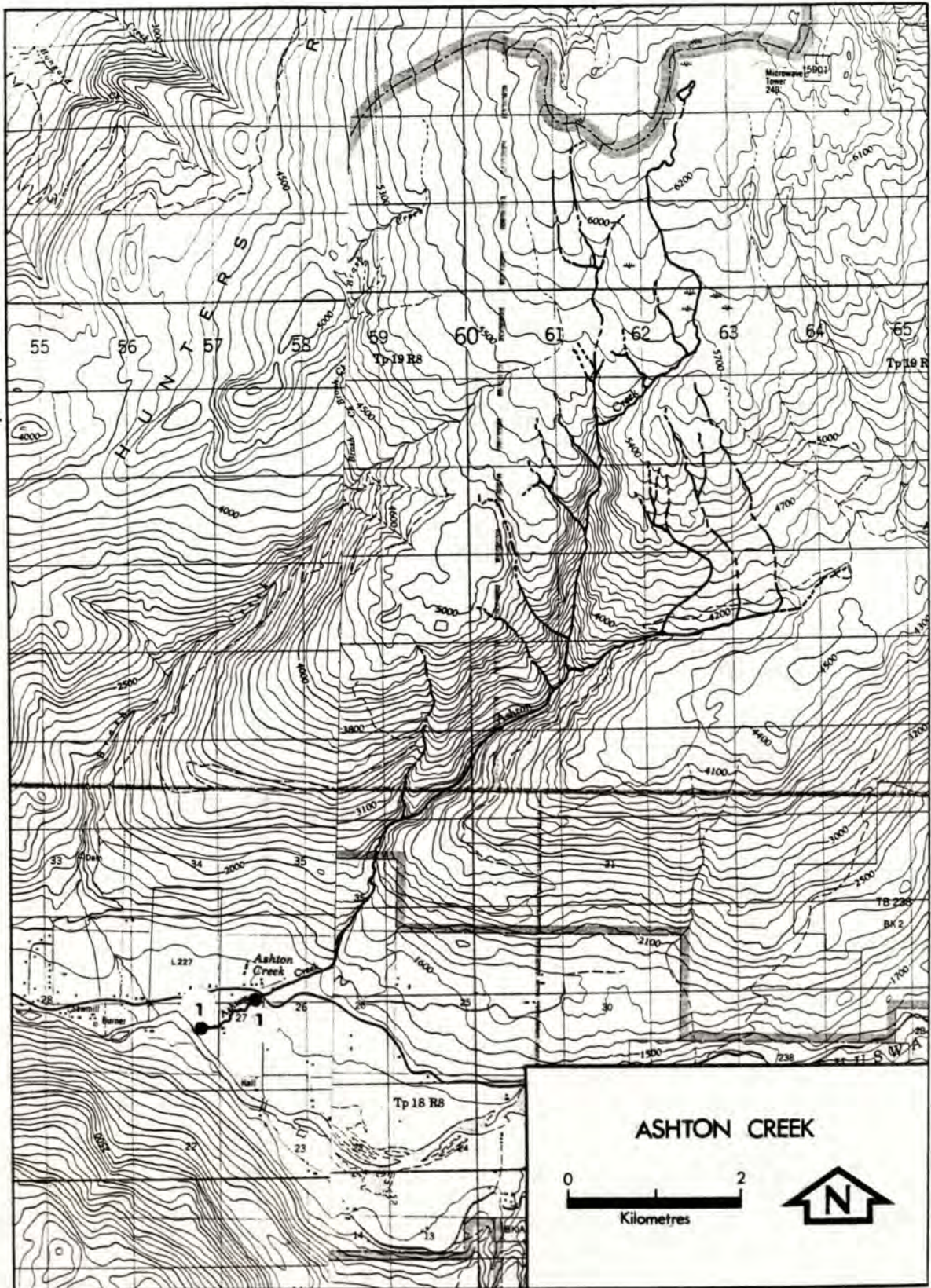
No record.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
26/10/78	Site No. 1 Bridge crossing to mouth	2.5	0.12	-	2.0	4	-	-	-

BIOLOGICAL SAMPLING DATA.

No biological sampling during 1978 survey.



25. ASHTON CREEK .50° 119° NE - 84 -

LOCATION

Flows southwest into Lower Shuswap River near the town of Ashton Creek (Kamloops District).

DESCRIPTION

Ashton Creek was surveyed for coho in early November, 1978. The section surveyed extended from Mabel Lake Highway to the mouth (0.3 km). This small stream has a moderate gradient with a streambed composed primarily of large cobble, offering very limited spawning potential. The banks are fairly stable with very little canopy cover. Spawning and rearing potential for coho is poor and limited to the vicinity of the mouth. No spawners were observed.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
08/11/78	<u>Site No. 1</u> At bridge 1.5 km upstream	2.0	0.2	0.5	5.0	4.5	-	18	8.2

ENHANCEMENT

Road access is good and hydro power is available. Enhancement potential is limited. Possible projects could include stream improvement for spawning as well as a small incubation facility. Possible problems that could be encountered are ice and low flows. In addition, donor stock would be required, but can be obtained from Lower Shuswap River.

HISTORICAL FLOW

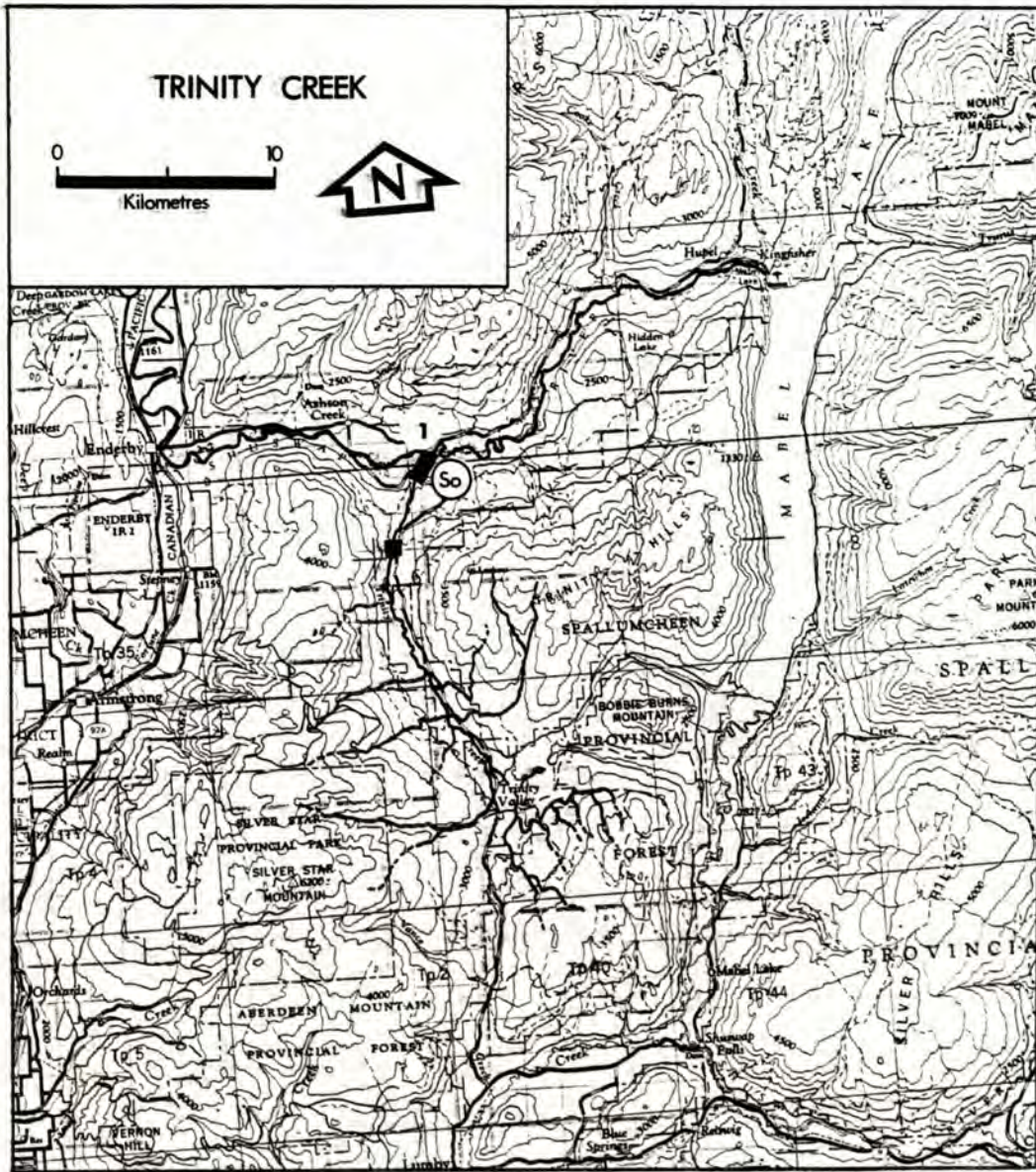
No record.

ESCAPEMENT AND TIMING

No record.

BIOLOGICAL SAMPLING DATA.

No biological sampling during 1978 survey.



26. TRINITY CREEK .50°119°NE

- 86 -

LOCATION

Flows north into Shuswap River, approximately 5 km east of the town of Ashton Creek (Kamloops District).

DESCRIPTION

Trinity Creek was surveyed for chinook and coho in late October, early November, and early December, 1978. The main section surveyed extended from 2.5 km above the Trinity Valley Road crossing to the mouth - a total length of approximately 5.0 km. The far upstream area was surveyed but found too steep and unsuitable for spawners.

During the survey four sockeye and approximately one thousand kokanee were observed spawning near the mouth. There were several obstructions located on this stream including a poorly placed road culvert at 2.5 km and a series of impassable falls beginning at 3.7 km.

In the 1.2 km section above the road culvert the substrate is predominantly pebble and cobble. The stream has a thick canopy of deciduous and coniferous growth, a moderate gradient and meanders slightly. Coho spawning and rearing potential is moderate to good.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
26/10/78	Site No. 1 Below road crossing	6.0	0.23	0.5	Moderate	3.0	-	-	-
08/11/78	Site No. 1 Below road crossing	8.0	0.30	0.5	-	4.5	-	-	-
11/12/78	Site No. 1 Below road crossing	-	-	-	-	1.3	-	-	-

BIOLOGICAL SAMPLING DATA.

No biological sampling during 1978 survey.

In the section below the bridge, the stream is similar to that above, except some braiding and side channeling is apparent as well as occasional bank slumping. The stream canopy in this area is primarily deciduous with grasses in the vicinity of the mouth. Coho habitat is moderate to good.

ENHANCEMENT

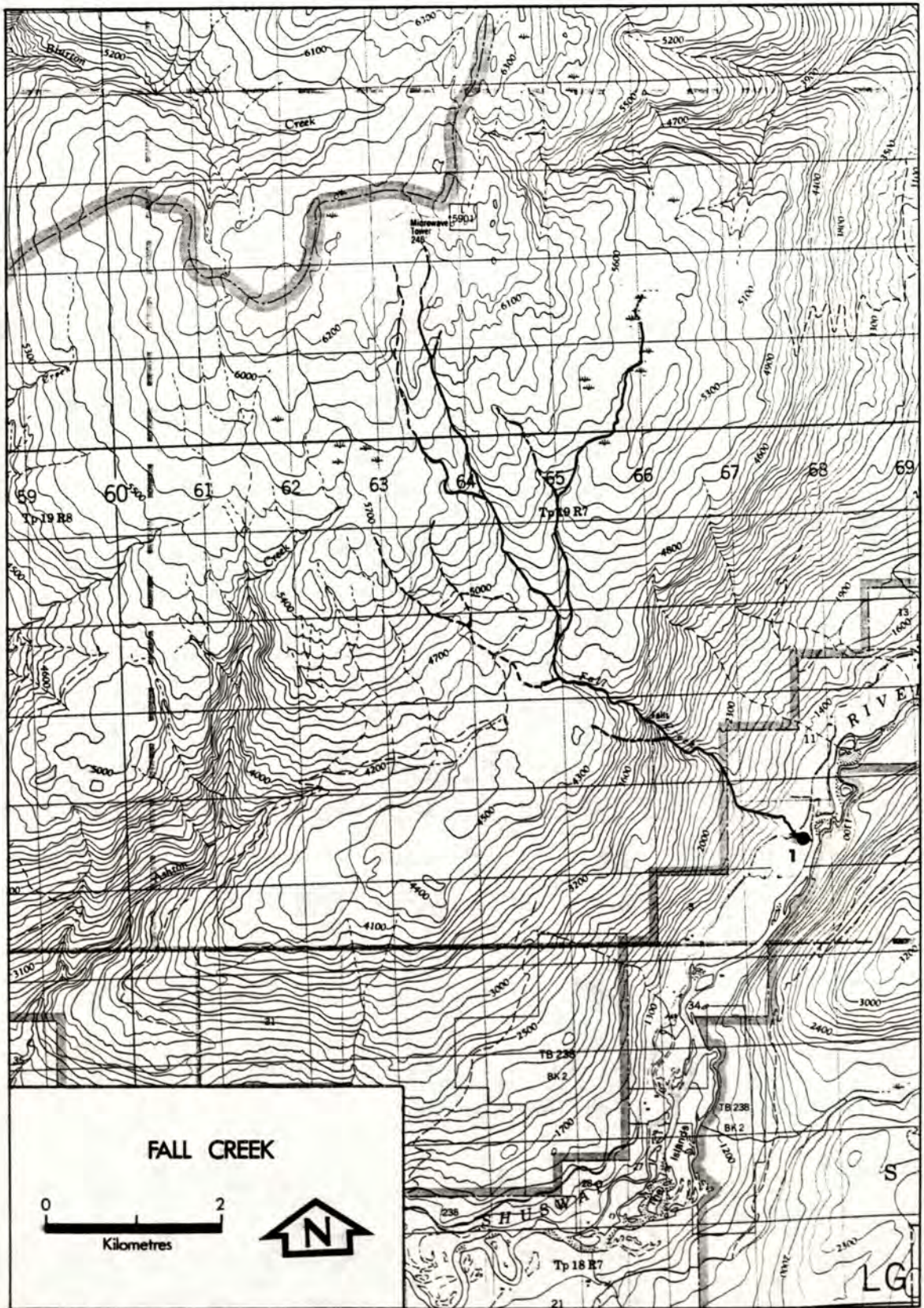
This tributary has the best potential for small projects enhancement on the Lower Shuswap drainage. Potential projects include a small incubation facility near the falls using a gravity feed system or available groundwater, fry transplants in upstream areas for rearing, stream improvements to create more pools for rearing, and mitigating access through the road culvert. Both road access and hydro power are available. In addition, the needed donor stock can be obtained from Lower Shuswap River.

HISTORICAL FLOW.

No record.

ESCAPEMENT AND TIMING.

No record.



27. FALL CREEK .50°119°NE

- 88 -

LOCATION

Fall Creek flows southeast into Lower Shuswap River, approximately 8.6 km downstream from Skookumchuck Rapids (Kamloops District).

DESCRIPTION

Fall Creek is a small mountain stream of steep gradient that was surveyed in late October and mid-December, 1978. The area surveyed was from 2 km upstream to the mouth. During the December survey, the stream was found to be iced over. The only habitat with potential fish use is limited to the initial 300 m. The substrate is coarse with very limited spawning potential. Lack of pool

development limits rearing potential. Low flows also restrict potential fish use.

ENHANCEMENT

Enhancement potential for this creek is poor, resulting from low flows, ice, a rapidly steepening gradient, and lack of potential fish habitat.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING

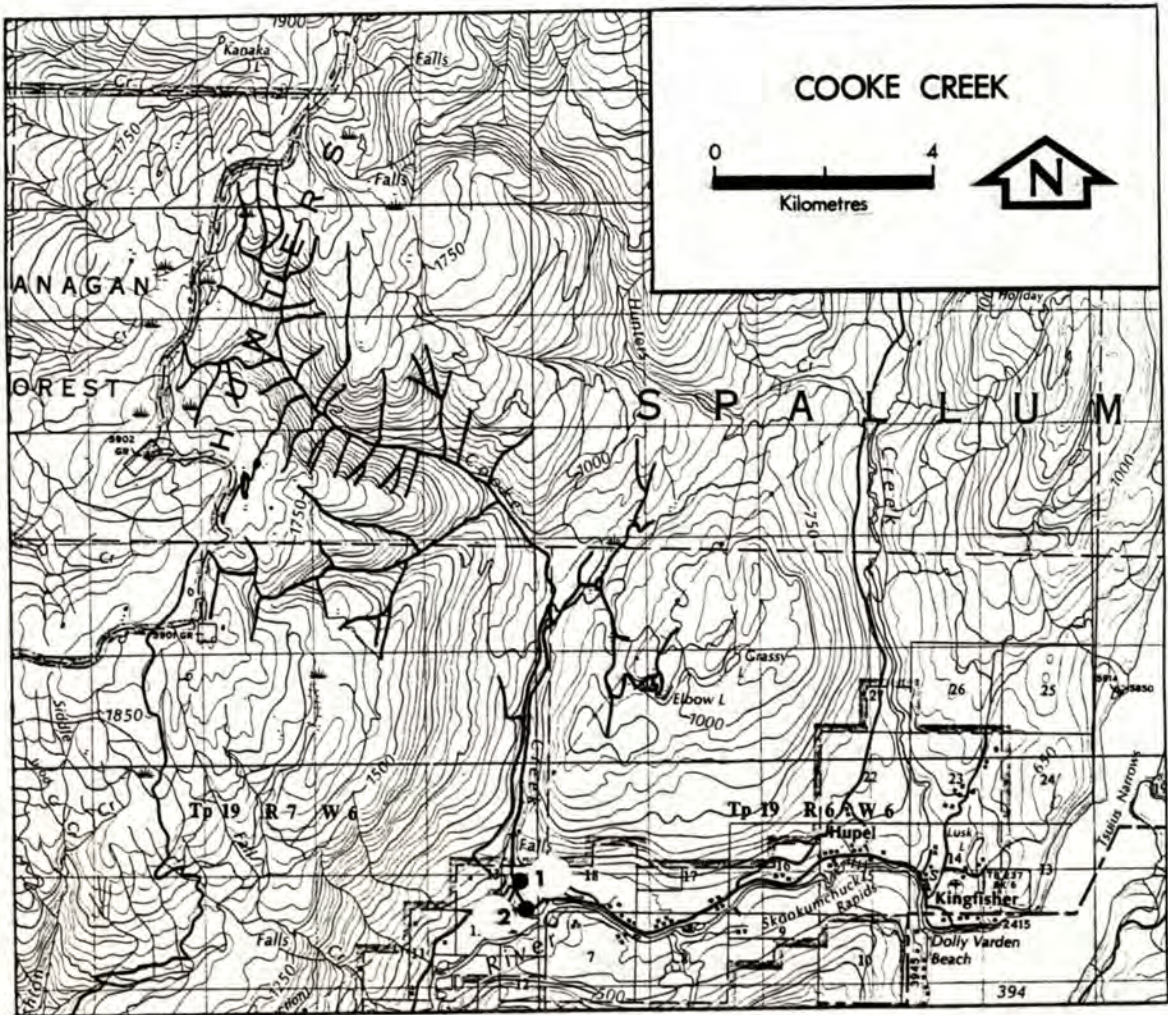
No record.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
24/10/78	Site No. 1	3.0	0.20	1.0	2 - 4	-	-	-	-
	Mouth to 0.7 km upstream								

BIOLOGICAL SAMPLING DATA.

No biological sampling during 1978 survey.



28. COOKE CREEK .50°119°NE

- 90 -

LOCATION

Flows south into Lower Shuswap River, approximately 7.5 km west of Mabel Lake outlet (Kamloops District).

Highways construction has modified the stream at 0.5 km.

ENHANCEMENT

No enhancement is recommended as problems with ice, low flows, high gradient and lack of substrate exist. Hydro power is available and access is good.

DESCRIPTION

Cooke Creek was surveyed in late October and mid-November, 1978. The area surveyed was from the mouth to 1.5 km upstream. This small turbulent mountain stream has little or no spawning/rearing habitat. The gradient is low near the mouth, rising quickly at 0.5 km. The substrate in the lower section is cobble and boulder with cobble and pebble at the mouth.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING

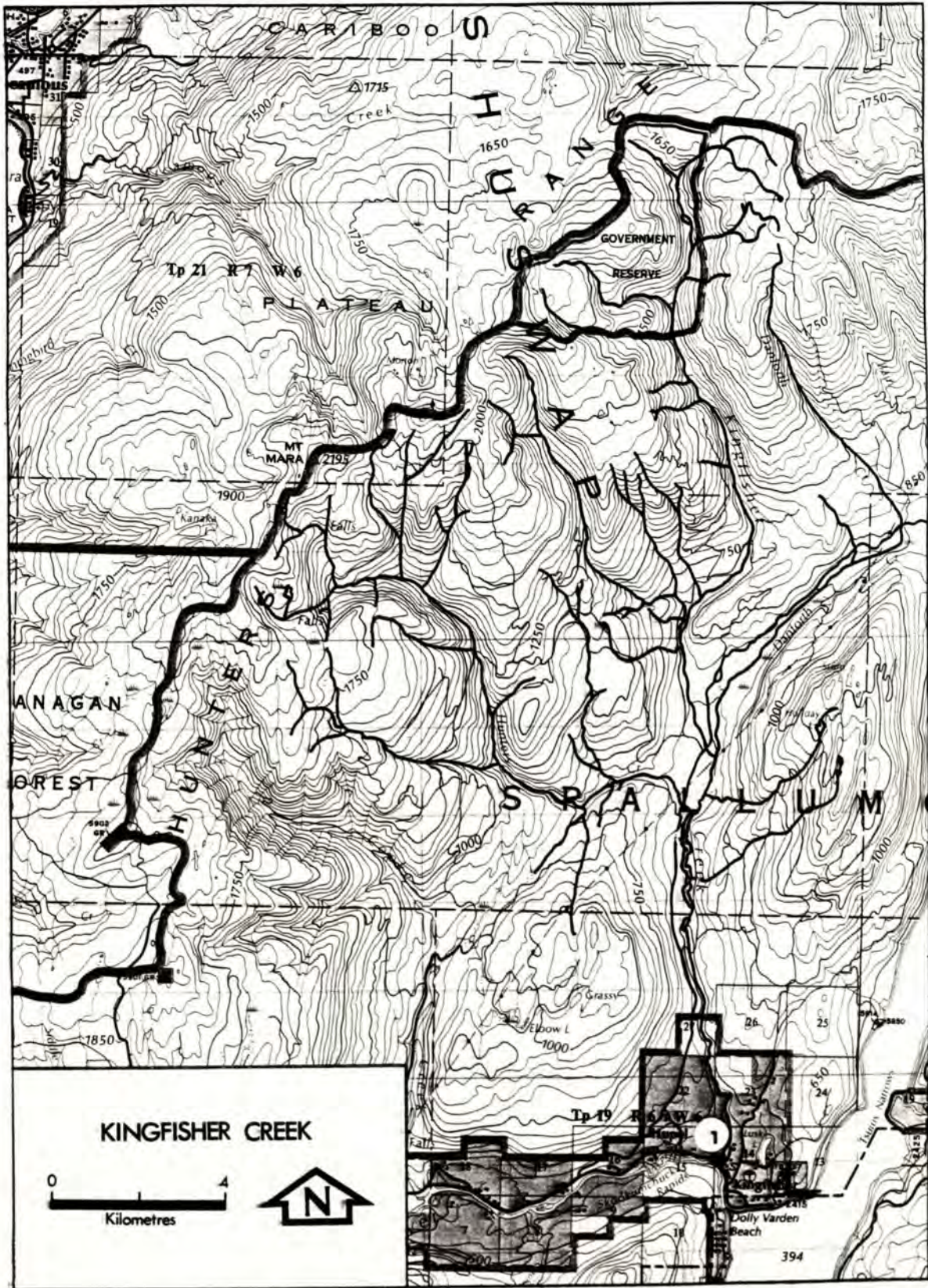
No record.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
24/10/78	<u>Site No. 1</u> At bridge	5.0	0.25	1.5	4+	-	0.5	18	-
11/11/78	<u>Site No. 2</u> At mouth	5.0	0.25	0.91	2	-	-	-	-

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1978 survey.



29. KINGFISHER CREEK .50°119°NE - 92 -

LOCATION

Flows south into Lower Shuswap River, approximately 1.4 km downstream of Mabel Lake outlet (Kamloops District).

Although there is occasional braiding and side channel development in the lower reaches, coho spawning and rearing potential is limited.

ENHANCEMENT

Although enhancement potential is limited, there are several small projects that are feasible. These projects include a small incubation/rearing facility using gravity feed water and stream improvements to increase rearing and spawning area. Ice and unstable flows may present problems. Donor stock for an incubation facility could be obtained from the Lower Shuswap River. Road access is good and hydro power available.

DESCRIPTION

Kingfisher Creek was surveyed in late October, mid-November and mid-December, 1978. The areas surveyed were from the mouth to 0.6 km upstream, from Hunter Creek confluence to 3 km upstream and at several locations just below Hunter Creek.

This is a typical mountain stream, largely contained in a steep-walled gully with swift flow and a substrate of predominantly cobble/boulder. In the upper sections above the Hunter Creek confluence (10.5 km) extensive log jams and windfalls with occasional bank erosion results in more debris introduction.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING

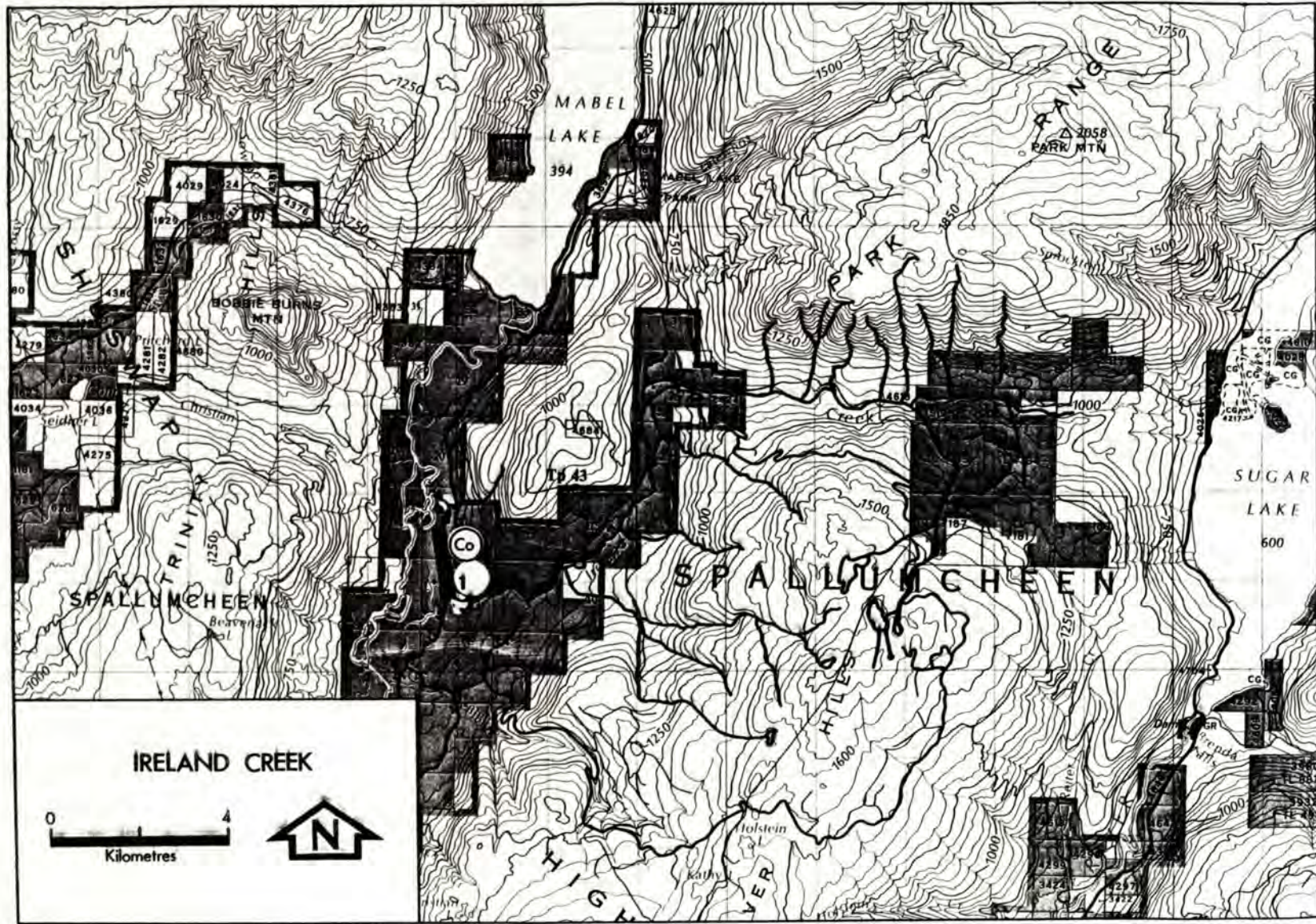
No record.

PHYSICAL AND CHEMICAL CHARACTERISTICS

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
11/11/78	Site No. 1 Bridge crossing	4.5	0.35	1.5	4 - 5	-	-	18	-

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1978 survey.



30. IRELAND CREEK .50°119'0"NE - 94 -

LOCATION

Flows into Middle Shuswap River, approximately 7.3 km above the town of Mabel Lake (Osoyoos District).

DESCRIPTION

Ireland Creek was surveyed for chinook in late October, 1978, and for coho in mid-November and mid-December, 1978. The section observed extended from immediately above South Mabel Lake Road to its mouth at the Middle Shuswap River - a length of approximately 2.5 km. In the November survey, 15 coho adults were observed.

Above the highway bridge, the stream has a steep gradient and is mountain-like with no potential for fish use. Approximately 1,400 meters of good coho spawning/rearing habitat exists below the highway. This habitat is limited for fish production owing to the stream's small size. The substrate is cobble and pebble grading to fines near the mouth. In the vicinity of the bridge there are two

obstructions; an old wooden dam below the bridge and a weir just above the bridge.

ENHANCEMENT

Enhancement of this stream is possible, although the size of the stream will restrict returns. Small project enhancement could utilize the dam as a gravity feed system to supply a small incubation/rearing facility. In addition, groundwater potential could also be investigated. A spawning/rearing channel is feasible as it could be easily fenced for future adult enumeration. Road access is good and hydro power is available. Due to existing low native stocks, donor stock obtained from the Middle Shuswap River may be necessary.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING

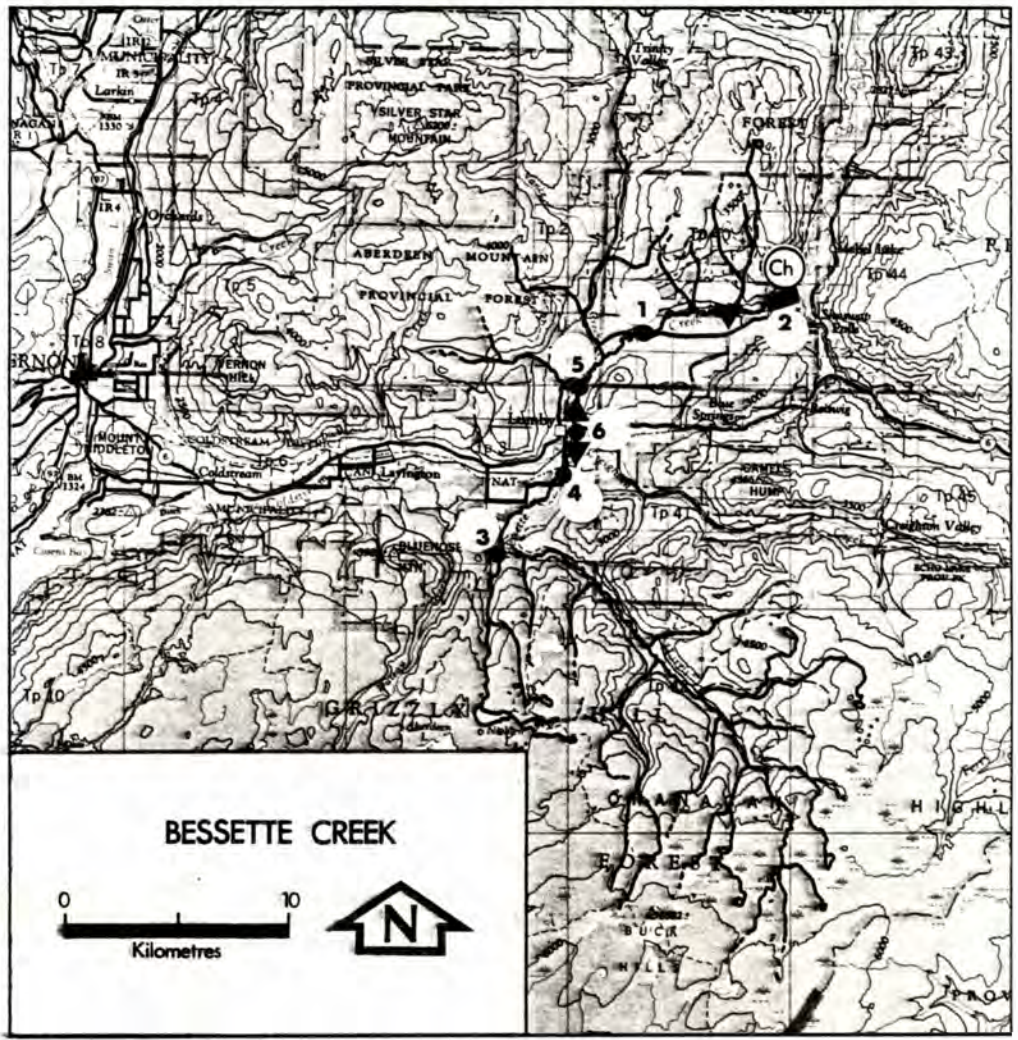
No record.

PHYSICAL AND CHEMICAL CHARACTERISTICS

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
10/11/78	Site No. 1 At bridge	4.0	0.22	0.5	1 - 7	-	-	-	-
11/12/78	Site No. 1 At bridge	-	-	-	-	1	-	-	-

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1978 survey.



LOCATION

Flows northeast through Lumby into Middle Shuswap River just below Shuswap Falls (Osoyoos District).

DESCRIPTION

Bessette Creek and Harris Creek were surveyed for chinook in mid and late October, 1978. They were also surveyed for coho in mid-November and mid-December, 1978. Five main sections were surveyed with a total length of 35.0 km.

Bessette Creek is fed by 3 major tributaries (Duteau, Creighton and Vance) and is one of the more important coho streams in the Shuswap system. It also supports a small population of chinook, a resident trout population and a small number of kokanee. Chinook generally restrict themselves to Bessette Creek below Lumby, while the majority of coho spawn in Duteau Creek.

Bessette Creek has a history characterized by erratic flow conditions, pollution from local mills, sewage, and industry and overall detrimental human influence.

The major tributaries all have dam structures which supply the high demand for agricultural, industrial and domestic needs, consequently reducing flows drastically from historic levels.

Bessette Creek is a medium-sized stream of low to moderate gradient. It is bordered by farmland for much of its length. The Harris Creek section is primarily a canyon feature with a coarse substrate of bedrock and boulder grading to boulder/cobble and gravel near the Nicklen Creek confluence. Coho spawning potential is limited and rearing potential limited to moderate.

HISTORICAL FLOW. cms (cfs).

1. Mean Monthly Discharge (1919; 1943 - 1948; 1965 - 1972; and 1974 - 1976): Station No. 08L C005 Near Lumby

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
-	-	-	0.48	6.54	7.62	1.31	5.32	0.48	-	-	-
-	-	-	(16.8)	(231.0)	(269.0)	(46.4)	(18.8)	(16.9)	-	-	-

• <u>Mean Yearly Discharge</u>	Incomplete Data
• <u>Maximum Daily Discharge</u>	28.1 cms (992.0 cfs)
• <u>Minimum Daily Discharge</u>	0.0 cms (0.1 cfs)

From the Nicklen/Harris confluence to the Duteau Creek confluence (9.6 km) the substrate is cobble/boulder with more gravel downstream. The stream banks are damaged in the Lumby area and a few minor log jams are present. Coho spawning potential is good in the lower section, but rearing potential is limited.

From Duteau Creek to the Middle Shuswap River confluence (18.4 km) the substrate is predominantly sand, cobble and pebble with a short boulder area near the mouth. The stream is meandering, of low gradient and has minor log jams and beaver activity. Coho spawning potential is moderate and rearing potential limited. In the lower 3.2 km chinook potential is moderate to good for spawning and rearing.

ENHANCEMENT

Recommendations are suggested primarily for coho enhancement in the middle and upper regions and chinook enhancement in the lower end. Access to the stream is good via municipal and logging roads. Hydro power is readily available.

In the area above Lumby, potential enhancement projects include construction of an incubation/rearing facility using pumped groundwater or a gravity feed system supplied by Harris Creek weirs and stream improvements for spawning and rearing. It is also advised that fencing to limit livestock intrusion and intake screening for all irrigation ditches be instigated. Donor stocks for this facility could be obtained from Duteau Creek. A similar facility for chinook could also be installed in the lower end with donor stock from Shuswap River. Streambank stabilization and revegetation could also be employed.

It is also advised to study the feasibility of a juvenile coho tagging program.

2. Mean Monthly Discharge (1973 - 1976): Station No. 08L C042
Above Lumby Lagoon outfall

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
0.41 (14.6)	0.42 (14.8)	0.62 (21.8)	1.93 (68.2)	10.70 (377.0)	13.40 (474.0)	2.63 (92.9)	1.70 (60.0)	1.32 (46.5)	0.86 (30.4)	0.66 (23.3)	0.55 (19.3)

- Mean Yearly Discharge 3.37 cms (119.0 cfs)
- Maximum Daily Discharge 33.3 cms (1190.0 cfs)
- Minimum Daily Discharge insufficient data.

3. Mean Monthly Discharge (1970 - 1972; 1975 - 1976): Station No. 08L C039
Above Beaverjack Creek

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
0.51 (17.9)	0.48 (16.8)	0.74 (26.1)	1.90 (67.0)	10.70 (536.0)	15.20 (562.0)	15.90 (111.0)	3.14 (69.6)	1.97 (54.4)	1.54 (43.2)	1.22 (35.3)	0.94 (33.1)

- Mean Yearly Discharge 4.9 cms (173.0 cfs)
- Maximum Daily Discharge 49.8 cms (1780.0 cfs)
- Minimum Daily Discharge insufficient data.

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Chinook	25	-	15	20	-	25	23 ¹
Coho	150	5	70	-	-	1,067 ²	590 ³

¹Excludes 1972 and 1976.

²Excludes 1961.

³Excludes 1978.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	September	September	Late September	Middle October
Coho	October	Late October	Middle November	December

- No records prior to 1962.
- Prior to 1973, escapements to Bessette Creek included those to Duteau, Harris and Creighton Creeks.
- Majority of coho spawn in Duteau Creek.

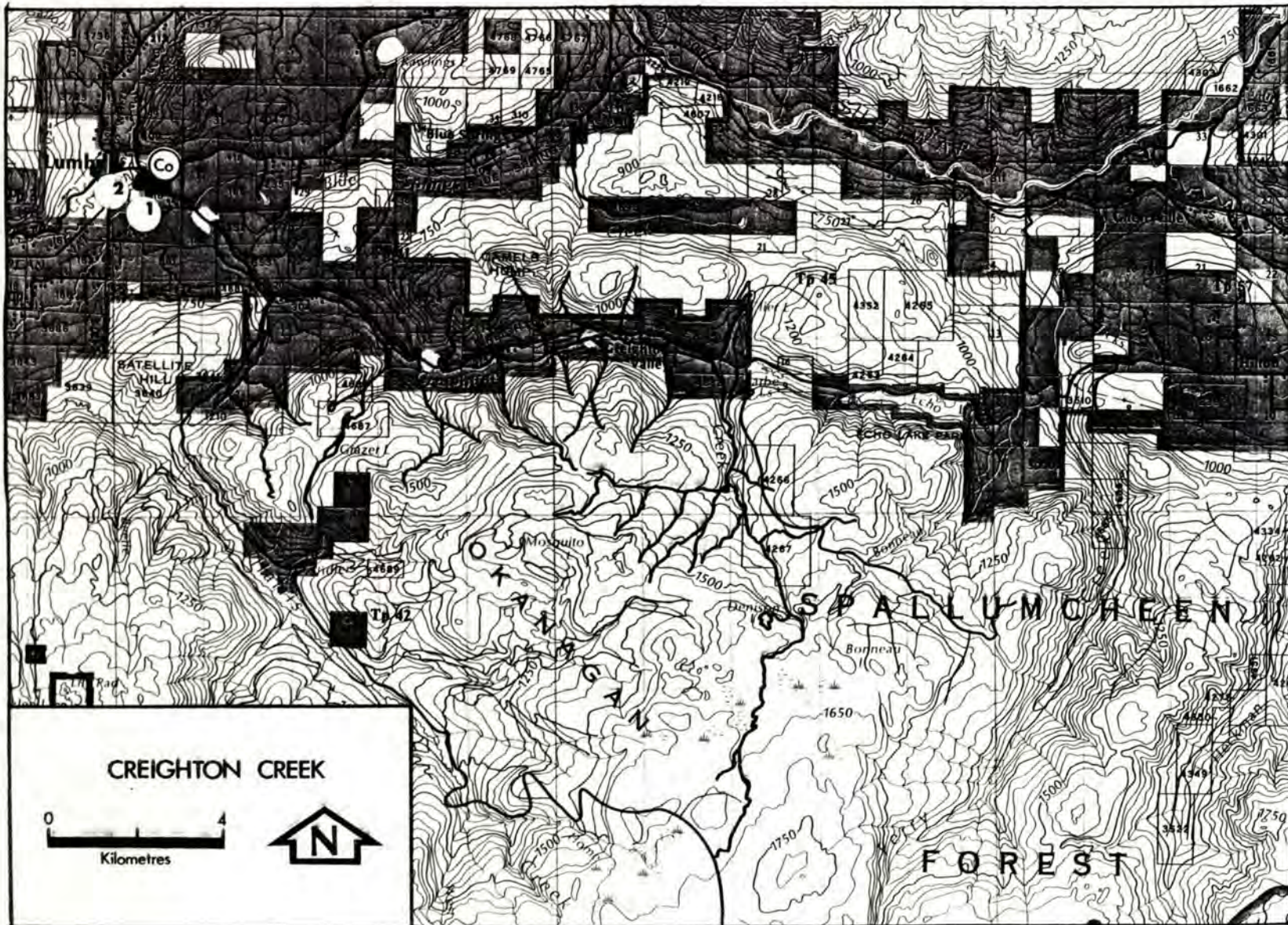
PHYSICAL AND CHEMICAL CHARACTERISTICS.

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
25/10/78	<u>Site No. 1</u> Immediately down Riggins Road	3.5	0.25	-	-	3.0	11.0	-	-
25/10/78	<u>Site No. 2</u> 1.0 km from mouth	6.5	0.35	-	-	-	-	-	-
09/11/78	<u>Site No. 3</u> Opening of canyon section (0.6 km from Harris/Nicklen confluence	4.0	-	1.0	-	-	3.5	-	-
10/11/78	<u>Site No. 4</u> Above Lumby	4.5	0.20	-	-	-	-	-	-
10/11/78	<u>Site No. 5</u> 2.0 km below Lumby	5.5	0.40	-	Moderate	1.0	-3.0	-	-
11/12/78	<u>Site No. 6</u> Lumby	----- Stream Mostly Iced Over -----							

BIOLOGICAL SAMPLING DATA.

Adult Sampling

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
11/10/78	Coho	3 ₂ R	2 -	46.9 -	- -	4 1	45.5 -	+ 3.4 -



32. CREIGHTON CREEK, 50° 118° SW - 100-

LOCATION

Flows northwest into Bessette Creek, near the town of Lumby (Osoyoos District).

DESCRIPTION

Creighton Creek was surveyed for coho in mid and late October and early November, 1978. No survey for chinook was done. The main area surveyed extended from the mouth (confluence with Bessette Creek) to 1.7 km upstream. Creighton Creek was also spot-checked to 20.0 km upstream. At 0.7 km upstream from the mouth, there is a small impassable weir-type dam. The substrate in this lower section is predominantly pebble and sand. Spawning and rearing habitat is limited. Above the dam, the characteristics remain consistent with those of the lower

section. Flows above and below the dam are marginal for coho spawning and rearing.

ENHANCEMENT

It is recommended that before enhancement work is undertaken, a survey of the upper reaches be conducted to determine spawning and rearing potential. If potential does exist, a small fishway could be constructed to mitigate the dam, thus allowing adult passage. Egg and fry transplants above the dam could be undertaken to utilize potential habitat.

In the downstream section, an incubation box could be installed and general stream improvement initiated. Highway access to this stream is good and hydro power available.

This stream is considered marginal for enhancement.

HISTORICAL FLOW. cms (cfs).

1. Mean Monthly Discharge (1959 - 1965): Station No. OBL C033 near Lumby

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
-	-	-	0.23	1.10	1.00	0.28	0.13	0.24	0.18	0.10	-
-	-	-	(8.1)	(38.5)	(35.7)	(10.0)	(4.6)	(8.4)	(6.2)	(3.5)	-

• <u>Mean Yearly Discharge</u>	Incomplete Data
• <u>Maximum Daily Discharge</u>	3.9 cms (139.0 cfs)
• <u>Minimum Daily Discharge</u>	0.02 cms (0.8 cfs)

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Coho *	25	40	2	30	-	-	-

* Prior to 1973, this stream was included with Bessette Creek records.

Spawning Timing

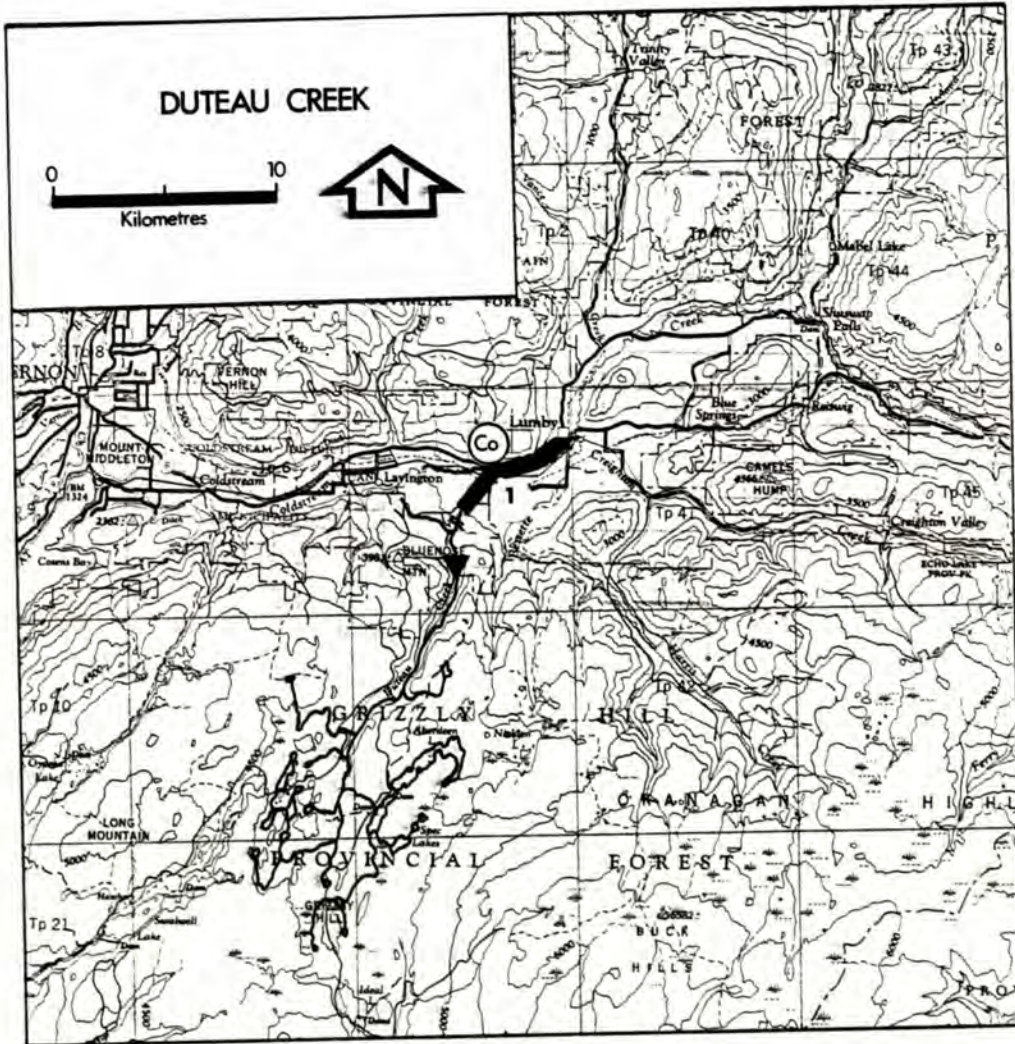
	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	Late October	End November	December

PHYSICAL AND CHEMICAL DATA.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
25/10/78	<u>Site No. 1</u> Just below dam	2.4	0.17	0.7	1 - 2	4.5	-	-	-
09/11/78	<u>Site No. 2</u> Mouth	2.0	0.25	0.8	1	1.5	5.0	-	-

BIOLOGICAL SAMPLING DATA.

No biological sampling during 1978 survey.



LOCATION

Flows east into Bessette Creek at Lumby (Osyoos District).

DESCRIPTION

Duteau Creek was surveyed for coho in mid-October and early November, 1978. No chinook survey was done. Duteau was walked from its mouth in Lumby (confluence with Bessette) upstream to approximately 1.5 km below a Vernon Irrigation District (V.I.D.) water gate. A total length of 11.6 km was surveyed.

This creek is the largest tributary in the Bessette Creek system (35 km). Approximately 70% to 80% of the Bessette system coho spawn in the 13 km from Lumby to the Vernon Irrigation District Dam with the most concentrated spawning in the lower 10.0 km. Heavy agricultural encroachment is presenting problems by overtaxing the water resource, and by allowing cattle access to the stream. The stream parallels farmland, therefore bank vegetation consists of sparse

deciduous growth. Coho spawning potential in the lower section is good, while rearing potential is considered good to moderate. In the vicinity of the dam, the substrate becomes coarser and coho potential limited.

ENHANCEMENT

This system is one of the better coho producers in the area with potential for higher yields. Enhancement of this stream can be accomplished with an incubation/rearing facility near the dam using a gravity feed system or pumped groundwater, development of semi-natural rearing ponds or channels, stream improvements for spawning and rearing and fencing the stream to restrict cattle access.

In 1978, an agreement with V.I.D. and D.O.E. was established, controlling flows to meet Fisheries requirements. A recommendation for future study is to assess habitat above the dam for egg and fry transplants.

Highway access to this stream is good and hydro power available.

HISTORICAL FLOW. cms (cfs).

1. Mean Monthly Discharge (1919 - 1921; 1936 - 1976): Station No. 08L C006 near Lavington*

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
0.03 (1.1)	0.03 (0.97)	0.03 (1.1)	0.86 (30.5)	2.60 (93.5)	1.40 (49.5)	0.38 (13.5)	0.25 (8.9)	0.32 (11.3)	0.09 (3.3)	0.03 (1.0)	0.03 (1.1)

• <u>Mean Yearly Discharge</u>	0.85 cms (30.1 cfs)
• <u>Maximum Daily Discharge</u>	13.7 cms (485.0 cfs)
• <u>Minimum Daily Discharge</u>	0.0 cms (0.0 cfs)

* This station is approximately 3.5 km above a Vernon Irrigation District water gate. Thus, the discharge values may not accurately represent the flows occurring on the spawning grounds downstream.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Coho *	550	325	94	400	-	-	-

* Prior to 1973, this stream was included with Bessette Creek records.

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	Late October	End November	December

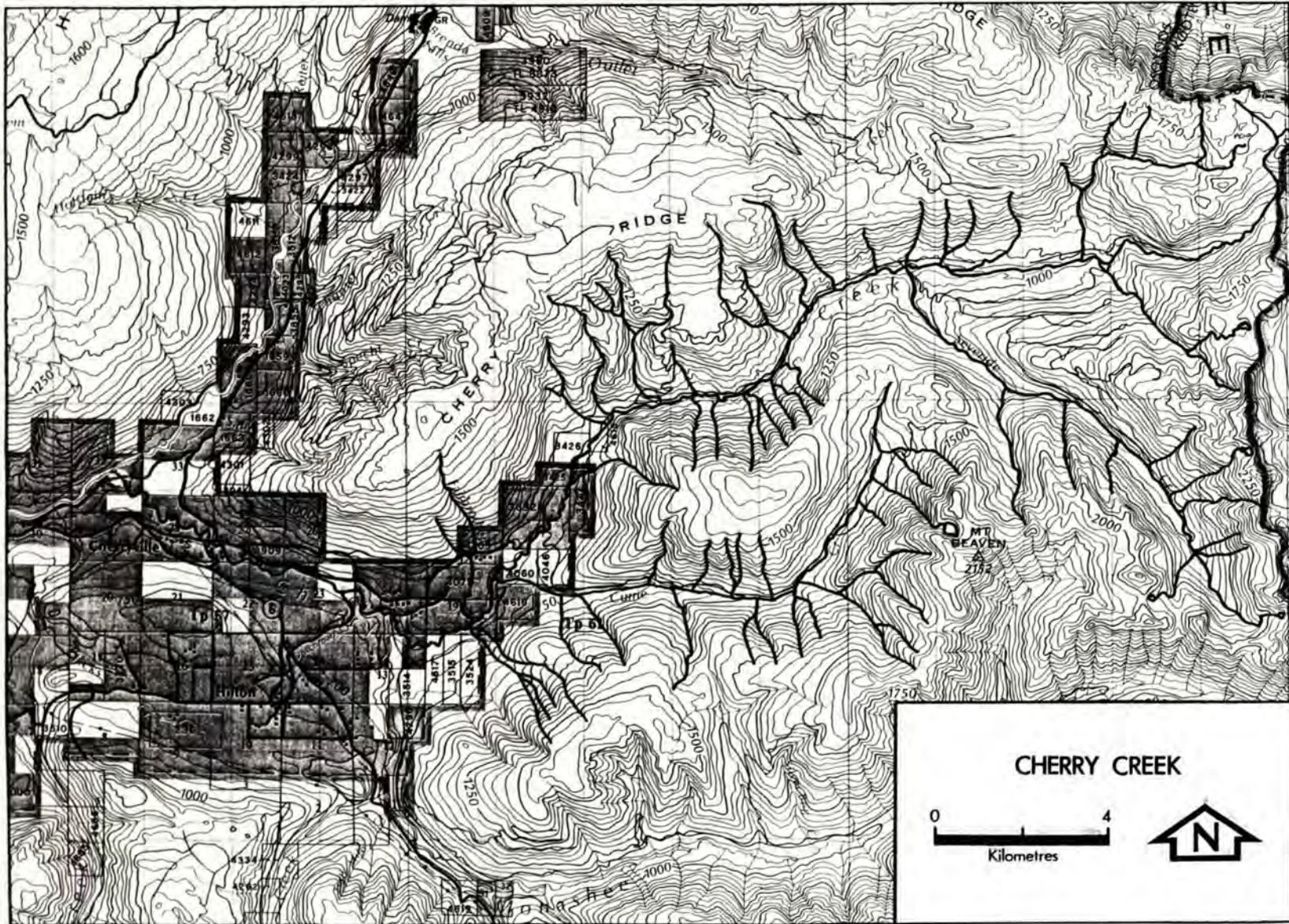
PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
09/11/78	<u>Site No. 1</u> Miller Road (just west of Lumby)	3.0	0.25	0.71	1	1.5	2.0	17	7.7

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
	Coho	32	5	51.4	+ 6.2	8	48.0	+ 3.5
		43	-	-	-	1	49.2	-
		R	1	-	-	-	-	-



34. CHERRY CREEK , 50° 118° SW - 106 -

LOCATION

Flows northwest into Middle Shuswap River, approximately 16.0 km upstream from Whiskey Dam (Osoyoos District).

DESCRIPTION

Cherry Creek was surveyed for potential chinook and coho habitat in early November, 1978. This creek is located above Whiskey Creek Dam and has no present chinook or coho use. This stream has a predominantly cobble substrate with good flows. The stream gradient is low to moderate at the mouth becoming steeper upstream. Spawning and rearing potential is limited and suitable only for chinook.

ENHANCEMENT

Before any enhancement procedures are attempted, provision must be made for passage through the Whiskey Dam. This stream has

limited potential for an incubation/rearing facility due to possible problems with ice. It is recommended that further reconnaissance be initiated before any procedures are implemented.

Highway access to this stream is moderate and hydro power available.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING

No record.

PHYSICAL AND CHEMICAL CHARACTERISTICS

No sampling.

BIOLOGICAL SAMPLING DATA

No biological sampling during the 1978 survey.



35. NORTH THOMPSON RIVER,
51° 120° NE

- 108 -

LOCATION

Flows south into Thompson River, just north of Kamloops (Kamloops District).

DESCRIPTION

The North Thompson River was surveyed for chinook in early October, 1976, late September, 1977 and late September, 1978. No survey was conducted for coho. The section surveyed extends approximately 10.0 km between Blackpool Station and Little Fort.

The North Thompson River is wide with large gravel bars and is normally very silty throughout spawning season, making enumeration difficult. These gravel bars which are continually shifting cause heavy silting and erosion. The majority of spawning appears to occur on these large bars primarily in the area between Blackpool and Little Fort.

Although information about coho use is sketchy, it is thought chinook also spawn in the area just below Porte d'Enfer Canyon, immediately above the Finn Creek confluence. Porte d'Enfer Canyon, or Little Hells Gate, is approximately 3.2 km long and is very narrow with two rapid flowing sections at each end. It is impassable at some water levels.

ENHANCEMENT

Enhancement potential for the North Thompson is good to moderate due to good access, availability of hydro power throughout and a good native stock of chinook and coho. Enhancement procedures would best be employed in the main spawning bed between Blackpool and Little Fort and could include an incubation/rearing facility using groundwater, a controlled flow spawning channel, and a semi-natural rearing channel with supplemental feeding.

HISTORICAL FLOW. cms (cfs).

1. Mean Monthly Discharge (1960 - 1976): Birch Island (19 km above Blackpool)

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
27.6 (974)	26.9 (951)	30.6 (1,080)	68.8 (2,430)	279.0 (9,860)	490.0 (17,300)	368.0 (13,000)	234.0 (8,270)	137.0 (4,850)	101.0 (3,580)	64.8 (2,290)	37.7 (1,330)

- Mean Yearly Discharge 154.9 cms (5,470.0 cfs)
- Maximum Daily Discharge 942.9 cms (33,300.0 cfs)
- Minimum Daily Discharge 10.8 cms (380.0 cfs)

2. Mean Monthly Discharge (1958 - 1976): McLure (50 km below Little Fort)

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
84.9 (3,000)	82.4 (2,910)	88.9 (3,140)	189.0 (6,680)	849.0 (30,000)	1,450.0 (51,200)	994.0 (35,100)	578.0 (20,400)	321.0 (13,100)	289.0 (10,200)	202.0 (7,120)	118.0 (4,180)

- Mean Yearly Discharge 444.6 cms (15,700.0 cfs)
- Maximum Daily Discharge 2,735.0 cms (96,600.0 cfs)
- Minimum Daily Discharge 49.3 cms (1,740.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	750	2,500	2,250	2,500	1,692 ¹	1,778 ²	1,550
Coho *	1,500	UNK	1,500	300	1,500 ³	750 ⁴	1,100 ⁵
Pink **	-	-	150	-	-	-	-

* Data for coho is not accurate as, in many instances, coho were observed but not enumerated due to poor visibility.

** First year pinks reported in North Thompson.

¹Excludes 1955 to 1958.

²Excludes 1963.

³Excludes 1951/1952, 1955 to 1960.

⁴Excludes 1961 to 1964, 1966 to 1970.

⁵Excludes 1971, 1973, 1976.

<u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye	135	300	283	183

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Middle August	September	Middle September	End October
Coho	Middle October	November	Middle November	End December
Sockeye	Middle August	End September	Middle October	End October

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
02/10/76	<u>Site No. 1</u> 10 km from Little Fort	73.0	1.50	-	-	11.0	-	11.0	7.2
26/09/77	<u>Site No. 2</u> 3.2 km up from Little Fort	160.0	1.14	0.69	-	9.5	-	10.0	7.2

BIOLOGICAL SAMPLING DATA.

Adult Sampling

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
02/10/76	Chinook	3 ₁	1	59.9	-	-	-	-
		4 ₁	3	75.4	-	9	70.8	+ 1.9
		4 ₂	-	-	-	3	57.0	-
		5 ₂	1	72.7	-	5	72.0	+ 5.3
26/09/77	Chinook	2 ₁	2	34.2	-	-	-	-
		3 ₁	1	62.8	-	-	-	-
		3 ₂	-	-	-	-	-	-
		4 ₁	1	71.6	-	-	-	-
		4 ₂	2	57.2	-	1	64.0	-
		5 ₂	2	72.5	-	1	76.0	-
		R	-	-	-	1	-	-
27/09/78	Chinook	2 ₁	1	37.5	-	-	-	-
		3 ₁	1	57.5	-	3	66.0	-
		4 ₁	1	80.6	-	7	74.1	+ 1.7
		4 ₂	-	-	-	2	71.7	-
		5 ₁	-	-	-	1	80.9	-
		5 ₂	-	-	-	3	74.8	-
		R	-	-	-	2	-	-

Juvenile Sampling

Date	Location (Gear)	Time		Species	Number Caught	Number Sampled	Nose-Fork Length (mm)	Other Fish Species
		Set	Haul					
02/10/76	In shallows of gravel bar 3 km from Little Fort (3 beach seines)	0900	0930	Ch	18	9	66.6	42 Rocky Mountain Whitefish 2 Suckers 1 Sculpin



LOCATION

Flows north into North Thompson River, at the town of Louis Creek, Kamloops District.

DESCRIPTION

Louis Creek is small to medium-sized with a length of approximately 48 km and a drainage of approximately 512 km². This meandering, low gradient stream is moderately braided in its lower reaches and fairly confined in its upper end. The upper reaches above Fadear Creek contain moderate to good spawning gravels while below this tributary the streambed is composed mostly of undesirable silts and sands. Moderate coho rearing areas exist throughout the system. Although the drainage is one of the more important coho streams of the North Thompson system, it only supports a small chinook run. All chinook and the majority of coho spawn in the upper reaches of the mainstream to Christian Creek. Tributary spawning is almost non-existent, due to extremely low water levels resulting from water licencing. Streambank slumping and siltation appears to

be a major problem resulting from heavy agricultural and recreational use in this area. In addition, beaver dams must be removed annually to minimize migration difficulties.

ENHANCEMENT

Due to the extensive agricultural and recreational use of this area, streambank and terrain erosion have created stream siltation problems. To reverse this trend, fencing to limit livestock access and streambank reclamation and revegetation should be initiated. Natural enhancement techniques should also include continued beaver dam removal.

Artificial enhancement techniques such as small spawning and rearing channels and incubation boxes have good potential due to ease of access, potential groundwater supply and an adequate native coho stock. In addition, chinook enhancement donor stock could be easily obtained from the North Thompson. Adult and juvenile enumeration should be initiated to monitor stream populations.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1971 - 1976): Station No. 08L B072 at mouth

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
0.6 (21.0)	0.6 (20.4)	1.0 (34.8)	1.5 (54.2)	13.0 (469.0)	13.0 (466.0)	3.7 (129.0)	1.8 (62.1)	1.3 (45.2)	1.1 (38.3)	1.0 (36.2)	0.8 (29.4)

- Mean Yearly Discharge 3.3 cms (117.1 cfs)
- Maximum Daily Discharge 43.3 cms (1,530.0 cfs)
- Minimum Daily Discharge 0.06cms (2.4 cfs)

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Chinook	54	200	60	75	500	169 ¹	110
Coho	1,200	1,100	2,200	1,300	1,855	1,110	2,041

¹Excludes 1965.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Early August	Middle August	Early September	Middle September
Coho	Middle October	Late October	Middle November	Early December

PHYSICAL AND CHEMICAL CHARACTERISTICS

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
26/09/77	Site No. 1 35 km from mouth	5.0	0.35	0.60	-	6.5	-	11.0	8.0
10/12/78	Site No. 1 Above confluence with McGillivray Creek	-	-	-	-	2.0	0.5	11.0	7.4
14/11/78	Site No. 2 Above Tod Mountain development (above confluence with McGillivray Creek)	1.5	0.15	0.33	Less than 1.0	-	-	-	-
14/11/78	Site No. 3 Below Tod Mountain development	3.0	0.30	0.66	1.0	-	-	-	-
14/11/78	Site No. 4 2.0 km downstream of Tod Mountain development	2.5	0.50	-	1.5	-	-	-	-
14/11/78	Site No. 5 4.0 km downstream of Tod Mountain development	6.0	0.30	0.40	-	0.5	-	-	-

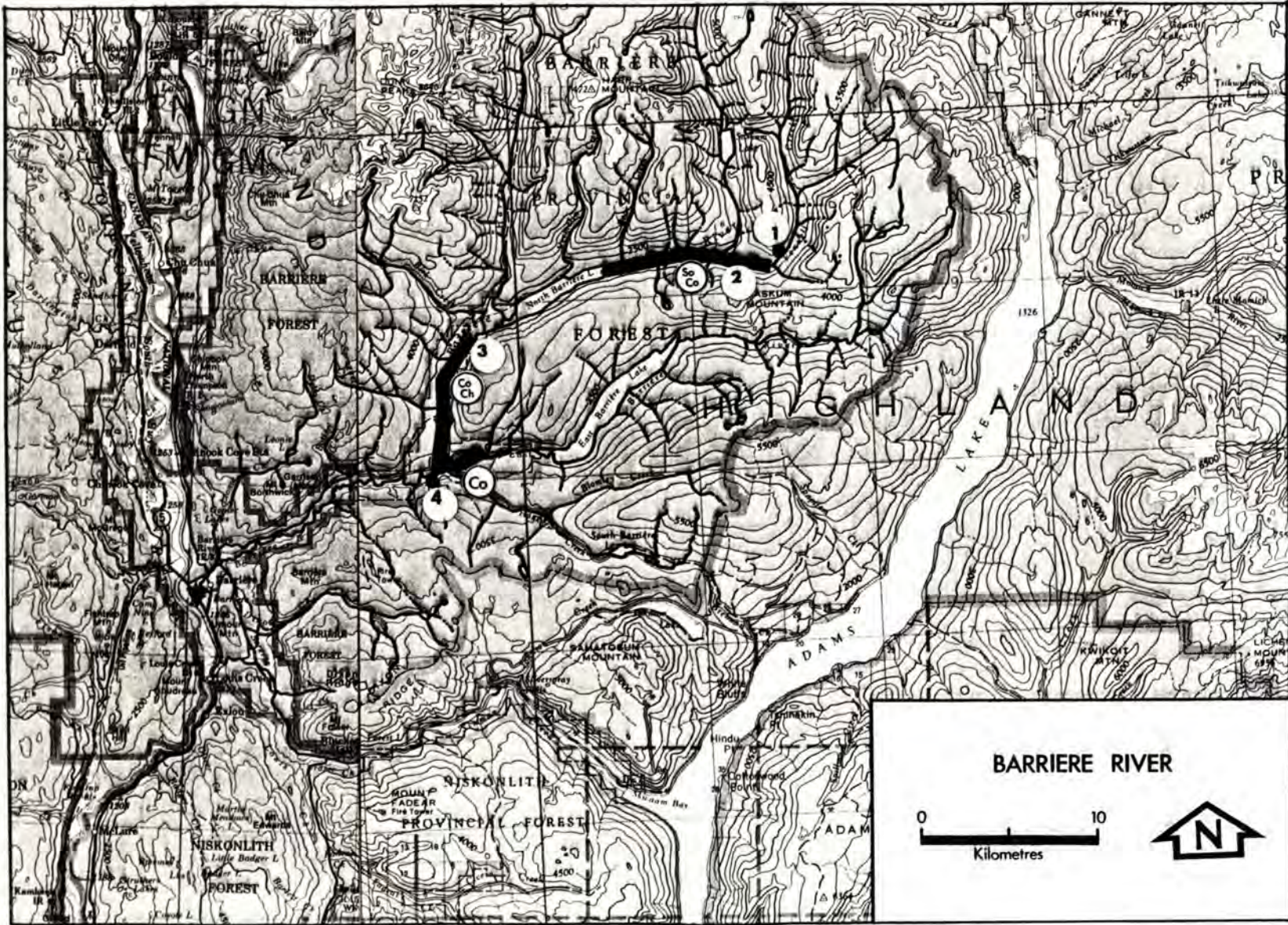
BIOLOGICAL SAMPLING DATA.

Adult Sampling

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
09/78	Chinook	3 ₁	-	-	-	1	51.0	-
11/78	Coho	3 ₂	21	42.7	+ 2.3	12	43.0	+ 2.1
		4 ₃	3	43.1	-	3	45.7	-
		R	5	39.7	+ 3.1	5	39.7	+ 3.1

Juvenile Sampling

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x}</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>				<u>Nose-Fork Length (mm)</u>	
09/09/78	Bridge crossing at Tod Mountain development (2 minnow traps)	1200	1300	Ch	27	3	61	-
10/09/78	Mouth (2 minnow traps)	1100	1300	Ch	1	-	-	-



37. BARRIERE RIVER 51° 120° SE - 116 -

LOCATION

Flows southwest into the North Thompson River at Barriere, 58.0 km north of Kamloops (Kamloops District).

East Barriere River has beaver dams and log jams throughout, creating migration problems. An abandoned sawmill at the lake outlet has contributed large amounts of mill rubbish and debris to the stream. Coho use is limited to the first 1.6 km.

DESCRIPTION

Barriere River was surveyed in early September, 1978 for chinook, and late November and early December, 1978 for coho. Four sections of the river were surveyed covering a total distance of 8.2 km. This system is composed of two major lakes (North and East Barriere) and several major tributaries (East Barriere River, Harper Creek and Fennel Creek). The Barriere River from the mouth to the East Barriere River confluence is approximately 18.5 km in length. Spawning and rearing potential in this stretch is low due to high flows and poor substrate. From East Barriere confluence to North Barriere Lake is 8.5 km of fair spawning and rearing habitat for coho. Isolated patches of substrate suitable for chinook spawners is also found in this stretch. Above the lake is approximately 8 km of marginal habitat with a moderate gradient and flow. Substrate is predominantly sand with some gravel and cobble indicating a limited spawning potential. The heavily forested banks are prone to slumping with debris accumulation, creating passable log jams and good coho rearing habitat.

Harper Creek, a tributary of North Barriere Lake contains medium-sized gravels, however, no evidence of spawning has been observed. Fennel Creek has approximately 8 km of good spawning and rearing habitat used by coho and sockeye. The numerous log jams and beaver dams which require constant removal have created erosion and scouring problems resulting in downstream silting.

ENHANCEMENT

The 1978 reconnaissance identified Barriere River as having high potential for major coho and chinook enhancement. Methods could include an incubation/rearing facility, spawning and rearing channels and floating pens in North Barriere Lake. This potential is based primarily on good road access, hydro power availability, a good native coho stock and the potential for a gravity feed water supply. In addition, clearing of debris accumulations and beaver dams should be maintained.

HISTORICAL FLOW. cms (cfs).

1. Mean Monthly Discharge (1965 - 1976): Station No. 08L B020
At the mouth (confluence with North Thompson)

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
3.2 (114)	3.0 (105)	3.3 (118)	9.2 (326)	47.0 (1,660)	56.6 (2,000)	21.9 (774)	7.4 (262)	5.4 (191)	5.4 (203)	5.2 (183)	3.9 (138)

- Mean Yearly Discharge 14.9 cms (527.0 cfs)
- Maximum Daily Discharge 156.6 cms (5,530.0 cfs)
- Minimum Daily Discharge 0.6 cms (20.0 cfs)

2. Mean Monthly Discharge (1965 - 1976): Station No. 08L B069
Below Sprague Creek (27 km upstream from mouth)

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
2.4 (85)	2.2 (79)	2.5 (87)	6.9 (243)	39.0 (1,390)	52.0 (1,850)	19.0 (664)	7.5 (264)	5.2 (182)	5.4 (189)	4.6 (161)	3.1 (109)

- Mean Yearly Discharge 12.49 cms (441.0 cfs)
- Maximum Daily Discharge 169.0 cms (5,970.0 cfs)
- Minimum Daily Discharge 0.7 cms (25.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	25	75	10	10	147 ¹	109 ²	25 ³
Coho *	300	300	420	400	592 ⁴	598	407

- ¹Excludes 1952, 1956.
- ²Excludes 1967, 1968.
- ³Excludes 1973.
- ⁴Excludes 1952.

<u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye	1,932	1,347	264	231

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	September	September	Middle September	Late September
Coho	Middle to Late October	November	Middle November	Late November
Sockeye	August	Late August	Late August	Middle September

* Includes data for Barriere River, East Barriere River and Fennel Creek.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
26/11/78	<u>Site No. 1</u> Fennel Creek	6.0	0.25	1.00	1.5	-	-	-	-
27/11/78	<u>Site No. 2</u> Fennel Creek	8.5	0.20	1.28	-	2.0	-	11	6.8
27/11/78	<u>Site No. 3</u> Below North Barriere Lake	30.0	0.40	0.33	Low	-	-	-	-
10/12/78	<u>Site No. 5</u> Below North Barriere Lake	-	-	-	-	3.0	-	-	-
27/11/78	<u>Site No. 4</u> Confluence of North Barriere River and East Barriere River	10.5	0.30	0.80	-	2.0	-	11	7.2

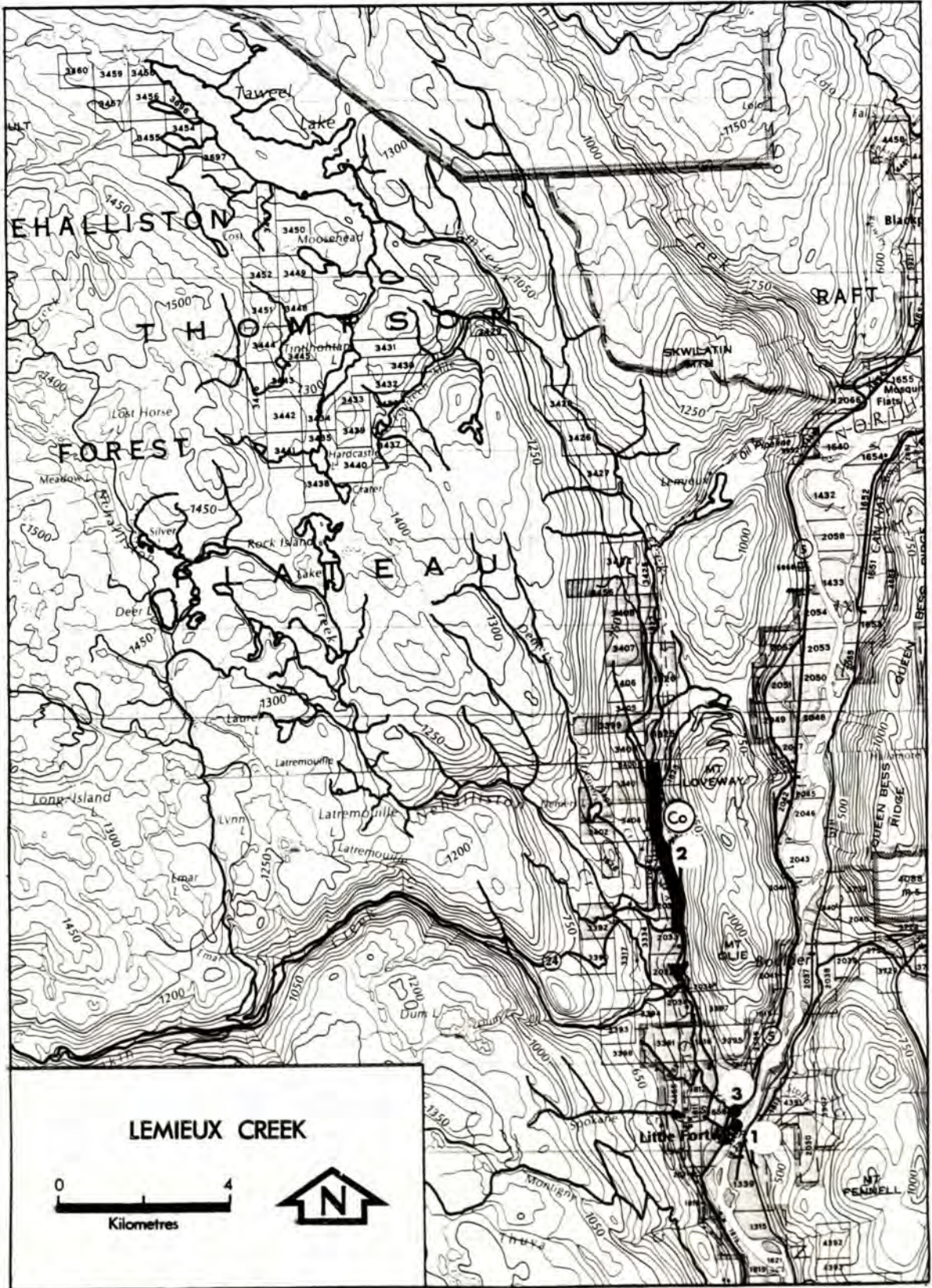
BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
11/78	Coho	32	8	43.2	+ 5.4	22	45.4	+ 2.0
		43	-	-	-	1	52.4	-
		R	3	-	-	-	2	-

Juvenile Sampling

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x} Nose-Fork Length (mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
08/09/78	Down from North Barriere Lake (minnow traps, beach seines)	-	-	-	-	-	-	1 Mottled Sculpin
08/09/78	Below Highway 5 Bridge	-	-	Ch	5	57	15	1 Mottled Sculpin 1 Rainbow Trout 1 Unknown



38. LEMIEUX CREEK .51° 120° SE - 120 -

LOCATION

Flows south into North Thompson River at Little Fort (Kamloops District).

since 1960. Impassible falls are located at 12.5 km. Beaver dams occur throughout, creating potential obstructions that must be removed annually.

DESCRIPTION

Lemieux Creek was surveyed for chinook in 1977 and coho in 1978.

Lemieux Creek is a small, low gradient, meandering stream paralleled by farmland for much of its length. Taweel Lake at the head end, 28 km from the mouth, tends to stabilize water flow under natural conditions; however, due to excessive irrigation extremely low water levels occur during the summer months. Optimal coho habitat occurs between 4.0 and 9.0 km where the stream is primarily riffle with a cobble/pebble substrate. However, fish production is severely limited as the stream often dries at the mouth and approximately 7 km upstream. Chinook use of this stream is very limited with only 4 small runs reported

ENHANCEMENT

A major problem encountered is access for salmon during low water level periods. Improving the channel mouth by dredging could alleviate this problem.

To improve the flow regime, terrain revegetation and streambank stabilization should be considered. In addition, installation of a small flow control dam at Taweel Lake outlet would create a reservoir to supply an adequate amount of water for spawning and rearing. Other enhancement techniques could include a small incubation/rearing facility using available groundwater or a gravity feed system, or a semi-natural spawning and rearing channel. Access by road is good and hydro power available.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1926 - 1928): Station No. 08L B042
Lemieux Creek near Mount Olie

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
-	-	-	1.91	10.60	3.43	2.00	0.48	0.27	-	-	-
-	-	-	(67.4)	(375.0)	(121.0)	(70.5)	(17.0)	(9.6)	-	-	-

- Mean Yearly Discharge Insufficient Data
- Maximum Daily Discharge 26.6 cms (938.0 cfs)
- Minimum Daily Discharge N/A

* Stream catalogue notes extremely low flows in summer occurring as a result of extensive irrigation.

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Chinook	-	25	-	-	118 ¹	75 ²	25 ³
Coho	400	200	650	600	1,245	1,270	666

¹Excludes 1955/1956/1959.

²Excludes 1961/1963 to 1970.

³Excludes 1971/1973 to 1975/1977/1978.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Late October	Middle November	Late November	Middle December

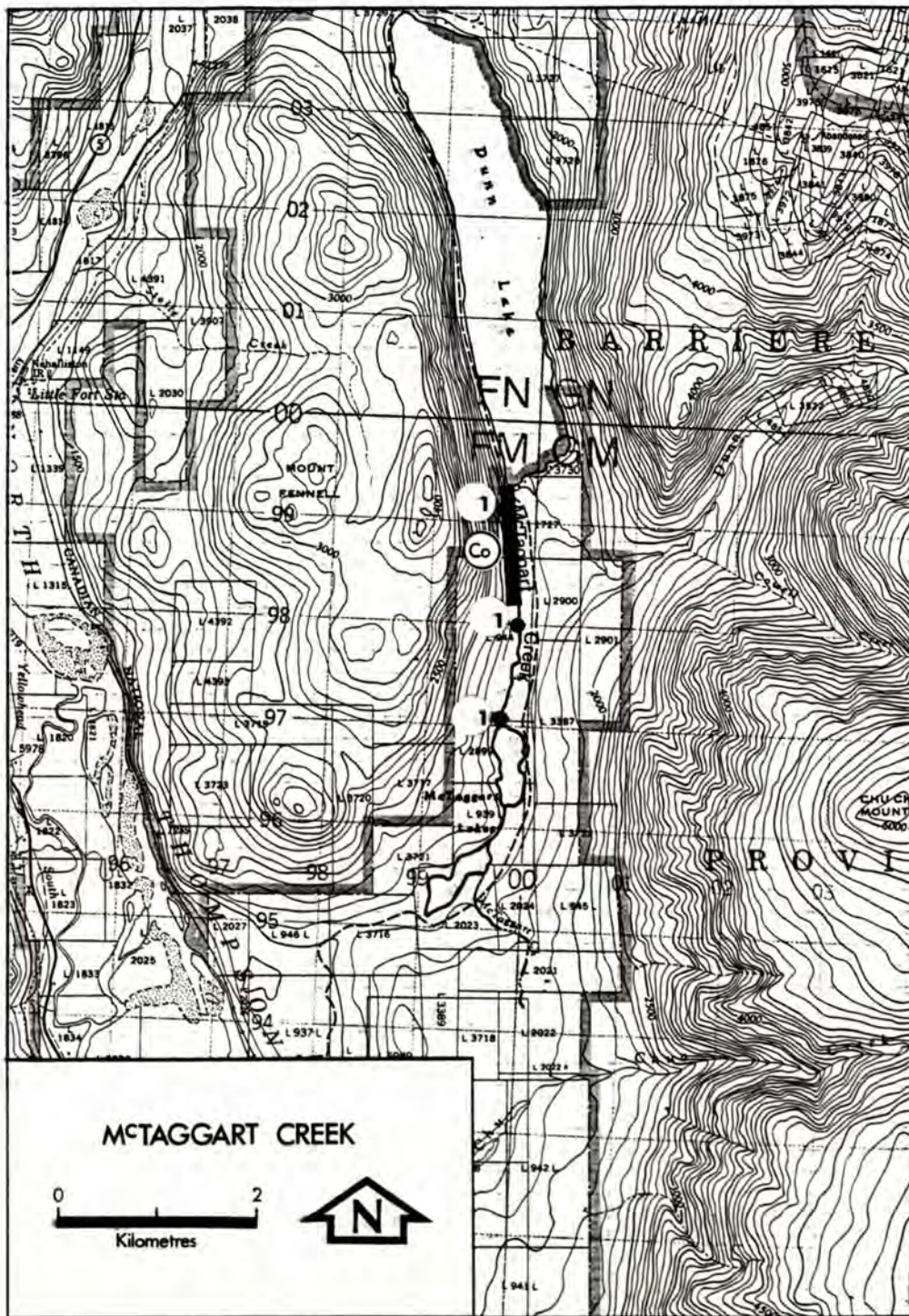
PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
26/09/77	<u>Site No. 1</u> Upstream of mouth	8.0	0.28	0.84	-	8.0	-	11.0	8.4
25/11/78	<u>Site No. 2</u> 6.0 km upstream	8.0	0.30	1.00	2 - 3	2.0	-	-	-
25/11/78	<u>Site No. 3</u> Downstream near mouth	10.0	0.40	-	Low to Moderate	3.5	3.0	12.0	9.0

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
25/11/78	Coho	32	7	40.0	+ 6.4	11	44.2	+ 2.6
		R	3	49.3	-	4	46.1	+ 5.2



39. McTAGGART CREEK .51° 120° SE - 123 -

LOCATION

Flows north from McTaggart Lakes into Dunn Lake (Kamloops District).

small size and low flows. Rearing potential in this stream is also low.

ENHANCEMENT

DESCRIPTION

McTaggart Creek was surveyed for coho in late November, 1978. The section surveyed extended from McTaggart Lake downstream to Dunn Lake, a distance of approximately 2.5 km. At the outlet of McTaggart Lake is an impassable beaver dam with 180 meters of shallow muskeg above. The lower stream contains good spawning gravel, but coho escapement is limited due to the stream's

Enhancement potential on McTaggart Creek is limited owing to its small size, low groundwater values, and poor hydro power availability. Enhancement options that are feasible include fry planting in McTaggart Lakes for natural rearing, controlled rearing pens, and improving stream flow by opening beaver dams.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Coho *	20	20	65	80	-	75 ¹	42
Chinook *	-	25	-	-	-	-	-

* Prior to 1970, escapements to this stream were included with those to Joseph Creek.

¹Excludes 1961 to 1969.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Late October	November	Middle November	Late November

PHYSICAL AND CHEMICAL CHARACTERISTICS.

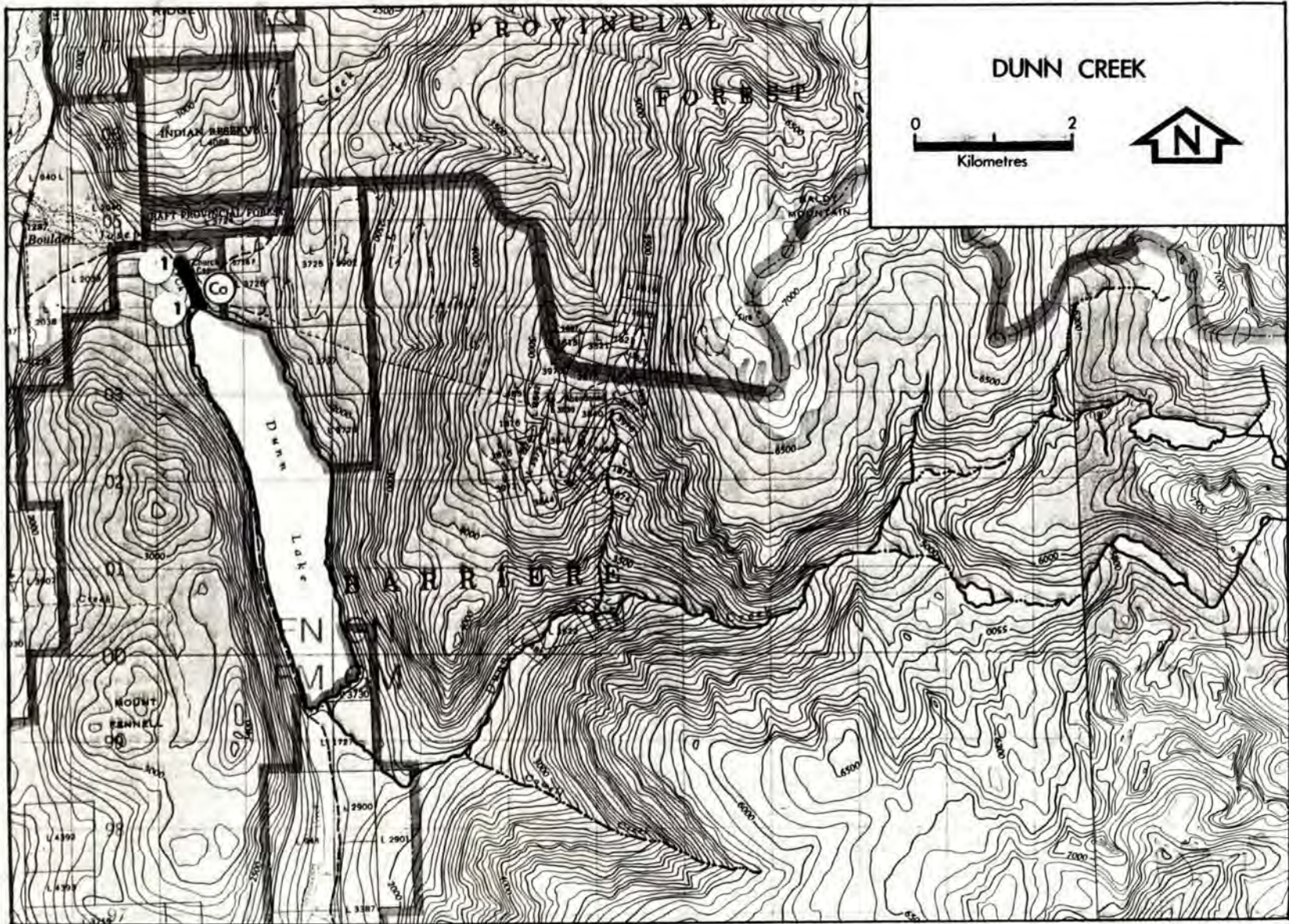
<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
26/11/78	<u>Site No. 1</u> From Dunn Lake to McTaggart Lake	3.5	0.2	-	1.0	-	-	-	-

• The stream was 98% frozen at the time of survey in 1978.

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
26/11/78	Coho	3 ₂	3	43.5	-	1	46.1	-



40. DUNN CREEK, 51° 120° SE

LOCATION

Flows north into Joseph Creek from Dunn Lake. Joseph Creek then flows west into the North Thompson at Boulder (Kamloops District).

potential. Due to the stream's shallow depth, predation of fish by bears and eagles is high. No obstructions are found in this stream.

DESCRIPTION

Dunn Creek was surveyed for coho in 1978. No survey for chinook was conducted. The section observed extended from the outlet of Dunn Lake to just below the confluence with Joseph Creek.

ENHANCEMENT

Several viable enhancement techniques could be implemented in this system as a good native coho donor stock exists. Dunn Lake has the potential for a high overwintering survival. Enhancement options include fry rearing pens in Dunn Lake as well as fry plants for natural lake rearing. In addition, an incubation/rearing facility using water pumped from Dunn Lake is also feasible. Road access is good, but hydro power is not available.

Dunn Creek is a small stream (0.8 km long) that is quite shallow with a moderately dense canopy. The stream substrate is cobble/pebble at the lake outlet, grading to cobble/boulder at the Joseph Creek confluence. The upper section has good coho spawning potential and moderate rearing

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Coho *	350	400	530	700	400 ¹	314 ²	443

* Prior to 1970, escapement for this creek were included with those to Joseph Creek.

¹Excludes 1952 to 1960.

²Excludes 1962 to 1964.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	November	Middle November	End December

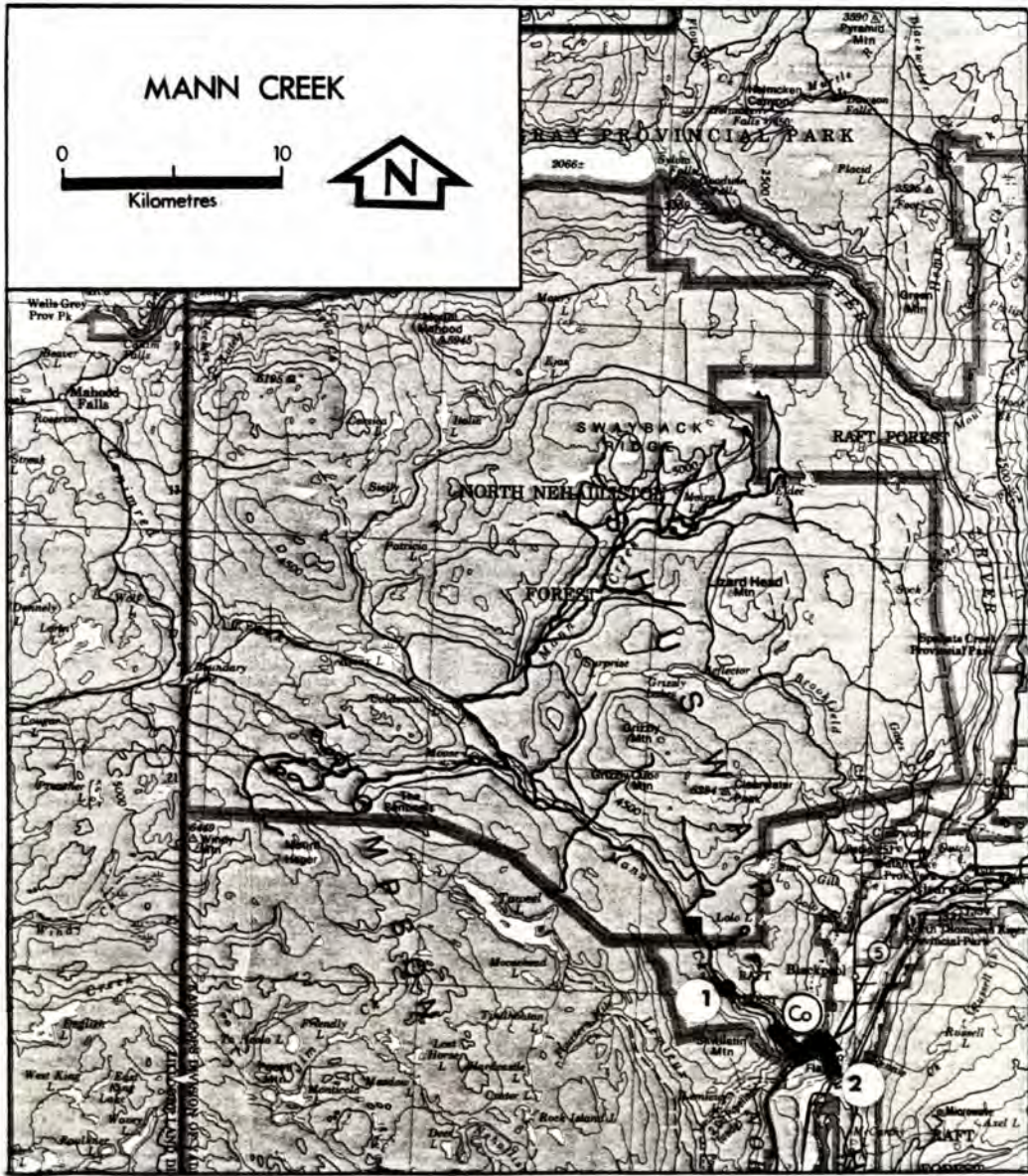
PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
26/11/78	<u>Site No. 1</u> Between Dunn Lake and bridge	6.0	0.25	0.9	-	5.0	2.0	11	7.2
09/12/78	<u>Site No. 1</u> Between Dunn Lake and bridge	-	-	-	-	5.0	-	-	-

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
26/11/78	Coho	3 ₂	16	47.9	+ 3.0	17	46.5	+ 1.4
		R	4	53.5	+ 3.6	-	-	-



41. MANN CREEK, 51° 120° NE

LOCATION

Flows southeast into the North Thompson River, approximately 12.0 km southwest of Clearwater (Kamloops District).

falls at 6.4 km. the lower 1.6 km has moderate coho spawning and rearing habitat; however, ice and scouring problems were evident. During high flows, the lower reaches become extremely braided and must be confined by rip-rap in the vicinity of the highway bridge. Beaver dams are also a problem in the lower reaches and must be periodically removed.

DESCRIPTION

Mann Creek was surveyed for coho in 1978, from its mouth to 4.0 km upstream.

ENHANCEMENT

Mann Creek is a moderately sized meandering stream with intensive human activities influencing the lower reaches. Spawning is limited to the lower 1.6 km, although access is available to an impassable

Enhancement possibilities are limited. The only feasible measure is an incubation/rearing facility using pumped groundwater. A gravity feed system would probably experience icing problems.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1965 - 1976): Station No. 08L B050
Mann Creek near Blackpool

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
0.5 (18.4)	0.5 (18.0)	0.6 (21.3)	3.0 (110.0)	16.0 (566.0)	9.4 (332.0)	2.7 (94.2)	1.3 (45.8)	1.1 (38.5)	1.3 (44.6)	1.1 (39.7)	0.7 (25.1)

- Mean Yearly Discharge 3.2 cms (114.0 cfs)
- Maximum Daily Discharge 61.2 cms (2,160.0 cfs)
- Minimum Daily Discharge 0.03 cms (0.9 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Coho	8	25	60	20	267 ¹	122 ²	53
		<u>1955</u>	<u>1968</u>				
Chinook were observed		25	25				

¹Excludes 1951/1953/1954/1956 to 1958/1960.

²Excludes 1967.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	Late October	November	Late November

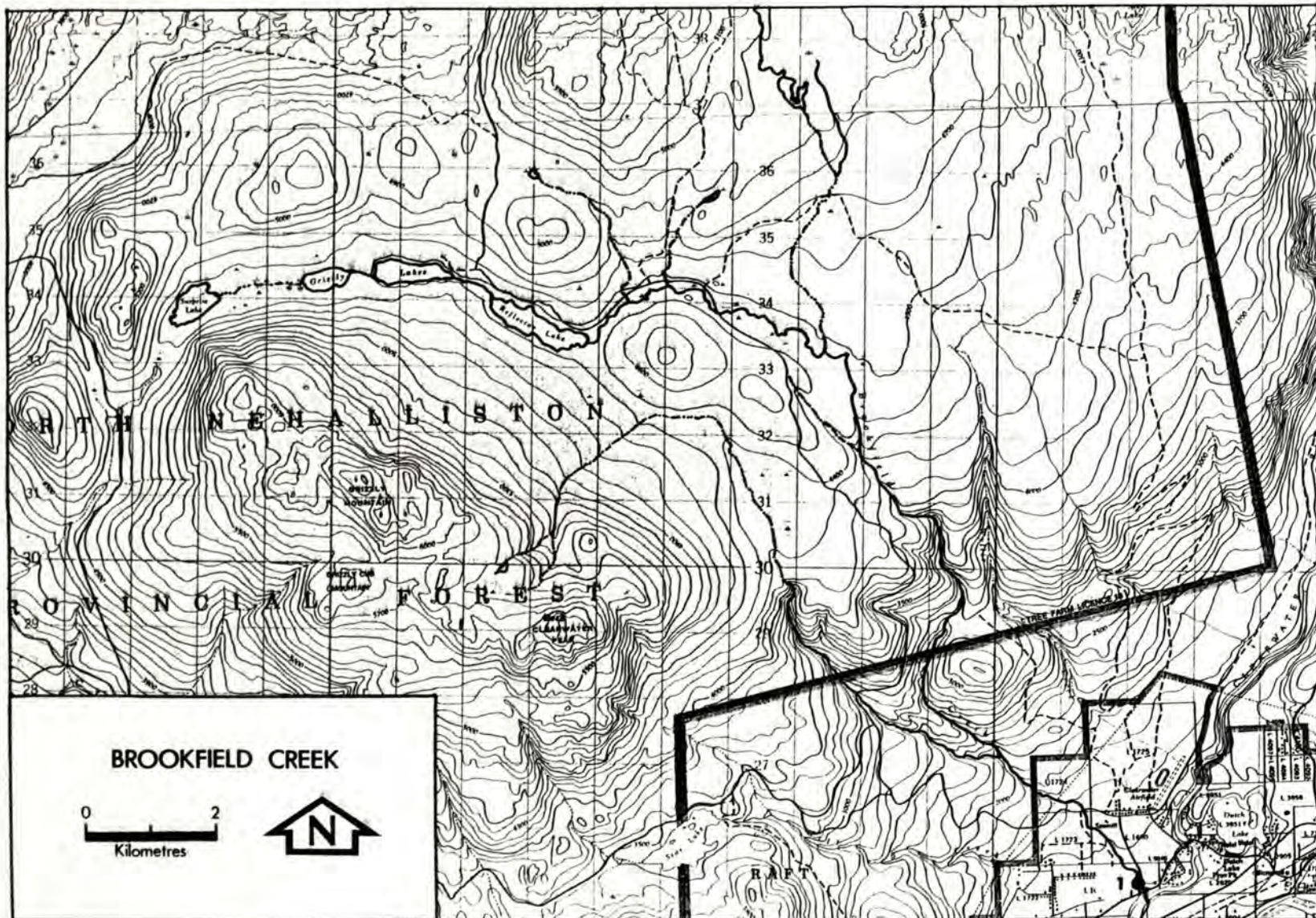
PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
24/11/78	<u>Site No. 1</u> Mouth	10.0	-	-	1.0	-	-	-	-
24/11/78	<u>Site No. 2</u> 4.0 km upstream	17.0	0.7	-	3.0	0.5	-2.0	11	8.3

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95%</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95%</u>
					<u>Confidence Interval</u>			<u>Confidence Interval</u>
24/11/78	Coho	32	1	45.7	-	-	-	-



42. BROOKFIELD CREEK, 51° 120° NE - 131 -

LOCATION

Flows southeast into Clearwater River, near the junctions of Clearwater and North Thompson Rivers (Kamloops District).

scouring has removed most of the spawning substrate reducing the streambed to bedrock and boulder and creating an impassable falls located at 0.75 km. In addition to these problems, this stream often dries up in the summer.

DESCRIPTION

Brookfield Creek was surveyed for coho in late November, 1978. The section observed was from the mouth (confluence with Clearwater) to 0.5 km upstream.

Brookfield Creek is a small stream influenced by the activities of a town and a nearby sawmill. Due to spring flash floods,

ENHANCEMENT

No enhancement potential exists due to the small stream size, cold temperatures, presence of ice in winter, lack of water in summer and low to non-existent coho runs.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Coho *	-	-	-	-	No Records	41 ¹	14 ²

* No records prior to 1968.

¹Excludes 1961 to 1967.

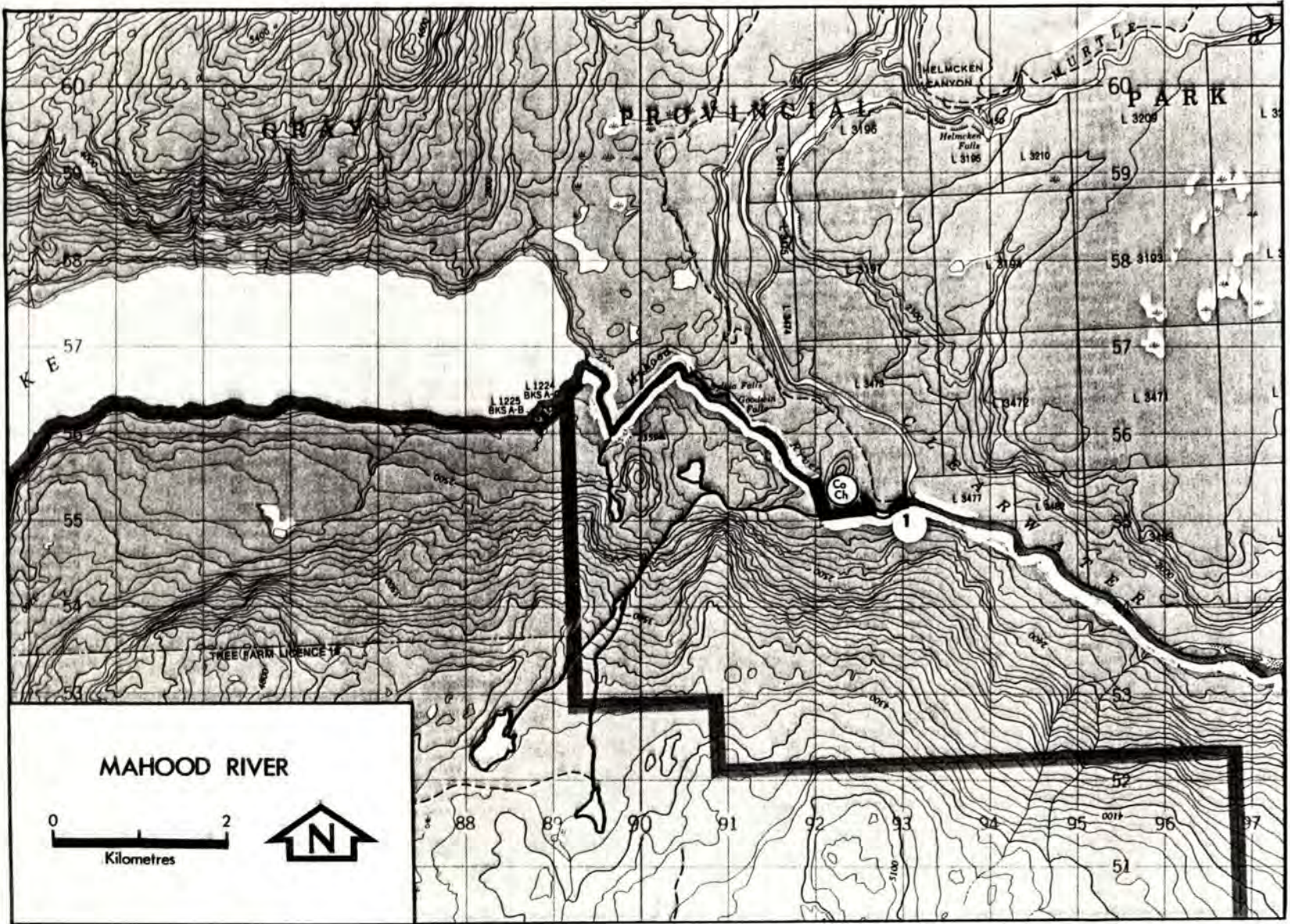
²Excludes 1973 to 1978.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
23/11/78	<u>Site No. 1</u> Near mouth	9	0.35	-	2.0	-	-2.0	12	6.7

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1978 survey.



43. MAHOOD RIVER ,51° 120°NE - 133 -

LOCATION

Flows southeast into Clearwater River from the east end of Mahood Lake (Kamloops District).

Obstructions exist in the form of two sets of falls, one approximately 12 m high at 2.5 km and the other approximately 18 m high at 3.0 km. Spawning and rearing potential is limited in the vicinity of the first obstruction, but improves further downstream.

DESCRIPTION

Mahood River was surveyed for chinook in early October, 1976 and in late September, 1978. A survey for coho was conducted in late November, 1978. The section surveyed extended from the mouth to 2.0 km upstream.

ENHANCEMENT

As hydro power is currently unavailable major enhancement facilities are not feasible. Several viable minor enhancement options do exist. These include an incubation/rearing facility using gravity feed water from the falls, floating pen rearing in Mahood Lake, or fry stocking in Mahood Lake. A good native stock is available. Due to the small coho run, additional donor stock could be obtained from Clearwater River.

Mahood River is a very short stream (5 km) with a fairly wide streambed and stable banks. The moderate gradient section at the mouth has good cobble/pebble spawning substrate and a moderate rearing potential, with observed use by chinook and coho.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1950 - 1976): Station No. 08L A008
At the outlet of Mahood Lake

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
9.2 (325)	9.1 (320)	9.9 (348)	18.0 (637)	97.7 (3,450)	122.0 (4,310)	57.2 (2,020)	23.5 (831)	16.6 (585)	15.4 (543)	14.1 (498)	11.6 (408)

- Mean Yearly Discharge 33.7 cms (1,190.0 cfs)
- Maximum Daily Discharge 272.7 cms (9,630.0 cfs)
- Minimum Daily Discharge 1.6 cms (56.2 cfs)

ESCAPEMENT AND TIMING.

Escapement.

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Chinook *	179	200	425	450	-	200 ¹	293
Coho *	25	-	10	12	-	-	21 ²

* Prior to 1970, escapements to this stream were included with those to Clearwater River.

¹Excludes 1961 to 1969.

²Excludes 1976.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	September	Middle September	Late September	End October
Coho	Late October	November	Middle November	End December

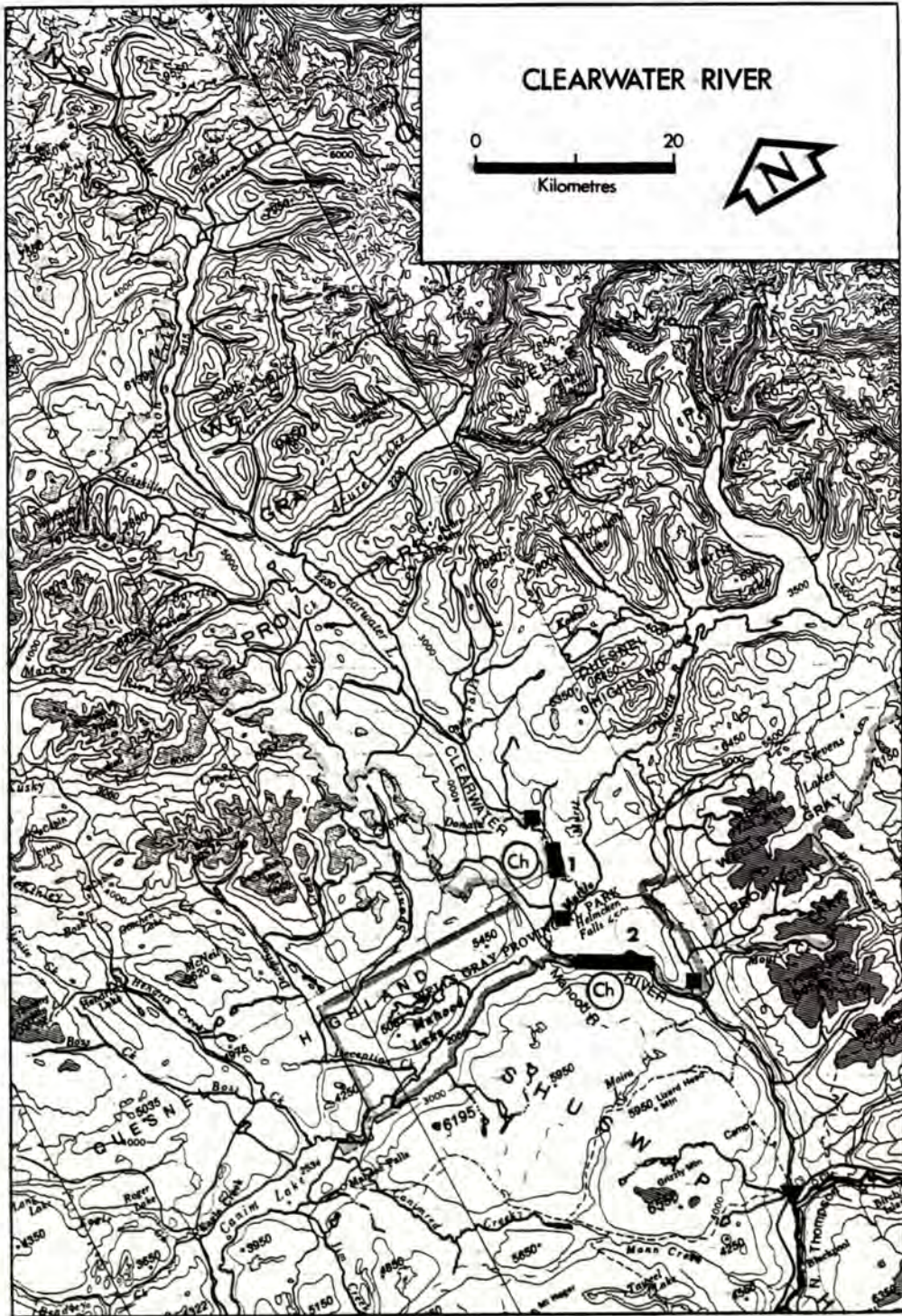
PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
04/10/76	<u>Site No. 1</u> Logging road bridge	12.0	0.6	1.67	-	12.0	-	10.0	7.9
23/11/78	<u>Site No. 1</u> Near mouth	-	-	-	3 - 4	4.5	-	-	7.9

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
10/76	Chinook	3 ₁	-	-	-	2	61.6	-
		4 ₁	-	-	-	1	73.2	-
		4 ₂	1	57.5	-	1	57.0	-
		5 ₂	-	-	-	1	71.9	-
		R	1	77.3	-	1	70.6	-
11/78	Chinook	4 ₁	4	-	-	1	80.1	-



44. CLEARWATER RIVER, 51° 120° NE - 136 -

LOCATION

Flows south into the North Thompson River just west of Clearwater (Kamloops District).

DESCRIPTION

Clearwater River was surveyed for chinook in early and late October, 1976, and mid and late September, 1977. Surveys for coho were conducted in late November, 1978. Two main areas of Clearwater River were surveyed: Horseshoe Bend and Whitehorse Bluffs.

Clearwater River, which originates in the Cariboo Mountains, has six major lakes and several large tributaries over its 160 km length. Due to high precipitation in its catchment basin, the Clearwater flood flows contributes 10 to 15% of the Fraser River flood crest at Hope. The lakes in this large system form efficient reservoirs and help to stabilize stream flow.

The topography of this region attributes to the fast flow of the river. Many rapids and falls are located near the mouths of the major tributaries. A falls at 56 km on the mainstem, Baileys chute, marks the upper limits for coho and chinook. At 7.2 km a canyon and chute is found which forms a point of difficult passage for coho.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1915 - 1973): Station No. 08L A001

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
50.1	44.2	43.6	85.5	427.6	730.7	521.0	294.5	190.6	145.3	100.8	65.1
(1,770)	(1,560)	(1,540)	(3,020)	(15,100)	(25,800)	(18,400)	(10,400)	(6,730)	(5,130)	(3,560)	(2,300)

- Mean Yearly Discharge 226.8 cms (8,010 cfs)
- Maximum Daily Discharge 1,461.1 cms (51,600.0 cfs)
- Minimum Daily Discharge 19.5 cms (690.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	1,200	1,550	2,750	3,000	1,747 ¹	1,975	1,738
Coho	400	UNK	1,500	400	1,764 ²	-	1,260 ³

¹Excludes 1953/1954/1956.

²Excludes 1951 to 1954/1956 to 1959.

³Excludes 1971/1972/1976.

There are two main spawning beds in the lower Clearwater River. The Horseshoe area is 6.4 km in length and is located just below Baileys Chute. The Whitehorse Bluffs area is 3.2 km in length and is located just below the Mahood River confluence. Both areas are comprised primarily of coarse gravel and have excellent spawning potential, but limited rearing capabilities. Good rearing habitat exists in the other reaches of the accessible mainstem. Information for coho escapements is limited as the actual spawning areas are unknown. Coho are assumed to spawn in the same areas as chinook.

ENHANCEMENT

There are numerous enhancement techniques that could be implemented in this system. To improve access for coho, the chute at 7.2 km could be blasted or a fish ladder installed. Elimination of the chute at 56 km and a 3 m falls at 62 km would open the upper Clearwater system to migratory fish. As there are large numbers of available coho and chinook donors, an incubation/rearing facility using gravity feed or groundwater is possible. Planting juvenile coho and chinook in rearing areas presently underutilized is also considered feasible. The 1978 reconnaissance identified this system as ideal for a hatchery or spawning/rearing channels.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook Coho	Late August Middle October	Middle September November	Late September Late November	Middle October End December

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u> <u>Water</u> <u>Air</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
03/10/76	<u>Site No. 1</u> Horseshoe Bend (downstream end)	59.0	1.0	-	-	10.5	-	-	-
04/10/76	<u>Site No. 2</u> Whitehorse Bluffs	59.0	-	1.14	-	9.5	-	9.5	7.4
27/09/78	<u>Site No. 2</u> Whitehorse Bluffs	-	-	-	Less than 1	12.0	16.0	10.0	8.0

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
10/76	Chinook	31	5	65.3	+ 1.6	-	-	-
		41	5	74.8	+ 5.2	3	73.3	-
		42	-	-	-	-	-	-
		52	3	78.4	-	-	-	-
		R	1	56.2	-	1	63.7	-
09/78	Chinook	31	1	68.2	-	-	-	-
		41	1	75.5	-	2	69.9	-
		42	1	62.5	-	-	-	-
		R	1	75.8	-	-	-	-



LOCATION

Flows southeast into the North Thompson River, 4.0 km northeast of Clearwater (Kamloops District).

DESCRIPTION

Raft River was surveyed for chinook in late August and early September, 1978. The section surveyed extended from a set of impassable falls 1.0 km above the highway crossing to the mouth - a total distance of approximately 6.0 km.

Above the barrier is a long canyon containing two more sets of falls. Above the canyon, for approximately 13 km, the stream becomes slow and meandering with potential rearing habitat.

The area from the mouth to the falls can be divided into two sections. A low gradient 5 km section, from the mouth to the highway, is composed primarily of gravel and has good

spawning potential. Rearing habitat, although limited, is available in the form of undercut banks, streamside debris and back channels. The 1 km section above the bridge is confined, of steeper gradient, and composed mainly of angular cobble and boulders. Spawning and rearing potential is very limited in this section. Records show consistently good escapement of coho, chinook and sockeye with all species utilizing the same spawning areas.

ENHANCEMENT

The 1978 study identified this stream as ideal for enhancement with major facilities such as a hatchery or a spawning/rearing channel. Access is good and hydro power is available. Other enhancement possibilities include an incubation/rearing facility using developed groundwater or a gravity feed system, fry plants in potential rearing area above the canyon, or the development of semi-natural rearing channels in the lower reaches. A good native donor stock of coho and chinook are available.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1915 - 1919; 1952 - 1958): Station No. 08L B017 near Clearwater

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
2.6 (93.1)	1.5 (54.5)	2.1 (73.0)	12.9 (456)	59.8 (2,110)	53.2 (1,880)	18.1 (638)	5.3 (187)	3.8 (133)	5.5 (195)	6.1 (214)	3.2 (114)

- Mean Yearly Discharge 15.2 cms (538.0 cfs)
- Maximum Daily Discharge 141.6 cms (5,000.0 cfs)
- Minimum Daily Discharge 0.3 cms (10.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Coho	500	350	350	250	883 ¹	705	488
Chinook	121	250	230	200	560	265	206

¹Excludes 1954.

<u>Three-Cycle Mean</u>	\bar{x} 67/71/75	\bar{x} 68/72/76	\bar{x} 69/73/77	\bar{x} 70/74/78
Sockeye	1,851	6,465	3,716	1,933

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Late October	November	Middle November	End December
Chinook	Middle August	Late August	September	Middle September
Sockeye	Middle August	Late August	September	Middle September

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u> <u>Water</u> <u>Air</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
23/11/78	<u>Site No. 1</u> At highway bridge	-	-	-	-	-	-	-	7.1
24/11/78	<u>Site No. 2</u> Above bridge	20	0.35	1.0	2	-	-	-	-
24/11/78	<u>Site No. 3</u> Below bridge	40	0.85	0.5	-	-	-	-	-

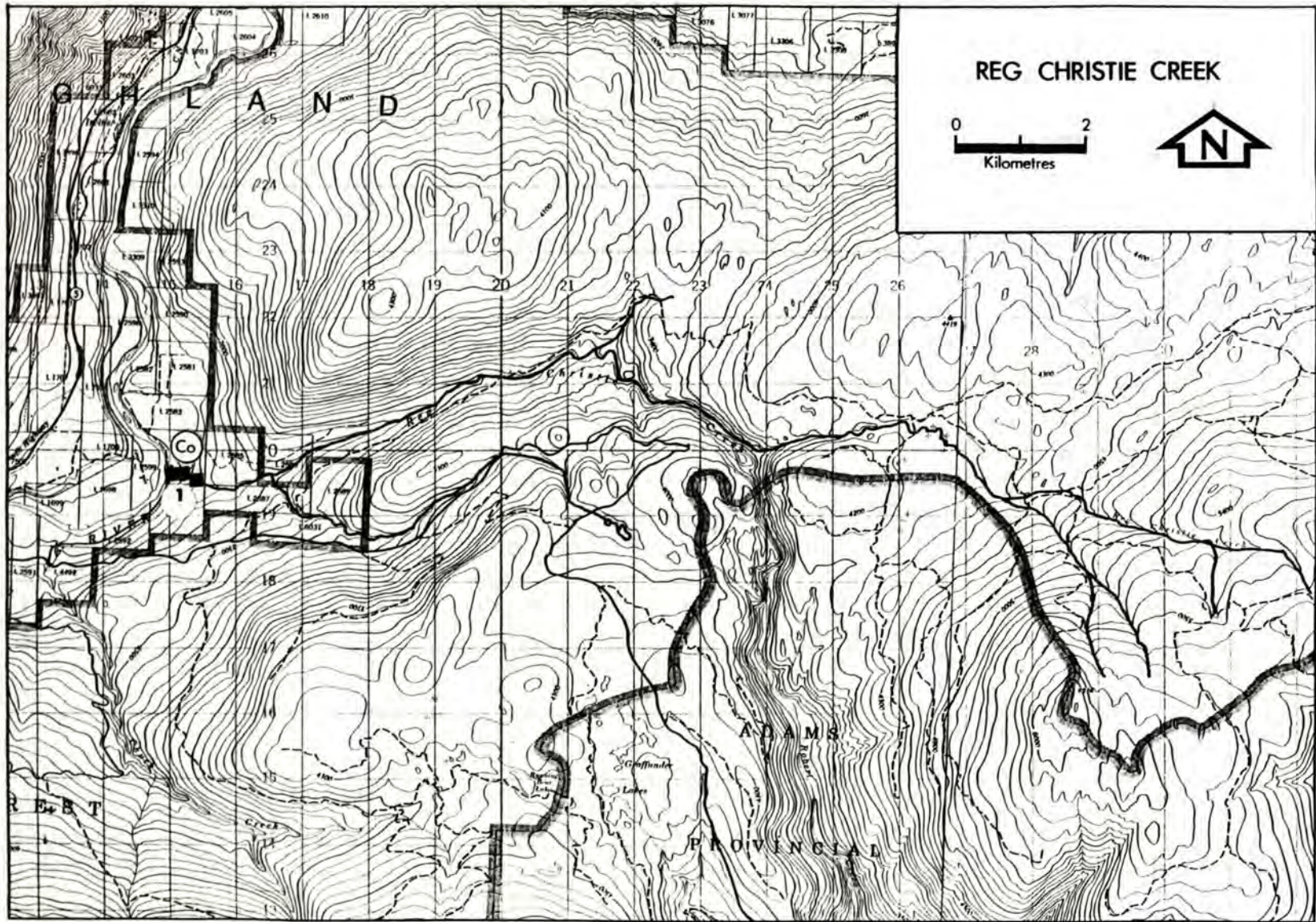
BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
08, 09/78	Chinook	2 ₁	1	39.7	-	-	-	-
		3 ₁	1	53.4	-	1	67.9	-
		4 ₁	-	-	-	5	70.5	+ 4.2
		5 ₂	-	-	-	1	72.4	-
		R	-	-	-	1	66.0	-

Juvenile Sampling

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x}</u> <u>Nose-Fork Length (mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
31/08/78	(Minnow traps)	1230	1400	Ch	2	1	5.8	-



46. REG CHRISTIE CREEK, _____

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51° 119° NW

LOCATION

Flows west into North Thompson River, just east of Vavenby (Kamloops District).

DESCRIPTION

Reg Christie Creek was surveyed for coho in late November, 1978. The section surveyed was from the mouth to 0.7 km upstream.

Reg Christie Creek is a small mountain stream with access to an impassable 15 m falls at 1.2 km. There is no potential above this falls as the substrate consists of bedrock and boulder. Below the falls, the substrate is cobble and pebble and the stream is narrow and

shallow with very limited spawning and rearing potential. Ice appears to be a problem, as during the survey the stream was frozen over. The majority of spawning occurs in a small groundwater fed side channel that drains into the North Thompson.

ENHANCEMENT

No enhancement is recommended as opportunities are limited due to lack of habitat, poor water supply and a very small coho stock.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Coho	-	50	8	20	150 ¹	81 ²	25 ³

¹Excludes 1951, 1954, 1958, 1960.

²Excludes 1961 to 1965, 1967.

³Excludes 1974, 1975.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	November	Middle November	Late November

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u> <u>Water</u> <u>Air</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
23/11/78	<u>Site No. 1</u> At mouth	0.7	0.15	1.5	2 - 4	-	-	19	7.4

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
23/11/78	Coho	3 ₂	-	-	-	2	45.3	-
		4 ₃	-	-	-	1	41.4	-



47. MAD RIVER .51° 119° NW

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LOCATION

Flows southwest into North Thompson River, approximately 9 km west of McMurphy (Kamloops District).

DESCRIPTION

Mad River was surveyed in late August and November, 1978. The section surveyed extended from its mouth to 1 km upstream.

Mad River is a fast flowing steep gradient stream confined within a canyon. The substrate consists of 80% boulder and bedrock with very little spawning and rearing potential. Passable falls are located at the mouth and at 1.5 km. An impassable 15 m falls is located at 6.4 km. The falls at the mouth is approximately 1.5 m and creates difficult

access problems for coho. During the November, 1978 survey, slush ice approximately 0.75 m thick was observed throughout.

ENHANCEMENT

No enhancement procedures are recommended, due to lack of habitat, ice problems and a lack of donor stock.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING

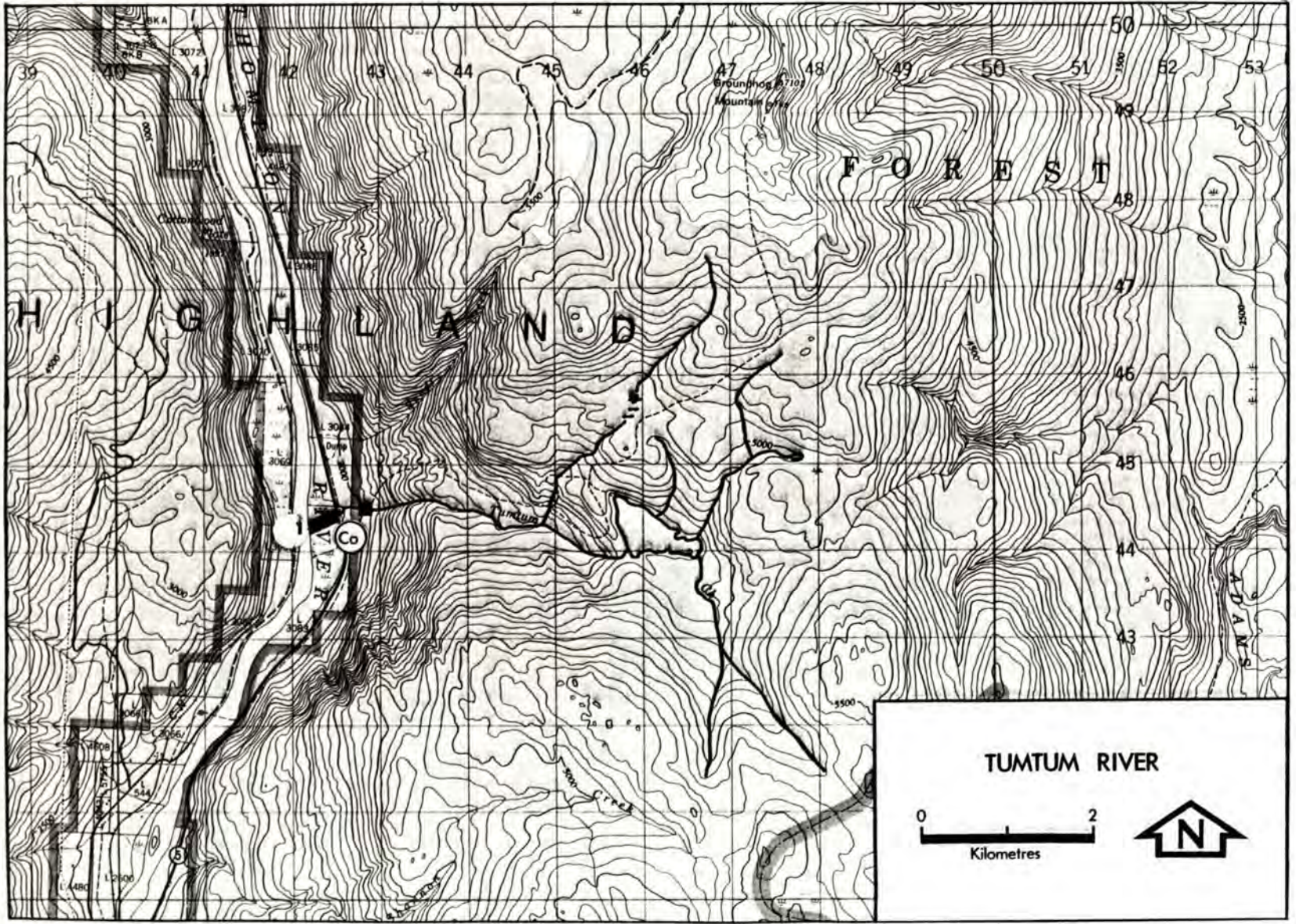
Records for this stream were discontinued after 1960. The last recorded escapement was 75 coho in 1952. There have never been more than 75 coho and 25 chinook observed.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
23/11/78	Site No. 1 Mouth to 1 km bridge	10.0	0.5	-	-	-	-	14.5	7.3

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1978 survey.



48. TUMTUM RIVER .51° 119° NE - 146 -

LOCATION

Flows west in North Thompson River, approximately 4.8 km north of Avola (Kamloops District).

DESCRIPTION

Tumtum Creek was surveyed for coho in late September and late November, 1978. The section surveyed extended from the highway to the mouth (0.5 km).

Tumtum Creek is a very small stream that drains from a steep mountainside onto the North Thompson flats. Salmon access on the flats is limited to about 800 m and is sometimes complicated by beaver which create

partial barriers and siltation problems. The spawning substrate on the lower flats is cobble and pebble, but due to the stream's small size and problems with ice accumulation, spawning potential is limited. Rearing habitat for coho is moderate as this meandering stream has numerous side channels and deep pools.

ENHANCEMENT

Fry stocking in the upstream areas may be feasible; however, rearing potential should be determined.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Coho *	6	-	10	10	-	50 ¹	24

* No records prior to 1968.

¹Excludes 1961 to 1967/1970.

Spawning Timing

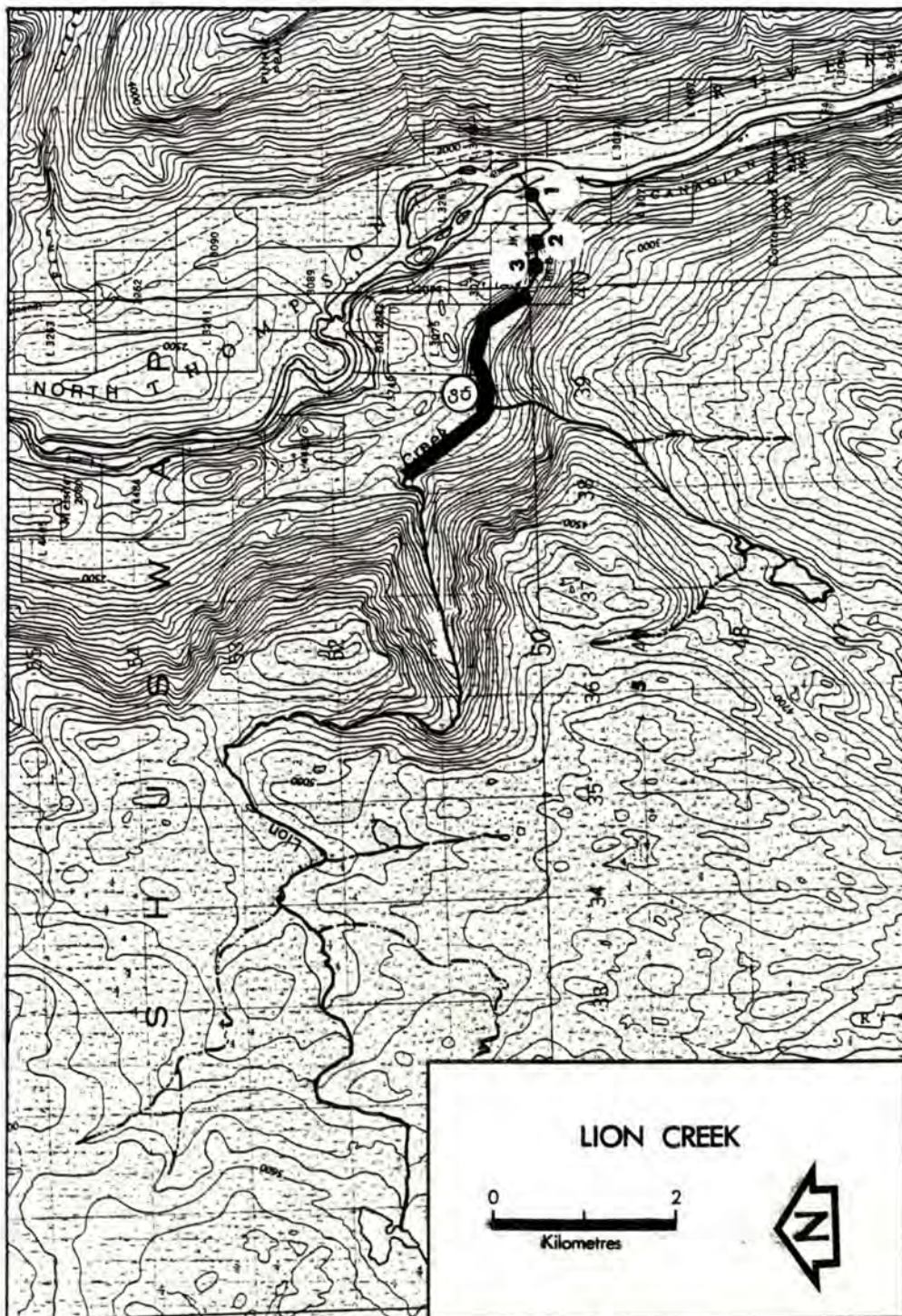
	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Late October	November	Middle November	Late November

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
22, 23 11/78	<u>Site No. 1</u> Mouth to 500 m	5	0.5	-	1 - 2	-	-	10	6.7

BIOLOGICAL SAMPLING DATA.

One carcass observed, but no samples taken.



49. LION CREEK .51° 119° NE

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LOCATION

Flows southeast into the North Thompson River 9.7 km north of Avola (Kamloops District).

DESCRIPTION

Lion Creek was surveyed for coho in late November and mid-October, 1978. Two main sections were surveyed over a total length of approximately 1.6 km.

Lion Creek is a small, low gradient meandering stream with salmon access limited to 4.8 km by a steep mountainside. Points of difficult access include beaver dams which must be removed annually, and a small falls at the outlet of the CNR railroad tunnel. The stream below the railway tunnel is composed of sand, silt and small gravel with spawning/rearing moderate potential. The 3.6 km section above the tracks is the main spawning bed and exhibits good spawning and rearing potential. The substrate in this area

is predominantly pebble with some compacting sand.

This watershed has been logged and has also experienced upper watershed forest fires in 1968 and 1971. In 1970, a fish baffle was installed in the CPR railroad culvert to assist migrating fish. Beaver dam construction has frequently caused silting of spawning beds.

ENHANCEMENT

This creek has been identified as a good stream for enhancement due to good access, availability of hydro power and a good coho native stock. Opportunities include an incubation/rearing facility using gravity feed as a water supply, construction of semi-natural rearing channels or minor stream improvements, and beaver dam removal.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook *	-	25	-	30	-	-	-
Coho	600	550	650	2,300	850 ¹	2,675	1,189

* Only 4 years of recorded chinook escapement (1969; 1972; 1976; and 1978).

¹Excludes 1951/1956.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Middle October	Late October	Middle November	Late November

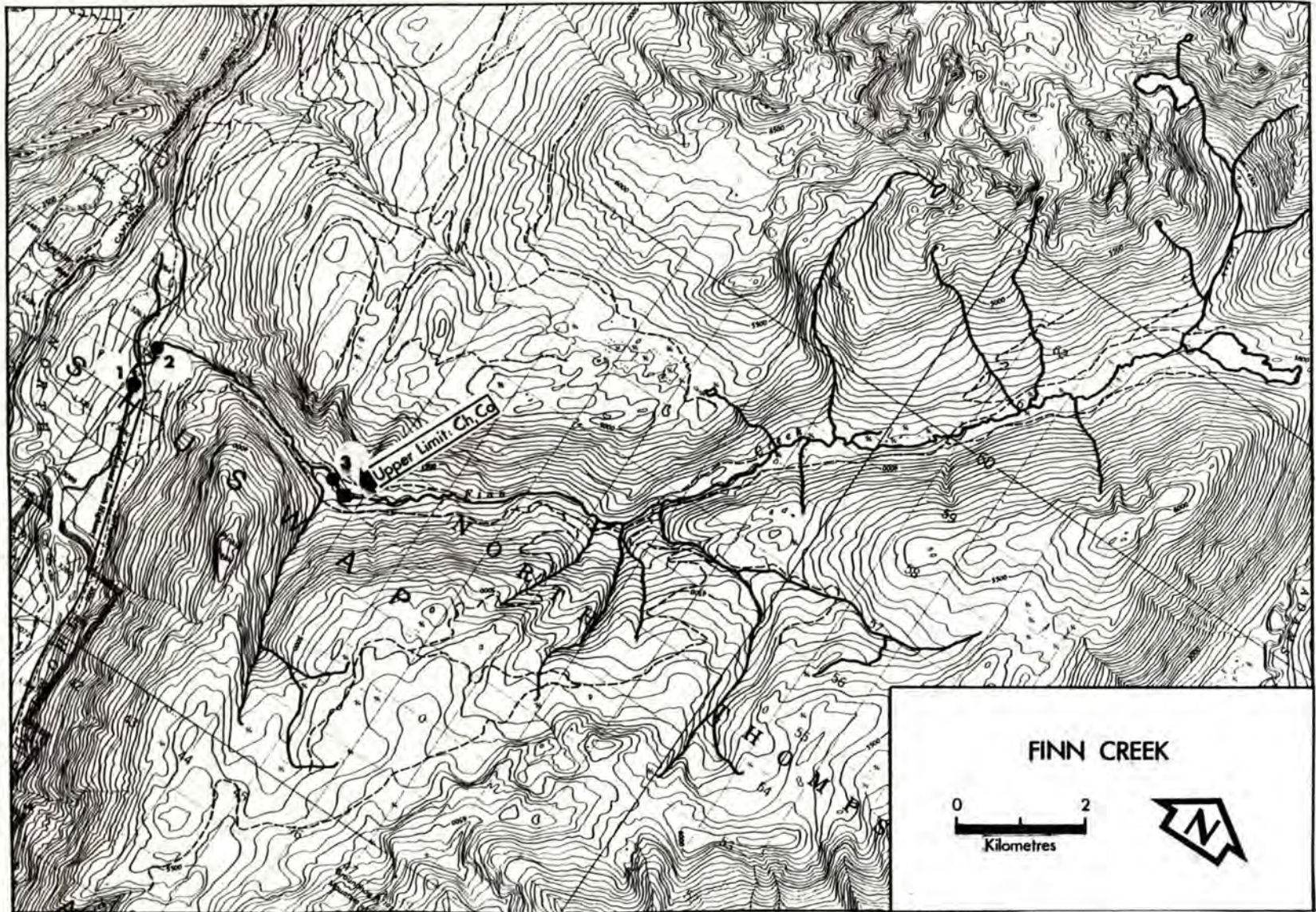
PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
23/11/78	<u>Site No. 1</u> On road at bridge	-	-	-	-	4.5	-	10	6.7
23/11/78	<u>Site No. 2</u> At bottom of tunnel	-	-	-	-	5.5	-	-	-
23/11/78	<u>Site No. 3</u> Above tunnel	-	-	-	1	2.5	-1.0	-	-

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
11/78	Coho	3 ₂	55	46.0	+ 1.8	55	48.1	+ 1.2
		4 ₃	4	44.2	+ 5.1	2	50.0	-
		R	6	-	-	9	-	-



LOCATION

Flows west and south into the North Thompson River, approximately 24 km south of Blue River (Kamloops District).

streambed shifting, erosion, bank slumping and log jam formation are now common. In addition, scouring and high flows have resulted in much of the good spawning gravel being washed into the North Thompson River.

DESCRIPTION

Finn Creek was surveyed for chinook in late August and for coho during late November, 1978. The area surveyed extended from the mouth (confluence with the North Thompson) to 4.0 km upstream. The upper reaches were spot-checked by vehicle.

Observations indicate that all available spawning areas are presently being utilized by chinook and coho. Spawning and rearing potential is less than optimal due to unstable watershed conditions.

ENHANCEMENT

Potential exists for a small gravity feed water supply incubation/rearing facility; however, problems may arise due to ice and stream instability. Stream improvements could also be attempted, but the benefits would probably be temporary.

Finn Creek is a medium-sized, low gradient stream with salmon access to an impassable falls at 6.4 km. Above this falls is a steeper gradient canyon containing 3 more sets of falls.

Since 1971, logging and road construction in the upper watershed have drastically altered the nature of the stream. Areas of

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	296	400	525	700	1,148	537	515
Coho	15	10	6	100	1,850 ¹	377	59

¹Excludes 1952/1954 to 1960.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Late July	August	Middle August	End September
Coho	Late August	November	Middle November	Late November

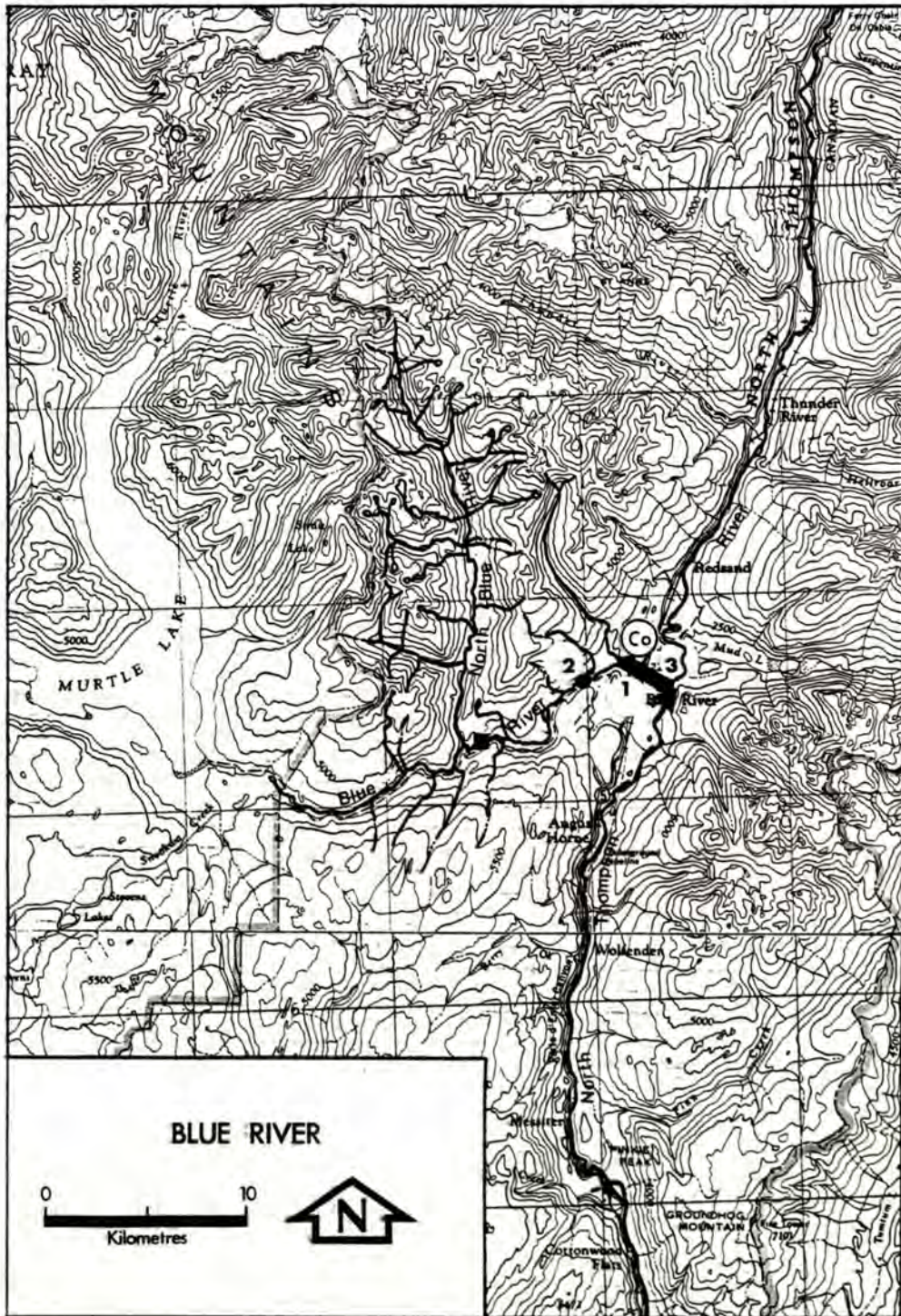
PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
29/08/78	<u>Site No. 1</u> Below Highway 5 bridge	8.5	0.43	1.4	1.2	-	-	-	-
22/11/78	<u>Site No. 2</u> Above Highway 5 bridge	4.0	0.20	1.5	-	1.0	1.0	-	-
22/11/78	<u>Site No. 3</u> Above Highway 5 bridge	-	-	0.9	-	-	4.0	-	-

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
29/08/78	Chinook	3 ₁	-	-	-	1	58.5	-
		4 ₁	1	67.9	-	6	68.5	+ 2.2
		R	-	-	-	1	66.5	-
27/08/76	Chinook	3 ₁	-	-	-	1	69.7	-
		4 ₁	-	-	-	1	71.0	-



LOCATION

Flows northeast into the North Thompson River, approximately 1.0 km north of Blue River (Kamloops District).

DESCRIPTION

Blue River was surveyed for chinook in late August and for coho in late November and early December, 1978. The main section observed extended from the highway bridge downstream to the mouth.

The Blue River in its lower 10.5 km is a moderately large clear-flowing river. The substrate in this section is generally cobble/pebble with isolated boulder patches and has good spawning and fair rearing habitat. The main spawning area is found in the lower sections in the highway vicinity and below. Above the low gradient section, the stream becomes confined. An impassable 8 m falls is located at 12.8 km from the mouth, just below the North Blue and Blue River confluence. Upstream of the falls, for a short distance on both forks, the stream remains incised and of steep gradient. Above the canyons the streams level out and contain

areas of potentially good spawning and rearing habitat; 3 to 4 km on the south fork and approximately 14 km on the north fork.

Logging operations began in this watershed in 1977. Concern has been expressed for the following reasons. Firstly, the first ever record of coho spawning was in 1973. Coho spawning escapement has been increasing steadily ever since. Secondly, the stream has a high potential for salmon production. Thirdly, major watershed disturbances could cause water quality degradation and changes in flow regime.

ENHANCEMENT

Blue River is ideal for coho and chinook enhancement as good habitat for both species exists and donor stocks are available. Hydro power is available and access is good. Enhancement potentials include an incubation/rearing facility using groundwater or a gravity feed system, construction of rearing channels, and coho and chinook fry transplants into rearing areas above falls. It is suggested that a more detailed survey of the upper reaches be carried out to better identify obstructions as well as potential rearing areas.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1963 - 1976): Station No. 10A C004 near the mouth

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
4.4 (157)	3.7 (132)	3.3 (117)	3.6 (128)	19.9 (702)	62.6 (2,210)	46.4 (1,640)	25.5 (901)	21.3 (751)	16.2 (572)	8.8 (310)	6.2 (220)

- Mean Yearly Discharge 18.5 cms (652.0 cfs)
- Maximum Daily Discharge 277.5 cms (9,800.0 cfs)
- Minimum Daily Discharge 0.9 cms (31.9 cfs)

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Coho *	250	25	510	600	-	-	337

- * No records prior to 1973.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Coho	Late October	November	Middle November	End December

PHYSICAL AND CHEMICAL CHARACTERISTICS.

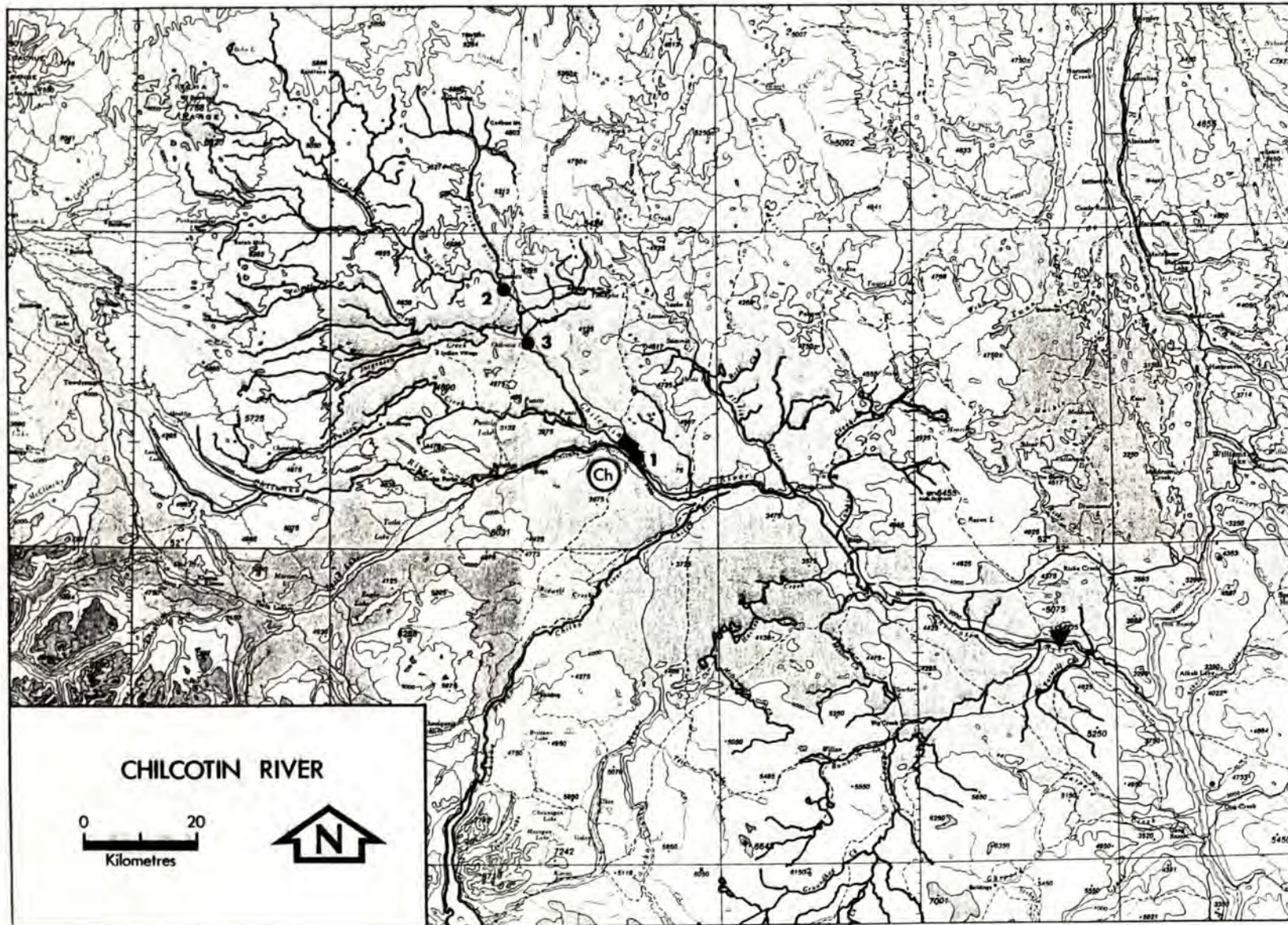
<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
22/11/78	<u>Site No. 1</u> At highway bridge	-	-	1.0	-	-	-5.0	11	6.8
22/11/78	<u>Site No. 2</u> Above spawning area	-	-	-	-	1.0	-	-	-
09/12/78	<u>Site No. 3</u> At spawning area	-	-	-	-	1.3	-	-	-

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
22/11/78	Coho	3 ₂	1	54.0	-	1	47.5	-

* The 1978 chinook recovery appears to be the first record of chinook spawners in Blue River.



LOCATION

Flows southeast into the Fraser River (Lillooet District).

DESCRIPTION

The Chilcotin was surveyed for chinook in September, 1977. Four sites were sampled between Hanceville and Alexis Lake Road turnoff in addition to areas near Redstone, near Chezacut, and at the outlet of Chilcotin Lake.

The Chilcotin River is relatively confined in its lower reaches below Hanceville. The substrate in this section is coarse, offering little spawning or rearing habitat for chinook. From Hanceville to Redstone, the river becomes very wide with some gravel bar and side channel development. Although limited, some chinook spawning does occur in the pebble/cobble/boulder substrate. This river is used primarily as a corridor for migrating salmon and as a rearing area for juvenile chinook.

Above the Chilcotin confluence, chinook spawning is usually concentrated in the vicinity below Redstone. Above Redstone the river is composed of pools, side channels and log jams. Spawning potential is poor and rearing potential good. At the Chilcotin Lake outlet, the streambed is quite coarse, offering limited spawning or rearing potential.

ENHANCEMENT

Upper River

The construction of an enhancement facility in the Redstone area appears feasible. Road access is good in the area of Redstone via Highway No. 20 and hydro power is available. Adequate brood stock exists and adult capture is possible by fence trapping, angling, seining, and gill netting. A pumped

groundwater supply for incubation and a river intake for rearing channels are available. Fairly warm water temperatures (exceeding 20° C) in summer were indicated by thermograph recordings on this stream in 1977 and could present a problem during rearing at an enhancement facility.

Many miles of potential spawning and rearing habitat appear to exist in this stream. The development of a coho run through transplants, in addition to chinook enhancement, appears practical for this stream.

Main-Stream River

Construction of a major enhancement facility in the area of Alexis Creek or Hanceville is a possibility. Road access is good and hydro power is available. Pumped groundwater for incubation and a river intake for rearing facilities should be feasible. A spring exists on the hillside above the river at Hanceville and is presently used for irrigation and domestic water by the T.H. Guest Ranch. It may be possible to utilize this water for incubation via a gravity feed system. A facility constructed on the main-stream Chilcotin River could be used as a central facility to enhance all stocks in the system by transplanting eggs to the facility for incubation, rearing fry, and then releasing fry or smolts in the stream of their origin. Capture of brook stock would generally have to take place on the Chilko River, Upper Chilcotin, Elkin Creek, and the Taseko River as little or no spawning takes place in the main-stream. Some adults may be captured enroute to these streams by seining or angling in the main-stream.

Developments of semi-natural rearing channels on the main-stream river should also be possible. However, enhancement of the Chilcotin system by the use of a central facility is probably the most practical.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1970 - 1976): Station No. 08M B005
Chilcotin River below Big Creek

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
23.1 (817)	23.6 (834)	27.4 (967)	38.8 (1,370)	104.2 (3,680)	201.6 (7,120)	246.7 (8,710)	240.7 (8,500)	132.8 (4,690)	72.8 (2,570)	47.3 (1,670)	31.7 (1,120)

- Mean Yearly Discharge 100.3 cms (3,540.0 cfs)
- Maximum Daily Discharge 492.7 cms (17,400.0 cfs)
- Minimum Daily Discharge 14.3 cms (505.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Chinook	850	800	700	850	505	645	888

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	June	Middle August	September	Middle September

PHYSICAL AND CHEMICAL CHARACTERISTICS

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u> <u>Water</u> <u>Air</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
15/09/77	<u>Site No. 1</u> Little Chilcotin at Redstone	15.0	0.5	-	-	10.5	-	13.0	9.0
27/09/77	<u>Site No. 2</u> Little Chilcotin at River Road Bridge	6.0	1.5	-	-	7.0	-	15.0	8.5
28/09/77	<u>Site No. 3</u> Outlet of Little Chilcotin Lake	30.0	0.3	1.3	-	7.0	-	-	-

<u>Site</u>	<u>Substrate</u>	<u>Site</u>	<u>Substrate</u>
No. 1	Angular cobble and boulder	No. 3	40% cobble, 50% boulder, 5% sand, and 5% pebble

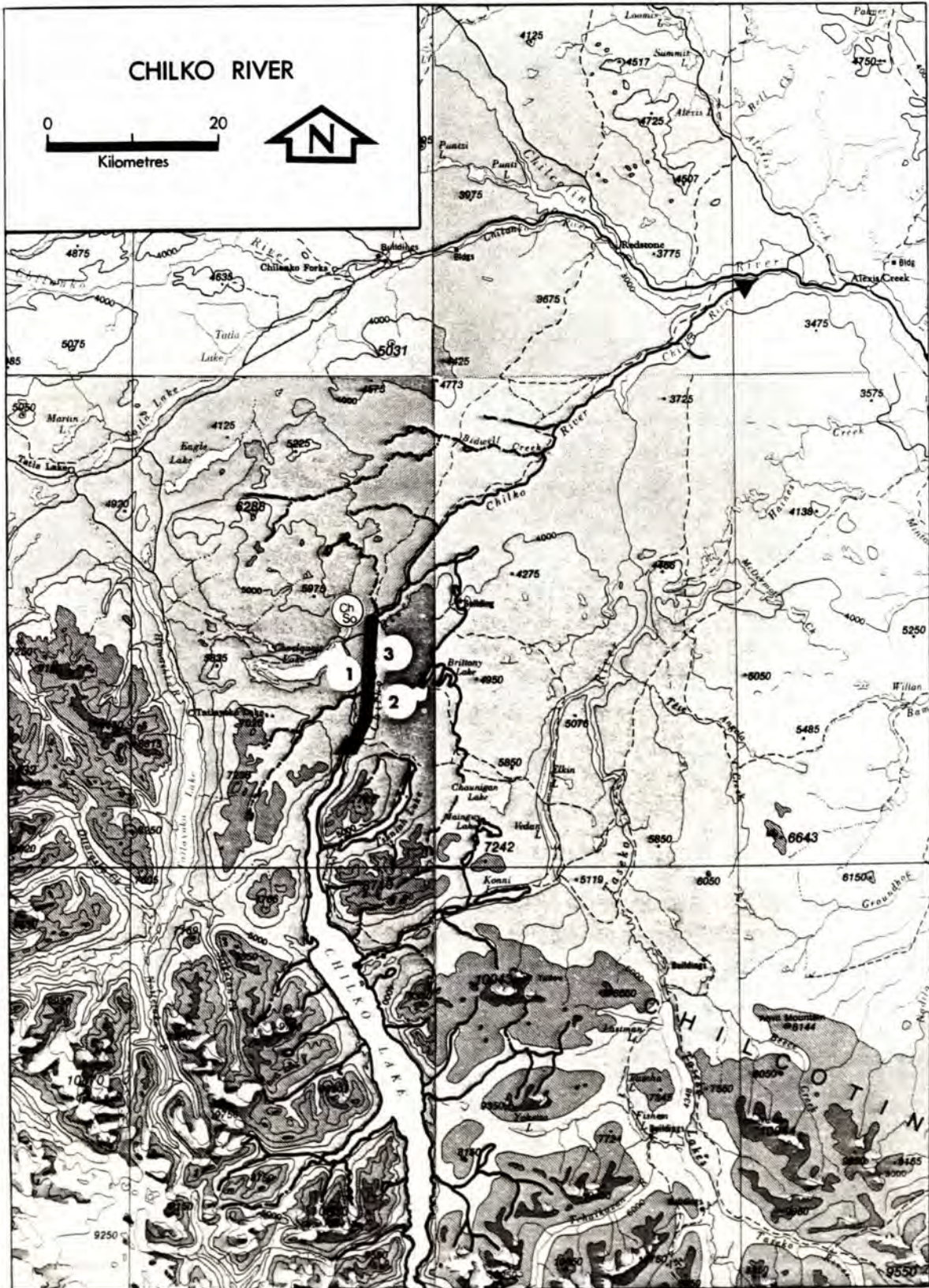
BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
1976	Chinook	2 ₁	1	38.1	-	-	-	-
		3 ₁	1	41.0	-	-	-	-
		4 ₁	2	83.2	-	3	71.0	-
		4 ₂	1	71.0	-	5	62.0	+ 9.2
		5 ₂	2	79.0	-	-	-	-
		R	1	-	-	-	-	-

Juvenile Sampling

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x} Nose-Fork Length (mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
15/09/77	Little Chilcotin River at Redstone Bridge area (10 minnow traps)	1415	1630	Ch	1	-	-	-
27/09/77	Little Chilcotin River at Redstone Bridge area (4 minnow traps)	1000	1300	-	-	-	-	-
28/09/77	Chilcotin Lake outlet (4 minnow traps)	1200	1440	-	-	-	-	3 Dace
27/09/77	Chilcotin River between Chilko confluence and Bull Canyon (10 minnow traps)	1430	1630	-	5	-	-	11 Red-Sided Shiners
29/09/77	Chilcotin River at Bull Canyon (7 minnow traps)	1000	1445	-	-	-	-	2 Dace 1 Rainbow Trout 2 Shiners 2 Suckers



LOCATION

Flows northeast into Chilcotin River, south of Redstone (Cariboo District).

DESCRIPTION

The Chilko River was surveyed for chinook in September, 1975, 1976 and 1977. The areas surveyed extended from Lingfield Creek to 6 km below Henry's Crossing and from Chilko Lake to Lingfield Creek confluence.

The Chilko River and its major tributary (Taseko River) are extensively used by chinook and sockeye with large numbers of char, resident trout and whitefish. The Chilko is also a major steelhead producer. The major chinook spawning beds include a 3 km section below Henry's Crossing, in the vicinity of Lingfield Creek confluence, and an area just below Chilko Lake. The area below Henry's Crossing is characterized by extensive side channel bar and island formation and a shallow riffle-run series with a substrate of cobble/pebble. Rearing potential for chinook is good with heavy use in the side channels. Below the "Islands" to the Lava Canyons, the river is wide, shallow and confined. Spawning and rearing potential is limited due to fast flows and a coarse bouldery substrate.

The Lingfield spawning ground is a confined single channel of moderate depth and a substrate of cobble/pebble. In this 2 km section spawning potential is excellent and

rearing potential moderate to low. From the Chilko Lake outlet to the Lingfield spawning ground the river is wide, shallow and clear flowing. Although the substrate is all gravel, limited spawning occurs in this area.

ENHANCEMENT

Construction of a major facility in the upper reaches of the river, near Henry's Crossing or Lingfield Creek, should be possible. A more than adequate brood stock is present with adult capture possible by angling, seining, and gill netting. A river intake for rearing channels could be constructed and groundwater pumping for incubation should be feasible. Road access to the Chilko River is fair; however, no hydro power is available.

As an alternative to a major facility, fry captures and subsequent "in stream" rearing and release could be implemented as an enhancement technique. Chinook fry could be captured at Henry's Crossing using downstream traps and transported to the Chilko Lake outlet. Floating raceways could be used for rearing. Similarly, fry could be captured and used to stock rearing channels, if constructed.

A much smaller enhancement project than the above would be to reopen an old side channel east of Henry's Crossing to provide increased natural rearing area. This side channel could also be developed into a semi-natural rearing channel with supplemental feeding of fry.

HISTORICAL FLOW. cms (cfs).

1. Mean Monthly Discharge (1928 - 1976): Station No. 08M A002
Chilko River at Chilko Lake outlet

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
13.7 (484)	10.0 (353)	8.7 (308)	9.5 (334)	21.5 (756)	78.7 (2,770)	113.9 (4,010)	108.8 (3,830)	72.7 (2,560)	43.5 (1,530)	29.5 (1,040)	20.7 (728)

- Mean Yearly Discharge 42.9 cms (1,510.0 cfs)
- Maximum Daily Discharge 203.0 cms (7,170.0 cfs)
- Minimum Daily Discharge 4.0 cms (140.0 cfs)

2. Mean Monthly Discharge (1927 - 1976): Station No. 08M A001
Chilko River near Redstone

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
23.6 (832)	20.3 (714)	18.3 (643)	21.6 (762)	70.4 (2,480)	189.4 (6,670)	232.0 (8,170)	215.8 (7,600)	137.7 (4,850)	74.4 (2,620)	46.0 (1,620)	32.7 (1,150)

- Mean Yearly Discharge 91.2 cms (3,210.0 cfs)
- Maximum Daily Discharge 475.7 cms (16,800.0 cfs)
- Minimum Daily Discharge 7.8 cms (275.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	11,000	6,500	7,000	7,500	755	4,090	5,813
<hr/>							
<u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>		\bar{x} <u>68/72/76</u>		\bar{x} <u>69/73/77</u>		\bar{x} <u>70/74/78</u>
Sockeye	296,667		529,167		68,333		141,667

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Middle August	September	Middle September	End October
Sockeye	Middle August	September	Late September	End October

PHYSICAL AND CHEMICAL CHARACTERISTICS

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u> <u>Water</u> <u>Air</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
27/09/75	<u>Site No. 1</u> Small side channel 1.6 km downstream from Henry's Crossing	10.0	0.3	Low	-	11.6	-	-	7.5
29/09/75	<u>Site No. 2</u> Lingfield spawning area	82.0	1.2	-	-	10.3	-	-	7.5
24/09/76	<u>Site No. 2</u> Lingfield spawning area	97.0	1.3	-	-	11.0	-	10.0	7.3
11/09/77	<u>Site No. 3</u> Main channel 3 km downstream of Henry's Crossing	40.0	1.5	-	-	-	-	16.0	7.4
<hr/>									
<u>Site</u>	<u>Substrate</u>			<u>Site</u>	<u>Substrate</u>				
No. 1	Cobble, pebble and light silting			No. 2	Cobble, pebble, boulder, sand and silt				
No. 2	Cobble, pebble, sand and boulder			No. 4	Cobble				

BIOLOGICAL SAMPLING DATA.

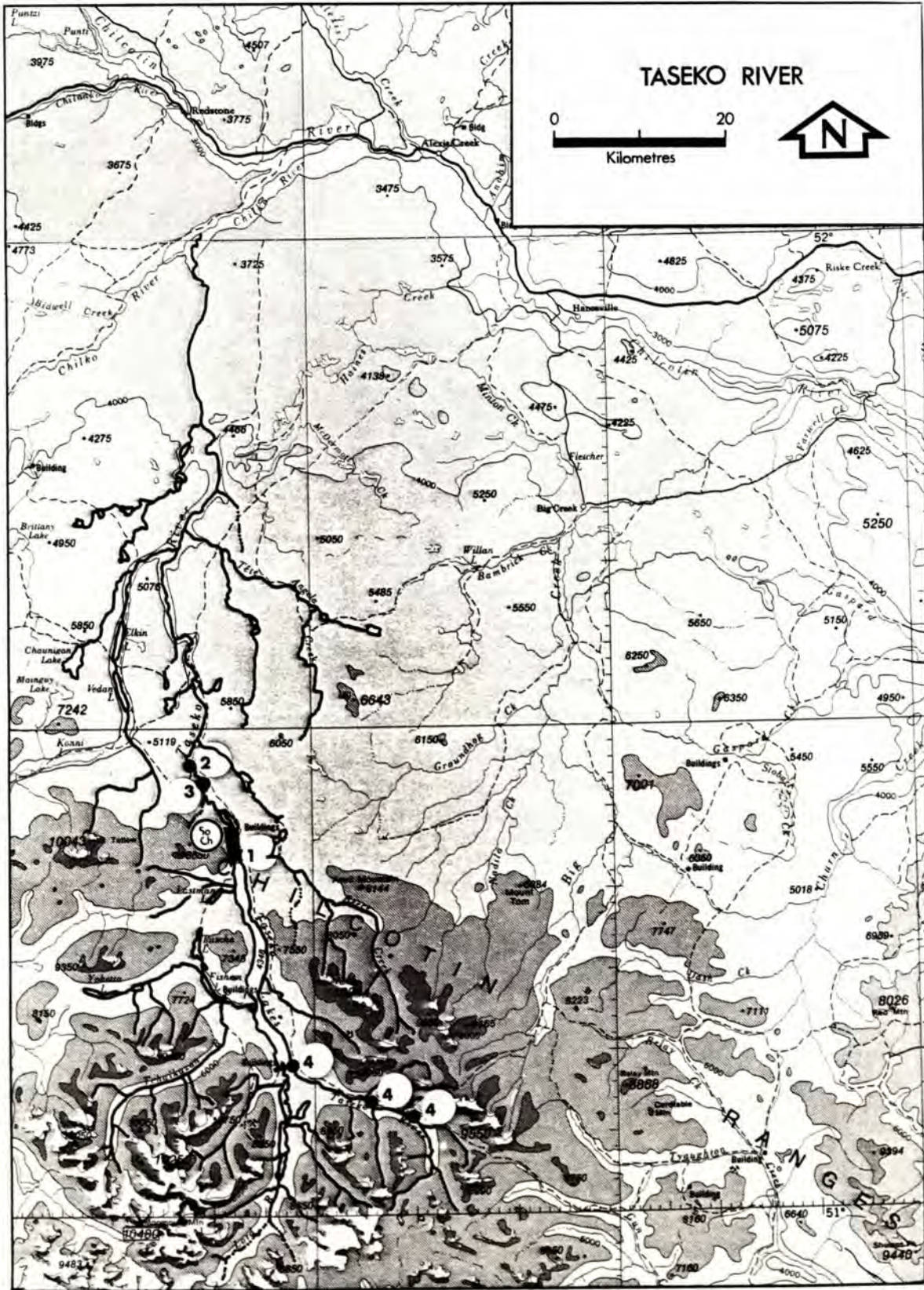
Adult Sampling

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
1975	Chinook	3 ₁	7	53.5	+ 5.1	10	68.5	+ 2.5
		4 ₁	7	72.5	+ 4.8	67	69.8	+ 0.8
		4 ₂	-	-	-	1	68.2	-
		5 ₁	-	-	-	1	80.0	-
		5 ₂	-	-	-	1	77.3	-
		6 ₂	-	-	-	1	74.3	-
		R	-	-	-	3	70.2	-
1976	Chinook	3 ₁	-	-	-	7	61.8	+ 4.6
		4 ₁	1	78.6	-	56	71.0	+ 0.8
		4 ₂	-	-	-	7	65.8	+ 4.4
		5 ₁	-	-	-	1	77.2	-
		5 ₂	-	-	-	2	75.3	-
		R	-	-	-	3	-	-
1977	Chinook	3 ₁	10	50.4	+ 4.3	10	59.4	+ 4.8
		4 ₁	18	75.4	+ 2.1	83	71.5	+ 0.8
		4 ₂	-	-	-	2	62.8	-
		5 ₁	2	86.0	-	6	77.7	+ 4.1
		5 ₂	6	74.5	+ 8.3	14	74.1	+ 0.9
		6 ₂	1	83.6	-	-	-	-
		R	6	-	-	12	-	
1978	Chinook	3 ₁	3	61.8	-	3	62.6	-
		4 ₁	6	76.7	+ 4.2	46	71.0	+ 0.9
		5 ₁	1	73.9	-	1	78.8	-
		5 ₂	1	80.6	-	1	71.1	-
		R	2	-	-	12	-	-

Juvenile Sampling

Date	Location (Gear)	Time		Species	Number Caught	Number Sampled	x Nose-Fork Length (mm)	Other Fish Species
		Set	Haul					
25, 26 09/75	Chilko Lake outlet (5 minnow traps)	1700	0900	-	-	-	-	1 Squawfish
26, 27 09/75	Lingfield Creek spawning area	1500	0900	-	-	-	-	4 Rainbow Trout 1 Dace
27/09/75	Side channels 1.6 km below Henry's Crossing (2 minnow traps)	1045	1200	-	56	-	-	3 Rainbow Trout
09/09/77	Between Chilko Lake and Lingfield Creek (3 sets minnow seine)	0830	0915	-	-	-	-	1 Whitefish
09/09/77	At Lingfield Creek confluence (beach seine)	1250	1300	Ch	3	-	-	147 Whitefish

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	\bar{x} <u>Nose-Fork Length (mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
11/09/77	2 km below Henry's Crossing (10 minnow traps)	1515	1645	Ch	49	-	-	10 Rainbow Trout
24/09/77	At Lingfield Creek confluence (10 minnow traps)	0930	1300	-	-	-	-	-
26/09/77	Between Lingfield Creek and Henry's Crossing (3 sets minnow seine)	0930	1030	-	-	-	-	-
26/09/77	3 km below Henry's Crossing (10 minnow traps)	1000	1330	-	76	-	-	-



54. TASEKO RIVER, 52° 123' SW - 166 -

LOCATION

Flows northeast into Chilko River (Cariboo District).

glacial silt. Rearing potential for chinook is limited.

ENHANCEMENT

DESCRIPTION

The Upper Taseko was surveyed in late August, 1978, at the mouth and 26 km upstream. The Lower Taseko was surveyed at Taseko Lakes outlet in late August and mid-September, 1977 and 18 km downstream from the lake outlet in late August, 1977.

Before enhancement measures are identified for the Upper Taseko River, it is recommended that further studies be carried out to identify why natural colonization has not occurred. Access is moderate but hydro power is not available.

The Upper Taseko River above Taseko Lakes is characteristically a glacially fed stream actively cutting new channels. The streambed consists mainly of cobble and pebble, with silt and sand content somewhat higher near the mouth. Although this river has moderate to good potential for chinook spawning and rearing, no adults or fry were observed.

Off-site incubation and rearing at a major facility elsewhere on the Chilcotin system could probably be used to enhance the Taseko to some degree. Smolts could be released in the Lower Taseko River and fry could be planted in the Upper Taseko. Adult collection is possible by seining, gill netting, or angling on the spawning ground; however, numbers in some years are very low.

The Lower Taseko River below Taseko Lakes has an alternate name (Whitewater River) that describes its character well. From 0.5 km downstream of the lake to the Chilko confluence, the river consists mainly of fast flowing rapids and riffles with occasional braiding and gravel bar development. The streambed is dominated by large boulders with some pebble/cobble in the braided areas. The 0.5 km section below the lake is composed of quiet runs with a cobble/pebble substrate.

Potential in the Lower Taseko appears limited due to the heavy load of glacial silt in the water. Access is fair to poor and hydro power is not available.

It appears that this system is too violent to support large stable runs of salmon.

HISTORICAL FLOW

Not available, as Station No. 08M A003, at Taseko Lake outlet, was removed after two years service (1929, 1930) due to inconsistent monitoring.

Although isolated chinook spawning may occur throughout, the main spawning bed is located in the short section just below the lake. Enumeration of chinook spawners in the Lower Taseko is difficult due to suspended

In view of the two active stations on the Chilko River, it appears that the Taseko River contributes about one-third of the flows observed at Redstone (mean yearly flow at Redstone: 91.2 cms; 3,210 cfs).

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Chinook	350	50	UNK	300	465	468	200 ¹

¹Excludes 1972 to 1974.

	\bar{x} 67/71/75	\bar{x} 68/72/76	\bar{x} 69/73/77	\bar{x} 70/74/78
<u>Three-Cycle Mean</u>				
Sockeye	4,233	133	67	8

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Middle July	Middle August	Late August	End September
Sockeye	End August	End August	Middle September	End September

PHYSICAL AND CHEMICAL CHARACTERISTICS

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
13/09/77	Site No. 1 Outlet of Taseko Lake - Lower Taseko	100.0	1.0	0.2	-	10.0	-	13.0	-
26/08/77	Site No. 2 Site No. 3 18 km below Taseko Lakes by road - Lower Taseko	22.0	Less than 1.0	-	-	13.0	-	10.0	-
28/08/77	Site No. 4 Upper Taseko 21.6 km upstream	20.0	0.6	2.5	-	7.5	-	13.0	-

Site	Substrate	Site	Substrate
No. 1	45% pebble, 30% cobble, 20% granule, and 5% sand	No. 3	40% pebble, 35% cobble, 20% silt and clay, and 5% boulder
No. 2	50% boulder and 50% cobble	No. 4	40% pebble, 25% cobble, 10% granule, 10% silt and clay, and 10% sand

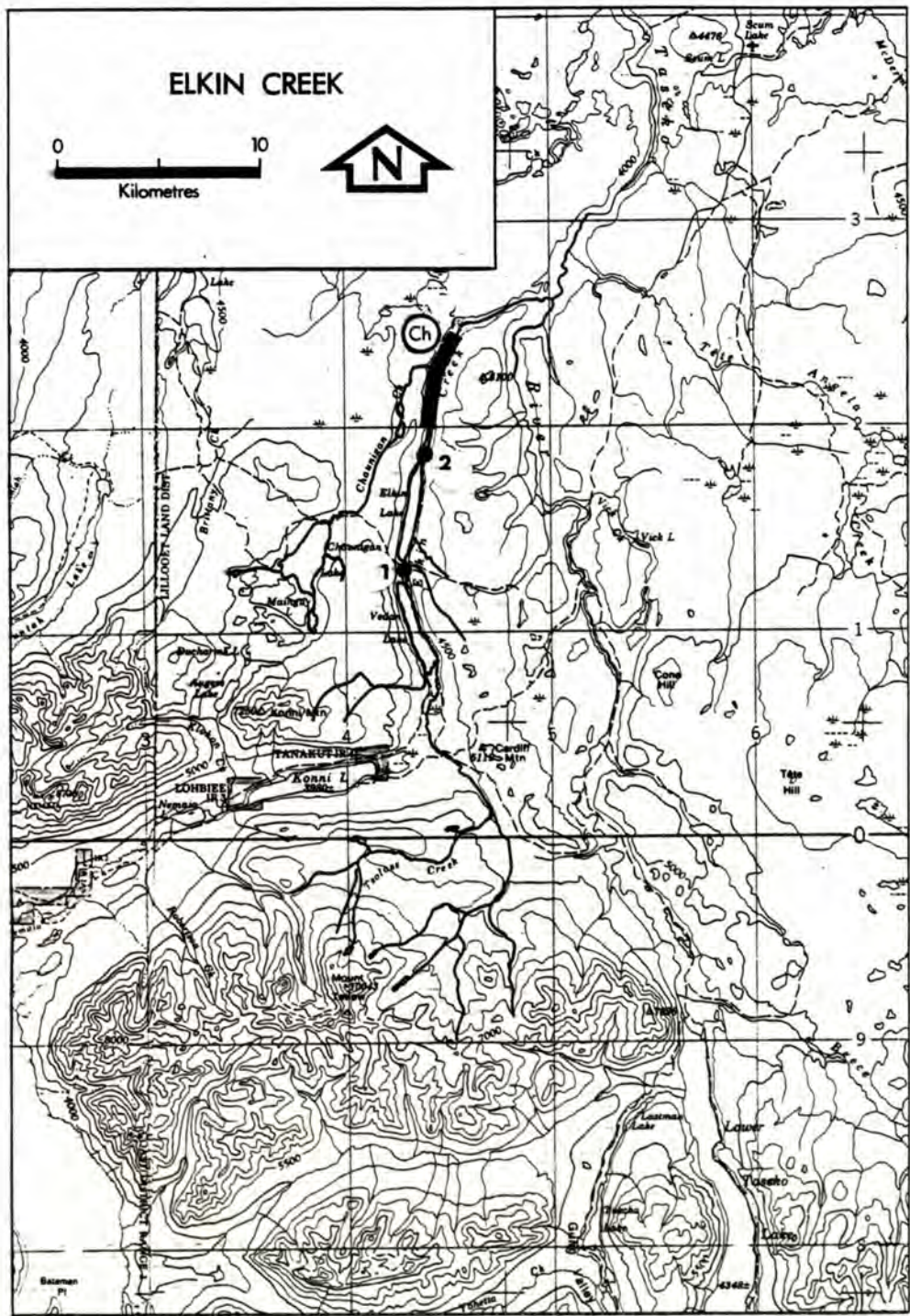
BIOLOGICAL SAMPLING DATA.

Adult Sampling

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
1975	Chinook	4 ₁	1	82.4	-	13	71.6	+ 2.0
		R	-	-	-	3	-	-
1977	Chinook	3 ₁	-	-	-	1	57.4	-
		4 ₁	11	77.1	+ 2.8	5	73.1	+ 3.2
		R	2	-	-	1	-	-
1978	Chinook	3 ₁	-	-	-	1	73.0	-
		4 ₁	-	-	-	8	72.6	+ 1.4
		5 ₂	-	-	-	1	69.9	-

Juvenile Sampling

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x}</u> <u>Nose-Fork</u> <u>Length</u> <u>(mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
26/08/77	Taseko Lake outlet (beach seine)	1500	1600	Ch	23	-	-	1 Rainbow Trout 12 Whitefish
30/08/77	Taseko Lake outlet (beach seine)	1350	1400	Ch	5	-	-	37 Whitefish
27, 28 08/77	Upper Taseko River at lake (minnow trap)	1630	0830	Ch	-	-	-	1 Dolly Varden
28/08/77	Upper Taseko River 21.6 km upstream from lake (minnow traps)	1355	1630	Ch	-	-	-	-



LOCATION

Flows northeast into Lower Taseko River (Lillooet District).

DESCRIPTION

Elkin Creek was surveyed in late September, 1977 between Vedan Lake and 5 km above the mouth. It was also surveyed by helicopter in September, 1975.

Elkin Creek is a small, clear meandering stream with a riffle-run series. Deciduous shrubs and emergent vegetation overhang most of the stream. This water course exhibits stable flows due to several lakes and swamps along its length. Between Vedan and Elkin Lakes is a short 1.5 km section with an angular cobble/pebble substrate. Spawning and rearing potential for chinook is limited.

Below Elkin Lake is a large swamp connected by a short length of streambed (0.75 km). This short section has good spawning and rearing habitat characterized by a pebble/cobble substrate, undercut banks and

side channels. Below the swamp to 5 km above the mouth is the main chinook spawning bed. This reach has habitat similar to the short stretch between the lake and the swamp, but grades to more fines at its lower end. Spawning and rearing potential in this area is excellent.

ENHANCEMENT

Access to Elkin Creek is fair. Hydro power is not available. Adequate brood stock is available with adult capture possible by fence trapping, angling, seining, or gill netting. Groundwater potential appears good, but would require pumping. A gravity feed water supply may be feasible.

Underutilization of potentially productive rearing habitat appears to exist in this system. Chinook and coho fry plants from a central incubation facility to various sections of this system should be feasible.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	100	350	450	350	-	200 ¹	269

¹Excludes 1961 to 1966, 1968 to 1970.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	August	Late August	September	Middle September

PHYSICAL AND CHEMICAL CHARACTERISTICS

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
31/08/77	<u>Site No. 1</u> Between Vedan and Elkin Lakes	10.0	0.2	1.3	-	14.0	-	12.0	8.3
31/08/77	<u>Site No. 2</u> Elkin Lake outlet	10.0	0.4	1.5	-	15.5	-	11.0	8.3

<u>Site</u>	<u>Substrate</u>	<u>Site</u>	<u>Substrate</u>
No. 1	40% cobble, 25% boulder, 20% pebble, 10% granule and 5% sand	No. 2	Cobble and pebble

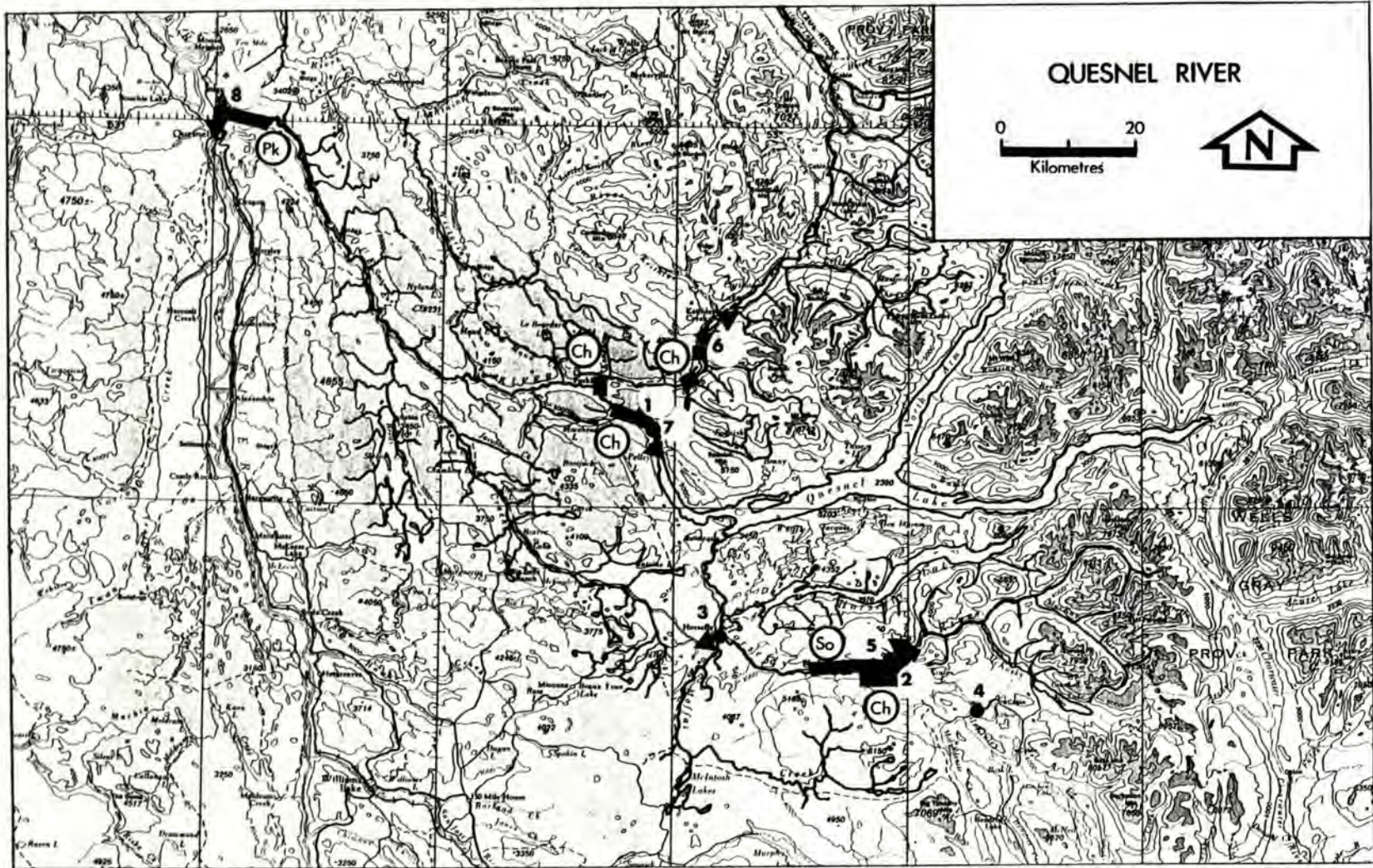
BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
1977	Chinook	3 ₁	5	56.6	+ 2.9	2	59.4	-
		4 ₁	7	72.3	+ 3.4	4	69.1	+ 5.3
		4 ₂	2	57.9	-	-	-	-
		5 ₁	1	78.1	-	-	-	-
		5 ₂	3	72.0	-	2	72.0	-
		R	1	-	-	2	-	-
1978	Chinook	3 ₁	1	47.0	-	1	56.6	-
		4 ₁	4	70.0	+ 7.2	1	65.5	-
		4 ₂	2	66.2	-	-	-	-
		5 ₂	-	-	-	1	70.1	-

Juvenile Sampling

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x} Nose-Fork Length (mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
31/08/77	Below Elkin Lake (minnow traps)	1545	1800	Ch	-	-	-	1 Rainbow Trout 10 Red-Sided Shiners
31/08/77 01/09/77	Between Vedan and Elkin Lakes (minnow traps)	1945	0950	Ch	-	-	-	1 Squawfish 21 Red-Sided Shiners



56. QUESNEL RIVER .52° 122° NE - 173 -

LOCATION

Flows northwest and then southwest into the Fraser River at Quesnel (Cariboo District).

DESCRIPTION

Ground surveys for chinook were conducted in October, 1976, and in August and October, 1977. Areas surveyed include the mainstem near Likely, the Horsefly and McKinley tributaries and the Cariboo River near Cariboo Falls.

The Quesnel system encompasses a large drainage area (11,390 km²) and is composed of several river/lake systems which include the Cariboo, Horsefly and Mitchell Rivers. The watershed supports resident populations of rainbow trout, dolly varden char and kokanee as well as chinook, sockeye and pink salmon. Coho have also recently been reported.

The Quesnel mainstem from the Fraser River confluence to the Cariboo River confluence is approximately 76 km in length. Pink salmon utilize the lower 13 km and chinook use is scattered in the vicinity of the Cariboo confluence. The South Fork Quesnel to Quesnel Lake is 11.2 km in length with the main chinook spawning area a 3.2 km section near Likely. Below this area is a 6.4 km fast flowing, steep-walled section composed of boulders and coarse gravel which is unsuitable for chinook spawning. The lower 1.6 km to the Cariboo confluence also provides spawning areas, but with a more limited use.

The North Fork Quesnel (Cariboo River) from the south fork confluence to Cariboo Lake is approximately 22 km in length. Throughout this section, the stream generally has a moderate gradient and flows through a steep-walled canyon. The substrate is almost entirely coarse gravel and boulders with a

passable falls located at kilometer 17. Spawning in this reach is limited to the north/south fork confluence, in the vicinity of Spanish Creek and near the lake outlet. Limited spawning potential exists in the upper reaches between Cariboo Lake and Kimball Creek.

The Horsefly River is the most productive tributary in the system, supporting a large sockeye run and some chinook. Salmon migration is blocked by an impassable falls at approximately 62 km from Quesnel Lake. The main spawning areas for chinook are located in the vicinity of McKinley Creek up to the falls and in McKinley Creek up to the lake. The heaviest concentrations occur just below McKinley Creek confluence and in the lower end of McKinley Creek. Sockeye spawning areas coincide with the chinook areas, but extend further downstream to Tisdal Creek. Spawning and rearing potential in these areas is excellent with highest potential in McKinley Creek.

The lower end of Horsefly River is slow and meandering with a substrate of silt and hardpacked sand. Spawning potential is nil and rearing potential moderate.

ENHANCEMENT

Artificial enhancement projects on the Quesnel mainstem are not recommended, as the present spawning ground near Likely is well used and has good stable escapements. An artificial incubation facility using pumped groundwater is feasible.

Road access is good and hydro power is available; however, enhancement options are limited. The installation of a small or moderately sized incubation/rearing facility would best be employed in the vicinity of the falls using a gravity feed water supply. In addition, chinook and coho fry plants into areas above McKinley Creek are also feasible.

HISTORICAL FLOW. cms (cfs).

1. Mean Monthly Discharge (1924 - 1976): Station No. 08K H001
Quesnel River at Likely

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
44.7 (1,580)	36.5 (1,290)	32.6 (1,150)	49.8 (1,760)	170.8 (6,030)	337.0 (11,900)	300.2 (10,600)	186.9 (6,600)	125.5 (4,430)	100.5 (3,550)	82.4 (2,910)	59.8 (2,110)

- Mean Yearly Discharge 128.0 cms (4,520.0 cfs)
- Maximum Daily Discharge 606.0 cms (21,400.0 cfs)
- Minimum Daily Discharge 8.2 cms (290.0 cfs)

2. Mean Monthly Discharge (1939 - 1976): Station No. 08K H006
Quesnel River near Quesnel

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
72.8 (2,570)	62.9 (2,220)	60.6 (2,140)	118.7 (4,190)	379.5 (13,400)	623.0 (22,000)	504.1 (17,800)	322.8 (11,400)	225.1 (7,950)	184.9 (6,530)	140.2 (4,950)	96.3 (3,400)

- Mean Yearly Discharge 236.8 cms (8,360.0 cfs)
- Maximum Daily Discharge 1153.3 cms (40,800.0 cfs)
- Minimum Daily Discharge 27.8 cms (980.0 cfs)

3. Mean Monthly Discharge (1961 - 1974): Station No. 08K H013
Cariboo River near Keithly Creek

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
23.9 (841)	20.9 (737)	20.2 (712)	36.9 (1,300)	167.0 (5,880)	298.2 (10,500)	196.8 (6,930)	123.8 (4,360)	85.8 (3,020)	77.8 (2,740)	50.6 (1,780)	29.5 (1,040)

- Mean Yearly Discharge 95.4 cms (3,360.0 cfs)
- Maximum Daily Discharge 608.8 cms (21,500.0 cfs)
- Minimum Daily Discharge 11.2 cms (395.0 cfs)

4. Mean Monthly Discharge (1955 - 1976): Station No. 08K H010
Horsefly River above McKinley Creek

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
4.0 (140)	3.7 (130)	3.9 (138)	9.4 (330)	51.4 (1,810)	71.0 (2,500)	40.6 (1,430)	18.1 (637)	12.0 (421)	12.5 (439)	9.2 (325)	5.4 (190)

- Mean Yearly Discharge 19.9 cms (699.0 cfs)
- Maximum Daily Discharge 148.7 cms (5,250.0 cfs)
- Minimum Daily Discharge 1.6 cms (56.0 cfs)

5. Mean Monthly Discharge (1955 - 1976): Station No. 08K H007
Horsefly River at Horsefly

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
5.4 (189)	5.2 (183)	5.0 (177)	19.2 (677)	94.0 (3,320)	93.7 (3,300)	48.0 (1,690)	23.6 (832)	15.3 (539)	13.8 (486)	12.3 (434)	8.9 (312)

- Mean Yearly Discharge 29.3 cms (1,030.0 cfs)
- Maximum Daily Discharge 215.8 cms (7,620.0 cfs)
- Minimum Daily Discharge 2.6 cms (91.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

<u>Quesnel River</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook *	1,000	1,000	1,400	1,200	590	1,140	1,044
Pink **	600	-	1,500	-	-	-	-

* Escapement includes 50 chinook to Cariboo River.

** Pink first recorded in 1967.

Spawning Timing

<u>Quesnel River</u>	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	September	Middle September	October	Middle October
Pink	-	-	-	-

Escapement

<u>Horsefly River</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	200	300	200	300	90	262	209

<u>Horsefly River</u>	\bar{x}	\bar{x}	\bar{x}	\bar{x}
<u>Three-Cycle Mean</u>	<u>67/71/75</u>		<u>68/72/76</u>	<u>69/73/77</u>
Sockeye	161		4,167	338,333
				5,750

Spawning Timing

<u>Horsefly River</u>	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Middle August	Late August	September	Middle September
Sockeye	Middle August	Late August	September	Middle September

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
05/10/76	Site No. 1 Quesnel River 0.8 km downstream from Likely Bridge	32.0	0.6	1.90	-	10.5	-	10.0	7.1
29/08/77	Site No. 2 McKinley Creek near mouth	12.0	0.42	1.20	-	13.0	-	9.0	7.3

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
29/08/77	Site No. 3 Horsefly River Bridge at Horsefly (Site No. 3)	35.7	0.82	1.50	-	11.0	-	10.0	7.5
30/08/77	Site No. 4 Upper McKinley Creek at bridge crossing	8.5	0.50	1.39	-	10.5	-	12.0	7.0
30/08/77	Site No. 5 Horsefly River McKinley Lake Road bridge	36.6	1.00	1.79	-	9.0	-	12.0	7.2
13/10/77	Site No. 6 Cariboo River near the falls	35.0	1.80	2.00	-	7.5	-	11.0	8.1
13/10/77	Site No. 7 Quesnel River Likely Bridge	-	-	-	-	9.0	-	11.0	7.9
27/08/77	Site No. 8 Quesnel River Highway No. 97 Bridge	110.0	-	1.50	-	16.0	-	12.0	8.0

Site	Substrate	Site	Substrate
No. 1	Boulder, cobble, pebble, sand and silt	No. 5	65% pebble, 15% sand, 15% granule and boulder, and 10% silt and clay
No. 2	80% pebble, 10% sand and cobble, 10% granule, silt and clay	No. 6	Boulder
No. 3	70% pebble, 15% sand, 8% granule and cobble, and 7% silt and clay	No. 7	-
No. 4	60% pebble, 15% sand, 15% granule and boulder, and 10% cobble, silt and clay	No. 8	Pebble, cobble and silt

BIOLOGICAL SAMPLING DATA.

Adult Sampling

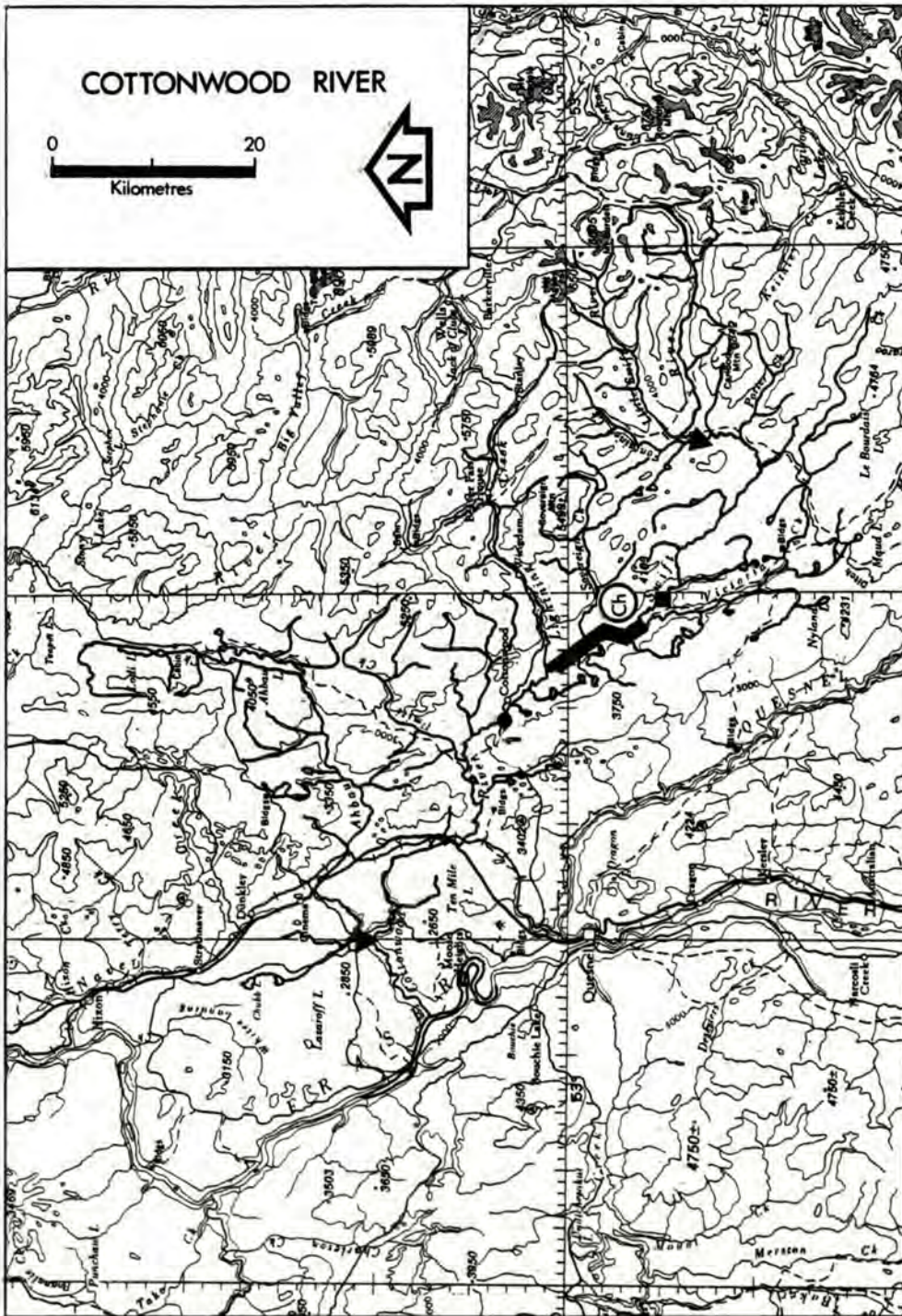
Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
10/76	Chinook	3 ₁	1	54.5	-	2	60.7	-
		4 ₁	1	80.2	-	12	73.1	+ 1.7
		5 ₁	1	84.0	-	2	80.6	-
		R	-	-	-	1	-	-
10/77	Chinook	3 ₁	-	-	-	2	65.4	-
		4 ₁	1	72.0	-	5	73.1	+ 4.6
		4 ₂	1	62.1	-	-	-	-
		5 ₁	-	-	-	1	75.7	-
		5 ₂	-	-	-	11	74.7	+ 1.8
		6 ₂	-	-	-	2	83.0	-
		R	-	-	-	4	-	-

Cariboo

10/77	Chinook	5 ₂	-	-	-	1	77.1	-
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Juvenile Sampling

Date	Location (Gear)	Time		Number Caught	Number Sampled	x Nose-Fork Length (mm)	Other Fish Species
		Set	Haul				
06/10/76	Quesnel River narrows upstream from Likely (beach seine)	0830	0840	-	-	-	-
12/10/77	Quesnel River at Likely (minnow trap)	1100	1300	-	-	-	-



57. COTTONWOOD RIVER.

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LOCATION 53° 122° SW

Flows southwest into Fraser River south of Prince George (Cariboo District).

DESCRIPTION

Cottonwood River was surveyed by boat from Cottonwood House to Highway No. 26, in August, 1977.

The majority of the mainstem from Lightning Creek confluence to the mouth is confined in a narrow, steep-sided valley. Isolated patches of suitable substrate are found in this predominantly coarse section, but due to heavy silting from extensive logging and placer mining in the Lightning Creek watershed, spawning potential is limited.

The major chinook spawning bed is located between Victoria Creek confluence and an

impassable falls approximately 6 to 7 kilometers upstream. The stream in this section is characterized by gravel bars, corner pools and frequent log debris. Spawning and rearing potential is good. Light spawning occurs between Lightning Creek and Victoria Creek confluences (W. R. Olmsted, pers. comm.).

ENHANCEMENT

Although enhancement opportunities in the lower reaches are very limited, due to human influences, the upper reaches are capable of supporting a larger run than is presently recorded. Road access to the upper reaches is poor and hydro power is not available. Enhancement opportunities are limited. The installation of a small incubation facility using gravity feed water from the falls has good potential to increase the present run.

HISTORICAL FLOW. cms (cfs).

1. Mean Monthly Discharge (1954 - 1976): Station No. 08K E009
Cottonwood River near Cinema

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
5.2 (184)	4.7 (162)	7.7 (271)	44.6 (1,570)	94.6 (3,330)	63.9 (2,250)	23.8 (837)	16.8 (592)	15.6 (550)	18.2 (640)	14.8 (522)	7.5 (265)

- Mean Yearly Discharge 25.6 cms (901.0 cfs)
- Maximum Daily Discharge 387.9 cms (13,700.0 cfs)
- Minimum Daily Discharge 1.54 cms (54.5 cfs)

2. Mean Monthly Discharge (1971 - 1976): Station No. 08K E024
Little Swift River at mouth

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
0.42 (14.9)	0.36 (12.6)	0.49 (17.2)	1.07 (37.6)	9.40 (331.0)	12.60 (445.0)	4.43 (156.0)	1.81 (63.6)	0.95 (33.3)	1.50 (52.8)	1.06 (37.2)	0.64 (22.4)

- Mean Yearly Discharge 2.9 cms (102.0 cfs)
- Maximum Daily Discharge 32.8 cms (1,160.0 cfs)
- Minimum Daily Discharge 0.2 cms (5.6 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	100	100	150	100	150	145	194

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	August	Late August	Late August	End September

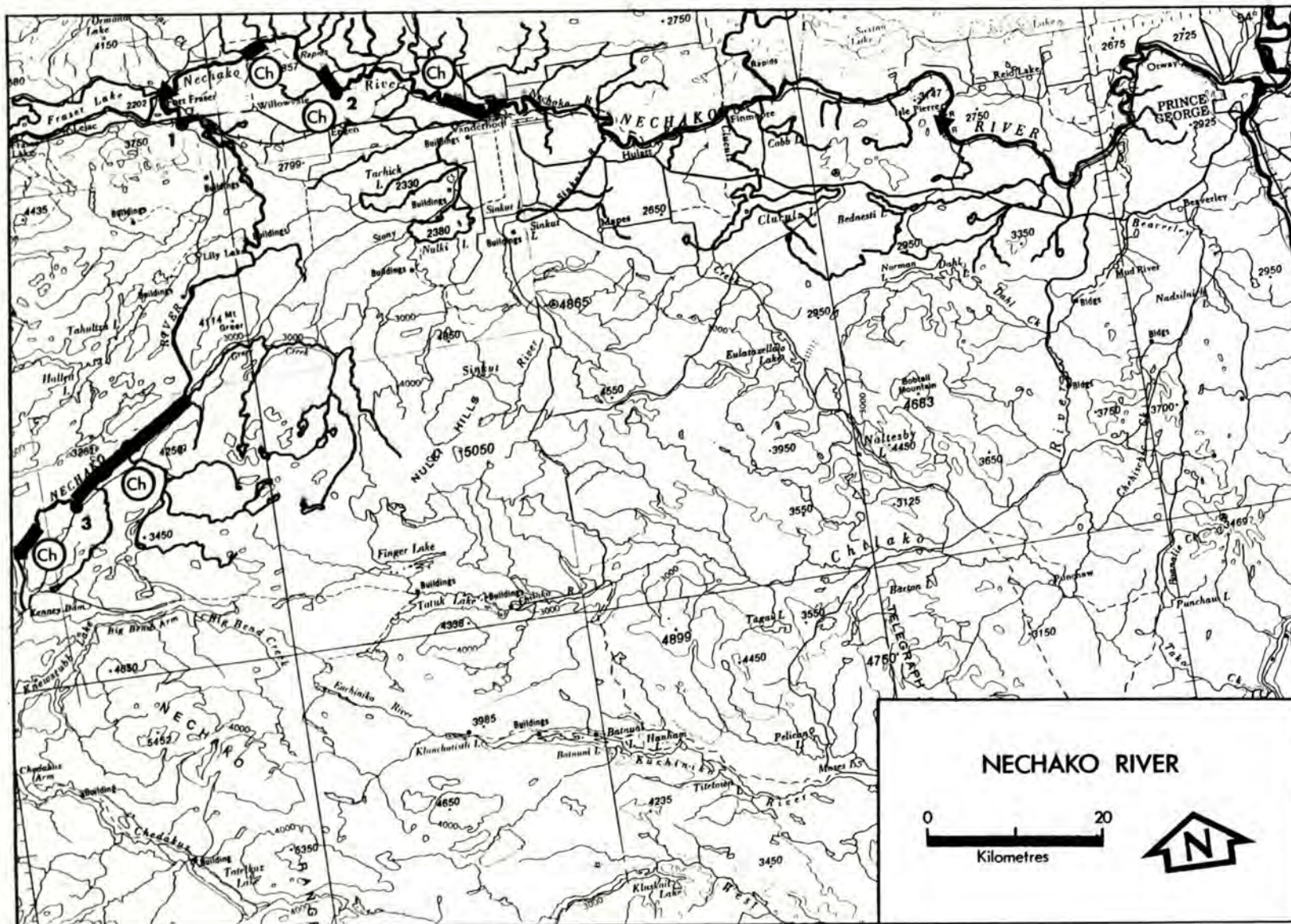
PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
27/08/77	Site No. 1 Cottonwood River Highway No. 26 Bridge	15.0	0.76	1.05	-	14.0	-	12.0	7.5

<u>Site</u>	<u>Substrate</u>
No. 1	60% pebble, 25% cobble, 10% boulder and sand, and 5% silt and clay

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1977 survey.



58. NECHAKO RIVER .53° 122° NW - 132 -

LOCATION

Flows southeast into Fraser River at Prince George (Cariboo District).

upper regions, but is concentrated in the vicinity of Noonla and Engen. Rearing potential is moderate with most use in the tributaries.

DESCRIPTION

Ground surveys of the Nechako River were conducted in September of 1976 and 1977. Areas surveyed were near Cutoff Creek and 20 km upstream, Highway No. 16 Bridge to 8 km upstream, in the vicinity of Engen and 14.5 km upstream, Vanderhoof Bridge to 3.2 km upstream and 3.2 km upstream from Irvine's Lodge.

Scattered spawning occurs from Diamond Island to Cheslatta Falls (approximately 65 km), the upstream limit of salmon migration. Characteristics of this section include steep valley walls with isolated canyons, a boulder/cobble/pebble substrate with some fines and fast water with pool formation near islands and side channels. The main spawning bed is located between Greer Creek and the Cheslatta Falls Canyon. There is moderate braiding and island formation in this section which is ideal for rearing salmonids.

Low flows in this system, causing extensive egg and fry mortalities, are a major problem resulting from Alcan's control of the waterflow at Skins Lake Dam.

ENHANCEMENT

The installation of a moderate-sized incubation/rearing facility on either the Stuart or Nechako Rivers could be used for enhancement of both systems. With proper flow control from the Skins Lake Dam, enhancement potential is very good as this system has the capability of producing a much larger run than is presently recorded. There are extensive spawning areas in this system presently not being utilized.

From the Fraser confluence to Vanderhoof (approximately 110 km), the river is characterized as being wide and meandering, with slow water, high banks and weedy/silty bars. The streambed substrate is predominantly sand and gravel, unsuitable for spawning. Rearing potential in this area is moderate. From Vanderhoof to Fort Fraser (approximately 55 km), the river is analagous to the lower section, but also contains isolated canyon sections. The substrate is generally coarser, but a high content of fines still prevail. Isolated spawning occurs in the

Road access is good and hydro power is available.

HISTORICAL FLOW. cms (cfs).

1. Mean Monthly Discharge (1948 - 1976): Station No. 08J C001
Nechako River at Vanderhoof

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
91.4 (3,220)	89.0 (3,130)	95.7 (3,370)	149.7 (5,270)	295.4 (10,400)	315.2 (11,100)	278.0 (9,790)	229.8 (8,090)	197.9 (6,970)	173.2 (6,100)	157.9 (5,560)	110.5 (3,890)

- Mean Yearly Discharge 187.70 cms (6,610.0 cfs)
- Maximum Daily Discharge 744.7 cms (26,300.0 cfs)
- Minimum Daily Discharge 8.9 cms (315.0 cfs)

2. Mean Monthly Discharge (1951 - 1976): Station No. 08J C002
Nechako River at Isle Pierre

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
162.8 (5,750)	150.7 (5,320)	145.3 (5,130)	215.5 (7,610)	458.8 (16,200)	606.0 (21,400)	608.9 (21,500)	467.3 (16,500)	362.5 (12,800)	294.5 (10,400)	255.4 (9,020)	191.7 (6,770)

- Mean Yearly Discharge 328.5 cms (11,600.0 cfs)
- Maximum Daily Discharge 1,078.9 cms (38,100.0 cfs)
- Minimum Daily Discharge 40.8 cms (1,440.0 cfs)

3. Mean Monthly Discharge (1956 - 1976*): Station No. 08J A013
Skins Lake Spillway

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
80.9 (2,850)	78.7 (2,770)	82.1 (2,890)	115.9 (4,080)	171.3 (6,030)	150.5 (5,300)	191.7 (6,750)	197.9 (6,970)	189.4 (6,670)	179.5 (6,320)	130.9 (4,610)	91.0 (3,190)

- Mean Yearly Discharge 134.3 cms (4,730.0 cfs)
- Maximum Daily Discharge 506.9 cms (17,900.0 cfs)
- Minimum Daily Discharge 0.0 cms (0.0 cfs)

* Zero discharge in 14 of 20 years.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	1,500	1,200	2,000	2,600	1,368 ¹	500	1,231

¹Excludes 1957 to 1959.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Late August	-	Middle September	-

PHYSICAL AND CHEMICAL CHARACTERISTICS

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius) Water Air</u>	<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
19/09/76	<u>Site No. 1</u> Railroad Bridge upstream from Highway No. 16	119.0	2.00	1.17	-	13.0 -	10.0	7.5
20/09/76	<u>Site No. 2</u> Old ferry crossing near Engen	100.0	1.50	-	-	12.0 -	-	-
13/09/77	<u>Site No. 3</u> 3.2 km upstream from Irvine's Lodge	80.0	0.83	1.70	-	13.5 -	10.0	7.5

<u>Site</u>	<u>Substrate</u>	<u>Site</u>	<u>Substrate</u>
No. 1	Pebble, cobble, silt, sand and boulder	No. 3	40% cobble, 40% pebble, 20% sand, and boulder
No. 2	Pebble, cobble, sand, silt, and boulder		

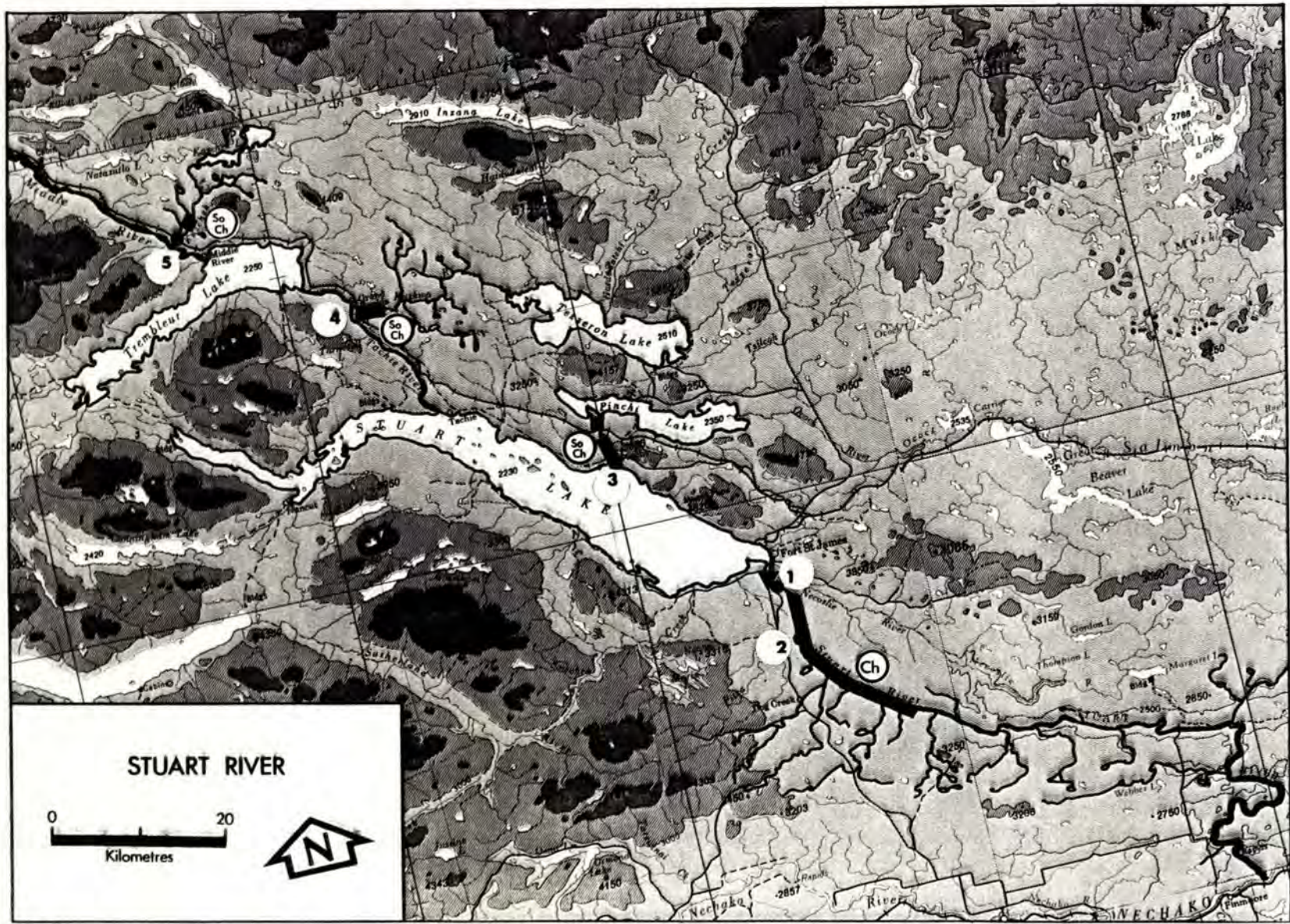
BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
1978	Chinook	3 ₁	7	57.6	+ 15.1	19	64.8	+ 2.4
		3 ₂	4	38.9	+ 6.2	-	-	-
		4 ₁	10	71.8	+ 3.1	28	69.5	+ 1.4
		4 ₂	20	71.3	+ 3.8	21	67.1	+ 1.3
		5 ₁	-	-	-	1	69.8	-
		5 ₂	10	76.1	+ 3.9	24	71.1	+ 1.4
		6 ₂	-	-	-	1	72.5	-

Juvenile Sampling

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>Nose-Fork Length (mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
19/09/76	Upper Nechako, boat launch site (beach seine)	1100	1125	Ch	-	-	-	-
19/09/76	5 km upstream from Highway No. 16 Bridge (beach seine)	1730	1750	Ch	3	3	85.0	2 Dace 1 Sculpin 1 Squawfish
20/09/76	13 km upstream from old ferry crossing near Engen (beach seine)	1230	1240	Ch	1	-	-	-
20/09/76	At old ferry crossing near Engen (beach seine)	1315	1325	Ch	7	7	91.6	1 Dace



STUART RIVER



LOCATION

Flows south into Nechako River north of Finmore (Cariboo District).

DESCRIPTION

Surveys of the Stuart River system were conducted in September of 1976 and September, 1977. Areas surveyed include the Stuart River immediately below, and 8 km below the Highway No. 27 Bridge crossing, the Kuzkwa River 4 km downstream of Tezzeron Lake, Kazchek Creek 4 km upstream from the mouth and Pinchi Creek near the highway.

Stuart River is primarily a slow moving river with wide meanders in the lower reaches. From Breadalbone Creek to the Nechako confluence, the substrate is composed mainly of silts and sands with isolated coarse canyon sections. Isolated spawning gravels are restricted mainly to the tributary fans. Rearing potential is moderate throughout.

The main chinook spawning area lies between Kec Creek and Fort St. James, a distance of approximately 20 km. The highest spawning concentration occurs in the vicinity of Dog Creek. Rearing potential is moderate to good.

Small numbers of chinook regularly spawn upstream of Stuart Lake, with most using Kuzkwa River and Kazchek and Pinchi Creeks. Spawning and rearing potential in Pinchi Creek is excellent up to an impassable falls at 4.8 km. Chinook use is restricted and sockeye use moderate. Kuzkwa River has excellent spawning and rearing habitat throughout with a good run of sockeye and a moderate to low chinook run. Kazchek Creek has an impassable falls at 4.8 km. The stream below has moderate habitat with runs of sockeye and chinook. These three tributaries have large runs of kokanee in addition to chinook and sockeye use.

ENHANCEMENT

An incubation and rearing facility, located on the upper mainstem or on one of the upper system tributaries, could be used for enhancement of both the Stuart and Nechako systems. Due to the level terrain and numerous lakes, groundwater should not be a problem, but hydro power is limited and may limit site possibilities. Road access is moderate in the mainstem and limited in the areas above Trembleur Lake. It is also recommended that a more detailed survey of the upper system be completed before initiating enhancement projects. A gravity feed water supply incubation facility is a possibility on Pinchi Creek.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1929 - 1976): Station No. 08J E001
Stuart River near Fort St. James

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
71.0	58.5	47.1	49.1	121.7	266.7	298.2	215.0	142.6	102.5	87.5	80.7
(2,500)	(2,060)	(1,660)	(1,730)	(4,290)	(9,390)	(10,500)	(7,570)	(5,020)	(3,610)	(3,080)	(2,840)

- Mean Yearly Discharge 136.0 cms (4,790.0 cfs)
- Maximum Daily Discharge 591.8 cms (20,900.0 cfs)
- Minimum Daily Discharge 20.4 cms (720.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	1975	1976	1977	1978	\bar{x} 1951 - 1960	\bar{x} 1961 - 1970	\bar{x} 1971 - 1978
Stuart							
Chinook	750	225	225	1,000	455	337	453
Pinchi							
Chinook	-	-	25	25	-	-	-

<u>Kazchek</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	-	25	25	25	45 ¹	25 ²	25 ³

¹Excludes 1951, 1952, 1955, 1956, 1960.

²Excludes 1962 to 1967, 1970.

³Excludes 1971, 1975.

<u>Kuzkwa</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	75	UNK	200	200	50 ¹	50	139

<u>Pinchi</u> <u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye	25	-	1,000	25

<u>Kazchek</u> <u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye	216	42	1,442	107

<u>Kuzkwa</u> <u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye	383	50	10,000	525

Spawning Timing

<u>Stuart</u>	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Late August	-	Middle September	-

<u>Pinchi</u>	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Late August	-	Middle September	-
Sockeye	September	-	Middle September	-

<u>Kazchek</u>	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	September	-	Middle September	-
Sockeye	Late August	-	Middle September	-

<u>Kuzkwa</u>	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Late August	-	Middle September	-
Sockeye	Late August	-	Middle September	-

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
18/09/76	<u>Site No. 1</u> Immediately downstream of Highway No. 27 Bridge	27.0	6.00	1.20	-	12.0	-	10.0	7.4
12/09/77	<u>Site No. 2</u> Stuart River 8.0 km downstream from Highway No. 27 Bridge	91.4	0.90	0.43	-	13.0	-	10.0	7.5
11/09/77	<u>Site No. 3</u> Pinchi Creek Tachie Road Bridge (Site No. 3)	-	0.45	0.87	-	8.0	-	12.0	8.4
22/09/77	<u>Site No. 4</u> Kuzkwa River 4 km downstream from Tezzeron Lake	18.9	0.40	0.68	-	11.5	-	10.0	7.5
22/09/77	<u>Site No. 5</u> Kazchek Creek 4 km upstream from mouth	9.1	0.55	0.51	-	10.5	-	10.0	8.0

<u>Site</u>	<u>Substrate</u>	<u>Site</u>	<u>Substrate</u>
No. 1	Silt, sand, cobble, pebble, and boulder	No. 4	Cobble, pebble, and boulder
No. 2	50% pebble, 20% granule, 15% cobble and sand, 15% boulder, silt and clay		
No. 3	50% pebble, 20% cobble, 12% granule, 5% boulder and silt, and 13% clay and sand		

BIOLOGICAL SAMPLING DATA.

Adult Sampling

Stuart

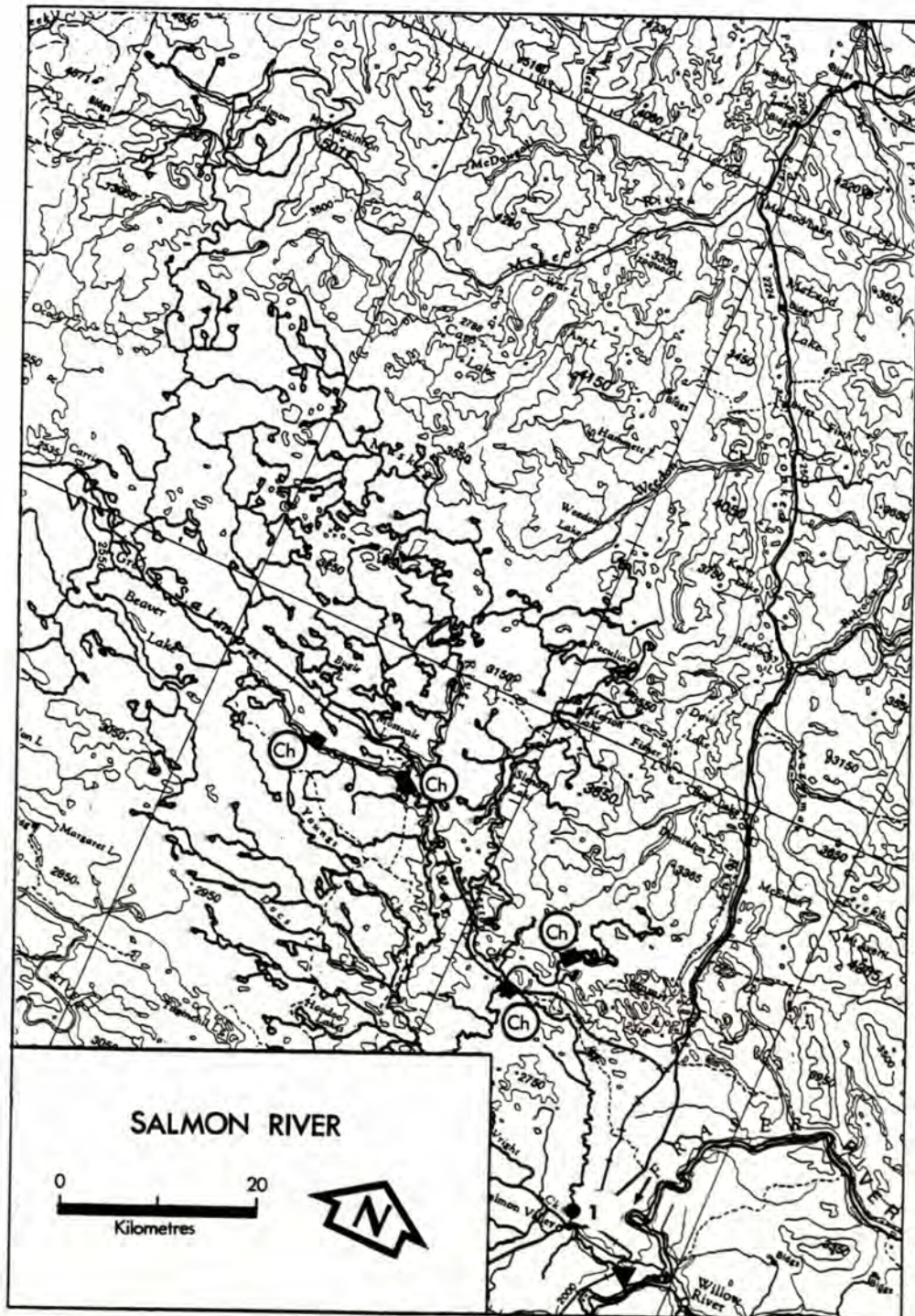
Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
18/09/76	Chinook	4 ₁	-	-	-	1	65.4	-
		4 ₂	-	-	-	1	67.5	-
		5 ₂	2	73.1	-	3	70.9	-
24/09/77	Chinook	3 ₁	1	56.3	-	2	64.2	-
		4 ₁	1	74.8	-	1	71.0	-
		4 ₂	6	65.2	+ 6.4	4	58.9	+ 4.4
		5 ₂	2	75.4	-	2	75.4	-
		R	-	-	-	2	-	-

Kuzkwa

22/09/77	Chinook	5 ₂	-	-	-	3	71.0	-
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Juvenile Sampling

Date	Location (Gear)	Time		Species	Number Caught	Number Sampled	\bar{x} Nose-Fork Length (mm)	Other Fish Species
		Set	Haul					
18/09/77	Stuart Lake at Parren Beach Provincial Park (beach seine)	0845	0905	Ch	-	-	-	10 Sculpins 1 Red-Sided Shiner
18/09/77	Stuart Lake, just upstream from outlet; across from Fort St. James (beach seine)	0915	0950	Ch	-	-	-	10 Dace 10 Sculpin
18/09/77	Stuart River, just upstream from Highway No. 27 Bridge (beach seine)	1015	1025	Ch	-	-	-	2 Sculpins



60. SALMON RIVER .54° 122° SW - 191 -

LOCATION

Flows southeast into the Fraser River northeast of Prince George (Cariboo District).

DESCRIPTION

This river was surveyed, by air, from the mouth to Great Beaver Lake in September, 1976. In September, 1977, it was surveyed in the vicinity of Highway No. 97 Bridge by a ground crew.

This river is very meandering from its mouth to Great Beaver Lake. In addition to some side channel development containing large gravel and sand bars, slow flowing runs and a few riffles characterize most of the river. Bottom composition is predominantly sand and

silt with patchy sections of gravel. Log jams are common. An unusual feature of this river occurs 60 kilometers from the mouth, where it disappears underground. The main spawning area is just below Muskeg River confluence. Scattered spawning occurs throughout the system.

ENHANCEMENT

There is no road access to this system except near the mouth where hydro power is available. The Salmon River fisheries could be enhanced using a pumped groundwater incubation/rearing facility near the mouth. Adult capture is possible by means of a fence. The system appears to have extensive rearing potential and it is recommended that a more detailed survey of the river be completed.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1954 - 1976): Station No. 08K C001
Salmon River near Prince George

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
9.6 (339)	9.3 (327)	11.2 (393)	61.6 (2,170)	155.6 (5,480)	52.0 (1,830)	18.2 (641)	10.9 (385)	8.8 (312)	13.3 (467)	18.6 (655)	12.2 (431)

- Mean Yearly Discharge 32.7 cms (1,150.0 cfs)
- Maximum Daily Discharge 379.4 cms (13,400.0 cfs)
- Minimum Daily Discharge 1.5 cms (54.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	200	200	200	400	263 ¹	179	319

¹Excludes 1951 to 1957, 1959.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Middle August	-	Middle September	-

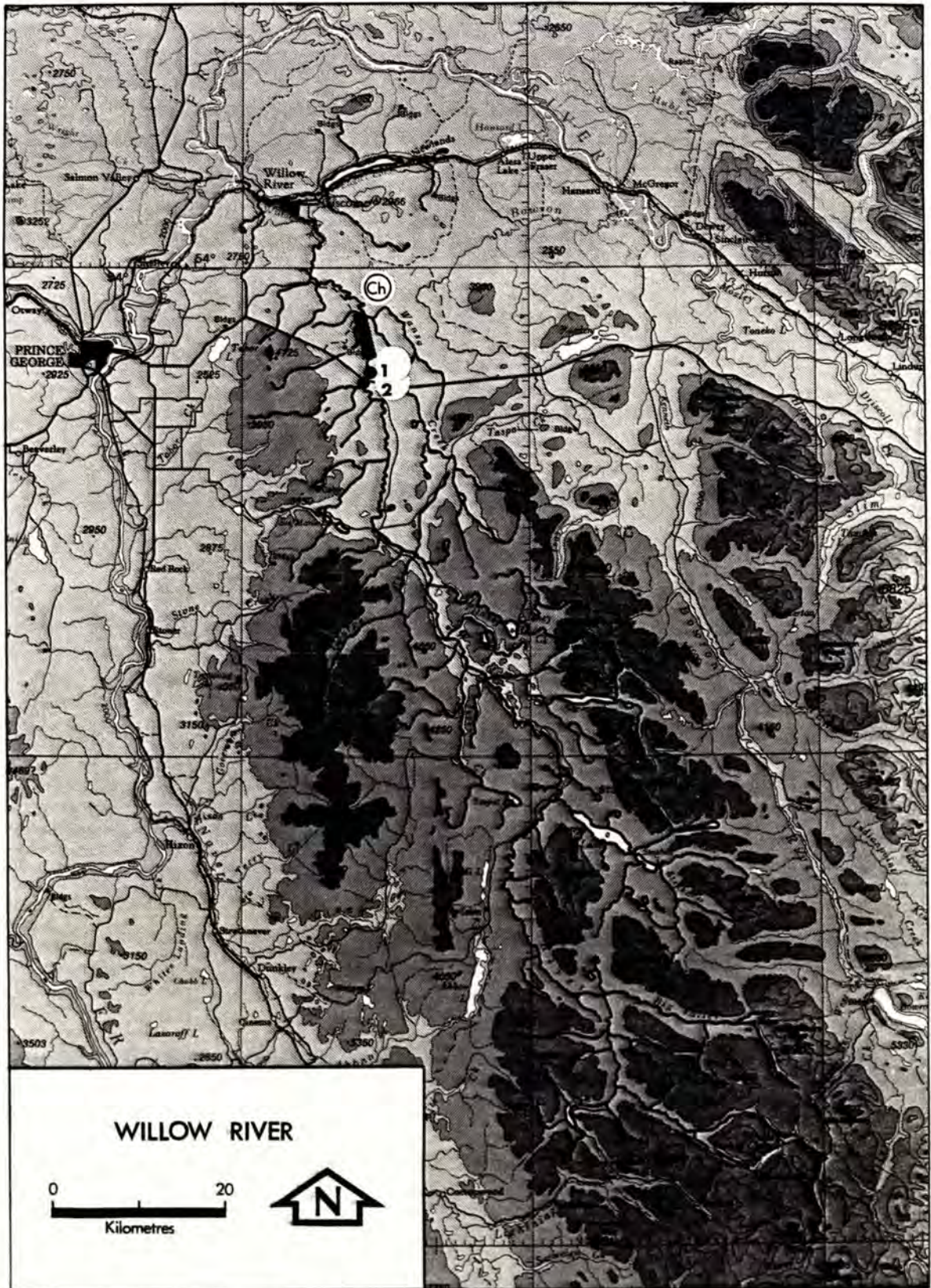
PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
20/09/77	<u>Site No. 1</u> Salmon River Highway No. 97 Bridge	14.0	0.50	1.50	-	10.5	-	12.0	8.0

<u>Site</u>	<u>Substrate</u>
No. 1	40% cobble, 40% pebble, and 20% sand and boulder

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1976 and 1977 survey.



LOCATION

Flows northwest into the Fraser River northeast of Prince George (Cariboo District).

DESCRIPTION

Willow Creek was surveyed in the vicinity of Highway No. 16 Bridge and 0.4 km downstream by a ground crew in August, 1976 and September, 1977.

From 1.5 km below the Highway No. 16 Bridge crossing to 1.25 km further downstream occurs a steep gradient canyon section impassable to anadromous fish. Anadromous fish use is thus limited to the 35 km from the canyon to the Fraser River confluence. Most of the river lies above the Highway No. 16 Bridge crossing.

The main chinook spawning bed is located between the canyon and Wansa Creek (approximately 6 km). Stream characteristics include a confined channel, moderate bank vegetation, some side channels and debris, in-stream boulder habitat, and a substrate of cobble/gravel/fines. Rearing potential for chinook is low to moderate. Spawning potential is good.

For 13 km below the spawning area, the river is heavily braided with very unstable banks, widespread large log jams and a gravel substrate with a high silt load. Spawning

potential in this area is poor, but rearing potential is excellent.

Below this braided area is a confined section (4 km) very similar to the reach below the canyon. Spawning potential in this area is limited as the substrate is fairly small with a lot of fines incorporated. Rearing potential for chinook is low.

The last 12 km to the Fraser confluence again reverts to a braided, meandering reach with extensive island and log jam formation. The substrate is small with a high silt content. Spawning potential is poor to nil, but rearing potential is excellent.

ENHANCEMENT

This river supports only a small chinook run which is due partly to the limited amount of available good spawning habitat (upper 6 km below canyon). Enhancement could be accomplished by fry transplants into the extensive rearing areas. Road access to the lower reaches below Highway No. 16 is very poor and hydro power is not available. It is recommended that a survey of the reaches above Highway No. 16 be conducted to identify potential habitat. The canyon section should be surveyed to determine the severity of the obstruction. There exists a potential for a gravity feed water incubation/rearing facility downstream of the canyon.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1953 - 1975): Station No. 08K D003
Willow River near Willow River

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
12.4 (437)	11.4 (403)	15.3 (540)	59.6 (2,100)	158.5 (5,580)	107.1 (3,770)	45.7 (1,610)	30.1 (1,060)	30.1 (1,060)	40.3 (1,420)	34.9 (1,230)	19.0 (669)

- Mean Yearly Discharge 47.4 cms (1,670.0 cfs)
- Maximum Daily Discharge 345.5 cms (12,200.0 cfs)
- Minimum Daily Discharge 4.4 cms (154.0 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	75	75	115	200	150 ¹	66	111

¹Excludes 1957, 1959.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Middle August	-	Late August	-

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
20/08/76	<u>Site No. 1</u> 0.4 km downstream from Highway No. 16 Bridge	27.0	-	1.71	-	12.0	-	9.0	7.0
20/09/77	<u>Site No. 2</u> Highway No. 16 Bridge	27.4	1.07	0.53	-	10.8	-	13.0	7.5

<u>Site</u>	<u>Substrate</u>	<u>Site</u>	<u>Substrate</u>
No. 1	Pebble, silt, cobble, and boulder	No. 2	-

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1976 and 1977 surveys.



62. MCGREGOR RIVER .54° 122° SE - 197 -

LOCATION

Flows west into the Fraser River north of Hansard Lake (Cariboo District).

DESCRIPTION

The McGregor River system was surveyed for chinook by air in September, 1975, and by ground in August, 1976.

The McGregor, from its headwaters near the Alberta border, descends for 38 km as a steep mountain river, at which point it reaches a plateau and meanders gently for 56 km. Below the plateau, the river plunges steeply for 4.8 km and is contained within a steep-walled canyon. Herrick Creek, the McGregor's main tributary, joins the latter below the canyon adding approximately the same water volume as the Upper McGregor. From the Herrick Creek confluence the McGregor River gently meanders for 18 km and is joined by one major tributary, Otter Creek. From the end of this plateau to the Fraser confluence, the river travels through a gentle gradient, a 5.5 km canyon and then onto a plateau where it meanders for 24 km. Seeback Creek, another major tributary, enters in the lower reach.

Chinook spawning is known to occur in Seeback, Otter, James, Captain, Fontoniko and Herrick Creeks. The most heavily utilized streams are Fontoniko and James Creeks. There is also limited spawning in the McGregor mainstem between the Seeback Creek and Herrick Creek confluence. Access on Herrick Creek is limited by an impassable falls at 44 km.

Seeback Creek has good spawning and rearing potential throughout, but has limited spawning.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1960 - 1976): Station No. 08K B003
McGregor Creek at Lower Canyon

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
41.6 (1,470)	41.1 (1,450)	45.3 (1,600)	127.4 (4,500)	492.8 (17,400)	688.2 (24,300)	461.6 (16,300)	305.9 (10,800)	235.1 (8,300)	255.4 (9,020)	142.2 (5,020)	61.2 (2,160)

- Mean Yearly Discharge 242.1 cms (8,550.0 cfs)
- Maximum Daily Discharge 1,942.5 cms (68,600.0 cfs)
- Minimum Daily Discharge 19.5 cms (690.0 cfs)

Otter Creek is characterized by a coarse, bouldery substrate up to an impassable falls at 3.5 km. Spawning and rearing potential is very limited.

Captain Creek, a tributary of Herrick Creek, is a clear stream of moderate gradient confined in steep valley walls. Good spawning/rearing habitat exists in the lower 4.0 km, but is underutilized.

James Creek, which flows southeasterly into Herrick Creek, contains good spawning substrate in the reach between Pacific Lake and Herrick Creek confluence (16 km). Spawning is distributed throughout, but the stream is underutilized. Rearing potential is good.

Fontoniko Creek joins Herrick Creek 17 km from the McGregor confluence. Salmon migration is impaired by a series of passable falls beginning at 6.5 km. The majority of chinook spawn between 2 and 6.5 km. There are two major tributaries to this creek, but both have no potential due to falls and steep gradients. Fontoniko Creek has good spawning/rearing potential, but is currently underutilized.

Although Herrick Creek contains patches of good spawning substrate, it is used primarily as a migratory corridor to the tributaries. Limited spawning does occur and rearing potential is moderate.

ENHANCEMENT

This system appears capable of supporting much larger runs of chinook than are presently being recorded. Road access is moderate and hydro power not available. The installation of several small incubation facilities, in the tributaries may have some potential for sizably increasing the run.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook *	400	760	1,150	730	811	573	668

* From 1951 to 1953 chinook were observed, but escapement was not estimated.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Late July	-	Middle August	-

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
17/08/76	<u>Site No. 1</u> Fontoniko Creek 2.4 km upstream from mouth	30.5	1.10	2.11	-	9.0	-	12.0	7.3
18/08/76	<u>Site No. 2</u> Fontoniko Creek mouth	-	-	-	-	7.0	-	14.0	7.3
18/08/76	<u>Site No. 3</u> James Creek 30.5 km upstream from mouth	13.1	0.60	1.02	-	9.5	-	12.0	8.0
18/08/76	<u>Site No. 4</u> James Creek 2.8 km upstream from mouth	7.9	0.50	0.69	-	12.0	-	-	-
18/08/76	<u>Site No. 5</u> Captain Creek 0.4 km upstream from mouth	12.2	0.60	0.82	-	12.0	-	10.0	-
19/08/76	<u>Site No. 6</u> Otter Creek 0.3 km upstream from mouth	12.0	0.65	1.15	-	13.5	-	8.0	7.4

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
19/08/76	<u>Site No. 7</u> Herrick Creek 0.8 km upstream from mouth	90.0	-	-	-	8.5	-	11.0	7.8
19/08/76	<u>Site No. 8</u> McGregor River 0.8 km upstream from Herrick Creek confluence	119.0	1.50	-	-	8.0	-	12.0	7.8
20/08/76	<u>Site No. 9</u> McGregor River 35.0 km upstream from Fraser River confluence	105.0	1.50	1.32	-	8.0	-	11.5	7.5
25/08/76	<u>Site No. 10</u> McGregor River just upstream from Seeback Creek confluence	105.0	3.00	1.52	-	9.0	-	-	7.6
25/08/76	<u>Site No. 11</u> Seeback Creek 0.8 km upstream from mouth	15.0	0.70	1.37	-	9.5	-	10.0	7.5

<u>Site</u>	<u>Substrate</u>	<u>Site</u>	<u>Substrate</u>
No. 1	Cobble, pebble and silt	No. 7	Cobble, pebble, boulder, and sand
No. 2	-	No. 8	Cobble, pebble, boulder, sand and silt
No. 3	Pebble, cobble, and sand	No. 9	-
No. 4	-	No. 10	Cobble, pebble, silt, and sand
No. 5	Pebble, cobble, sand, and silt	No. 11	Pebble, cobble, silt, and sand
No. 6	Cobble, pebble, and boulder		

BIOLOGICAL SAMPLING DATA.

Adult Sampling

Seeback Creek

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
26/08/76	Chinook	3 ₁	-	-	-	1	55.2	-

James Creek

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
26/08/76	Chinook	3 ₁	-	-	-	1	67.0	-

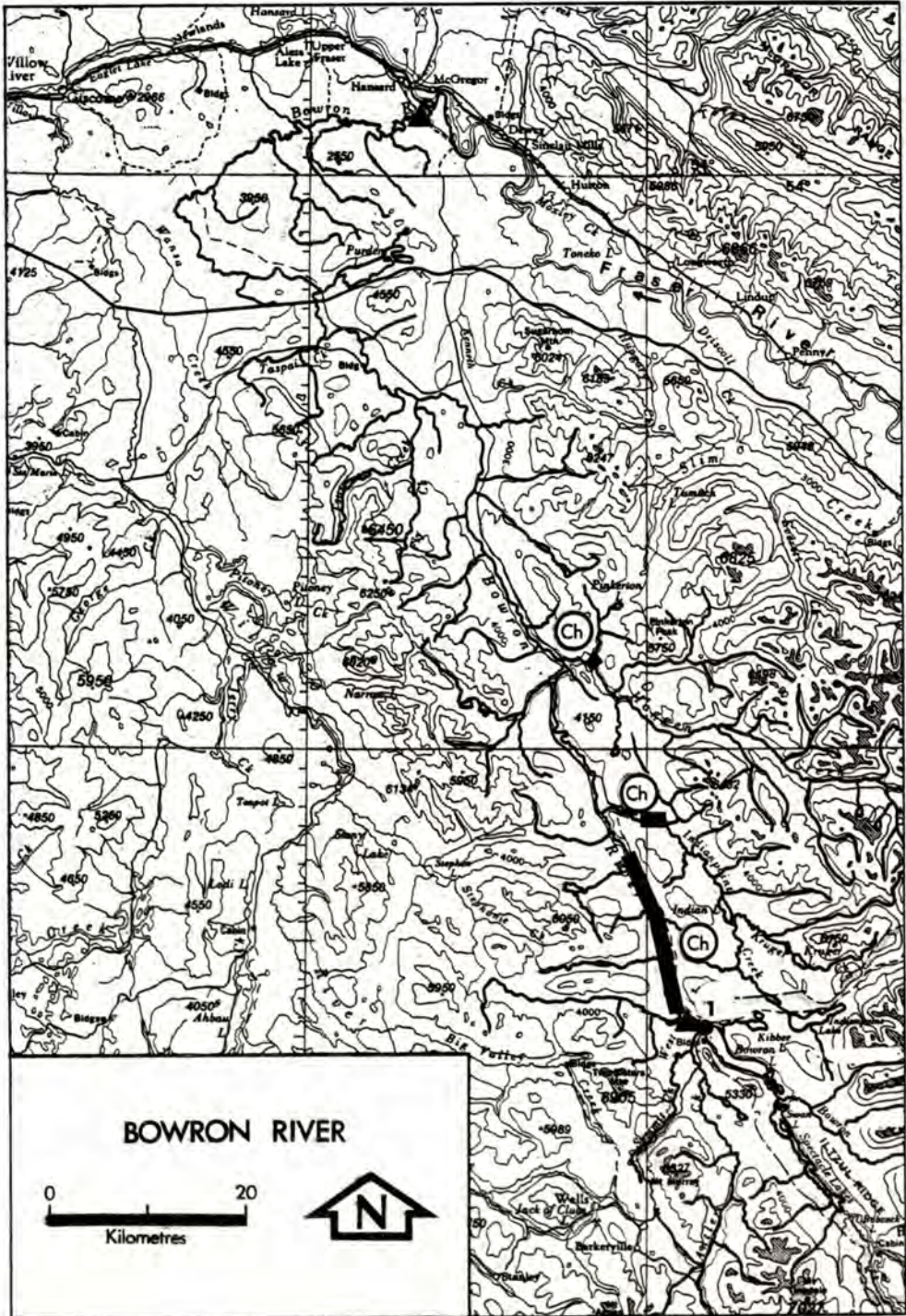
McGregor System

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
08/77	Chinook	3 ₁	3	49.7	-	-	-	-
		4 ₁	5	72.4	+ 16.2	3	77.2	-
		4 ₂	3	57.5	-	3	55.7	-
		5 ₂	3	80.4	-	4	73.1	+ 2.7
		R	2	-	-	3	-	-

Juvenile Sampling

Date	Location (Gear)	Time		Number Caught	Number Sampled	Nose-Fork Length (mm)	Other Fish Species
		Set	Haul				
18/08/76	James Creek, upstream from mouth (2 minnow traps)	1100	1400	-	-	-	-
18/08/76	Captain Creek, 0.8 km upstream from mouth (angling)	1500	1500	-	-	-	1 Rainbow Trout
19/08/76	Captain Creek, 0.8 km upstream from mouth (dip net)	1200	1200	-	-	-	-
19/08/76	Captain Creek, small side channel, 0.4 km upstream from mouth (minnow seine)	1030	1030	-	-	-	17 Rocky Mountain Whitefish
19/08/76	Captain Creek, small side channel, 0.4 km upstream from mouth (2 minnow traps)	1100	1300	-	-	-	-

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Number Caught</u>	<u>Number Sampled</u>	<u>Nose-Fork Length (mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>				
19/08/76	Captain Creek, 0.7 km upstream from mouth (fyke net)	1130	1300	-	-	-	-
24/08/76	Captain Creek, 1.2 km upstream from mouth (minnow seine)	0930	0930	-	-	-	1 Rainbow Trout 1 Rocky Mountain Whitefish
24/08/76	Captain Creek, upstream from mouth (3 sets minnow seine)	0900	0930	-	-	-	75 Rocky Mountain Whitefish



63. BOWRON RIVER 54° 12' SE - 203 -

LOCATION

Flows north and then east into the Fraser River near McGregor (Cariboo District).

fast flowing runs and riffles, isolated pools, some side channels, and moderate debris load. Spawning potential is moderate to limited due to a predominantly coarse substrate.

DESCRIPTION

Bowron River was surveyed for chinook near the Bowron Lake outlet in September, 1976. Bowron River flows from Bowron Lake 185 km to its confluence with the Fraser. Major runs of chinook and sockeye utilize this system as well as resident populations of dolly varden, char, rocky mountain whitefish and rainbow trout.

From Saw Creek to Highway No. 16 the river is confined. The streambed substrate is boulders/cobble with spawning and rearing potential for chinook very limited. The river below Highway No. 16 was not surveyed due to access problems.

The major chinook spawning areas are located in sections between Indianpoint Creek and Bowron Lake outlet. These upper reaches are located in a wide "U-shaped" valley with swampy areas on both sides of the river. Riparian vegetation is thick and log debris extensive, providing excellent rearing habitat. Spawning habitat is good with a substrate of cobble and pebble and extensive bar formations. Fast flows prevail in this section.

There are several major and minor tributaries whose lower reaches are utilized by chinook. These streams include Antler Creek, Haggen Creek, Indianpoint Creek, Towkuh Creek, Craze Creek, 10/14/18 Mile Creeks, Grizzly Bear Creek, Saw Creek and Purden Creek.

From 4 km below Indianpoint Creek to Haggen Creek is a canyon section with little potential for chinook spawning or rearing.

Sockeye utilization is mainly in Sus Creek.

From Haggen Creek to Saw Creek, the river has good rearing habitat and is composed of

ENHANCEMENT

No recommendations for enhancement were made as more information about the systems' capabilities are needed. At present the system supports a large sockeye run and a moderate chinook run. It is believed the system could support larger runs.

Boat access is good and road access moderate. Hydro power is available at some locations.

HISTORICAL FLOW. cms (cfs).

- 1. Mean Monthly Discharge (1954 - 1976): Station No. 08K D004
Bowron River near Hansard

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
21.0 (738)	20.0 (704)	23.4 (824)	62.8 (2,210)	199.1 (7,010)	210.2 (7,400)	105.1 (3,700)	63.9 (2,250)	62.8 (2,210)	69.6 (2,450)	56.5 (1,990)	33.5 (1,180)

- Mean Yearly Discharge 75.0 cms (2,640.0 cfs)
- Maximum Daily Discharge 455.9 cms (68,600.0 cfs)
- Minimum Daily Discharge 19.5 cms (690.0 cfs)

- 2. Mean Monthly Discharge (1954 - 1976): Station No. 08K D001
Bowron River near Wells

Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
3.5 (123)	3.0 (106)	2.8 (99.7)	5.7 (202)	19.9 (699)	26.3 (927)	16.5 (582)	9.7 (340)	8.5 (300)	8.0 (283)	7.1 (250)	5.3 (185)

- Mean Yearly Discharge 9.6 cms (338.0 cfs)
- Maximum Daily Discharge 51.5 cms (1,820.0 cfs)
- Minimum Daily Discharge 1.2 cms (43.2 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	1,200	800	950	2,000	650 ¹	960	1181

¹Excludes 1951.

<u>Three-Cycle Mean</u>	\bar{x} <u>67/71/75</u>	\bar{x} <u>68/72/76</u>	\bar{x} <u>69/73/77</u>	\bar{x} <u>70/74/78</u>
Sockeye	24,000	3,350	4,033	2,017

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	August	Late August	September	Middle September
Sockeye	End August	Middle September	Late September	End September

- 1950 - Escapement includes 200 sockeye to Antler Creek.
- 1978 - Escapement includes 400 chinook to Indianpoint Creek.

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
04/09/76	<u>Site No. 1</u> Bridge at Bowron Lake outlet	16.5	0.80	1.20	-	13.5	-	7.0	7.3

<u>Site</u>	<u>Substrate</u>
No. 1	Silt, sand, cobble and boulder

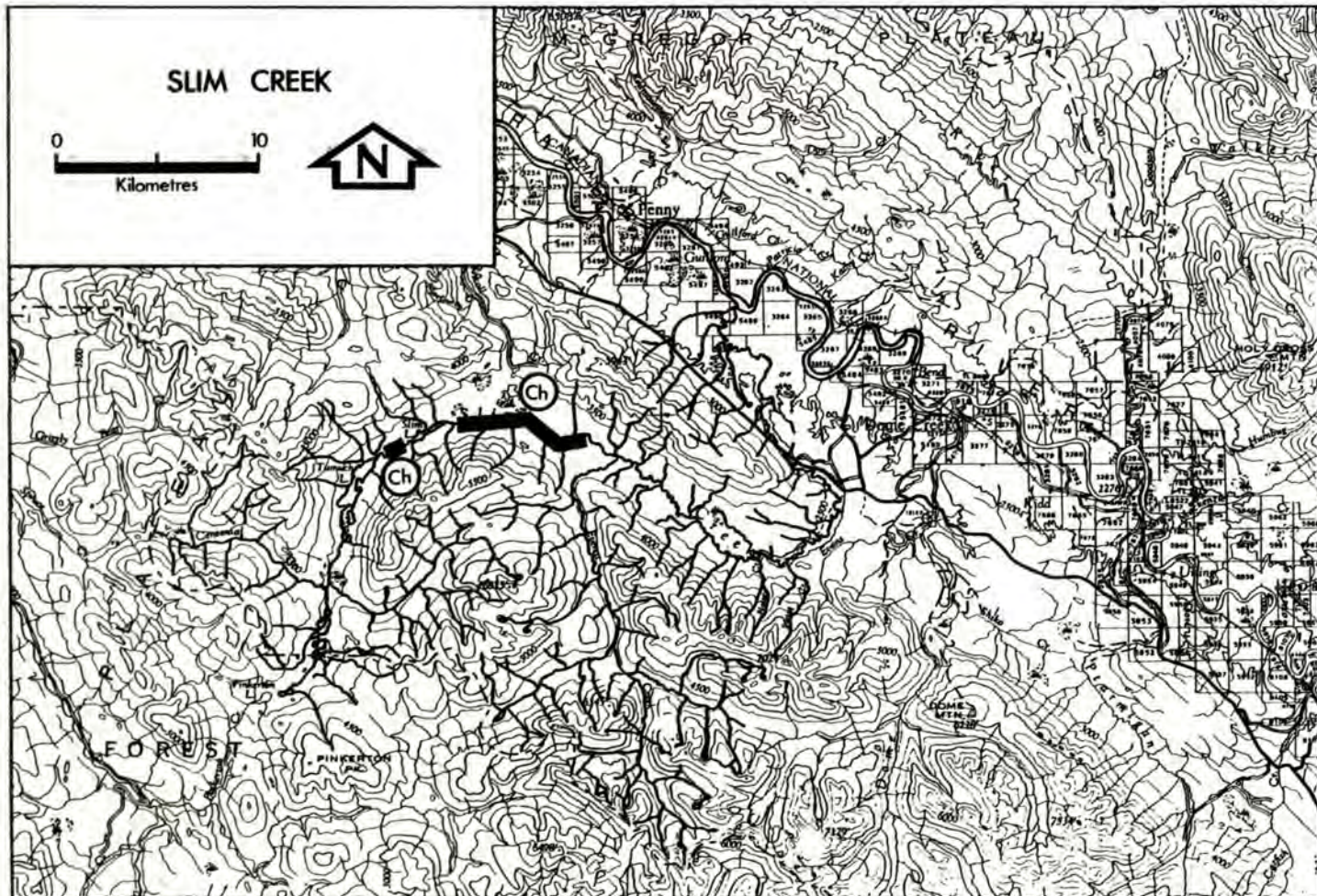
BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
04/09/76	Chinook	4 ₁	-	-	-	1	67.3	-
		5 ₁	-	-	-	1	67.0	-

Juvenile Sampling

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x}</u> <u>Nose-Fork</u> <u>Length</u> <u>(mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
04/09/76	Antler Creek, just upstream from mouth (beach seine)	1545	1605	Ch	1	1	63.0	4 Rocky Mountain Whitefish 1 Sculpin
04/09/76	Bowron River, just downstream from bridge below lake outlet (beach seine)	1610	1620	Ch	-	-	-	3 Sculpin



64. SLIM CREEK .53° 121° NE

LOCATION

Flows northeast into Fraser River, near Guildford (Cariboo District).

DESCRIPTION

Slim Creek was surveyed for chinook by air in mid-September, 1975.

Slim Creek is 60 km long from its headwaters to the mouth. It passes through several lakes and is joined by three major tributaries. These lakes act as efficient sediment settling ponds and reservoirs for flow control. Logging is the most influential human activity in this watershed along with angling, boating, hunting and trapping.

Slim Creek has a fairly steep gradient from its mouth to 16 km upstream. Coarse gravel and boulder dominate the substrate with rapids frequently observed. With the exception of a 2 km section of rapids a short distance below Slim Lake, the next 11 km meanders, forming riffles with a substrate of cobble and pebble. This reach plus the stream between Slim and Tumuch Lakes and a short section above Tumuch Lake are the main spawning

beds for the system's chinook run. Upper Slim Creek has good rearing potential as there are many pools and streamside vegetation is abundant.

Tributary spawning and rearing is virtually non-existent with the exception of limited use in the lower end (approximately 1 km) of Everett Creek. Everett Creek above this short section has a steep gradient for 25 km.

ENHANCEMENT

This stream appears to have good potential for enhancement as the present run does not utilize the available habitat to its full extent. The most favourable enhancement technique would be the installation of one or more incubation boxes.

Access to the spawning ground is good via logging roads but hydro power is not available. A good native chinook stock is available for enhancement.

HISTORICAL FLOW

No record.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	750	1,422	1,900	1,600	-	835	1,084

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Middle August	-	September	Late September

PHYSICAL AND CHEMICAL CHARACTERISTICS.

No record.

BIOLOGICAL SAMPLING DATA.

No biological sampling during the 1975 survey.

LOCATION

Flows southwest into the Fraser River, southeast of McBride (Cariboo District).

DESCRIPTION

Holmes River was surveyed for chinook by air and ground crews in September, 1976 and by a ground crew (near Highway No. 16) in August, 1976. The watershed's forest cover has been removed through forest fires and logging, resulting in extreme run-off flows and unstable conditions.

Holmes River, from its headwaters to the mouth, is approximately 71 km in length. Salmon spawning is lightly scattered throughout to the 48 km mark with passable falls located at 5.3 and 6.9 km. Above Kilometer 48, the gradient increases and the streambed becomes coarse and less suitable for spawning.

In the lower 1 km the stream has a silt, mud and sand substrate and is unsuitable for spawning. Rearing potential in this deep, meandering section is good. Above this reach to the first falls the river widens forming

gravel bars, slow moving runs and few riffles. This section is the major spawning area and has a substrate of cobble/pebble/sand. Rearing potential is moderate. Spawning areas are found between the falls to Kilometer 12.3.

Although isolated patches of spawning gravels occur above the major areas, the upper reaches are, in general, unsuitable as the stream character alternates from a confined stream with coarse substrate to a meandering stream with a sandy substrate. Rearing potential in these upper areas is good as there are numerous deep pools and log jams.

ENHANCEMENT

Enhancement potential for this stream is good with several alternatives available, including fry transplants into good rearing habitat in the upper reaches, an incubation facility using gravity feed water from the falls, bank and terrain revegetation to reduce watershed instability, removal of silt from potential spawning beds, and placing good gravel in potential spawning areas. Holmes Creek has good access on gravel roads and has the potential for hydro power. A good native stock of chinook is available.

HISTORICAL FLOW.

(1949 - 1952): Station No. 08K A003
Holmes River near McBride

Due to inconsistent recording, this station was discontinued after four years.

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook *	200	75	150	675	-	255 ¹	316

* No records prior to 1966.

1967 to 1970 includes escapements to Horsey and Nevin Creeks.

¹Excludes 1964, 1965.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	August	Middle August	Late August	Middle September

PHYSICAL AND CHEMICAL CHARACTERISTICS.

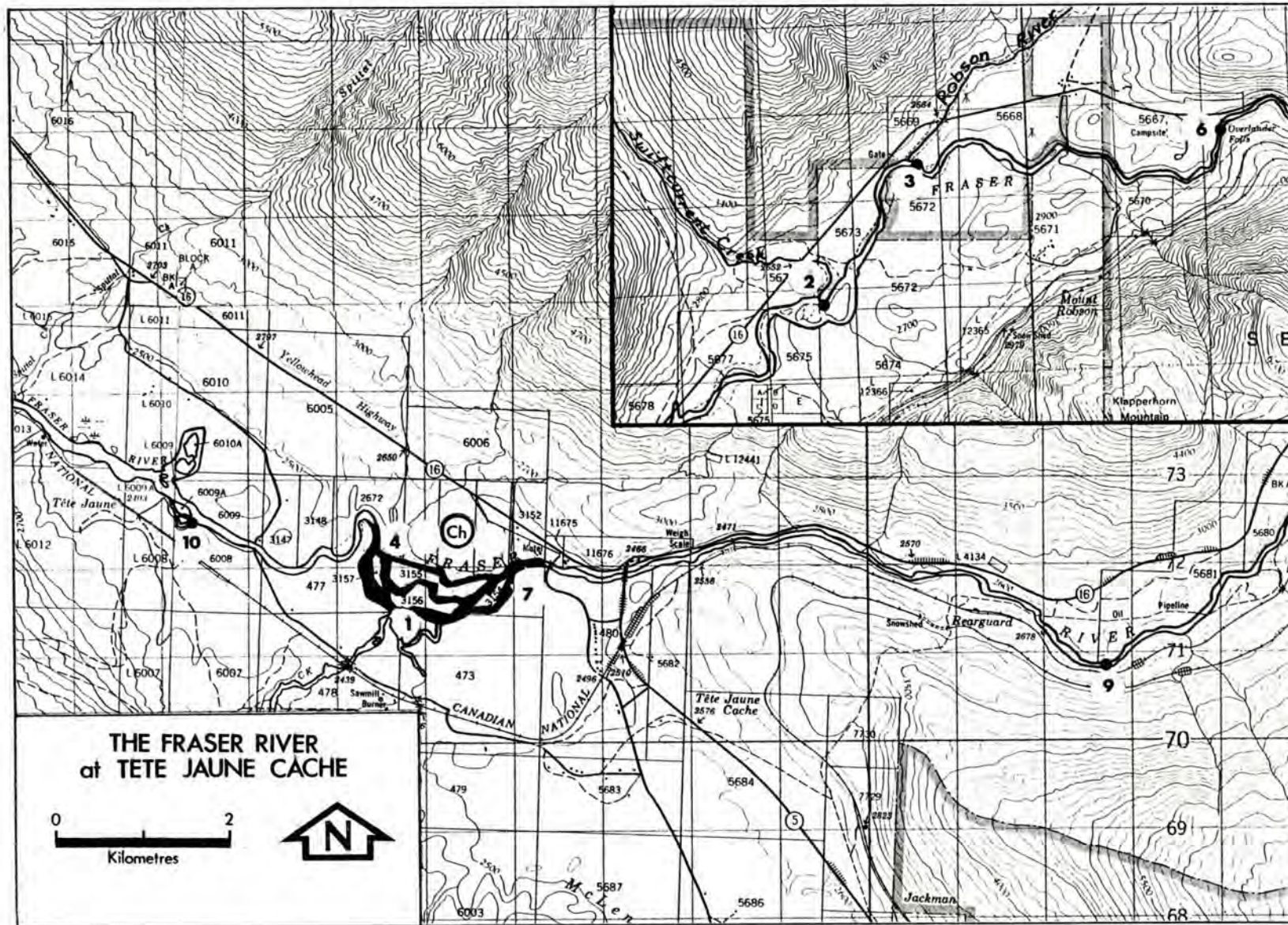
<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
14/09/75	<u>Site No. 1</u> 23 km upstream from Highway No. 16 Bridge	6.9	0.3 - 0.4	Swift	-	7.0	-	-	7.6
27/08/76	<u>Site No. 2</u> Immediately upstream from Highway No. 16 Bridge	27.4	0.7	-	-	7.0	-	13.0	7.4

<u>Site</u>	<u>Substrate</u>	<u>Site</u>	<u>Substrate</u>
No. 1	Cobble, pebble, and sand	No. 2	Cobble, pebble, and boulder

BIOLOGICAL SAMPLING DATA.

Adult Sampling

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
27/08/76	Chinook	4 ₂	-	-	-	1	71.5	-



66. FRASER RIVER MAINSTEM
at TETE JAUNE CACHE,
53° 119° SW

LOCATION

Fraser River mainstem at McLennan River confluence (Cariboo District).

DESCRIPTION

The Tete Jaune Cache spawning ground was surveyed in September, 1975, August and September, 1976, and September, 1977.

The Tete Jaune Cache area is a spawning bed of 2.4 to 3.2 km length on the Fraser River mainstem. This area is characterized by two major channels, numerous small side channels and a cobble/pebble substrate. Spawning and rearing potential in this area is excellent as escapements of up to 9,000 have been recorded.

Rearguard Falls, located 4.8 km upstream from the spawning area, is a major obstruction passable only in ideal low flow conditions. During the 1975 survey a few chinook were observed above the falls near the confluences of Swiftcurrent Creek and the Robson River. Enumeration of chinook and assessment of the

Upper Fraser River habitat is difficult due to poor visibility resulting from glacial silt.

Above Rearguard Falls to Overlander Falls good spawning and rearing habitat is found that is presently unused as a result of Rearguard Falls.

ENHANCEMENT

Recommendations for future projects in this area should include a more detailed survey of the area above Rearguard Falls to determine the extent of spawning/rearing areas. Should the area prove favourable, adult and/or egg transplants would greatly increase the extent of habitat utilization.

Other projects in this area could include a groundwater incubation/rearing facility near the mouth of Swiftcurrent Creek and fry stocking in the Fraser River above Moose Lakes and in the oxbow lakes below Tete Jaune Cache.

Road access is good and hydro power available.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1953 - 1976): Station No. 08K A005
Fraser River at McBride

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
34.6 (1,220)	33.7 (1,190)	32.3 (1,140)	54.7 (1,930)	241.1 (8,510)	586.2 (20,700)	555.1 (19,600)	382.3 (13,500)	215.2 (7,600)	131.1 (4,630)	78.2 (2,760)	46.2 (1,630)

- Mean Yearly Discharge 202.8 cms (7,160.0 cfs)
- Maximum Daily Discharge 1,390.3 cms (49,100.0 cfs)
- Minimum Daily Discharge 19.2 cms (678.0 cfs)

ESCAPEMENT AND TIMING.

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	1,200	1,800	2,000	3,500	5,198	944 ¹	1713

¹Includes escapements to Swift Creek in 1967 to 1969.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	August	Middle August	September	Middle September

PHYSICAL AND CHEMICAL CHARACTERISTICS.

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
10/09/75	<u>Site No. 1</u> Tete Jaune Cache spawning area (south channel)	64.0	0.5	-	-	8.8	-	-	8.2
11/09/75	<u>Site No. 2</u> Fraser River just upstream from Swift Current Creek mouth	27.0	-	-	-	9.5	-	-	7.8
11/09/75	<u>Site No. 3</u> Fraser River just upstream from Robson River mouth	69.0	-	-	-	10.5	-	-	7.8
13/09/75	<u>Site No. 4</u> Small side channel at lower end of Tete Jaune Cache	2.4	0.1	low	-	12.5	-	-	-
13/09/75	<u>Site No. 5</u> Fraser River, at the end of Carr Road	-	-	-	-	8.5	-	-	8.5
28/08/76	<u>Site No. 6</u> Fraser River, just downstream of Overlander Falls	15.0	-	2.22	-	9.5	-	11.5	8.0
30/08/76	<u>Site No. 7</u> Tete Jaune Cache; upper end of south channel	110.0	0.6	1.26	-	9.0	-	11.5	8.0
30/08/76	<u>Site No. 8</u> Small side channel near Tete Jaune Cache	4.5	0.3	-	-	10.0	-	9.5	7.5

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
01/09/76	Site No. 9 1.6 km upstream from Rearguard Falls	51.0	-	2.66	-	8.5	-	10.0	7.9
01/09/76	Site No. 10 Small backwater, approximately 10 to 12 km below Tete Jaune Cache Bridge	7.6	0.3	low	-	13.5	-	8.0	8.0

Site	Substrate	Site	Substrate
No. 1	Cobble and pebble	No. 6	Bedrock at falls; some cobble and boulder above and below
No. 2	Cobble, pebble, and light silting	No. 7	Pebble, cobble, sand, and silt
No. 3	Cobble, pebble, and sand	No. 8	Pebble, sand, and silt
No. 4	Pebble	No. 9	Boulder, cobble, pebble, bedrock, sand, and silt
No. 5	Pebble/sand	No. 10	Silt, aquatic debris, and rooted aquatics

BIOLOGICAL SAMPLING DATA.

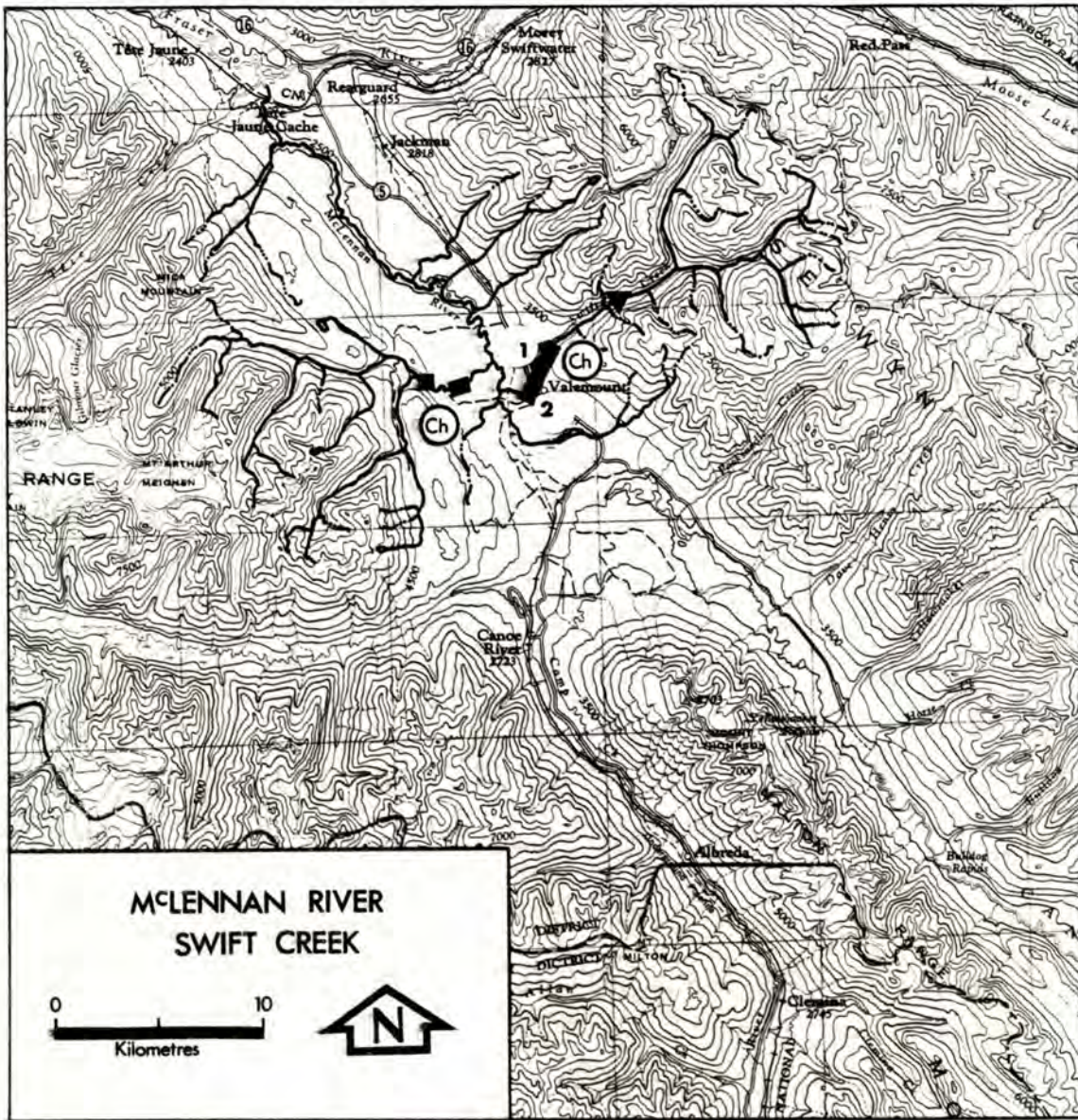
Adult Sampling

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
1975	Chinook	3 ₁	1	50.6	-	-	-	-
		4 ₁	12	77.1	+ 3.2	21	93.2	+ 2.0
		5 ₁	4	82.1	+ 2.7	2	75.4	-
		R	-	-	-	1	-	-
1976	Chinook	4 ₁	4	76.6	+ 4.6	5	71.8	+ 4.5
		5 ₁	-	-	-	2	74.7	-
		5 ₂	3	79.9	-	1	72.5	-
		R	2	-	-	2	-	-
1977	Chinook	3 ₁	3	66.6	-	2	75.2	-
		3 ₂	1	64.6	-	-	-	-
		4 ₁	13	79.8	+ 2.5	30	75.8	+ 1.6
		4 ₂	1	61.4	-	1	67.6	-
		5 ₁	-	-	-	2	76.5	-
		5 ₂	3	81.0	-	9	76.4	+ 1.6

Juvenile Sampling

Date	Location (Gear)	Time		Species	Number Caught	Number Sampled	Nose-Fork Length (mm)	Other Fish Species
		Set	Haul					
12/09/75	Tete Jaune Cache, small side channel (pole seine)	1500	-	Ch	1	-	-	-
13/09/75	Tete Jaune Cache, small side channel (pole seine)	1700	-	Ch	1	-	-	1 Rocky Mountain Whitefish
28/08/76	Moose Lake, 2km downstream from outlet (2 sets minnow seine)	1130	1140	-	-	-	-	6 Rocky Mountain Whitefish
01/09/76	Moose Lake, at outlet (2 sets beach seine)	1000	1010	-	-	-	-	10 Rocky Mountain Whitefish
01/09/76	Moose Lake, 2.7 km from outlet (3 sets beach seine)	1110	1125	-	-	-	-	100 Rocky Mountain Whitefish 1 Dolly Varden 1 Sucker
30/08/76	Small side channel, approximately 8 km below Tete Jaune Cache (minnow seine)	1030	1050	Ch	12	11	66.8	2 Rocky Mountain Whitefish
30, 31 08/76	Small side channel, approximately 8 km below Tete Jaune Cache (2 minnow traps)	1100	0800	Ch	24	20	74.0	4 Red-sided Shiners
30/08/76	Small side channel, approximately 7 km below Tete Jaune Cache (minnow traps)	1500	1550	Ch	10	-	-	14 Rocky Mountain Whitefish 5 Red-Sided Shiners
30, 31 08/76	Small side channel, approximately 7 km below Tete Jaune Cache (minnow traps)	1630	0830	-	-	-	-	2 Red-Sided Shiners 5 Red-Sided Shiners
07/09/76	Small side channel, approximately 7 km below Tete Jaune Cache (beach seine)	1045	1100	Ch	7	-	-	7 Rocky Mountain Whitefish 1 Sucker

Date	Location (Gear)	Time		Species	Number Caught	Number Sampled	Nose-Fork Length (mm)	Other Fish Species
		Set	Haul					
30/08/76	Gravel bar, approximately 7 km below Tete Jaune Cache (beach seine)	1600	1630	Ch	9	-	-	21 Rocky Mountain Whitefish 5 Red-Sided Shiners
31/08/76	Gravel bar, approximately 7 km below Tete Jaune Cache (beach seine)	1030	1100	Ch	25	-	-	15 Rocky Mountain Whitefish 5 Red-Sided Shiners 2 Dolly Vardens 1 Sculpin
07/08/76	Gravel bar, approximately 7 km Tete Jaune Cache (beach seine)	1030	1040	Ch	1	-	-	4 Rocky Mountain Whitefish
31/08/76	Side channel, 4 km below Highway No. 5 Bridge Tete Jaune Cache (minnow traps)	0850	1600	Ch	2	-	-	1 Red-Sided Shiner
31/08/76	Gravel bar, 5 km below Highway No. 5 Bridge Tete Jaune Cache (beach seine)	1340	1406	Ch	36	-	-	37 Rocky Mountain Whitefish 4 Red-Sided Shiners 2 Sculpins 4 Suckers
31/08/76	Gravel bar on lower end of south channel Tete Jaune Cache (beach seine)	1430	1445	-	-	-	-	2 Rocky Mountain Whitefish
31/08/76	Gravel bar on lower end of north channel Tete Jaune Cache (beach seine)	1455	1520	Ch	19	-	-	52 Rocky Mountain Whitefish 4 Dolly Vardens 3 Red-Sided Shiners 1 Sculpin
31/08/76	Gravel bar, 2.4 km below Highway No. 5 Bridge Tete Jaune Cache (beach seine)	1530	1545	Ch	22	-	-	13 Rocky Mountain Whitefish 1 Red-Sided Shiner 1 Sculpin
01/09/76	Backwater, 10.2 km below Highway No. 5 Bridge Tete Jaune Cache (beach seine)	1300	1305	Ch	57	-	-	32 Rocky Mountain Whitefish 3 Suckers 1 Red-Sided Shiner
01/09/76	Backwater, 10.2 km below Highway No. 5 Bridge Tete Jaune Cache (minnow traps)	1315	1400	Ch	1	-	-	10 Red-Sided Shiners



67. McLENNAN RIVER
SWIFT CREEK .52°119° NE

LOCATION

Flows northwest into McLennan River at Valemount and north into the Fraser River at Tete Jaune Cache (Cariboo District).

DESCRIPTION

Swift Creek was surveyed for chinook in September, 1975, 1976 and 1977. The survey area extended from the debris catcher to 0.5 km below the Highway No. 5 Bridge.

McLennan River from its headwaters to the Fraser River confluence is approximately 48 km in length. The initial 30 km meanders extensively, is slow moving and has a mud and sand substrate. Spawning and rearing potential is nil owing to the poor substrate and heavily silted water. From the lower reach to an impassable falls at 40 km the substrate is cobble/pebble with a heavy silt load. Spawning and rearing potential is moderate. Limited spawning has been observed in this section.

Swift Creek flows 20 km from its headwaters to its confluence with the McLennan River, 30 km from the Fraser River confluence. Salmon migration is blocked at

4.0 km by the Valemount Village water diversion dam and hindered by a drift catcher at 3.2 km. This stream is of moderate gradient and generally clear flow. It has silt-free gravel suitable for spawning. Although good spawning potential exists, low escapements indicate underutilization.

This stream is subject to erratic flows and silting. To prevent bank erosion, sections of the stream have been rip-rapped.

ENHANCEMENT

Swift Creek has the potential for a much larger chinook run than presently exists. The installation of an incubation facility using a gravity feed intake from the debris catcher has good potential. In addition, small stream improvement work such as bank stabilization, bank revegetation, removal of silt, placement of good quality gravel in potential spawning areas and the strategic placement of brush piles and stone deflectors to create additional rearing habitat may enhance the production of Swift Creek considerably. Hydro power and road access are available. There is potential for groundwater development. Native chinook stocks are available. Brood capture may be accomplished via fence trapping.

HISTORICAL FLOW. cms (cfs).

- Mean Monthly Discharge (1971 - 1976): Station No. 08K A010
Swift Creek above Barrett Creek

<u>Jan.</u>	<u>Feb.</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Sept.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
0.48 (16.9)	0.38 (13.5)	0.35 (12.3)	0.53 (18.8)	3.92 (138.0)	11.05 (389.0)	11.56 (407.0)	5.28 (186.0)	2.36 (83.1)	1.84 (64.8)	1.10 (38.9)	0.71 (25.1)

- Mean Yearly Discharge 3.29 cms (116.0 cfs)
- Mean Maximum Daily Discharge 23.5 cms (829.0 cfs)
- Mean Minimum Daily Discharge 0.2 cms (7.9 cfs)

ESCAPEMENT AND TIMING.

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook *	75	150	275	200	-	75	153

* First recorded escapement in 1970.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	August	Middle August	Late August	End September

PHYSICAL AND CHEMICAL CHARACTERISTICS

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
10/09/75	Site No. 1 Upstream from Highway No. 5 Bridge	12.0	0.40	-	-	9.0	-	-	7.6
02/09/76	Site No. 1 Upstream from Highway No. 5 Bridge	14.0	0.50	0.66	-	8.5	-	10.5	7.3
10/09/77	Site No. 2 Highway No. 5 Bridge	16.0	0.50	0.72	-	5.0	-	12.0	7.3

Site	Substrate	Site	Substrate
No. 1	Cobble and pebble	No. 2	-
No. 1	Pebble, silt, cobble, sand, and boulder		

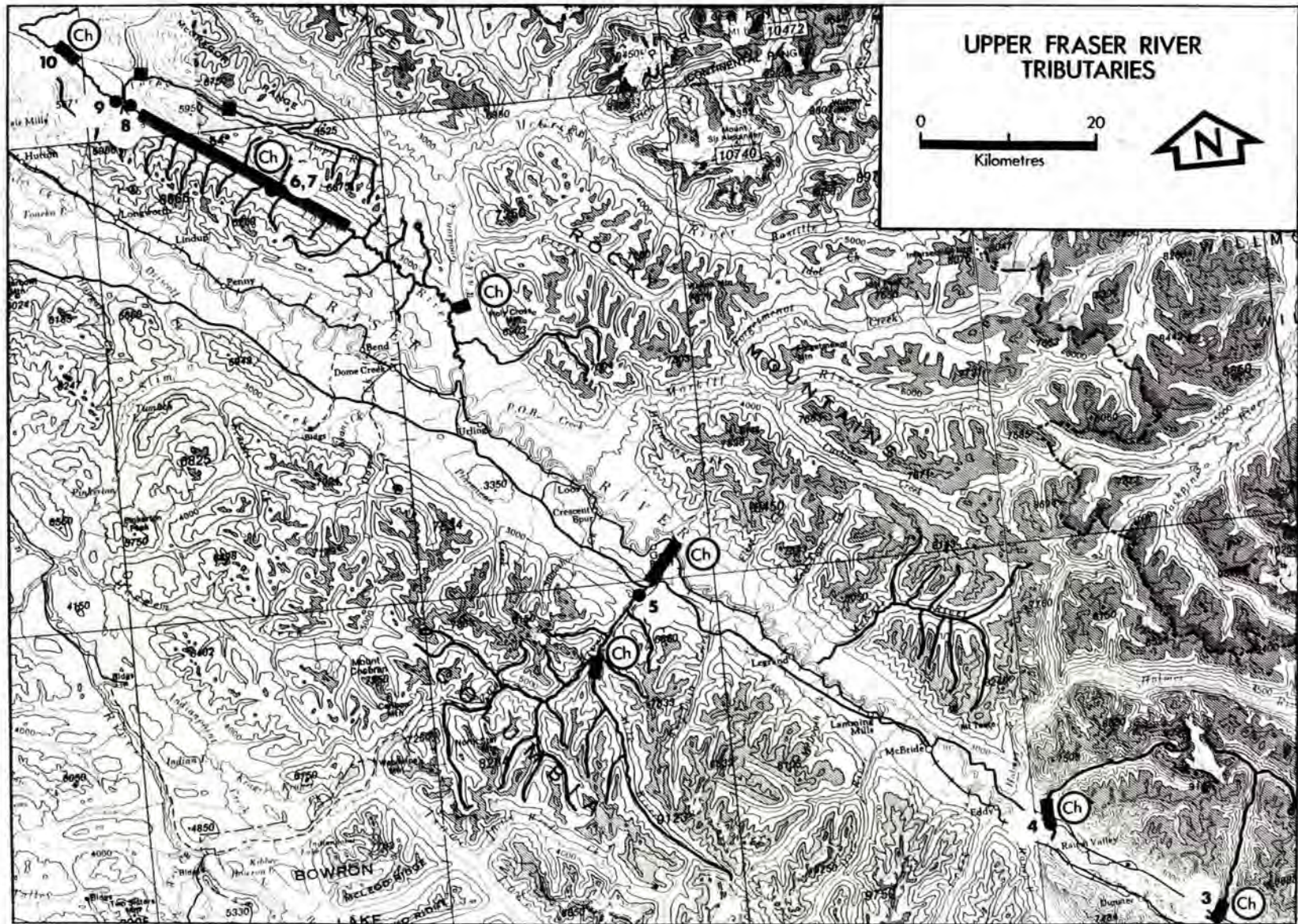
BIOLOGICAL SAMPLING DATA.

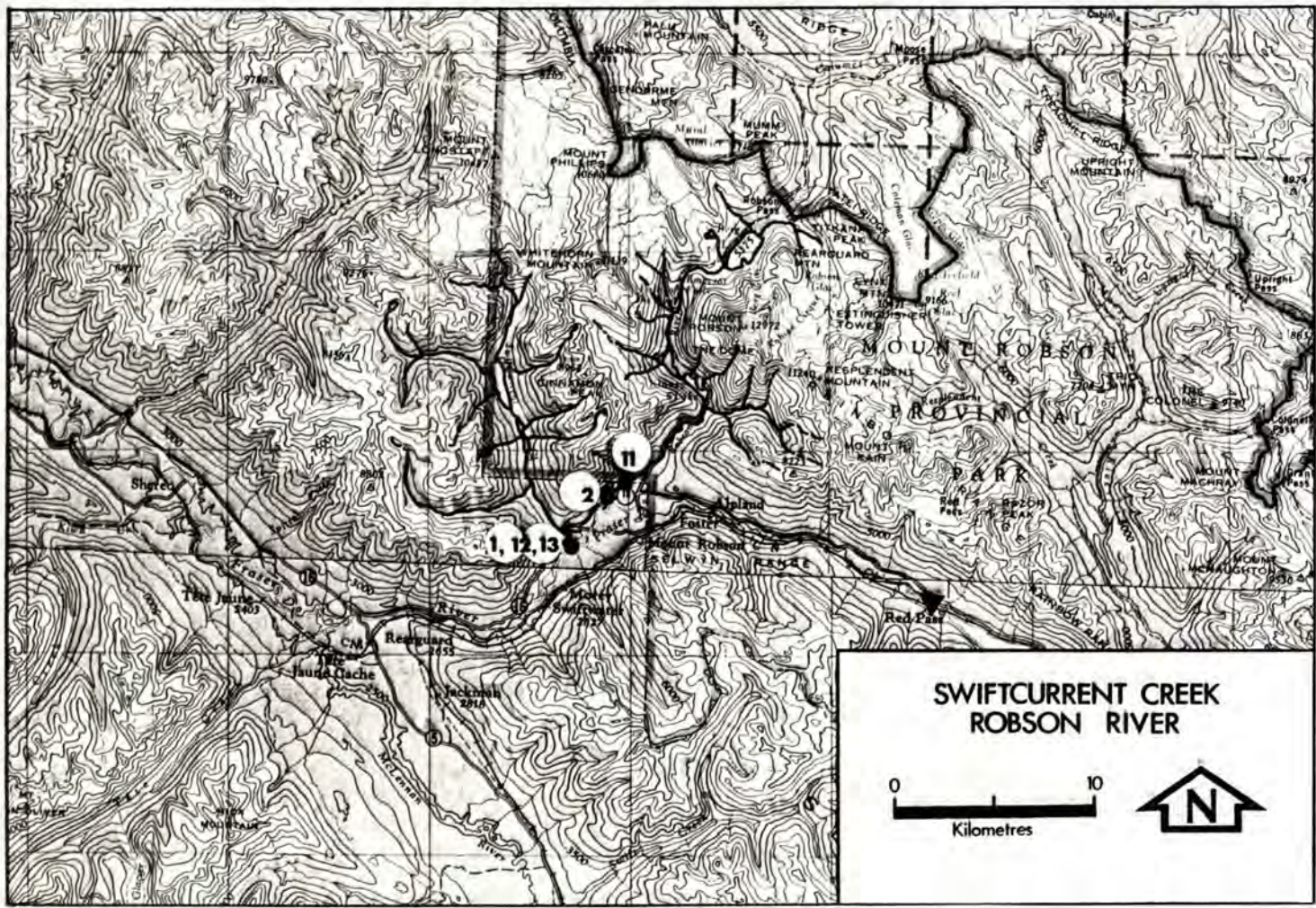
Adult Sampling

Date	Species	Age	Males			Females		
			Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
1976	Chinook	3 ₁	1	64.0	-	-	-	-
		4 ₁	2	71.8	-	3	70.3	-
		5 ₂	1	64.0	-	1	68.0	-
		R	-	-	-	-	-	-

Juvenile Sampling

Date	Location (Gear)	Time		Species	Number Caught	Number Sampled	Nose-Fork Length (mm)	Other Fish Species
		Set	Haul					
03/09/76	Immediately upstream of Highway No. 5 Bridge (beach seine)	0935	0945	-	-	-	-	2 Sculpins
03/09/76	70 m downstream of Highway No. 5 Bridge	0950	1000	-	-	-	-	12 Rocky Mountain Whitefish 3 Sculpins





68. UPPER FRASER RIVER TRIBUTARIES

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LOCATION

Flow into the Fraser River between Crescent Spur and Moose Lake (Cariboo District).

DESCRIPTION

Torpy System

This is one of the major systems of the Upper Fraser River and includes West Torpy and Walker Creeks. Aerial surveys were conducted in September, 1975 and ground and air surveys conducted in late August, 1976. The lower 30 to 40 km of mainstem is generally slow flowing and meandering with a sand/clay substrate unsuitable for spawning. Rearing potential is moderate. From this reach to the West Torpy confluence is the main spawning area. Above this confluence, the gradient increases and several impassable falls are present.

The lower end of West Torpy Creek has an unsuitable sand substrate. It grades to good spawning gravels 1 km upstream from the confluence. In total, there are approximately 9 km of good spawning habitat. Rearing habitat is also good with a thick bank canopy, windfalls, log jams and numerous pools.

Walker Creek has good potential spawning habitat up to 10 km, but concentrated spawning occurs mainly in the lower 2 km. The Walker Creek confluence is at Kilometer 9.6 of the Torpy mainstem.

Goat/Milk

The mouths of both streams were surveyed by a ground crew in September, 1975. An aerial survey was also conducted. The Goat River is accessible throughout and moderate spawning habitat exists above a steep canyon section at Kilometer 8. However, the present run is very small and utilizes only the lower 6 km with highest concentration of spawning near the mouth.

The Milk River, a tributary of the Goat River with its confluence at 15.5 km has spawning recorded in the initial 1.6 km. Above this for 11 km the stream is steep with a coarse substrate unsuitable for spawning. The present run in this river is small with limited potential for enhancement.

Nevin Creek

Aerial and ground surveys were conducted on this creek in September, 1975. Nevin Creek is a small mountain stream heavily overgrown and containing beaver dams and numerous windfalls in the lower section. Potentially good spawning and rearing habitat exists in the lower 3.5 km but spawning is limited and scattered throughout this area. This stream presently supports a small chinook run but is capable of supporting a moderate-sized run. An impassable falls is located at 13 km.

Horse Creek

Aerial and ground surveys were conducted on this stream in September, 1975. Salmon

access is limited to the lower 1.8 km as the reaches above are steep, fast flowing and contain unfavourable substrate. The lower moderate gradient meandering section contains good spawning gravel but is compacted with silt. The available spawning substrate is limited as evidenced by the small chinook run. Rearing potential is limited to moderate.

Swiftcurrent Creek/Robson River

Both streams, located above Rearguard Falls, were surveyed by ground crews in September, 1975, August, 1976, and September, 1977. From the Highway No. 16 Bridge upstream, both streams are steep and have limited potential for spawning/rearing. Below the highway the gradients are moderate with potential habitat available near the mouth. Bottom substrate is predominantly pebble and cobble. The mouth of Swiftcurrent Creek forms a delta with the Fraser River and contains numerous small side channels with a pebble substrate. Spawning and rearing potential is moderate to good at Swiftcurrent Creek and the Robson River mouths.

Adult chinook have been observed in the vicinity of both streams. In addition, numerous juveniles were captured in a side channel of Swiftcurrent Creek mouth and in the lower section of the mainstem.

ENHANCEMENT

It is recommended that a small incubation facility be installed on the Torpy system as the present habitat can support a much larger run than is recorded. In addition, watershed rehabilitation through reforestation and soil conservation should be instigated as silting and tributary erosion due to logging practices were observed in the 1976 survey. Road access to the Torpy system is good, but hydro power is unavailable.

Enhancement of Goat River, Milk River, Nevin Creek and Horse Creek can be accomplished by egg and/or fry transplants as these systems in general could support somewhat larger runs than recorded at present. Enhancement of these streams though, is not considered of high priority due to their overall limited potentials. Road access to these systems is limited and hydro power available only at the mouth.

The installation of an incubation/rearing facility at Swiftcurrent Creek mouth has excellent potential due to good access, available hydro power and the presence of a potential groundwater supply. A facility at this location could supply eggs and fry for small stream enhancement projects in the area. In addition, eggs and fry placed in good incubation and rearing habitat above Rearguard Falls could increase the chinook stocks in the Upper Fraser. If done in conjunction with improving access past the falls, the colonization of this area would be greatly expedited.

Enhancement potential for Robson River is limited.

HISTORICAL FLOW.

No record.

ESCAPEMENT AND TIMING.

Torpy

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook *	400	600	525	350	-	570	622

* Includes escapements to West Torpy and Walker Creek in 1971/1972/1973.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	Late July	-	Late August	-

Goat/Milk

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook *	11	25	20	70	-	24 ¹	38

* ● 1967 to 1972 includes escapements to Milk River and West Twin Creek.
● Escapements for this stream begins in 1967.

¹Excludes 1962 to 1966.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook .	August	Middle August	Late August	End September

Nevin Creek

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	11	25	5	30	-	150 ¹	24

¹Excludes 1961, 1964 to 1970.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	August	Middle August	Late August	September

Horsey Creek

Escapement

	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	\bar{x} <u>1951 - 1960</u>	\bar{x} <u>1961 - 1970</u>	\bar{x} <u>1971 - 1978</u>
Chinook	6	25	-	40	-	150 ¹	23

¹Excludes 1961, 1964 to 1970.

Spawning Timing

	<u>Arrive</u>	<u>Start</u>	<u>Peak</u>	<u>End</u>
Chinook	August	Middle August	Late August	End September

PHYSICAL AND CHEMICAL CHARACTERISTICS.

<u>Date</u>	<u>Location</u>	<u>Mean Wetted Width (m)</u>	<u>Mean Depth (m)</u>	<u>Surface Velocity (mps)</u>	<u>Estimated Gradient Per Cent</u>	<u>Temperature (Celsius)</u>		<u>Dissolved Oxygen (ppm)</u>	<u>pH</u>
						<u>Water</u>	<u>Air</u>		
11/09/75	<u>Site No. 1</u> Swiftcurrent Creek, just downstream from Highway No. 16 Bridge	11.0	-	-	-	3.5	-	-	7.6
11/09/75	<u>Site No. 2</u> Robson River 270 m downstream from Highway No. 16 Bridge	27.0	-	-	-	9.2	-	-	8.2
14/09/75	<u>Site No. 3</u> Horsey Creek, 70 km downstream from Highway No. 16 Bridge	10.5	-	Swift	-	6.0	-	-	7.5
14/09/75	<u>Site No. 4</u> Nevin Creek, 30 m downstream from Highway No. 16 Bridge	6.9	0.3 - 0.4	Swift	-	7.0	-	-	7.6
14/09/75	<u>Site No. 5</u> Goat Creek, just upstream of Highway No. 16 Bridge	25.5	-	Swift	-	8.0	-	-	8.3

Date	Location	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
						Water	Air		
20/08/76	<u>Site No. 6</u> Torpy River, 35.2 km on Torpy River Road	27.0	0.9	2.14	-	8.0	-	9.0	7.8
25/08/76	<u>Site No. 7</u> Torpy River, side channel at 35.2 km on Torpy River Road	11.6	0.6	1.20	-	10.0	-	-	-
23/08/76	<u>Site No. 8</u> Torpy River, just downstream from West Torpy confluence	20.0	0.6	2.83	-	9.0	-	11.5	8.0
20/08/76	<u>Site No. 9</u> West Torpy River at bridge	24.0	-	1.80	-	8.0	-	9.0	7.5
23/08/76	<u>Site No. 10</u> West Torpy River at Pass Lake Road Bridge	14.0	0.5	1.17	-	8.0	-	9.0	7.4
28/08/76	<u>Site No. 11</u> Robson River, 1 km upstream from bridge	19.8	0.6	2.00	-	8.5	-	11.5	8.1
28/08/76	<u>Site No. 12</u> Swiftcurrent Creek, just downstream from bridge	15.0	0.6	1.30	-	8.5	-	11.5	8.0
28/08/76	<u>Site No. 13</u> Swiftcurrent Creek groundwater stream near mouth	2.4	0.8	low	-	11.5	-	7.0	7.4

Site	Substrate	Site	Substrate
No. 1	Cobble, pebble, and silt	No. 8	Pebble, sand, silt, and cobble
No. 2	Pebble and cobble	No. 9	Cobble, pebble, and sand

<u>Site</u>	<u>Substrate</u>	<u>Site</u>	<u>Substrate</u>
No. 3	Pebble and cobble	No. 10	Pebble, cobble, and sand
No. 4	Cobble, pebble, sand, and light silting	No. 11	Pebble, cobble, sand, and boulder
No. 5	Cobble, pebble, sand, and light silting	No. 12	Cobble, pebble, sand, and silt
No. 6	Pebble, cobble, and sand	No. 13	-
No. 7	Pebble and cobble		

BIOLOGICAL SAMPLING DATA.

Adult Sampling

Holmes

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
27/08/76	Chinook	4 ₂	-	-	-	1	71.5	-

Torpy

<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
			<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
08/76	Chinook	3 ₁	2	66.9	-	2	71.8	-
		4 ₁	-	-	-	1	73.0	-
		5 ₂	1	78.8	-	-	-	-
		R	-	-	-	1	-	-

Juvenile Sampling

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x} Nose-Fork Length (mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
25/08/76	Torpy River, mouth of West Torpy (beach seine)	1615	1645	Ch	1	1	77.0	1 Rocky Mountain Whitefish
28/08/76	Robson River, side channel near mouth (minnow seine)	1330	1340	Ch	1	1	82.0	20 Sculpins
28/08/76	Swiftcurrent Creek, spring-fed side channel (minnow seine)	1100	1110	Ch	3	3	-	-

<u>Date</u>	<u>Location (Gear)</u>	<u>Time</u>		<u>Species</u>	<u>Number Caught</u>	<u>Number Sampled</u>	<u>\bar{x}</u> <u>Nose-Fork</u> <u>Length</u> <u>(mm)</u>	<u>Other Fish Species</u>
		<u>Set</u>	<u>Haul</u>					
02/09/76	Swiftcurrent Creek, side channel near mouth (beach seine)	0820	0830	Ch	27	20	74.0	1 Burbot 5 Rocky Mountain Whitefish
02/09/76	Swiftcurrent Creek, side channel near mouth (beach seine)	0845	0855	Ch	11	-	-	11 Rocky Mountain Whitefish 1 Sculpin

APPENDIX 9.1

MEAN ESCAPEMENT BY STREAM FROM 1951 TO 1978, AND TIMING

River or Stream	Species	Escapement			Timing			
		1951 - 1960	1961 - 1970	1971 - 1978	Arrive	Start	Peak	End
1. Nicola	Chinook	6,567	2,950	2,775	July	Late July	Late August	End September
	Coho	1,230 ¹	1,108	394	September	Late September	Middle October	Middle November
	Pink	2,140	820	1,300	September	Middle September	Late September	Middle October
2. Spius	Chinook	528 ²	118 ⁴	398	July	Late July	Late August	End September
	Coho	964 ³	222 ⁵	406	September	Late September	Middle October	End November
3. Coldwater	Chinook	780 ⁶	251	639	August	Late August	Middle September	Late September
	Coho	2,400 ⁷	1,461 ⁸	619	October	Late October	Middle November	End November
4. Bonaparte	Chinook	200 ⁹	2911	551 ³	August	End August	End September	Middle September
	Coho	1,275 ¹⁰	441 ²	14 ⁴	October	Late October	End November	Middle November
	Pink	345	1,491	320	September	Late September	End October	Late October
5. Deadman	Chinook	535	243 ¹⁶	152	Early July	July	Middle July	Late August
	Coho	1,328 ¹⁷	441 ¹⁸	54	October	Middle October	Late October	Middle November
	Pink ¹⁵	-	-	-	September	Late September	Early October	Middle October
6. South Thompson	Chinook	2,769 ²⁰	4,350	4,450	August	Late September	Late October	End October
	Pink ¹⁹	-	-	275	September	October	Late October	End October
7. Adams	Chinook - Upper ²¹	-	-	-	-	-	-	-
	- Lower	2,025	2,140	1,481	Early September	Middle September	Early October	Late October
	Coho - Upper ²²	1,833 ²⁴	1,563 ²⁵	142 ²⁶	Late October	End November	Middle November	Late November
	- Lower	1,615	500	194	Middle October	Late October	Middle November	December
	Pink - Upper ²³	-	-	-	-	-	-	-
- Lower	-	-	-	Late September	Early October	End October	Middle October	
9. Sinmax	Coho	444 ²⁷	270	99	Middle October	November	Middle November	Late November
10. Momich	Coho	400 ²⁸	304 ²⁹	34 ³⁰	Middle October	November	Middle November	Late November
11. Scotch	Coho	Erratic	Erratic	64 ³¹	Middle October	Late October	Middle November	Late November
13. Seymour	Chinook ³²	-	-	-	September	Middle September	Middle September	End September
	Coho ³²	-	-	-	October	Middle October	Late October	December
14. Anstey	Coho	-	117	33	Middle October	Late October	Early November	December

River or Stream	Species	Escapement			Timing			
		1951 - 1960	1961 - 1970	1971 - 1978	Arrive	Start	Peak	End
15. Hunakwa	Coho	-	45 ³⁶	64	Middle October	Late October	November	Late November
16. Tappen	Coho	281 ³⁷	47 ³⁸	13 ³⁹	Middle October	November	Middle November	Late November
17. Salmon	Chinook	447 ⁴⁰	190	250	Middle July	September	Middle September	Late September
	Coho	2,200 ⁴⁰	1,185	1,349	Middle October	Late October	End November	Late November
18. Canoe	Coho ⁴¹	-	-	32 ⁴²	Middle October	Late October	November	Late November
19. Eagle	Chinook	1,565	930	432	Middle August	Middle September	Late September	October
	Coho	2,625	1,875	1,774	October	Late October	Middle November	December
20. South Pass	Coho ⁴³	-	-	-	October	Late October	Middle November	December
21. Wap	Coho ⁴⁴	-	-	189	October	November	Middle November	December
22. Blurton	Coho ⁴⁵	-	-	-	Middle October	Late October	End November	December
23. Shuswap	Chinook - Lower	3,625	5,650	8,863	Middle July	End October	End October	End November
	- Middle	1,083 ⁴⁶	770	498	Middle July	Middle September	Late September	Middle October
	Coho - Lower	2,250 ⁴⁷	810	158	End October	November	Middle November	Late November
	- Middle	1,518 ⁴⁸	980	382	Middle October	Late October	-	Late November
31. Bessette	Chinook	-	25	23 ⁴⁹	September	September	Late September	Middle October
	Coho	-	1,067 ⁵⁰	590 ⁵¹	October	Late October	Middle November	December
32. Creighton	Coho ⁵²	-	-	-	Middle October	Late October	End November	December
33. Duteau	Coho ⁵²	-	-	-	Middle October	Late October	End November	December
35. North Thompson	Chinook	1,692 ⁵⁴	1,778 ⁵⁵	1,550	Middle August	September	Middle September	End October
	Coho ⁵³	1,500 ⁵⁶	750 ⁵⁷	1,100 ⁵⁸	Middle October	November	Middle November	End December
36. Louis	Chinook	500	169 ⁵⁹	110	Early August	Middle August	Early September	Middle September
	Coho	1,855	1,110	2,041	Middle October	Late October	Middle November	Early December
37. Barriere	Chinook	147 ⁶¹	109 ⁶²	25 ⁵³	September	September	Middle September	Late September
	Coho ⁶⁰	592 ⁶⁴	598	407	Middle October	November	Middle November	Late November
38. Lemieux	Chinook	118 ⁶⁵	76 ⁶⁶	26 ⁶⁷	-	-	-	-
	Coho	1,245	1,270	666	Late October	Middle November	Late November	Middle December
39. McTaggart	Coho ⁶⁸	-	75 ⁶⁹	42	Late October	November	Middle November	Late November
40. Dunn	Coho ⁶⁸	400 ⁷⁰	314 ⁷¹	443	Middle October	November	Middle November	End December

(iii)

River or Stream	Species	Escapement			Timing			
		1951 - 1960	1961 - 1970	1971 - 1978	Arrive	Start	Peak	End
41. Mann	Coho	267 ⁷²	122 ⁷³	53	Middle October	Late October	November	Late November
42. Brookfield	Coho	-	41 ⁷⁴	147 ⁵	-	-	-	-
43. Mahood	Chinook ⁷⁶	-	200 ⁷⁷	293	September	Middle September	Late September	End October
	Coho ⁷⁸	-	-	217 ⁸	Late October	November	Middle November	End December
44. Clearwater	Chinook	1,747 ⁷⁹	1,975	1,738	Late August	Middle September	Late September	Middle October
	Coho	1,764 ⁸⁰	-	1,260 ⁸¹	Middle October	November	Late November	End December
45. Raft	Chinook	560	265	206	Middle August	Late August	September	Middle September
	Coho	883 ⁸²	705	488	Late October	November	Middle November	End December
46. Reg Christie	Coho	150 ⁸³	81 ⁸⁴	258 ⁵	Middle October	November	Middle November	Late November
48. Tumtum	Coho ⁸⁶	-	50 ⁸⁷	24	Late October	November	Middle November	Late November
49. Lion	Chinook ⁸⁸	-	-	-	-	-	-	-
	Coho	850 ⁸⁹	2,675	1,189	Middle October	Late October	Middle November	Late November
50. Finn	Chinook	1,147	537	515	Late July	August	Middle August	End September
	Coho	1,850 ⁹⁰	377	59	Late August	November	Middle November	Late November
51. Blue	Coho ⁹¹	-	-	337	Late October	November	Middle November	End December
52. Chilcotin	Chinook	505	645	888	June	Middle October	September	Middle September
53. Chilko	Chinook	755	4,090	5,813	Middle August	September	Middle September	End October
54. Taseko	Chinook	465	468	200 ⁹²	Middle July	Middle August	Late August	End September
55. Elkin	Chinook	-	200 ⁹³	269	August	Late August	September	Middle September
56. Quesnel	Chinook	590	1,140	1,044	September	Middle September	October	Middle October
	Pink ⁹⁴	-	-	-	-	-	-	-
Horsefly	Chinook	90	262	209	Middle August	Late August	September	Middle September
57. Cottonwood	Chinook	150	145	194	August	Late August	Late August	End September
58. Nechako	Chinook	1,368 ⁹⁵	500	1,231	Late August	-	Middle September	-
59. Stuart	Chinook	455	337	453	Late August	-	Middle September	-
	Pinchi	-	-	-	Late August	-	Middle September	-
	Kazchek	459 ⁶	259 ⁷	259 ⁸	September	-	Middle September	-
	Kuzkwa	509 ⁹	50	139	Late August	-	Middle September	-

River or Stream	Species	Escapement			Timing			
		1951 - 1960	1961 - 1970	1971 - 1978	Arrive	Start	Peak	End
60. Salmon	Chinook	263 ¹⁰⁰	179	319	Middle August	-	Middle September	-
61. Willow	Chinook	150 ¹⁰¹	66	111	Middle August	-	Late August	-
62. McGregor	Chinook ¹⁰²	811	573	668	Late July	-	Middle August	-
63. Bowron	Chinook	650 ¹⁰³	960	1,181	August	Late August	September	Middle September
64. Slim	Chinook	-	835	1,084	Middle August	-	September	Late September
65. Holmes	Chinook	-	255 ¹⁰⁵	316	August	Middle August	Late August	Middle September
66. Fraser at Tete Jaune Cache	Chinook	5,198	944 ¹⁰⁶	1,713	August	Middle August	September	Middle September
67. McLennan/Swift	Chinook ¹⁰⁷	-	75	153	August	Middle August	Late August	End September
68. Upper Fraser								
Torpy	Chinook ¹⁰⁸	-	570	622	July	-	Late August	-
Goat/Mile	Chinook	-	24 ¹¹⁰	38	August	Middle August	Late August	End September
Nevin	Chinook	-	150 ¹¹¹	24	August	Middle August	Late August	September
Horsey	Chinook	-	150 ¹¹¹	23	August	Middle August	Late August	End September

1 Excludes 1951, 1953, 1954, 1956 and 1959.
2 Excludes 1956.
3 Excludes 1953, 1956, 1959.
4 Excludes 1961.
5 Excludes 1964.
6 Excludes 1956.
7 Excludes 1953, 1956, 1958, 1959.
8 Excludes 1964.
9 Excludes 1960.
10 Mean of 1951, 1952, 1953, 1954.
11 Excludes 1965, 1966.
12 Mean of 1965, 1966, 1969, 1970.
13 Excludes 1977.
14 Excludes 1977, 1978.
15 Erratic runs make 10-year means of no value.
16 Excludes 1967.
17 Excludes 1951.
18 Excludes 1967.
19 Odd-year pinks with first run observed in 1965.
20 Excludes 1954.

21 A single report of 25 in 1965.
22 Coho data sketchy. High runs up to 3,500 between 1955 and 1965.
23 Odd-year pink run first observed in 1965.
24 Excludes 1951 to 1954.
25 Excludes 1965 to 1971.
26 Excludes 1973, 1976.
27 Includes 1957 to 1961 only.
28 Excludes 1951 to 1957.
29 Excludes 1965 and 1967.
30 Excludes 1970 to 1976.
31 Excludes 1977.
32 Erratic and poor escapements.
33 1958 and 1960 only, 750 and 25 respectively.
34 Excludes 1966.
35 Excludes 1971 and 1977.
36 Excludes 1961, 1962, 1963, 1967.
37 Excludes 1954.
38 Excludes 1966, 1967.
39 Excludes 1974.
40 Excludes 1954.
41 No record prior to 1968.
42 Excludes 1977.
43 Prior to 1975, escapements were included with Eagle River.
44 No record prior to 1968.
45 First recorded use was in 1976.
46 Excludes 1954.
47 Excludes 1951, 1952, 1954.
48 Excludes 1951 and 1952.
49 Excludes 1972 and 1976.
50 Excludes 1961.
51 Excludes 1978.
52 Prior to 1976, this stream included with Bessette Creek records.
53 Data for coho is not accurate as, in many instances, poor visibility hindered accurate counts.
54 Excludes 1955 to 1958.
55 Excludes 1963

56 Excludes 1951, 1952 and 1955 to 1960.
57 Excludes 1961 to 1964 and 1966 to 1970.
58 Excludes 1971, 1973 and 1976.
59 Excludes 1965.
60 Includes Barriere, East Barriere and Fennel Creek.
61 Excludes 1951, 1956.
62 Excludes 1967, 1968.
63 Excludes 1973.
64 Excludes 1952.
65 Excludes 1955, 1956, 1959.
66 Excludes 1961 and 1963 to 1970.
67 Excludes 1971, 1973, 1975, 1977, 1978.
68 Prior to 1970, escapements were included with Joseph Creek.
69 Excludes 1961 to 1969.
70 Excludes 1952 to 1960.
71 Excludes 1962 to 1964.
72 Excludes 1951, 1953, 1954, 1956, 1957, 1958, 1960.

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- 73 Excludes 1967.
74 Excludes 1961 to 1967.
75 Excludes 1973 to 1978.
76 Prior to 1970, escapements were included with Clearwater River.
77 Excludes 1961 to 1969.
78 Excludes 1976.
79 Excludes 1953, 1954, 1956.
80 Excludes 1951 to 1954 and 1956 to 1959.
81 Excludes 1971, 1972, 1976.
82 Excludes 1954.
83 Excludes 1951, 1954, 1958, 1960.
- 84 Excludes 1961 to 1965 and 1967.
85 Excludes 1974, 1975.
86 No records prior to 1968.
87 Excludes 1961 to 1967 and 1970.
88 Only 4 years of recorded escapements, 1969, 1972, 1976, 1978.
89 Excludes 1952, 1956.
90 Excludes 1952 and 1954 to 1960.
91 No record prior to 1973.
92 Excludes 1972, 1973, 1974.
93 Excludes 1961 to 1966 and 1968 to 1970.
- 94 Pink escapement first recorded in 1967.
95 Excludes 1957 to 1959.
96 Excludes 1951, 1952, 1955, 1956, 1960.
97 Excludes 1962 to 1967 and 1970.
98 Excludes 1971, 1975.
99 Excludes 1951, 1952, 1954, 1955, 1956, 1959.
100 Excludes 1951 to 1957 and 1959.
101 Excludes 1957, 1959.
- 102 In 1951 to 1953, chinook were observed, but escapement not recorded.
103 Excludes 1951.
104 No record prior to 1965.
105 Excludes 1964, 1965.
106 Includes escapements to Swift Creek in 1967 to 1969.
107 First record in 1970.
108 Includes escapements to West Torpy and Walker Creek in 1971, 1972, 1973.
109 Includes escapement to Milk River and West Twin Creek in 1967 to 1972.
110 Excludes 1962 to 1966.
111 Excludes 1961 and 1964 to 1970.

APPENDIX 9.2

PHYSICAL AND CHEMICAL PARAMETERS

River or Stream	Date	Location *	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
							Water	Air		
1. Nicola	17/09/76	Site No. 1	13.0	0.4 - 0.5	0.56	1.0	15.0	20.0	-	-
	17/09/76	Site No. 2	10.0 - 13.0	0.4 - 0.5	0.64	0.3	15.0	20.0	-	-
	23/09/76	Site No. 3	11.0 - 13.0	0.5 - 0.6	1.90	0.7	16.0	18.0	-	-
	23/09/76	Site No. 4	12.0 - 15.0	0.6	1.50	0.2	18.0	21.0	-	-
	05/10/76	Site No. 5	15.0	0.45	-	0.2	14.0	12.0	-	-
	24/09/76	Site No. 6	19.0 - 21.0	0.45	-	0.3	13.0	14.0	-	-
	12/10/76	Site No. 7	15.0 - 18.0	0.5	-	0.5	11.0	16.0	-	-
	/10/76	Site No. 8	-	-	-	0.7	-	-	-	-
2. Spius	15/09/76	Site No. 1	15.0 - 16.0	-	-	1.1	12.0	-	-	-
3. Coldwater	21/09/76	Site No. 1	11.0 - 12.0	0.35	0.25	0.6	11.0	14.5	-	-
	22/09/76	Site No. 2	15.0 - 18.0	0.20	0.91	0.4	13.5	-	-	-
	-	Site No. 3	10.0 - 11.0	0.30	0.96	0.6	9.0	13.5	-	-
6. South Thompson	15/10/75	Site No. 1	114.0	2.4	-	-	12.5	-	-	7.8
	18/10/76	Site No. 1	100.0	2.0	1.0	-	14.0	-	10.5	7.1
	15/10/77	Site No. 2	-	-	-	-	11.0	-	12.0	8.1
7. Hiuihill	22/11/78	Site No. 1	4.0	0.28	0.5	2.0	2.5	2.0	12.0	9.0
8. Adams	28/09/78	Site No. 1	-	-	-	-	9.5	15.0	11.0	7.0
	07/10/76	Site No. 2	60.0	0.4	1.5	-	13.0	-	9.0	7.0
9. Sinmax	27/11/78	Site No. 1	4.0	0.2	1.0	Moderate	5.5	4.0	10.0	9.0
10. Momich	26/11/78	Site No. 1	10.0	0.51	0.37	Moderate	4.5	0.5	12.0	7.0
	26/11/78	Site No. 2	13.5	0.9	0.24	Low	4.5	1.0	12.0	6.9
	26/11/78	Site No. 3	-	-	-	-	3.0	-	-	-
11. Scotch	29/10/78	Site No. 1	30.0	0.35	0.97	-	4.0	4.0	-	8.5
12. Celista	29/10/78	Site No. 1	13.0	0.5	0.75	2.5 - 4.0	6.5	7.5	16.0	7.0
13. Seymour	27/09/77	Site No. 1	38.4	0.76	1.63	-	6.5	-	12.0	6.8
16. Tappen	29/10/78	Site No. 1	2.5	0.25	0.4	1.0	7.0	7.0	16.0	8.7

River or Stream	Date	Location *	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
							Water	Air		
17. Salmon	07/12/78	Site No. 1	14.0	0.35	0.38	1.5	0.5	- 12.0	12.0	8.5
18. Canoe	08/11/78	Site No. 1	2.0	0.15	0.5	-	6.0	-	10.0	9.0
19. Eagle	30/09/78	Site No. 1	19.5	0.50	1.3	0.75	10.5	15.0	16.0	7.3
	28/10/78	Site No. 2	7.7	0.24	0.75	-	11.0	-	17.0	7.0
	28/10/78	Site No. 3	3.0	0.30	-	Low to Moderate	-	-	-	-
	13/11/78	Site No. 4	18.0	0.35	1.0	1.0	1.0	-	-	-
	13/11/78	Site No. 5	10.0	1.5	-	-	-	1.0	-	-
	14/11/78	Site No. 6	1.5	0.4	-	Moderate to High	-	-	-	-
	14/11/78	Site No. 7	6.5	0.4	1.0	-	1.0	- 2.0	-	-
21. Wap	12/11/78	Site No. 1	16.0	0.4	0.7	-	1.0	5.0	-	-
	12/11/78	Site No. 2	6.0	0.5	1.25	Moderate	2.5	- 1.0	12.0	7.25
22. Blurton	08/11/78	Site No. 1	5.0	0.25	1.0	1.0 - 3.0	7.0	3.0	-	-
23. Shuswap	16/10/75	Site No. 1	25.5	0.8 - 0.9	-	-	12.0	-	-	7.8
	08/10/76	Site No. 2	50.0	0.8	1.0	-	13.0	-	10.5	7.2
	18/10/77	Site No. 3	-	1.5	0.2 - 0.3	-	10.5	-	11.0	7.8
	14/10/78	Site No. 4	-	-	-	-	11.5	8.5	15.0	8.4
	16/10/75	Site No. 5	30.0	1.1	-	-	9.0	-	-	7.6
	16/10/75	Site No. 6	26.0	1.0	-	-	9.0	-	-	8.0
	08/10/76	Site No. 7	35.0	1.0	-	-	10.0	-	10.5	7.8
	07/10/77	Site No. 8	23.0	-	0.65	1.0	8.5	6.0	-	-
	08/10/77	Site No. 9	23.0	0.65	0.65	0.3	8.5	7.0	-	-
	11/10/77	Site No. 6	15.0	6.0	0.65	-	9.0	5.0	-	-
	19/10/77	Site No. 10	25.0	1.0 - 2.0	0.3 - 2.0	-	10.0	-	11.0	8.2
12/10/78	Site No. 11	-	-	1.1	-	9.0	9.0	16.0	7.8	
24. Brash	26/10/78	Site No. 1	2.5	0.12	-	2.0	4.0	-	-	-
25. Ashton	08/11/78	Site No. 1	2.0	0.2	0.5	5.0	4.5	-	18.0	8.2
26. Trinity	26/10/78	Site No. 1	6.0	0.23	0.5	Moderate	3.0	-	-	-
	08/11/78	Site No. 1	8.0	0.30	0.5	-	4.5	-	-	-
	11/12/78	Site No. 1	-	-	-	-	1.3	-	-	-
27. Fall	24/10/78	Site No. 1	3.0	0.20	1.0	2.0 - 4.0	-	-	-	-
28. Cooke	24/10/78	Site No. 1	5.0	0.25	1.5	4+	-	0.5	18.0	-
	11/11/78	Site No. 2	5.0	0.25	0.91	2.0	-	-	-	-

River or Stream	Date	Location *	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
							Water	Air		
29. Kingfisher	11/11/78	Site No. 1	4.5	0.35	1.5	4.0 - 5.0	-	-	18.0	-
30. Ireland	10/11/78	Site No. 1	4.0	0.22	0.5	1.0 - 7.0	-	-	-	-
	11/12/78	Site No. 1	-	-	-	-	1.0	-	-	-
31. Bessette	25/10/78	Site No. 1	3.5	0.25	-	-	3.0	11.0	-	-
	25/10/78	Site No. 2	6.5	0.35	-	-	-	-	-	-
	09/11/78	Site No. 3	4.0	-	1.0	-	-	3.5	-	-
	10/11/78	Site No. 4	4.5	0.20	-	-	-	-	-	-
	10/11/78	Site No. 5	5.5	0.40	-	Moderate	1.0	- 3.0	-	-
	11/12/78	Site No. 6	-	-	-	-	Ice	-	-	-
32. Creighton	25/10/78	Site No. 1	2.4	0.17	0.7	1.0 - 2.0	4.5	-	-	-
	09/11/78	Site No. 2	2.0	0.25	0.8	1.0	1.5	5.0	-	-
33. Duteau	09/11/78	Site No. 1	3.0	0.25	0.71	1.0	1.5	2.0	17.0	7.7
35. North Thompson	02/10/76	Site No. 1	73.0	1.50	-	-	11.0	-	11.0	7.2
	26/09/77	Site No. 2	160.0	1.14	0.69	-	9.5	-	10.0	7.2
36. Louis	26/09/77	Site No. 1	5.0	0.35	0.60	-	6.5	-	11.0	8.0
	14/11/78	Site No. 2	1.5	0.15	0.33	Less than 1.0	-	-	-	-
	14/11/78	Site No. 3	3.0	0.30	0.66	1.0	-	-	-	-
	14/11/78	Site No. 4	2.5	0.50	-	1.5	-	-	-	-
	14/11/78	Site No. 5	6.0	0.30	0.40	-	0.5	-	-	-
	10/12/78	Site No. 1	-	-	-	-	2.0	0.5	11.0	7.4
37. Barriere	26/11/78	Site No. 1	6.0	0.25	1.00	1.5	-	-	-	-
	27/11/78	Site No. 2	8.5	0.20	1.28	-	2.0	-	11.0	6.8
	27/11/78	Site No. 3	30.0	0.40	0.33	Low	-	-	-	-
	27/11/78	Site No. 4	10.5	0.30	0.80	-	2.0	-	11.0	7.2
	10/12/78	Site No. 3	-	-	-	-	3.0	-	-	-
38. Lemieux	26/09/77	Site No. 1	8.0	0.28	0.84	-	8.0	-	11.0	8.4
	25/11/78	Site No. 2	8.0	0.30	1.00	2.0 - 3.0	2.0	-	-	-
	25/11/78	Site No. 3	10.0	0.40	-	Low to Moderate	3.5	3.0	12.0	9.0
39. McTaggart	26/11/78	Site No. 1	3.5	0.2	-	1.0	-	-	-	-
40. Dunn	26/11/78	Site No. 1	6.0	0.25	0.9	-	5.0	2.0	11.0	7.2
	09/12/78	Site No. 1	-	-	-	-	5.0	-	-	-
41. Mann	24/11/78	Site No. 1	10.0	-	-	1.0	-	-	-	-
	24/11/78	Site No. 2	17.0	0.7	-	3.0	0.5	- 2.0	11.0	8.3

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River or Stream	Date	Location *	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
							Water	Air		
42. Brookfield	23/11/78	Site No. 1	9.0	0.35	-	2.0	-	- 2.0	12.0	6.7
43. Mahood	04/10/76	Site No. 1	12.0	0.6	1.67	-	12.0	-	10.0	7.9
	23/11/78	Site No. 1	-	-	-	3.0 - 4.0	4.5	-	-	7.9
44. Clearwater	03/10/76	Site No. 1	59.0	1.0	-	-	10.5	-	-	-
	04/10/76	Site No. 2	59.0	-	1.4	-	9.5	-	9.5	7.4
	27/09/78	Site No. 2	-	-	-	Less than 1.0	12.0	-	10.0	8.0
45. Raft	23/11/78	Site No. 1	-	-	-	-	-	-	-	7.1
	24/11/78	Site No. 2	20.0	0.35	1.0	2.0	-	-	-	-
	24/11/78	Site No. 3	40.0	0.85	0.5	-	-	-	-	-
46. Reg Christie	23/11/78	Site No. 1	0.7	0.15	1.5	2.0 - 4.0	-	-	19.0	7.4
47. Mad	23/11/78	Site No. 1	10.0	0.5	-	-	-	-	14.5	7.3
48. Tumtum	23/11/78	Site No. 1	5.0	0.5	-	1.0 - 2.0	-	-	10.0	6.7
49. Lion	23/11/78	Site No. 1	-	-	-	-	4.5	-	10.0	6.7
	23/11/78	Site No. 2	-	-	-	-	5.5	-	-	-
	23/11/78	Site No. 3	-	-	-	1.0	2.5	- 1.0	-	-
50. Finn	29/08/78	Site No. 1	8.5	0.43	1.4	1.2	-	-	-	-
	22/11/78	Site No. 2	4.0	0.20	1.5	-	1.0	1.0	-	-
	22/11/78	Site No. 3	-	-	0.9	-	-	4.0	-	-
51. Blue	22/11/78	Site No. 1	-	-	1.0	-	-	- 5.0	11.0	6.8
	22/11/78	Site No. 2	-	-	-	-	1.0	-	-	-
	09/12/78	Site No. 3	-	-	-	-	1.3	-	-	-
52. Chilcotin	15/09/77	Site No. 1	15.0	0.5	-	-	10.5	-	13.0	9.0
	27/09/77	Site No. 2	6.0	1.5	-	-	7.0	-	15.0	8.5
	28/09/77	Site No. 3	30.0	0.3	1.3	-	7.0	-	-	-
53. Chilko	27/09/75	Site No. 1	10.0	0.3	Low	-	11.6	-	-	7.5
	29/09/75	Site No. 2	82.0	1.2	-	-	10.3	-	-	7.5
	24/09/76	Site No. 2	97.0	1.3	-	-	11.0	-	10.0	7.3
	11/09/77	Site No. 3	40.0	1.5	-	-	-	-	16.0	7.4
54. Taseko	13/09/77	Site No. 1	100.0	1.0	0.2	-	10.0	-	13.0	-
	26/08/77	Site No. 2	22.0	Less than 1.0	-	-	13.0	-	10.0	-
	28/08/77	Site No. 4	20.0	0.6	2.5	-	7.5	-	13.0	-

(x)

River or Stream	Date	Location *	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
							Water	Air		
55. Elkin	31/08/77	Site No. 1	10.0	0.2	1.3	-	14.0	-	12.0	8.3
	31/08/77	Site No. 2	10.0	0.4	1.5	-	15.5	-	11.0	8.3
56. Quesnel	05/10/76	Site No. 1	32.0	0.6	1.90	-	10.5	-	10.0	7.1
	29/08/77	Site No. 2	12.0	0.42	1.20	-	13.0	-	9.0	7.3
	29/08/77	Site No. 3	35.7	0.50	1.50	-	11.0	-	10.0	7.5
	30/08/77	Site No. 4	8.5	0.50	1.39	-	10.5	-	12.0	7.0
	30/08/77	Site No. 5	36.6	1.00	1.79	-	9.0	-	12.0	7.2
	13/10/77	Site No. 6	35.0	1.80	2.00	-	7.5	-	11.0	8.1
	13/10/77	Site No. 7	-	-	-	-	9.0	-	11.0	7.9
	27/08/77	Site No. 8	110.0	-	1.50	-	16.0	-	12.0	8.0
57. Cottonwood	27/08/77	Site No. 1	15.0	0.76	1.05	-	14.0	-	12.0	7.5
58. Nechako	19/09/76	Site No. 1	119.0	2.00	1.17	-	13.0	-	10.0	7.5
	20/09/76	Site No. 2	100.0	1.50	-	-	12.0	-	-	-
	13/09/77	Site No. 3	80.0	0.83	1.70	-	13.5	-	10.0	7.5
59. Stuart	10/09/76	Site No. 1	27.0	6.00	1.20	-	12.0	-	10.0	7.4
	12/09/77	Site No. 2	91.4	0.90	0.43	-	13.0	-	10.0	7.5
	11/09/77	Site No. 3	-	0.45	0.87	-	8.0	-	12.0	8.4
	22/09/77	Site No. 4	18.9	0.40	0.68	-	11.5	-	10.0	7.5
	22/09/77	Site No. 5	9.1	0.55	0.51	-	10.0	-	10.0	8.0
60. Salmon	20/09/77	Site No. 1	14.0	0.50	1.50	-	10.5	-	12.0	8.0
61. Willow	20/08/76	Site No. 1	27.0	-	1.71	-	12.0	-	9.0	7.0
	20/09/77	Site No. 2	27.4	1.07	0.53	-	10.8	-	13.0	7.5
62. McGregor	17/08/76	Site No. 1	30.5	1.10	2.11	-	9.0	-	12.0	7.3
	17/08/76	Site No. 2	-	-	-	-	7.0	-	14.0	7.3
	18/08/76	Site No. 3	13.1	0.60	1.02	-	9.5	-	12.0	8.0
	18/08/76	Site No. 4	7.9	0.50	0.69	-	12.0	-	-	-
	18/08/76	Site No. 5	12.2	0.60	0.82	-	12.0	-	10.0	-
	19/08/76	Site No. 6	12.0	0.65	1.15	-	13.5	-	8.0	7.4
	19/08/76	Site No. 7	90.0	-	-	-	8.5	-	11.0	7.8
	19/08/76	Site No. 8	119.0	1.50	-	-	8.0	-	12.0	7.8
	20/08/76	Site No. 9	105.0	1.50	1.32	-	8.0	-	11.5	7.5
	25/08/76	Site No. 10	105.0	3.00	1.52	-	9.0	-	-	7.6
	25/08/76	Site No. 11	15.0	0.70	1.37	-	9.5	-	10.0	7.5
63. Bowron	04/09/76	Site No. 1	16.5	0.80	1.20	-	13.5	-	7.0	7.3

River or Stream	Date	Location *	Mean Wetted Width (m)	Mean Depth (m)	Surface Velocity (mps)	Estimated Gradient Per Cent	Temperature (Celsius)		Dissolved Oxygen (ppm)	pH
							Water	Air		
65. Holmes	14/09/75	Site No. 1	6.9	0.3 - 0.4	Swift	-	7.0	-	-	7.6
	27/08/76	Site No. 2	27.4	0.7	-	-	7.0	-	13.0	7.4
66. Fraser at Tete Jaune Cache	10/09/75	Site No. 1	64.0	0.5	-	-	8.8	-	-	8.2
	11/09/75	Site No. 2	27.0	-	-	-	9.5	-	-	7.8
	11/09/75	Site No. 3	69.0	-	-	-	10.5	-	-	7.8
	13/09/75	Site No. 4	2.4	0.1	Low	-	12.5	-	-	-
	13/09/75	Site No. 5	-	-	-	-	8.5	-	-	8.5
	28/09/76	Site No. 6	15.0	-	2.22	-	9.5	-	11.5	8.0
	30/08/76	Site No. 7	110.0	0.6	1.26	-	9.0	-	11.5	8.0
	30/08/76	Site No. 8	4.5	0.3	-	-	10.0	-	9.5	7.5
	01/09/76	Site No. 9	51.0	-	2.66	-	8.5	-	10.0	7.9
	01/09/76	Site No. 10	7.6	0.3	Low	-	13.5	-	8.0	8.0
67. McLennan/Swift	10/09/75	Site No. 1	12.0	0.40	-	-	9.0	-	-	7.6
	02/09/76	Site No. 1	14.0	0.50	0.66	-	8.5	-	10.5	7.3
	10/09/77	Site No. 2	16.0	0.50	0.72	-	5.0	-	12.0	7.3
68. Upper Fraser Tributaries	11/09/75	Site No. 1	11.0	-	-	-	3.5	-	-	7.6
	11/09/75	Site No. 2	27.0	-	-	-	9.2	-	-	8.2
	14/09/75	Site No. 3	10.5	-	Swift	-	6.0	-	-	7.5
	14/09/75	Site No. 4	6.9	0.3 - 0.4	Swift	-	7.0	-	-	7.6
	14/09/75	Site No. 5	25.5	-	Swift	-	8.0	-	-	8.3
	20/08/76	Site No. 6	27.0	0.9	2.14	-	8.0	-	9.0	7.8
	25/08/76	Site No. 7	11.6	0.6	1.20	-	10.0	-	-	-
	23/08/76	Site No. 8	20.0	0.6	2.83	-	9.0	-	11.5	8.0
	20/08/76	Site No. 9	24.0	-	1.80	-	8.0	-	9.0	7.5
	23/08/76	Site No. 10	14.0	0.5	1.17	-	8.0	-	9.0	7.4
	28/08/76	Site No. 11	19.8	0.6	2.00	-	8.5	-	11.5	8.1
	28/08/76	Site No. 12	15.0	0.6	1.30	-	8.5	-	11.5	8.0
	28/08/76	Site No. 13	2.4	0.8	Low	-	11.5	-	7.0	7.4

* Refer to stream catalogues and maps for site locations.

APPENDIX 9.3

SUMMARY BY STREAM OF SIZE AT AGE

River or Stream	Date	Species	Age	Males			Females		
				Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
1. Nicola	09/76	Chinook	3 ₁	1	58.3	-	2	55.2	-
			3 ₂	5	32.4	+ 3.5	-	-	-
			4 ₂	42	56.6	+ 1.7	49	55.9	+ 1.5
			5 ₂	-	-	-	2	64.3	-
			R	6	-	-	8	-	-
2. Spius	09/76	Chinook	3 ₁	3	57.5	-	-	-	-
			3 ₂	1	43.0	-	-	-	-
			4 ₂	-	-	-	2	59.0	-
			R	2	57.0	-	1	67.2	-
3. Coldwater	09/76	Chinook	2 ₁	1	31.0	-	-	-	-
			3 ₁	2	50.3	-	2	53.3	-
			3 ₂	3	35.4	-	-	-	-
			4 ₂	33	54.7	+ 1.4	46	52.5	+ 2.3
			5 ₂	-	-	-	3	63.9	-
			R	7	-	-	6	-	-
5. Deadman	08, 09, 10/77	Chinook	3 ₁	1	38.9	-	-	-	-
			3 ₂	17	39.7	+ 5.0	1	45.4	-
			4 ₂	5	53.5	+ 5.1	27	53.7	+ 1.4
			5 ₂	-	-	-	1	65.2	-
			R	3	-	-	4	-	-
		Pink Sockeye	6	43.3	-	17	44.3	+ 0.8	
		-	4	31.6	-	-	-	-	
6. South Thompson	10/75	Chinook	2 ₁	3	36.9	-	-	-	-
			3 ₁	3	63.4	-	3	63.7	-
			3 ₂	-	-	-	1	45.5	-
			4 ₁	19	70.4	+ 2.9	68	67.6	+ 0.7
			5 ₁	-	-	-	2	76.0	-
	10/76	Chinook	R	1	34.1	-	-	-	-
			2 ₁	1	32.4	-	-	-	-
			2 ₂	1	30.2	-	-	-	-
			3 ₁	10	46.9	+ 2.9	2	46.5	-
			3 ₂	1	48.0	-	-	-	-

River or Stream	Date	Species	Age	Males			Females		
				Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
Little River	10/77	Chinook	4 ₁	2	58.5	-	4	65.1	+ 7.3
			5 ₁	3	77.6	-	25	72.5	+ 1.5
			2 ₁	13	31.9	+ 1.1	-	-	-
			3 ₁	3	51.6	-	2	58.0	-
			4 ₁	8	67.2	+ 2.6	53	66.9	+ 1.0
			4 ₂	-	-	-	1	62.1	-
			5 ₁	1	71.3	-	4	72.3	+ 7.1
			5 ₂	-	-	-	1	67.2	-
			R	-	-	-	2	58.9	-
			2 ₁	6	34.4	+ 5.5	-	-	-
	3 ₁	11	51.3	+ 2.8	3	61.5	-		
	4 ₁	5	67.4	+ 4.4	23	66.8	+ 1.3		
	4 ₂	-	-	-	3	67.2	-		
	5 ₁	1	74.5	-	5	71.7	+ 4.7		
	R	1	74.1	-	2	71.4	-		
10/77	Sockeye	4 ₂	-	-	-	1	51.6	-	
10/77	Chinook	2 ₁	4	32.4	+ 2.4	-	-	-	
		3 ₁	3	52.4	-	-	-	-	
		4 ₁	13	65.1	+ 3.6	8	65.4	+ 1.8	
		4 ₂	-	-	-	1	51.6	-	
		R	-	-	-	1	-	-	
10/78	Chinook	2 ₁	1	28.3	-	-	-	-	
		3 ₁	3	50.9	-	1	65.8	-	
		4 ₁	2	69.4	-	3	68.5	-	
7. Hiuihill	16/11/78	Chinook	4 ₁	1	55.0	-	3	66.6	-
		Coho	3 ₂	-	-	-	2	44.5	-
8. Adams (Lower)	15/10/76	Chinook	2 ₁	1	32.0	-	-	-	
			3 ₁	3	48.5	-	-	-	
			4 ₁	3	67.3	-	3	67.5	-
			5 ₁	4	78.2	+ 4.0	8	71.2	+ 4.4
			R	1	72.7	-	-	-	
			R	1	34.1	-	-	-	
14/10/77	Chinook	2 ₁	1	33.9	-	-	-	-	
			3 ₁	9	52.9	+ 3.5	4	58.8	+ 2.9
			4 ₁	5	68.7	+ 5.9	19	66.3	+ 1.2
			5 ₁	-	-	-	1	75.4	-
			R	1	72.7	-	-	-	
			R	1	34.1	-	-	-	
16/10/78	Chinook	4 ₁	2	65.2	-	10	68.3	+ 1.3	
			5 ₁	-	-	-	2	77.3	-
27/11/78	Coho	3 ₂	1	48.8	-	-	-	-	

River or Stream	Date	Species	Age	Males			Females				
				Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval		
9. Sinmax	27/11/78	Coho	3 ₂	3	47.3	-	4	41.6	+ 2.1		
			R	1	-	-	3	-	-		
16. Tappen	29/10/78	Coho	3 ₂	2	54.8	-	-	-	-		
17. Salmon	07/12/78	Coho	3 ₂	3	46.8	-	6	47.6	+ 5.1		
			R	1	-	-	3	-	-		
18. Canoe	08/11/78	Coho	3 ₂	-	-	-	1	47.2	-		
19. Eagle	09, 10, 11/78	Chinook	3 ₁	-	-	-	4	60.9	+ 12.9		
			4 ₁	-	-	-	1	65.2	-		
		Coho	3 ₂	12	50.3	+ 3.6	20	49.6	+ 1.5		
			4 ₃	1	42.3	-	-	-	-		
R	1	46.5	-	4	47.4	+ 3.5					
20. South Pass	03/11/78	Coho	3 ₂	-	-	-	1	45.9	-		
22. Blurton	-	Coho	3 ₂	-	-	-	1	38.6	-		
23. Shuswap (Lower)	16/10/75	Chinook	2 ₁	7	33.2	+ 1.2	-	-	-		
			3 ₁	3	60.0	-	4	56.5	+ 9.9		
			4 ₁	24	72.2	+ 1.6	57	67.0	+ 0.8		
			4 ₂	2	68.7	-	-	-	-		
			R	1	31.2	-	2	69.8	-		
			10/76	Chinook	2 ₁	7	33.0	+ 4.9	-	-	-
	3 ₁	9	50.9		+ 4.2	3	55.0	-			
	3 ₂	1	49.5		-	-	-	-			
	4 ₁	5	69.6		+ 7.4	11	66.9	+ 4.1			
	4 ₂	-	-		-	1	65.5	-			
	5 ₁	2	82.1		-	5	71.8	+ 7.0			
	10/77	Chinook	5 ₂	1	80.5	-	1	72.6	-		
			R	1	28.5	-	-	-	-		
			2 ₁	6	38.3	+ 8.0	-	-	-		
			3 ₁	14	57.8	+ 5.8	20	63.4	+ 2.8		
			4 ₁	17	68.8	+ 3.8	35	67.6	+ 1.1		
4 ₂			1	66.0	-	1	45.2	-			
5 ₁			2	77.0	-	1	72.0	-			
R			-	-	-	4	66.8	+ 4.9			
Shuswap (Middle)			10/76	Chinook	3 ₁	1	58.8	-	2	60.2	-
					4 ₁	5	72.0	+ 4.5	11	69.6	+ 1.4
	4 ₂	1			56.3	-	2	59.2	-		
	5 ₂	2			72.5	-	1	73.9	-		
R	1	72.0	-	1	66.8	-					

River or Stream	Date	Species	Age	Males			Females					
				Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval			
	10/77	Chinook	2 ₁	1	41.0	-	-	-	-			
			3 ₁	4	56.7	+ 1.2	21	58.7	+ 1.4			
			3 ₂	1	31.2	-	1	53.0	-			
			4 ₁	7	71.8	+ 4.9	32	67.3	+ 1.3			
			4 ₂	3	68.8	-	9	61.2	+ 3.1			
	10/78	Chinook	R	3	-	-	-	-	-			
			3 ₁	-	-	-	8	64.0	+ 5.6			
			4 ₁	-	-	-	1	77.1	-			
			31. Bessette	10/11/78	Coho	3 ₂	2	46.9	-	4	45.5	+ 3.4
						R	-	-	-	1	-	-
33. Duteau	-	Coho	3 ₂	5	51.4	+ 6.2	8	48.0	+ 3.5			
			4 ₃	-	-	-	1	49.2	-			
			R	1	-	-	-	-	-			
35. North Thompson	02/10/76	Chinook	3 ₁	1	59.9	-	-	-	-			
			4 ₁	3	75.4	-	9	70.8	+ 1.9			
			4 ₂	-	-	-	3	57.0	-			
			5 ₂	1	72.7	-	5	72.0	+ 5.3			
			R	-	-	-	-	-	-			
	26/09/77	Chinook	2 ₁	2	34.2	-	-	-	-			
			3 ₁	1	62.8	-	-	-	-			
			3 ₂	-	-	-	-	-	-			
			4 ₁	1	71.6	-	-	-	-			
			4 ₂	2	57.3	-	1	64.0	-			
			5 ₂	2	72.5	-	1	76.0	-			
			R	-	-	-	1	-	-			
	27/09/78	Chinook	2 ₁	1	37.5	-	-	-	-			
			3 ₁	1	57.5	-	3	66.0	-			
			3 ₂	1	80.6	-	7	74.1	+ 1.7			
4 ₁			-	-	-	2	72.5	-				
4 ₂			-	-	-	1	80.9	-				
5 ₂			-	-	-	3	74.8	-				
R			-	-	-	2	-	-				
36. Louis	09/09/78 11/78	Chinook Coho	3 ₁	-	-	-	1	51.0	-			
			3 ₂	21	42.7	+ 2.3	12	43.0	+ 2.1			
			4 ₃	3	43.1	-	3	45.7	-			
			R	5	39.7	+ 3.1	5	45.7	+ 7.6			

River or Stream	Date	Species	Age	Males			Females		
				Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
37. Barriere	11/78	Coho	3 ₂	8	43.2	+ 5.4	22	45.4	+ 2.0
			4 ₃	-	-	-	1	52.4	-
			R	3	-	-	2	-	-
38. Lemieux	25/11/78	Coho	3 ₂	7	40.0	+ 6.4	1	44.2	-
			R	3	49.3	-	4	46.1	+ 5.2
39. McTaggart	26/11/78	Coho	3 ₂	3	43.5	-	1	46.1	-
40. Dunn	26/11/78	Coho	3 ₂	16	47.9	+ 3.0	17	46.5	+ 1.4
			R	5	53.5	+ 3.6	-	-	-
41. Mann	24/11/78	Coho	3 ₂	1	45.7	-	-	-	
43. Mahood	10/76	Chinook	3 ₂	-	-	-	2	61.6	-
			4 ₁	-	-	-	1	93.2	-
			4 ₂	1	57.5	-	1	57.0	-
			5 ₂	-	-	-	1	71.9	-
			R	1	77.3	-	1	70.6	-
	23/11/78	Chinook	4 ₁	4	-	-	1	80.1	-
44. Clearwater	10/76	Chinook	3 ₁	5	65.3	+ 1.6	-	-	-
			4 ₁	5	74.8	+ 5.2	3	73.3	-
			4 ₂	-	-	-	-	-	-
			5 ₂	3	78.4	-	-	-	-
	27/09/78	Chinook	R	1	56.2	-	1	63.7	-
			3 ₁	1	68.2	-	-	-	-
			4 ₁	1	75.5	-	2	69.9	-
			4 ₂	1	62.5	-	-	-	-
R	1	75.8	-	-	-	-			
45. Raft	08, 09 /78	Chinook	2 ₁	1	39.7	-	-	-	-
			3 ₁	1	53.4	-	1	67.9	-
			4 ₁	-	-	-	5	70.5	+ 4.2
			5 ₂	-	-	-	1	72.4	-
			R	-	-	-	1	66.0	-
46. Reg Christie	23/11/78	Coho	3 ₂	-	-	-	2	45.3	-
			4 ₃	-	-	-	1	44.1	-
49. Lion	11/78	Coho	3 ₂	55	46.0	+ 1.8	55	48.1	+ 1.2
			4 ₃	4	44.2	+ 5.1	2	50.0	-
			R	6	-	-	9	-	-

River or Stream	Date	Species	Age	Males			Females				
				Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval		
50. Finn	27/08/76	Chinook	3 ₁	-	-	-	1	58.5	-		
			4 ₁	1	67.9	-	6	68.5	+ 2.2		
			R	-	-	-	1	66.5	-		
	29/08/78	Chinook	3 ₁	-	-	-	1	69.7	-		
			4 ₁	-	-	-	1	71.0	-		
51. Blue	22/11/78	Coho	3 ₂	1	54.0	-	1	47.5	-		
52. Chilcotin	1976	Chinook	2 ₁	1	38.1	-	-	-	-		
			3 ₁	1	41.0	-	-	-	-		
			4 ₁	2	83.2	-	3	71.0	-		
			4 ₂	1	71.0	-	5	62.0	+ 9.2		
			5 ₂	2	79.0	-	-	-	-		
			R	1	-	-	-	-	-		
53. Chilko	1975	Chinook	3 ₁	7	53.5	+ 5.1	10	68.5	+ 2.5		
			4 ₁	7	72.5	+ 4.8	67	69.8	+ 0.8		
			4 ₂	-	-	-	1	68.2	-		
			5 ₁	-	-	-	1	80.0	-		
			5 ₂	-	-	-	1	77.3	-		
			6 ₂	-	-	-	1	74.3	-		
			R	-	-	-	3	70.2	-		
			1976	Chinook	3 ₁	-	-	-	7	61.8	+ 4.6
					4 ₁	1	78.6	-	56	71.0	+ 0.8
					4 ₂	-	-	-	7	65.8	+ 4.4
	5 ₁	-			-	-	1	77.2	-		
	5 ₂	-			-	-	2	75.3	-		
	R	-			-	-	3	-	-		
	1977	Chinook	3 ₁	10	50.4	+ 4.3	10	59.4	+ 4.8		
			4 ₁	18	75.4	+ 2.1	83	71.5	+ 0.8		
			4 ₂	-	-	-	2	62.8	-		
			5 ₁	2	86.0	-	6	77.7	+ 4.1		
			5 ₂	6	74.5	+ 8.3	14	74.1	+ 0.9		
			6 ₂	1	83.6	-	-	-	-		
			R	6	-	-	12	-	-		
			1978	Chinook	3 ₁	3	61.8	-	3	62.6	-
	4 ₁	6			76.7	+ 4.2	46	71.0	+ 0.9		
	5 ₁	1			73.9	-	1	78.8	-		
	5 ₂	1			80.6	-	1	71.1	-		
	R	2			-	-	12	-	-		

River or Stream	Date	Species	Age	Males			Females		
				Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
54. Taseko	1975	Chinook	4 ₁	1	82.4	-	13	71.6	+ 2.0
			R	-	-	-	3	-	-
	1977	Chinook	3 ₁	-	-	-	1	57.4	-
			4 ₁	11	77.1	+ 2.8	5	73.1	+ 3.2
			R	2	-	-	1	-	-
	1978	Chinook	3 ₁	-	-	-	1	73.0	-
			4 ₁	-	-	-	8	72.6	+ 1.4
			5 ₂	-	-	-	1	69.9	-
	55. Elkin	1977	Chinook	3 ₁	5	56.6	+ 2.9	2	59.4
4 ₁				7	72.3	+ 3.4	4	69.1	+ 5.3
4 ₂				2	57.9	-	-	-	-
5 ₁				1	78.1	-	-	-	-
5 ₂				3	72.0	-	2	72.0	-
R				1	-	-	2	-	-
1978		Chinook	3 ₁	1	47.0	-	1	56.6	-
			4 ₁	4	70.0	+ 7.2	1	65.5	-
			4 ₂	2	66.2	-	-	-	-
			5 ₂	-	-	-	1	70.1	-
56. Quesnel	10/76	Chinook	3 ₁	1	54.5	-	2	60.7	-
			4 ₁	1	80.2	-	12	73.1	+ 1.7
			5 ₁	1	84.0	-	2	80.6	-
	12/10/77	Chinook	R	-	-	-	1	-	-
			3 ₁	-	-	-	2	65.4	-
			4 ₁	1	72.0	-	5	73.1	+ 4.6
			4 ₂	1	62.1	-	-	-	-
			5 ₁	-	-	-	1	75.7	-
			5 ₂	-	-	-	11	74.7	+ 1.8
			6 ₂	-	-	-	2	83.0	-
			R	-	-	-	4	-	-
58. Nechako	1978	Chinook	3 ₁	7	57.6	+ 15.1	19	64.8	+ 2.4
			3 ₂	4	38.9	+ 6.2	-	-	-
			4 ₁	10	71.8	+ 3.1	28	69.5	+ 1.4
			4 ₂	20	71.3	+ 3.8	21	67.1	+ 1.3
			5 ₁	-	-	-	1	69.8	-
			5 ₂	10	76.1	+ 3.9	24	71.1	+ 1.4
			6 ₂	-	-	-	1	72.5	-

River or Stream	Date	Species	Age	Males			Females		
				Number of Samples	Mean Length (cm)	95% Confidence Interval	Number of Samples	Mean Length (cm)	95% Confidence Interval
59. Stuart	18/09/76	Chinook	4 ₁	-	-	-	1	65.4	-
			4 ₂	-	-	-	1	67.5	-
			5 ₂	2	73.1	-	3	70.9	-
		Chinook	3 ₁	1	56.3	-	2	64.2	-
			4 ₁	1	74.8	-	1	71.0	-
			4 ₂	6	65.2	+ 6.4	4	58.9	+ 4.4
			5 ₂	2	75.4	-	2	75.4	-
			R	-	-	-	2	-	-
62. McGregor (Seeback) (James)	26/08/76	Chinook	3 ₁	-	-	-	1	55.2	-
			3 ₁	-	-	-	1	67.0	-
	08/77	Chinook	3 ₁	3	49.7	-	-	-	-
			4 ₁	5	72.4	+ 16.2	3	77.2	-
			4 ₂	3	57.5	-	3	55.7	-
			5 ₂	3	80.4	-	4	73.1	+ 2.7
			R	2	-	-	3	-	-
63. Bowron	04/09/76	Chinook	4 ₁	-	-	-	1	67.3	-
			5 ₁	-	-	-	1	67.0	-
65. Holmes	27/08/76	Chinook	4 ₂	-	-	-	1	71.5	-
66. Fraser at Tete Cache	1975	Chinook	3 ₁	1	50.6	-	-	-	-
			4 ₁	12	77.1	+ 3.2	21	93.2	+ 2.0
			5 ₁	4	82.1	+ 2.7	2	75.4	-
			R	-	-	-	1	-	-
	1976	Chinook	4 ₁	4	76.6	+ 4.6	5	71.8	+ 4.5
			5 ₁	-	-	-	2	74.7	-
			5 ₂	3	79.9	-	1	72.5	-
			R	2	-	-	2	-	-
	1977	Chinook	3 ₁	3	66.6	-	2	75.2	-
			3 ₂	1	64.6	-	-	-	-
			4 ₁	13	79.8	+ 2.5	30	75.8	+ 1.6
			4 ₂	1	61.4	-	1	67.6	-
5 ₁			-	-	-	2	76.5	-	
			5 ₂	3	81.0	-	9	76.4	+ 1.6
67. McLennan/Swift	1976	Chinook	3 ₁	1	64.0	-	-	-	-
			4 ₁	2	71.8	-	3	70.3	-
			5 ₂	1	64.0	-	1	68.0	-
			R	-	-	-	-	-	-

(xx)

<u>River or Stream</u>	<u>Date</u>	<u>Species</u>	<u>Age</u>	<u>Males</u>			<u>Females</u>		
				<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>	<u>Number of Samples</u>	<u>Mean Length (cm)</u>	<u>95% Confidence Interval</u>
68. Upper Fraser Holmes Torpy	27/08/76	Chinook	42	-	-	-	1	71.5	-
			31	2	66.9	-	2	71.8	-
	08/76	Chinook	41	-	-	-	1	73.0	-
			52	1	78.8	-	-	-	-
			R	-	-	-	1	-	-

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DATE DE RETOUR

JUN 25 1986

2007/04/26

LOWE-MARTIN No. 1137

