File: 0140-7
Nechako River

RECONNAISSANCE REPORT

(Fisheries Improvement)

PROJECT: Nechako River tributary Reconnaissance

REGION: 7

MANAGEMENT UNIT: 7-12

LOCATION: Nechako River, upstream of Fort Fraser

AIR PHOTO REFERENCE NO

MAP REFERENCE NO: 93 K,F

REPORT DATE: March 12, 1985

DATE SURVEYED: July 3-10, 1984

PERSONS PRESENT: D. Tredger, B. Yaworski, J. Ptolemy

REPORT PREPARED BY: D. Tredger, B. Yaworski, J. Ptolemy

PURPOSE: To assess spawning and rearing capability of 7 Nechako River tributaries relative to enhancement of Nechako River sport fish populations.

OBSERVATIONS: (see attached)

PROPOSED ACTION: (see attached)

PHOTOGRAPHS ATTACHED: YES X NO___ AVAILABLE: YES X NO___

CIRCULATE TO: D. Ableson, P. Slaney, R. Morley, G. Taylor

SUGGESTED CONTACTS:

COMMENTS BY:

SEE ATTACHED SHEETS: YES X NO___

OBSERVATIONS:

1. Introduction

A brief reconnaissance of Nechako River tributary streams was conducted July 3 to 10, 1984, by the Fisheries Improvement Unit. The purpose of the reconnaissance was to assess spawning and rearing capability of Nechako River tributaries relative to recruitment of Nechako River rainbow trout (and Dolly Varden char) populations. This project was part of a larger program to identify restoration techniques for the Nechako River sport fishery (Slaney et. al., 1984).

Unfortunately, high flow conditons in many of the tributaries (due to heavy rainfall) did not allow all of the project objectives to be met. High flows produced poor fish sampling conditions, and estimates of habitat parameters were not considered representative of average conditions. Data from other sources (e.g. R.A.B./Aquatic Studies) has been used to better appreciate average conditions. Analysis of the data in terms of fish production potential was conducted at a very cursory level. These estimates should be considered crude at best.

2. Methods

A brief reconnaissance was conducted on 7 "major" tributaries to the Nechako River above Fort Fraser. These included Smith, Tahultzu, Greer, Swanson, Targe, Cutoff and "old Nechako Canyon" Creeks. Techniques included brief ground and helicopter reconnaissance, using where possible R.A.B. mapping as a base reference. All sampling was conducted following the techniques outlined deLeeuw (1981).

3. Results And Discussion

Results of the reconnaissance are presented for each individual stream in Appendix 1. Information presented includes observations on habitat, fish sampling results and "opinions" on probable constraints to fish production. In this section of the report, results will be briefly summarized and discussed in terms of significance to Nechako River fish production.

Of the seven Nechako River tributaries "assessed" during the July 3-10, 1984, reconnaissance, only four were considered significant in terms of Nechako River fish production. These include Swanson, Greer and Targe Creeks, and the old Nechako canyon. The remaining 3 streams, Cutoff, Smith and Tahultzu Creeks are affected by severe habitat problems at this time.

Table 1 outlines a very general summary of fisheries "values" in Nechako River tributaries in terms of "productive" habitat, current trout production, probable production constraints, potential habitat (through stream improvement), and potential trout production. Categories outlined in Table 1 are discussed below:

"Productive" habitat

"Productive" habitat represents the habitat that is currently available for Nechako River trout production. This value takes into account the presence of barriers to fish migration, lakes and swamps, and some biological determinants. Cutoff, Smith and Tahultzu Creeks are indicated as having little or no productive habitat. This indicates that habitat was not conducive to trout producton (i.e., presence of beaver dams and swamps). Nechako canyon and Targe Creeks, estimated as having 1.5 and 6.0 km of porductive habitat respectively, are thought to have upper limits determined by the presence of lakes. Any production occurring above lakes is assumed to contribute only to lake populations.

Greer and Swanson Creeks have long accessible stream lengths (30 and 25 km respectively). At this time it is not clear how much of these streams are (or would be) utilized by Nechako River fish. Estimates of "productive" habitat (amount of use) must therefore be based on habitat type and evidence from literature sources. Thurow and Bjornn (1974) present evidence that migratory cutthroat trout of the St. Joe River (Idaho) only utilize the lower 3 miles (5 km) of tributary streams. Although caution must be exercised in applying this guideline directly to the Nechako situation (i.e. unknown effects of habitat type), it should be considered. All of the streams studied have populations of lake or stream resident trout. In Swanson Creek, "productive" length was estimated at 6.5 km, coinciding with the presence of an area of low gradient, swamp-type habitat. Bearing in mind the Idaho situaton, it was assumed that upstreaming adult migrants would

Table 1. General summary of Nechako River tributary fisheries values.

Stream	Habitat "Productive" Length (km)	Habitat "Productive" Area (m^2)	Current Production	Constraints	Potential Habitat Length (km)	Potential Habitat Area (m^2)	Potential Production (migrants/m^2) .03	Potential Production (migrants/m^2) .10
Cutoff	0	0	0	poor habitat	0	0	0	
Nechako Canyon	1.5	6,000	0(?)	recruitment	1.5	6,000	180	600
Targe	6.0	28,000	low(?)	recruitment	6.0	28,000	840	2,800
Swanson	6.5	47,000	low(?)	recruitment	6.5	47,000	1,400	4,700
Greer	30.5	111,500[4]	low(?)	?	30.5	111,500	3,350	11,500
Smith	0.3	1,000	low	beaver dams	4	27,500	830	2,750
Tahultzu	0	0	0	beaver dams	4	16,000	480	1,600
TOTAL							7,080	23,950
TOTAL excluding Smith and Tahultzu							5,770	19,600

[1] habitat with potential to produce Nechako River recruits.
[2] rough estimate as to low, medium or high
[3] based on migrant yield of 0.03 to 0.10 migrants/m^2
[4] Reaches 1 to 3 have edge restrictions, therefore approximately 1 m^2/m of stream

not pass through an expanse of poor habitat already 6.5 km from the mainstem. The situation is different in Greer Creek, in that "good" habitat is not available until Reach 4, some 21 km from the Nechako mainstem. If Greer Creek is used at all by Nechako fish, then migrations up to the falls (30.5 km) must be considered. As Greer Creek is a much larger stream than any of the others, it is "sensible" that fish might migrate greater distances in this stream.

Current production and constraints

Fish sampling indicated that current production of rainbow in Nechako tributaries was very low. However, there are some remaining questions due to the poor assessment conditions. The major question concerns Greer Creek. Although some rainbow juveniles were caught, densities are unknown and origin is unclear (residence or migration). Detailed sampling to address this question (i.e. age group analysis) was not possible under prevailing sampling conditions.

Constraints fall into two general categories; lack of recruitment and habitat problems. Severe habitat problems exist in Smith, Tahultzu and Cutoff Creeks. Beaver dams are the problem in Smith and Tahultzu Creeks, alienating approximately 4 km of potential habitat in each system. Cutoff Creek has a combination of beaver and man-made problems (e.g. water diversion).

In terms of recruitment, all tributaries appeared to be underseeded or not seeded at all (at least in 1984). Juvenile (yearling) populations were also low, indicating this may be an annual problem. Lack of recruitment is seen as the major constraint to overall Nechako tributary trout production. This in turn is viewed as a reflection of current low adult numbers in the Nechako River mainstem.

Potential production

As an exercise to generally determine what potential the tributaries possess in terms of Nechako fish production, rough estimates of potential "smolt" production were calculated. Two methods were used to give a range in values:

1) area/TDS (Slaney et. al. 1980, method A).

Smolt yield ($g/m^2/yr$)= 0.026 (TDS) - 0.085

Nechako TDS = approximately 42 (Slaney et. al, 1984)

Smolt yield = 0.026 (42) - 0.085 = 1.007 $g/m^2/yr$

If "smolts" in the Nechako are 1+ and 2+ migrants (i.e. mean weight of 10 g) then migrant yield is $\frac{1.007\ g/m^2/yr}{10\ g} = 0.10/m^2/yr$.

2) Juvenile production capacity--Lardeau River (Slaney. 1981)

Total migrants = Age 2 and 3 migrants (from steelhead model) + Age 1 migrants (60% of total)

Given:

TDS = 42

T = mean annual temperature = 5.6°C

H_S = habitat smolt yield = $0.0159/m^2$

N_S = 0.00049 (TDS) + .0037 = 0.0243

Age 2 and 3 = $H_S \quad (\frac{N_S}{0.02})(\frac{T}{9}) = .0159\ (\frac{.0243}{.02})\ (\frac{5.6}{9}) = .012/m^2$

Total migrants = $0.012/m^2 + [(\frac{.60}{.40})\ X\ 0.012/m^2] = 0.030/m^2$

From the above migrant density estimates (0.03 to 0.10 migrants/m^2), and "productive" habitat area values, very rough capacity estimates of Nechako tributary juvenile production can be made. The range in values is 7,080 to 23,950 migrants/year. Exclusion of Smith and Tahultzu brings this down slightly to 5,770 to 19,600 migrants/year. These values represent the range in total number of migrants per year, assuming any migration of fry does not contribute to Nechako fish populations (i.e. fry migrants do not survive).

4. Potential Production And Nechako River Capacity

Slaney et.al. (1984) estimated the capacity of the Nechako River (Reaches 1 to 5) for catchable trout at 14,200 kg. Assuming an average size of 0.3 kg, this capacity translates to roughly 47,000 catchable trout. Further, assuming a survival rate for "migrant" (1+ or 2+ juveniles) to catchable of roughly 50%, total migrants (or juveniles) required to meet the capacity is 94,000. Comparing this with estimated juvenile production from tributaries, a shortfall in the range of 70,000 to 90,000 juveniles is conceivable. Tributaries may therefore produce a maximum of roughly 25% of theoretical Nechako River capacity.

The capacity of the mainstem Nechako to produce juvenile trout has not been addressed by this (or any other) report. Some mainstem areas (e.g. Cheslatta Falls to Irvines, Larsen Canyon, Canyon below Nautley River) have habitat which appears conducive for juvenile trout production. In fact, the presence of adults in the Nechako, and lack of juveniles in the tributaries, indicates the majority of current recruitment may be occurring in the mainstem. As an action point for further work, mainstem rearing habitat should be investigated in terms of productive capacity and impacts of the different flow regime proposals (e.g. Slaney et. al., 1984).

PROPOSED ACTION:

1. Investigation of Smith, Tahultzu and Cutoff Creeks for "Improvement" Potential

Subsequent to the F.I.U. reconnaissance, this was addressed by Region. Results suggested improvements to these streams in terms of beaver dam removal and control were not feasable at this time (see individual stream summaries in Appendix I for details).

2. Tributary Capacity

Due to poor weather conditions during the sampling period, the 1984 tributary assessment was incomplete. A more through investigation could be completed in future, with emphasis on Greer, Swanson and Targe Creeks. Preferred sampling time would be late August to September. As an aid to the tributary assessment program, an experimental fry stocking program should be conducted to better define actual tributary capacity.

3. Mainstem Juvenile Capacity

Distribution and abundance of juvenile trout and rearing habitat in the Nechako River mainstem should be quantified. Some areas appear to have juvenile rearing potential (e.g. Cheslatta to Irvines, Larsen Canyon, Canyon below Nautley), which may contribute significantly to the system's overall juvenile production capacity.

REFERENCES

deLeeuw, A. D. 1981. A British Columbia Stream Habitat and Fish Population Inventory System. Unpubl. MS. B.C. Fish and Wildlife Branch, Fish Habitat Improvement Section, Victoria, B.C.

Slaney, P.A. 1981. Lardeau River RBT Production. Memo to H. Andrusak, Sept. 29, 1981. File 1720-1, Fish and Wildlife Branch, Fisheries Research Section, U.B.C. Vancouver, B.C.

Slaney, P.A., M. L. Rosenau, D.H.G. Ableson and R.L. Morley 1984. Habitat Capability of the Nechako River for Rainbow Trout and Char and the Effects of Various Flow Regimes. Fisheries Technical Circular No. 63. B.C. Fish and Wildlife Branch, Fisheries Research Section, U.B.C. Vancouver, B.C.

Slaney, P.A., D. Marshall, G. Taylor and H. Mundie (Stream Enhancement Research Committee) 1980. Preliminary Review of the Predictability of Smolt Yield for Wild Stocks of Chinook Salmon, Steelhead Trout and Coho Salmon.

Thurow, R.F. and T.C. Bjornn, 1978. Response of Cutthroat Trout Populations to the Cessation of Fishing in St. Joe River Tributaries. Idaho Dept. of Fish and Game. Project F-60-R.

Appendix I. Summary of Nechako River tributary reconnaissance, July 3-10, 1984.

1. Cutoff Creek
2. Nechako Canyon
3. Targe Creek
4. Swanson Creek
5. Greer Creek
6. Smith Creek
7. Tahultzu Creek
8. Nechako River tributary rainbow trout
9. Photographs to accompany file

1. CUTOFF CREEK (Fig. 1)

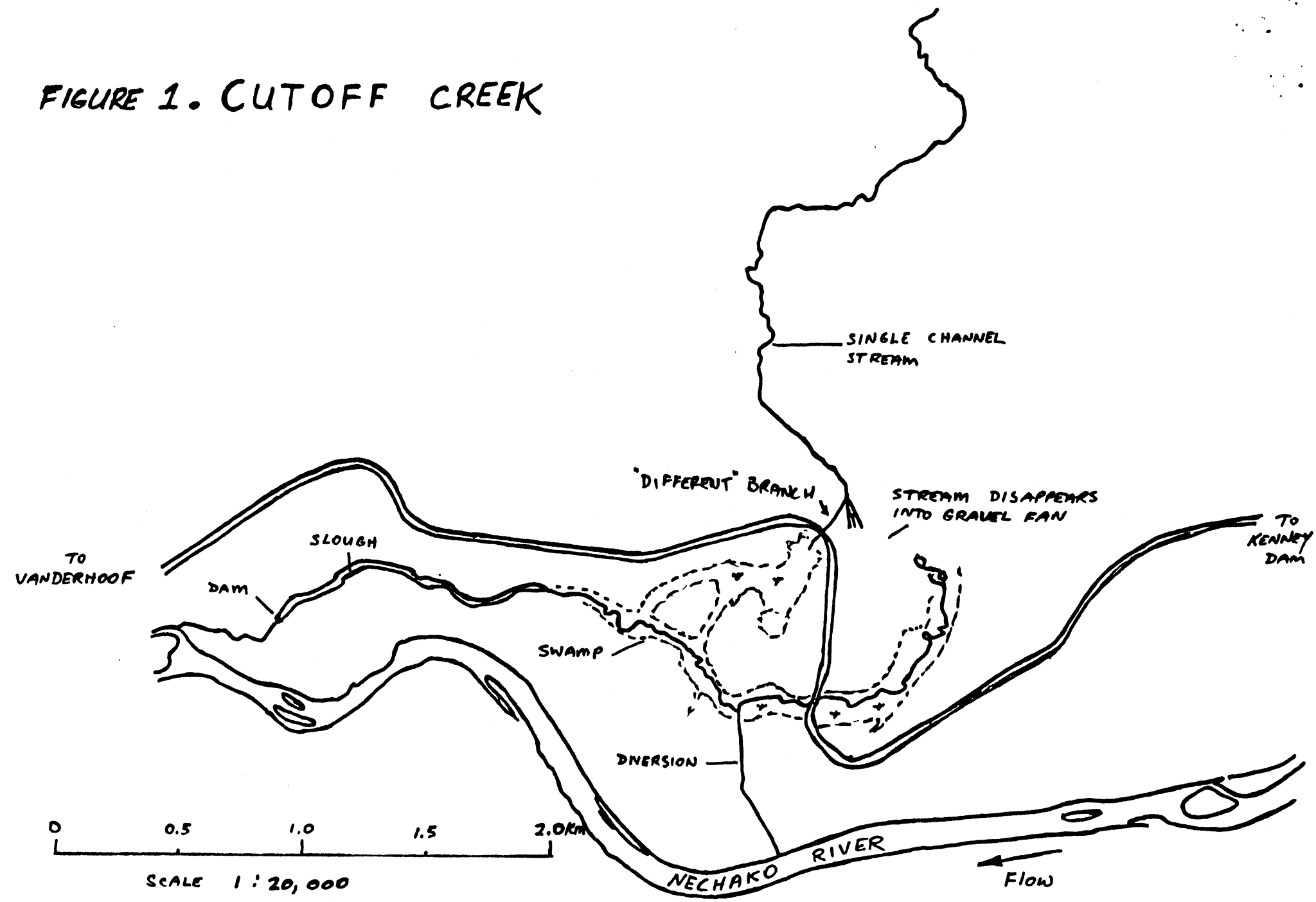
Ground and helicopter reconnaissance was conducted only; no fish sampling was attempted (or warranted). Features from the Nechako confluence include:

- man-made dam at 0.4 to 2.0 km;
- slough for 1.6 km from 0.4 to 2.0 km (some beaver dams);
- extensive swamp for 2.0 km from 2.0 to 4.0 km;
- dry streambed for <0.5 km immediately above swamp. Stream disappears into gravel "fan";
- single channel stream from approximately 5.0 km above the Nechako.

These observations suggest little potential for Nechako River rainbow. Problems include the vast swamp/slough and the dry streambed (even at a time when other streams were high). Further investigation of potential rehabilitation of the stream for trout production might include:

- removal of man-made and beaver dams in lower 2 km. This might produce a flowing stream if enough gradient is available;
- investigation of the "disappearing stream". There may be a possibility to divert flow (back?) into a different branch of the stream.

FIGURE 1. CUTOFF CREEK



2. NECHAKO CANYON

a) Habitat

Source	Reach	Length (km)	Gradient(%)	Width (m)	Area (m^2)	% P/G/R
Field	1	1.5	1	4	6000	-
	2	1.0	0			Pond

- discharge when sampled = 0.08 m^3/s (3 cfs);
- originates as groundwater seepage from below the Kenney Dam;
- length of Canyon = 8 km;
- "productive" length = 1.5 km (up to pond).

b) Fishing Sampling (salmonids only)

Site	Reach	Species	Age Group	N	Mean F.L. (mm)	No/m^2
1	1	Chinook	0+	195	68.8	2.01
		M. whitefish	0+	12	60.2	0.12

- no rainbow captured, although sampling by region in 1983 found rainbow in this stream (R. Little, Pers. Comm).

c) Current Rainbow Production and Constraints

- as fish sampling indicates, no rainbow production occurred in this stream in 1984. As rainbow have been found in previous years, use of this stream by rainbow may depend on spring conditions as they affect spawning;

- the only apparent constraint to natural production of rainbow is recruitment--lack of spawners (at least in 1984). Habitat in the stream was fine, as evidenced by the high density of chinook fry. One likely problem which may reflect on spawning success (egg to fry survival), is the high percentage of fine substrate (average approximately 40% in sample site).

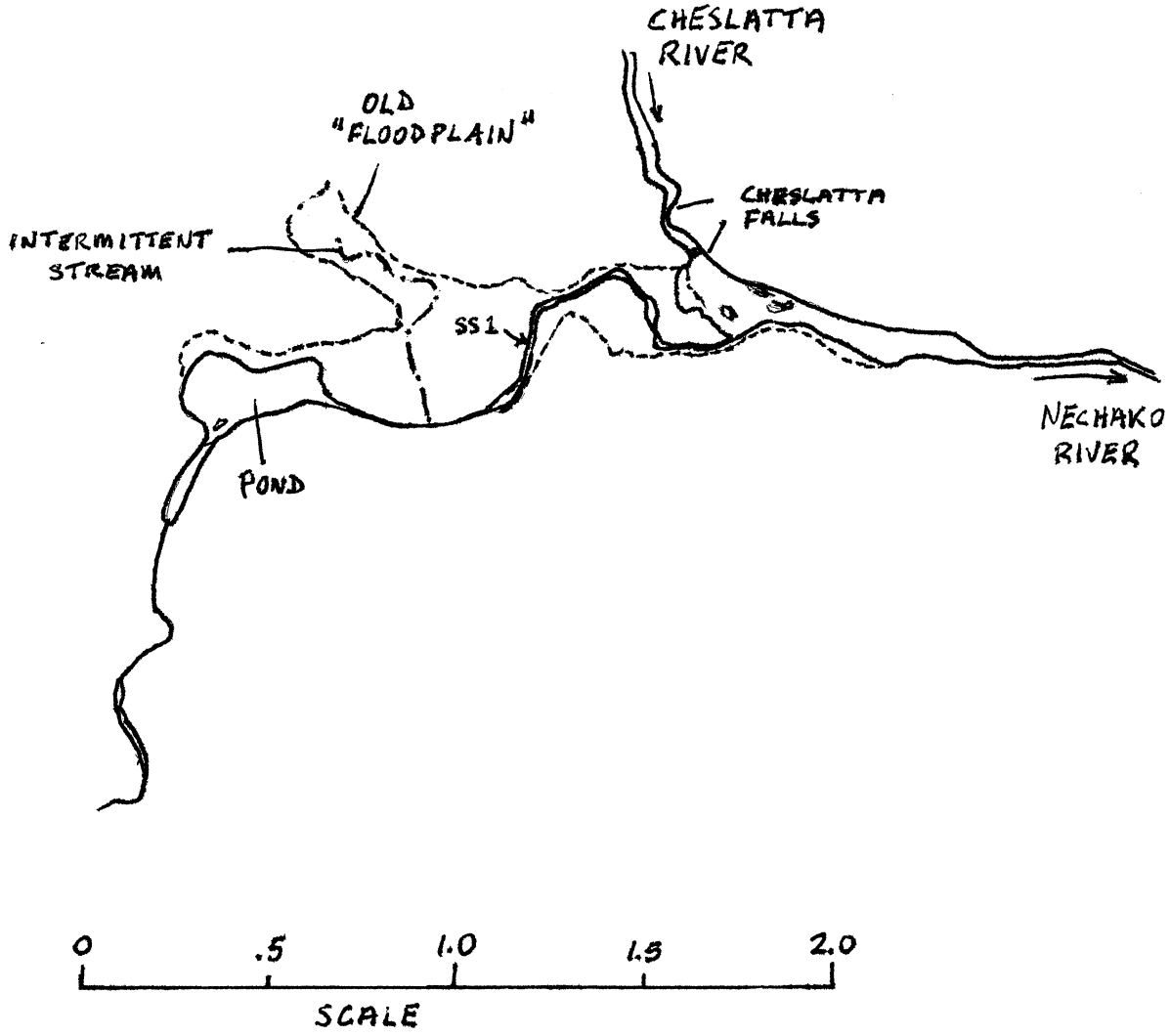


FIGURE 2. "OLD NECHAKO CANYON"

NECHAKO CANYON DATE July 5/84 AREA 108 M^2 SITE # 1

LENGTH 25 M

SPECIES	AGE	fl-RANGE	$\bar{fl}$	MEAN WEIGHT	C_1	$\bar{p}$	$\bar{n}$	TOTAL BIOMASS	No/M^2 DENSITY	BIOMASS DENSITY	No / linear meter
CHK	0+	58-81	68.80	4.63	195	.9	216.67	1004.17	2.01	9.30	8.67
MW	0+	56-64	60.17	2.89	12	.9	13.33	38.51	0.12	0.36	0.53
LND	all	29-77	48.91	1.54	22	.9	24.44	37.67	0.23	0.35	0.98
RSS	all	77		6.72	1	.9	1.11	7.47	0.01	0.07	0.04
LSU	all	79		7.30	1	.9	1.11	8.11	0.01	0.08	0.04

HABITAT DESCRIPTION:

Discharge Gradient ~1%

Temperature (°C) 16° @ 1400 hrs. Turbidity clear

Hydraulic Type	Pool	Glide	Riffle
% area		40	60
mean width		4.05 m	4.35 m
mean depth		0.10 m	0.08 m
mean velocity		0.35 m/s	0.85 m/s
cover type[1]		OV, IV	L, IV, OV
% cover		6	5
substrate[2]		60F, 35 SG, 5 LG	20F, 65 SG, 10 LG, 5C

COMMENTS:

[1] L log, B boulder, IV instream vegetation, OV overstream vegetation, C cutbanks

[2] F fines, SG small gravel, LG large gravel, C cobbles, B boulders, Br bedrock

3. TARGE CREEK

a) Habitat

Source	Reach	Length (km)	Gradient (%)	Width (m)	Area (m^2)	%P/G/R
RAB/Field	1	3.5	0.4	9 (4.7)	16,500	-
	2	2.5	1.8	10 (4.7)	11,500	-
	Copley Lake		0			

- discharge when sampled was approximately 1.1 m^3/s (40 cfs);
- R.A.B. sampling indicates low flow (September) width of 4.7 m;
- "productive length = 6.0 km (to Copley Lake).

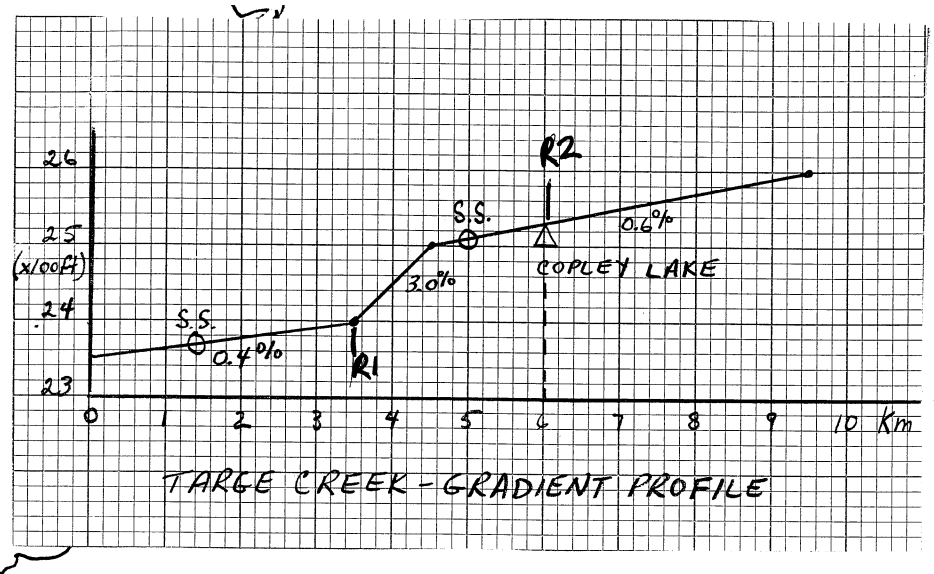
b) Fish Sampling

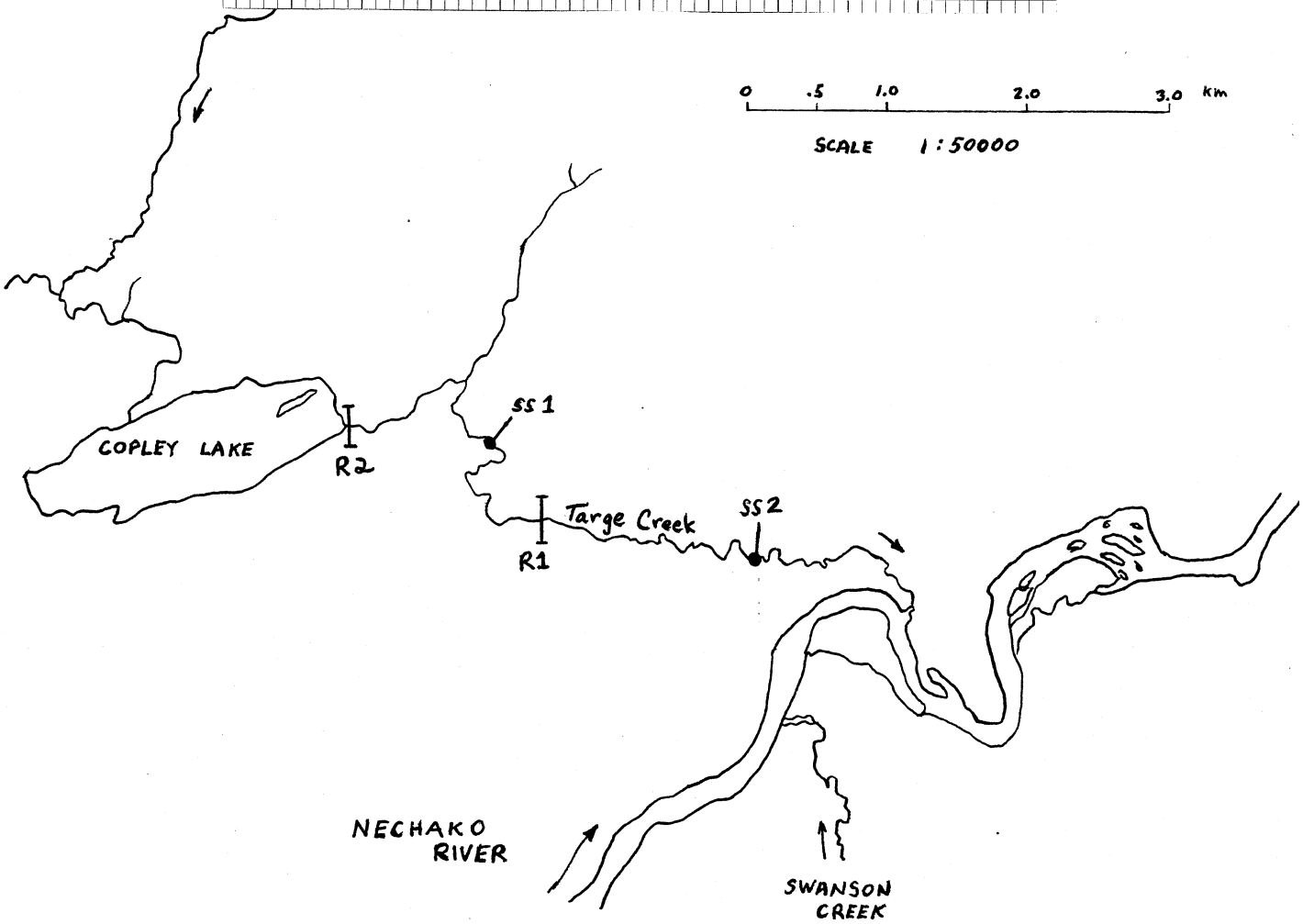
Site	Reach	Species	Age Group	N	Mean F.L. (mm)	No/m^2
2	1	Rainbow	0+	13	36.5	0.14
1	2	Rainbow	0+	96	41.3	0.99
			1+	4	133.8	0.04

- rainbow fry were abundant in sampling, particularly at Site 1 near Copley Lake. These rainbow may be of Copley Lake stock;
- no chinook were found.

c) Current Rainbow Production and Constraints

- production in terms of Nechako River fish populations is thought to be quite low. The rainbow captured in Targe Creek are thought to be largely of Copley Lake stock. As evidence, one can point to the lower fry density at the lowest (closest to Nechako) site, and the lack of rainbow parr in a "good" log jam within this lower sample site. Admittedly this is rather weak evidence. An alternate theory could be that Nechako rainbow spawn near Copley Lake, and that the vast majority of yearlings outmigrate to the Nechako by early summer;
- in either case, the capacity of Targe Creek is suspected to be greater than that sampled (i.e. habitat was good, but juvenile rainbow densities were poor). Recruitment of Nechako rainbow may be the major constraint in Targe Creek.





TARGE CREEK BELOW COPLEY LAKE.

TARGE CR. DATE JULY 7/84 AREA 100.63 M² SITE # 2

LENGTH 17.5 M

SPECIES	AGE	fl-RANGE	$\bar{fl}$	MEAN WEIGHT	C_1	$\bar{p}$	$\bar{n}$	TOTAL BIOMASS	No/M² DENSITY	BIOMASS DENSITY	No / linear meter
Rbt	0+	32-41	36.54	0.50	13	0.9	14.44	7.16	0.14	0.07	0.83
LND	all	45-77	59.75	2.39	4	0.9	4.44	10.64	0.04	0.11	0.25
SU	all	45-51	47.20	1.66	5	0.9	5.56	9.25	0.06	0.09	0.32

HABITAT DESCRIPTION:

Discharge Gradient

Temperature (°C) 14° @ 1330 hrs. Turbidity clear

Hydraulic Type	Pool	Glide	Riffle
% area			
mean width	5.75 m		
mean depth	0.4 (1.0 max.) m		
mean velocity	.25 m/s		
cover type[1]	OV, C, L		
% cover	8%		
substrate[2]	SF, 84SG, 10 LG, 1C		

COMMENTS: Useable fry habitat consisted of .5m on 1 edge, .25m other edge and 3m² on island. Good log jam and undercut bank but no fish.

[1] L log, B boulder, IV instream vegetation, OV overstream vegetation, C cutbanks

[2] F fines, SG small gravel, LG large gravel, C cobbles, B boulders, Br bedrock

TARGE CR. DATE JULY 7/84 AREA 108 M^2 SITE # 1 (UPPER)
LENGTH 12 M

SPECIES	AGE	fl-RANGE	$\bar{fl}$	MEAN WEIGHT	C_1	$\bar{p}$	$\bar{n}$	TOTAL BIOMASS	No/M^2 DENSITY	BIOMASS DENSITY	No / linear meter
Rbt	0+	26-52	41.35	0.74	96	0.9	106.67	78.70	0.99	0.73	8.89
	1+	122-140	133.75	28.94	4	0.9	4.44	128.64	0.04	1.19	0.37
ΣRbt					100		111.11	207.34	1.03	1.92	9.26
LSU	all	70		5.15	1	0.9	1.11	5.72	0.01	0.05	0.09
SQ	all	270		315.63	1	0.9	1.11	350.70	0.01	3.25	0.09

HABITAT DESCRIPTION:

Discharge Gradient 1.5 %

Temperature (°C) 13.5° Turbidity clear

Hydraulic Type	Pool	Glide	Riffle
% area		100	
mean width		9 m	
mean depth		0.3 m	
mean velocity		0.7 m/s	
cover type[1]		B, C	
% cover		10%	
substrate[2]		SF, SG, 30LG, 50C, 10B	

COMMENTS:

[1] L log, B boulder, IV instream vegetation, OV overstream vegetation, C cutbanks

[2] F fines, SG small gravel, LG large gravel, C cobbles, B boulders, Br bedrock

4. SWANSON CREEK

a) Habitat

Source	Reach	Length (km)	Gradient(%)	Width (m)	Area (m^2)	% P/G/R
RAB/ Field	1	1.5	0.6	8	12,000	0/60/40
	2	5.0	2.0	7	35,000	0/80/20
	3	3.0	0.6	some low gradient swamp		
	4	1.0	1.2-1.4	-	-	-
	5	2.5	1.2-1.4	-	-	-
	6	1.5	4-6	-	-	-
	7	1.5	1.5	4.5	68,000	10/90/0
	8-13	10.	2-4	-	-	-
	Boomerang Lake					

- discharge of Reach 1 and 2 approximately 1.4 m^3/s (50 cfs). This discharge was high in terms of average summer flows. RAB sampling indicated mean width (September) of 5.5 m for estimated late summer area estimates of 8,000 m^2 in Reach 1 and 27,500 m^2 in Reach 2;
- Reach 1 was moderately low gradient habitat, with abundant cover in terms of undercut banks and brush;
- Reach 2 was basically canyon habitat, being high gradient and quite straight;
- "productive" length in terms of the Nechako was taken as R1 plus R2, since R3 became quite swampy.

b) Fish Sampling

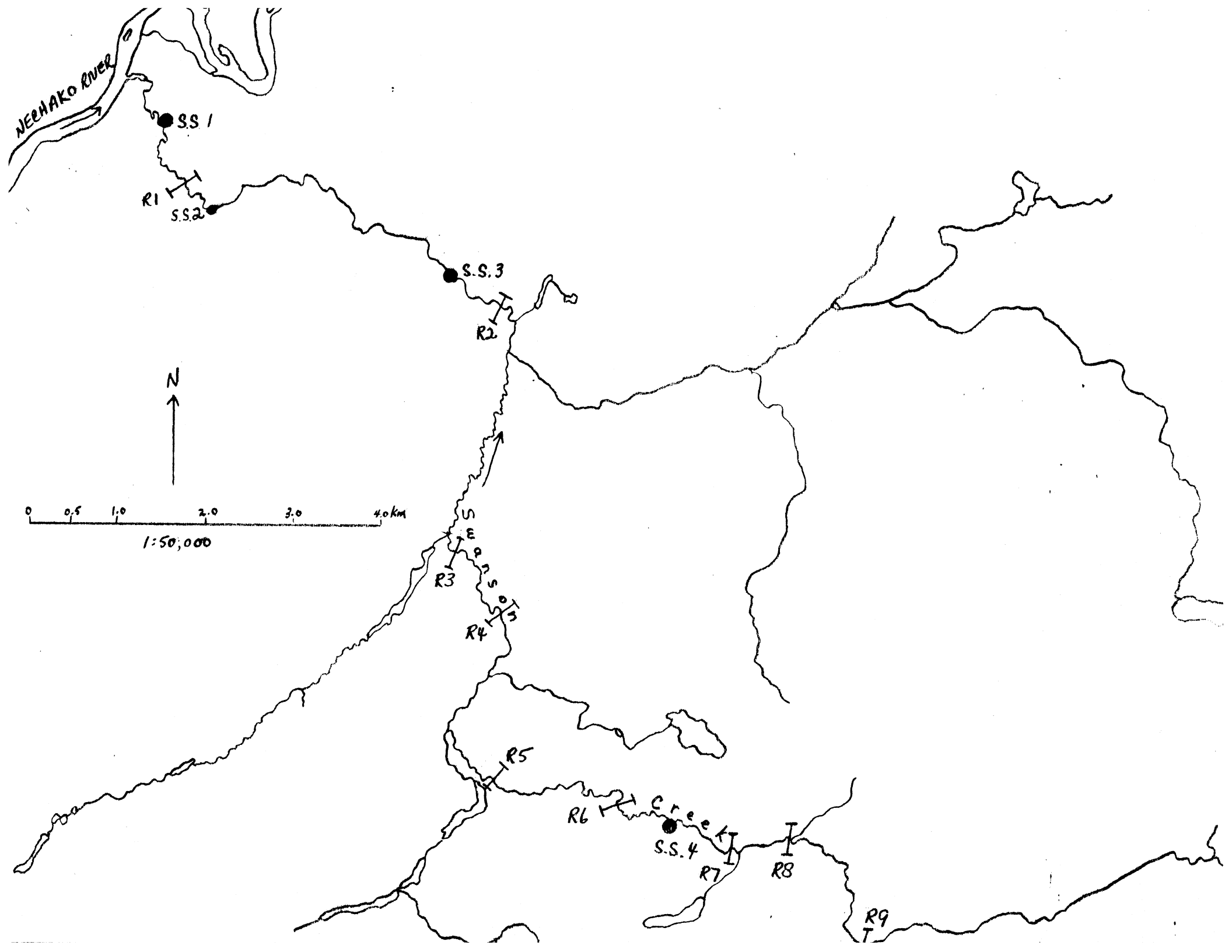
Site	Reach	Species	Age Group	N	Mean F.L. (mm)	No/m^2
1	1	Rainbow	1+	1	82	0.02
		Chinook	0+	12	61.6	0.26
		M. Whitefish	0+	1	43	0.02
2	2	Rainbow	2+	1	94	0.02
3	2	Rainbow	1+	1	87	0.02
		Chinook	0+	11	58.6	0.22
4	7	Rainbow	1+	8	56.5	0.19

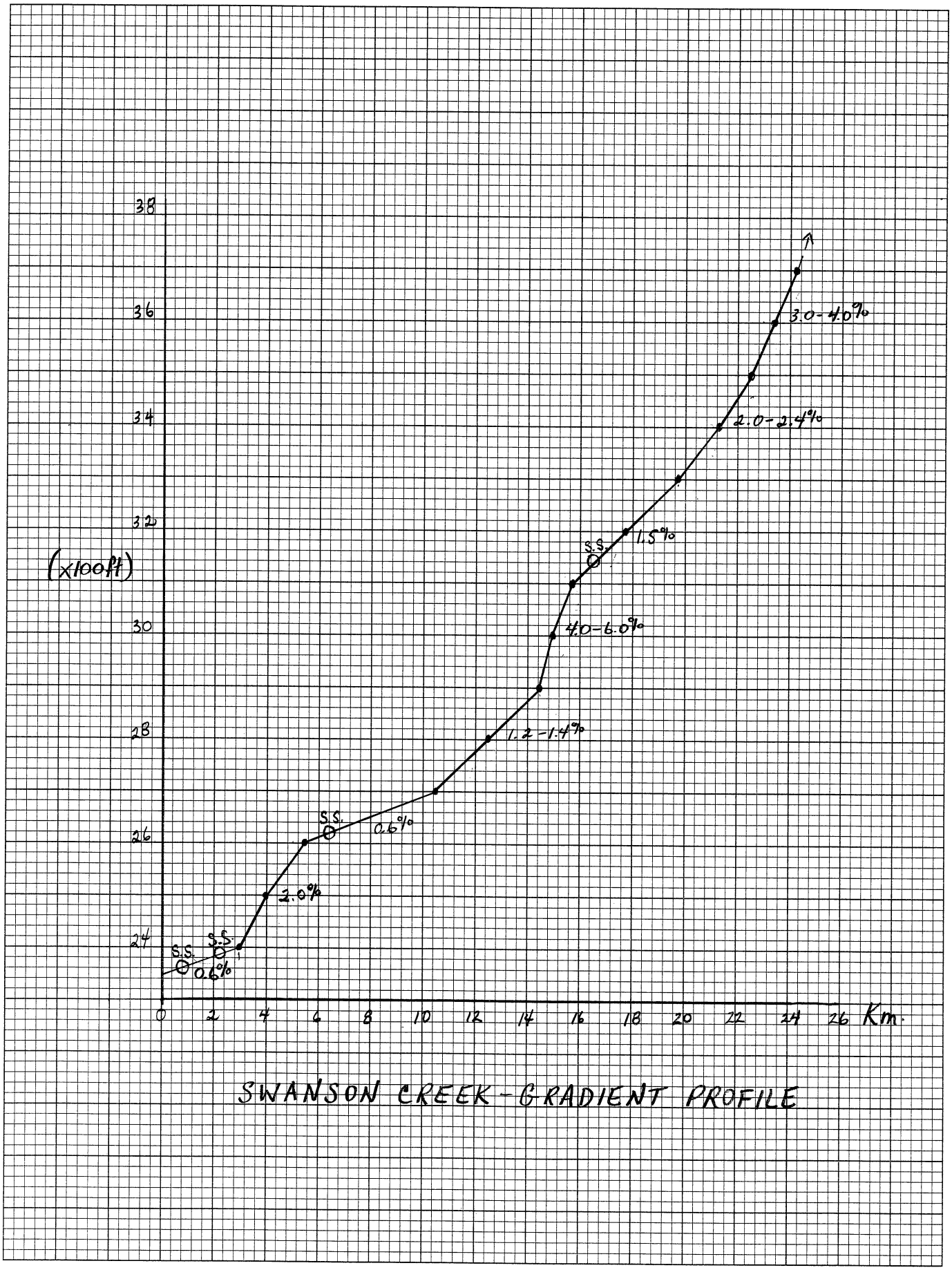
- no rainbow fry were captured;
- in "accessible" portion (R1 + R2) average rainbow parr density was 0.02/m^2;
- in headwaters, rainbow density was higher at 0.19/m^2, but average size was very small (these were 1+ as scale analysis was conducted);
- chinook fry were present in R1 and upper R2. Absence from Site 2 may have been habitat related (velocity);

- because flows were high, sampling may not be representative of "low flow" fish density. However, as we did sample habitat which should hold fish, particularly during high flows (e.g. log jam/undercut in Reach 1), it is valid to say densities of rainbow were low. This contrasts with R.A.B. reports of a large number of rainbow captured near our Site 2 in 1978.

c) Current Rainbow Production and Constraints

- current production of rainbow in Swanson Creek (in terms of potential Nechako River recruitment) was quite low. If our sampling was representative, and if all juveniles in Reach 1 and 2 are Nechako stock (as opposed to stream residents), then standing stock was roughly 950 rainbow parr;
- the constraint on production is clearly recruitment. Evidence for this includes: 1) no fry in 1984 (though we may have been a little early in terms of emergence and dispersal. However, fry were out in Targe Creek); 2) apparently abundant population of juveniles in 1978; and 3) low population of juveniles in 1984. Recruitment may be high in some years, low in others.


NECHAKO RIVER
S.S. 1
R1
S.S.2
S.S.3
R2
N
0
0.5
1.0
2.0
3.0
4.0km
1:50,000
R3
R4
R5
R6
Creek
S.S.4
R7
R8
R9



SWANSON CREEK - GRADIENT PROFILE

SWANSON CR. DATE JULY 8/84 AREA 58.75 M^2 SITE # 1 (LOWER)

LENGTH 17.50 M

SPECIES	AGE	fl-RANGE	$\bar{fl}$	MEAN WEIGHT	C_1	$\bar{p}$	$\bar{n}$	TOTAL BIOMASS	No/M^2 DENSITY	BIOMASS DENSITY	No / linear meter
Rbt	1+	82		6.62	1	0.8	1.25	8.27	0.02	0.14	0.07
CH	0+	56-70	61.58	3.33	12	0.8	15.00	49.93	0.26	0.85	0.86
Σ Salmonids					13		16.25	58.20	0.28	0.99	0.93
MWF	0+	43		1.05	1	0.8	1.25	1.31	0.02	0.02	0.07
LND	all	50-68	59.00	2.13	2	0.8	2.50	5.33	0.04	0.09	0.14

HABITAT DESCRIPTION:

Discharge ~ $1m^3/s$ Gradient

Temperature (°C) 10° @ 1330 hrs. Turbidity clear

Hydraulic Type	Pool	Glide		Riffle
% area		slow 100	fast	
mean width		3.5 m	3.0 m	
mean depth		0.35 m	0.40 m	
mean velocity		0.8 m/s	1.0 m/s	
cover type[1]		L, OV, IV, C	OV, IV, C, L	
% cover		19	40	
substrate[2]		30F, 40SG, 30LG	20F, 60SG, 20LG	

COMMENTS:

[1] L log, B boulder, IV instream vegetation, OV overstream vegetation, C cutbanks

[2] F fines, SG small gravel, LG large gravel, C cobbles, B boulders, Br bedrock

SWANSON CR DATE JULY 8/84 AREA 48 M^2 SITE # 2 (ABOVE KENNY DAM RD.)
LENGTH 24 M

SPECIES	AGE	fl-RANGE	$\bar{fl}$	MEAN WEIGHT	C_1	$\bar{P}$	$\bar{n}$	TOTAL BIOMASS	No/M^2 DENSITY	BIOMASS DENSITY	No / linear meter
Rbt	2+	94		9.97	1	0.9	1.11	11.07	0.02	0.23	0.05

HABITAT DESCRIPTION:

Discharge 2.25 m^3/s Gradient 1.25

Temperature (°C) 10°C Turbidity clear

Hydraulic Type	Pool	Glide	Riffle
% area			100
mean width			2m edge (8 total)
mean depth			0.4 m
mean velocity			1.0 m/s
cover type[1]			OV, B, C
% cover			13%
substrate[2]			5F, 5SG, 10LG, 50C, 30B

COMMENTS:

[1] L log, B boulder, IV instream vegetation, OV overstream vegetation, C cutbanks

[2] F fines, SG small gravel, LG large gravel, C cobbles, B boulders, Br bedrock

SWANSON CR. DATE JULY 7/84 AREA 56 M² SITE # 3 (MIDDLE)
LENGTH 16 M

SPECIES	AGE	fl-RANGE	$\bar{fl}$	MEAN WEIGHT	C_1	$\bar{p}$	$\bar{n}$	TOTAL BIOMASS	No/M² DENSITY	BIOMASS DENSITY	No / linear mete
Rbt	1+	87		7.90	1	0.9	1.11	8.78	0.02	0.16	0.07
CH	0+	53-63	58.64	2.84	11	0.9	12.22	34.69	0.22	0.62	0.76
Σ Salmonids					12		13.33	43.47	0.24	0.78	0.83
SU	all	57-68	61.00	3.53	3	0.9	3.33	11.76	0.06	0.21	0.21

HABITAT DESCRIPTION:

Discharge — Gradient

Temperature (°C) — Turbidity clear

Hydraulic Type	Pool	Glide	/	Riffle
% area		75		25
mean width		3.5 m		
mean depth		0.3 m		
mean velocity		0.3 m/s		
cover type[1]		OV, B, IV, L, OV		
% cover		16%		
substrate[2]		29 F, 40 SG, 15 LG, 15 C, 1 B		

COMMENTS:

[1] L log, B boulder, IV instream vegetation, OV overstream vegetation, C cutbanks

[2] F fines, SG small gravel, LG large gravel, C cobbles, B boulders, Br bedrock

SWANSON CR. DATE JULY 7/84 AREA 63 M^2 SITE # 4 (UPPER)

LENGTH 15 M

SPECIES	AGE	fl-RANGE	$\bar{fl}$	MEAN WEIGHT	C_1	$\bar{p}$	$\bar{n}$	TOTAL BIOMASS	No/M^2 DENSITY	BIOMASS DENSITY	No / linear meter
Rbt	1+	49 - 64	56.50	2.22	8	0.67	11.94	26.46	0.19	0.42	0.80

HABITAT DESCRIPTION:

Discharge Gradient < 0.5 %

Temperature (°C) 8.0° @ 1045 hrs. Turbidity clear

Hydraulic Type	Pool	Glide	Riffle
% area	30	70	
mean width	5 m	4 m	
mean depth	1.0 m	0.4	
mean velocity	0.3 m/s	0.5 m/s	
cover type[1]	IV, OV, C	IV, C, OV	
% cover	20%	21%	
substrate[2]	30F, 60 SG, 10 LG	30 F, 70 SG	

COMMENTS:

[1] L log, B boulder, IV instream vegetation, OV overstream vegetation, C cutbanks

[2] F fines, SG small gravel, LG large gravel, C cobbles, B boulders, Br bedrock

5. GREER CREEK

a) Habitat

Source	Reach	Length (km)	Gradient(%)	Width (m)	Area (m^2)	% P/G/R
RAB/ Field	1	15	0.3	15	225,000	0/100/0
	2	1.5	0.2	(15)	22,500	-
	3	5	0.2	(15)	75,000	-
	4	9	3	10	90,000	-

- 12 m falls located near top of Reach 4;
- discharge very high when sampled - approximately 3.4 m^3/s (120 cfs);
- habitat in Reach 1 generally poor in terms of rainbow trout. Substrates were very sandy and compacted. Hydraulic character of Reach 1 was basically glide at the flows observed; little cover was present (high velocity with small substrates);
- habitat in Reach 4 appeared more conducive to trout production (high gradient, riffle habitat with cobble/boulder substrates). Again, flows were too high to make a proper assessment.

b) Fish Sampling (Salmonids only)

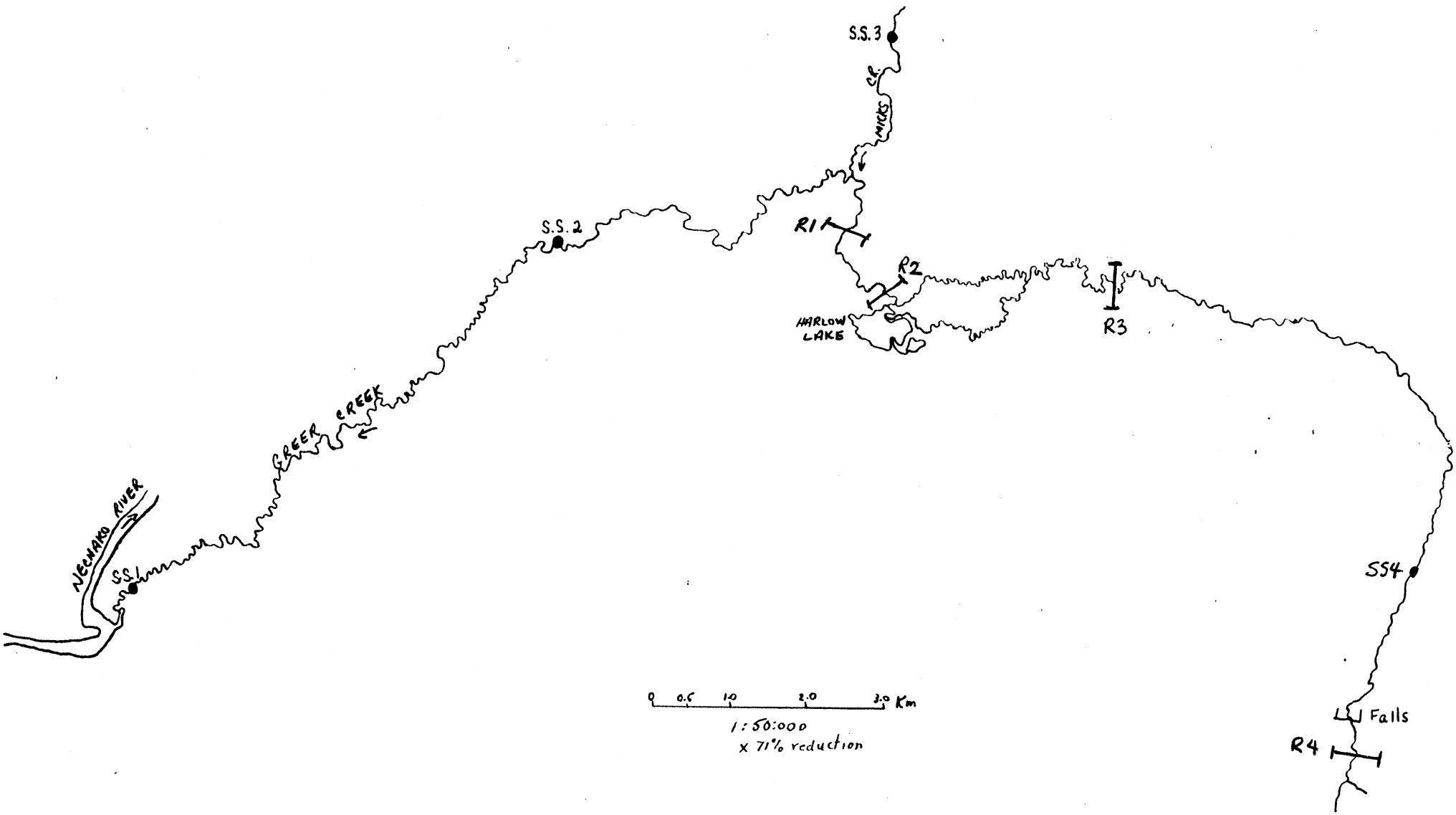
Site	Reach	Species	Age Group	N	Mean F.L. (mm)	No/m^2
1	1 M.	Whitefish	0+	5	45	-
			1+	1	200	-
2	1	none				
3	4	Rainbow	1+	4	85.8	0.14
4	Micks Ck.	Rainbow	1+	1	102	0.05

- no rainbow or chinook were found in Reach 1 of Greer Creek;
- sampling in upper Greer Creek, below the falls, indicated the presence of rainbow parr. The high flows encountered preclude any discussion of densities;
- origin of these rainbow parr is uncertain - Nechako or headwater stock? The headwaters of Greer Creek are known to support large populations of rainbow (in lakes and streams), suggesting that these may be headwater stock.

c) Current Rainbow Production and Constraints

- as we didn't get much of a look at Greer Creek (due to flows), current production cannot be estimated. It appears from sampling that whatever production is occurring, comes from Reach 4;
- brief observations of habitat in Greer Creek indicated surprisingly poor habitat throughout Reach 1 (and perhaps Reach 2 and Reach 3). High flow conditions may have biased this observation. The small

substrate material present, and suspected moderately high velocity (even under lesser flow conditions) suggest that this area may be prone to edge habitat restrictions (i.e. fish distribution restricted to stream edges).


S.S.3
C.P.
MICKS
S.S.2
R1
R2
HARLOW LAKE
R3
GREER CREEK
GREER CREEK
NECHAKO RIVER
S.S.1
SS4
Falls
R4
0 0.5 1.0 2.0 3.0 Km
1:50:000
x 71% reduction

GREER CREEK

6. SMITH CREEK

a) Habitat

Source	Reach	Length (km)	Gradient(%)	Width (m)	Area (m^2)	% P/G/R
Field	1	1.0	0.5	3.5	3,500	0/40/60
	2	2.5	0.9	beaverponds		-
	3		1.5	8.0	4,000	11/64/25
	4	18 approx.	0.2	great swamp		-
	Headwaters	-	6	2.6	-	0/0/100

- currently accessible for 350 m (approx.) from Nechako;
- beaver dams very abundant throughout Reach 2. "Underlying" gradient of Reach 2 is approximately 0.9%, indicating good potential habitat if beavers were not present;
- area near Lily Lake Road was excellent habitat, though fines build-up was fairly high;
- area above Lily Lake Road is a vast unconfined swamp;
- lower 3 reaches (4 km) are viewed as the area with potential fish habitat vis-a-vis. Nechako production.

b) Fish Sampling

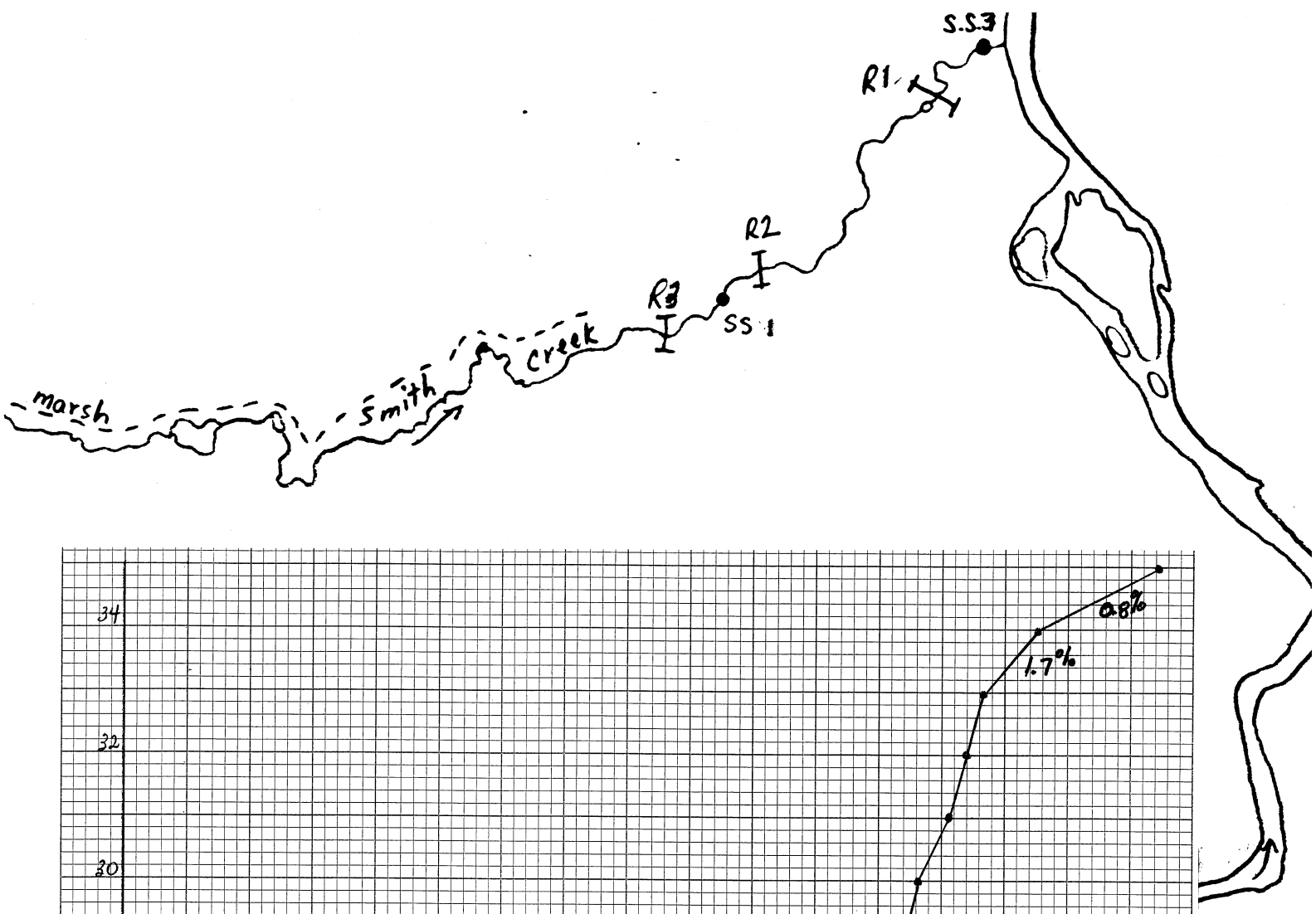
Site	Reach	Species	Age Group	N	Mean F.L. (mm)	No/m^2
3	1	Rainbow	0+	8	42.5	0.17
		Chinook	0+	1	51	0.02
1	3	Rainbow	0+	8	33.9	0.14
			1+	3	96.3	0.05
			2+	1	138	0.02
2	Headwaters	Rainbow	2+	4	118.3	0.08
			3S	1	143	0.02

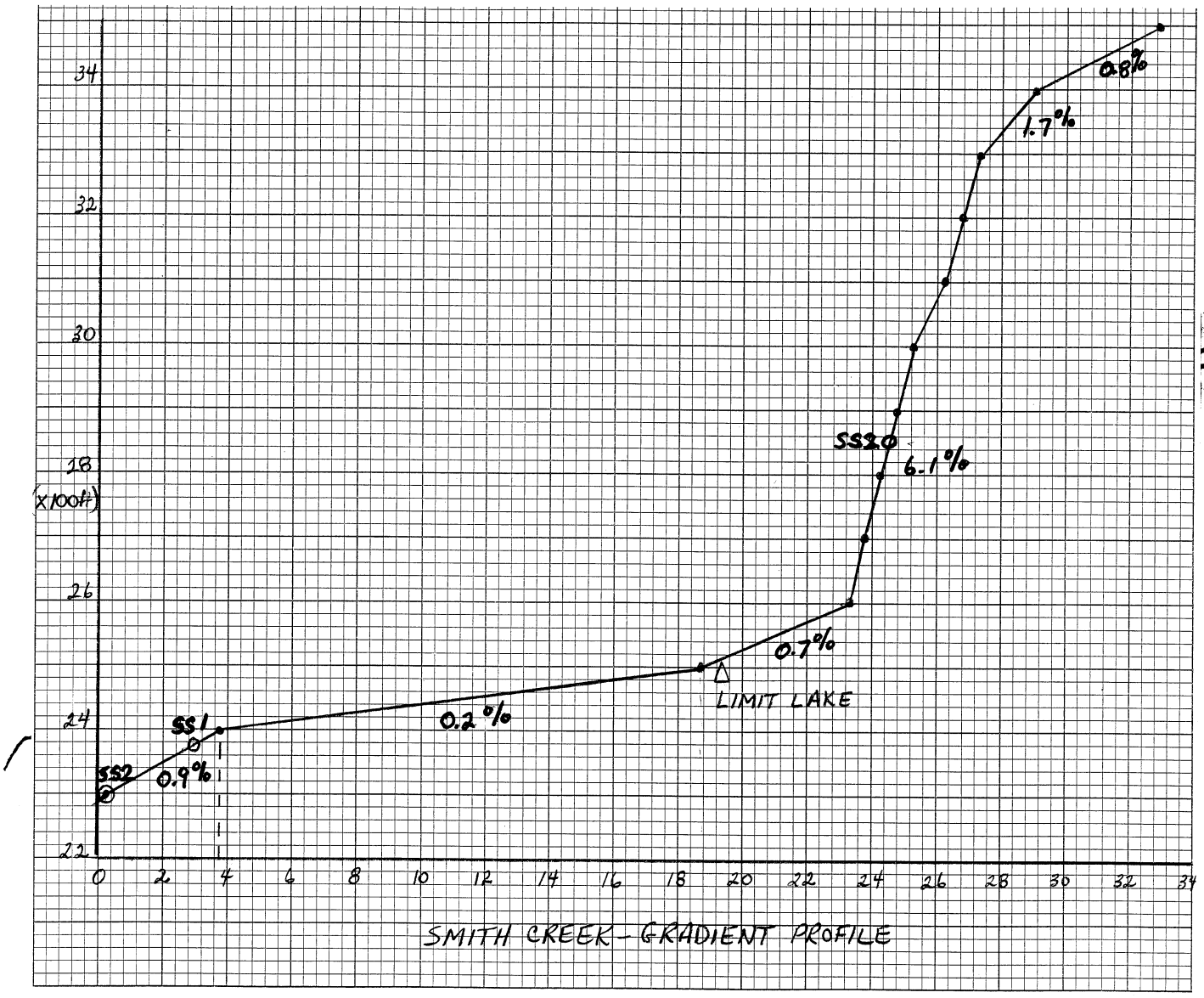
- in "accessible" portion (Reach 1) low densities of rainbow fry and chinook fry were present;
- in "accessible" portion (above extensive beaver dam area and in headwaters) low densities of stream resident rainbow were found. Stream residence was suspected because of maturing gonads found in some older rainbow (i.e. fish at 143 mm was identified as a kelt).

c) Current Rainbow Production and Constraints

- Nechako River rainbow production is very small at this time. If sampled density is representative of the approximately 350 m of accessible stream, then total fry population is roughly 200. This level of population could be achieved with a few spawning pairs;
- constraints on rainbow production are clearly beaver dams, limiting fish access and changing the habitat into a series of ponds;

- potential for rehabilitating Smith Creek in terms of rainbow production could be fairly high. If beaver dams were not a problem, a productive stream of approximately 4 km in length could be gained;
- unfortunately, such stream rehabilitation does not appear feasible at this time. Reconnaissance of the problem by Regional staff (D. Ableson, Pers. Comm.) indicated too many problems exist, including poor access to the stream, the number and size of beaver dams present, and the unlikely prospects of controlling beaver activity if work was done. If some of these conditions change in the future (e.g. better access, better price for beaver pelts and therefore incentive to trappers), such a project could be reviewed.


S.S.3
R1
R2
R3
SS 1
Creek
Smith
marsh


34
32
30
28
(X100ft)
26
24
22
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
SS1
SS2
SS20
0.9%
0.2%
0.7%
6.1%
1.7%
0.8%
LIMIT LAKE
SMITH CREEK - GRADIENT PROFILE

SMITH CR. DATE JULY 7/84 AREA 52.5 M^2 SITE # (LOWER) 3

LENGTH 15 M

SPECIES	AGE	fl-RANGE	$\bar{fl}$	MEAN WEIGHT	C_1	$\bar{p}$	$\bar{n}$	TOTAL BIOMASS	No/M^2 DENSITY	BIOMASS DENSITY	No / linear meter
Rbt	0+	39-46	42.50	0.77	8	0.9	8.89	6.88	0.17	0.13	0.59
CH	0+	51		1.86	1	0.9	1.11	2.06	0.02	0.04	0.07
Σ Salmonids					9		10.00	8.94	0.19	0.17	0.66
LND	all	50 - 71	56.08	1.80	13	0.9	14.44	25.97	0.28	0.49	0.96
Burbot	all	147		22.65	1	0.9	1.11	25.14	0.02	0.48	0.07

HABITAT DESCRIPTION:

Discharge Gradient 0.5 %

Temperature (°C) 13° Turbidity clear

Hydraulic Type	Pool	Glide	Riffle
% area		40	60
mean width		3.5 m	3.5 m
mean depth		0.35 m	0.1 m
mean velocity		0.05 m/s	0.6 m/s
cover type[1]		OV	OV, L, C
% cover		5	15
substrate[2]		60F, 30, SG, 10 LG	15F, 70SG, 15 LG

COMMENTS:

[1] L log, B boulder, IV instream vegetation, OV overstream vegetation, C cutbanks

[2] F fines, SG small gravel, LG large gravel, C cobbles, B boulders, Br bedrock

SMITH CR. DATE JULY 5/84 AREA 80 M^2 SITE # 1 (BELOW BR.)

LENGTH 10 M

SPECIES	AGE	fl-RANGE	$\bar{fl}$	MEAN WEIGHT	C_1	$\bar{P}$	$\bar{n}$	TOTAL BIOMASS	No/M^2 DENSITY	BIOMASS DENSITY	No / linear mete
Rbt	0+	28-41	33.88	0.41	8	0.7	11.43	4.65	0.14	0.06	1.14
	1+	88-102	96.33	10.85	3	0.7	4.29	46.51	0.05	0.58	0.43
	2+	138		31.54	1	0.7	1.43	45.05	0.02	0.56	0.14
Σ Rbt					12		17.15	96.21	0.21	1.20	1.71
SU.	all	71-83	75.33	6.45	3	0.7	4.29	27.66	0.05	0.35	0.43

HABITAT DESCRIPTION:

Discharge Gradient 1.5

Temperature (°C) 15° @ 1630 Turbidity clear

Hydraulic Type	Pool	Glide	/	Riffle
% area		65		35
mean width		8 m		
mean depth		0.35 m		
mean velocity		0.3 m/s		
cover type[1]		B, OV, C		
% cover		31%		
substrate[2]		20F, 15SG, 20LG, 15C, 30B		

COMMENTS:

[1] L log, B boulder, IV instream vegetation, OV overstream vegetation, C cutbanks

[2] F fines, SG small gravel, LG large gravel, C cobbles, B boulders, Br bedrock

SMITH CR. DATE July 6/84 AREA 53.82 m^2 SITE # 2 (upper)

LENGTH 20.7 m

SPECIES	AGE	fl-RANGE	$\bar{fl}$	MEAN WEIGHT	C_1	$\bar{p}$	$\bar{n}$	TOTAL BIOMASS	No/m^2 DENSITY	BIOMASS DENSITY	No / linear mete
Rbt	2+	110-126	118.25	19.98	4	0.9	4.44	88.79	0.08	1.68	0.21
	3S	143		35.09	1	0.9	1.11	38.99	0.02	0.74	0.05
ERbt					5		5.55	127.78	0.10	2.42	0.26

HABITAT DESCRIPTION:

Discharge 0.10 m^3/s Gradient 5%

Temperature (°C) 8° @ 1600 hrs. Turbidity clear

Hydraulic Type	Pool	Glide	Riffle
% area			100
mean width			2.6 m
mean depth			0.12 m (0.4 max.)
mean velocity			0.5 m/s
cover type[1]			B, L, OV, C
% cover			24%
substrate[2]			SF 40SG, 20LG, 30C, 5B

COMMENTS:

[1] L log, B boulder, IV instream vegetation, OV overstream vegetation, C cutbanks

[2] F fines, SG small gravel, LG large gravel, C cobbles, B boulders, Br bedrock

7. TAHULTZU CREEK

a) Habitat

Source	Reach	Length (km)	Gradient(%)	Width (m)	Area (m^2)	% P/G/R
air and	1	4	0.9	(4)	(16,000)	-
air photo	2	4.5	0.4	(3.5)	(16,000)	-
	Lily Lake	0.5	0.4	(3.5)	(2,000)	-

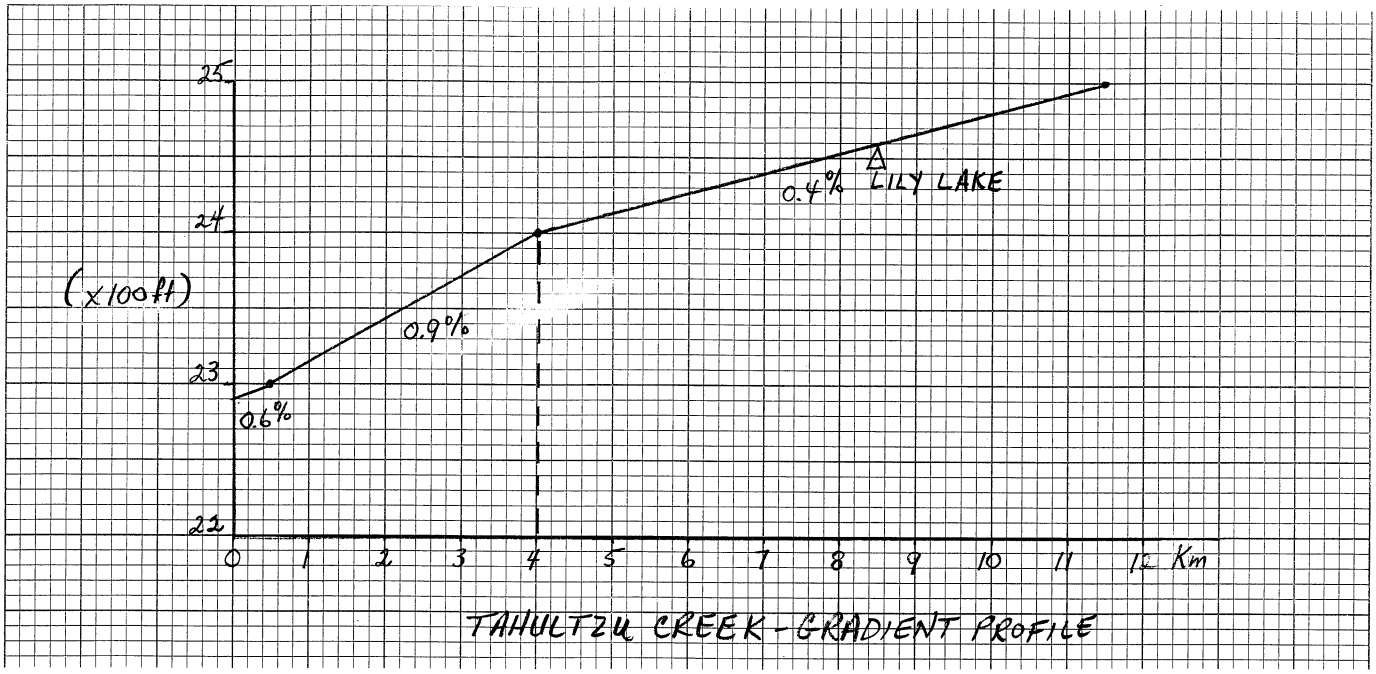
- Tahultzu Creek is ditched in Reach 2 and through Lily Lake (i.e. Lily Lake does not appear on air photo's as a lake at all);
- Reach 1 completely inaccessible to Nechako fish due to extensive beaver dams and beaver ponds;
- "underlying" gradient of Reach 1 was 0.9%, indicating good potential habitat if beavers were not present;
- extensive lake - headed watershed above Lily Lake.

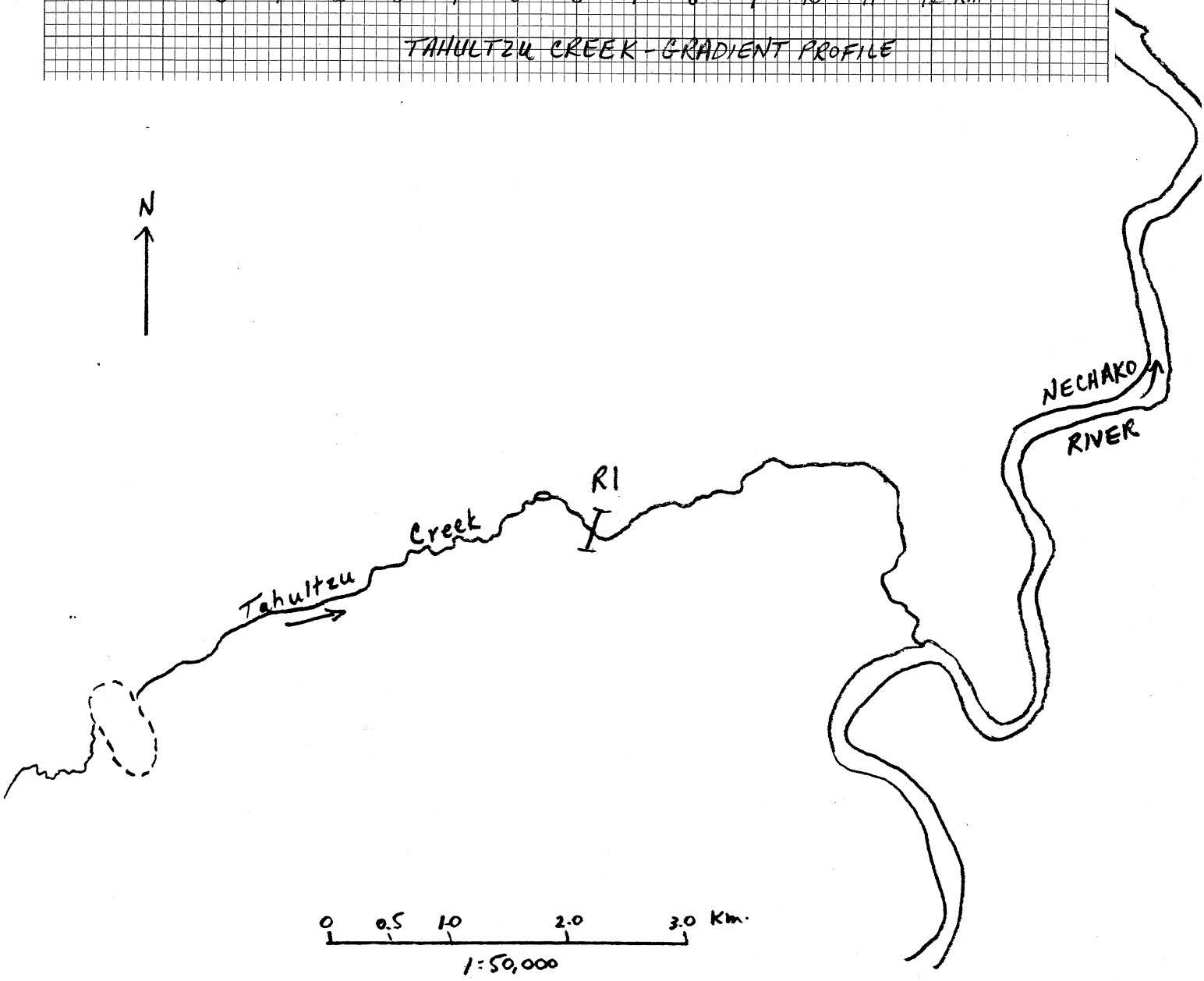
b) Fish Sampling

- no fish sampling was conducted.

c) Current Rainbow Production and Constraints

- current rainbow production is nil, as beaver dams begin at the Nechako confluence;
- the major (only) constraint is beaver dams which limit access to the streams, and change what at one time might have been a productive stream, into an area of beaver ponds and swamps;
- as in Smith Creek, restoration at this time is unlikely;
- if the above was conducted, then further instream improvement may be possible in the ditched portion of stream.





TAHULTZU CREEK.

8. NECHAKO RIVER TRIBUTARIES JULY 3 -10, 1984

RAINBOW TROUT LENGTH - FREQUENCY DISTRIBUTION

FL	FREQ.	AGE
200		
201		
202		
203		
204		
205		
206	|	
207		
208	|	
209	|	
300		
301		
302	|||	
303	||	
304	|	
305	|	
306	||||	
307	||	
308	|	
309	||||	
400	|||	
401	|||	
402	||	
403	|	
404	|	
405	|	
406	|	
407	|	
408		
409	||	1+
500	|	
501		
502		
503	|	
504		
505		
506	|	
507	|	1+
508		
509	|	1+
600		
601		
602		
603	|	1+
604	|	1+
605		
606		
607		
608		
609		
700		
701		
702		
703		
704		
705		
706		
707		
708		
709	|	1+
800		
801	|	1+
802	|	1+
803		
804		
805		
806		
807	|	1+
808	||	1+, 1+
809		
900		
901	|	
902		
903		
904	|	2+
905	|	1+
906		
907		
908		
909	|	1+

FL	FREQ.	AGE
1000		
1001		
1002	||	1+, 1+
1003		
1004		
1005		
1006		
1007		
1008		
1009		
1100	|	2+
1101		
1102		
1103		
1104		
1105		
1106		
1107		
1108	|	2+
1109	|	2+
1200		
1201		
1202	|	1+
1203		
1204		
1205		
1206	|	
1207		
1208		
1209		
1300		
1301		
1302		
1303		
1304		
1305	|	1+
1306		
1307		
1308	||	1+, 2+ MG
1309		
1400	|	1+
1401		
1402		
1403	|	35
1404		
1405		
1406		
1407		
1408		
1409		
1500		
1501		
1502		
1503		
1504		
1505		
1506		
1507		
1508		
1509		

Of the seven Nechako River tributaries "assessed" during the July 3-10, 1984, reconnaissance, only four were considered significant in terms of Nechako River fish production. These include Swanson, Greer and Targe Creeks, and the old Nechako canyon. The remaining 3 streams, Cutoff, Smith and Tahultzu Creeks are affected by severe habitat problems at this time.

Table 1 outlines a very general summary of fisheries "values" in Nechako River tributaries in terms of "productive" habitat, current trout production, probable production constraints, potential habitat (through stream improvement), and potential trout production. Categories outlined in Table 1 are discussed below:

"Productive" habitat

"Productive" habitat represents the habitat that is currently available for Nechako River trout production. This value takes into account the presence of barriers to fish migration, lakes and swamps, and some biological determinants. Cutoff, Smith and Tahultzu Creeks are indicated as having little or no productive habitat. This indicates that habitat was not conducive to trout producton (i.e., presence of beaver dams and swamps). Nechako canyon and Targe Creeks, estimated as having 1.5 and 6.0 km of porductive habitat respectively, are thought to have upper limits determined by the presence of lakes. Any production occurring above lakes is assumed to contribute only to lake populations.

Greer and Swanson Creeks have long accessible stream lengths (30 and 25 km respectively). At this time it is not clear how much of these streams are (or would be) utilized by Nechako River fish. Estimates of "productive" habitat (amount of use) must therefore be based on habitat type and evidence from literature sources. Thurow and Bjornn (1974) present evidence that migratory cutthroat trout of the St. Joe River (Idaho) only utilize the lower 3 miles (5 km) of tributary streams. Although caution must be exercised in applying this guideline directly to the Nechako situation (i.e. unknown effects of habitat type), it should be considered. All of the streams studied have populations of lake or stream resident trout. In Swanson Creek, "productive" length was estimated at 6.5 km, coinciding with the presence of an area of low gradient, swamp-type habitat. Bearing in mind the Idaho situaton, it was assumed that upstreaming adult migrants would

Table 1. General summary of Nechako River tributary fisheries values.

Stream	Habitat "Productive" Length (km)	Habitat "Productive" Area (m^2)	Current Production	Constraints	Potential Habitat Length (km)	Potential Habitat Area (m^2)	Potential Production (migrants/m^2) .03	Potential Production (migrants/m^2) .10
Cutoff	0	0	0	poor habitat	0	0	0	
Nechako Canyon	1.5	6,000	0(?)	recruitment	1.5	6,000	180	600
Targe	6.0	28,000	low(?)	recruitment	6.0	28,000	840	2,800
Swanson	6.5	47,000	low(?)	recruitment	6.5	47,000	1,400	4,700
Greer	30.5	111,500[4]	low(?)	?	30.5	111,500	3,350	11,500
Smith	0.3	1,000	low	beaver dams	4	27,500	830	2,750
Tahultzu	0	0	0	beaver dams	4	16,000	480	1,600
TOTAL							7,080	23,950
TOTAL excluding Smith and Tahultzu							5,770	19,600

[1] habitat with potential to produce Nechako River recruits.
[2] rough estimate as to low, medium or high
[3] based on migrant yield of 0.03 to 0.10 migrants/m^2
[4] Reaches 1 to 3 have edge restrictions, therefore approximately 1 m^2/m of stream

1) area/TDS (Slaney et. al. 1980, method A).

Smolt yield ($g/m^2/yr$)= 0.026 (TDS) - 0.085

Nechako TDS = approximately 42 (Slaney et. al, 1984)

Smolt yield $\simeq$ 0.026 (42) - 0.085 = 1.007 $g/m^2/yr$

If "smolts" in the Nechako are 1+ and 2+ migrants (i.e. mean weight of 10 g) then migrant yield is $\frac{1.007\ g/m^2/yr}{10\ g} = 0.10/m^2/yr$.

2) Juvenile production capacity--Lardeau River (Slaney, 1981)

Total migrants = Age 2 and 3 migrants (from steelhead model) + Age 1 migrants (60% of total)

Given:

TDS = 42

T = mean annual temperature = 5.6°C

H_S = habitat smolt yield = $0.0159/m^2$

N_S = 0.00049 (TDS) + .0037 = 0.0243

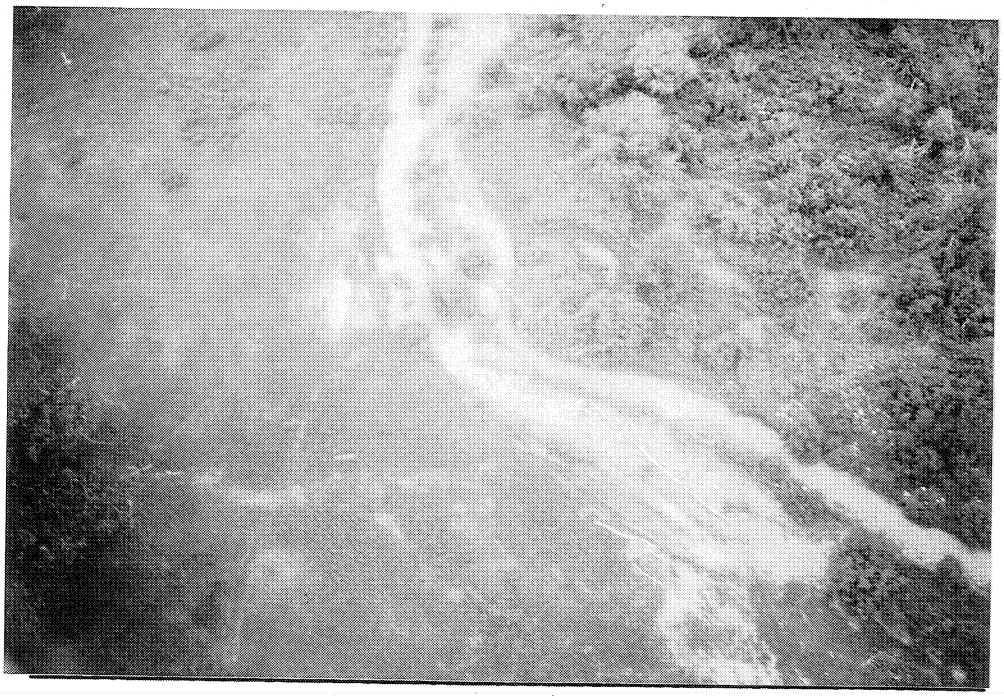
Age 2 and 3 = $H_S \quad (\frac{N_S}{0.02})(\frac{T}{9}) = .0159\ (\frac{.0243}{.02})\ (\frac{5.6}{9}) = .012/m^2$

Total migrants = $0.012/m^2 + [(\frac{.60}{.40}) \times 0.012/m^2] = 0.030/m^2$

From the above migrant density estimates (0.03 to 0.10 migrants/m^2), and "productive" habitat area values, very rough capacity estimates of Nechako tributary juvenile production can be made. The range in values is 7,080 to 23,950 migrants/year. Exclusion of Smith and Tahultzu brings this down slightly to 5,770 to 19,600 migrants/year. These values represent the range in total number of migrants per year, assuming any migration of fry does not contribute to Nechako fish populations (i.e. fry migrants do not survive).

PHOTOGRAPHS TO ACCOMPANY FILE

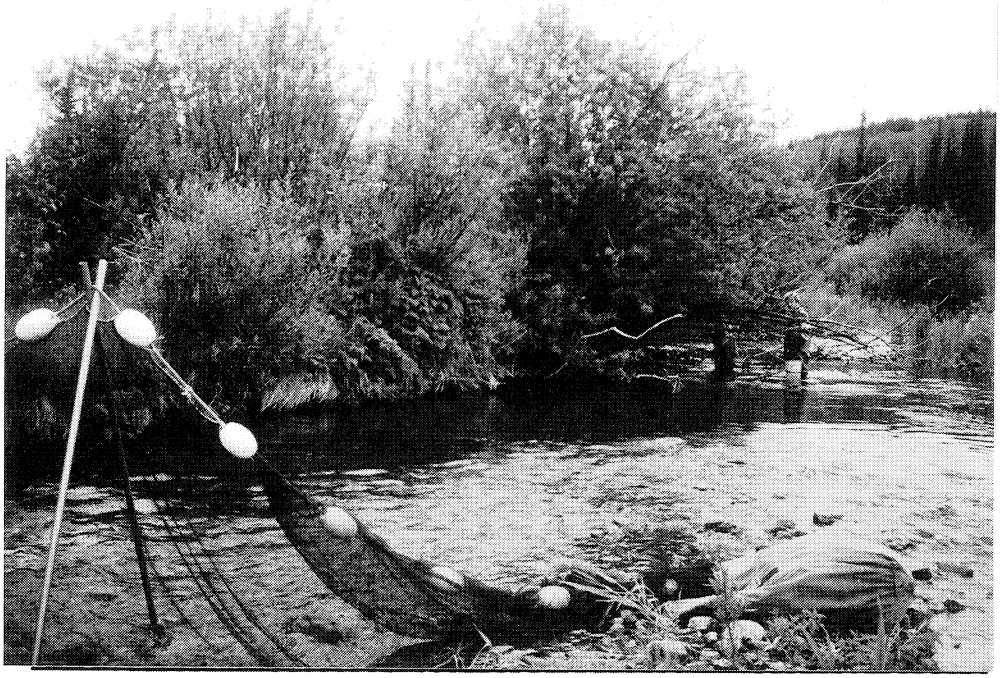
CUTOFF CREEK - "TYPICAL" SWAMP IN LOWER PORTION OF CUTOFF CREEK



CUTOFF CREEK - GRAVEL "FAN" WHERE STREAM "DISAPPEARS"

PHOTOGRAPHS TO ACCOMPANY FILE

"OLD NECHAKO CANYON" - SAMPLE SITE IN REACH 2



TARGE CREEK - SAMPLE SITE NO. 2 IN REACH 1

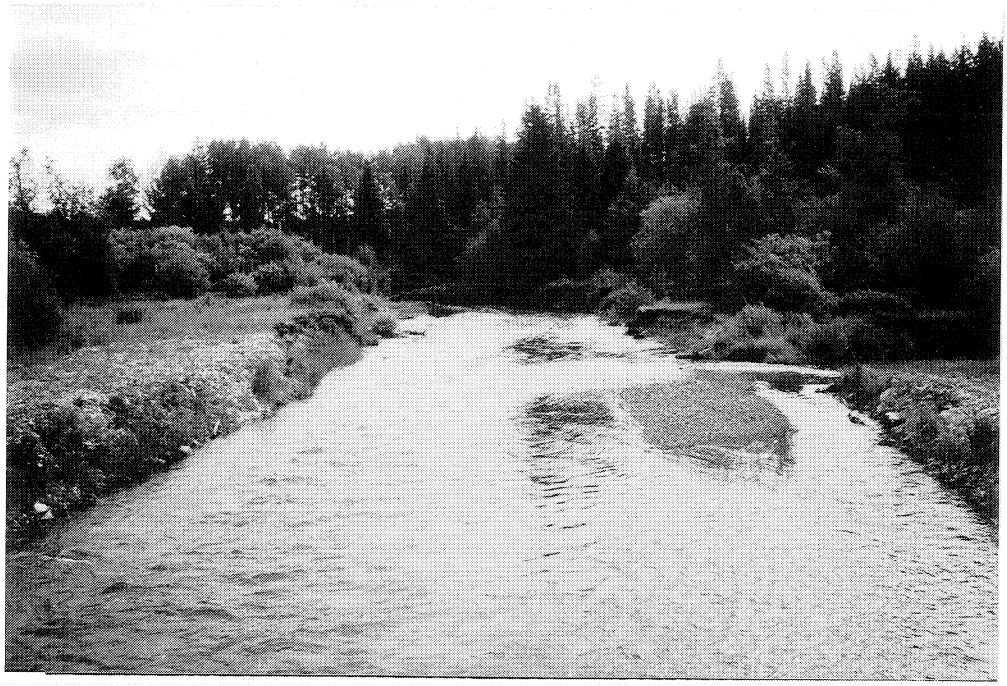
PHOTOGRAPHS TO ACCOMPANY FILE

TARGE CREEK
- AERIAL VIEW OF REACH 2 HABITAT NEAR SITE 1.

SWANSON CREEK - SITE NO. 1 IN REACH 1

PHOTOGRAPHS TO ACCOMPANY FILE

SWANSON CREEK - SITE NO. 2 IN REACH 2 ABOVE KENNEY DAM ROAD UNDER HIGH FLOW CONDITIONS



GREER CREEK - REACH 1 ABOVE KENNEY DAM ROAD UNDER HIGH FLOW CONDITIONS

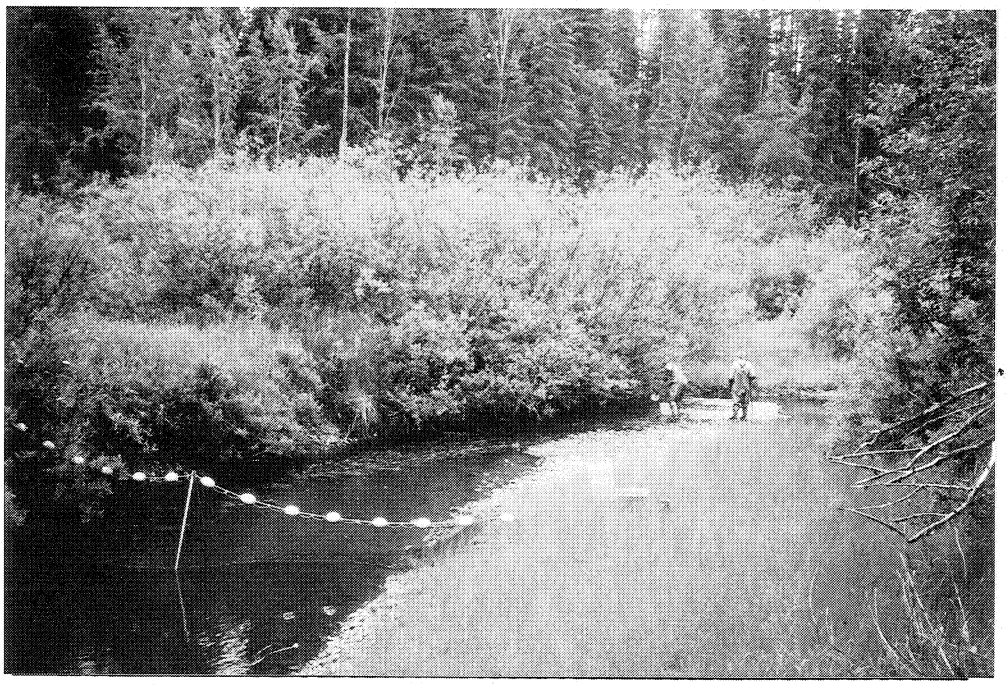
PHOTOGRAPHS TO ACCOMPANY FILE

GREER CREEK - MIDDLE PORTION OF REACH 1 NEAR SAMPLE SITE NO. 2

GREER CREEK - SAMPLE SITE 4 IN REACH 3.

PHOTOGRAPHS TO ACCOMPANY FILE

TAHULTZU CREEK
- SIMILAR HABITAT
IN SMITH CREEK



SMITH CREEK - SAMPLE SITE NO. 1 BELOW
BEAVER DAMS

PHOTOGRAPHS TO ACCOMPANY FILE

SMITH CREEK - SAMPLE SITE NO. 2 BELOW LILY LAKE ROAD