JUVENILE STEELHEAD SURVEYS IN THE KITWANGA, MORICE, SUSTUT AND ZYMOETZ RIVERS 1992

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for

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1.0 INTRODUCTION

Surveys of juvenile steelhead fry and parr abundance were conducted on four steelhead systems tributary to the Skeena River in northwestern B.C. during August and September, 1992. The four systems assessed were the Kitwanga, Morice, Sustut and Zymoetz (Copper) rivers. This is the second consecutive year of surveys in these systems. The surveys were conducted under contract to B.C. Environment and were funded by the Habitat Conservation Fund. This report summarizes the results of the surveys. A separate appendix volume has been prepared documenting detailed location maps (1:50,000), site sketch maps, photographs of each site for each year, and the detailed habitat information collected on MOE/DFO Stream Survey Forms.

1.1 BACKGROUND

There is a general concern for the status of Skeena River summer steelhead stocks - particularly for those runs that enter the Skeena early in the season during an intensive commercial fishery targeting mainly on sockeye and pink salmon. B.C. Environment is concerned that interception of these early-run fish may be decimating this component of the steelhead stocks in the upper Skeena tributaries, in some instances to the point of near extinction. Upper sections of the Sustut, Morice, and Zymoetz rivers are areas where summer steelhead arrive in the upper river during August and early September and where this early component is threatened (B.C. Environment, data on file).

Establishing "index sites" to determine juvenile steelhead abundance estimates throughout these early-run tributaries provides a systematic basis for assessing the strength of past adult escapements to the river systems. At the same time, it offers a means of assessing whether existing habitat is seeded to carrying capacity. Repeated sampling of these sites over time can provide a valuable tool for assessing the condition of the steelhead stocks in these tributaries relative to their potential. It should be noted however, that the juvenile assessments are unable to separate the "early-run" component from fish originating from spawners that may have moved into the upper river system later in the fall period (Zymoetz and Morice rivers).

A total of 123 sites were sampled during the late summer and fall of 1992 and information summarizing the first year of studies is reported in Bustard (1992). Good background data describing juvenile steelhead abundances for the Morice River system was collected by B.C. Environment from 1980 to 1986 (Tredger 1981-87) and during the Kemano Completion Studies (Envirocon Ltd. 1984). Although similar index site assessments were also conducted in the

upper Sustut during the period 1983 to 1985 (Tredger 1986), sampling was conducted on a small number of sites limiting its suitability as an estimate of juvenile steelhead abundance. Similarly, data collected by B.C. Environment at a single site in the Kitwanga River (1983) and several locations in the upper Zymoetz (Ptolemy 1979) provides useful but limited estimates of background levels of juvenile steelhead use in these systems.

Data collected by Williams et al. (1985) and Shirvell (unpublished data, DFO, Pacific Biological Station) is also of limited value as juvenile steelhead "index site" information due to the different techniques used in collecting the information. Williams et al. (1985) relied mainly on seining to delineate juvenile fish abundance in the Sustut, while Shirvell used snorkel observations.

1.2 STUDY OBJECTIVES

The 1992 studies had the following objectives:

1.) To continue juvenile steelhead sampling at a network of index sites throughout the mainstem Kitwanga, Morice, Sustut and Zymoetz rivers in a program to estimate juvenile steelhead fry and parr abundance. The sample sites are located to emphasize the upper reaches of these systems but also includes sites lower in the rivers and a limited number of key tributary streams.

2.) To conduct quantitative estimates of juvenile steelhead abundance in these index sites.

3.) To compare these estimates to 1991 information and to data collected from earlier years when available, and to relate abundance estimates to those expected under full habitat utilization.

As well, in conjunction with adult steelhead studies in the upper Sustut, a water quality sampling program was conducted in this system during 1993. The program included collecting background information describing the water temperature and nutrient regime of the upper Sustut to allow for some comparison of the potential productivity of this regime to streams elsewhere. The detailed results of the temperature studies are presented in Bustard (1993) while the nutrient studies are presented in a separate report (Perrin 1993) and are appended to the back of this report.

2.0 METHODS

Studies were conducted between mid-August and September 25, with some additional sampling conducted in mid-October. Efforts were made to sample the same sites within a few days of the 1991 sample date to reduce variability due time of sampling. This was not possible in all cases. For example mainstem Zymoetz River sites were all sampled in late August 1992 compared to sampling in August and September 1991.

A helicopter was used to access many of the sites in the Sustut River and tributaries, some Morice River tributaries, and the upper sections of the mainstem Zymoetz River. A riverboat was used to access the upper Morice River locations, while all other sites were accessible by vehicle. Crew size ranged from two to five people.

The total number of sites proposed for the 1992 sampling was reduced from the 1991 program due to a lower approved budget in 1992. The sampling program came to an abrupt halt in late September before sample sites in Reaches 2 and 3 of the Morice and in the Clore River (including Trapline Creek) could be completed. Heavy rains throughout late September and October resulted in freshet conditions on the study streams and further sampling was not possible. It had been the plan to move several of the sample sites from locations in the upper reaches of the Morice River to Reach 3 (downstream of Owen Creek) to provide a larger and more representative sample in this reach.

Table 1 summarizes the number and location of sample sites conducted in the river systems. The column listing **PROPOSED** sites is the number identified in the proposal to B.C. Environment (102 sites). The **COMPLETED** column identifies the number of sites that were in fact completed during the 1992 surveys (91 sites).

Table 1. Summary of Number and Location of Index Sites in Upper Skeena Tributaries.

SYSTEM	PROPOSED	COMPLETED
KITWANGA	8	9
MORICE	35	23
SUSTUT	30	38
ZYMOETZ	29	21
TOTAL	102	91

A single mainstem site in Reach 2 of the Morice was sampled on August 19 to provide some comparison for steelhead fry sizes to those obtained during sampling later in September. An additional repeat sample site was located in Lamprey Creek on October 13, but high flows and ice conditions resulted in sampling problems and this data has not been used in the comparisons to earlier catches. Two sites in the Kitwanga were repeat sampled in August and October.

Sample sites ranged in length from 12 to 43 m, with a mean length of 21 m. Stopnets were used to enclose the sites. On smaller tributaries and sidechannels of the mainstem river, the nets were located at the top and bottom ends of the sites. In mainchannel locations, rebar and a minimum of 30 m of stopnet was used to enclose a section of the margin of the site out into the fastwater habitat, often 5-7 m out from the edge in mainstem sites.

Sample crews worked up and down through the site at least twice with a Coffelt gas-powered electroshocker. The two-step removal method was used to estimate fish populations from catches within these sites (Seber and LeCren 1967). If a suitable declining catch was not obtained, a third pass was made. All fish were sorted by species, counted, fork lengths measured to the nearest mm, and returned to the stream after sampling. At least 30 steelhead fry were measured at each site when available.

A sample of weights from all fish species and a range of size classes were obtained from each system. In total, 643 juvenile steelhead were weighed in the four systems using a Sartorius electronic balance and the results were used in calculating regressions for biomass estimates. Scales were retained from a representative range of juvenile steelhead size classes for aging in each system. Typically scales were taken from large fry and small age 1+ steelhead as well as most larger parr to determine the age class separation for various fork lengths. Scales were removed from 192 juvenile steelhead during the 1992 studies.

Sample site areas were calculated from a length and series of width measurements at each site. MOE/DFO Stream Survey Forms were completed for each site. This provided basic descriptions of the physical characteristics of the sites. A photo record of each site was retained. Aside from the physical habitat information recorded on these forms for each site, water temperature, pH, and total dissolved solids (TDS) were measured. TDS measurements were made using a Corning Checkmate TDS meter.

An effort was made to locate sample sites in the same locations as those sampled in 1991. The previous year's maps and photographs were used in the field to re-locate the sample locations. In many cases, the identical site could be sampled. However, in some instances, streamflow and channel changes (particularly in the

Zymoetz and Sustut mainstem) necessitated selecting alternative sites with similar habitat characteristics in the same general location. Sample site location maps presented in this report show the 1992 locations and any sites that were either deleted or shifted from their 1991 locations.

An effort was made to locate sample sites in what was judged to be the best available habitat for steelhead fry and parr. In 1991, a four-class habitat suitability rating system for steelhead fry and parr based on the site physical features (water velocity, depth, bed material and cover characteristics) was developed and each index site was rated as shown in Table 2. This system was re-used in 1992, and during the data analysis some comparisons were made grouping results for the sites that were considered **good** and **excellent** compared to those rated as **poor** or **moderate.** This is important for steelhead parr, where many of the sites selected as good fry rearing habitat were poorly suited for steelhead parr rearing.

Table 2. Juvenile Steelhead Habitat Suitability Rating Criteria.	
STEELHEAD FRY	
EXCELLENT	Shallow (<50 cm) low velocity (<30 cm/sec) cobble\boulder sites with interstitial spaces for hiding and food production - often riffle locations.
GOOD	Similar to above but might include some smaller bed material with less interstitial spaces, higher water velocities, etc.
MODERATE	Limited habitat due to smaller bed material size, poor cover, higher velocities and deeper habitat, etc.
POOR	Generally unsuitable for fry rearing due to high water velocities, small bed material with no hiding spaces, poor cover, etc.
STEELHEAD PARR	
EXCELLENT	Deep (>15 cm) boulder or cobble bed material with moderate water velocity (<75 cm/sec). Large interstitial spaces or good adjacent cover within the site (eg, log jam).
GOOD	Similar to above but poorer cover and less suitable water velocities.
MODERATE	Either too fast or too slow water velocity with poorer cover (few interstitial spaces or lack of debris cover). Typically smaller bed material.
POOR	Unsuitable for parr rearing - typically water velocities are too slow and depths are shallow. In this study, many of the shallow riffle sites selected as good fry rearing offered poor parr rearing habitat.

3.0 RESULTS

3.1 KITWANGA RIVER

The location of the seven sample sites established along the mainstem of the Kitwanga River in 1992 is shown in Figure 1. These sites were located at the same locations as in 1991 although several sites (K4 and K5) were shifted slightly (20 m) to accomodate lower discharges. As well, the total area and length of habitat sampled at several of the sites was increased from 1991 (Table 3). Detailed catch results, habitat descriptions, area and length of each site is presented in Appendix 1.

Repeat sampling was conducted at the two lower sites on the Kitwanga River on October 21 to provide additional density and growth information for juvenile steelhead. A significant freshet occurred on the Kitwanga River during the time between the two sample periods.

3.1.1 Kitwanga River Catch Composition

The total number of fish estimated in the Kitwanga sample sites was less than 50% of the 1991 estimates (Table 3). Steelhead fry comprised 26.5% of the overall catch, down significantly from 1991. Numbers of chinook and Dolly Varden were also down, while coho and steelhead parr numbers and overall percentage of the catch were higher. The October sample (two sites only) was dominated by steelhead fry and parr.

3.1.2 Kitwanga River Juvenile Steelhead Densities

Steelhead fry densities average 0.22 fry/m^2 for the seven sites. Fry densities were highest at Site K5 (0.55 fry/m^2) and were less than 0.1 fry/m^2 at Sites K3 and K7 (just downstream of Kitwancool Lake). These levels are approximately 15% of the 1991 densities and occurred in all reaches of the Kitwanga River (Figure 2A).

Data from a single site (51 m^2) sampled during 1983 in the vicinity of Site K4 (Reach 3)[1] indicated fry densities were 2.8 fry/m^2 and were far in excess of the past two years' results (Figure 2B). Sampling for all three years was conducted during the latter half of August.

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[1] Data on file, B.C. Environment, Victoria (R. Ptolemy)

Table 3. Catch Composition of Fish at Kitwanga River Sample Sites in 1991 and 1992.

	AUGUST				OCTOBER	
	1991		1992		1992	
	N	%	N	%	N	%
Steelhead 0+	921	61.8	178	26.5	48	76.0
Steelhead 1+	33	2.2	53	7.9	8	12.8
Steelhead ≥2+	0	0.0	2	0.3	0	0
Chinook	159	10.7	89	13.3	6	9.6
Coho	35	2.3	144	21.4	0	0
Dolly Varden	278	18.6	130	19.3	1	1.6
Whitefish	11	0.8	0	0	0	0
Sculpins	54	3.6	76	11.3	0	0
TOTAL	1491		672		63	
AREA (m^2)	695		935		137	
LENGTH (m)	133		146		37	

The mean fry densities at Sites K1 and K2 during late October were 0.36 fry/m^2 compared to 0.32 fry/m^2 in late August, indicating little difference in steelhead fry densities at these sites despite a major freshet between sample periods. Fry densities were approximately twice as high at sites rated as **good** or **excellent** fry habitat versus those rated **poor** and **moderate** (Table 5).

Parr densities averaged 0.06 parr/m^2 with the highest densities at Sites K2, K4 and K7 (Table 4). This compares to a density of 0.04 parr/m^2 sampled in 1991 and 0.26 parr/m^2 sampled at a single site in 1983[2]. In 1991 parr were virtually absent from all reaches of the Kitwanga River except immediately downstream from the lake. Although the densities were still far below the 1983 sample densities in 1992, parr were more numerous and widespread in the lower sample sites than in 1991. The relatively high steelhead fry densities of 1991 did not lead to exceptional parr densities this year. Sample sites that were rated **good** and **excellent** parr habitat

[2] Data on file, B.C. Environment, Victoria (Ron Ptolemy)

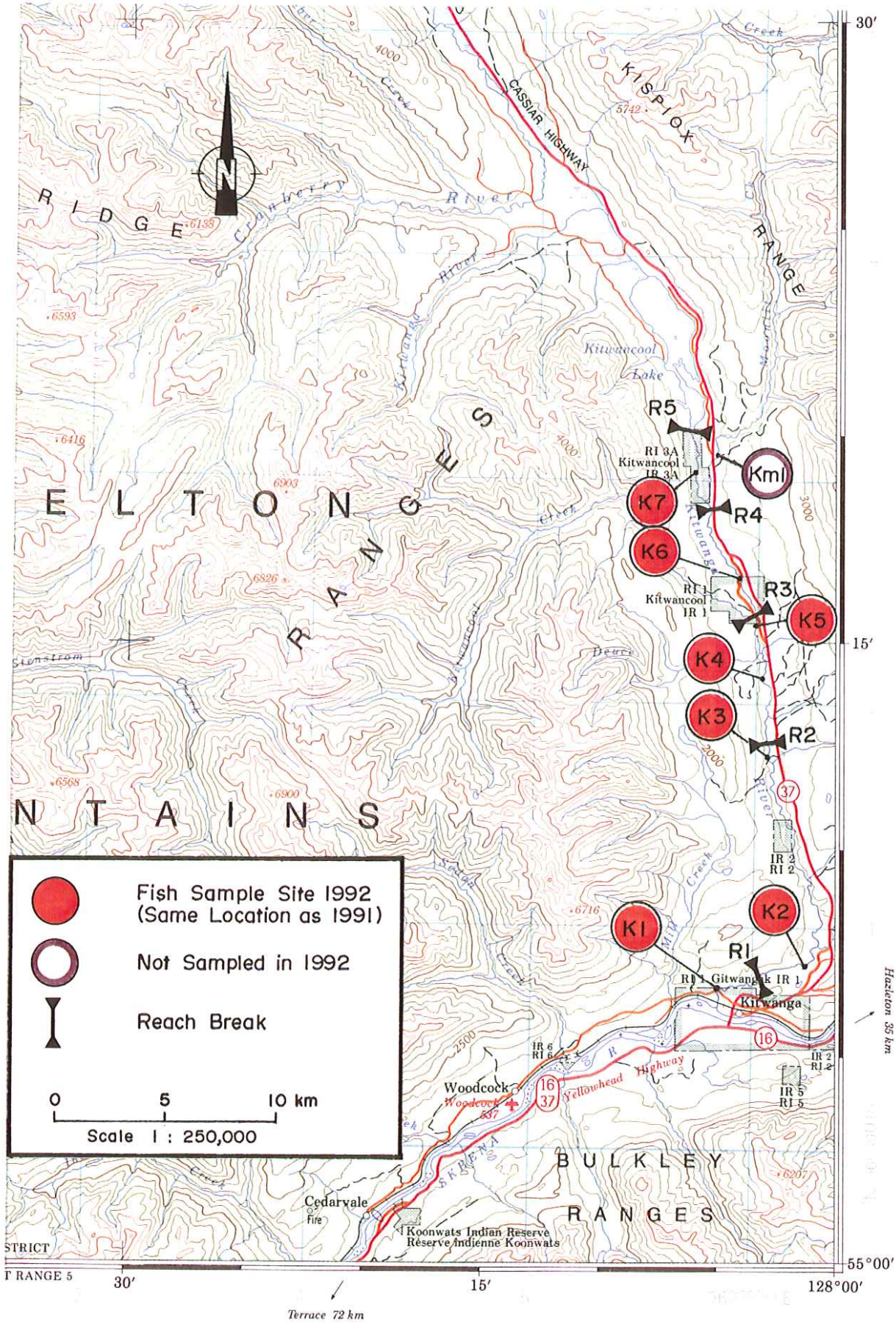

Figure 1. Location of Kitwanga River Juvenile Fish Sample Sites.

Table 4. Summary of Juvenile Steelhead Density Estimates in the Kitwanga River in 1991 and 1992.

SITE (REACH)	AUGUST				OCTOBER	
	FRY/M^2		PARR/M^2		1992	
	1991	1992	1991	1992	FRY/M^2	PARR/M^2
K1 (1)	1.28	0.34	0.01	0.01	0.14	0.06
K2 (2)	2.32	0.30	0.02	0.12	0.59	0.06
K3 (2)	1.59	0.03	0.02	0		
K4 (3)	1.55	0.11	0	0.13		
K5 (3)	1.54	0.55	0	0.01		
K6 (4)	1.42	0.19	0.01	0.02		
K7 (5)	0.32	0.01	0.21	0.12		
MEAN	1.43	0.22	0.04	0.06	0.36	0.06

Table 5. Summary of Juvenile Steelhead Catches in Kitwanga River Habitat Suitability Rating Categories.

SUITABILITY RATING	FRY/M^2		PARR/M^2	
	1991	1992	1991	1992
POOR AND MODERATE	1.15	0.14	0.06	0.05
GOOD AND EXCELLENT	1.80	0.32	0.01[3]	0.07

had only slightly higher parr densities than poorer habitat sites (Table 5).

The mean steelhead parr densities in October at sites K1 and K2 (0.06 parr/m^2) were comparable to the August densities at these two sites.

[3] Nearly all parr captured in 1991 were in Reach 1 immediately downstream from Kitwancool Lake.

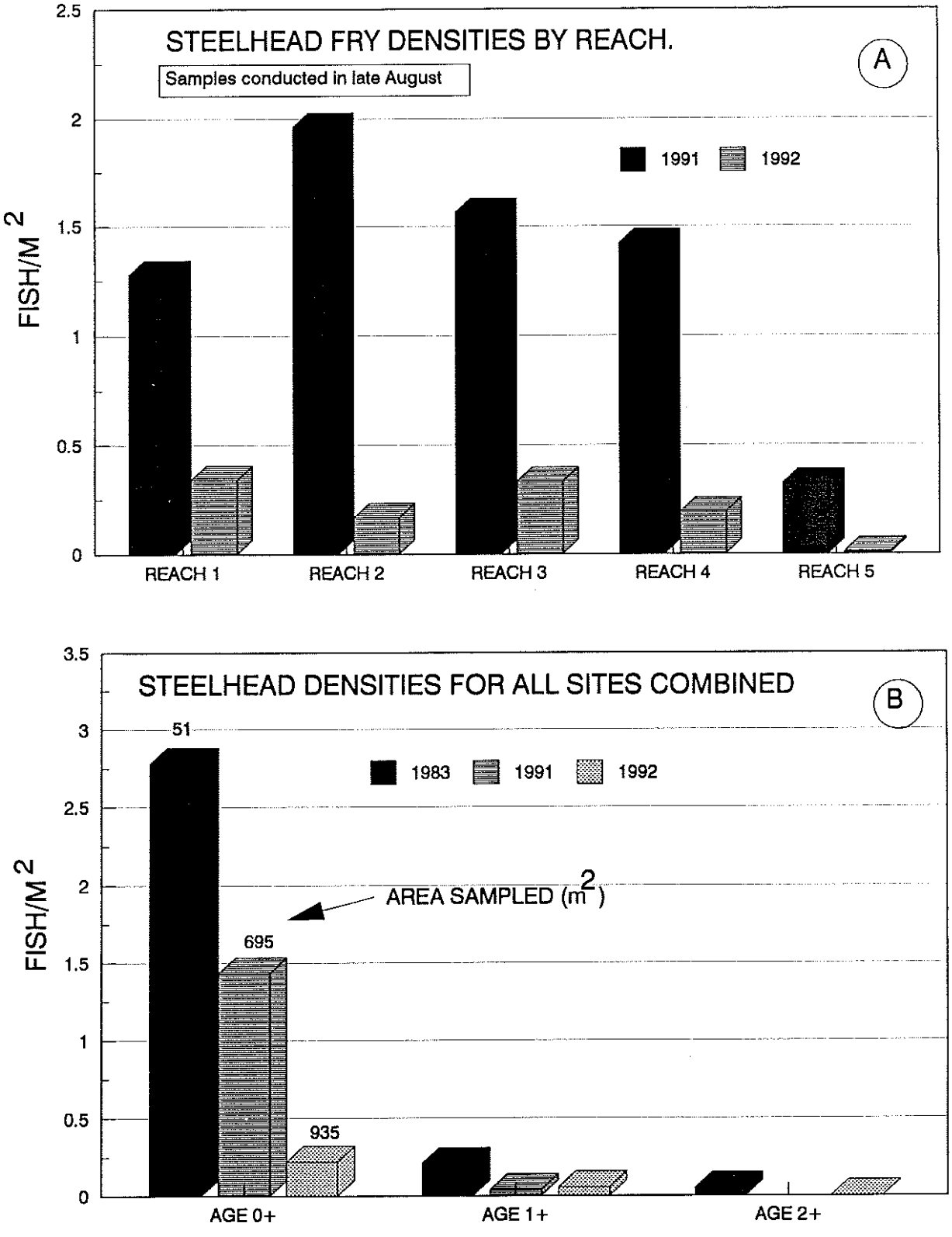

Figure 2. Summary of Juvenile Steelhead Densities in the Kitwanga River.

3.1.3 Kitwanga Biomass Estimates

Total fish biomass estimates at the sites ranged from a low of 0.25 fish/m^2 at Site K3 to nearly 4 g/m^2 at Site K7 (Table 6). The mean biomass of 2.0 g/m^2 was approximately 75% of the mean for 1991. Site K3 had a substantially higher biomass in 1991 reflecting a higher abundance of steelhead and Dolly Varden present at this site. The site was rated as generally poor habitat, largely due to low water velocities and small bed material (Appendix 1).

Steelhead fry biomass estimates were less than 50% of the levels estimated in 1991 while steelhead parr biomass estimates were more than double, largely reflecting the changes in density of these two age classes present in the Kitwanga River in 1992.

Table 6. Summary of Juvenile Steelhead Biomass Estimates in the Kitwanga River in 1991 and 1992.

	FRY/M^2		PARR/M^2		ALL SPECIES	
	1991	1992	1991	1992	1991	1992
K1 (1)	0.79	0.39	0.05	0.04	1.35	0.98
K2 (2)	1.49	0.43	0.10	0.84	5.00	3.22
K3 (2)	0.63	0.04	0.08	0.00	2.67	0.25
K4 (3)	0.66	0.08	0.00	0.78	2.37	3.76
K5 (3)	0.88	0.68	0.00	0.04	2.17	0.98
K6 (4)	0.87	0.18	0.03	0.12	1.63	0.97
K7 (5)	0.56	0.02	0.79	0.80	3.77	3.99
MEAN	0.84	0.26	0.15	0.37	2.71	2.02

3.1.4 Kitwanga River Fish Size Estimates

Steelhead fry mean fork lengths for each reach for 1991 and 1992 are presented in Figure 3A. The data indicates that steelhead fry were larger in all of the reaches of the Kitwanga River in 1992 compared to the previous year. If the lengths for the lower four reaches of the Kitwanga River (excluding the lake outlet area) are compared then steelhead fry were approximately 8 mm larger in 1992 compared to 1991 (Table 7). The larger steelhead fry in the Kitwanga River in 1992 may reflect a lower density present compared to 1991, although possible earlier emergence may be a factor.

Steelhead fry measured at a single site in 1983 when steelhead fry densities were very high, were comparable in size to the 1992 fry

Table 7. Summary of Steelhead Fry and Parr Mean Fork Lengths and Weights in the Kitwanga River Compared to Past Sample Data[4].

DATE	AGE 0		AGE 1+	
	FORK LENGTH (mm)	WEIGHT (g)	FORK LENGTH (mm)	WEIGHT (g)
1983 (Aug 26)[5] (N)	43.5 NR[6]	0.98	98.4 (9)	10.6
1991 (Aug 15-19) (N)	36.0 (184)	0.62	70.0 (5)	4.72
1992 (Aug 17-18) (N)	44.1 (161)	1.13	77.4 (45)	5.98
1992 (Oct 21) (N)	58.5 (48)	2.46	76.0 (8)	5.29

densities (Table 7). However, the 1983 measurements were made 8-9 days later than in 1991 and 1992. This may account for at least some of the size differences observed in 1983 compared to 1991 when fry densities were also high. Steelhead fry at Sites K1 and K2 in the lower Kitwanga River averaged 58.5 mm on October 21 (Table 7) compared to a mean fork length of 45.2 mm for these sites in mid August, indicating the mean fry size had increased over 13 mm during this period.

Steelhead age 1+ parr mean fork lengths averaged 77.4 mm in 1992 (Table 7). Parr data for other years is based on very small sample sizes. This is a small mean size for age 1+ parr, with parr sizes ranging from 61 mm to 100 mm fork length (Figure 3B). Several small juveniles in the 61-63 mm range were captured in the uppermost sample site downstream of Kitwanga Lake and were determined to be age 1+ fish based on scale analysis. Sampling during 1991 indicated fry emergence at some locations in the Kitwanga River such as Moonlit Creek occurred later than in the mainstem river and that fry were on average 10 mm smaller than mainstem fish. Some of the small parr captured in the 1992 surveys may have been from fish that emerged late from locations such as Moonlit Creek.

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[4] Excludes Reach 5 of Kitwanga River (not sampled in 1983 and October 1992)

[5] Data on file, B.C. Environment, Victoria (R. Ptolemy)

[6] Sample size not reported

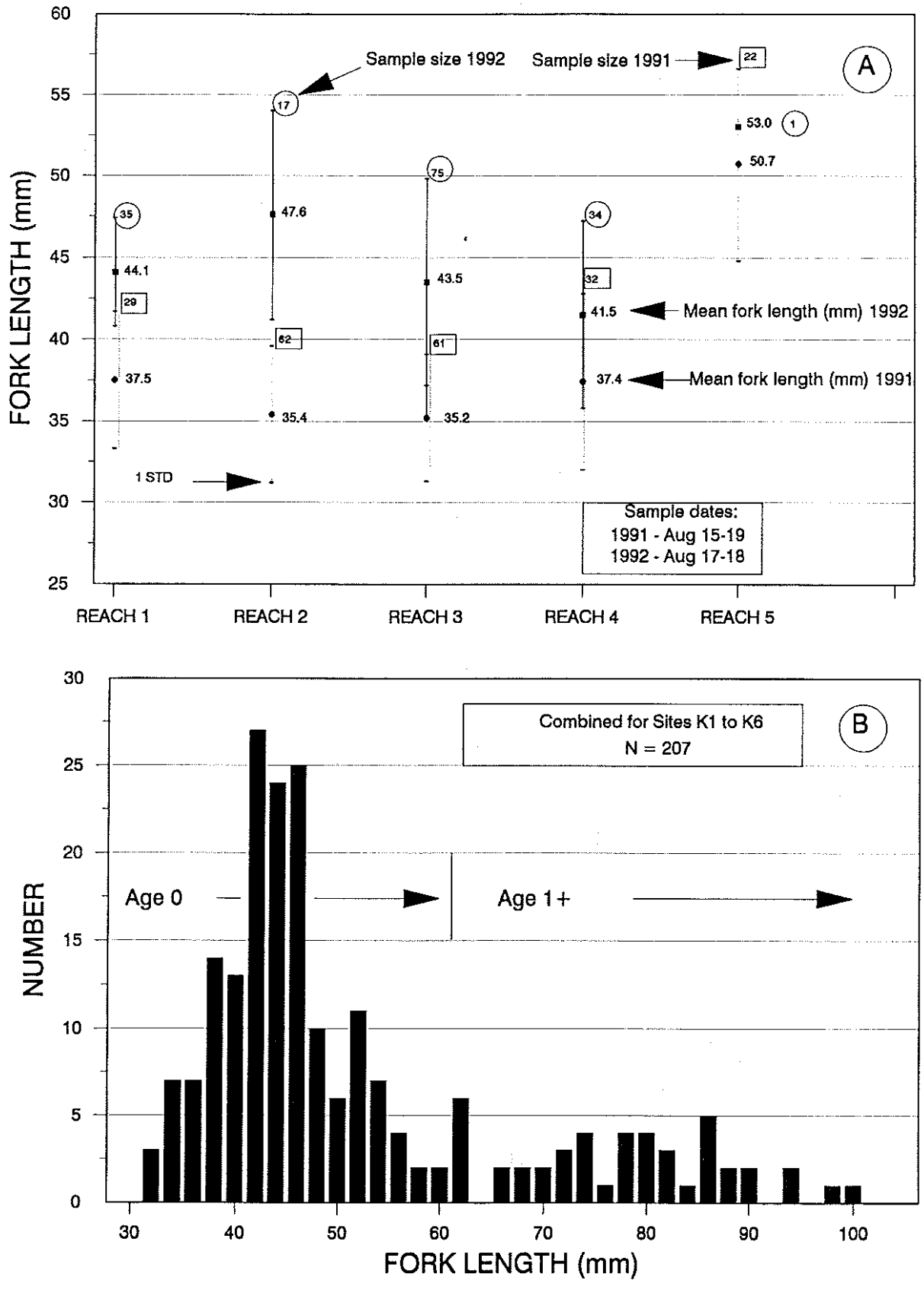

Figure 3. Length Summaries for Kitwanga River Steelhead 1992.

3.2 MORICE RIVER

A total of 23 sample sites were located in the Morice River watershed, including 10 on the mainstem river and 13 in tributary streams. An additional nearby upper Bulkley River tributary (Buck Creek) was sampled as part of this survey since the site has served as a steelhead index site since 1987. All sample site locations are shown in Figure 4.

The mainstem sites comprised 1131 m^2 of habitat (196 m of margin) in the uppermost reach of the Morice River (Table 8). A total of 2206 m^2 of habitat (303 m of stream length) was sampled in six tributaries. Specific site descriptions and catch data for each site is presented at the end of Appendix 2.

3.2.1 Morice River Catch Composition

A total of 410 fish were estimated within the nine sites in the upper Morice River (Table 8). This is less than half of the number of fish sampled in a larger overall area in this reach in 1991. The catch was predominantly steelhead fry (49.4%), juvenile coho (24.9%) and chinook salmon (18.9%). Steelhead parr comprised 3.9% of the overall catch. The composition of the catch by species was generally similar to the catch for this section of the river in 1991.

The combined tributary catch of fish was 1701 fish compared to 2521 fish captured in 1991 (Table 8). Steelhead fry predominated the 1992 catch (44.6%) but numbers were approximately one-half of the 1991 levels. Steelhead parr numbers were higher than in 1991 while coho juvenile catches were up in lower Owen, Lamprey and Shea creeks (Appendix 2 Table 1).

3.2.2 Morice River Juvenile Steelhead Densities

Mainstem Morice River Fry Densities

Juvenile steelhead densities in the nine Morice River sites (Reach 1) are summarized in Table 9 and Figure 5. Fry densities averaged 0.17 fry/m^2 for all of the sites combined. This is down from densities of 0.27 fry/m^2 for these same sites in 1991. Fry were present at all of the sites sampled, but densities did not exceed 0.3 fry/m^2 at any of the sites. In 1991, fry densities were similar in Reaches 1 and 2 and were approximately one-half of the levels found in Reach 3 of the Morice.

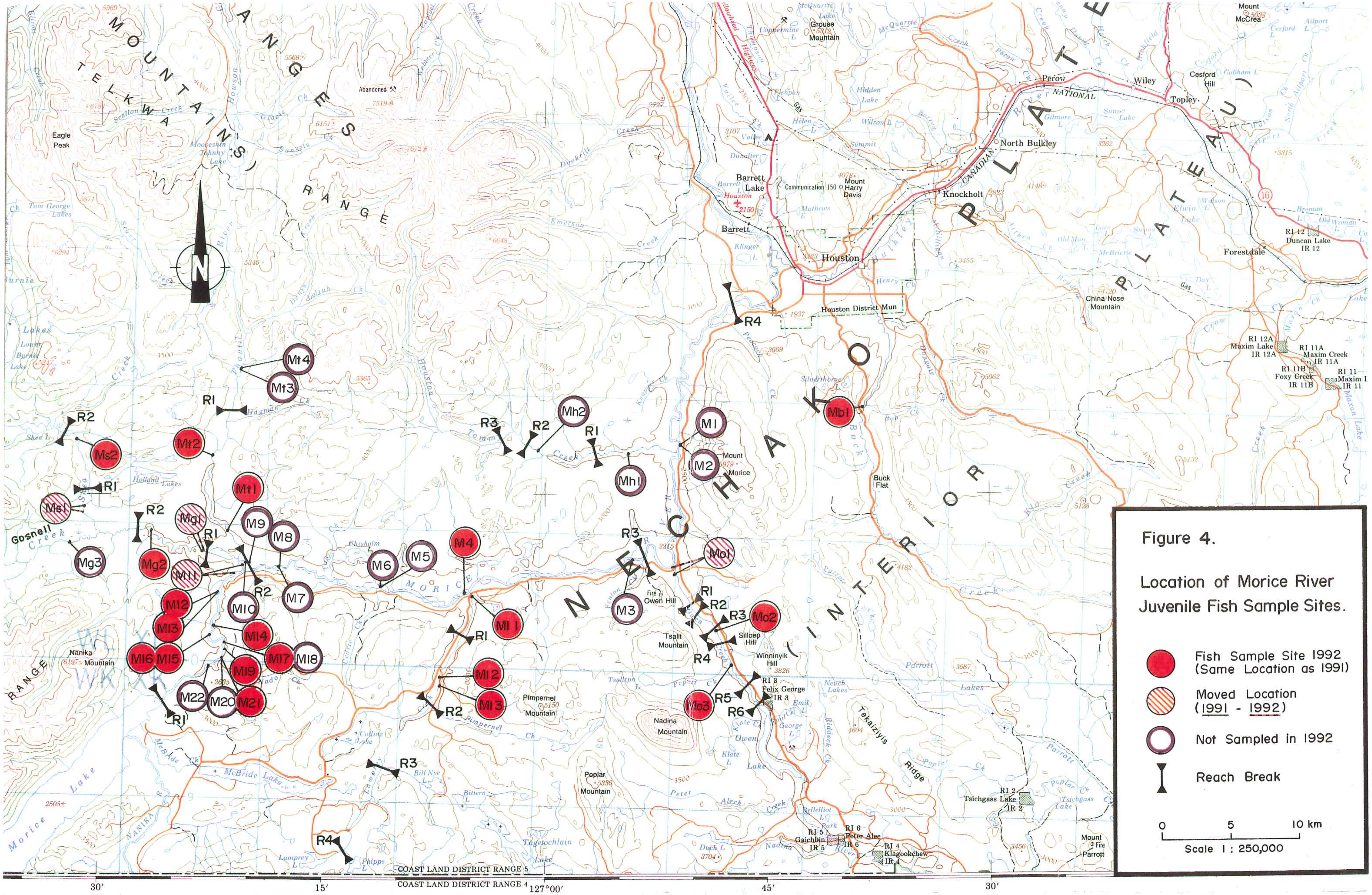

Figure 4.

Location of Morice River Juvenile Fish Sample Sites.

Table 8. Catch Composition of Fish at Morice River Mainstem Sample and Tributary Sample Sites in 1991 and 1992.

	MAINSTEM[4]				TRIBUTARIES			
	1991		1992		1991[5]		1992	
	N	%	N	%	N	%	N	%
Steelhead 0+	425	50.5	202	49.4	1418	61.2	758	44.6
Steelhead 1+	29	3.4	10	2.4	151	6.5	173	10.2
Steelhead ≥2+	25	3.0	6	1.5	45	1.9	62	3.5
Chinook	132	15.7	78	18.9	57	2.5	51	3.0
Coho	187	22.2	102	24.9	142	6.1	369	21.7
Dolly Varden	0	0	0	0	73	3.2	71	4.2
RM Whitefish	1	0.1	0	0	52	2.2	85	5.0
Sculpins sp.	40	4.8	12	2.9	0	0	1	0.1
LN Dace	3	0.4	0	0	365	15.8	134	7.9
Sucker sp	0	0	0	0	13	0.6	3	0.2
TOTAL	842		410		2316		1701	
AREA (m^2)	1565		1131		2521		2206	
LENGTH (m)	254.2		196.4		354.3		303.4	

There was little difference in fry densities between mainchannel and sidechannel locations in Reach 1 (Table 10). As well, fry densities were similar in habitats rated as **good** or **excellent** compared to **poor** or **moderate** (Table 10).

Figure 5B compares the mainstem Morice steelhead fry densities to data collected since 1980 (Tredger 1981 to 1987) and from last year's sampling. The data suggests that fry densities are in the lower range of levels obtained in the past. Fry densities have been higher in four of the sample years and slightly lower during three years. It should be noted that data from all sites sampled were used in making these comparisons. The sample data for 1985

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[4] Data is for Reach 1 of the mainstem Morice River only for both years.

[5] 1991 data from Houston Tommy Creek is not included as this system was not sampled in 1992.

Table 9. Summary of Juvenile Steelhead Density Estimates in Reach 1 of the Mainstem Morice River Sample Sites

SITE	FRY/M^2		PARR/M^2	
	1991	1992	1991	1992
M11	0.02	0.13	0	0
M12	0.48	0.24	0.02	0
M13	0.18	0.06	0.10	0.06
M14	0.23	0.08	0.09	0
M15	0.32	0.18	0.10	0.03
M16	0.46	0.17	0.02	0.01
M17	0.33	0.31	0.02	0.02
M19	0.27	0.18	0	0
M21	0.11	0.16	0	0.02
REACH 1 mean	0.266	0.168	0.039	0.016

Table 10. Summary of Juvenile Steelhead Catches in Morice River Habitat Suitability Rating Categories and in Sidechannel and Mainchannel Habitat.

	FRY/M^2		PARR/M^2	
SUITABILITY RATING	1991	1992	1991	1992
POOR AND MODERATE	0.14	0.21	0.01	0.01
GOOD AND EXCELLENT	0.30	0.16	0.09	0.03
	SIDE	MAIN	SIDE	MAIN
REACH 1 - 1991	0.24	0.28	0.02	0.05
REACH 1 - 1992	0.20	0.14	0.03	0.01

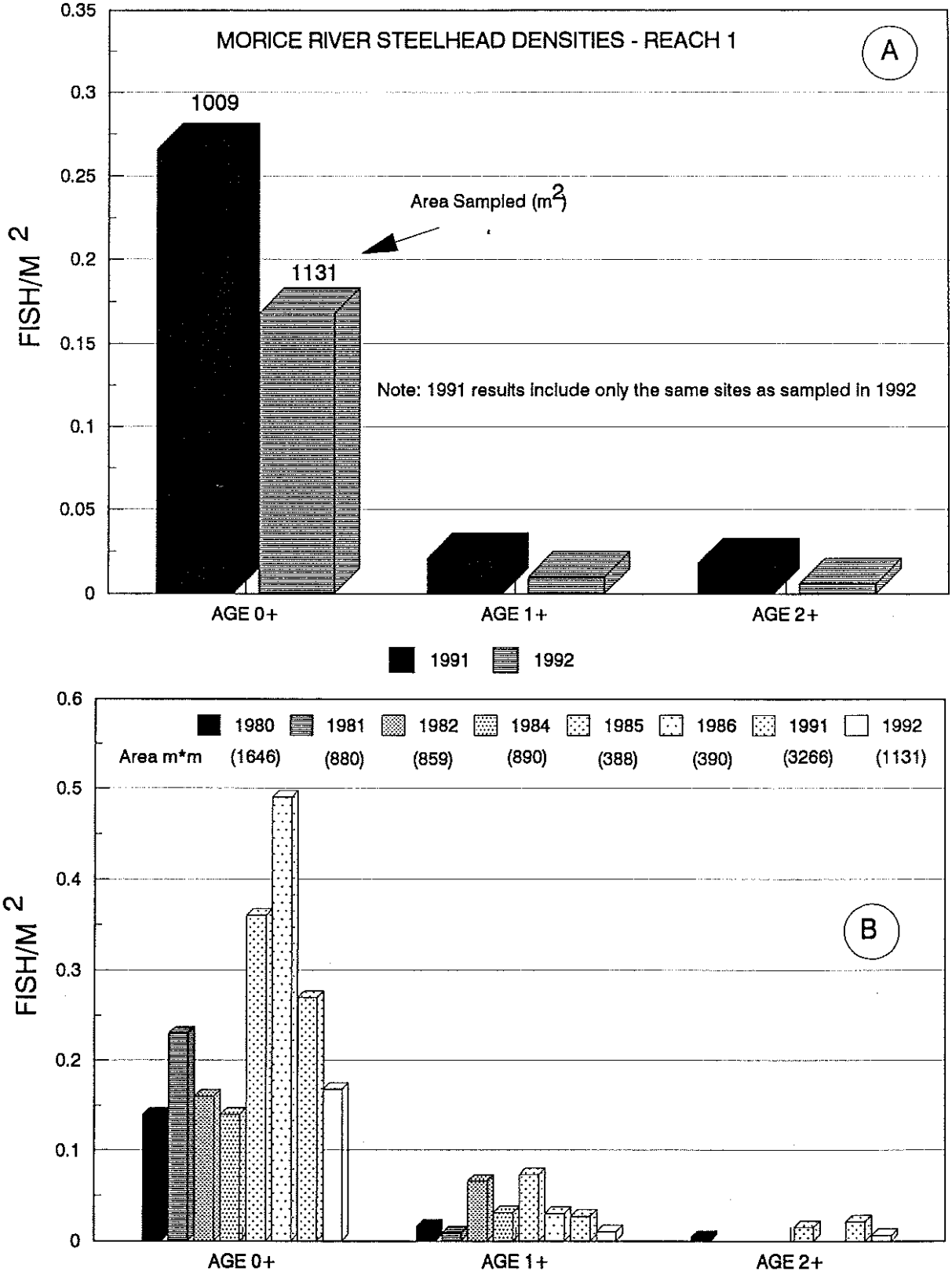

Figure 5. Summary of Juvenile Steelhead Densities in the Morice River.

and 1986 is based on less than 400 m^2 of habitat sampled, mainly in Reach 3, where fry densities have tended to be higher than in the upper reaches (Bustard 1992).

Mainstem Morice River Parr Densities

Steelhead parr densities at the nine Morice River sites are summarized in Table 9. Parr densities averaged a low 0.016 parr/m^2 for all of the sites combined (0.010/m^2 age 1+ fish and 0.006/m^2 age ≥2+ fish). These densities were less than 50% of the levels obtained at these sites in 1991.

If we omit the **poor** and **moderate** habitat sites which tend to be the areas selected as most suitable for steelhead fry rearing, then the parr densities averaged 0.03 parr/m^2, approximately one-third of the levels obtained at the **good** and **excellent** parr sites in 1991 (Table 10). The decline in parr abundance occurred mainly at mainchannel sites compared to sidechannel areas (Table 10).

Steelhead parr densities from past surveys (Tredger 1981 to 1987) are shown in Figure 5B. The data suggests that parr densities are in the low range of those obtained from past sampling. Again, it should be recognized that the parr data for past years is based largely on estimates made in Reaches 2 and 3 of the Morice where parr densities have tended to be higher than in Reach 1 (Bustard 1992). As well, comparisons to years prior to 1991 are limited by typically small sample areas that were only partially enclosed.

Morice River Tributary Fry Densities

Juvenile steelhead densities in the 12 tributary sample sites are presented in Table 11. Both Owen and Lamprey creeks had mean fry densities in the range of 0.8 fry/m^2 indicating good recruitment to these two key steelhead streams in 1992 but down from 1991 levels. However, average fry densities did not exceed 1 fry/m^2 in any of the systems in 1992, although they were a very high 1.9 fry/m^2 at one site in Lamprey Creek (Site M11). Fry densities in the Thautil River, and Gosnell, Shea and Buck creeks were less than 0.2 fry/m^2 and indicated poor recruitment to all of these systems in 1992.

Figure 6A illustrates the decline in steelhead densities that occurred throughout the Morice tributaries compared to the 1991 results at the same sites. For a longer term view of these results, Figure 7 compares the fry densities obtained in 1992 to sampling results from Tredger (1981 to 1987) in four of the tributaries. These results suggest that although the densities are lower than those obtained in 1991, the fry densities measured in Lamprey Creek and the Thautil River are still in the upper range of

Table 11. Summary of Juvenile Steelhead Density Estimates in Morice River Tributary Sites.

SITE	FRY/M^2		PARR/M^2	
	1991	1992	1991	1992
Mt1	0.38	0.16	0.07	0.11
Mt2	0.12	0.08	0.13	0.04
THAUTIL mean	0.25	0.12	0.10	0.07
Mo2	1.12	0.89	0.19	0.37
Mo3	1.34	0.79	0.10	0.24
OWEN mean[6]	1.23	0.84	0.14	0.31
Ml1	0.99	0.33	0.06	0.04
Ml2	0.14	0.14	0.05	0.06
Ml3	1.97	1.89	0.08	0.01
LAMPREY mean	1.04	0.79	0.06	0.04
Mb1 BUCK	0.45	0.02	0.08	0.11
Mg1	0.28	0.12	0.04	0.15
Mg2	0.55	0.22	0.05	0.06
GOSNELL mean	0.42	0.17	0.04	0.10
Ms1	0.56	0.16	0.10	0.20
Ms2	0.40	0.07	0.12	0.05
SHEA mean	0.48	0.12	0.11	0.12

past sampling. Owen Creek steelhead fry densities are in the mid-range results and Shea Creek densities are in the lower end of the range of past sampling.

The Buck Creek results are of particular interest since this site has been sampled in an identical fashion for the past six consecutive years. Steelhead fry densities in Buck Creek were down drastically from past sample results at this site (Figure 8A). Fry

[6] Results from Site Mo1 are not included in these summaries. This site was modified substantially by a beaver dam located at the road culverts and was judged to be not representative.

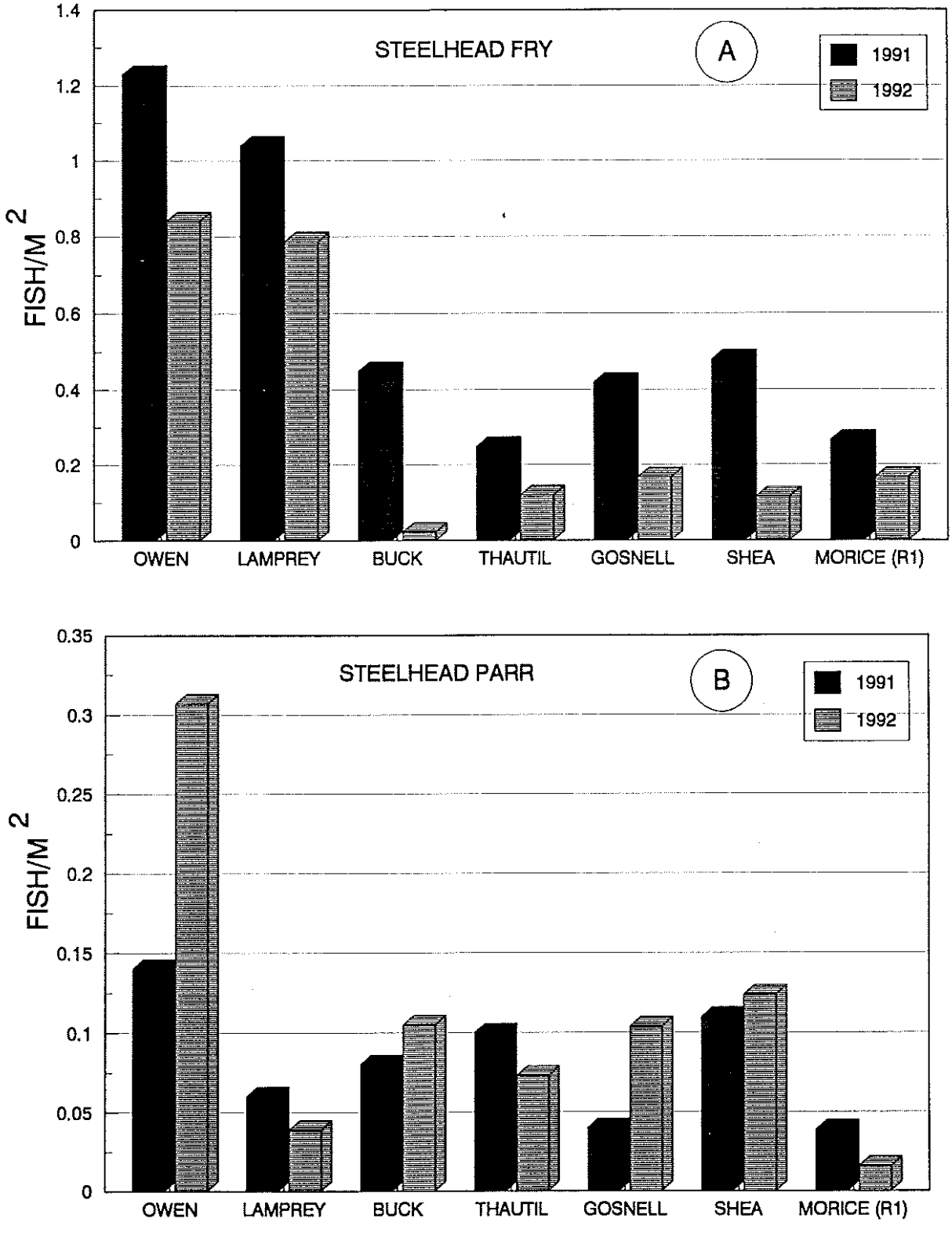

Figure 6. Steelhead Fry and Parr Densities in Morice System in 1991 and 1992.

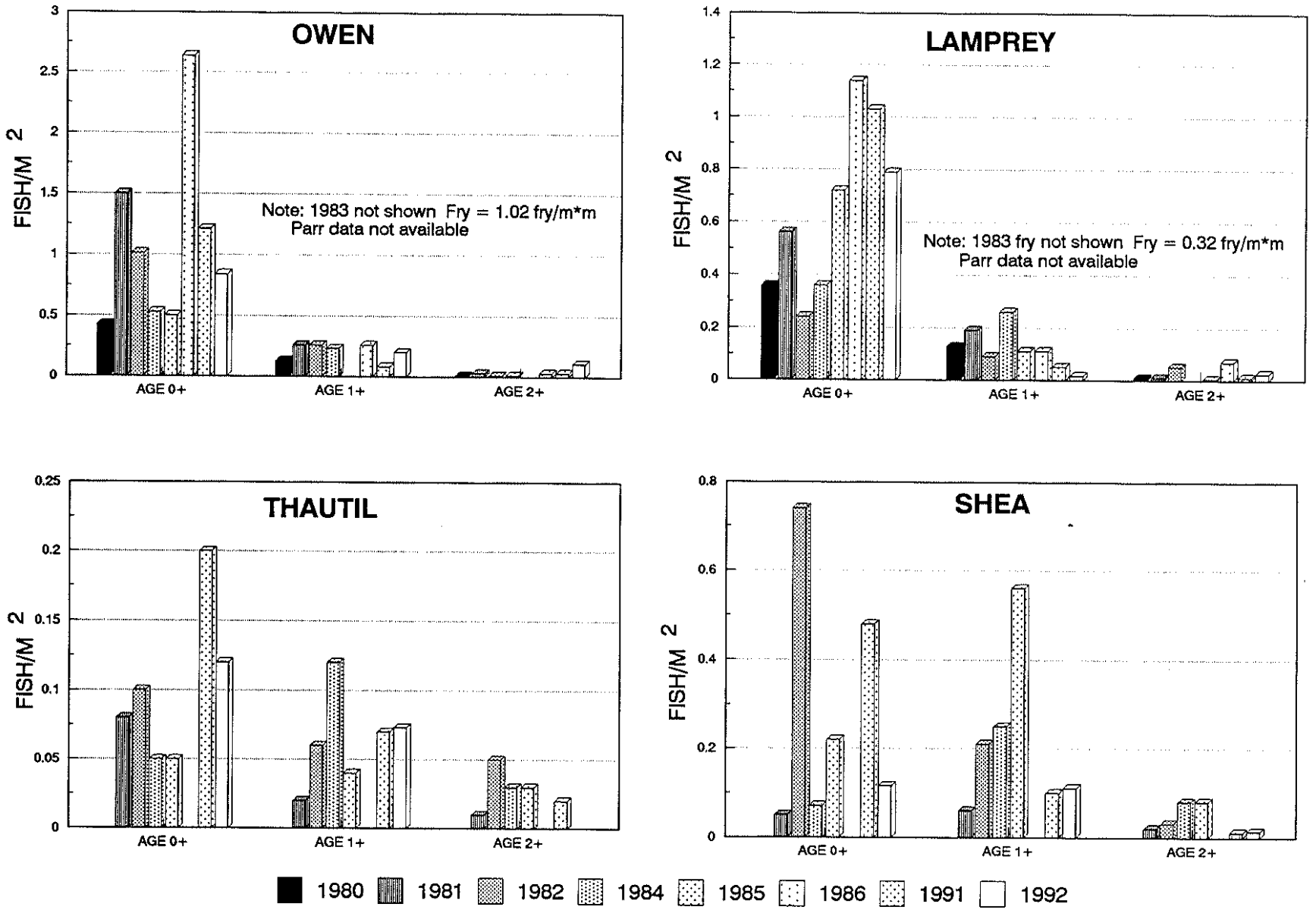

Figure 7. Summary of Juvenile Steelhead Densities in Four Morice Tributaries from 1980 to 1992.

numbers have fluctuated in the range of 50 to over 200 in this 43 m long site from 1987 to 1991. In 1992, just 8 fry were sampled at this site, indicating very poor recruitment to this steelhead tributary compared to past years (Figure 8B).

Morice Tributary Parr Densities

The average parr densities in tributary streams (Table 11) indicate that densities were in the range of 0.1 parr/m^2 in Buck, Gosnell and Shea creeks, slightly lower in the Thautil River (0.07 parr/m^2) and considerably higher in Owen Creek (0.31 parr/m^2). Lamprey Creek parr densities were again the lowest of the tributary streams (0.04 parr/m^2).

A comparison of the parr density data in the tributary streams to data collected in 1991 is shown in Figure 6B. The biggest change between years was a substantial increase in parr densities in Owen Creek and to a lesser extent in Gosnell Creek. The other systems were either up or down a small amount from the previous year.

Steelhead parr data from past surveys conducted by Tredger (1981 to 1987) is shown in Figure 7 for four of the tributaries. The data suggests that the Owen Creek parr densities are up in the range of those sampled from 1981 to 1986 and are probably more representative of the capability of this system compared to the 1991 results.

The Lamprey Creek parr densities remained very depressed compared to sampling conducted in the 1980's, and occurred despite very high fry densities in 1991. The late summers of 1991 and 1992 have been very dry and Lamprey Creek streamflows were very low during both summers. Tredger's data suggests that Lamprey Creek can support steelhead parr densities in the order of 0.2 to 0.3 parr/m^2 during some years. Similarly, Shea Creek steelhead parr densities remained low relative to levels measured in the period 1982 to 1985 and suggest that this system can support higher parr densities than measured in 1991 and 1992.

Sample data from the Thautil River continues to suggest that despite lower fry recruitment compared to the other tributaries, this system is capable of providing significant rearing for steelhead parr. Fry densities in this system have not exceeded 0.2 fry/m^2 in any of the six years of sampling. Parr densities have tended to be in the range of 0.07 to 0.15 parr/m^2 during most years of sampling.

Parr densities in Buck Creek remained near 0.1 parr/m^2, similar to the densities measured in the previous 5 years (Figure 8B). This occurred despite relatively high steelhead fry densities in Buck

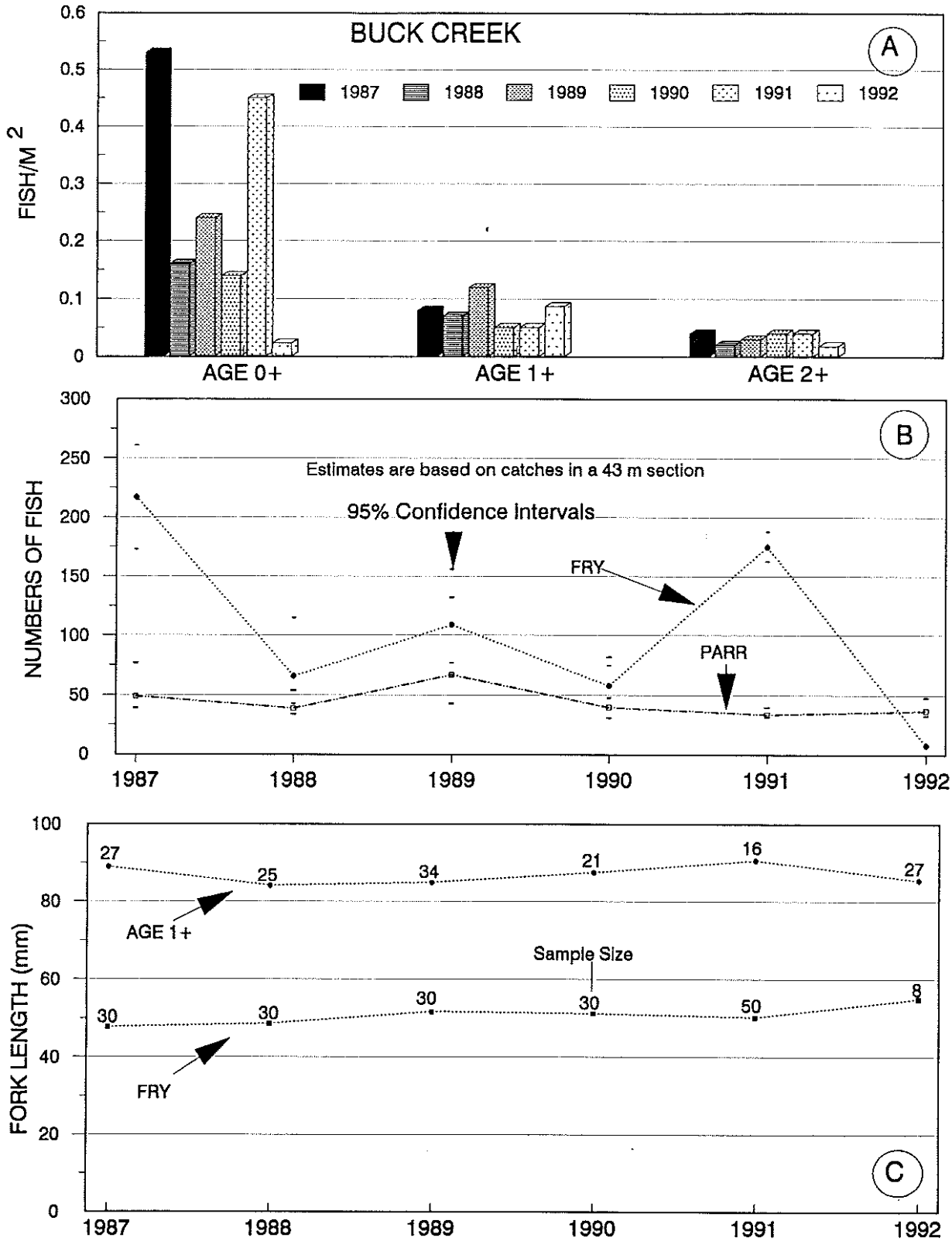

Figure 8. Juvenile Steelhead Density, Population and Size Estimates in Lower Buck Creek (Site BB3) from 1987 to 1992.

Creek in 1992. A similar pattern was noted in 1988, when parr densities remained stable despite high fry recruitment the previous season (Figure 8).

3.2.3 Morice River Biomass Estimates

Total fish biomass in the Reach 1 of the Morice averaged just over 2 g/m^2, up from the 1991 estimates of 1.4 g/m^2 in this reach (Table 12). The highest biomass sampled (6.6 g/m^2) was at Site M14 and was largely the result of high juvenile chinook catches at this site (Appendix 2). Steelhead fry (0.4 g/m^2) and parr (0.5 g/m^2) mean biomass estimates were comparable to levels estimated in this reach in 1991 (Table 12).

The highest biomass in the tributary streams was in Owen Creek (6.3 g/m^2) and was comprised largely of steelhead parr and fry (4.5 g/m^2). Total fish biomass in the other tributaries ranged from 0.8 g/m^2 to 2.5 g/m^2 with a significant decline in overall biomass in Buck Creek compared to 1991 (Table 12). This decline was largely the result of a decline in longnose dace and steelhead fry at the Buck Creek site.

Table 12. Summary of Juvenile Steelhead Biomass Estimates in the Morice River and Tributaries in 1991 and 1992.

	FRY (g/m^2)		PARR (g/m^2)		ALL SPECIES (g/m^2)	
	1991	1992	1991	1992	1991	1992
MORICE R1	0.31	0.42	0.59	0.51	1.43	2.02
OWEN	1.65	1.14	1.06	3.41	3.49	6.34
LAMPREY	1.25	0.74	0.50	0.62	2.56	2.46
BUCK	0.70	0.05	1.11	0.92	4.57	1.75
THAUTIL	0.23	0.10	0.84	0.45	1.48	0.84
GOSNELL	0.18	0.14	0.30	0.69	0.77	1.08
SHEA	0.34	0.08	0.83	0.77	2.26	1.54

3.2.4 Morice River Fish Size Estimates

Morice Mainstem

Steelhead fry from Reach 1 of the Morice River averaged 48.5 mm fork length while parr averaged 84.8 mm (Table 13). These fry were the largest recorded to date in the mainstem Morice River for the September period. A sample of steelhead fry from a single site on the mainstem Morice on August 19 averaged 31.3 mm fork length (Table 14). The very small fry sizes on this date indicated that

Table 13. Summary of Juvenile Steelhead Mean Fork Lengths and Weights in the Morice River Compared to Past Sample Data.

YEAR	AGE 0		AGE 1+	
	FORK LENGTH (mm)	WEIGHT (g)	FORK LENGTH (mm)	WEIGHT (g)
1979[7]	42.3	NA[8]	NA	NA
1980[9]	42.8	0.87	81.8	6.04
1981	36.1	0.53	82.7	6.70
1982	35.5	0.52	76.0	4.85
1984	37.2	0.50	73.3	3.70
1985	34.2	0.45	NA	NA
1986	34.6	0.47	NA	NA
1991 Reach 2 (N)	42.5 (238)	0.92	85.2 (40)	6.35
1991 Reach 1 (N)	45.7 (281)	1.27	88.4 (29)	7.10
1992 Reach 1 (N)	48.5 (157)	1.51	84.8 (10)	8.48

[7] Data from Envirocon Ltd. (1984)

[8] Inadequate sample size or data not available.

[9] Data from Tredger (1980 to 1986) for those sites located in Reach 2 of the Morice River. Note sampling from 1981 to 1986 was conducted during late August. Sampling in 1979, 1980, 1991 and 1992 was conducted in September.

emergence was still underway in this section of the river. The average parr fork lengths were not larger than past years, however the mean weight was the highest estimated to date. It must be noted that the mean sample size of 10 age 1+ parr is very small.

The date and location of sampling can have a significant bearing on the estimates of fry size in this system. Much of the sampling during the mid-1980's was conducted during late August compared to the late September sampling in 1991 and 1992. This would account for the small size of fry for the period 1981 to 1986. The importance of location is illustrated by the results from 1991 that indicated steelhead fry in Reach 2 were more than 3 mm smaller than Reach 1 fry and more than 7 mm smaller than Reach 3 fry (Bustard 1992).

Table 14. Summary of Steelhead Fry Fork Lengths in the Mainstem Morice River and Lamprey Creek for Different Sample Dates.

DATE	SITES	MEAN FORK LENGTH (mm)	SAMPLE SIZE	STD
LAMPREY CREEK				
Aug 19/92	M13	43.0	49	6.4
Sept 25/92	M11 & M12	47.1	86	7.2
Aug 28/91	M13	47.4	31	5.4
Sept 29-Oct 3	M11 & M12	47.8	67	7.9
MAINSTEM MORICE RIVER				
Aug 19/92	M4	31.3	29	2.4
Sept 21-22/92	M11-M21	48.5	157	6.4
Sept 23-25/91	M11-M22	45.7	281	6.6

Morice Tributaries

Steelhead fry mean fork lengths for five tributaries sampled during late August are shown in Figure 9A. Fry sizes in Owen and Shea creeks and the Thautil River were similar to the 1991 data. Lamprey fry were over 4 mm smaller and Buck Creek fry were nearly 5 mm larger, possibly reflecting the very low densities in Buck Creek in 1992.

The Lamprey Creek fry data was collected 10 days earlier in 1992 compared to 1991 (Table 14), and it is probable that this difference in timing of sampling could largely account for the size differences. All other tributary sampling was conducted within a few days of the previous year's sampling. By late September, the Lamprey Creek fry mean lengths were virtually the same as those measured the previous year. It is interesting to note that there was very little change in steelhead fry size in Lamprey Creek from late August to late September during both 1991 and 1992. It appears that most of the growth occurs during late July and August. Presumably the very low streamflows and high densities of steelhead fry limited growth during September of both years.

Mainstem Morice River fry averaged a very small 31 mm on the same date that Lamprey Creek fry were 43 mm but were of a comparable size by late September (Table 14). Fry in the mainstem are not subject to the low flow and crowding conditions experienced by the Lamprey Creek fry during dry summers such as 1991 and 1992.

The larger fry sizes in Owen and Buck creeks carry through to larger age 1+ parr sizes (Figure 9B). Age 1+ parr sizes were approximately 5 mm smaller in Buck and Shea creeks and the Thautil River than in 1991. Owen parr were slightly larger, but were in the mid-range of past age 1+ parr samples collected in this system (Table 15).

Table 15. Summary of Juvenile Steelhead Mean Fork Lengths and Weights in Lamprey and Owen Creeks Compared to Past Sample Data.

YEAR	AGE 0		AGE 1+	
	FORK LENGTH (mm)	WEIGHT (g)	FORK LENGTH (mm)	WEIGHT (g)
OWEN CREEK				
1980[10]	50.5	1.38	92.0[11]	8.37
1981	45.4	1.01	91.7	8.29
1982	47.0	1.12	80.1	5.53
1983	44.8	1.03	88.0	7.60
1984	45.5	0.93	89.5	7.11
1985	46.1	1.15	85.2	7.07
1986	44.4	1.01	82.6	6.39
1991	47.3	1.34	84.2	6.93
1992	49.5	1.56	87.0	7.33
LAMPREY CREEK				
1980	47.8	1.17	87.5	7.20
1981	39.0	0.64	78.4	5.18
1982	41.1	0.75	75.4	4.61
1983	46.3	1.12	83.1	6.37
1984	44.9	0.86	84.7	5.72
1985	40.0	0.74	88.2	8.28
1986	41.8	0.85	82.4	6.21
1991	47.4	1.22	80.2	5.87
1992	43.0	0.88	Inadequate sample size	

[10] Data from Tredger (1981 to 1986) calculated from summaries. 1991 and 1992 data is for late August sampling only.

[11] Note - the break-off from age 1+ to age 2+ was higher in 1981, 1982 and 1985 than during other years. Therefore age 1+ fish included more larger parr than subsequent years. These differences may reflect different scale readers for fish aging.

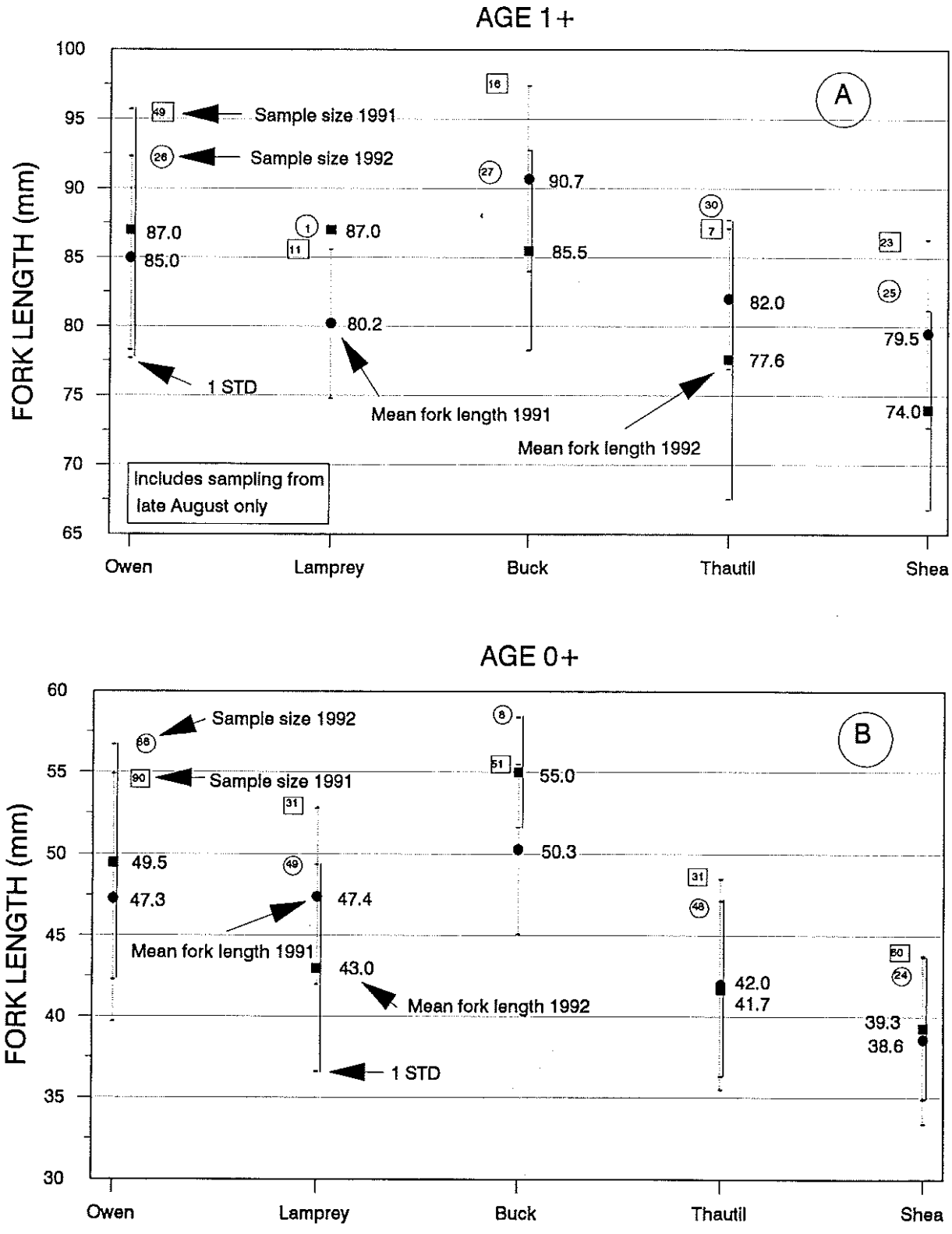

Figure 9. Juvenile Steelhead Length Summaries for Morice River Tributaries.

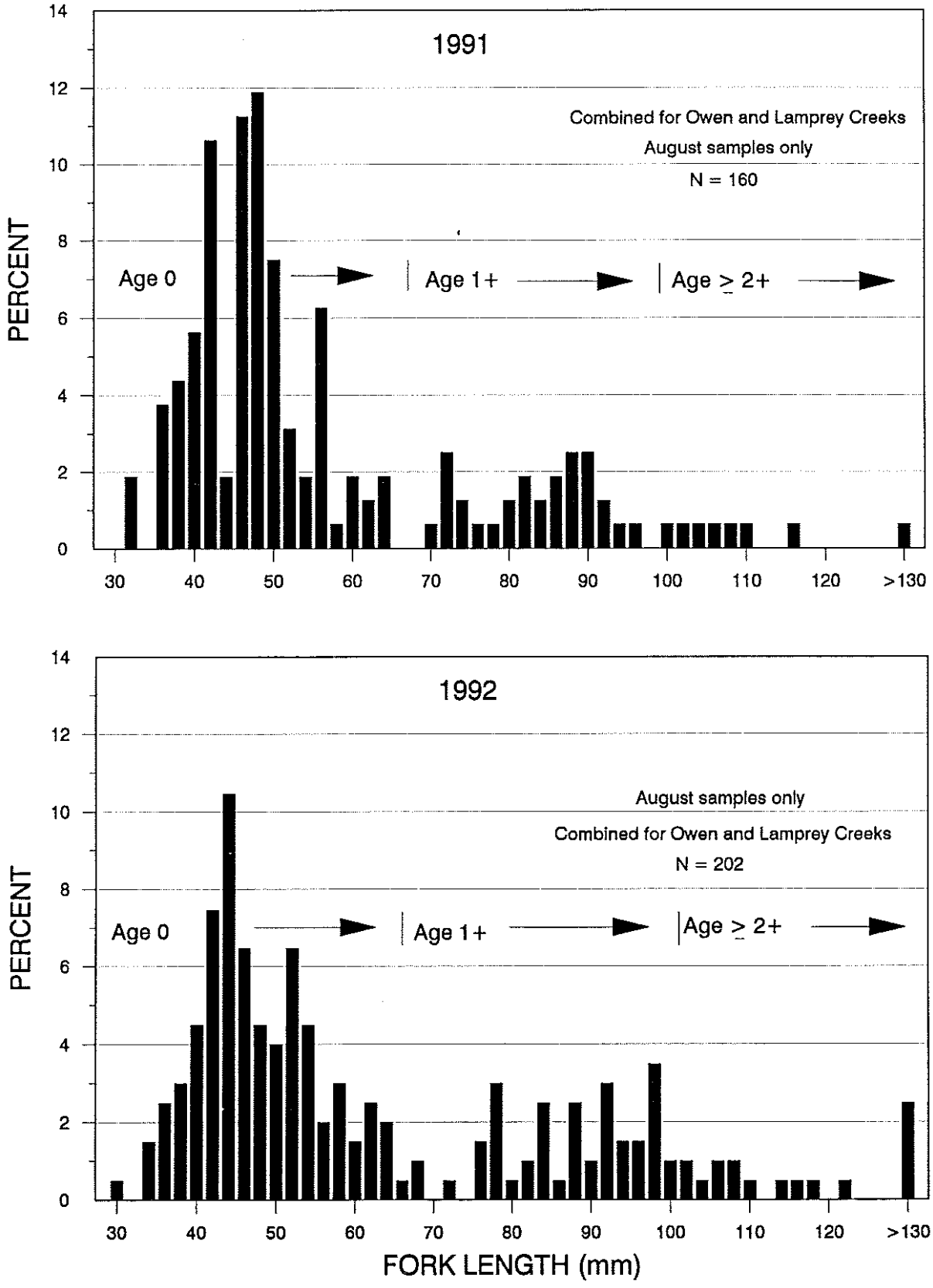

Figure 10. Length-frequency of Juvenile Steelhead in Owen and Lamprey Creeks.

3.3 SUSTUT RIVER

A total of 38 sample sites were located in the Sustut River watershed, including 23 on the mainstem of the Sustut and an additional 15 in tributaries including Johanson Creek (5 sites) and the Bear River (2 sites). Additional sites including Darb, Solo and an unnamed tributary to Johanson Creek (SUc1) and several inlet tributaries to Sustut Lake and the upper Sustut River were sampled for the first time. All sample site locations are shown in Figure 11.

The mainstem sites comprised 3038 m^2 of habitat (430 m of margin) in the 7 reaches of the Sustut River to its confluence with the Skeena River (Table 16). A total of 1616 m^2 of habitat (299 m of stream margin) was sampled in the tributaries. Specific site descriptions and catch data for each site is presented at the end of Appendix 3.

3.3.1 Sustut River Catch Composition

A total of 1065 fish were estimated in the mainstem sample sites in 1992. This is up from the numbers estimated in a larger number of sites in 1991 (Table 16). The numbers of all species and age classes of fish were higher in the mainstem sites in 1992, particularly steelhead parr and chinook salmon. Steelhead parr comprised nearly 14% of the catch in 1992 compared to just over 5% in 1991. Juvenile coho numbers remained at less than 4% of the overall catch.

The combined tributary catch of fish was 457 fish compared to 273 in 1991. It should be noted that the tributary catches include a number of new sites in tributaries that were not sampled in 1991 and do not include catches in systems such as Two Lakes and Moosevale creeks that were sampled in 1991. The biggest differences compared to the previous year were increases in steelhead fry, coho, Dolly Varden and mountain whitefish at the 1992 sites.

Detailed results summarizing the numbers of all fish species captured at each site in the mainstem and tributaries are presented in Appendix 3 Table 1.

3.3.2 Sustut River Juvenile Steelhead Densities

Juvenile steelhead densities in mainstem sites on the Sustut River are summarized in Table 17. Fry densities averaged 0.18 fry/m^2 for all of the sites combined. This compares to overall fry densities of 0.13 fry/m^2 at these same sites in 1991.

Table 16. Catch Composition of Fish in the Sustut River and Tributary Sample Sites in 1991 and 1992.

	MAINSTEM				TRIBUTARIES			
	1991		1992		1991[12]		1992[13]	
	N	%	N	%	N	%	N	%
Steelhead 0+	395	56.1	429	40.3	87	31.9	166	36.3
Steelhead 1+	27	3.8	116	10.9	16	5.9	21	4.6
Steelhead ≥2+	11	1.6	32	3.0	11	4.0	14	3.1
Chinook	203	28.8	321	30.1	25	9.2	40	8.8
Coho	18	2.6	35	3.3	12	4.4	33	7.2
Dolly Varden	41	5.8	73	6.9	112	41.0	159	34.8
RM Whitefish	8	1.1	52	4.9	7	2.6	22	4.7
LN Dace	0	0.0	0	0	3	1.1	2	0.4
Burbot	1	0.1	7	0.7	0	0.0	0	0
TOTAL	704		1065		273		457	
AREA (m^2)	4282		3038		2355		1616	
LENGTH (m)	670.8		430.1		375.2		299.3	

Similar to 1991, the highest steelhead fry densities occurred at Site S22 in Reach 5 and in S27 in Reach 6 (Table 17). Densities were close to 0.6 fry/m^2 at these two locations. The mean fry densities were in the 0.3 to 0.4 fry/m^2 range in Reaches 6 and 7 of the Sustut River. Steelhead fry densities in the upper three reaches of the Sustut River were notably higher than those measured in this section in 1991 (Figure 12). At the same time, steelhead fry densities in Reach 1 of the Sustut were down from levels measured in 1991 and considerably lower than the upper river estimates. Steelhead fry densities at all sites from Reach 5 upstream consistently exceeded 0.2 fry/m^2 except at Site S30 located just downstream of Mud Lake. No steelhead were captured at this site in either 1991 or 1992 and it is assumed that all steelhead spawning occurs downstream of this location. Estimates from Site

[12] Includes Bear, Johanson, two unnamed tributaries to Johanson Creek, Two Lakes and Moosevale Creek sites.

[13] Includes Bear, Johanson (and three unnamed tributaries to Johanson Creek), Solo, Darb, and Sustut Lake inlets streams

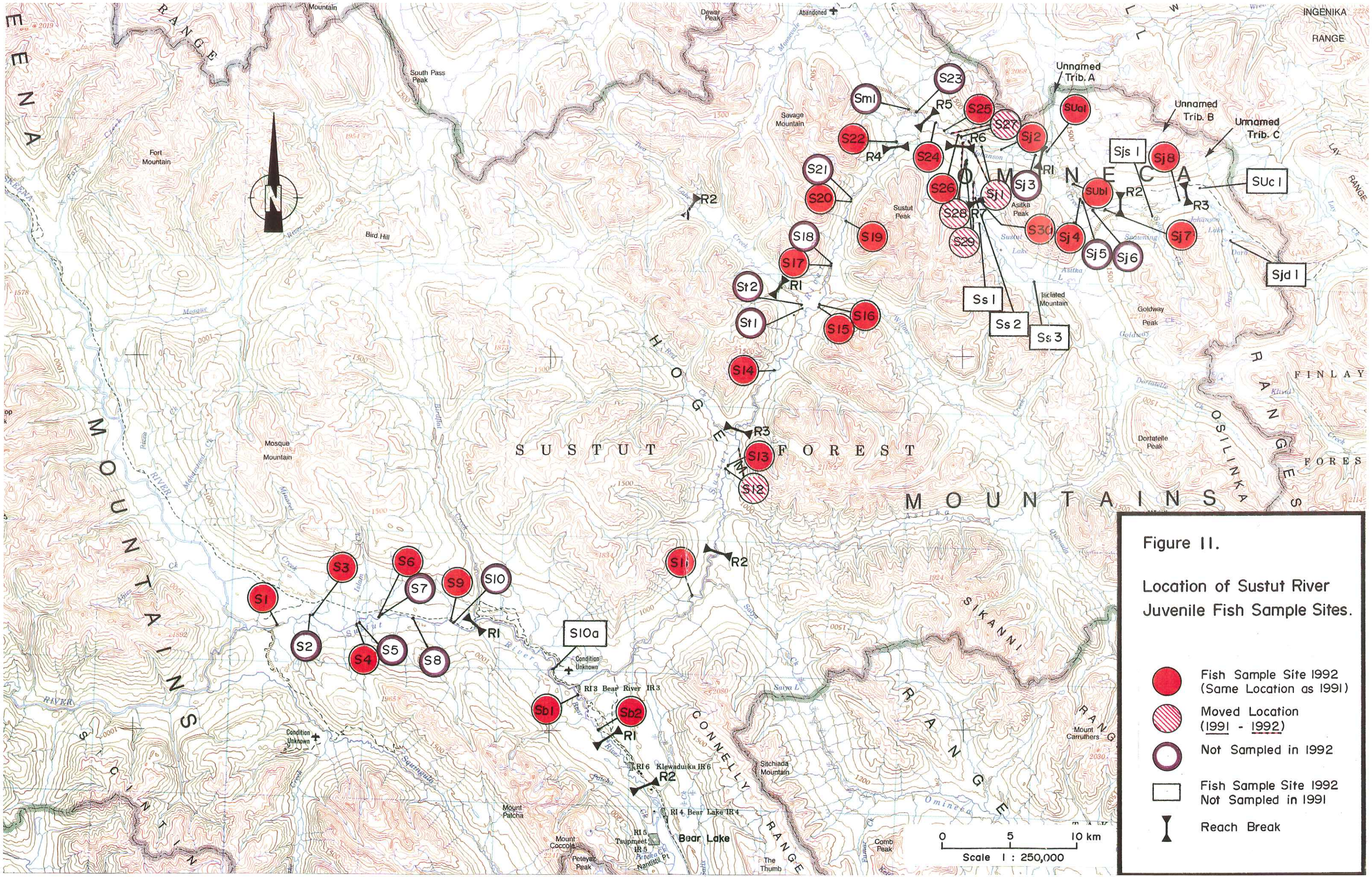

Figure 11.

Location of Sustut River Juvenile Fish Sample Sites.

- Fish Sample Site 1992 (Same Location as 1991)
- Moved Location (1991 - 1992)
- Not Sampled in 1992
- Fish Sample Site 1992 Not Sampled in 1991
- Reach Break

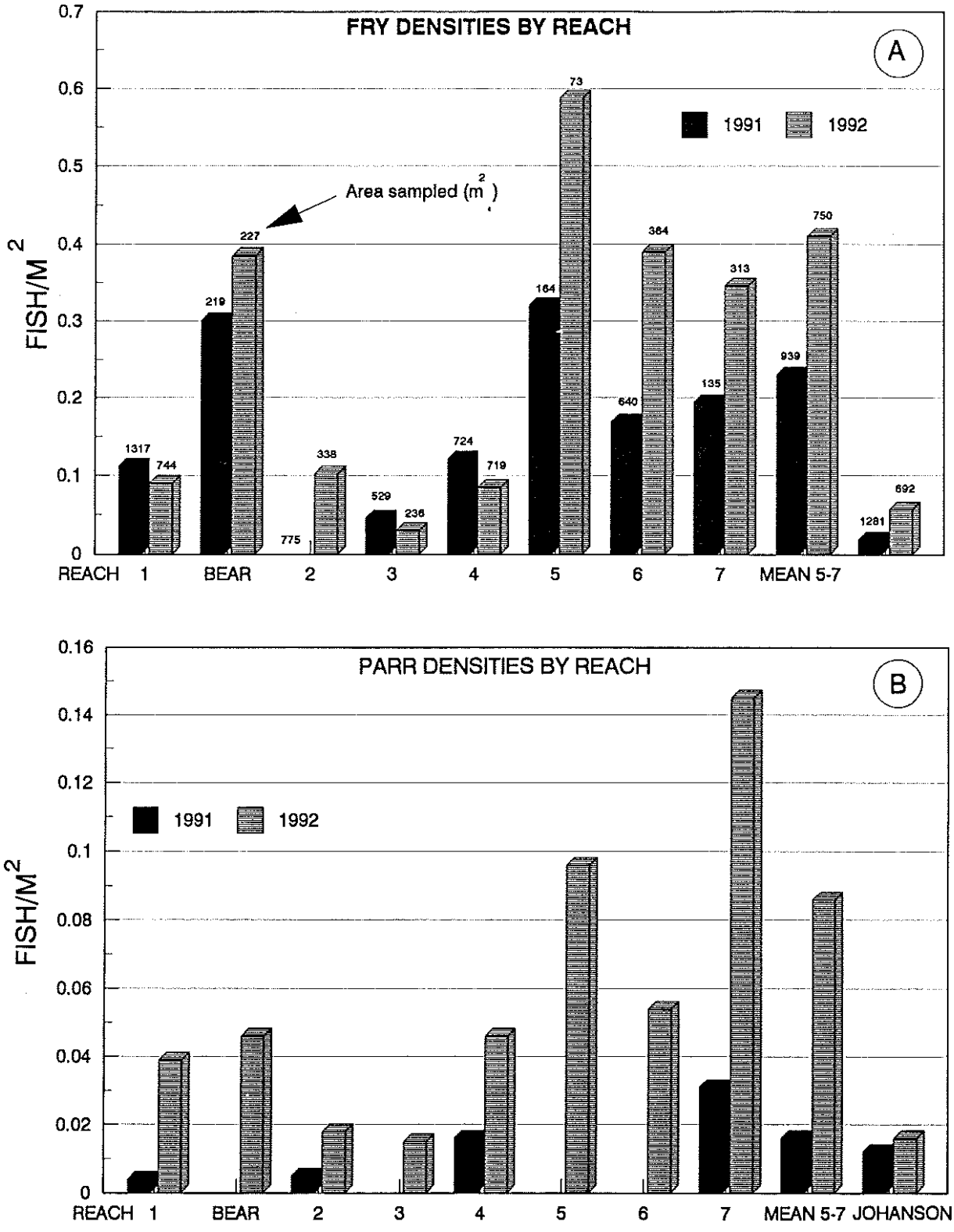

Figure 12. Steelhead Fry and Parr Densities by Reach in the Sustut River.

S30 have been excluded when calculating density and biomass estimates for Reach 7.

The fry density estimates for Reach 2 of the Sustut were higher than 1991, largely the result of including a second site (S10a) downstream of the Bear River in this reach. Estimates for this reach in 1991 were based solely on sampling conducted upstream of the Bear. It is assumed that much of the recruitment into the Sustut below the Bear is from steelhead that spawned in the Bear and that a migration of fry occurs into rearing areas downstream as reported by Williams et al. (1984).

Similar to 1991, there was little apparent difference in fry densities at sites that were rated as **poor** and **moderate** compared to **good** and **excellent** (Table 18). As well, the overall densities of steelhead fry in mainstem and sidechannel locations were similar.

Figure 13 compares mainstem Sustut River steelhead fry densities to data collected by Tredger (1986 and file data). It should be emphasized that data collected in 1983 to 1986 is based on very small sample areas, in some instances a single site, and is not very representative of the overall river. For example, the high densities measured in the upper Sustut River in 1985 (0.7 fry/m^2) were based on a single site sampled in Reach 5. If we only used the Reach 5 results from 1992 (0.6 fry/m^2), the density estimates would be very close to the levels measured in 1985. The mean density estimates for the upper Sustut are depressed by low catches in Reaches 2, 3 and 4 of the Sustut. The mean density of steelhead fry in the three uppermost reaches (Reaches 5 to 7) of the Sustut River in 1991 and 1992 is 0.41 and 0.23 fry/m^2 for the two years respectively (Figure 12A).

Mainstem Sustut River Parr Densities

Steelhead parr densities for the Sustut River mainstem are summarized in Table 17. Parr densities averaged 0.05 parr/m^2 for all of the sites combined compared to 0.01 parr/m^2 estimated in 1991. The parr were dominated by age 1+ (.040 parr/m^2), with low densities of age 2+ (.006 parr/m^2) and age 3+ steelhead (.004 parr/m^2). It is assumed that the older age classes of parr are not effectively sampled at most sites by the methods used in this study.

The 1992 parr densities were higher at 18 of 22 sites sampled during both years (Table 17), and the means were significantly higher in all of the seven reaches of the Sustut River. Parr densities in the upper Sustut River averaged 0.15 parr/m^2 in Reach 7 and 0.10 parr/m^2 in Reach 5. Similar to the steelhead fry

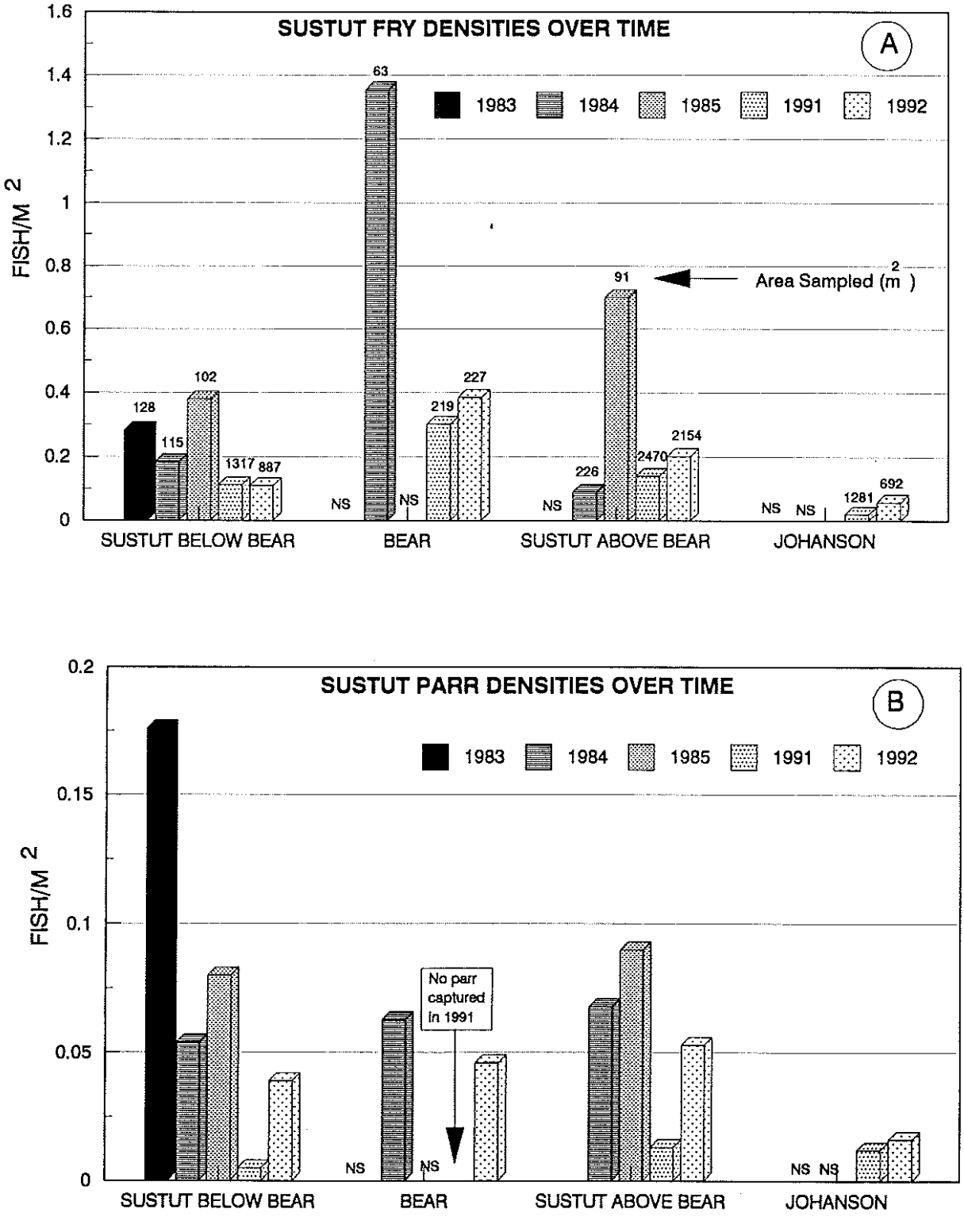

Figure 13. Steelhead Densities in the Sustut River Over Time.

Table 17. Summary of Juvenile Steelhead Density Estimates in the Sustut River Sample Sites.

SITE	FRY/M^2		PARR/M^2	
	1991	1992	1991	1992
S1	0.11	0.17	0	0.04
S3	0.06	0.05	0	0.02
S4	0.27	0.01	0.02	0.03
S6	0.11	<.01	0	0.08
S10	0.04	0.21	0	0.03
REACH 1 mean	0.12	0.09	<0.01	0.04
S10a	NS	0.20	NS	0.04
S11	0	0	<.01	0
REACH 2 mean	0	0.10	<.01	0.02
S12	0.01	0.01	0	0.03
S13	0.04	0.05	0	0
REACH 3 mean	0.02	0.03	0	0.02
S14	0.06	0.01	0	0.02
S15	0.08	0.10	0	0.03
S16	0.04	0.17	0.01	0.01
S17	0.26	0.10	0.02	0.03
S19	0.14	0.07	0.06	0.10
S20	0.06	0.07	0.01	0.07
REACH 4 mean	0.11	0.08	0.02	0.05
S22	0.32	0.59	0	0.10
REACH 5 mean	0.32	0.59	0	0.10
S24	0.11	0.43	0	0.19
S25	0.19	0.31	0	0.01
S26	0.34	0.21	0.02	0
S27	0.04	0.61	0	0.02
REACH 6 mean	0.17	0.39	<0.01	0.05
S28	0.37	0.18	0.03	0.13
S29	0.22	0.51	0.06	0.17
S30	0	0	0	0
REACH 7 mean	0.29	0.35	0.05	0.15
MEAN REACH 1-7	0.13	0.18	0.01	0.05

Table 18. Summary of Juvenile Steelhead Catches in the Sustut River Habitat Suitability Rating Categories and in Sidechannel and Mainchannel Habitat.

	FRY/M^2		PARR/M^2	
SUITABILITY RATING	**1991**	**1992**	**1991**	**1992**
POOR AND MODERATE	0.13	0.19	0.01	0.02
GOOD AND EXCELLENT	0.13	0.17	0.01	0.08
	SIDE	**MAIN**	**SIDE**	**MAIN**
SUSTUT - 1991	0.08	0.18	0.01	0.01
SUSTUT - 1992	0.17	0.18	0.06	0.04

estimates, Site S30 has been excluded from the estimates for Reach 7 since juvenile steelhead have not been found this far up in the system. The results suggest that the section of the Sustut River upstream of the Junction Pool to some distance below Site S30 just downstream from Mud Lake is the most productive parr rearing section of the Sustut River.

Sites that were rated as **good** and **excellent** for parr rearing had parr densities approximately four times as high as those rated **poor** or **moderate** rearing areas (Table 18). Overall parr densities were slightly higher in sidechannel sites compared to mainchannels.

Sustut River Tributary Fry Densities

Juvenile steelhead densities in 15 tributary sample sites are presented in Table 19. The results from three inlet tributaries to Sustut Lake are combined in the table since steelhead juveniles were not found in any of them. The detailed results for each of the tributary sample sites including other species captured are presented in Appendix 3.

Similar to 1991, highest steelhead fry densities were found in the Bear River sample sites (mean of 0.38 fry/m^2). Densities were slightly higher than the 1991 levels (Figure 12), but not close to the densities that exceeded 1.3 fry/m^2 measured in 1984 (Figure 13). Recently-emerged steelhead fry (0.28 fry/m^2) were captured in a small unnamed tributary that enters Johanson Creek 1.5 km downstream from the lake outlet (SUc1 in Figure 11). It was noted that steelhead fry were abundant throughout the lower 800 m of this creek that offered excellent potential spawning habitat.

Table 19. Summary of Juvenile Steelhead Density Estimates in Tributaries of the Sustut River.

SITE	FRY/M^2		PARR/M^2	
	1991	1992	1991	1992
Sb1	0.29	0.50	0	0.01
Sb2	0.31	0.27	0	0.08
BEAR	0.30	0.38	0	0.05
Sj1	0	<0.01	0	0.02
Sj2	0.02	0.02	0.02	0.04
Sj4	0	0.06	0.06	0
Sj7	0.01	0	0.01	0.03
Sj8	0.09	0.19	0	0
JOHANSON	0.02	0.06	0.02	0.02
Unnamed A	0	0	0.06	0.05
Unnamed B	0	0	0.01	0.03
Unnamed C	NS	0.28	NS	0
Sjs1 Solo	NS	0	NS	0
Sjd1 Darb	NS	0	NS	0.05
Sustut Lake Inlets[14]	NS	0	NS	0

Steelhead fry densities in five sites in Johanson Creek were again low (0.06 fry/m^2). It is interesting to note that the highest densities in Johanson Creek were found at Site Sj8 in the top end of the creek and a short distance downstream from Unnamed Tributary C. It is possible that steelhead recruitment into this section of Johanson Creek is from fish spawned in the tributary stream.

Steelhead fry were not captured at sites in Darb, Solo and two unnamed tributaries to Johanson Creek (Table 19 and Figure 11). Darb and Solo creeks had not been sampled in the past.

[14] Includes Ss1, Ss2, and Ss3

Sustut River Tributary Parr Densities

Steelhead parr densities increased in the Bear River during 1992 compared to previous sampling (Table 19 and Figures 12 and 13). Parr densities averaged 0.05 parr/m^2 in the two Bear River sample sites in 1992 while no parr were captured in the Bear in 1991. Densities remained low in Johanson Creek (0.02 parr/m^2), and parr were present in two unnamed tributaries (Tributary A and B) to Johanson Creek. Similarly, parr were captured in Darb Creek, an inlet to Johanson Lake (0.05 parr/m^2).

Survey data for Johanson Lake (Grant 1986) indicates that resident rainbow were not captured in Johanson Lake, so it is assumed that the parr captured in Darb Creek are derived from steelhead. It should be noted that snorkel, angling and fence surveys in the Sustut River during 1992 (Bustard 1993) noted the presence of resident rainbow trout in the vicinity of the Sustut-Johanson confluence during the fall. The origin of these fish is not known and there is the possibility that some of the juveniles that are referred to as steelhead in this study were, in fact, resident rainbow trout.

3.3.3 Sustut River Biomass Estimates

Significant increases in total fish biomass were measured throughout the entire Sustut watershed in 1992 compared to 1991 (Table 20). For example, the average biomass for all fish species in the mainstem Sustut River sites increased from 0.4 g/m^2 in 1991 to 1.4 g/m^2 - more than a three-fold increase between years. Overall fish biomass for the mainstem Sustut was a consistent 1.2 g/m^2 for the lower four reaches of the Sustut and increased as sampling progressed upstream from Reach 4.

Steelhead parr average biomass increased to 0.5 g/m^2 for mainstem sites compared to 0.1 g/m^2 in 1991 for all Sustut sites combined. Parr biomass in Reach 7 sites was an impressive 1.6 g/m^2.

Steelhead fry biomass was slightly lower in Reach 1 of the Sustut (reflecting lower fry densities) and higher in the three upper reaches of the river (Table 20).

3.3.4 Sustut River Fish Size Estimates

Juvenile steelhead mean fork lengths and length-frequency relationships are shown in Figures 14 and 15 respectively. The fork length data has been combined for those sites located upstream of the Bear River confluence with the Sustut and those located downstream, and is presented along with summaries from the Bear River and Johanson Creek.

Table 20. Summary of Juvenile Steelhead Biomass Estimates in the Sustut River and Tributaries in 1991 and 1992.

REACH	FRY (g/m^2)		PARR (g/m^2)		ALL SPECIES (g/m^2)	
	1991	1992	1991	1992	1991	1992
1	0.09	0.07	0.03	0.27	0.38	1.21
2	0	0.13	0.13	0.22	0.43	1.22
3	0.05	0.06	0.01	0.39	0.28	1.20
4	0.14	0.10	0.18	0.49	0.39	1.22
5	0.31	0.53	0	0.60	0.58	1.72
6	0.15	0.33	0.03	0.43	0.43	1.51
7	0.14	0.30	0.42	1.60	0.65	2.13
REACHES 1-7	0.12	0.17	0.09	0.50	0.41	1.37
BEAR	0.22	0.29	0	0.40	1.13	1.35
JOHANSON	0.08	0.06	0.04	0.21	0.41	0.68

The data indicates that steelhead fry in the lower Sustut River were larger than their counterparts in the upper river (46.4 mm compared to 42.3 mm). This is almost the exact reverse of the results from 1991, when upper river fry were larger (Figure 14). The larger fry in the lower river may reflect the lower densities observed at sites in this section of the Sustut compared to upper river sites in 1992 (Figure 12).

Steelhead fry in the Bear River were the smallest of the four locations shown in Figure 14. The Bear River fry have been smaller than other areas in the Sustut watershed for both years of sampling. It is possible that the samples in the Bear include more of the later emerging steelhead fry since the sampling is conducted in closer proximity to the actual area of spawning than downstream locations.

The mean fork lengths and weights of steelhead fry sampled in the Sustut is compared to data from past years in Table 21. This data suggests that steelhead fry in the Sustut downstream from the Bear confluence are the largest recorded to date, while fry in the upper river are the same length as the mean for past years. The 1992 fry were heavier than similar-sized fry from past years. Weights for the upper Sustut fry were derived from 111 measurements in 1992.

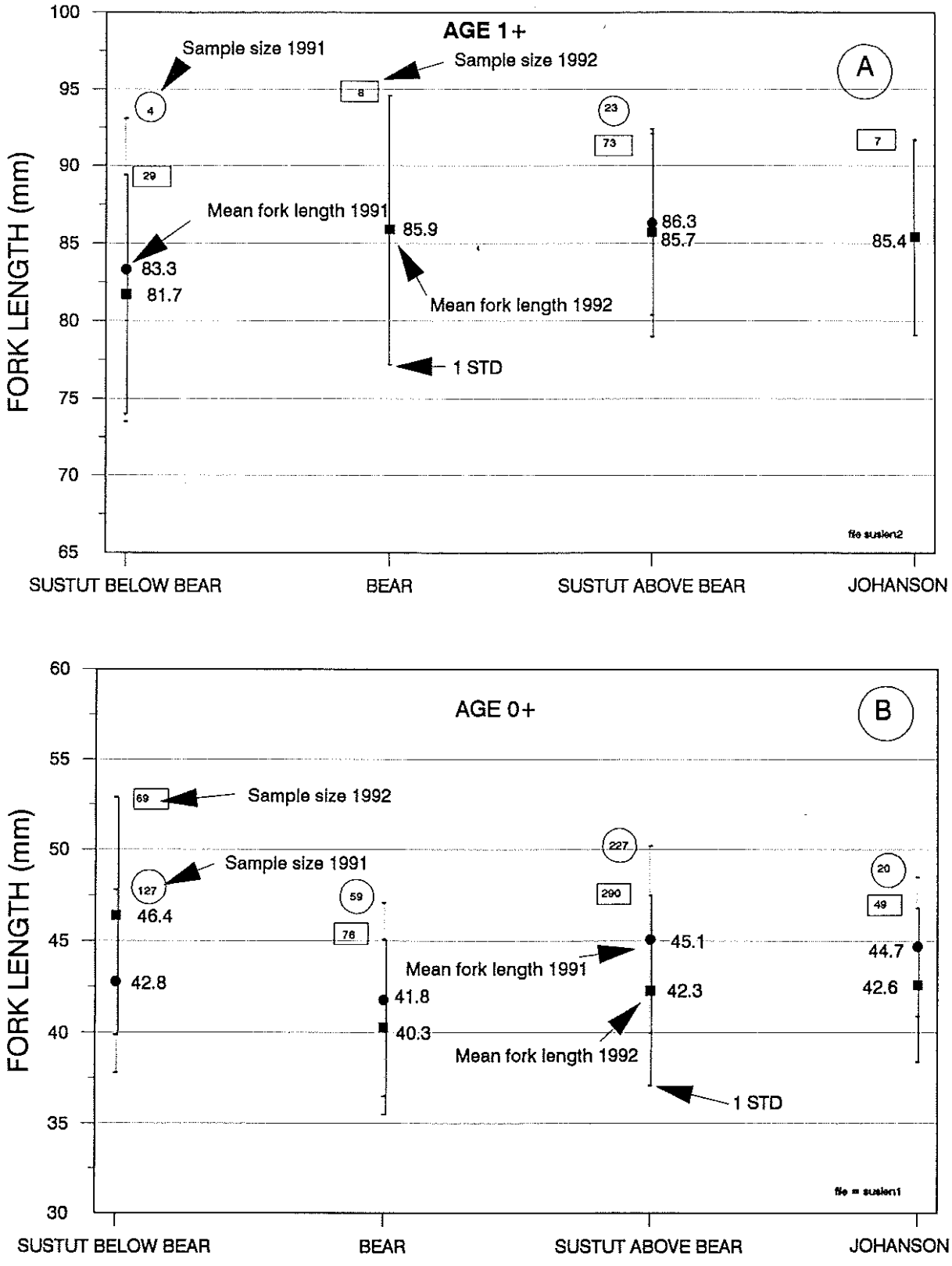

Figure 14. Juvenile Steelhead Length Summaries for Sustut River and Tributaries.

Table 21. Summary of Juvenile Steelhead Mean Fork Lengths and Weights in the Sustut River Compared to Past Sample Data.

YEAR	SUSTUT BELOW BEAR		SUSTUT ABOVE BEAR	
	FORK LENGTH (mm)	WEIGHT (g)	FORK LENGTH (mm)	WEIGHT (g)
1983[15]	39.4	0.58	NA[16]	NA
1984	41.2	0.65	41.1	0.67
1985	41.1	0.79	40.5	0.75
1991	42.8	0.81	45.1	0.95
MEAN	41.1	0.71	42.3	0.79
1992	46.4	0.97	42.3	0.93

Age 1+ steelhead parr sizes in 1992 were smaller in the lower Sustut (81.7 mm) compared to the upper Sustut River (85.7 mm) as shown in Figure 14. These smaller fry may reflect the small size observed in the lower Sustut steelhead fry compared to upper river fish in 1991.

Newly-emerged steelhead fry were first noted in the vicinity of the confluence of the Sustut and Johanson Creek on July 27 and were common along the margin by the end of July. Steelhead were observed spawning at this location on June 9 (Bustard 1993). This timing of emergence corresponds to observations by Williams et al. (1985) of a movement of steelhead fry out of the Bear River during late July and early August. It appears that despite earlier spawning in the Bear River[17] compared to the upper Sustut steelhead[18], the timing of fry emergence may be quite similar.

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[15] Data from 1983-1985 provided by Dave Tredger, B.C. Environment, Victoria. Sampling was conducted during late September and early October.

[16] No sampling was conducted on the Sustut River upstream of the Bear confluence in 1983.

[17] Estimated peak in period May 20-25th based on B.C. Environment memos on file, Smithers.

[18] Estimated to occur in the first week of June based on memos on file, B.C. Environment, Smithers

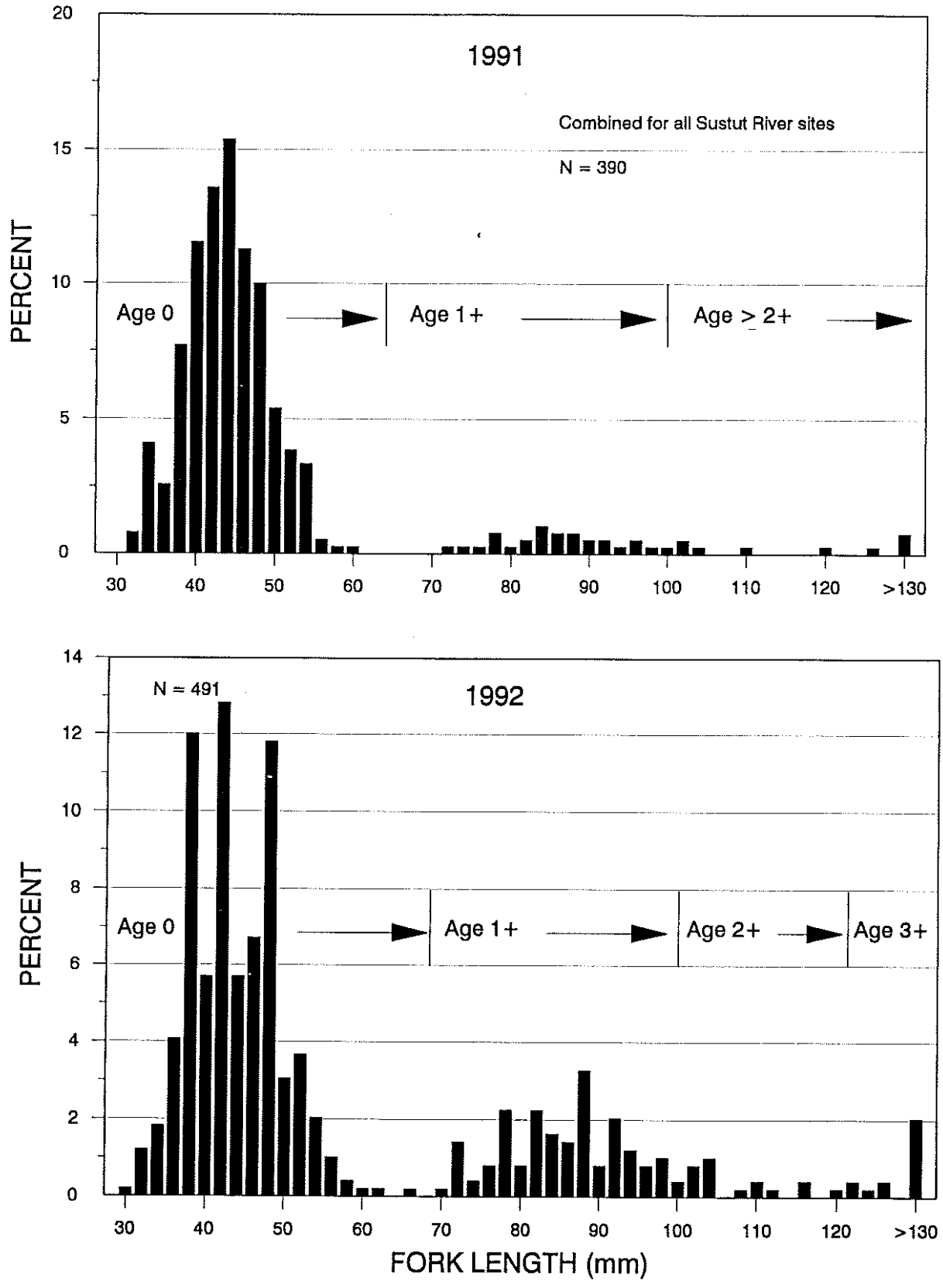

Figure 15. Length-frequency of Juvenile Steelhead in the Sustut River.

Table 22 summarizes the results of electrofishing conducted in the Sustut just upstream of the Johanson confluence during three dates from late August to mid-October. The data suggests steelhead fry growth had stopped after the September 12 sample date, and that fry captured in mid-October were the same size as a month earlier. It should be noted that some of the fry captured in both the September and October sampling were newly-emerged and this site may not be very representative of overall steelhead fry growth in the upper river since it is so close to the location of spawning. Larger fry may have dispersed into downstream areas. The mean fry length for the upper Sustut for all sites combined in mid-September (42.3 mm in Figure 14) was larger than fry measured at S28, suggesting this may be a factor. Water temperatures at this site (Appendix 3 Figure 1) indicate that although temperatures did drop below 5°C for a period in mid-September, they were above this level for much of late September and some growth should have occurred until at least the end of September.

Table 22. Summary of Steelhead Fry Fork Lengths in the Sustut River and Johanson Creek for Different Sample Dates in 1992.

DATE	SITES	MEAN FORK LENGTH (mm)	SAMPLE SIZE	STD
SUSTUT RIVER - REACH 7				
July 27-29	Newly-emerged steelhead fry first observed at fence on July 27. Steelhead fry common along margin 2-3 days later.			
Aug 21	S28[19]	34.8	28	3.6
Sept 12	S28	39.8	30	4.3
Oct 13	S28	39.0	52	4.6
JOHANSON CREEK				
Aug 22	Sj4	34.7	3	1.7
Aug 31	Throughout	40.5	20	
Sept 9-12	"	42.6	49	4.2
Sept 12	SUc1	37.3	31	4.0

[19] Site located in a sidechannel 100 m upstream from S28. The October 13 sample was also conducted in this sidechannel.

Fry sizes for three different time periods in Johanson Creek are summarized in Table 22. These measurements were made at a variety of sites throughout the system with the early measurements in particular based on small numbers. The observations at SUc1 (Unnamed Tributary C) are of interest. Several of the fry captured at this site on September 12 were newly-emerged (29 mm). Again, the mean fry size close to the suspected spawning area were smaller than the fry collected at sites downstream, a similar pattern as observed in the Bear River and the Sustut near the Johanson Creek confluence.

3.4 ZYMOETZ RIVER

A total of 20 sample sites were located in the Zymoetz River watershed including 18 on the mainstem river between the Clore River confluence and McDonell Lake and single sites on Treasure and Coal creeks (Figure 16). Attempts to sample in the Clore River and Trapline Creek were abandoned due to excessive flows during the late September and October period.

The mainstem Zymoetz River sites comprised 2415 m^2 of habitat (340 m of margin), similar to the 1991 sampling effort (Table 23). Specific site descriptions and catch data for each site are presented at the end of Appendix 4.

3.4.1 Zymoetz River Catch Composition

Although steelhead fry comprised nearly 68% of the catch in 1992, total numbers of fry were down significantly from 1991 results (548 fry in 1992 compared to 1341 fry in 1991). Steelhead parr (both age 1+ and age 2+) numbers were down compared to the previous year, although parr still comprised approximately 12% of the overall catch. Juvenile chinook numbers were lower while coho catches were higher in 1992. A table summarizing the catch composition for each site is presented in Appendix 4 Table 1.

The catch results at Coal Creek provided an interesting contrast to the 1991 results. The 1991 catch was dominated by high numbers of suspected steelhead fry. Trout fry numbers were considerably lower in 1992 (Appendix 4) and high numbers of coho juveniles (completely absent in 1991) were present in the site.

3.4.2 Zymoetz River Juvenile Steelhead Densities

Zymoetz River Fry Densities

Juvenile steelhead densities in the mainstem sites are summarized in Table 24. Fry densities average 0.25 fry/m^2 for all of the sites combined. Densities were higher in Reach 7 (0.37 fry/m^2) than in Reach 6 (0.18 fry/m^2). The overall densities were approximately one-half of the levels measured in 1991 (0.58 fry/m^2 for all sites combined). The lower fry densities occurred at all of the 18 mainstem sites that were sampled in the two years. The highest fry densities measured in 1992 were 0.86 fry/m^2 at site Z14. In 1991, fry densities exceeded this level at five of the sample sites.

Only a single sample site was located in Reach 8, a short section of the upper Zymoetz located between the Serb River confluence and McDonnel Lake. Fry densities were very low at this site in 1992.

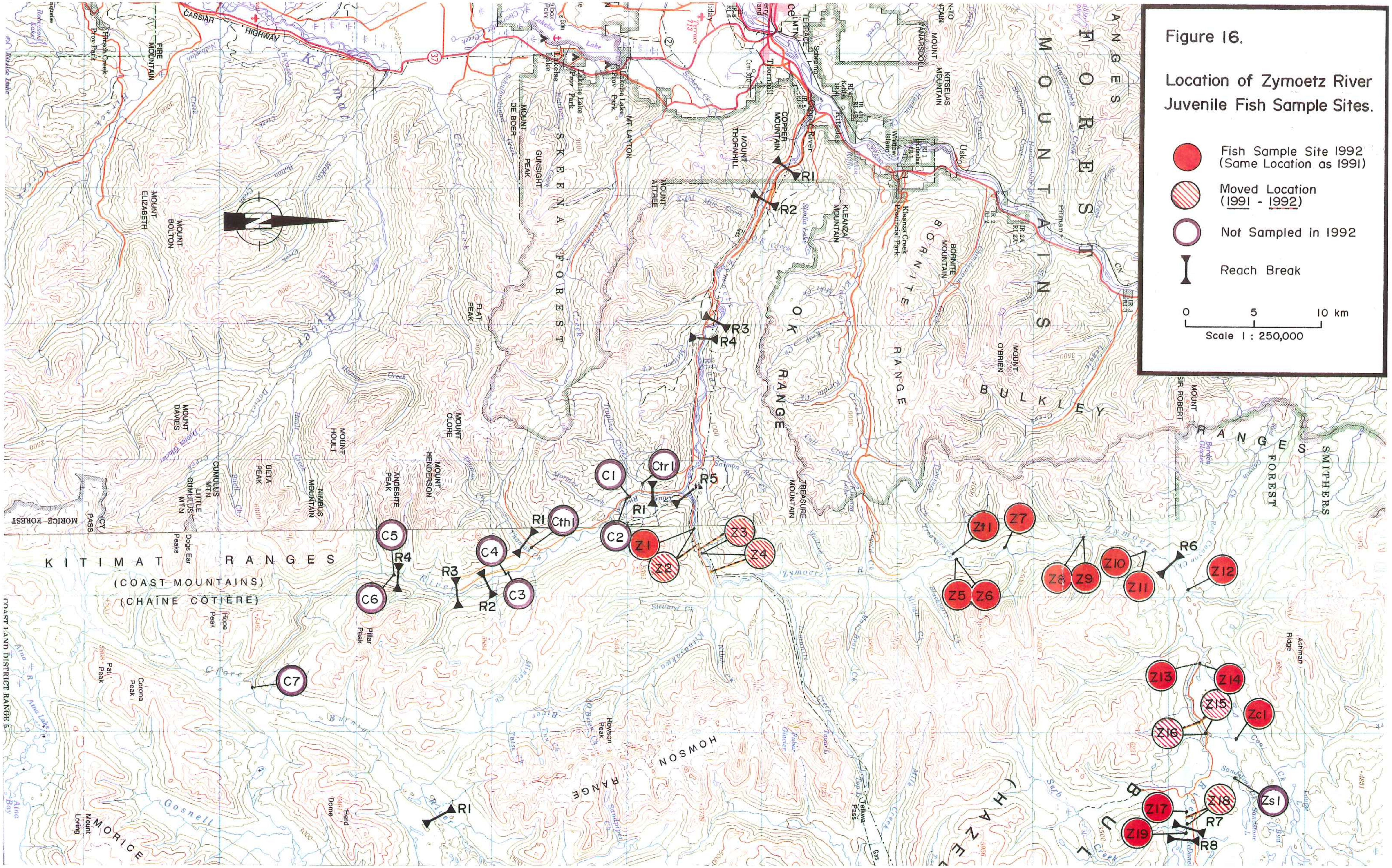

Figure 16.

Location of Zymoetz River Juvenile Fish Sample Sites.

Table 23. Catch Composition of Fish in the Zymoetz River Sample Sites in 1991 and 1992.

	1991		1992	
	N	%	N	%
Steelhead 0+	1341	77.3	548	67.7
Steelhead 1+	131	7.5	81	10.0
Steelhead ≥2+	60	3.4	19	2.4
Chinook	70	4.0	14	1.7
Coho	32	1.8	68	8.4
Dolly Varden	12	0.7	18	2.2
RM Whitefish	7	0.4	21	2.6
Sculpins sp.	63	3.6	37	4.6
LN Dace	21	1.2	4	0.5
Cutthroat	0	0	0	0
TOTAL	1737		810	
AREA (m^2)	2469		2415	
LENGTH (m)	382.6		340.3	

Water temperatures and flow conditions are quite different in this short section of river compared to the Zymoetz River downstream of the Serb, where flows and water quality are strongly influenced by headwater glaciers.

Figure 17 shows steelhead fry densities measured in 1992 in the three reaches of the Zymoetz River compared to those measured in 1991 and in 1978 (Ptolemy 1979). The 1978 data indicates very low levels of steelhead fry were present in the upper Zymoetz River, particularly at the two sample sites located in Reach 7 downstream of the Serb confluence.

There was little difference between steelhead fry densities in sites located in the mainstem sidechannel locations or in areas rated as **good** and **excellent** fry habitat compared to **poor** and **moderate** sites (Table 25).

Table 24. Summary of Juvenile Steelhead Density Estimates in the Zymoetz River Mainstem and Tributary Sample Sites.

SITE (REACH)	FRY/M^2		PARR/M^2	
	1991	1992	1991	1992
MAINSTEM ZYMOETZ RIVER				
Z1 (6)	1.40	0.23	0.07	0.08
Z2 (6)	0.37	0.15	0.06	0.02
Z3 (6)	0.17	0.05	0.15	0.03
Z4 (6)	0.21	0.04	0.06	0.03
Z5 (6)	0.26	NS	0.04	NS
Z6 (6)	0.40	0.10	0.14	0.04
Z7 (6)	0.37	0.16	0.14	0.01
Z8 (6)	0.48	0.34	0.08	0.07
Z9 (6)	1.13	0.19	0.20	0.07
Z10 (6)	0.62	0.17	0.07	0.07
Z11 (6)	0.51	0.40	0.05	0.06
REACH 6 mean	0.54	0.18	0.10	0.05
Z12 (7)	0.89	0.19	0.03	0.05
Z13 (7)	1.05	0.70	0.02	0.07
Z14 (7)	0.91	0.86	0.03	0.06
Z15 (7)	0.45	0.35	0	0.05
Z16 (7)	0.78	0.14	0.06	0.04
Z17 (7)	0.26	0.08	0	0
Z18 (7)	0.43	0.25	0	0.02
REACH 7 mean	0.68	0.37	0.02	0.04
Z19 (8)	0.40	0.02	0.02	0.02
TRIBUTARIES[20]				
TREASURE	0.15	0	0.01	0.04
COAL	1.77	0.52	0.11	0.19

[20] Sampling was not conducted in the Clore River and Trapline Creek during 1992 due to flooding during the late September sample period.

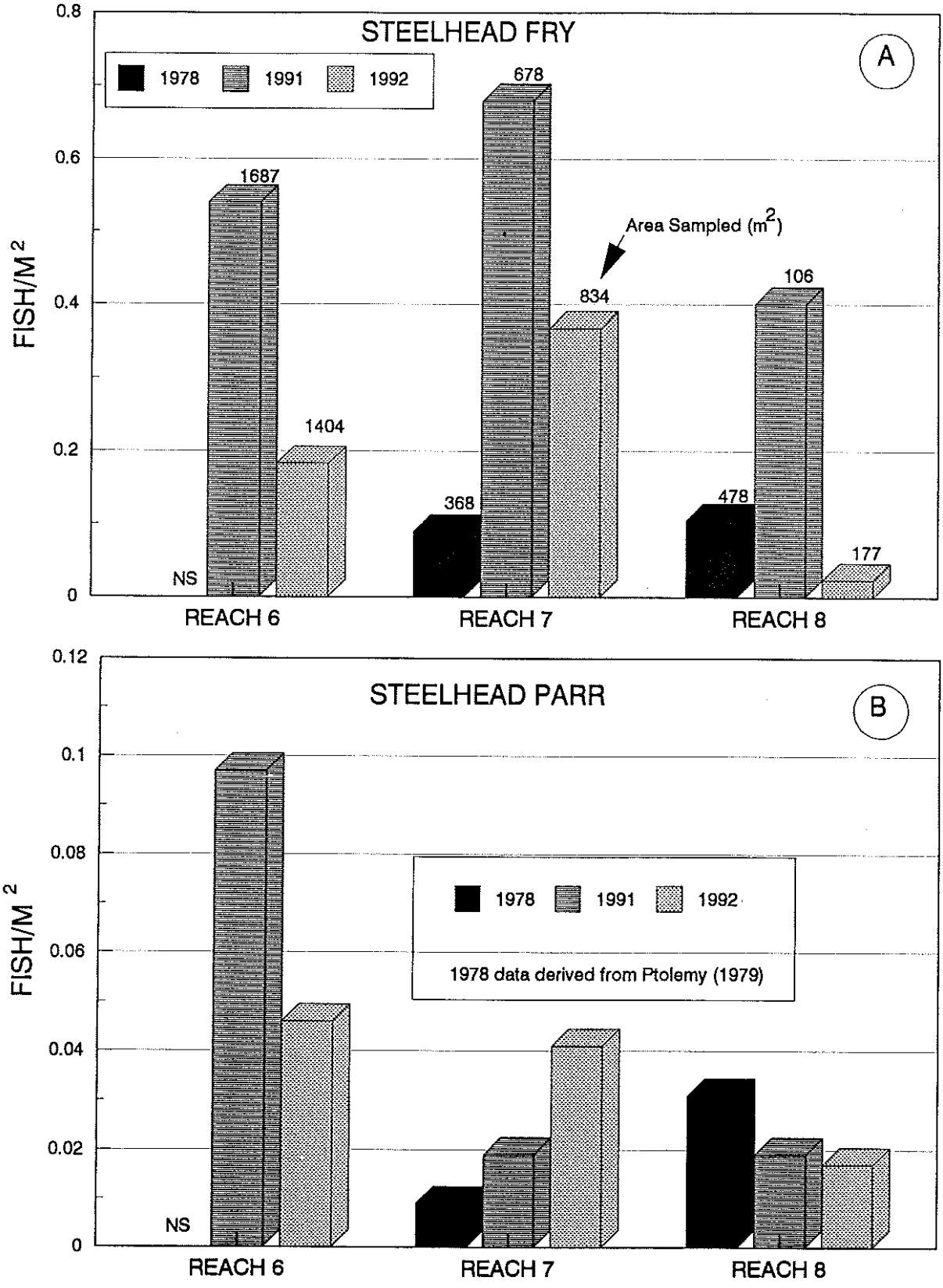

Figure 17. Steelhead Fry and Parr Densities in the Zymoetz River by Reach.

Table 25. Summary of Juvenile Steelhead Catches in the Zymoetz River Habitat Suitability Rating Categories and in Sidechannel and Mainchannel Habitat.				
	FRY/M^2		PARR/M^2	
SUITABILITY RATING	1991	1992	1991	1992
POOR AND MODERATE	0.35	0.22	0.030	0.035
GOOD AND EXCELLENT	0.64	0.26	0.094	0.048
	SIDE	MAIN	SIDE	MAIN
ZYMOETZ - 1991	0.54	0.62	0.083	0.047
ZYMOETZ - 1992	0.26	0.23	0.048	0.035

Zymoetz River Parr Densities

Steelhead parr densities for the mainstem Zymoetz River and two tributary sites are summarized in Table 24. Parr densities averaged 0.042 parr/m^2 for all sites combined (0.035 age 1+ and 0.007 age 2+ and age 3+ combined). This is down from densities of 0.064 parr/m^2 sampled in 1991. Parr densities were higher in Reach 7 but lower in Reach 6 in 1992 compared to the previous year (Figure 17 and Table 24).

It is interesting to note that extensive channel shifting had occurred in the Zymoetz River in Reach 6 between sampling dates in 1991 and 1992. Similarly, considerable channel changes had occurred at the lower end of Reach 8 in the vicinity of the Serb confluence. The mainstem Zymoetz in Reach 7 appears to be more stable than the lower reach and sample sites remained relatively intact compared to the previous year.

Steelhead parr densities in Reach 7 of the Zymoetz were considerably lower in 1978 compared to the past two years (Figure 17). At least some of these differences may be accounted to differences in site selection and sampling methods used in the two studies. Parr densities in the short upper reach were higher than those measured in 1991 and 1992.

Parr densities were somewhat higher in sidechannel habitats compared to mainstem areas and higher in sites rated as **good** and **excellent** compared to **poor** and **moderate** (Table 25). This is the same pattern as noted in 1991, although the differences were not as large.

Steelhead parr densities in Treasure and Coal Creek were higher in 1992 than in 1991. Coal Creek parr densities (0.19 parr/m^2) indicate this system is an important juvenile steelhead stream with high productive capabilities.

3.4.3 Zymoetz River Biomass Estimates

Overall fish biomass estimates in the mainstem Zymoetz River were 0.8 g/m^2 for all sites combined (Table 26). This is approximately one-half of the 1991 levels. Fish biomass levels in Reach 6 showed a considerable drop from the previous year, while Reach 7 biomass estimates were the same. Reach 8 biomass estimates showed a sharp decline from 1991 levels, largely reflecting a decline in longnose dace and sculpins at this site.

Steelhead fry and parr together comprised more than 50% of the overall biomass of fish in the two main sample reaches (Reaches 6 and 7) in the Zymoetz River. Biomass of steelhead fry in these two reaches was approximately one-half of the 1991 levels. Steelhead parr biomass was lower in Reach 6 and higher in Reach 7, similar to the trend in density estimates for these reaches.

Table 26. Summary of Juvenile Steelhead Biomass Estimates in the Zymoetz River and Tributaries in 1991 and 1992.

REACH	FRY (g/m^2)		PARR (g/m^2)		ALL SPECIES (g/m^2)	
	1991	1992	1991	1992	1991	1992
REACH 6	0.53	0.20	0.98	0.42	1.89	0.79
REACH 7	0.48	0.28	0.13	0.27	0.85	0.85
REACH 8	0.64	0.04	0.08	0.26	4.27	1.03
REACHES 6-8	0.52	0.22	0.62	0.35	1.63	0.81
TREASURE	0.16	0	0.14	0.75	0.44	0.94
COAL	2.20	0.50	0.81	2.46	3.75	5.59

3.4.4 Zymoetz River Fish Size Estimates

Steelhead fry mean fork lengths and length-frequency data for 1991 and 1992 are shown in Figures 18 and 19. A summary of mean fry and parr lengths and weights by reach and year is presented in Table 27.

Steelhead fry in Reach 6 were considerably larger in 1992 compared to 1991 fry (44.1 mm compared to 37.2 mm) and were larger than their counterparts in Reach 7 (40.8 mm). It is assumed that the larger size is a reflection of the lower densities found in this reach in 1992 compared to the previous year (Figure 17). Steelhead fry in Reach 7 were only slightly larger than last year's fry in this reach. A very small sample of fry captured in the McDonnel Lake outlet indicated that those fry that are present in the lake outlet area are considerably larger than fry found downstream of the Serb River confluence (Figure 18B).

Juvenile steelhead age 1+ parr mean fork lengths were little different between Reaches 6 and 7 of the Zymoetz and between years (Figure 18A).

Table 27. Summary of Juvenile Steelhead Mean Fork Lengths in the Zymoetz River Compared to Past Sample Data.

	AGE 0		AGE 1+	
DATE (SAMPLE SIZE)	**FORK LENGTH (mm)**	**WEIGHT (g)**	**FORK LENGTH (mm)**	**WEIGHT (g)**
1978[21] - OCT (N)	45.1 (21)	1.06	NS[22]	
1991[23] - AUG (N)	38.4 (334)	0.69	78.5 (68)	5.89
1991 - SEPT (N)	48.3 (193)	1.37	82.9 (51)	6.85
1992 - AUG (N)	42.6 (398)	0.94	79.3 (75)	5.96

[21] Data derived from Ptolemy (1979) for Reach 7 fish only. Sample dates October 4 and 5.

[22] Inadequate sample size of parr.

[23] 1991 and 1992 data does not include Reach 8 fish (lake outlet).

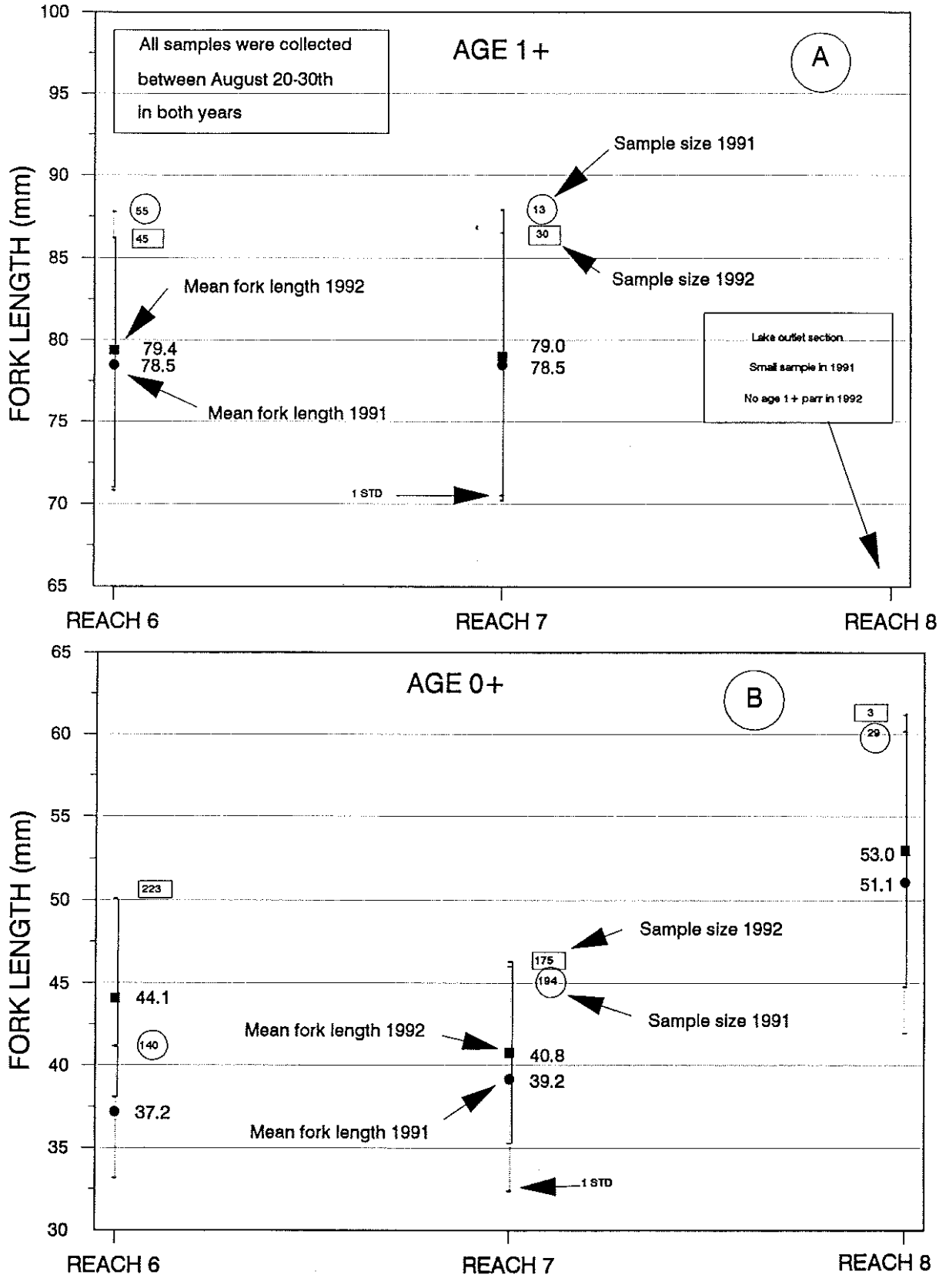

Figure 18. Juvenile Steelhead Length Summaries for the Zymoetz River by Reach.

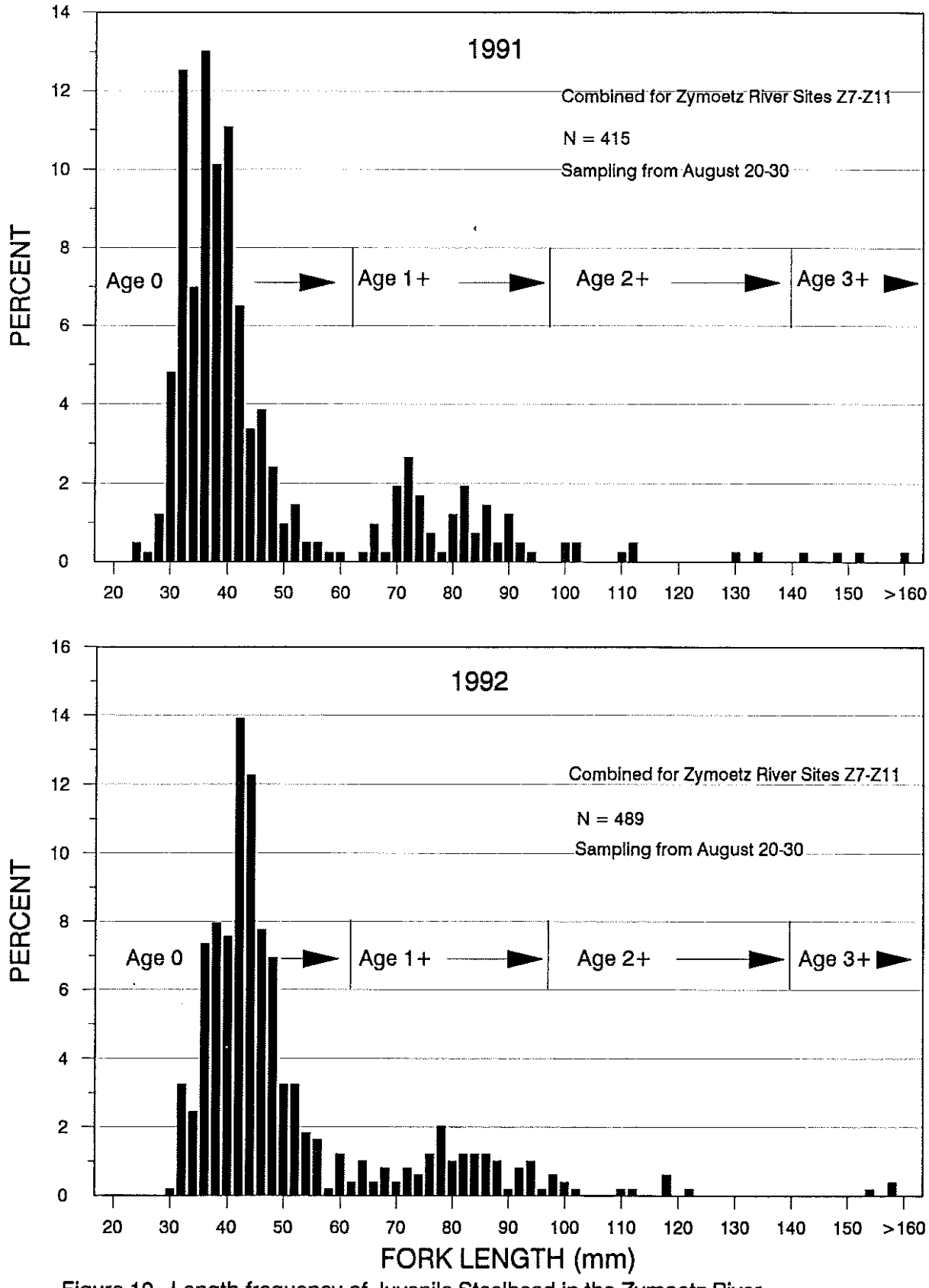

Figure 19. Length-frequency of Juvenile Steelhead in the Zymoetz River.

4.0 SUMMARY AND CONCLUSIONS

4.1 STEELHEAD FRY DENSITIES

Steelhead fry densities were lower throughout the upper Skeena watershed in all of the systems sampled except the upper reaches of the Sustut River and in the Bear River during 1992 compared to the previous year (Figure 20). The declines were very marked in some of the systems, and the trend occurred throughout the mainstem and tributaries of the Morice and Zymoetz rivers, the Kitwanga River and the lower Sustut.

In the Kitwanga River, fry densities declined from approximately 1.4 fry/m^2 in 1991 to a mean of 0.2 fry/m^2 in 1992. These declines occurred in all reaches of the mainstem river (Figure 2). Sampling in the Kitwanga River occurred during the latter portion of August. Repeat sampling at two of the sites during October after a large freshet indicated that the mean steelhead fry densities at these two sites were little changed (Table 4).

In the Morice watershed, all of the tributaries including Owen, Lamprey, Shea and Gosnell creeks, the Thautil River and the upper section of the Morice mainstem (Reach 1) had lower fry densities than in 1991 (Figure 6A). Typically, fry densities in these systems were in the 0.1 to 0.2 fry/m^2 range except in Owen and Lamprey creeks where densities were approximately 0.8 fry/m^2. The mainstem Morice River and Shea Creek densities are near the low end of the range measured in past years (Figure 7). The results in Owen and Lamprey creeks and the Thautil River are in the middle to upper end of the range of densities measured in the past.

Mean fry densities in the Zymoetz River mainstem (0.25 fry/m^2) were approximately 50% of the levels measured the previous year (Figure 17). The lower densities occurred at all of the 18 sites on the mainstem river and in the two tributaries sampled in 1992 (Table 24).

The results of sampling steelhead fry in the Sustut River were less consistent than the results from the other Skeena systems. While steelhead fry densities in Reach 1 downstream from the Bear confluence were slightly lower than levels measured in 1991 (Figure 12), the Bear River densities were higher. Similarly, fry densities in the Upper Sustut (Reaches 5 to 7) and in Johanson Creek were higher. These densities (0.4 fry/m^2) exceeded densities in the lower river and in all of the other systems examined except Lamprey and Owen creeks (Figure 20).

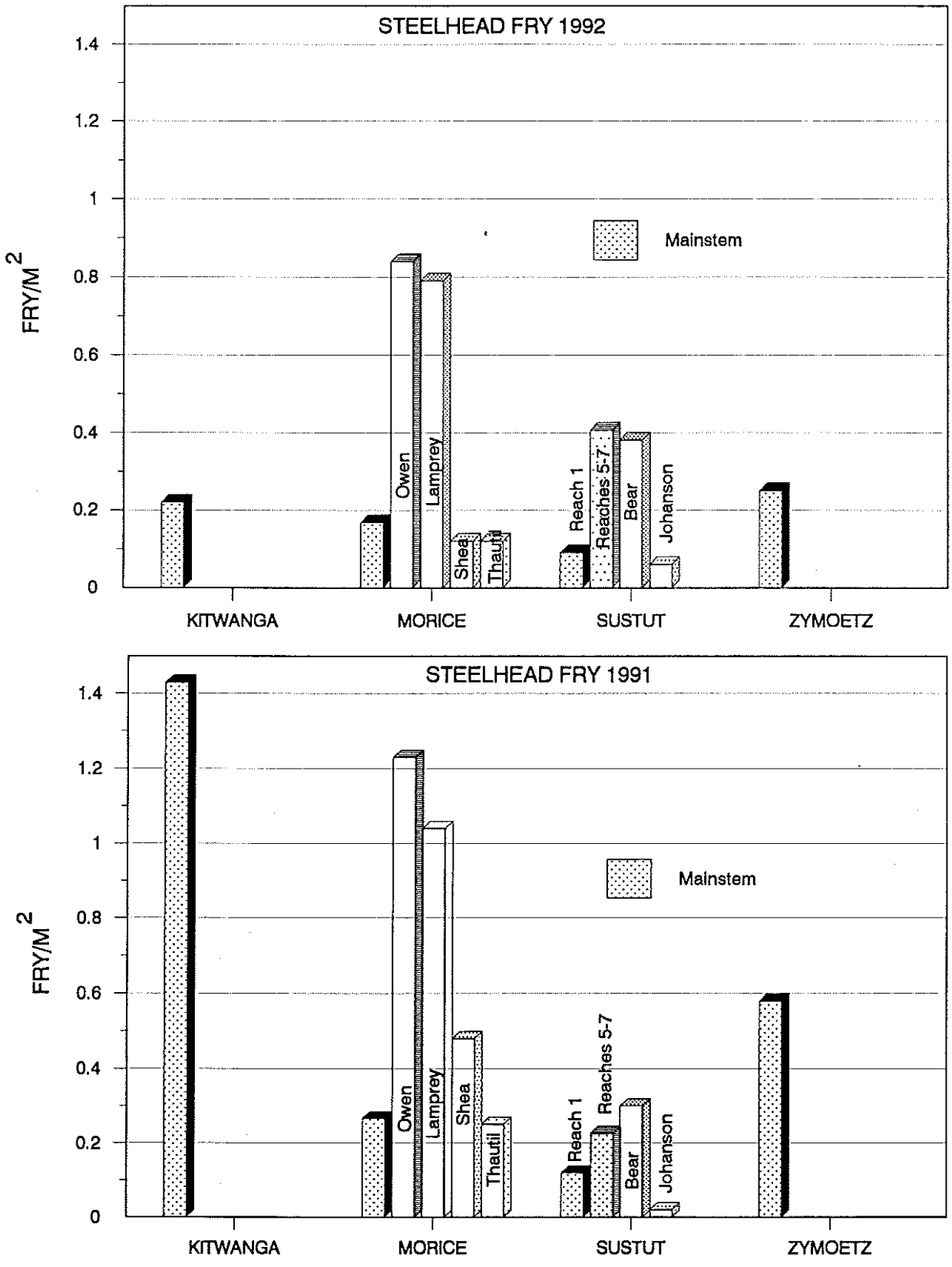

Figure 20 . Summary of Steelhead Fry Densities in Mainstem and Selected Tributaries of the Upper Skeena Study Streams for 1991 and 1992.

Steelhead fry densities in Buck Creek, an upper Bulkley River tributary included in the sampling program were sharply lower than the other tributaries, and were well below levels obtained during past sampling at this site (Figure 8). It is interesting to note that sampling steelhead fry and parr at this site since 1987 suggests that despite significant fluctuations in fry numbers in Buck Creek, parr numbers have remained fairly constant. The data for this system suggests that fry densities in the 0.15 to 0.2 fry/m^2 range may be adequate to maintain steelhead parr production in Buck Creek. The higher fry densities in 1987 and 1991 have not resulted in significantly higher age 1+ parr densities the following year. These estimates suggest very high fry to parr survival during some years or alternatively significant recruitment from upstream areas into the sample area during years of low fry abundance in the site itself. Tributaries and upper mainstem reaches with higher steelhead fry densities presumably have an important role in serving as recruitment areas for fry and parr into downstream locations. If high production of fry does not occur in some of these key systems (eg., Owen and Lamprey creeks, upper Sustut and Bear rivers) then downstream mainstem sites may not be adequately recruited.

The 1992 results suggest that in most of the sites, fry recruitment was below satisfactory levels to ensure adequate seeding of the systems. Although definitive estimates of densities of steelhead fry needed to adequately seed these tributaries are not available, we do know that stocking steelhead fry at densities higher than 0.4 to 0.7 fry/m^2 does not yield higher autumn fry or parr densities (Hume and Parkinson 1987). These estimates are for a heavily-logged coastal winter steelhead stream and may not apply to wild steelhead in the interior.

Steelhead fry densities in the four rivers (all mainstem sites combined) were little different in areas rated as **good/excellent** compared to **poor/moderate** in 1992 (Table 28). For comparison, fry densities in the sites rated as good were nearly double those measured in the poorer areas in 1991 in all systems except the Sustut River. It was unexpected that there were no differences in densities between the sites in 1992, since it is assumed that fry densities would be higher in areas with better cover and flow conditions, and that poorer quality sites would tend to be utilized after the better sites were occupied to capacity.

Since the fry sampling program was conducted within 1-2 months of fry emergence, the mainstem fry have not been exposed to significant events such as floods, severe low flows, or ice conditions prior to sampling. It is assumed that the fry densities reflect egg deposition and hence the strength of the spawning run.

Table 28. Summary of Steelhead Fry and Parr Densities in Different Habitat Categories in the Mainstem of Four Skeena Tributaries in 1991 and 1992.

		STEELHEAD FRY				
		KITWANGA	MORICE	SUSTUT	ZYMOETZ	MEAN
POOR/MEDIUM	1992	0.14	0.21	0.19	0.22	0.19
	1991	1.15	0.14	0.13	0.35	0.44
GOOD/EXCELLENT	1992	0.32	0.16	0.17	0.26	0.23
	1991	1.80	0.30	0.13	0.64	0.72
		STEELHEAD PARR				
POOR/MEDIUM	1992	0.05	0.01	0.02	0.04	0.03
	1991	0.06	0.01	0.01	0.03	0.03
GOOD/EXCELLENT	1992	0.07	0.03	0.08	0.05	0.06
	1991	0.01	0.09	0.01	0.09	0.05

The sampling results suggest that the steelhead escapements to the Skeena tributaries in the fall of 1991 (spawning in the spring of 1992) were low compared to the previous year in all of the tributaries except the upper Sustut system. Other indicators of steelhead escapements to the Skeena in 1991 such as information provided by angling guides and test-fishery results also indicate a low escapement in the fall of 1991 (Bob Hooton, B.C. Environment, pers. comm.). Based on the low fry densities measured it would appear that the escapements were too low to ensure adequate seeding of the tributary streams.

The upper Sustut and Bear rivers were the exception to the pattern of lower fry densities. Snorkel and aerial surveys during the fall of 1991 had suggested extremely low numbers of steelhead were present in the upper Sustut (data on file, B.C. Environment, Smithers), and it was expected that fry numbers would be even lower than those measured in 1991 which originated from a larger adult population. Instead fry numbers were nearly twice as high as the previous year, suggesting that the adult surveys as conducted may not have provided a good index of the true escapement or that significantly higher egg-to-fry survival was experienced in 1992.

Fry densities in the Bear River were also slightly higher than the previous year. Aerial escapement estimates in the Bear during May 1992 indicated approximately 150 steelhead were observed in the upper sections of the Bear (data on file, B.C. Environment, Smithers). Comparable data for previous years is not available for this system. Although the fry densities were higher, it is probable that the lower Sustut River is dependant to some extent

upon the Bear River for fry recruitment based on the results of Williams et al. (1985). The very low fry densities measured in the lower Sustut River suggests inadequate recruitment into this section of river from upstream areas. Presumably, steelhead escapements to the Bear River were inadequate to produce enough fry to seed the lower Sustut River in 1992.

4.2 STEELHEAD PARR DENSITIES

A summary of steelhead parr densities in the main systems sampled during the past two years is shown in Figure 21. Generally, most parr captured in the mainstem systems are age 1+ fish (81.5% for all of the systems combined). In the tributaries, the age 1+ component of the parr was lower (71.9%), presumably reflecting an improved ability to more effectively sample parr habitat in the tributary sites. Typically the older age classes of steelhead parr present in the mainstem rivers are in deeper and faster water than normally enclosed within our sample sites.

Kitwanga River parr densities (0.06 parr/m^2) were up from the 1991 estimates when nearly all parr were restricted to the upper reach, immediately downstream from Kitwancool Lake. The very high fry densities measured in the Kitwanga during 1991 (1.4 fry/m^2) did not lead to exceptionally high parr densities in 1992.

In the Morice system, parr densities were down in Reach 1 of the mainstem river and in the Thautil River (Figure 6). However parr densities in Owen Creek were sharply higher (0.31 parr/m^2) and comparable to levels measured in the early 1980's (Figure 7). Parr densities in Lamprey and Shea creeks were similar to 1991 results (Figure 6) but well below levels in the period 1982-84 when parr densities in the 0.2 to 0.4 parr/m^2 were measured (Figure 7). It is interesting to note that the parr densities were below the apparent potential of these two tributaries despite generally high fry recruitment the previous year (Figure 6). It appears that these systems are important steelhead fry producers, but that parr abundance may be limited during years of very low flows such as 1991 and 1992 when suitable parr habitat may be limited and the older fish drop out of the smaller tributaries to downstream locations. Flow and cover conditions in other tributaries such as Owen and Buck creeks appear to be adequate to hold the older age classes of steelhead during most years (eg., Figure 8).

Steelhead parr densities in the Sustut River were up significantly throughout the mainstem system and tributaries (Figure 12). This occurred despite relatively low fry densities measured the previous year. It is interesting to note that parr densities in Reach 7 of the upper Sustut River were approximately 0.14 parr/m^2, indicating that this is a very important section of the river for juvenile

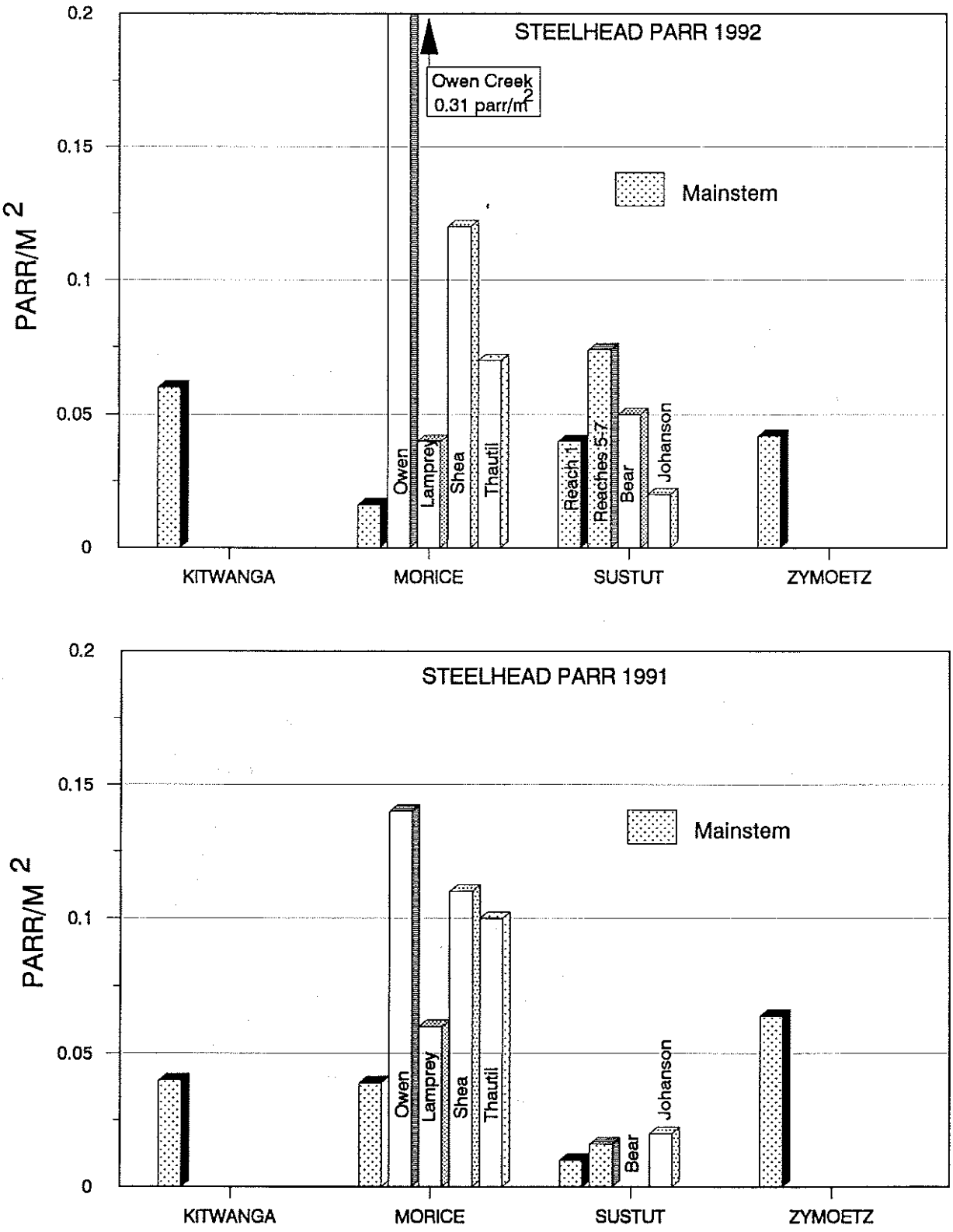

Figure 21. Summary of Steelhead Parr Densities in Mainstem and Selected Tributaries of the Upper Skeena Study Streams for 1991 and 1992.

steelhead rearing and is comparable to some of the most productive parr rearing systems found elsewhere in the Skeena River. This high productivity occurs despite being located at an elevation of 1200 m in an area with a very short growing season and harsh winters.

Parr densities in the lower Sustut, although up substantially compared to 1991, were still well below levels measured in this section of the river from 1983 to 1985 (Figure 13). The higher parr and fry densities in the upper river suggest that this component of the Sustut steelhead run (early fish) was more capable of seeding the available habitat in the top end of the system than the run of steelhead into the lower Sustut and Bear rivers (later fish) during the past two years. The results also suggest that fry recruitment to all parts of the Sustut in 1990 must have been abysmal, considering the almost complete lack of parr found in the system in 1991.

Johanson Creek continues to support low densities of steelhead parr compared to other steelhead rearing sections of the Sustut River. There is no evidence from past sampling to indicate Johanson Creek itself supports high densities of steelhead fry or parr. However, Unnamed Tributary C appears to be a significant fry recruitment area and parr have consistently been found in the lower ends of several other tributaries (Table 19). Although Johanson Creek macronutrient levels are comparable to the upper Sustut River (Perrin 1993), water temperatures in the Sustut upstream of the confluence were on average 3°C warmer than Johanson Creek at this location from July through September (Bustard 1993).

Zymoetz River steelhead parr densities for all sites combined were lower in 1992 compared to 1991 (0.04 parr/m^2 compared to 0.06 parr/m^2). The lower densities were largely the result of lower catches in Reach 6 (Figure 17). Parr densities in Reach 7 were, in fact, higher in 1992. Considerable channel shifting has been occurring in the Zymoetz River in Reach 6 leading to instability in the sample sites in this section. Steelhead parr densities in Coal Creek in the upper Zymoetz (0.19 parr/m^2) were higher than 1991 levels and presumably reflect high fry recruitment in this system in 1991 and this system's importance as a productive juvenile steelhead rearing system (Table 23).

Steelhead parr densities in the four river systems at sites rated as **good/excellent** were approximately double the densities measured at sites rated as **poor/moderate** (Table 28). This is similar to the 1991 results. It should be noted that these differences were not as definitive in the Zymoetz and Kitwanga rivers as in the Sustut and Morice rivers in 1992. These results suggest that site selection for habitat characteristics such as cover and flow conditions is a more important consideration when monitoring

steelhead parr abundance compared to steelhead fry since there was little difference in fry densities between habitat types in the 1992 sampling.

4.3 BIOMASS ESTIMATES

The highest total fish biomass measured in the various study streams during the past two years of sampling has occurred in Owen Creek followed by Buck, Coal and Trapline creeks where total fish biomass has exceeded 3 grams/m^2. Steelhead fry biomass has exceeded 1 gram/m^2 in Coal, Owen, Trapline and Lamprey creeks. Trapline Creek information is based on 1991 sampling results, as we were unable to sample this system in 1992 due to freshet conditions. The biomass estimates for most of the systems sampled during the surveys is shown in Figure 22 plotted against measurements of total dissolved solids for these systems.

The Stock Management Unit of the Recreational Fisheries Branch of B.C. Environment has placed considerable emphasis on linking system productive capacity to measurements of TDS. As part of the 1992 sampling program, TDS measurements were collected at most of the sample sites (Appendix 5) and are intended to provide B.C. Environment staff with support data to help develop their models for steelhead productive capacity.

A simplistic analysis (plotting fish biomass against TDS) suggests that while total fish biomass tended to increase at sites with higher TDS (r^2=0.496), systems such as Johanson Creek, the lower Sustut and Thautil rivers do not fit well into the relationship. These systems may be significantly under-recruited. The relationship is also quite poor for the steelhead fry estimates (r^2=0.279) based on the two years of data. Other factors such as temperature and nutrient limitations (Perrin 1993), habitat conditions, and poor recruitment probably play significant roles in determining fish biomass in these systems.

4.4 JUVENILE STEELHEAD SIZE ESTIMATES

Considerable emphasis has been placed on providing detailed information describing juvenile steelhead size estimates for the various systems including some sampling at several times during the season. Fry size has been found to be an important determinant of eventual smolt age in steelhead (Ward and Slaney, in press) and is used by the B.C. Environment research staff to assist with modelling exercises to predict smolt output for various Skeena tributaries. Studies during 1992 continue to provide an improved database for the Skeena River for this purpose. It is assumed that the differences in fry sizes reflect differences in timing of

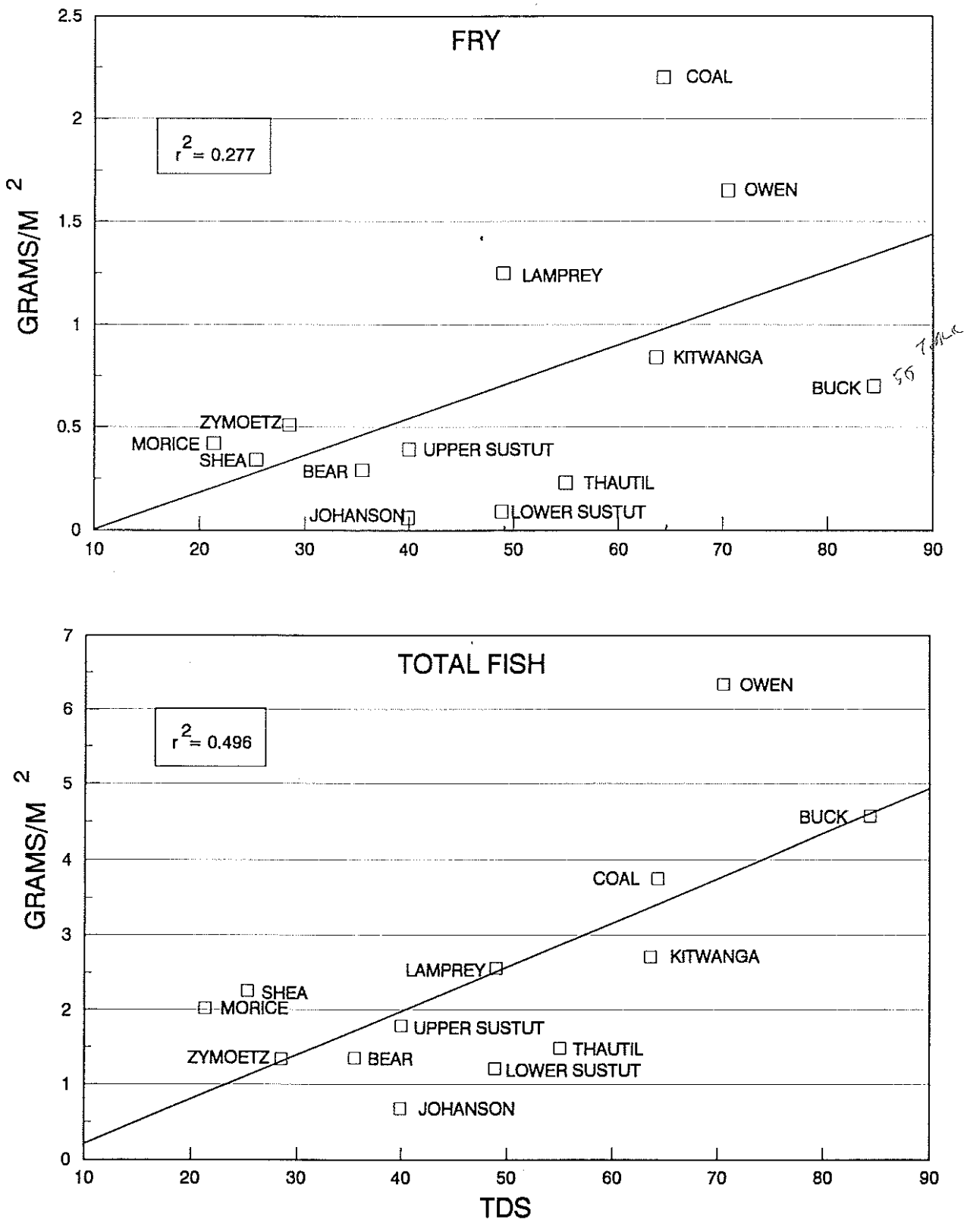

Figure 22. Observed Steelhead Fry and Total Fish Biomass Versus Total Dissolved Solids in Skeena Tributaries.

sampling, fish densities, and habitat productivity amongst the sites. It is not the purpose of this study to conduct detailed analysis of these factors, but rather to provide the building blocks for ongoing modelling and research.

With this as background, Table 29 summarizes the results for the main systems and a few tributaries sampled during September of 1991 and 1992. More detailed information can be found within the individual system results.

The results suggest that by mid- to late September, steelhead fry in most of the systems are in the 45-50 mm fork length range. Exceptions include Reach 2 of the Morice in 1991, the Bear River and sections of the Sustut depending upon the year.

Steelhead fry size in the Sustut upstream of the Bear was reversed from 1991 when fry in the upper portion of the system were on average 4 mm larger than in the lower Sustut. In 1992, Sustut fry below the Bear confluence were 3 mm larger than in the upper portion of the system. It should be noted that fry densities were higher in the upper system. Sampling in the Bear and sections of the upper Sustut near spawning locations suggests smaller steelhead fry are present in close proximity to spawning locations (Table 22).

Observations in the upper Sustut indicated that steelhead fry emergence started to occur in the last week of July, but that some newly-emerged fry were still present in the system in September and early October (Table 22). It appears that emergence in some locations such as Unnamed Tributary C in Johanson Creek occurs during late August and early September. For comparison, steelhead fry emergence in the upper Morice occurred throughout August with a peak on August 9-13 (Envirocon Ltd. 1984). Williams et al. (1985) report that steelhead fry emergence in the Bear was virtually complete by August 6.

Water temperature data and fry sampling results in the vicinity of the Sustut-Johanson confluence suggests that steelhead fry stop growing by the end of September and enter the winter at a mean size of 39-45 mm depending upon the year and sample location. For comparison, steelhead fry sampled in the Kitwanga River in late October were 58.5 mm fork length. Data collected in Reach 2 of the Morice River in November 1979 indicated fry entered the winter at 50.0 mm while Owen Creek fry were 54.5 mm (Envirocon Ltd. 1984).

In the Sustut River water temperatures rise above 5°C by early June and typically remain at these levels through September (Appendix 3 Figure 1). It is assumed that nearly all juvenile growth occurs during this four-month period. For comparison, water temperatures in the mainstem Morice are above 5°C from mid-May until early November, with maximum temperatures approaching 15°C during August (Envirocon 1984).

It is interesting to note that age 1+ steelhead parr in the upper Sustut (approximately 85 mm by mid-September) are comparable in size to similar-aged parr in other Skeena tributaries (Table 29). Growth of parr in these high elevation sites must be very rapid, reflecting a warm headwater lake (Sustut Lake) and long daylight hours. The upper Sustut River is a moderate to high alkalinity system with low levels of inorganic N and P concentrations (Perrin 1993). Inorganic N levels are among the lowest levels reported in any stream in B.C.

Table 29. Summary of Mean Fork Length (mm) of Steelhead Fry and Age 1+ Parr in Upper Skeena Tributaries Sampled During September 1991 and 1992.

	AGE 0+		AGE 1+	
	1991	1992	1991	1992
Morice (Reach 1)	45.7	48.5	88.4	84.8
Morice (Reach 2)	42.5	NS[24]	85.2	NS
Lamprey	47.8	47.1	80.2	NA[25]
Owen[26]	47.3	49.5	85.0	87.0
Sustut Below Bear	42.8	46.4	NA	81.7
Sustut Above Bear	45.1	42.3	86.3	85.7
Bear	41.8	40.3	NA	85.9
Zymoetz Mainstem	48.6	NS	81.3	NS

Similar to 1991 observations, productive tributaries such as Owen and Lamprey creeks appear to provide a distinct advantage to juvenile steelhead growth during the spring and early summer due to warmer water temperatures early in the year compared to the mainstem river. For example, steelhead fry in the mainstem Morice averaged 12 mm smaller than Lamprey Creek fry on August 19 (Table 14). By late September, fry in the mainstem Morice were slightly larger than Lamprey Creek fry which had grown little during the

[24] NS - either not sampled or not sampled during the same time period.

[25] NA - Inadequate sample size (<10)

[26] Late August sample

late August-September period, presumably reflecting the high densities of fry present in the system during this low-flow period. The data suggests that during warm dry summers such as 1991 and 1992 the advantages of the early growth in these warm productive tributaries is lost during the late summer/fall period when growth is more rapid in the mainstem river system.

5.0 RECOMMENDATIONS

1.) It is recommended that the juvenile steelhead index sampling program be continued on an annual basis at approximately the level undertaken during 1992 with some small modifications. The program provides fisheries management biologists with a meaningful index of the strength of the past year's spawning escapement through the fry density estimates. As well, the sampling provides a measure of the various systems' capability for age 1+ parr production, a key stage in developing production estimates from steelhead streams. Such programs need to be conducted over a number of years reflecting high and low steelhead escapement estimates in an effort to understand where the various systems stand in terms of productive capability. The data provided from the surveys allows for verification and improvement of steelhead production models for the Skeena River steelhead stocks.

2.) The sample results in 1992 indicate the importance of including a range of systems in the index assessments. For example, the results in the upper Sustut River were very different than in the lower Sustut (these runs have a distinctly different timing). Recruitment to the Zymoetz, Morice and Kitwanga rivers has also been different than the upper Sustut in both 1991 and 1992. Similarly, relying on a single tributary can be misleading. For example, Buck Creek fry recruitment in 1992 was sharply lower than Morice River tributaries.

3.) The upper Sustut River provides an important opportunity to relate fry abundance to a known spawning population in 1993 due to adult studies conducted on this system in the fall of 1992. It is strongly recommended that juvenile assessments be continued in this system. Some of the exploratory sampling conducted in the upper Sustut (eg., Darb, Solo and Sustut Lake tributaries) could be ended. Tributary C in Johanson Creek should definitely be included in any index surveys in the upper Sustut River.

4.) The sample results continue to suggest that less emphasis needs to be placed on assessing steelhead fry sites and more on parr habitat. The results suggest that fewer sites are needed to provide an index of fry abundance, but that parr results are variable and need specific sampling in sites suitable for parr rearing (often not the fry sites). Whenever possible, parr sites should emphasize tributaries and large sidechannels where effective sampling can be conducted in complex cover sites.

5.) Although freshet conditions curtailed sampling in Reaches 2 and 3 of the Morice River in 1992, these areas both provide valuable indices of juvenile steelhead abundance and monitoring sites in these reaches should be continued to allow comparisons to past data.

6.) Repetitive sampling at a number of locations during two or three different time periods is recommended to provide growth data on the various systems. This program was limited by the freshet conditions that persisted through the fall of 1992. Steelhead parr growth rates in the upper Sustut are unexpectedly rapid (based on age 1+ parr sizes in September) and difficult to explain in terms of the short growing season and limited nutrients in this area. This is an area that should be examined in more detail to validate model assumptions of productivity.

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Appendix 1. Site Descriptions and Detailed Results of Fish Sampling in the Kitwanga River 1992.

Appendix 1 Table 1. Kitwanga River Catch Composition for Sample Sites 1991 and 1992

FILE = KITSUM

1992

SYSTEM	SITE	RAINBOW 0+	RAINBOW 1+	RAINBOW 2+	RAINBOW 3+	CHIN	COHO	DV	SCULPIN RMW	SCULPIN PRICKLY	SCULPIN SLIMY	AREA (M)2	LENGTH (M)
Kitwanga	K1	36	1			15		8				105	21.4
August	K2	27	11			17		11		1	17	89	12.6
	K3	5					16	11				147	27.2
	K4	22	25			55	58	57		1		196	28.5
	K5	51	1					16				92	16.4
	K6	37	3			2	57	27				188	24.3
	K7	1	12	2			12			56		118	15.3
TOTAL		178.2	53.1	2		89.4	143.7	129.9		58.3	17.3	935.4	145.7
PERCENT		26.5	7.9	0.3		13.3	21.4	19.3		8.7	2.6		100
										TOTAL FISH =		671.9	
Kitwanga	K1	10	4			4						73	20.5
October	K2	38	4			2		1				63	16.8
TOTAL		47.6	8	0	0	6	0	1	0	0	0	136.6	37.3
PERCENT		76.0	12.8	0.0	0.0	9.6	0.0	1.6	0.0	0.0	0.0		100
										TOTAL FISH =		62.6	

1991

SYSTEM	SITE	RAINBOW 0+	RAINBOW 1+	RAINBOW 2+	RAINBOW 3+	CHIN	COHO	DV	RMW	SCULPIN	AREA (M)2	LENGTH (M)
Kitwanga	K1	103	1			4		11	8	1	80	20.5
August	K2	133	1			44	1	9		5	57	16.8
	K3	137	2			25	10	133	2		86	20.2
	K4	146				49	1	22			94	17.0
	K5	153				31	1	17	1		99	20.3
	K6	206	1			6	2	86			145	23.0
	K7	43	28				20			48	134	15.0
TOTAL		921	33			159	35	278	11	54	695	132.8
PERCENT		61.8	2.2			10.7	2.3	18.6	0.7	3.6		100
										TOTAL FISH =	1491	
Moonlit Ck Km1		6				8		50			115	11.3

Appendix 1 Table 2. Kitwanga River Biomass Estimates for 1991 and 1992.

FILE = KITSUM

1992

SITE	REACH	RAINBOW 0+	RAINBOW 1+	RAINBOW 2+	RAINBOW 3+	CHIN	COHO	DV	RMW	SCULPIN PRICKLY	SCULPIN SLIMY	AREA (M)2	TOTAL
K1	1	0.39	0.04	0.00		0.44	0.00	0.11		0.00	0.00	105	0.980
K2	2	0.43	0.84	0.00		0.92	0.00	0.58		0.09	0.36	89	3.220
K3	2	0.04	0.00	0.00		0.00	0.12	0.09		0.00	0.00	147	0.250
K4	3	0.08	0.78	0.00		0.98	0.53	1.33		0.06	0.00	196	3.760
K5	3	0.68	0.04	0.00		0.00	0.00	0.26		0.00	0.00	92	0.980
K6	4	0.18	0.12	0.00		0.04	0.35	0.28		0.00	0.00	188	0.970
K7	5	0.02	0.51	0.29		0.00	0.37	0.00		2.80	0.00	118	3.990
TOTAL		1.82	2.33	0.29		2.38	1.37	2.65		2.95	0.36	935	14.15
PERCENT		12.86	16.47	2.05		16.82	9.68	18.73		20.85	2.54		100
										TOTAL BIOMASS		14.15	
MEAN		0.26	0.33	0.04		0.34	0.20	0.38		0.42	0.05		2.02
Kitwanga	K1	0.34	0.31			0.29		0.00				73	0.940
October	K2	1.43	0.31			0.24		0.04				63	2.020
TOTAL		1.77	0.62			0.53		0.04				137	2.96
PERCENT		59.80	20.95			17.91		1.35					100
										TOTAL BIOMASS		2.96	
MEAN		0.89	0.31			0.27		0.02					1.48

1991

SITE	REACH	RAINBOW 0+	RAINBOW PARR	CHIN	COHO	DV	RMW	SCULPIN	AREA (M)2	TOTAL
K1	1	0.79	0.05	0.11	0.00	0.12	0.09	0.19	80	1.350
K2	2	1.49	0.10	2.11	0.03	0.17	0.00	1.10	57	5.000
K3	2	0.63	0.08	0.49	0.09	1.36	0.02	0.00	86	2.670
K4	3	0.66	0.00	1.24	0.01	0.46	0.00	0.00	94	2.370
K5	3	0.88	0.00	1.00	0.01	0.26	0.02	0.00	99	2.170
K6	4	0.87	0.03	0.13	0.02	0.58	0.00	0.00	145	1.630
K7	5	0.56	0.79	0.00	0.34	0.00	0.00	2.08	134	3.770
TOTAL		5.88	1.05	5.08	0.50	2.95	0.13	3.37	695	18.96
PERCENT		31.01	5.54	26.79	2.64	15.56	0.69	17.77		100
								TOTAL FISH =	18.96	
MEAN		0.84	0.15	0.73	0.07	0.42	0.02	0.48		2.71
Km1	1	0.01		0.11		0.70			115	0.820

KITWANGA RIVER STEELHEAD INDEX SITE 1992

SITE: K1 REACH: 1 MAP#: 103 P/1 PHOTO: (1)#1 ACCESS: VEH DATE: Aug 17

SITE LOCATION: Approximately 40 m downstream from the Woodcock Road bridge.
Same location as 1991

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 12.5 TDS (ppm): 70 pH: 7.7
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Discharge was lower than 1991. Observed several hundred pinks spawning along edge.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	38-53	44.1	30	5	35	36.0	1.4	0.342	1.68	1.14	0.39
Rbt	1+	66	66.0	1	0	1	1.0	0.0	0.009	0.05	4.10	0.04
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	52-66	59.1	11	3	14	15.1	1.9	0.144	0.71	3.08	0.44
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	37-44	40.5	6	0	6	6.0	0.0	0.057	0.28	0.89	0.05
Dolly Varden	1+	65-66	65.5	2	0	2	2.0	0.0	0.019	0.09	3.23	0.06
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							60.1		0.571	2.81		0.98

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	4.2	LOD		POOL	25	N/A
3	5.8	COBBLE/BOULDER	100	RIFFLE	25	N/A
6	5.1	IN VEG		RUN	50	
9	2.5	OVER VEG		OTHER		
12	7.0	CUTBANK				
15						
18		TOTAL	N/A	D90/50:	10/7	
20				(cm)		
24						
	4.9					
AREA (M*M)	105.3	MARGIN (M)	21.4			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Moderate
RATIONALE:

STEELHEAD PARR RATING: 100% Poor
RATIONALE:

KITWANGA RIVER STEELHEAD INDEX SITE 1992

SITE: K2 REACH: 2 MAP#: 103 P/1 PHOTO: (1)#2,3 ACCESS: VEH DATE: Aug 17

SITE LOCATION: Kitwanga River left access road from the National Historic Site.
Same location as 1991. Tea Creek was dewatered at the mouth.

S = SIDE / M = MAINSTEM: M SLOPE (%): 2 TEMP (C): 14.1 TDS (ppm): 67.7 pH: 7.6
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	38-59	47.6	20	5	25	26.7	2.2	0.301	2.12	1.43	0.43
Rbt	1+	68-94	81.3	10	1	11	11.1	0.4	0.125	0.88	6.72	0.84
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	53-78	68.8	15	2	17	17.3	0.7	0.195	1.37	4.74	0.92
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	38-43	40.0	2	1	3	4.0	3.5	0.045	0.32	0.87	0.04
Dolly Varden	1+	80-95	86.6	7	0	7	7.0	0.0	0.079	0.56	6.81	0.54
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all	85	85.0	1	0	1	1.0	0.0	0.011	0.08	7.60	0.09
Slimy Sculpin	all	95-140	112.70	11	4	15	17.3	3.5	0.195	1.37	1.87	0.36
TOTAL							84.4		0.951	6.70		3.22

230 g/unit (1 pass)
248 g/unit expanded

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	4.1	LOD		POOL			100
3	6.5	COBBLE/BOULDER	100	RIFFLE	80		40
6	7.6	IN VEG		RUN	20		
9	8.5	OVER VEG		OTHER			
12	8.5	CUTBANK					
15							
18		TOTAL	100	D90/50:	40/8		
20				(cm)			
24							
	7.0						
AREA (M*M)	88.7	MARGIN (M)	12.6				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Excellent 40% Moderate
RATIONALE: Limited by deep water with high velocity.

STEELHEAD PARR RATING: 60% Good
RATIONALE: Boulders with adequate water depth and velocity.

KITWANGA RIVER STEELHEAD INDEX SITE 1992

SITE: K3 REACH: 2 MAP#: 103 P/1 PHOTO: (1)#4,5 ACCESS: VEH DATE: Aug 17

SITE LOCATION: Approximately 70 m upstream from the Mill Creek bridge crossing.
Same location as 1991. Ground water seepage still present along margin.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 13.7 TDS (ppm): 64.5 pH: 7.4
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Observed a few chinook spawning in the riffle just downstream.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	37-55	44.4	5	0	5	5.0	0.0	0.034	0.18	1.16	0.04
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	44-55	46.1	8	4	12	16.0	6.9	0.109	0.59	1.14	0.12
Dolly Varden	0+	36-64	42.3	7	2	9	9.8	1.7	0.067	0.36	1.00	0.07
Dolly Varden	1+	64	64.0	1	0	1	1.0	0.0	0.007	0.04	3.04	0.02
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							31.8		0.217	1.17		0.25

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	4.2	LOD		POOL	30	30
3	5.0	COBBLE/BOULDER	100	RIFFLE	30	25
6	6.8	IN VEG		RUN	40	
9	6.1	OVER VEG		OTHER		
12	6.2	CUTBANK				
15	4.1					
18		TOTAL	50	D90/50: 40/7		
20				(cm)		
24						
	5.4					

AREA (M*M) 146.9 MARGIN (M) 27.2

HABITAT COMMENTS:

STEELHEAD FRY RATING: 80% Moderate 20% Poor
RATIONALE:

STEELHEAD PARR RATING: 95% Poor 5% Moderate
RATIONALE: Limited by low water velocity and small substrate.

KITWANGA RIVER STEELHEAD INDEX SITE 1992

SITE: K4 REACH: 3 MAP#: 103 P/1 PHOTO: (1)#10 ACCESS: VEH DATE: Aug 18

SITE LOCATION: Approximately 4 km downstream from Kitwancool. Accessed from a small road near Highway pull–out. Due to low discharge, this site was moved slighlty upstream from the 1991 location.

S = SIDE / M = MAINSTEM: M SLOPE (%): 2 TEMP (C): 14.4 TDS (ppm): 62.1 pH: 7.6
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Observed 15–20 chinook spawning in riffle just upstream.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN–M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	32–56	38.5	14	5	19	21.8	3.8	0.111	0.76	0.76	0.08
Rbt	1+	61–100	78.3	15	6	21	25.0	5.1	0.127	0.88	6.15	0.78
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	49–71	61.6	34	13	47	55.0	6.9	0.281	1.93	3.50	0.98
Coho	all	41–66	52.5	54	4	58	58.3	0.7	0.297	2.05	1.77	0.53
Dolly Varden	0+	42–49	45.0	11	4	15	17.3	3.5	0.088	0.61	1.19	0.10
Dolly Varden	1+	68–117	82.8	40	0	40	40.0	0.0	0.204	1.40	6.04	1.23
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all	102	102.0	1	0	1	1.0	0.0	0.005	0.04	12.57	0.06
TOTAL							218.4		1.113	7.66		3.78

201 g/ha/yr (1+ years)
238 expanded

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	6.0	LOD		POOL	20		40
3	8.7	COBBLE/BOULDER	70	RIFFLE	80		8
6	9.1	IN VEG		RUN			
9	8.4	OVER VEG	30	OTHER			
12	5.8	CUTBANK					
15	3.3						
18		TOTAL	50	D90/50:	20/5		
20				(cm)			
24							
	6.9						
AREA (M*M)	196.2	MARGIN (M)	28.5				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Excellent 30% Good 20% Moderate
RATIONALE:

STEELHEAD PARR RATING: 35% Good 40% Moderate 25% Poor
RATIONALE:

KITWANGA RIVER STEELHEAD INDEX SITE 1992

SITE: K5 REACH: 3 MAP#: 103 P/8 PHOTO: (1)#8,9 ACCESS: VEH DATE: Aug 18

SITE LOCATION: Kitwanga River below lower bridge at Kitwancool Village.
This site was moved downstream approximately 20 m from the 1991 location.

S = SIDE / M = MAINSTEM: M SLOPE (%): 2 TEMP (C): 14.2 TDS (ppm): 64.9 pH: 7.5
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	34-57	45.2	48	3	51	51.2	0.5	0.555	3.12	1.22	0.68
Rbt	1+	61	61.0	0	1	1	1.0	0.0	0.011	0.06	3.41	0.04
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	38-51	43.0	10	2	12	12.5	1.1	0.136	0.76	1.05	0.14
Dolly Varden	1+	60-72	68.0	3	0	3	3.0	0.0	0.033	0.18	3.57	0.12
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							67.7		0.734	4.13		0.97

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	8.2	LOD		POOL	20	N/A
3	5.4	COBBLE/BOULDER	100	RIFFLE	50	
6	5.4	IN VEG		RUN	30	
9	3.5	OVER VEG		OTHER		
12		CUTBANK				
15						
18		TOTAL	95	D90/50:	20/10	
20				(cm)		
24						
	5.6					
AREA (M*M)	92.2	MARGIN (M)	16.4			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Excellent 30% Good 20%Moderate
RATIONALE:

STEELHEAD PARR RATING: 50% Good 50% Poor
RATIONALE:

KITWANGA RIVER STEELHEAD INDEX SITE 1992

SITE: K6 REACH: 4 MAP#: 103 P/8 PHOTO: (1)#7 ACCESS: VEH DATE: Aug 18

SITE LOCATION: Kitwanga River downstream from the Kitwancool Forest Service bridge.
Same location as 1991.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 13.3 TDS (ppm): 64.8 pH: 7.5
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	32-60	41.5	27	7	34	36.5	2.8	0.194	1.50	0.95	0.18
Rbt	1+	80-90	85.3	1	2	3	3.0	3.5	0.016	0.12	7.51	0.12
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	58-66	62.0	2	0	2	2.0	0.0	0.011	0.08	3.57	0.04
Coho	all	34-56	45.0	13	10	23	57.3	69.3	0.304	2.36	1.14	0.35
Dolly Varden	0+	37-54	47.8	16	5	21	23.3	3.0	0.124	0.96	1.39	0.17
Dolly Varden	1+	75-82	79.3	2	1	3	4.0	3.5	0.021	0.16	5.38	0.11
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							126.1		0.669	5.19		0.97

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	10.0	LOD		POOL	50	80
3	9.7	COBBLE/BOULDER	100	RIFFLE	50	10
6	9.5	IN VEG		RUN		
9	8.9	OVER VEG		OTHER		
12	5.9	CUTBANK				
15	2.5					
18		TOTAL	30	D90/50: 7/3		
20				(cm)		
24						
	7.8					
AREA (M*M)	188.3	MARGIN (M)	24.3			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 80% Moderate 20% Poor
RATIONALE: Poor in sections having limited cover due to small bed material.

STEELHEAD PARR RATING: 100% Poor
RATIONALE: Limited cover due to shallow depth and small substrate.

KITWANGA RIVER STEELHEAD INDEX SITE 1992

SITE: K7 REACH: 5 MAP#: 103 P/8 PHOTO: (1)#6 ACCESS: VEH DATE: Aug 18

SITE LOCATION: Approximately 1.5 km upstream from Moonlit Creek. Accessed from spur road off old Highway. Same location as 1991. Natives have a rebar fence situated 100 m upstream (3 chinook in box).

S = SIDE / M = MAINSTEM: M SLOPE (%): 2 TEMP (C): 15.8 TDS (ppm): 51.3 pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	53	53.0	1	0	1	1.0	0.0	0.008	0.07	2.20	0.02
Rbt	1+	61-97	71.3	6	3	9	12.0	6.0	0.102	0.78	5.05	0.51
Rbt	2+	112-113	112.5	2	0	2	2.0	0.0	0.017	0.13	17.12	0.29
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	59-77	64.4	10	1	11	12.1	0.4	0.103	0.79	3.64	0.37
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all	61-108	80.2	13	10	23	56.3	69.3	0.478	3.68	5.85	2.80
TOTAL							83.4		0.708	5.45		3.99

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	7.7	LOD		POOL	20	40
3	8.0	COBBLE/BOULDER	70	RIFFLE	50	5
6	9.4	IN VEG		RUN	30	
9	8.5	OVER VEG	30	OTHER		
12	4.9	CUTBANK				
15						
18		TOTAL	50	D90/50:	20/5	
20				(cm)		
24						
	7.7					
AREA (M*M)	117.8	MARGIN (M)	15.3			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Moderate
RATIONALE:

STEELHEAD PARR RATING: 60% Moderate 40% Poor
RATIONALE: Limited in some sections by shallow depth.

KITWANGA RIVER STEELHEAD INDEX SITE 1992

SITE: K1 REACH: 1 MAP#: 103 P/1 PHOTO: (7)#5,6 ACCESS: VEH DATE: Oct 21

SITE LOCATION: Approximately 40 m downstream from the Woodcock Road bridge.
Same location as 1991. (October sample)

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 4.3 TDS (ppm): 63.6 pH: 7.7
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Heavy rains and flooding since last sampling at this site.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	53-63	58.9	10	0	10	10.0	0.0	0.137	0.49	2.50	0.34
Rbt	1+	72-84	78.0	4	0	4	4.0	0.0	0.055	0.20	5.75	0.31
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	59-82	71.0	2	1	3	4.0	3.5	0.055	0.20	5.38	0.29
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							18.0		0.246	0.88		0.95

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	1.5	LOD		POOL		
3	3.8	COBBLE/BOULDER	100	RIFFLE	60	15
6	4.9	IN VEG		RUN	40	
9	4.5	OVER VEG		OTHER		
12	4.8	CUTBANK				
15	3.5					
18	2.0	TOTAL	75	D90/50: 10/7 (cm)		
20						
24						
	3.6					
AREA (M*M)	73.2	MARGIN (M)	20.5			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Moderate 10% Good
RATIONALE: Moderate along slower sections of margin. Good in cobble sections with low velocity.

STEELHEAD PARR RATING: 20% Moderate 80% Poor
RATIONALE: Limited by shallow depth and small substrate.

KITWANGA RIVER STEELHEAD INDEX SITE 1992

SITE: K2 REACH: 2 MAP#: 103 P/1 PHOTO: (7)#7,8 ACCESS: VEH DATE: Oct 21

SITE LOCATION: Kitwanga River left access road from the National Historic site.
This site was moved downstream approx. 125 m from the original location. (October sample)

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 4.3 TDS (ppm): 59.4 pH: 7.8
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Some influence within this site from Tea Creek water. Heavy rains and flooding since last sampling at this site.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	37-68	58.1	26	8	34	37.6	3.7	0.593	2.24	2.42	1.43
Rbt	1+	68-82	74.0	4	0	4	4.0	0.0	0.063	0.24	4.86	0.31
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	78-81	79.5	2	0	2	2.0	0.0	0.032	0.12	7.59	0.24
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	61	61.0	0	1	1	1.0	0.0	0.016	0.06	2.30	0.04
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							44.6		0.703	2.65		2.02

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	1.3	LOD		POOL			
3	2.7	COBBLE/BOULDER	100	RIFFLE			
6	3.8	IN VEG		RUN	90		40
9	5.3	OVER VEG		FLAT	10		
12	4.9	CUTBANK					
15	5.0						
18	3.4	TOTAL	75	D90/50:	25/11		
20				(cm)			
24							
	3.8						
AREA (M*M)	63.4	MARGIN (M)	16.8				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 25% Good 25% Moderate 50% Poor
RATIONALE: Good in shallow cobble flat along margin. Moderate in low velocity run sections with <40 cm depth.

STEELHEAD PARR RATING: 30% Excellent 40% Good 30% Poor
RATIONALE: Good to Excellent in sections with large substrate and moderate depth.

Appendix 2. Site Descriptions and Detailed Results of Fish Sampling in the Morice River and Tributaries 1992.

Appendix 2 Table 1. Morice River Catch Composition for Sample Sites 1992.

FILE = MORSUM

SITE	LOCATION	RAINBOW 0+	RAINBOW 1+	RAINBOW 2+	RAINBOW 3+	RAINBOW 4+	CHIN	COHO	DV	RMW	LN DACE	COTT	SUCKER	AREA (M)2	LENGTH (M)
M4	REACH 2	29	3				18			2	72			156	25.7
M11a	REACH 1	22					2	16				4		169	21.9
M12	"	42						3				1		177	25.7
M13	"	5	3		2			31				1		89	24.3
M14	"	8					4							97	23.2
M15	"	21	3	1			2	47				1		118	22.1
M16	"	20	1				2	1						119	21.0
M17	"	49	1	3			22	4				4		157	22.8
M19	"	18					45					1		97	21.3
M21	"	17	2				1							109	14.1
Mo1	OWEN 1	6	4				15	136		40	20			113	20.1
Mo2	OWEN 2	117	32	16	1				16	7	2			132	20.0
Mo3	OWEN 3	113	22	9	2	1			27	10	17			142	21.3
Ml1	LAMPREY 1	77	6	4			36	157	1	5	3	1		229	31.0
Ml2	LAMPREY 2	38	3	9	5			9		18	37		2	275	35.4
Ml3	LAMPREY 3	291	1	1							24			154	23.5
Mt1	THAUTIL 1	36	24					1	4	1	13			229	19.0
Mt2	THAUTIL 2	13	6						7					158	15.0
Mg1	GOSNELL 1	11	11	2					6		7			89	23.3
Mg2	GOSNELL 2	21	6					2		1	10			98	18.2
Ms1	SHEA 1	20	21	3				59	10	1				121	16.8
Ms2	SHEA 2	8	6					5		1				116	16.8
BB3	BUCK CK	8	31	6						1			1	352	43.0
Ml3	LAMPREY 3 (REPEAT)	4	2	1										270	23.5
TOTAL		993.4	188.4	55.3	9.5	1	147	470.7	70.8	87	206.2	13	3	3763.4	549
PERCENT		44.2	8.4	2.5	0.4	0.0	6.5	21.0	3.2	3.9	9.2	0.6	0.1		100
											TOTAL FISH =			2245.3	

Appendix 2 Table 2. Morice River Catch Composition by Reach and Tributary 1992.

FILE = MORSUM (Block to Bottom)

LOCATION	RAINBOW					CHIN	COHO	DV	RMW	LN DACE	COTT.	SUCKER	AREA (M)2	TOTAL CATCH
	0+	1+	2+	3+	4+									
REACH 2	29	3	0	0	0	18.3	0	0	2	72.3	0	0	155.7	124.6
%	23.3	2.4	0.0	0.0	0.0	14.7	0.0	0.0	1.6	58.0	0.0	0.0		100
REACH 1	202.4	10	4	2	0	77.6	102.1	0	0	0	12	0	1131.1	410.1
%	49.4	2.4	1.0	0.5	0.0	18.9	24.9	0.0	0.0	0.0	2.9	0.0		100
REACHES 1–2	231.4	13	4	2	0	95.9	102.1	0	2	72.3	12	0	1286.8	534.7
%	43.3	2.4	0.7	0.4	0.0	17.9	19.1	0.0	0.4	13.5	2.2	0.0		100
OWEN	235.7	58.3	25	3	1	15.1	136.3	42.8	57.5	39.1	0	0	386.7	613.8
%	38.4	9.5	4.1	0.5	0.2	2.5	22.2	7.0	9.4	6.4	0.0	0.0		100
LAMPREY	405.7	10.3	14	4.5	0	36	165.5	1	22.5	64.4	1	2	657.6	726.9
%	55.8	1.4	1.9	0.6	0.0	5.0	22.8	0.1	3.1	8.9	0.1	0.3		100
THAUTIL	49	30.3	0	0	0	0	1	11	1	13.1	0	0	386.5	105.4
%	46.5	28.7	0.0	0.0	0.0	0.0	0.9	10.4	0.9	12.4	0.0	0.0		100
GOSNELL	31.8	17.1	2	0	0	0	2	6	1	17.3	0	0	186.8	77.2
%	41.2	22.2	2.6	0.0	0.0	0.0	2.6	7.8	1.3	22.4	0.0	0.0		100
SHEA CK	27.6	26.6	3	0	0	0	63.8	10	2	0	0	0	236.6	133
%	20.8	20.0	2.3	0.0	0.0	0.0	48.0	7.5	1.5	0.0	0.0	0.0		100
BUCK CK	8.2	30.8	6.3	0	0	0	0	0	1	0	0	1	352.1	47.3
%	17.3	65.1	13.3	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	2.1		100
ALL TRIBS COMB.	758	173.4	50.3	7.5	1	51.1	368.6	70.8	85	133.9	1	3	2206.3	1700.6
%	44.6	10.2	3.0	0.4	0.1	3.0	21.7	4.2	5.0	7.9	0.1	0.2		100

NOTE: ALL TRIBS COMB. DOESN'T INCLUDE THE LAMPREY REPEAT SITE.

Appendix 2 Table 3. Summary of Morice River Biomass Estimates 1992.

FILE = MORBIO

SITE	LOCATION	RAINBOW 0+	RAINBOW 1+	RAINBOW 2+	RAINBOW 3+	RAINBOW 4+	CHIN	COHO	DV	RMW	LN DACE	COTT.	SUCKER	AREA (M)2	TOTAL
M4	REACH2	0.05	0.09	0.00	0.00	0.00	0.23	0.00	0.00	0.01	0.64	0.00	0.00	156	1.020
M11a	REACH1	0.20	0.00	0.00	0.00	0.00	0.08	0.26	0.00	0.00	0.00	0.30	0.00	169	0.840
M12	"	0.25	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.02	0.00	177	0.300
M13	"	0.09	0.35	0.00	1.38	0.00	0.00	1.29	0.00	0.00	0.00	0.09	0.00	89	3.200
M14	"	1.55	0.00	0.00	0.00	0.00	5.07	0.00	0.00	0.00	0.00	0.00	0.00	97	6.620
M15	"	0.32	0.24	0.13	0.00	0.00	0.08	1.18	0.00	0.00	0.00	0.03	0.00	118	1.980
M16	"	0.23	0.06	0.00	0.00	0.00	0.08	0.02	0.00	0.00	0.00	0.00	0.00	119	0.390
M17	"	0.49	0.06	0.25	0.00	0.00	0.73	0.06	0.00	0.00	0.00	0.08	0.00	157	1.670
M19	"	0.36	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.11	0.00	97	0.710
M21	"	0.27	0.09	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	109	0.420
Mo1	OWEN 1	0.05	0.22	0.00	0.00	0.00	0.30	3.10	0.00	0.19	0.17	0.00	0.00	113	4.030
Mo2	OWEN 2	0.86	1.86	1.81	0.43	0.00	0.00	0.00	0.77	0.21	0.04	0.00	0.00	132	5.980
Mo3	OWEN 3	1.43	1.12	0.97	0.67	1.01	0.00	0.00	0.57	0.46	0.48	0.00	0.00	142	6.710
Ml1	LAMPREY 1	0.38	0.17	0.27	0.00	0.00	0.61	1.68	0.08	0.03	0.01	0.00	0.00	229	3.230
Ml2	LAMPREY 2	0.18	0.07	0.64	0.64	0.00	0.00	0.30	0.00	0.22	0.20	0.00	0.02	275	2.270
Ml3	LAMPREY 3	1.66	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	154	1.860
Mt1	THAUTIL 1	0.14	0.65	0.00	0.00	0.00	0.00	0.002	0.04	0.003	0.48	0.00	0.00	229	1.315
Mt2	THAUTIL 2	0.05	0.24	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	158	0.360
Mg1	GOSNELL 1	0.15	0.83	0.21	0.00	0.00	0.00	0.00	0.27	0.00	0.16	0.00	0.00	89	1.620
Mg2	GOSNELL 2	0.13	0.34	0.00	0.00	0.00	0.00	0.03	0.00	0.01	0.04	0.00	0.00	98	0.550
Ms1	SHEA CK 1	0.09	0.96	0.25	0.00	0.00	0.00	0.97	0.19	0.01	0.00	0.00	0.00	121	2.470
Ms2	SHEA CK 2	0.06	0.32	0.00	0.00	0.00	0.00	0.20	0.00	0.02	0.00	0.00	0.00	116	0.600
BB3	BUCK CK	0.05	0.66	0.26	0.00	0.00	0.00	0.00	0.00	0.22	0.56	0.00	0.02	352	1.770
Ml3	LAMPREY 3 (REPEAT)	0.01	0.05	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	270	0.140

BIOMASS ESTIMATES BY REACH AND TRIBUTARY

LOCATION	RAINBOW FRY	RAINBOW PARR	CHIN	COHO	DV	RMW	LN DACE	COTT.	SUCKER	AREA (M)2	TOTAL
REACH2	0.05	0.09	0.23	0.00	0.00	0.01	0.64	0.00	0.00	155.70	1.020
REACH1	0.42	0.51	0.70	0.32	0.00	0.00	0.00	0.07	0.00	1131.10	2.018
REACH 1&2	0.38	0.44	0.66	0.28	0.00	0.00	0.06	0.06	0.00	1286.80	1.890
OWEN	0.78	2.70	0.10	1.03	0.45	0.29	0.23	0.00	0.00	386.70	5.577
LAMPREY	0.74	0.62	0.20	0.66	0.03	0.08	0.12	0.00	0.01	657.60	2.457
THAUTIL	0.10	0.45	0.00	0.00	0.00	0.00	0.06	0.00	0.24	386.50	0.843
GOSNELL	0.14	0.69	0.00	0.00	0.00	0.02	0.14	0.01	0.10	186.80	1.085
SHEA CK 2	0.08	0.77	0.00	0.00	0.00	0.59	0.10	0.02	0.00	236.60	1.540
BUCK CK	0.05	0.92	0.00	0.00	0.00	0.00	0.00	0.22	0.56	352.10	1.750
LAMPREY (REPEAT)	0.01	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	270.00	0.140
ALL TRIBS COMB.	0.37	1.06	0.07	0.45	0.14	0.10	0.16		0.00	2476.30	2.354

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: M11a REACH: 1 MAP#: 93 L/7 PHOTO: (1)#6 ACCESS: BOAT DATE: Sept 22

SITE LOCATION: Approximately 50 m upstream of rock outcrop.
Moved site upstream from the 1991 location.

S = SIDE / M = MAINSTEM: M SLOPE (%): <1 TEMP (C): 12 TDS (ppm): N/A pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	35-60	49.7	15	4	19	21.5	2.2	0.127	0.98	1.60	0.20
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	71-79	75.0	2	0	2	2.0	0.0	0.012	0.09	6.79	0.08
Coho	all	52-62	57.9	8	4	12	16.0	6.9	0.095	0.73	2.70	0.26
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Sculpin	all	92-100	97.5	4	0	4	4.0	0.0	0.024	0.18	12.49	0.30
TOTAL							43.5		0.258	1.98		0.84

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	3.4	LOD	5	POOL		40
3	6.8	COBBLE/BOULDER	95	RIFFLE		20
6	10.2	IN VEG		RUN	100	
9	11.2	OVER VEG		OTHER		
12	10.7	CUTBANK				
15	9.3					
18	2.3	TOTAL	100	D90/50: 25/12 (cm)		
20						
24						
	7.7					
AREA (M*M)	168.6	MARGIN (M)	21.9			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 30% Excellent 50% Good 20% Moderate
RATIONALE: Excellent habitat in loose cobbles along margin. Good in sections with smaller substrate.

STEELHEAD PARR RATING: 15% Good 15% Moderate 70% Poor
RATIONALE: Limited by shallow water depth in most of site.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: M12 REACH: 1 MAP#: 93 L/7 PHOTO: (5)#24 ACCESS: BOAT DATE: Sept 22

SITE LOCATION: Approximately 0.5 km upstream from the upper bridge crossing.
Same location as 1991. (Blind bay habitat)

S = SIDE / M = MAINSTEM: S SLOPE (%): <1 TEMP (C): 11.8 TDS (ppm): 22.2 pH: N/A
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: This habitat has changed to a flow-through site with last seasons, root wad no longer present.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	33-51	41.6	13	9	22	42.3	34.3	0.239	1.64	1.05	0.25
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	50-53	51.3	3	0	3	3.0	0.0	0.017	0.12	1.91	0.03
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Sculpin	all	26	26.0	1	0	1	1.0	0.0	0.006	0.04	3.19	0.02
TOTAL							46.3		0.262	1.80		0.30

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	6.0	LOD		POOL			15
3	6.5	COBBLE/BOULDER	100	RIFFLE			13
6	6.4	IN VEG		RUN			
9	6.8	OVER VEG		FLAT	100		
12	8.5	CUTBANK					
15	7.0						
18		TOTAL	80	D90/50:	10/4		
20				(cm)			
24							
	6.9						
AREA (M*M)	176.5	MARGIN (M)	25.7				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Moderate
RATIONALE: Different type of fry habitat in shallow blind bay.

STEELHEAD PARR RATING: 100% Poor
RATIONALE: Limited by small substrate and shallow depth.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: M13 REACH: 1 MAP#: 93 L/7 PHOTO: (5)#25 ACCESS: BOAT DATE: Sept 22

SITE LOCATION: Approximately 500 m upstream from Site M12.
Same location as 1991.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 11.8 TDS (ppm): 22.4 pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	47-54	50.8	2	2	4	5.0	0.0	0.056	0.21	1.68	0.09
Rbt	1+	85-95	90.7	3	0	3	3.0	0.0	0.034	0.12	10.23	0.35
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+	172-173	172.5	2	0	2	2.0	0.0	0.023	0.08	61.31	1.38
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	42-87	64.6	14	7	21	31.0	9.2	0.350	1.28	3.70	1.29
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Sculpin	all	82	82.0	1	0	1	1.0	0.0	0.011	0.04	7.73	0.09
TOTAL							42.0		0.474	1.73		3.20

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	3.5	LOD		POOL	70	
3	3.5	COBBLE/BOULDER	100	RIFFLE		
6	3.6	IN VEG		RUN	30	
9	3.6	OVER VEG		OTHER		
12	4.3	CUTBANK				
15	3.4					
18		TOTAL	95	D90/50:	35/20	
20				(cm)		
24						
	3.7					
AREA (M*M)	88.7	MARGIN (M)	24.3			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 60% Good 40% Moderate
RATIONALE: Loose cobble with good spaces along inner edge.

STEELHEAD PARR RATING: 60% Good
RATIONALE: Good habitat along the outer edge; deeper sections with higher velocity.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: M14 **REACH:** 1 **MAP#:** 93 L/7 **PHOTO:** (5)#23 **ACCESS:** BOAT **DATE:** Sept 22

SITE LOCATION: Morice River at the large gravel bank. Approximately 3.5 km upstream from the upper Morice bridge crossing. Same location as 1991.

S = SIDE / M = MAINSTEM: M **SLOPE (%):** 1 **TEMP (C):** 11.3 **TDS (ppm):** 21.4 **pH:** 7.5
M = MARGIN / F = FULL SAMPLE: M

15 mg/L T.Alk.
139 [illegible]

SAMPLING COMMENTS: Heavy coating of algae on substrate.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	42-60	49.1	3	5	8	8.0	10.6	0.083	0.34	1.55	0.13
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	65-74	69.5	2	1	3	4.0	3.5	0.041	0.17	5.07	0.21
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							12.0		0.124	0.52		0.34

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	3.3	LOD		POOL		50
3	4.7	COBBLE/BOULDER	100	RIFFLE		25
6	5.2	IN VEG		RUN	100	
9	4.6	OVER VEG		OTHER		
12	3.0	CUTBANK				
15						
18		TOTAL	60	D90/50: 35/10 (cm)		
20						
24						
	4.2					

AREA (M*M) 96.5 **MARGIN (M)** 23.2

HABITAT COMMENTS:

STEELHEAD FRY RATING: Good 50% Moderate 50%
RATIONALE: Good habitat along the margin with shallow cobbles.

STEELHEAD PARR RATING: 25% Good 75% Moderate to Poor
RATIONALE: Good in sections along the outer edge containing large boulders. Moderate in sections of shallow cobble.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: M15 REACH: 1 MAP#: 93 L/7 PHOTO: (5)#21 ACCESS: BOAT DATE: Sept 22

SITE LOCATION: Approximately 4.0 km upstream from upper bridge crossing.
Same location as 1991. However, due to higher discharge, sampled a margin of the sidechannel.

S = SIDE / M = MAINSTEM: S SLOPE (%): 0.5 TEMP (C): 10.7 TDS (ppm): 21.5 pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	37-63	51.6	16	4	20	21.3	2.0	0.180	0.97	1.75	0.32
Rbt	1+	84-95	88.7	3	0	3	3.0	0.0	0.025	0.14	9.61	0.24
Rbt	2+	101-109	105.0	1	1	2	1.0	0.0	0.008	0.05	15.38	0.13
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	66-72	69.0	2	0	2	2.0	0.0	0.017	0.09	4.93	0.08
Coho	all	42-83	59.8	35	9	44	47.1	3.1	0.398	2.13	2.97	1.18
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Sculpin	all	60	60.0	1	0	1	1.0	0.0	0.008	0.05	3.25	0.03
TOTAL							75.4		0.638	3.41		1.98

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	3.9	LOD		POOL		50
3	4.1	COBBLE/BOULDER	100	RIFFLE	50	25
6	9.0	IN VEG		RUN	50	
9	4.4	OVER VEG		OTHER		
12		CUTBANK				
15						
18		TOTAL	100	D90/50:	30/12	
20				(cm)		
24						
	5.4					
AREA (M*M)	118.2	MARGIN (M)	22.1			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 75% Excellent 25% Moderate
RATIONALE: Excellent habitat in shallow sections with large loose cobbles.

STEELHEAD PARR RATING: 25% Good
RATIONALE: Limited in most of site due to shallow depth. Good in sections along the outer edge.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: M16 REACH: 1 MAP#: 93 L/7 PHOTO: (5)#22 ACCESS: BOAT DATE: Sept 22

SITE LOCATION: Adjacent to Site M15.
Same location as 1991.

S = SIDE / M = MAINSTEM: M
M = MARGIN / F = FULL SAMPLE: M

SLOPE (%): <0.5 TEMP (C): 10.6 TDS (ppm): 21.8 pH: N/A

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	39-56	46.5	10	5	15	20.0	7.7	0.168	0.95	1.37	0.23
Rbt	1+	81	81.0	1	0	1	1.0	0.0	0.008	0.05	7.47	0.06
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	66-72	69.0	1	1	2	2.0	0.0	0.017	0.10	4.93	0.08
Coho	all	57	57.0	0	1	1	1.0	0.0	0.008	0.05	2.59	0.02
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							24.0		0.201	1.14		0.40

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	2.8	LOD		POOL			40
3	6.0	COBBLE/BOULDER	100	RIFFLE	100		15
6	7.9	IN VEG		RUN			
9	6.4	OVER VEG		OTHER			
12	5.3	CUTBANK					
15							
18		TOTAL	80	D90/50:	25/10		
20				(cm)			
24							
	5.7						
AREA (M*M)	119.3	MARGIN (M)	21.0				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Moderate
RATIONALE: Good in shallow cobble.

STEELHEAD PARR RATING: 25% Moderate 75% Poor
RATIONALE: Moderate in deeper sections along the outer margin. Most of site is limited by shallow depth and low velocity.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: M17 REACH: 1 MAP#: 93 L/7 PHOTO: (5)#20 ACCESS: BOAT DATE: Sept 21

SITE LOCATION: Approximately 1.5 km downstream from Nado Creek.
Same location as 1991.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 10.6 TDS (ppm): 21.8 pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Site M18 was not sampled in 1992, due to the presence of chinook redds.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	37-62	48.1	35	10	45	49.0	3.8	0.312	2.15	1.55	0.49
Rbt	1+	88	88.0	0	1	1	1.0	0.0	0.006	0.04	9.40	0.06
Rbt	2+	99-100	99.7	3	0	3	3.0	0.0	0.019	0.13	13.31	0.25
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	61-79	70.3	18	3	21	21.6	1.1	0.138	0.95	5.30	0.73
Coho	all	51-61	56.7	2	1	3	4.0	3.5	0.025	0.18	2.55	0.06
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Sculpin	all	51-66	58.50	4	0	4	4.0	0.0	0.025	0.18	3.03	0.08
TOTAL							82.6		0.527	3.62		1.67

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	6.2	LOD		POOL			35
3	7.6	COBBLE/BOULDER	100	RIFFLE	100		10
6	8.1	IN VEG		RUN			
9	8.2	OVER VEG		OTHER			
12	4.3	CUTBANK					
15							
18		TOTAL	100	D90/50:	15/8		
20				(cm)			
24							
	6.9						
AREA (M*M)	156.9	MARGIN (M)	22.8				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 90% Excellent Good 10%
RATIONALE: Excellent in shallow cobble flats. Good in slighlty deeper sections.

STEELHEAD PARR RATING: 80% Poor 20% Moderate
RATIONALE: Limited in most of site due to shallow depth and low velocity. Moderate in deeper sections along the outer edge.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: M19 REACH: 1 MAP#: 93 L/7 PHOTO: (4)#5 ACCESS: BOAT DATE: Sept 21

SITE LOCATION: Approximately 1.5 km downstream of Nado Creek.
Same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 11.1 TDS (ppm): 20.6 pH: 7.6
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	47-61	54.1	6	4	10	18.0	19.0	0.185	0.85	1.95	0.36
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	62-75	70.3	3	1	4	4.5	1.5	0.046	0.21	5.30	0.24
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Sculpin	all	91	91.0	1	0	1	1.0	0.0	0.010	0.05	10.31	0.11
TOTAL							23.5		0.241	1.10		0.71

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	5.2	LOD		POOL			65
3	4.6	COBBLE/BOULDER	100	RIFFLE			
6	4.8	IN VEG		RUN	100		
9	3.7	OVER VEG		OTHER			
12		CUTBANK					
15							
18		TOTAL	N/A	D90/50:	40/25		
20				(cm)			
24							
	4.6						
AREA (M*M)	97.4	MARGIN (M)	21.3				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 60% Good 40% Moderate
RATIONALE: Good in loose cobble along the margin. Moderate in deeper sections along the outer edge.

STEELHEAD PARR RATING: 50% Good 50% Moderate
RATIONALE: Good in deeper sections along the outer edge. Moderate in shallow cobbles.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: M21 REACH: 1 MAP#: 93 L/7 PHOTO: (5)#18 ACCESS: BOAT DATE: Sept 21

SITE LOCATION: Approximately 400 m downstream of Nado Creek.
Same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 10.9 TDS (ppm): 21.7 pH: 7.7
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Discharge was slightly lower than the 1991 sample period.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	43-58	51.4	11	4	15	17.3	3.5	0.159	1.23	1.73	0.27
Rbt	1+	68-73	70.5	2	0	2	2.0	0.0	0.018	0.14	5.07	0.09
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	74	74.0	1	0	1	1.0	0.0	0.009	0.07	6.45	0.06
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							20.3		0.186	1.44		0.43

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	4.3	LOD		POOL			60
3	7.2	COBBLE/BOULDER	100	RIFFLE	50		15
6	9.5	IN VEG		RUN	50		
9	11.0	OVER VEG		OTHER			
12	9.3	CUTBANK					
15	5.1						
18		TOTAL	N/A	D90/50:	45/15		
20				(cm)			
24							
	7.7						
AREA (M*M)	109.0	MARGIN (M)	14.1				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 60% Good 40% Moderate
RATIONALE: Good habitat in shallow cobbles.

STEELHEAD PARR RATING: 50% Good 50% Moderate
RATIONALE: Good in outer cobble sections with greater depth and velocity. Moderate along inner edge.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: Mo1 REACH: 1 MAP#: 93 L/2 PHOTO: (2)#17 ACCESS: VEH DATE: Aug 27

SITE LOCATION: Approximately 50 m downstream of road culvert.
Site was moved below the road because of beaver activity at culvert.

S = SIDE / M = MAINSTEM: M SLOPE (%):1.5 TEMP (C): 10.5 TDS (ppm): 92 pH: 7.5
M = MARGIN / F = FULL SAMPLE: F

64 mg/L T.ALK.

SAMPLING COMMENTS: Total estimated discharge was 3 cfs. Upstream fish movements restricted by culverts and beaver dam.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	28-46	41.5	5	1	6	6.3	0.8	0.055	0.31	0.97	0.05
Rbt	1+	68-97	81.7	2	1	3	4.0	3.5	0.035	0.20	6.14	0.22
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	48-68	56.1	14	1	15	15.1	0.3	0.133	0.75	2.23	0.30
Coho	all	40-82	56.9	115	18	133	136.3	2.5	1.207	6.78	2.57	3.10
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+	31-48	37.7	37	3	40	40.3	0.6	0.356	2.00	0.54	0.19
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all	30-81	43.3	11	5	16	20.2	6.1	0.179	1.00	0.95	0.17
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							222.1		1.966	11.05		4.03

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	3.7	LOD	50	POOL	60		40
3	5.0	COBBLE/BOULDER	25	RIFFLE			6
6	5.4	IN VEG	25	RUN	40		
9	6.5	OVER VEG		OTHER			
12	7.5	CUTBANK					
15							
18		TOTAL	50	D90/50:	50/2		
20				(cm)			
24							
	5.6						
AREA (M*M)	113.0	MARGIN (M)	20.1				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Moderate
RATIONALE: Good in debris cover and moderate in shallow areas.

STEELHEAD PARR RATING: 40% Moderate 60% Poor
RATIONALE: Complex debris cover in some sections but generally limited by shallow depth.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: Mo2 REACH: 4 MAP#: 93 L/2 PHOTO: (2)#19 ACCESS: VEH DATE: Aug 28

LOCATION: Owen Creek, downstream of old bridge site on the winter access road below Puport Creek.
Same location as 1991. Lower flows than last year.

S = SIDE / M = MAINSTEM: M SLOPE (%): <0.5 TEMP (C): 12.1 TDS (ppm): 65 pH: 7.3
M = MARGIN / F = FULL SAMPLE: F

T.Alk = 45 ↓ 243 g/m^3

SAMPLING COMMENTS: Discharge was estimated at 3 cfs.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	40-53	46.6	85	23	108	116.5	5.3	0.886	5.83	0.97	0.86
Rbt	1+	67-100	88.2	17	8	25	32.1	8.4	0.244	1.61	7.62	1.86
Rbt	2+	102-132	111.8	4	3	7	16.0	31.7	0.122	0.80	14.86	1.81
Rbt	3+	180	180.0	1	0	1	1.0	0.0	0.008	0.05	56.90	0.43
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	41-52	46.6	9	1	10	10.1	0.4	0.077	0.51	1.04	0.08
Dolly Varden	1+	74-153	111.2	5	1	6	6.3	0.8	0.048	0.31	14.58	0.69
M. Whitefish	0+	63-80	71.2	6	1	7	7.2	0.6	0.055	0.36	3.78	0.21
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all	57-65	61.0	1	1	2	2.0	0.0	0.015	0.10	2.43	0.04
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							191.2		1.454	9.56		5.98

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	5.8	LOD	40	POOL	90		70
3	5.7	COBBLE/BOULDER		RIFFLE	10		5
6	3.7	IN VEG		RUN			
9	3.7	OVER VEG	20	OTHER			
12	6.8	CUTBANK	10				
15	6.7						
18	11.9	TOTAL	40	D90/50:	21/5		
20	8.3			(cm)			
24							
	6.6						
AREA (M*M)	131.5	MARGIN (M)	20.0				

HABITAT COMMENTS:

0.3 0.5 0.2 WMF = 0.5%

243 g/m^3 / 0.5% = 181

STEELHEAD FRY RATING: 40% Good 40% Moderate 20% Poor
RATIONALE:

STEELHEAD PARR RATING: 70% Good (for Owen Creek) 30% Poor
RATIONALE:

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: Mo3 REACH: 5 MAP#: 93 L/2 PHOTO: (2)#20 ACCESS: VEH DATE: Aug 31

SITE LOCATION: Approximately 70 m downstream of the 36 km sign, where creek is alongside road.
Same location as 1991. Lower net was moved downstream 3–4 m to include more pool habitat.

S = SIDE / M = MAINSTEM: M SLOPE (%): 0.5 TEMP (C): 11.9 TDS (ppm): 54.4 pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

TALK ~ 38 ↓ 2229/um1

SAMPLING COMMENTS:

of BPU = 143 + 25 + .. = 168

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN–M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	40–65	52.2	83	22	105	112.9	5.0	0.794	5.30	1.81	1.43
Rbt	1+	75–98	86.3	17	4	21	22.2	1.8	0.156	1.04	7.17	1.12
Rbt	2+	104–133	113.0	6	2	8	9.0	2.1	0.063	0.42	15.30	0.97
Rbt	3+	158–180	169.0	2	0	2	2.0	0.0	0.014	0.09	47.63	0.67
Rbt	4+	250	250.0	1	0	1	1.0	0.0	0.007	0.05	143.60	1.01
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	45–61	53.1	20	3	23	23.5	1.0	0.165	1.10	1.51	0.25
Dolly Varden	1+	74–133	113.0	3	0	3	3.0	0.0	0.021	0.14	15.32	0.32
M. Whitefish	0+	62–80	71.8	4	2	6	8.0	4.9	0.056	0.38	3.88	0.22
M. Whitefish	1+	110–124	117.0	1	1	2	2.0	0.0	0.014	0.09	17.41	0.24
Longnose Dace	all	41–109	73.1	13	3	16	16.9	1.6	0.119	0.79	4.01	0.48
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							200.6		1.411	9.42		6.71

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	7.2	LOD	20	POOL	60	60
3	8.0	COBBLE/BOULDER	60	RIFFLE	40	7
6	4.3	IN VEG		RUN		
9	7.2	OVER VEG	10	OTHER		
12		CUTBANK				
15						
18		TOTAL	N/A	D90/50:	20/6	
20				(cm)		
24						
	6.7					
AREA (M*M)	142.2	MARGIN (M)	21.3			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 60% Good 40% Moderate
RATIONALE: Good habitat in shallow riffle sections. Moderate in deeper pool areas.

STEELHEAD PARR RATING: 40% Good 40% Moderate 20% Poor
RATIONALE: Good habitat in deeper pool sections with nearby cover. Moderate in shallow cobbles.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: Ml1 REACH: 1 MAP#: 93 L/3 PHOTO: (6)#3 ACCESS: VEH DATE: Sept 25

SITE LOCATION: Lamprey Creek under lower bridge crossing.
Same location as 1991. Discharge slightly higher than last season.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 7.7 TDS (ppm): 57.0 pH: 7.5
M = MARGIN / F = FULL SAMPLE: F

40 mg/L TALK

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	23-61	46.2	35	19	54	76.6	19.1	0.335	2.47	1.12	0.38
Rbt	1+	66-90	83.5	5	1	6	6.3	0.8	0.027	0.20	6.28	0.17
Rbt	2+	103-119	112.0	4	0	4	4.0	0.0	0.017	0.13	15.25	0.27
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	62-76	68.1	6	5	11	36.0	99.5	0.157	1.16	3.86	0.61
Coho	all	28-90	59.3	74	39	113	156.5	25.0	0.684	5.05	2.46	1.68
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	118	118.0	1	0	1	1.0	0.0	0.004	0.03	17.47	0.08
M. Whitefish	0+	44-68	52.8	2	3	5	5.0	13.4	0.022	0.16	1.36	0.03
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all	25-45	33.3	1	2	3	3.0	3.5	0.013	0.10	0.46	0.01
Sculpin	all	95	95.00	1	0	1	1.0	0.0	0.004	0.03		0.00
TOTAL							289.3		1.265	9.33		3.21

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	9.2	LOD		POOL	50	50
3	8.1	COBBLE/BOULDER	100	RIFFLE	50	20
6	8.0	IN VEG		RUN		
9	6.8	OVER VEG		OTHER		
12	7.5	CUTBANK				
15	5.7					
18	6.5	TOTAL	90	D90/50: 35/10		
20	7.2			(cm)		
24						
	7.4					
AREA (M*M)	228.6	MARGIN (M)	31.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Good to Excellent
RATIONALE: Large cobbles with good interstitial spaces.

STEELHEAD PARR RATING: 50% Good 50% Moderate
RATIONALE: Good in deeper sections with higher velocity. Limited in other areas due shallow depth.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: MI2 REACH: 2 MAP#: 93 L/3 PHOTO: (6)#2 ACCESS: VEH DATE: Sept 25

SITE LOCATION: Approximately 100 m downstream of the upper bridge crossing.
Same location as 1991. Due to heavy rains, discharge was higher than last season.

S = SIDE / M = MAINSTEM: M SLOPE (%):<1 TEMP (C): 7.6 TDS (ppm): 56.1 pH: 7.3
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	40-59	48.5	27	8	35	38.4	3.5	0.140	1.08	1.32	0.18
Rbt	1+	63-93	82.8	3	0	3	3.0	0.0	0.011	0.08	6.12	0.07
Rbt	2+	102-136	121.5	6	2	8	9.0	2.1	0.033	0.25	19.50	0.64
Rbt	3+	150-155	152.8	3	1	4	4.5	1.5	0.016	0.13	38.99	0.64
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	81-100	89.7	2	7	9	9.0	1.7	0.033	0.25	9.24	0.30
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Sucker	0+	60-64	62.0	1	1	2	2.0	0.0	0.007	0.06	3.05	0.02
M. Whitefish	0+	62-67	64.2	0	5	5	5.0	0.0	0.018	0.14	2.48	0.05
M. Whitefish	1+	112-202	153.9	5	3	8	12.5	10.6	0.045	0.35	3.68	0.17
Longnose Dace	all	23-98	50.9	28	7	35	37.3	2.6	0.136	1.05	1.48	0.20
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							120.7		0.439	3.41		2.27

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	7.0	LOD	50	POOL	95	100
3	8.2	COBBLE/BOULDER		RIFFLE	5	8
6	8.9	IN VEG		RUN		
9	9.1	OVER VEG		OTHER		
12	7.6	CUTBANK	50			
15	6.7					
18	6.8	TOTAL	50	D90/50:	8/3	
20	7.8			(cm)		
24						
	7.8					
AREA (M*M)	274.8	MARGIN (M)	35.4			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Poor 50% Moderate
RATIONALE: Moderate habitat in deeper sections. Limited cover in most sections.

STEELHEAD PARR RATING: 50% Good 50% Moderate
RATIONALE: Good in deep sections near cutbank cover. Moderate along gravel edge due to shallow depth with poor cover.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: MI3 REACH: 2 MAP#: 93 L/3 PHOTO: (1)#12 ACCESS: VEH DATE: Aug 19

SITE LOCATION: Approximately 1 km upstream of the bridge on the Bill Nye road.
Same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 16.7 TDS (ppm): 34.0 pH: 7.3
M = MARGIN / F = FULL SAMPLE: F

ALK = 24 mg/L
↓
176 g/um³

SAMPLING COMMENTS: Heavy seeding again with extreme low flow, est 1 cfs.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	33-58	43.0	217	55	272	290.7	7.5	1.886	12.37	0.88	1.66
Rbt	1+	87	87.0	1	0	1	1.0	0.0	0.006	0.04	7.21	0.05
Ct	0+	42	42.0	1	0	1	1.0	0.0	0.006	0.04	0.82	0.01
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all	25-111	42.1	19	4	23	24.1	1.6	0.156	1.02	0.88	0.14
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							316.7		2.055	13.48		1.85

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	5.8	LOD		POOL	95		25
3	5.6	COBBLE/BOULDER	50	RIFFLE	5		5
6	8.4	IN VEG		RUN			
9	5.0	OVER VEG	10	OTHER			
12	8.0	CUTBANK	40				
15							
18		TOTAL	25	D90/50:	25/3		
20				(cm)			
24							
	6.6						
AREA (M*M)	154.2	MARGIN (M)	23.5				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Good
RATIONALE: Shallow, slow moving water.

STEELHEAD PARR RATING: Poor
RATIONALE:

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: Mt1 REACH: 1 MAP#: 93 L/3 PHOTO: (2)#8 ACCESS: HEL DATE: Aug 25

SITE LOCATION: Approximately 4 km upstream from the Gosnell Creek confluence.
Due to low discharge this site was moved across the channel from the 1991 location.

S = SIDE / M = MAINSTEM: S SLOPE (%): 0.5 TEMP (C): 15.3 TDS (ppm): 55.0 pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	35-53	43.5	31	4	35	35.6	1.0	0.155	1.87	0.89	0.14
Rbt	1+	64-112	77.9	23	1	24	24.0	0.2	0.105	1.27	6.16	0.65
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	35	35.0	1	0	1	1.0	0.0	0.004	0.05	0.45	0.002
Dolly Varden	0+	40-42	41.0	1	1	2	2.0	0.0	0.009	0.11	0.61	0.01
Dolly Varden	1+	70-73	71.5	2	0	2	2.0	0.0	0.009	0.11	3.43	0.03
M. Whitefish	0+	43	43.0	1	0	1	1.0	0.0	0.004	0.05	0.72	0.003
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all	85-122	103.1	12	1	13	13.1	0.4	0.057	0.69	8.47	0.48
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							78.7		0.344	4.14		1.31

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	12.5	LOD		POOL	50	30
3	12.5	COBBLE/BOULDER	100	RIFFLE	50	20
6	12.0	IN VEG		RUN		
9	11.2	OVER VEG		OTHER		
12		CUTBANK				
15						
18		TOTAL	60	D90/50:	70/8	
20				(cm)		
24						
	12.1					
AREA (M*M)	229.0	MARGIN (M)	19.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 30% Excellent 30% Good 40% Moderate
RATIONALE: Shallow low velocity cobble habitat.

STEELHEAD PARR RATING: 30% Good 70% Moderate
RATIONALE: Good habitat in deep, fast flowing sections with boulder substrate. Moderate in shallow areas with poor cover.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: Mt2 REACH: 1 MAP#: 93 L/6 PHOTO: (2)#9 ACCESS: HEL DATE: Aug 25

SITE LOCATION: Approximately 100 m upstream of the small tributrary below Gabriel Creek.
Same general location as 1991 site.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1.5 TEMP (C): 15 TDS (ppm): N/A pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 60 cfs discharge in sample sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	29-46	37.1	11	2	13	13.4	1.0	0.085	0.90	0.56	0.05
Rbt	1+	66-93	76.5	5	1	6	6.3	0.8	0.040	0.42	6.01	0.24
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	32-56	42.8	2	2	4	4.0	0.0	0.025	0.27	0.70	0.02
Dolly Varden	1+	62-72	67.0	3	0	3	3.0	0.0	0.019	0.20	2.81	0.05
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							26.7		0.169	1.78		0.36

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	9.6	LOD		POOL		30
3	10.3	COBBLE/BOULDER	100	RIFFLE	95	15
6	9.9	IN VEG		RUN	5	
9	12.2	OVER VEG		OTHER		
12		CUTBANK				
15						
18		TOTAL	80	D90/50:	40/10	
20				(cm)		
24						
	10.5					
AREA (M*M)	157.5	MARGIN (M)	15.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Moderate
RATIONALE: Good in shallow cobble riffle. Moderate habitat in sections with higher velocity.

STEELHEAD PARR RATING: 50% Good 50% Moderate
RATIONALE: Good in mid-channel sections with high velocity.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: Mg1 REACH: 1 MAP#: 93 L/3 PHOTO: (7)#3,4 ACCESS: VEH DATE: Oct 16

SITE LOCATION: Approximately 50 m downstream of bridge.
Due to higher discharge this site was moved downstream approximately 100 m from the 1991 location.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 1.3 TDS (ppm): 30.4 pH: 7.9
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: This sampling was conducted during high discharge after heavy rains.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	41-58	48.6	8	2	10	10.7	1.4	0.120	0.46	1.24	0.15
Rbt	1+	69-98	82.2	10	1	11	11.1	0.4	0.125	0.48	6.63	0.83
Rbt	2+	103-106	104.5	2	0	2	2.0	0.0	0.022	0.09	9.19	0.21
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	51-53	52.0	2	0	2	2.0	0.0	0.022	0.09	1.28	0.03
Dolly Varden	1+	72-98	82.5	4	0	4	4.0	0.0	0.045	0.17	5.35	0.24
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all	40-68	55.1	6	1	7	7.2	0.6	0.081	0.31	1.95	0.16
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							37.0		0.416	1.59		1.61

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	2.5	LOD		POOL			
3	4.9	COBBLE/BOULDER	100	RIFFLE	80		25
6	4.9	IN VEG		RUN			
9	4.5	OVER VEG		FLAT	20		
12	3.7	CUTBANK					
15	2.4						
18		TOTAL	70	D90/50:	12/7		
20				(cm)			
24							
	3.8						
AREA (M*M)	88.9	MARGIN (M)	23.3				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Poor
RATIONALE: Good habitat in lower velocity areas near the margin.

STEELHEAD PARR RATING: 80% Moderate 20% Poor
RATIONALE: Moderate habitat in sections with adequate depth and velocity. Could be improved with large substrate.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: Mg2 REACH: 2 MAP#: 93 L/3 PHOTO: (2)#7 ACCESS: HEL DATE: Aug 25

SITE LOCATION: Gosnell Creek, below the square corner (mapsheet) and upstream of the unnamed tributary. Same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): <1 TEMP (C): 12.6 TDS (ppm): 42.7 pH: 7.6
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	32-47	38.0	13	5	18	21.1	4.3	0.216	1.16	0.60	0.13
Rbt	1+	61-83	72.3	6	0	6	6.0	0.0	0.061	0.33	5.57	0.34
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	44-55	49.5	1	1	2	2.0	0.0	0.020	0.11	1.38	0.03
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+	47	47.0	1	0	1	1.0	0.0	0.010	0.05	0.95	0.01
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all	25-32	28.6	9	1	10	10.1	0.4	0.103	0.56	0.42	0.04
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							40.3		0.411	2.21		0.55

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	4.5	LOD		POOL	20
3	6.7	COBBLE/BOULDER	100	RIFFLE	10
6	7.3	IN VEG		RUN	
9	5.3	OVER VEG		OTHER	
12	3.1	CUTBANK			
15					
18		TOTAL	75	D90/50: 20/10	
20				(cm)	
24					
	5.4				
AREA (M*M)	97.9	MARGIN (M)	18.2		

HABITAT COMMENTS:

STEELHEAD FRY RATING: 80% Good 20% Moderate
RATIONALE: Shallow cobble with adequate current.

STEELHEAD PARR RATING: 100% Poor
RATIONALE: Limited by shallow depth and small substrate.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: Ms1 REACH: 1 MAP#: 93 L/SW PHOTO: (2)#5 ACCESS: HEL DATE: Aug 25

SITE LOCATION: Lower end of Shea Creek, approximately 1 km upstream from Gosnell Creek.
Same general area as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 0.5 TEMP (C): 12.5 TDS (ppm): 26.1 pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimated discharge was 3–5 cfs.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN–M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	32–47	37.8	14	4	18	19.6	2.4	0.162	1.17	0.56	0.09
Rbt	1+	60–88	72.9	12	5	17	20.6	5.0	0.170	1.22	5.63	0.96
Rbt	2+	105–119	112.7	3	0	3	3.0	0.0	0.025	0.18	10.19	0.25
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	38–91	55.7	39	13	52	58.5	5.4	0.484	3.48	2.01	0.97
Dolly Varden	0+	37–43	40.7	4	2	6	8.0	4.9	0.066	0.48	0.60	0.04
Dolly Varden	1+	65–143	98.2	2	0	2	2.0	0.0	0.017	0.12	9.17	0.15
M. Whitefish	0+	53	53.0	1	0	1	1.0	0.0	0.008	0.06	1.37	0.01
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							112.7		0.931	6.71		2.48

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	8.9	LOD	10	POOL	95	50
3	7.4	COBBLE/BOULDER	60	RIFFLE		15
6	7.2	IN VEG	30	RUN	5	
9	6.2	OVER VEG		OTHER		
12	6.3	CUTBANK				
15						
18		TOTAL	75	D90/50:	12/25	
20				(cm)		
24						
	7.2					
AREA (M*M)	121.0	MARGIN (M)	16.8			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 75% Good 25% Moderate
RATIONALE:

STEELHEAD PARR RATING: 25% Good 75% Moderate
RATIONALE:

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: Ms2 REACH: 2 MAP#: 93 L/SW PHOTO: (6)#2 ACCESS: HEL Aug 25

SITE LOCATION: Shea Creek downstream of falls below lake outlet.
Same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1.5 TEMP (C): 13.8 TDS (ppm): 24.5 pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Extreme low flow, discharge was estimated at 3–5 cfs.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN–M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	40–48	43.8	4	2	6	8.0	4.9	0.069	0.48	0.91	0.06
Rbt	1+	68–87	77.3	6	0	6	6.0	0.0	0.052	0.36	6.10	0.32
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	51–86	71.2	4	1	5	5.3	1.0	0.046	0.32	4.41	0.20
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+	62	62.0	1	0	1	1.0	0.0	0.009	0.06	2.23	0.02
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							20.3		0.176	1.21		0.60

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	7.3	LOD		POOL	95	60
3	6.8	COBBLE/BOULDER	100	RIFFLE		30
6	7.4	IN VEG		RUN	5	
9	6.3	OVER VEG		OTHER		
12	6.6	CUTBANK				
15						
18		TOTAL	80	D90/50: 35/10		
20				(cm)		
24						
	6.9					
AREA (M*M)	115.6	MARGIN (M)	16.8			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 60% Good 40% Moderate
RATIONALE: Good in sections with cobble substrate.

STEELHEAD PARR RATING: 50% Good 50% Moderate
RATIONALE: Good in deep sections with cobble/boulder substrate. Moderate in slow shallow sections of margin.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: BB3 REACH: MAP#: PHOTO: (2)#19 ACCESS: VEH DATE: Aug 31

SITE LOCATION: Approximately 150 m downstream of Buck Creek bridge.
Same location as past years.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1.5 TEMP (C): 9.5 TDS (ppm): 84.4 pH: 7.7
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Low discharge estimated 5 cfs.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	47-59	55.0	7	1	8	8.2	0.5	0.023	0.19	2.28	0.05
Rbt	1+	73-98	85.5	20	7	27	30.8	4.3	0.087	0.72	7.55	0.66
Rbt	2+	101-124	107.2	5	1	6	6.3	0.8	0.018	0.15	14.53	0.26
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Sucker	0+	83	83.0	0	1	1	1.0	0.0	0.003	0.02	7.40	0.02
M. Whitefish	1+	202	202.0	1	0	1	1.0	0.0	0.003	0.02	79.10	0.22
Longnose Dace	all	18-108	53.0	49	61	110	110.0	0.0	0.312	2.56	1.78	0.56
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							157.2		0.446	3.66		1.77

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	9.4	LOD		POOL	30	40
3	10.1	COBBLE/BOULDER	95	RIFFLE	70	12
6	8.6	IN VEG	5	RUN		
9	9.0	OVER VEG		OTHER		
12	8.0	CUTBANK				
15	7.1					
18	6.5	TOTAL	80	D90/50:	35/10	
20	6.8			(cm)		
24						
	8.2					
AREA (M*M)	352.1	MARGIN (M)	43.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 80% Good 20% Moderate
RATIONALE: Good in shallow sections with cobble/boulder substrate.

STEELHEAD PARR RATING: 50% Moderate 50% Poor
RATIONALE: Limited by low flows this season. Parr may have moved into downstream habitat.

MORICE RIVER STEELHEAD INDEX SITE 1992

SITE: MI3 REACH: 2 MAP#: 93 L/3 PHOTO: (7)#1,2 ACCESS: VEH DATE: Oct 16

SITE LOCATION: Approximately 1 km upstream of the bridge on the Bill Nye road.
Repeat site at same location. October sample.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 0.1 TDS (ppm): N/A pH:7.8
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Approximately 50% of site was ice covered. Lost lower net during the first pass.
Sampling difficulty due to higher flows after heavy rains.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	32-48	42.3	1	2	3	4.0	3.5	0.015	0.17	0.84	0.01
Rbt	1+	83-91	87.0	2	0	2	2.0	0.0	0.007	0.09	7.21	0.05
Rbt	2+	126	126.0	0	1	1	1.0	0.0	0.004	0.04	21.76	0.08
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							7.0		0.026	0.30		0.15

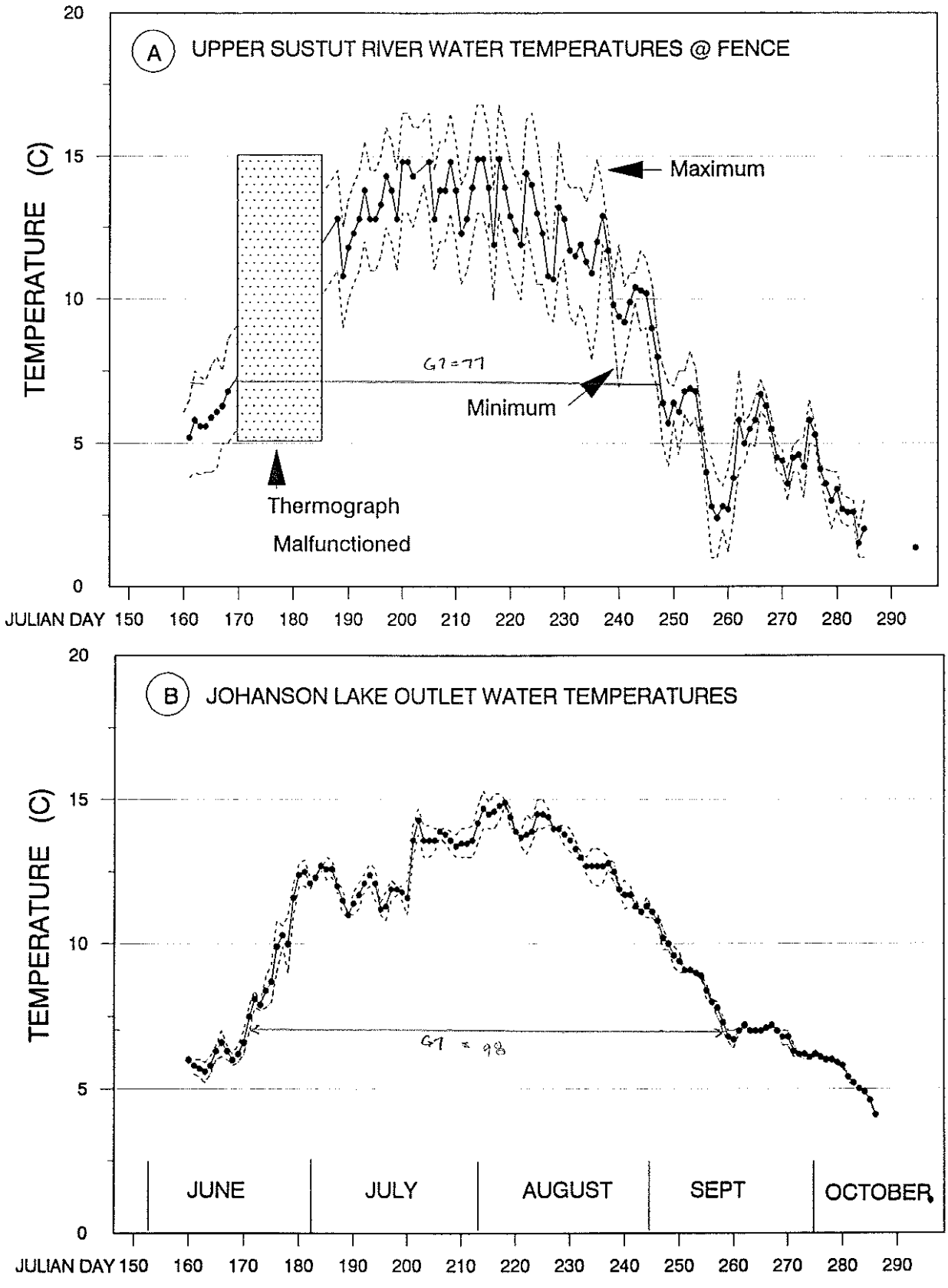
LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	11.5	LOD	10	POOL		
3	11.4	COBBLE/BOULDER	50	RIFFLE		
6	11.5	IN VEG		RUN	100	35
9	11.6	OVER VEG		OTHER		
12		CUTBANK	40			
15						
18		TOTAL	30	D90/50: 25/3		
20				(cm)		
24						
	11.5					
AREA (M*M)	270.3	MARGIN (M)	23.5			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Moderate 50% Poor
RATIONALE: Limited cover due to small substrate. Faster, deep water at these flows.

STEELHEAD PARR RATING: 20% Good 80% Poor to Moderate
RATIONALE: Good habitat in some sections with cutbanks and LOD.

Appendix 3. Site Descriptions and Detailed Results of Fish Sampling in the Sustut River and Tributaries 1992.



Appendix 3 Figure 1. Water Temperatures in the Upper Sustut River 1992.

Appendix 3 Table 1. Sustut River Catch Composition for Sample Sites 1992.

FILE = FISH2

SITE	LOCATION	RAINBOW 0+	RAINBOW 1+	RAINBOW 2+	RAINBOW 3+	RAINBOW Parr	CHIN	COHO	DV	RMW	LN DACE	BURBOT	AREA (M)2	LENGTH (M)
S1	Sustut	19	4			4	15		9	1			108	16.3
S3	below Bear	8	3			3	10		9	23			154	17.3
S4	"	1	2			2	17		5	1			76	20.0
S6	"	1	20	1		20.6	15	29	22	9			250	22.7
S10	"	32	3	2		5	23						156	16.3
S10a	"	29		5		5	15						143	16.3
S11	Sustut						12		1	9			195	21.0
S12	above Bear	1	1		4	5	16		8				162	16.1
S13	"	4					4		1				74	13.0
S14	"	1	2		1	3	20		6				119	19.6
S15	"	12	3		1	4	18		1				125	17.0
S16	"	24	2			2	10		1				140	22.0
S17	"	12	3	1		4	20		5				124	18.5
S19	"	9	9	4	1	14	11						138	16.9
S20	"	5	5			5.3	12						73	11.5
S22	"	43	7			7	8		1	1			73	12.0
S24	"	41	16	1	1	18	32	3	5				95	15.8
S25	"	34	1			1	4						110	25.9
S26	"	20					1			1			92	21.2
S27	"	41	1			1	23	3		5			67	25.8
S28	"	38	20	2	4	26.1	15						207	19.1
S29	"	54	14	2	2	17.5	9			1			106	25.8
S30	"						10			1		7	252	20.0
		428.6	115.5	18.0	14.0	147.5	320.8	34.8	73.4	52.3	0.0	7.0	3038.2	430.1
		40.3	10.9	1.7	1.3		30.1	3.3	6.9	4.9	0.0	0.7		100
						Parr =13.9 %						TOTAL FISH =	1064.4	
Ss1	Sustut								22				59	20.5
Ss2	Lake inlet												30	20.0
Ss3	"								1	7			83	26.2
Sb1	Bear River	52	1			1	1			1	2		103	21.3
Sb2	"	33	7	3		10	24	15	2	13			124	17.0
Sj1	Johanson Ck	1	2	1		3	14	1	28	1			186	25.3
Sj2	"	3	4		1	5	1		17				136	21.5
Sj4	"	6							5				94	16.7
Sj7	"		1		1	2			1				72	17.4
Sj8	"	40							1				205	22.2
SUa1	Unnamed A		2	2		4			2				79	12.9
SUb1	Unnamed B			1	2	3		5	18				105	15.9
Sjs1	Solo Creek							4	21				76	17.2
SUc1	"	32						8	35				112	28.5
Sjd1	Darb Creek		4	3		7			6				153	16.7
TOTAL		165.9	21	10	4	35	40.1	33.1	159.1	21.7	2	0	1616	299.3
PERCENT		36.3	4.6	2.2	0.9		8.8	7.2	34.8	4.7	0.4	0.0		100
						Parr =7.7 %						TOTAL FISH =	456.9	

Appendix 3 Table 1 (cont'd). Sustut River Catch Compostion for Sample Sites 1992.

FILE = FISHSUM (Block to Bottom)

LOCATION	RAINBOW				CHIN	COHO	DV	RMW	LN DACE	BURBOT	AREA (M)2	TOTAL CATCH
	0+	1+	2+	3+								
Sustut below Bear	89.8	31.6	8	0	95.2	28.8	43.6	34.2	0	0	886	331.2
%	27.1	9.5	2.4	0.0	28.7	8.7	13.2	10.3	0.0	0.0		100
Sustut above Bear	338.8	83.9	10	14	225.6	6	29.8	18.1	0	7	2152.2	733.2
%	46.2	11.4	1.4	1.9	30.8	0.8	4.1	2.5	0.0	1.0		100
Sustut Lk inlet	0	0	0	0	0	0	23	7.2	0	0	171.7	30.2
%	0.0	0.0	0.0	0.0	0.0	0.0	76.2	23.8	0.0	0.0		100
Bear River	84.7	8	3	0	25	15.1	2	13.5	2	0	226.6	153.3
%	55.3	5.2	2.0	0.0	16.3	9.8	1.3	8.8	1.3	0.0		100
Johanson Creek	49.5	7	1	2	15.1	1	52.5	1	0	0	692.3	129.1
%	38.3	5.4	0.8	1.5	11.7	0.8	40.7	0.8	0.0	0.0		100
Johanson Tribs.	31.7	6	6	2	0	17	81.6	0	0	0	525.4	144.3
%	22.0	4.2	4.2	1.4	0.0	11.8	56.5	0.0	0.0	0.0		100
Sustut River Total	428.6	115.5	18	14	320.8	34.8	73.4	52.3	0	7	3038	1064.4
%	40.3	10.9	1.7	1.3	30.1	3.3	6.9	4.9	0.0	0.7		100

Appendix 3 Table 2. Sustut Rvier Biomass Estimates by Reach and Tributaries 1992.

FILE = SUSBIO2

Note: The area sampled is shown as total area within the shaded rows.

SITE	LOCATION	RAINBOW 0+	RAINBOW 1+	RAINBOW 2+	RAINBOW 3+	RAINBOW Parr	CHIN	COHO	DV	RMW	LN DACE	BURBOT	AREA (M)2	TOTAL
S1	Reach 1	0.11	0.16	0.00	0.00	0.16	0.33	0.00	0.21	0.01	0.00	0.00	108	0.820
S3	"	0.05	0.12	0.00	0.00	0.12	0.22	0.00	0.49	0.19	0.00	0.00	154	1.070
S4	"	0.01	0.19	0.00	0.00	0.19	0.70	0.00	0.10	0.01	0.00	0.00	76	1.010
S6	"	0.004	0.52	0.08	0.00	0.60	0.17	0.46	0.84	0.00	0.00	0.00	250	2.074
S9	"	0.20	0.15	0.15	0.00	0.30	0.57	0.00	0.00	0.00	0.00	0.00	156	1.070
	Mean	0.07	0.23	0.05	0.00	0.27	0.40	0.09	0.33	0.04	0.00	0.00	744	1.21
S10a	Reach 2	0.26	0.00	0.44	0.00	0.44	0.46	0.00	0.00	0.00	0.00	0.00	143	1.160
S11	"	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.30	0.70	0.00	0.00	195	1.270
	Mean	0.13	0.00	0.22	0.00	0.22	0.37	0.00	0.15	0.35	0.00	0.00	338	1.22
S12	Reach 3	0.01	0.07	0.00	0.70	0.77	0.41	0.00	0.74	0.00	0.00	0.00	162	1.930
S13	"	0.10	0.00	0.00	0.00	0.00	0.24	0.00	0.13	0.00	0.00	0.00	74	0.470
	Mean	0.06	0.04	0.00	0.35	0.39	0.33	0.00	0.44	0.00	0.00	0.00	236	1.20
S14	Reach 4	0.02	0.14	0.00	0.16	0.30	0.62	0.00	0.36	0.00	0.00	0.00	119	1.300
S15	"	0.10	0.15	0.00	0.27	0.42	0.43	0.00	0.05	0.00	0.00	0.00	125	1.000
S16	"	0.19	0.09	0.00	0.00	0.09	0.22	0.00	0.04	0.00	0.00	0.00	140	0.540
S17	"	0.12	0.22	0.15	0.00	0.37	0.47	0.00	0.85	0.00	0.00	0.00	124	1.810
S19	"	0.08	0.48	0.45	0.24	1.17	0.22	0.00	0.00	0.00	0.00	0.00	138	1.470
S20	"	0.08	0.57	0.00	0.00	0.57	0.52	0.00	0.00	0.00	0.00	0.00	73	1.170
	Mean	0.10	0.28	0.10	0.11	0.49	0.41	0.00	0.22	0.00	0.00	0.00	719	1.22
S22	Reach 5	0.53	0.60	0.00	0.00	0.60	0.22	0.00	0.03	0.34	0.00	0.00	73	1.720
S24	Reach 6	0.38	1.16	0.16	0.25	1.57	1.18	0.17	0.12	0.00	0.00	0.00	95	3.420
S25	"	0.25	0.07	0.00	0.00	0.07	0.09	0.00	0.00	0.00	0.00	0.00	110	0.410
S26	"	0.18	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.04	0.00	0.00	92	0.260
S27	"	0.52	0.08	0.00	0.00	0.08	1.05	0.18	0.00	0.13	0.00	0.00	67	1.960
	Mean	0.33	0.33	0.04	0.06	0.43	0.59	0.09	0.03	0.04	0.00	0.00	363	1.51
S28	Reach 7	0.14	0.70	0.12	0.64	1.46	0.18	0.00	0.00	0.00	0.00	0.00	207	1.780
S29	"	0.46	0.95	0.23	0.55	1.73	0.25	0.00	0.00	0.03	0.00	0.00	106	2.470
	Mean	0.30	0.83	0.18	0.60	1.60	0.22	0.00	0.00	0.02	0.00	0.00	314	2.13
Mean Reaches 1–7		0.17	0.29	0.08	0.13	0.50	0.40	0.04	0.19	0.07	0.00	0.00	2786	1.37
S30	Sustut	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.01	0.00	0.52	252	0.760
Ss1	Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.42	0.00	0.00	0.00	59	4.420
Ss2	"	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30	0.000
Ss3	"	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.18	0.00	0.00	83	0.310
Sb1	Bear River	0.37	0.10	0.00	0.00	0.10	0.04	0.00	0.00	0.03	0.08	0.00	103	0.620
Sb2	"	0.20	0.39	0.31	0.00	0.70	0.63	0.30	0.06	0.19	0.00	0.00	124	2.080
		0.29	0.25	0.16	0.00	0.40	0.34	0.15	0.03	0.11	0.04	0.00	227	1.35
Sj1	Johanson Ck	0.01	0.08	0.08	0.00	0.16	0.16	0.03	0.54	0.02	0.00	0.00	186	0.920
Sj2	"	0.02	0.24	0.00	0.30	0.54	0.05	0.00	1.02	0.00	0.00	0.00	136	1.630
Sj4	"	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	94	0.270
Sj7	"	0.00	0.00	0.00	0.33	0.33	0.00	0.00	0.06	0.00	0.00	0.00	72	0.390
Sj8	"	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	205	0.190
		0.06	0.06	0.02	0.13	0.21	0.04	0.01	0.37	0.00	0.00	0.00	692	0.68
SUa1	Unnamed A	0.00	0.19	0.39	0.00	0.58	0.00	0.00	0.22	0.00	0.00	0.00	79	0.800
SUb1	Unnamed B	0.00	0.00	0.14	1.47	1.61	0.00	0.41	1.12	0.00	0.00	0.00	105	3.140
Sjs1	Solo Creek	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.60	0.00	0.00	0.00	76	0.880
SUc1	"	0.20	0.00	0.00	0.00	0.00	0.00	0.30	1.68	0.00	0.00	0.00	112	2.180
Sjd1	Darb Creek	0.00	0.26	0.32	0.00	0.58	0.00	0.00	0.06	0.00	0.00	0.00	153	0.640

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S1 REACH: 1 MAP#: 94 D/6 PHOTO: (4)#5 ACCESS: HEL DATE: Sept 11

SITE LOCATION: Approximately 3 km upstream of Skeena River confluence.
Due to changes in stream channel, sampled across the river from the 1991 location.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 9.3 TDS (ppm): 46.6 pH: 7.5
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Estimated discharge in the sample sidechannel was 100 cfs.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	36-47	40.1	15	3	18	18.8	1.3	0.173	1.15	0.61	0.11
Rbt	1+	61-80	71.0	2	1	3	4.0	3.5	0.037	0.25	4.43	0.16
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	47-63	56.0	14	1	15	15.1	0.3	0.139	0.92	2.40	0.33
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	41-52	47.3	3	1	4	4.5	1.5	0.042	0.28	1.34	0.06
Dolly Varden	1+	68-72	70.0	2	1	3	4.0	3.5	0.037	0.25	3.95	0.15
M. Whitefish	0+	49	49.0	1	0	1	1.0	0.0	0.009	0.06	1.11	0.01
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							47.3		0.437	2.90		0.82

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	1.7	LOD		POOL	50	N/A
3	6.4	COBBLE/BOULDER	100	RIFFLE		
6	9.0	IN VEG		RUN		
9	8.2	OVER VEG		OTHER	50	N/A
12	9.1	CUTBANK				
15	8.5					
18	3.6	TOTAL	100	D90/50:	18\10	
20				(cm)		
24						
	6.6					
AREA (M*M)	108.3	MARGIN (M)	16.3			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 90% Excellent 10% Moderate
RATIONALE: Excellent habitat in low velocity cobble, riffle and flat sections. Good cover in cobble substrate. Moderate habitat in high velocity sections along the outer edge.

STEELHEAD PARR RATING: Poor
RATIONALE: Limited by shallow depth and low velocity. No large boulders present within site.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S3 REACH: 1 MAP#: 94 D/6 PHOTO: (4)#6 ACCESS: HEL DATE: Sept 11

SITE LOCATION: Approximatley 4.2 km upstream of the Skeena confluence.
Due to changes in stream channel, sampled a sidechannel near the 1991 site.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 8.2 TDS (ppm): 46.8 pH: 7.5
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Sampled a small sidechannel with an estimated 30–40 cfs.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN–M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	41–52	46.0	4	2	6	8.0	4.9	0.052	0.46	0.94	0.05
Rbt	1+	69–87	80.7	3	0	3	3.0	0.0	0.020	0.17	6.28	0.12
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	54–73	63.7	9	1	10	10.1	0.4	0.066	0.59	3.30	0.22
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	68–112	91.8	3	2	5	9.0	13.4	0.059	0.52	8.32	0.49
M. Whitefish	0+	37–59	49.3	18	4	22	23.1	1.7	0.151	1.34	1.27	0.19
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							53.3		0.347	3.08		1.07

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	7.4	LOD		POOL		
3	8.3	COBBLE/BOULDER	100	RIFFLE		
6	9.0	IN VEG		RUN	70	40
9	9.7	OVER VEG		FLAT	30	
12	10.0	CUTBANK				
15						
18		TOTAL	30	D90/50: 15/4		
20				(cm)		
24						
	8.9					
AREA (M*M)	153.6	MARGIN (M)	17.3			

HABITAT COMMENTS:

STEELHEAD FRY RATING: Poor
RATIONALE: Limited by small gravel substrate (poor cover) in low velocity sections.

STEELHEAD PARR RATING: 30% Good
RATIONALE: Good habitat in cobble/run sections. Limited cover for parr in other areas within the site.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S4 REACH: 1 MAP#: 94 D/6 PHOTO: (4)#7 ACCESS: HEL DATE: Sept 11

SITE LOCATION: Approximately 4 km downstream from Suskeena Lodge.
Due to changes in stream channel, sampled a large sidechannel near the 1991 site.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 8.8 TDS (ppm): 53.4 pH:7.5
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Sampled a large sidechannel with an estimated 100+ cfs.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	47	47.0	1	0	1	1.0	0.0	0.013	0.05	1.01	0.01
Rbt	1+	78-92	85.0	2	0	2	2.0	0.0	0.026	0.10	7.22	0.19
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	54-71	62.6	13	3	16	16.9	1.6	0.222	0.85	3.16	0.70
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	37-49	45.0	3	1	4	4.5	1.5	0.059	0.23	1.77	0.10
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+	41	41.0	1	0	1	1.0	0.0	0.013	0.05	0.66	0.01
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							25.4		0.334	1.27		1.02

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	1.7	LOD		POOL		
3	3.5	COBBLE/BOULDER	100	RIFFLE		
6	4.4	IN VEG		RUN	100	90-100
9	4.3	OVER VEG		OTHER		
12	5.3	CUTBANK				
15	4.8					
18	4.3	TOTAL	100	D90/50: 25/14		
20	2.1			(cm)		
24						
	3.8					
AREA (M*M)	76.0	MARGIN (M)	20.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 10% Moderate
RATIONALE: Some moderate habitat within 0.5 m of the edge with low velocity and large cobble substrate.

STEELHEAD PARR RATING: 100% Good
RATIONALE: Good habitat due to large cobble substrate with adequate depth.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S6 REACH: 1 MAP#: 94 D/6 PHOTO: (4)#8,9 ACCESS: HEL DATE: Sept 11

SITE LOCATION: Approximately 3 km downstream from Suskeena Lodge.
Due to changes in stream channel, sampled a sidechannel near the 1991 site.

S = SIDE / M = MAINSTEM: S SLOPE (%): < 0.5 TEMP (C): 8.5 TDS (ppm): 46.7 pH: 7.5
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Sampled a low velocity (nearly ponded) section of sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	48	48.0	1	0	1	1.0	0.0	0.004	0.04	1.08	0.004
Rbt	1+	72-93	82.4	14	4	18	19.6	2.4	0.078	0.86	6.64	0.52
Rbt	2+	126	126.0	1	0	1	1.0	0.0	0.004	0.04	21.02	0.08
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	51-78	59.1	13	2	15	15.4	0.8	0.061	0.68	2.74	0.17
Coho	all	51-97	67.7	12	7	19	28.8	14.6	0.115	1.27	3.98	0.46
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	71-123	95.6	18	3	21	21.6	1.1	0.086	0.95	9.29	0.80
M. Whitefish	0+	38-61	50.1	8	1	9	9.1	0.5	0.037	0.40	1.18	0.04
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							96.5		0.386	4.25		2.08

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	12.5	LOD		POOL		
3	11.0	COBBLE/BOULDER	100	RIFFLE		
6	10.9	IN VEG		RUN	100	50
9	10.2	OVER VEG		OTHER		
12	10.3	CUTBANK				
15	11.2					
18		TOTAL	100	D90/50: 30/15		
20				(cm)		
24						
	11.0					
AREA (M*M)	250.1	MARGIN (M)	22.7			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Good
RATIONALE: Good throughout site due to cobble cover. Deep in midsection, but low velocity.

STEELHEAD PARR RATING: 100% Good
RATIONALE: Good cover in large cobble/boulder substrate. Could be improved with increased velocity.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S9 REACH: 1 MAP#: 94 D/6 PHOTO: (4)#25 ACCESS: HEL DATE: Sept 13

SITE LOCATION: Approximately 13 km downstream of the Bear River confluence.
Same location as 1991 (cobble margin of mainstem).

S = SIDE / M = MAINSTEM: M SLOPE (%): N/A TEMP (C): 5.2 TDS (ppm): 49.6 pH: 7.4
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	37-55	46.4	8	6	14	32.0	44.9	0.206	1.96	0.97	0.20
Rbt	1+	84-90	86.3	3	0	3	3.0	0.0	0.019	0.18	7.53	0.15
Rbt	2+	100-101	100.5	2	0	2	2.0	0.0	0.013	0.12	11.32	0.15
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	59-85	68.2	19	3	22	22.6	1.0	0.145	1.38	3.91	0.57
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							59.6		0.383	3.65		1.06

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	6.3	LOD		POOL			40
3	10.9	COBBLE/BOULDER	100	RIFFLE			20
6	11.1	IN VEG		RUN			
9	11.6	OVER VEG		FLAT	100		
12	7.8	CUTBANK					
15							
18		TOTAL	100	D90/50:	30/11		
20				(cm)			
24							
	9.5						
AREA (M*M)	155.5	MARGIN (M)	16.3				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Good to Excellent
RATIONALE: Shallow cobble/flat habitat.

STEELHEAD PARR RATING: 20% Moderate 80% Poor
RATIONALE: Moderate on outside edge and poor in low velocity shallow sections.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S10a REACH: 2 MAP#: 94 D/7 PHOTO: (5)#1 ACCESS: HEL DATE: Sept 13

SITE LOCATION: Approximately 100 m downstream of the Meathole (below the Bear River).
No sample site here in 1991. Historical sampling in this area.

S = SIDE / M = MAINSTEM: S SLOPE (%): 2.5 TEMP (C): 5.8 TDS (ppm): 50 pH: N/A
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	35-65	50.4	28	1	29	29.0	0.2	0.204	1.78	1.26	0.26
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+	102-111	104.4	5	0	5	5.0	0.0	0.035	0.31	12.62	0.44
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	64-80	71.1	11	3	14	15.1	1.9	0.106	0.93	4.33	0.46
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							49.2		0.345	3.02		1.16

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	9.1	LOD		POOL			25
3	8.8	COBBLE/BOULDER	100	RIFFLE	100		20
6	9.4	IN VEG		RUN			
9	8.1	OVER VEG		OTHER			
12	8.3	CUTBANK					
15							
18		TOTAL	100	D90/50:	35/15		
20				(cm)			
24							
	8.7						
AREA (M*M)	142.5	MARGIN (M)	16.3				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Moderate
RATIONALE: Good interstitial spaces within cobbles. Moderate habitat in deeper sections with higher velocity.

STEELHEAD PARR RATING: 75% Good 25% Moderate
RATIONALE: Fast water with deep riffle habitat.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S11 REACH: 2 MAP#: 94 D/7 PHOTO: (5)#3 ACCESS: HEL DATE: Sept 13

SITE LOCATION: Approximately 2 km downstream from Saiya Creek.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 5.5 TDS (ppm): 53.3 pH: 7.5
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Same location as 1991 with lower discharge. Estimate 5 cfs in sample sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	64-86	70.5	9	2	11	11.6	1.2	0.059	0.55	4.61	0.27
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	85	85.0	1	0	1	1.0	0.0	0.005	0.05	6.73	0.03
M. Whitefish	0+	51-58	55.4	8	1	9	9.1	0.5	0.047	0.44	1.58	0.07
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							21.7		0.111	1.03		0.38

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	5.3	LOD		POOL	80		30
3	8.4	COBBLE/BOULDER	100	RIFFLE	20		22
6	9.0	IN VEG		RUN			
9	9.5	OVER VEG		OTHER			
12	10.5	CUTBANK					
15	13.0						
18		TOTAL	70	D90/50:	35/12		
20				(cm)			
24							
	9.3						
AREA (M*M)	195.0	MARGIN (M)	21.0				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Good
RATIONALE: Good habitat with low velocity cobble flats.

STEELHEAD PARR RATING: 20% Moderate 80% Poor
RATIONALE: Moderate habitat in sections of cobble with some flow.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S12 REACH: 3 MAP#: 94 D/7 PHOTO: (5)#5,6 ACCESS: HEL DATE: Sept 13

SITE LOCATION: Approximately 1 km downstream from Red Creek.
Sidechannel sample site was moved upstream approx. 2 km from 1991 location.

S = SIDE / M = MAINSTEM: S SLOPE (%): 0.5 TEMP (C): 5.5 TDS (ppm): 42.1 pH: N/A
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 50 cfs in sample sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	46	46.0	0	1	1	1.0	0.0	0.006	0.06	1.19	0.01
Rbt	1+	98	98.0	1	0	1	1.0	0.0	0.006	0.06	10.75	0.07
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+	126-147	137.8	4	0	4	4.0	0.0	0.024	0.25	28.54	0.70
Chinook	0+	56-82	68.6	15	1	16	16.1	0.3	0.098	1.00	4.24	0.41
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	57	57.0	0	1	1	1.0	0.0	0.006	0.06	2.25	0.01
Dolly Varden	1+	94-165	118.4	6	1	7	7.2	0.6	0.044	0.45	16.69	0.73
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							30.3		0.184	1.88		1.93

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	10.3	LOD		POOL		
3	10.5	COBBLE/BOULDER	100	RIFFLE	20	15
6	10.5	IN VEG		RUN	80	40
9	9.5	OVER VEG		OTHER		
12	10.2	CUTBANK				
15						
18		TOTAL	100	D90/50: 30/12		
20				(cm)		
24						
	10.2					
AREA (M*M)	164.2	MARGIN (M)	16.1			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 40% Good 60% Moderate
RATIONALE: Good in shallow cobble habitat. Moderate in deeper sections with higher velocity.

STEELHEAD PARR RATING: 60% Good 40% Moderate
RATIONALE: Good in cobble/boulder sections. Moderate along the margin in shallow low velocity cobbles.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S13 REACH: 3 MAP#: 94 D/7 PHOTO: (5)#4 ACCESS: HEL DATE: Sept 13

SITE LOCATION: Approximately 3–4 km downstream of Red Creek.
Due to changes in stream channel, sampled similar habitat near the 1991 site.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 5.6 TDS (ppm): 41.9 pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN–M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	52–53	52.5	4	0	4	4.0	0.0	0.054	0.31	1.75	0.10
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	65–75	69.3	4	0	4	4.0	0.0	0.054	0.31	4.37	0.24
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	96	96.0	1	0	1	1.0	0.0	0.014	0.08	9.40	0.13
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							9.0		0.123	0.69		0.46

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	2.8	LOD		POOL			30
3	6.5	COBBLE/BOULDER	100	RIFFLE	100		15
6	7.4	IN VEG		RUN			
9	7.9	OVER VEG		OTHER			
12	6.3	CUTBANK					
15	3.0						
18		TOTAL	70	D90/50:	40/12		
20				(cm)			
24							
	5.7						

AREA (M*M) 73.5 MARGIN (M) 13.0 (Assumed distance)

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Moderate
RATIONALE: Good in shallow cobbles. Moderate in sections with sands deposited on cobbles.

STEELHEAD PARR RATING: 50% Moderate 50% Poor
RATIONALE: Moderate along deeper sections of the outside edge.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S14 REACH: 4 MAP#: 94 D/7 PHOTO: (5)#7 ACCESS: HEL DATE: Sept 13

SITE LOCATION: Approximately 8 km upstream of Red Creek.
Same location as 1991, however discharge was lower.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 4.8 TDS (ppm): 43.3 pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	58	58.0	1	0	1	1.0	0.0	0.008	0.05	2.34	0.02
Rbt	1+	87-93	90.0	1	1	2	2.0	0.0	0.017	0.10	8.41	0.14
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+	121	121.0	1	0	1	1.0	0.0	0.008	0.05	19.66	0.16
Chinook	0+	60-74	65.5	18	2	20	20.3	0.6	0.170	1.03	3.68	0.62
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	56	56.0	1	0	1	1.0	0.0	0.008	0.05	2.14	0.02
Dolly Varden	1+	67-125	88.8	4	1	5	5.3	1.0	0.045	0.27	7.59	0.34
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							30.6		0.256	1.56		1.31

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	3.5	LOD		POOL			20
3	7.6	COBBLE/BOULDER	100	RIFFLE	100		15
6	8.2	IN VEG		RUN			
9	7.7	OVER VEG		OTHER			
12	6.9	CUTBANK					
15	2.6						
18		TOTAL	75	D90/50:	20/12		
20				(cm)			
24							
	6.1						
AREA (M*M)	119.2	MARGIN (M)	19.6				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Good to Excellent
RATIONALE: Shallow cobble /riffle habitat with good spaces for cover.

STEELHEAD PARR RATING: Poor
RATIONALE: Limited by shallow depth and low velocity.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S15 REACH: 4 MAP#: 94 D/10 PHOTO: (3)#20 ACCESS: HEL DATE: Sept 10

SITE LOCATION: Approximately 300 m upstream of Two Lakes Creek.
Same location as in 1991. However, due to low discharge sampled the full sidechannel.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1.5 TEMP (C): 6.3 TDS (ppm): 41.8 pH: 7.5
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Lower discharge than 1991, est. 5 cfs in sample sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	45-53	48.2	4	4	8	12.0	0.0	0.096	0.71	1.03	0.10
Rbt	1+	78-89	84.0	3	0	3	3.0	0.0	0.024	0.18	6.09	0.15
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+	146	146.0	1	0	1	1.0	0.0	0.008	0.06	33.68	0.27
Chinook	0+	42-70	61.2	6	4	10	18.0	19.0	0.144	1.06	2.98	0.43
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	85	85.0	1	0	1	1.0	0.0	0.008	0.06	6.73	0.05
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							35.0		0.281	2.06		1.00

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	5.5	LOD	50	POOL			60
3	6.6	COBBLE/BOULDER		RIFFLE	10		40
6	7.2	IN VEG	25	RUN	90		
9	7.7	OVER VEG		OTHER			
12	8.4	CUTBANK	25				
15	8.6						
18		TOTAL	65	D90/50:	30/4		
20				(cm)			
24							
	7.3						
AREA (M*M)	124.7	MARGIN (M)	17.0				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 25% Moderate 75% Poor
RATIONALE: Moderate habitat in shallow cobbles along margin. Limited by high water velocity.

STEELHEAD PARR RATING: 25% Good 50% Moderate 25% Poor
RATIONALE: Good to moderate habitat along cutbank and cobble substrate.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S16 REACH: 4 MAP#: 94 D/10 PHOTO: (3)#18,19 ACCESS: HEL DATE: Sept 10

SITE LOCATION: Approximately 300 m upstream of Two Lakes Creek.
Due to low discharge this site was moved from between the islands (1991) into the sidechannel just upstream of S15.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1.5 TEMP (C): 6.3 TDS (ppm): 41.8 pH: 7.5
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimated 5 cfs in sample sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	30-53	44.7	22	2	24	24.2	0.5	0.173	1.10	1.10	0.19
Rbt	1+	75-87	81.0	2	0	2	2.0	0.0	0.014	0.09	6.22	0.09
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	49-70	61.9	10	0	10	10.0	0.0	0.071	0.45	3.09	0.22
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	78	78.0	1	0	1	1.0	0.0	0.007	0.05	5.32	0.04
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							37.2		0.266	1.69		0.54

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	7.2	LOD		POOL			20
3	6.6	COBBLE/BOULDER	80	RIFFLE	50		15
6	7.1	IN VEG	20	RUN	50		
9	7.0	OVER VEG		OTHER			
12	6.6	CUTBANK					
15	3.7						
18		TOTAL	50	D90/50:	30/10		
20				(cm)			
24							
	6.4						
AREA (M*M)	140.1	MARGIN (M)	22.0				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 80% Moderate 20% Poor
RATIONALE: Moderate habitat due to compacted cobbles.

STEELHEAD PARR RATING: Poor
RATIONALE: Limited by shallow depth and compacted cobbles.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S17 REACH: 4 MAP#: 94 D/10 PHOTO: (3)#21 ACCESS: HEL DATE: Sept 10

SITE LOCATION: Approximately 3 km upstream of Willow Creek.
Same area as 1991. However sampled a full sidechannel.

S = SIDE / M = MAINSTEM: S SLOPE (%): 0.5 TEMP (C): 6.9 TDS (ppm): 41.3 pH: 7.4
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 20 cfs in sample sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	38-55	46.0	7	3	10	12.3	4.2	0.099	0.66	1.19	0.12
Rbt	1+	87-96	92.7	3	0	3	3.0	0.0	0.024	0.16	9.16	0.22
Rbt	2+	120	120.0	1	0	1	1.0	0.0	0.008	0.05	19.20	0.15
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	48-75	60.4	18	2	20	20.3	0.6	0.163	1.09	2.87	0.47
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	87-167	126.0	4	1	5	5.3	1.0	0.043	0.29	19.80	0.85
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							41.8		0.337	2.26		1.81

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	7.4	LOD	20	POOL	20	40
3	5.7	COBBLE/BOULDER	80	RIFFLE	80	15
6	6.5	IN VEG		RUN		
9	7.0	OVER VEG		OTHER		
12	7.1	CUTBANK				
15	6.6					
18		TOTAL	90	D90/50: 40/10 (cm)		
20						
24						
	6.7					
AREA (M*M)	124.3	MARGIN (M)	18.5			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 30% Good 70% Moderate
RATIONALE: Good in shallow cobbles. Moderate in boulders with higher water velocity.

STEELHEAD PARR RATING: 80% Good 20% Moderate
RATIONALE: Good in boulder substrate with moderate flow.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S19 REACH: 4 MAP#: 94 D/10 PHOTO: (3)#23 ACCESS: HEL DATE: Sept 10

SITE LOCATION: Approximately 7 km upstream of the Willow Creek confluence.
Same location as 1991. However slightly different due to lower flows.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 7.1 TDS (ppm): 42.5 pH: 7.4
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 25 cfs in sample sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	40-51	45.8	8	1	9	9.1	0.5	0.066	0.54	1.18	0.08
Rbt	1+	81-94	86.2	9	0	9	9.0	0.0	0.065	0.53	7.44	0.48
Rbt	2+	109-116	111.7	2	1	3	4.0	3.5	0.029	0.24	15.60	0.45
Rbt	3+	145	145.0	1	0	1	1.0	0.0	0.007	0.06	33.03	0.24
Chinook	0+	52-67	59.8	10	1	11	11.1	0.4	0.081	0.66	2.78	0.22
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							34.3		0.248	2.03		1.48

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	8.2	LOD		POOL		50
3	8.1	COBBLE/BOULDER	95	RIFFLE	100	30
6	7.8	IN VEG		RUN		
9	8.5	OVER VEG		OTHER		
12	8.5	CUTBANK	5			
15	7.9					
18		TOTAL	100	D90/50:	40/15	
20				(cm)		
24						
	8.2					
AREA (M*M)	138.0	MARGIN (M)	16.9			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 30% Good to Excellent 70% Moderate
RATIONALE: Good habitat in shallow sections over cobble/boulder substrate. Moderate in higher velocity sections.

STEELHEAD PARR RATING: 70% Good 30% Moderate
RATIONALE: Good in high velocity sections with large cobbles for cover.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S20 REACH: 4 MAP#: 94 D/10 PHOTO: (3)24 ACCESS: HEL DATE: Sept 10

SITE LOCATION: Approximately 10 km downstream of Moosevale Creek.
Same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1.5 TEMP (C): 7.3 TDS (ppm): 42.0 pH: 7.4
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	39-48	45.6	5	0	5	5.0	0.0	0.069	0.43	1.16	0.08
Rbt	1+	72-99	87.4	4	1	5	5.3	1.0	0.073	0.46	7.74	0.57
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	55-72	62.3	6	3	9	12.0	6.0	0.165	1.04	3.15	0.52
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							22.3		0.306	1.94		1.16

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	5.0	LOD		POOL		60
3	6.7	COBBLE/BOULDER		RIFFLE	50	20
6	7.5	IN VEG		RUN	50	
9	7.0	OVER VEG		OTHER		
12	5.5	CUTBANK				
15						
18		TOTAL	N/A	D90/50:	80/10	
20				(cm)		
24						
	6.3					
AREA (M*M)	72.9	MARGIN (M)	11.5			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 40% Good to Excellent
RATIONALE: Clean cobble and boulder substrate with good interstitial spaces for cover.

STEELHEAD PARR RATING: 60% Good to Excellent
RATIONALE: Deep sections with boulder substrate.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S22 REACH: 5 MAP#: 94 D/10 PHOTO: (3)25 ACCESS: HEL DATE: Sept 10

SITE LOCATION: Approximately 2 km downstream of Moosevale Creek.
Same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): N/A TEMP (C): 7.9 TDS (ppm): 44.2 pH: 7.9
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	33-50	41.8	37	5	42	42.8	1.2	0.588	3.57	0.90	0.53
Rbt	1+	72-88	81.1	7	0	7	7.0	0.0	0.096	0.58	6.24	0.60
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	49-60	53.5	4	2	6	8.0	4.9	0.110	0.67	1.97	0.22
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	56	56.0	1	0	1	1.0	0.0	0.014	0.08	2.14	0.03
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+	142	142.0	1	0	1	1.0	0.0	0.014	0.08	24.42	0.34
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							59.8		0.821	4.98		1.71

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	3.7	LOD		POOL	20	20
3	6.7	COBBLE/BOULDER	100	RIFFLE	15	15
6	9.0	IN VEG		RUN		
9	7.2	OVER VEG		OTHER		
12	6.1	CUTBANK				
15	3.7					
18		TOTAL	50	D90/50: 30/5		
20				(cm)		
24						
	6.1					
AREA (M*M)	72.8	MARGIN (M)	12.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 80% Moderate
RATIONALE: Moderate habitat in low velocity riffle. Some silt deposition on substrate.

STEELHEAD PARR RATING: 20% Moderate
RATIONALE:

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S24 REACH: 6 MAP#: 94 D/10 PHOTO: (3)#7,8 ACCESS: RAFT DATE: Sept 8

SITE LOCATION: Approximately 4 km upstream of Moosevale Creek.
Same location as 1991.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1.5 TEMP (C): 12 TDS (ppm): N/A pH: N/A
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Due to high water velocity, the lower stopnet was lifted for cleaning between pass 1 and 2.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	33-51	41.6	9	7	16	40.5	63.0	0.427	2.56	0.89	0.38
Rbt	1+	72-96	83.9	4	3	7	16.0	31.7	0.169	1.01	6.88	1.16
Rbt	2+	108	108.0	1	0	1	1.0	0.0	0.011	0.06	14.90	0.16
Rbt	3+	129	129.0	1	0	1	1.0	0.0	0.011	0.06	23.62	0.25
Chinook	0+	48-77	64.3	17	8	25	32.1	8.4	0.339	2.03	3.47	1.18
Coho	all	67-78	72.3	3	0	3	3.0	0.0	0.032	0.19	5.25	0.17
Dolly Varden	0+	46-57	50.3	1	3	4	4.0	1.5	0.042	0.25	1.60	0.07
Dolly Varden	1+	77	77.0	1	0	1	1.0	0.0	0.011	0.06	5.13	0.05
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							98.6		1.040	6.24		3.41

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	6.0	LOD	20	POOL			60
3		COBBLE/BOULDER	10	RIFFLE	20		40
6		IN VEG		RUN	80		
9		OVER VEG		OTHER			
12		CUTBANK	70				
15							
18		TOTAL	50	D90/50:	10/4		
20				(cm)			
24							
	6.0						
AREA (M*M)	94.8	MARGIN (M)	15.8				

HABITAT COMMENTS:

STEELHEAD FRY RATING: Poor
RATIONALE: Limited by high velocity. Some fry habitat along margin in sections of LOD.

STEELHEAD PARR RATING: 60% Good to Excellent 40% Moderate
RATIONALE: Good in deep sections with moderate velocity and undercut banks. Could be improved with larger substrate.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S25 REACH: 6 MAP#: 94 D/10 PHOTO: (3)#6 ACCESS: RAFT DATE: Sept 8

SITE LOCATION: Margin of mainstem at the Corner Pool, located just downstream of the Grizzly Run. Appears to be the same approximate location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 12 TDS (ppm): N/A pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	32-48	39.9	31	3	34	34.3	0.7	0.313	1.33	0.79	0.25
Rbt	1+	88	88.0	1	0	1	1.0	0.0	0.009	0.04	7.89	0.07
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	53-62	58.5	4	0	4	4.0	0.0	0.036	0.15	2.60	0.09
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							39.3		0.359	1.52		0.41

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	1.5	LOD		POOL		
3	3.5	COBBLE/BOULDER	100	RIFFLE	80	12
6	5.7	IN VEG		RUN		
9	5.8	OVER VEG		FLAT	20	
12	5.2	CUTBANK				
15	3.7					
18		TOTAL	80	D90/50:	10/5	
20				(cm)		
24						
	4.2					
AREA (M*M)	109.6	MARGIN (M)	25.9			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 90% Good to Excellent
RATIONALE: Excellent along cobble riffle sections with low velocity. Good in slightly faster sections.

STEELHEAD PARR RATING: Poor
RATIONALE: Limited by shallow depth and small cobble substrate.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S26 REACH: 6 MAP#: 94 D/19 PHOTO: (3)#1,2 ACCESS: RAFT DATE: Sept 8

SITE LOCATION: Approximately 40 m downstream of the Juction Pool.
Same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 12 TDS (ppm): N/A pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	35-51	40.9	16	3	19	19.7	1.2	0.214	0.93	0.85	0.18
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	68	68.0	0	1	1	1.0	0.0	0.011	0.05	4.13	0.04
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+	76	76.0	1	0	1	1.0	0.0	0.011	0.05	3.90	0.04
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							21.7		0.236	1.02		0.27

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	4.2	LOD		POOL			
3	5.1	COBBLE/BOULDER	100	RIFFLE	70		20
6	5.2	IN VEG		RUN	30		30
9	5.2	OVER VEG		OTHER			
12	4.8	CUTBANK					
15	3.9						
18	2.0	TOTAL	40	D90/50: 7/4 (cm)			
20							
24							
	4.3						
AREA (M*M)	92.1	MARGIN (M)	21.2				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good to Excellent 50% Poor
RATIONALE: Good along margin in medium velocity riffle/flat with gravel cover. Poor in high velocity sections.

STEELHEAD PARR RATING: 30% Moderate 70% Poor
RATIONALE: Limited by small substrate along margin. Some Moderate habitat in deeper sections along the outer edge.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S27 REACH: 6 MAP#: 94 D/10 PHOTO: (3)#3,4,5 ACCESS: RAFT DATE: Sept 8

SITE LOCATION: Sidechannel at the Lower White Rock Pool, located just downstream of the Long Run.
Due to changes in stream channnel, moved this site downstream from the 1991 location.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 12 TDS (ppm): N/A pH: N/A
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Tried to find a similar sidechannel as 1991 sample.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	31-51	41.0	27	9	36	40.5	4.5	0.607	1.57	0.85	0.52
Rbt	1+	78	78.0	0	1	1	1.0	0.0	0.015	0.04	5.58	0.08
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	50-72	61.4	18	4	22	23.1	1.7	0.347	0.90	3.02	1.05
Coho	all	60-70	65.3	3	0	3	3.0	0.0	0.045	0.12	3.96	0.18
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+	50-67	57.6	5	0	5	5.0	0.0	0.075	0.19	1.77	0.13
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							72.6		1.089	2.82		1.96

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	4.1	LOD	35	POOL	20	40
3	4.3	COBBLE/BOULDER	65	RIFFLE	40	10
6	2.0	IN VEG		RUN	40	
9	2.9	OVER VEG		OTHER		
12	2.6	CUTBANK				
15	1.2					
18	1.0	TOTAL	75	D90/50: 9/3		
20				(cm)		
24						
	2.6					
AREA (M*M)	66.7	MARGIN (M)	25.8			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Poor
RATIONALE: Good habitat in gravel riffle sections with LOD. Limited in other areas by small substrate.

STEELHEAD PARR RATING: 10% Good 90% Poor
RATIONALE: Good parr habitat in pool and LOD sections. Limited by shallow depth and small substrate.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S28 REACH: 7 MAP#: 94 D/9 PHOTO: (4)#14,15 ACCESS: Foot DATE: Sept 12

SITE LOCATION: Approximately 250 m upstream from the Juction Pool.
This site was moved downstream from the 1991 location that was 1.5 km upstream of the Juction Pool.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 5.6 TDS (ppm): 39.3 pH: 7.3
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	31-50	39.8	27	8	35	38.4	3.5	0.185	2.01	0.78	0.14
Rbt	1+	71-98	85.3	19	1	20	20.1	0.3	0.097	1.05	7.22	0.70
Rbt	2+	101-103	102.0	2	0	2	2.0	0.0	0.010	0.10	12.05	0.12
Rbt	3+	124-163	145.3	4	0	4	4.0	0.0	0.019	0.21	33.22	0.64
Chinook	0+	42-70	57.4	11	3	14	15.1	1.9	0.073	0.79	2.45	0.18
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							79.5		0.384	4.16		1.78

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	10.8	LOD	5	POOL		
3	10.7	COBBLE/BOULDER	95	RIFFLE	90	20
6	10.4	IN VEG		RUN		
9	11.3	OVER VEG		FLAT	10	
12	11.1	CUTBANK				
15						
18		TOTAL	80	D90/50:		
20				(cm)		
24						
	10.9					
AREA (M*M)	207.4	MARGIN (M)	19.1			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 15% Good
RATIONALE: Good in lower velocity cobble/gravel sections along the margin. Limited for fry by depth and high velocity.

STEELHEAD PARR RATING: 80% Good 20% Poor
RATIONALE: Good in large substrate with moderate velocity. Could be improved with deeper sections and larger substrate.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S29 REACH: 7 MAP#: 94 D/9 PHOTO: (3)#15,16 ACCESS: HEL DATE: Sept 9

SITE LOCATION: Approximately midway upstream from the Junction Pool to Mud Lake.
This site was moved slightly upstream from the 1991 location.

S = SIDE / M = MAINSTEM: S SLOPE (%): 2 TEMP (C): 7.3 TDS (ppm): 39.5 pH: 7.8
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	32-53	42.0	36	12	48	54.0	5.2	0.507	2.09	0.92	0.46
Rbt	1+	76-98	86.9	9	3	12	13.5	2.6	0.127	0.52	7.50	0.95
Rbt	2+	102-104	103.0	2	0	2	2.0	0.0	0.019	0.08	12.05	0.23
Rbt	3+	122-156	139.0	2	0	2	2.0	0.0	0.019	0.08	29.25	0.55
Chinook	0+	47-83	60.8	8	1	9	9.1	0.5	0.086	0.35	2.93	0.25
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+	68	68.0	1	0	1	1.0	0.0	0.009	0.04	2.87	0.03
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							81.6		0.767	3.16		2.47

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	2.3	LOD	2	POOL	10	40
3	5.0	COBBLE/BOULDER	98	RIFFLE	80	20
6	7.4	IN VEG		RUN		
9	2.5	OVER VEG		FLAT	10	
12	3.3	CUTBANK				
15	3.8					
18	4.0	TOTAL	80	D90/50:	35/12	
20	4.7			(cm)		
24						
	4.1					
AREA (M*M)	106.4	MARGIN (M)	25.8			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Poor
RATIONALE: Good in upper section of shallow cobble riffle.

STEELHEAD PARR RATING: 50% Good 50% Poor
RATIONALE: Good in lower riffle section with large cobble/boulder substrate. Would be excellent with loose boulders and greater water depth. The upper section is limited by shallow depth.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: S30 REACH: 7 MAP#: 94 D/9 PHOTO: (5)#8 ACCESS: HEL DATE: Sept 14

SITE LOCATION: Approximately 200 m downstream of Mud Lake at trail crossing.
Same location as 1991, but full site.

S = SIDE / M = MAINSTEM: M SLOPE (%): 0.5 TEMP (C): 3.3 TDS (ppm): 39.9 pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	68-81	75.1	7	2	9	9.8	1.7	0.039	0.49	5.86	0.23
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+	61	61.0	0	1	1	1.0	0.0	0.004	0.05	2.09	0.01
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Burbot	all	66-230	117.9	6	1	7	7.2	0.6	0.029	0.36	18.25	0.52
TOTAL							18.0		0.071	0.90		0.76

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	13.7	LOD		POOL		30
3	14.0	COBBLE/BOULDER	75	RIFFLE		20
6	13.0	IN VEG		RUN	70	
9	11.4	OVER VEG		FLAT	30	
12	12.8	CUTBANK	25			
15	10.8					
18		TOTAL	60	D90/50:	40/12	
20				(cm)		
24						
	12.6					
AREA (M*M)	252.3	MARGIN (M)	20.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 10% Good 90% Moderate
RATIONALE: Heavy algae cover.

STEELHEAD PARR RATING: 90% Moderate
RATIONALE: Parr cover along cutbank and around boulders. Good flow through most of site.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Ss1 REACH: 1 MAP#: 94 D/9 PHOTO: (5)#9 ACCESS: HEL DATE: Sept 14

SITE LOCATION: Approximately 300 m up tributary that enters Sustut River just downstream of the Mud Lake outlet. Not previously sampled.

S = SIDE / M = MAINSTEM: M SLOPE (%): 2 TEMP (C): 1.9 TDS (ppm): 40.5 pH: 7.5
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 5–8 cfs in stream. DVC 137,163,167 and 182 were ripe.
This stream contained some good quality spawning gravels in the lower few hundred meters.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN–M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	31–60	41.3	5	0	5	10.0	0.0	0.169	0.49	0.84	0.14
Dolly Varden	1+	79–182	126.2	10	0	10	12.0	0.0	0.203	0.59	21.08	4.28
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							22.0		0.372	1.07		4.42

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	1.8	LOD	50	POOL	30	25
3	3.0	COBBLE/BOULDER		RIFFLE	30	10
6	2.6	IN VEG		RUN	40	
9	3.1	OVER VEG	20	OTHER		
12	3.6	CUTBANK	30			
15	3.8					
18	2.3	TOTAL	75	D90/50:	25/8	
20				(cm)		
24						
	2.9					
AREA (M*M)	59.2	MARGIN (M)	20.5			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Moderate
RATIONALE:

STEELHEAD PARR RATING: 50% Moderate 50% Good
RATIONALE: Good cover with adequate flows.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Ss2 REACH: 1 MAP#: 94 D/9 PHOTO: (5)#12 ACCESS: HEL DATE: Sept 14

SITE LOCATION: Enters Sustut Lake near cabin.
Not previously sampled.

S = SIDE / M = MAINSTEM: SLOPE (%): 1 TEMP (C): 2.9 TDS (ppm): 43.7 pH: N/A
M = MARGIN / F = FULL SAMPLE:

SAMPLING COMMENTS: Made one pass upstream with no stopnet. No fish caught.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.0	0.0		0.00
Rbt	1+			0	0	0	0.0	0.0	0.0	0.0		0.00
Rbt	2+			0	0	0	0.0	0.0	0.0	0.0		0.00
Rbt	3+			0	0	0	0.0	0.0	0.0	0.0		0.00
Chinook	0+			0	0	0	0.0	0.0	0.0	0.0		0.00
Coho	all			0	0	0	0.0	0.0	0.0	0.0		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.0	0.0		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.0	0.0		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.0	0.0		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.0	0.0		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.0	0.0		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.0	0.0		0.00
TOTAL							0.0					0.00

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	1.5	LOD		POOL	100		50
3		COBBLE/BOULDER		RIFFLE			40
6		IN VEG		RUN			
9		OVER VEG	10	OTHER			
12		CUTBANK	90				
15							
18		TOTAL	100	D90/50: <1			
20				(cm)			
24							
	1.5						

AREA (M*M) 30.0 MARGIN (M) 20.0 Estimated

HABITAT COMMENTS:

STEELHEAD FRY RATING: Poor
RATIONALE: No significant spawning opportunity with a thick silt bottom.

STEELHEAD PARR RATING: Poor
RATIONALE:

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Ss3 REACH: 1 MAP#: 94 D/9 PHOTO: (5)#13,14 ACCESS: HEL DATE: Sept 14

SITE LOCATION: Approximately 1 km upstream of inlet at the South end of Sustut Lake.
Not previously sampled.

S = SIDE / M = MAINSTEM: M SLOPE (%): 0.5 TEMP (C): 0.6 TDS (ppm): 64.5 pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Lifted the lower net before starting due to surface ice problems.
Observed beach spawning sockeye at mouth of inlet creek and midway down SW side of lake.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	101	101.0	1	0	1	1.0	0.0	0.012	0.04	11.08	0.13
M. Whitefish	0+	52-71	60.3	6	1	7	7.2	0.6	0.087	0.27	2.02	0.18
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							8.2		0.099	0.31		0.31

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	3.9	LOD		POOL	50	20
3	3.7	COBBLE/BOULDER		RIFFLE	10	10
6	3.2	IN VEG	50	RUN	40	
9	2.6	OVER VEG		OTHER		
12	3.1	CUTBANK	50			
15	2.4					
18		TOTAL	25	D90/50: 7/3 (cm)		
20						
24						
	3.2					
AREA (M*M)	82.5	MARGIN (M)	26.2			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Moderate 50% Poor
RATIONALE: Moderate habitat in small cobbles and cutbank sections. Limited cover in other sections.

STEELHEAD PARR RATING: 100% Poor
RATIONALE: Limited by cover.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Sb1 REACH: 1 MAP#: 94 D/7 PHOTO: (4)#2,3 ACCESS: HEL DATE: Sept 11

SITE LOCATION: Bear River, approximately 0.8 km upstream from the Sustut confluence.
Same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 8.2 TDS (ppm): 37.8 pH: 7.6
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Rbt fry at 29 mm was newly-buttoned.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	29-52	40.2	38	10	48	51.6	3.4	0.503	2.42	0.74	0.37
Rbt	1+	98	98.0	1	0	1	1.0	0.0	0.010	0.05	10.40	0.10
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	68	68.0	1	0	1	1.0	0.0	0.010	0.05	4.02	0.04
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+	72	72.0	0	1	1	1.0	0.0	0.010	0.05	2.94	0.03
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all	36-121	78.5	0	2	2	2.0	0.0	0.020	0.09	3.94	0.08
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							56.6		0.552	2.66		0.62

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	3.2	LOD		POOL		
3	5.7	COBBLE/BOULDER	100	RIFFLE	85	10
6	6.2	IN VEG		RUN		
9	6.3	OVER VEG		FLAT	15	
12	6.5	CUTBANK				
15	4.3					
18	1.5	TOTAL	100	D90/50:	24/11	
20				(cm)		
24						
	4.8					
AREA (M*M)	102.5	MARGIN (M)	21.3			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 80% Excellent 20% Poor to Moderate
RATIONALE: Excellent in shallow riffle/cobble habitat with good interstitial spaces for cover.
Poor to moderate along outer edge of site due to higher water velocity.

STEELHEAD PARR RATING: 20% Good 80% Poor
RATIONALE: Good along outer edge. Limited by shallow depth along inner sections.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Sb2 REACH: 1 MAP#: 94 D/2 PHOTO: (4)#4 ACCESS: HEL DATE: Sept 11

SITE LOCATION: Bear River, approximately 6 km downstream from north end of airstrip.
Same location as 1991, but sampled the sidechannel instead of mainstem margin.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 7.8 TDS (ppm): 33.1 pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	29-49	40.6	23	7	30	33.1	3.4	0.266	1.94	0.76	0.20
Rbt	1+	74-99	84.1	7	0	7	7.0	0.0	0.056	0.41	6.90	0.39
Rbt	2+	101-111	106.3	3	0	3	3.0	0.0	0.024	0.18	12.62	0.31
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	47-76	63.5	23	1	24	24.0	0.2	0.194	1.41	3.26	0.63
Coho	all	49-80	57.4	14	1	15	15.1	0.3	0.121	0.89	2.50	0.30
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	61-78	69.5	2	0	2	2.0	0.0	0.016	0.12	3.79	0.06
M. Whitefish	0+	47-67	59.5	5	3	8	12.5	10.6	0.101	0.74	1.86	0.19
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							96.7		0.779	5.69		2.08

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	7.5	LOD	70	POOL		
3	6.8	COBBLE/BOULDER	30	RIFFLE		
6	6.8	IN VEG		RUN	80	32
9	8.1	OVER VEG		FLAT	20	
12	7.3	CUTBANK				
15						
18		TOTAL	90	D90/50: 20/5		
20				(cm)		
24						
	7.3					
AREA (M*M)	124.1	MARGIN (M)	17.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Moderate 10% Good
RATIONALE: Moderate in run sections with small substrate. Good in slow sections of LOD.

STEELHEAD PARR RATING: 70% Good 30% Moderate
RATIONALE: Good in deep sections with cobble and LOD. Moderate in run sections. Limited cover due to small substrate.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Sj1 REACH: 1 MAP#: 94 D/9 PHOTO: (4)#6 ACCESS: FOOT DATE: Sept 12

SITE LOCATION: Approximately 20 m upstream from the access trail to DFO camp near the Junction Pool.
This site was moved downstream from the 1991 location due to accessibility.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1.5 TEMP (C): 5.2 TDS (ppm): 43.0 pH: 7.3
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	52	52.0	1	0	1	1.0	0.0	0.005	0.04	1.52	0.01
Rbt	1+	82	82.0	2	0	2	2.0	0.0	0.011	0.08	7.66	0.08
Rbt	2+	102	102.0	1	0	1	1.0	0.0	0.005	0.04	14.14	0.08
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	48-63	54.9	13	1	14	14.1	0.3	0.076	0.56	2.14	0.16
Coho	all	75	75.0	1	0	1	1.0	0.0	0.005	0.04	5.41	0.03
Dolly Varden	0+	49-57	52.5	15	2	17	17.3	0.7	0.093	0.68	2.12	0.20
Dolly Varden	1+	66-98	77.5	10	1	11	11.1	0.4	0.060	0.44	5.76	0.34
M. Whitefish	0+	68	68.0	1	0	1	1.0	0.0	0.005	0.04	2.87	0.02
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							48.5		0.261	1.92		0.91

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	2.5	LOD		POOL		
3	9.0	COBBLE/BOULDER	100	RIFFLE	85	8
6	14.8	IN VEG		RUN		
9	10.0	OVER VEG		FLAT	15	
12	5.6	CUTBANK				
15	2.2					
18		TOTAL	70	D90/50:	12/5	
20				(cm)		
24						
	7.4					
AREA (M*M)	186.0	MARGIN (M)	25.3			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good
RATIONALE: Good in slower sections along inner half of site. Limited on outer section by high velocity.

STEELHEAD PARR RATING: Poor
RATIONALE: Limited by small substrate and shallow depth in some sections.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Sj2 REACH: 1 MAP#: 94 D/9 PHOTO: (3)#13,14 ACCESS: HEL DATE: Sept 9

SITE LOCATION: Approximately 5.5 km upstream of the Sustut River confluence.
Same location as 1991.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1.5 TEMP (C): 6.5 TDS (ppm): 43.4 pH: 7.8
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 6–8 cfs in sample sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN–M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	43–46	44.0	1	2	3	3.0	3.5	0.022	0.14	1.02	0.02
Rbt	1+	80–92	84.0	2	2	4	4.0	0.0	0.029	0.19	8.07	0.24
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+	147	147.0	1	0	1	1.0	0.0	0.007	0.05	40.60	0.30
Chinook	0+	82	82.0	0	1	1	1.0	0.0	0.007	0.05	7.34	0.05
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	48–59	53.5	2	0	2	2.0	0.0	0.015	0.09	2.22	0.03
Dolly Varden	1+	79–106	91.9	14	1	15	15.1	0.3	0.111	0.70	8.92	0.99
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							26.1		0.192	1.21		1.64

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	6.3	LOD	5	POOL			
3	5.8	COBBLE/BOULDER	95	RIFFLE	80		12
6	5.9	IN VEG		RUN	20		
9	6.2	OVER VEG		OTHER			
12	7.4	CUTBANK					
15							
18		TOTAL	100	D90/50:	23/10		
20				(cm)			
24							
	6.3						
AREA (M*M)	135.9	MARGIN (M)	21.5				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 70% Excellent 30% Moderate
RATIONALE: Excellent habitat in low velocity cobbles. Moderate in deeper run sections.

STEELHEAD PARR RATING: 50% Moderate 50% Poor
RATIONALE: Moderate in deeper sections of cobbles. Limited by shallow depth.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Sj4 REACH: 2 MAP#: 94 D/6 PHOTO: (4)#13 ACCESS: FOOT DATE: Sept 12

SITE LOCATION: Approximately 100 m downstream of cabin.
Appears to be same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1.5 TEMP (C): 3.8 TDS (ppm): 39.4 pH: 7.5
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	42-49	45.0	6	0	6	6.0	0.0	0.064	0.36	1.08	0.07
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	48-59	54.7	2	1	3	4.0	3.5	0.043	0.24	2.35	0.10
Dolly Varden	1+	95	95.0	1	0	1	1.0	0.0	0.011	0.06	9.72	0.10
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							11.0		0.118	0.66		0.27

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	3.9	LOD		POOL		
3	6.2	COBBLE/BOULDER	100	RIFFLE	90	16
6	6.0	IN VEG		RUN		
9	7.2	OVER VEG		FLAT	10	
12	7.3	CUTBANK				
15	5.5					
18	3.1	TOTAL	75	D90/50: 26/8		
20				(cm)		
24						
	5.6					
AREA (M*M)	93.5	MARGIN (M)	16.7			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 80% Good
RATIONALE: Good in cobble riffle habitat. Limited along outer edge by high velocity.

STEELHEAD PARR RATING: 70% Good
RATIONALE: Could be improved with deeper sections and larger boulders.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Sj7 REACH: 2 MAP#: 94 D/9 PHOTO: (4)#17,18 ACCESS: VEH DATE: Sept 12

SITE LOCATION: Approximately 10 m upstream of old bridge.
Appears to be the same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 2 TEMP (C): 5.3 TDS (ppm): 39.6 pH: 7.3
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	1+	98	98.0	1	0	1	1.0	0.0	0.014	0.06	12.60	0.18
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+	122	122.0	1	0	1	1.0	0.0	0.014	0.06	23.73	0.33
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	72	72.0	1	0	1	1.0	0.0	0.014	0.06	4.27	0.06
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							3.0		0.042	0.17		0.56

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	2.1	LOD		POOL		
3	4.1	COBBLE/BOULDER	100	RIFFLE	100	20
6	6.0	IN VEG		RUN		
9	5.8	OVER VEG		OTHER		
12	4.8	CUTBANK				
15	2.0					
18		TOTAL	70	D90/50:	23/10	
20				(cm)		
24						
	4.1					
AREA (M*M)	71.9	MARGIN (M)	17.4			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 20% Moderate 80% Poor
RATIONALE: Moderate habitat in slower sections of cobble/gravel. Limited by high water velocity.

STEELHEAD PARR RATING: 60% Moderate 40% Good
RATIONALE: Moderate in most of site due to limited cover. Substrate is cemented with fines.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Sj8 REACH: 3 MAP#: 92 D/9 PHOTO: (3)#9,10 ACCESS: HEL DATE: Sept 9

SITE LOCATION: Approximately 5.5 km downstream of Johanson Lake.
Same location as 1991.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 6.1 TDS (ppm): 34.3 pH: N/A
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	34-52	41.9	35	4	39	39.5	0.9	0.193	1.78	0.91	0.18
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	51	51.0	1	0	1	1.0	0.0	0.005	0.05	1.97	0.01
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							40.5		0.198	1.83		0.19

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	13.0	LOD		POOL		
3	11.4	COBBLE/BOULDER	100	RIFFLE	50	15
6	9.0	IN VEG		RUN	40	30-35
9	7.6	OVER VEG		FLAT	10	
12	7.3	CUTBANK				
15	7.1					
18		TOTAL	50	D90/50: 12/7		
20				(cm)		
24						
	9.2					
AREA (M*M)	205.0	MARGIN (M)	22.2			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Moderate 50% Poor
RATIONALE: Limited cover due to hard substrate compaction with fines. Moderate in shallow riffle sections.

STEELHEAD PARR RATING: Poor
RATIONALE: Limited by shallow depth and small substrate (poor cover).

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Sua1 REACH: MAP#: 94 D/9 PHOTO: (5)#17 ACCESS: VEH DATE: Sept 14

SITE LOCATION: Tributary to Johanson Creek located approximately 10 m upstream from bridge crossing. Same general location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 3 TEMP (C): 1.3 TDS (ppm): 19.0 pH: 7.5
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 10 cfs total discharge.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	1+	82-83	82.5	2	0	2	2.0	0.0	0.025	0.16	7.66	0.19
Rbt	2+	102-109	105.5	2	0	2	2.0	0.0	0.025	0.16	15.59	0.39
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	80-107	93.5	2	0	2	2.0	0.0	0.025	0.16	8.86	0.22
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							6.0		0.076	0.47		0.81

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	7.3	LOD		POOL		40
3	5.9	COBBLE/BOULDER	80	RIFFLE	100	20
6	5.8	IN VEG		RUN		
9	5.6	OVER VEG	10	OTHER		
12		CUTBANK	10			
15						
18		TOTAL	80	D90/50: 120/50 (cm)		
20						
24						
	6.2					
AREA (M*M)	79.3	MARGIN (M)	12.9			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 10% Good 90% Poor
RATIONALE: Good habitat in small sidechannel on left side.

STEELHEAD PARR RATING: 90% Good
RATIONALE: Tumbling water with boulder substrate.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Sub1 REACH: 1 MAP#: 94 D/9 PHOTO: (5)#15,16 ACCESS: VEH DATE: Sept 14

SITE LOCATION: Tributary to Johanson Creek located approximately 15 m upstream of bridge crossing.
Same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 2.5 TEMP (C): 1.6 TDS (ppm): 23.4 pH: 7.7
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 6 cfs discharge.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+	104	104.0	1	0	1	1.0	0.0	0.010	0.06	14.96	0.14
Rbt	4+	179-188	183.5	2	0	2	2.0	0.0	0.019	0.13	77.18	1.47
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	78-100	90.8	5	0	5	5.0	0.0	0.048	0.31	8.67	0.41
Dolly Varden	0+	38-48	43.0	1	1	2	2.0	0.0	0.019	0.13	0.94	0.02
Dolly Varden	1+	58-128	86.8	9	4	13	16.2	5.2	0.154	1.02	7.15	1.10
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							26.2		0.250	1.65		3.15

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	7.2	LOD		POOL	50	45
3	6.3	COBBLE/BOULDER	100	RIFFLE	50	15
6	6.8	IN VEG		RUN		
9	6.1	OVER VEG		OTHER		
12		CUTBANK				
15						
18		TOTAL	100	D90/50:	60/35	
20				(cm)		
24						
	6.6					
AREA (M*M)	104.9	MARGIN (M)	15.9			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 25% Good
RATIONALE: Shallow over cobble and boulder substrate.

STEELHEAD PARR RATING: 90% Excellent
RATIONALE: Fast and deep flow over cobbles and boulders.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Suc1 REACH: 1 MAP#: 94 D/9 PHOTO: (4)#19 ACCESS: VEH DATE: Sept 12

SITE LOCATION: Approximately 200 m downstream of twin culverts at road.
Not previously sampled. Rbt fry at 29 mm was newly buttoned.

S = SIDE / M = MAINSTEM: SLOPE (%): 1.5 TEMP (C): 4.8 TDS (ppm): 29.7 pH: 4.8
M = MARGIN / F = FULL SAMPLE:

SAMPLING COMMENTS: Spawning habitat present from sample site downstream to confluence with Johanson Creek.
Numerous Rbt fry observed from approximately 200 m above road culverts to Johanson Creek.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	29-42	37.3	27	4	31	31.7	1.1	0.283	1.11	0.69	0.20
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	64-73	67.7	4	2	6	8.0	4.9	0.071	0.28	4.20	0.30
Dolly Varden	0+	33-49	42.6	3	4	7	7.0	0.0	0.063	0.25	0.92	0.06
Dolly Varden	1+	62-162	84.1	19	6	25	27.8	3.4	0.248	0.97	6.53	1.62
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							74.5		0.665	2.61		2.17

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	4.8	LOD		POOL	20		40
3	4.3	COBBLE/BOULDER	60	RIFFLE	10		10
6	2.8	IN VEG		RUN	70		20
9	5.0	OVER VEG		OTHER			
12	4.4	CUTBANK	40				
15	3.2						
18	3.0	TOTAL	60	D90/50:	14/6		
20				(cm)			
24							
	3.9						
AREA (M*M)	112.0	MARGIN (M)	28.5				

HABITAT COMMENTS:

STEELHEAD FRY RATING: Moderate
RATIONALE: Cover is limited with fine gravel between cobbles, riffle sections have high velocity.

STEELHEAD PARR RATING: 30% Moderate 70% Poor
RATIONALE: Some moderate habitat in deep pools and undercut banks. Limited by shallow depth and cover.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Sjs1 REACH: 1 MAP#: 94 D/9 PHOTO: (3)#11,12 ACCESS: HEL DATE: Sept 9

SITE LOCATION: Solo Creek, approximately 1 km upstream from the confluence at the start of high gradient section. Not previously sampled.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1.5 TEMP (C): 7.2 TDS (ppm): 35.0 pH: 7.7
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 10–15 cfs in sample sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN–M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	61–102	75.0	4	0	4	4.0	0.0	0.052	0.23	5.41	0.28
Dolly Varden	0+	31–56	37.8	11	1	12	12.1	0.4	0.158	0.70	0.65	0.10
Dolly Varden	1+	63–85	72.6	3	2	5	9.0	13.4	0.118	0.52	4.27	0.50
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							25.1		0.329	1.46		0.89

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	3.4	LOD		POOL	20	70
3	4.2	COBBLE/BOULDER	70	RIFFLE	60	20–50
6	4.7	IN VEG		RUN	20	20
9	5.7	OVER VEG		OTHER		
12	4.2	CUTBANK	30			
15						
18		TOTAL	80	D90/50: 40/8		
20				(cm)		
24						
	4.4					
AREA (M*M)	76.4	MARGIN (M)	17.2			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Moderate 50% Poor
RATIONALE: Limited by high water velocity.

STEELHEAD PARR RATING: 70% Good to Excellent 30% Poor
RATIONALE: Excellent in deep sections with large boulder substrate. Good in sections with cobble substrate.

SUSTUT RIVER STEELHEAD INDEX SITE 1992

SITE: Sjd1 REACH: 1 MAP#: 94 D/9 PHOTO: (3)#17 ACCESS: HEL DATE: Sept 9

SITE LOCATION: Darb Creek approximately 400 m upstream from the confluence at Johanson Lake.
Not previously sampled.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1 TEMP (C): 8 TDS (ppm): 30.8 pH: 7.7
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Poor spawning habitat in this section with angular bed materials. Some gravels present at confluence.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	1+	89-94	92.3	2	1	3	4.0	3.5	0.026	0.24	10.06	0.26
Rbt	2+	108-112	110.3	3	0	3	3.0	0.0	0.020	0.18	16.15	0.32
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	39-56	50.0	3	1	4	4.5	1.5	0.029	0.27	1.48	0.04
Dolly Varden	1+	61	61.0	1	0	1	1.0	0.0	0.007	0.06	2.45	0.02
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							12.5		0.082	0.75		0.64

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	9.7	LOD		POOL			
3	9.2	COBBLE/BOULDER	100	RIFFLE	100		12
6	9.0	IN VEG		RUN			
9	8.7	OVER VEG		OTHER			
12		CUTBANK					
15							
18		TOTAL	90	D90/50:	25/10		
20				(cm)			
24							
	9.2						
AREA (M*M)	152.8	MARGIN (M)	16.7				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 30% Good 70% Poor
RATIONALE: Good in shallow low velocity riffle sections. Limited in other sections by high velocity.

STEELHEAD PARR RATING: 75% Good 25% Poor
RATIONALE: Good in deeper sections. This site could be improved with some large boulders providing more cover.

Appendix 4. Site Descriptions and Detailed Results of Fish Sampling in the Zymoetz River and Tributaries 1992

Appendix 4 Table 1. Zymoetz River Catch Composition for Sample Sites 1992.

FILE = COPCATCH

NOTE: CT INCLUDES 0+ to 3+.

SITE	REACH	RAINBOW 0+	RAINBOW 1+	RAINBOW 2+	RAINBOW 3+	CHIN	COHO	DV	RMW	LN DACE	COTT PRICKLY	CT	AREA (M)2	LENGTH (M)
Z3	6	4	4	2			2	2					78	20.0
Z2	6	30	1	2		7	19	4					207	23.8
Z1	6	29	3	1		5	5	1					126	15.3
Z4	6	9		2	4	1	1	1					228	18.0
Z6	6	9	3					1					87	21.0
Z7	6	18	1										112	20.0
Z8	6	34	6	1									101	19.2
Z9	6	45	17			1							239	18.0
Z10	6	23	8	1				1	1				136	20.3
Z11	6	37	5					2					90	22.1
Z12	7	19	3	2					2				99	15.6
Z13	7	125	12	1			8		2				178	14.6
Z14	7	56	4					1					66	19.1
Z15	7	49	7				6	4	15				139	19.1
Z16	7	16	4					1	1				113	15.0
Z17	7	9					9				11		109	22.0
Z18	7	32	2				8			3	15		130	19.2
Z19	8	4		3			10			1	11		177	18.0
Zt1				4	1			1					113	18.0
Zc1			9				45	5				31	48	15.9
TOTAL		547.8	89.5	19	5	13.7	113.3	24	21.1	4	36.9	30.5	2576	374.2
PERCENT		60.5	9.9	2.1	0.6	1.5	12.5	2.7	2.3	0.4	4.1	3.4		100
										TOTAL FISH =			904.8	
TOTAL Z1–19		547.8	80.5	15	4	13.7	67.9	18	21.1	4	36.9	0	2415	340.3
PERCENT		67.7	10.0	1.9	0.5	1.7	8.4	2.2	2.6	0.5	4.6	0.0		100
										TOTAL FISH =			808.9	

Appendix 4 Table 2. Zymoetz River Biomass Estimates for Sample Sites 1992.

FILE = COPBIO

SITE	LOCATION	RAINBOW 0+	RAINBOW 1+	RAINBOW 2+	RAINBOW 3+	RAINBOW Parr	CHIN	COHO	DV	RMW	LN DACE	SCULPIN PRICKLY	AREA (M)2	TOTAL
Z3	REACH 6	0.10	0.46	0.29	0.00	0.75	0.00	0.09	0.25	0.00	0.00	0.00	78	1.190
Z2	6	0.19	0.04	0.12	0.00	0.16	0.19	0.23	0.09	0.00	0.00	0.00	207	0.860
Z1	6	0.33	0.19	0.13	0.00	0.32	0.31	0.12	0.09	0.00	0.00	0.00	126	1.170
Z4	6	0.07	0.00	0.14	0.77	0.91	0.02	0.02	0.04	0.00	0.00	0.00	228	1.060
Z6	6	0.15	0.24	0.00	0.00	0.24	0.00	0.00	0.01	0.00	0.00	0.00	87	0.400
Z7	6	0.13	0.06	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	112	0.190
Z8	6	0.32	0.37	0.19	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00	101	0.880
Z9	6	0.17	0.36	0.00	0.00	0.36	0.02	0.00	0.00	0.00	0.00	0.00	239	0.550
Z10	6	0.17	0.33	0.14	0.00	0.47	0.00	0.00	0.19	0.01	0.00	0.00	136	0.840
Z11	6	0.32	0.34	0.00	0.00	0.34	0.00	0.00	0.07	0.00	0.00	0.00	90	0.730
Z12	REACH 7	0.17	0.18	0.27	0.00	0.45	0.00	0.00	0.00	0.04	0.00	0.00	99	0.660
Z13	7	0.51	0.36	0.11	0.00	0.47	0.00	0.08	0.00	0.18	0.00	0.00	178	1.240
Z14	7	0.53	0.26	0.00	0.00	0.26	0.00	0.00	0.14	0.00	0.00	0.00	66	0.930
Z15	7	0.28	0.32	0.00	0.00	0.32	0.00	0.09	0.37	0.13	0.00	0.00	139	1.190
Z16	7	0.15	0.26	0.00	0.00	0.26	0.00	0.00	0.01	0.18	0.00	0.00	113	0.600
Z17	7	0.10	0.00	0.00	0.00	0	0.00	0.15	0.00	0.00	0.00	0.33	109	0.580
Z18	7	0.24	0.11	0.00	0.00	0.11	0.00	0.11	0.00	0.00	0.06	0.26	130	0.780
Z19	REACH 8	0.04	0.00	0.26	0.00	0.26	0.00	0.11	0.00	0.00	0.03	0.33	177	0.770
Zt1	Treasure	0.00	0.00	0.45	0.30	0.75	0.00	0.00	0.19	0.00	0.00	0.00	113	0.940
	REACHES 6 TO 8													
TOTAL		3.97	3.88	1.65	0.77	6.30	0.54	1.00	1.26	0.54	0.09	0.92	2415	14.62
PERCENT		27.2	26.5	11.3	5.3		3.7	6.8	8.6	3.7	0.6	6.3		100
					Parr = 43.1 %									
MEAN		0.22	0.22	0.09	0.04	0.35	0.03	0.06	0.07	0.03	0.01	0.05		0.81

SITE	LOCATION	CUTTHROAT 0+	CUTTHROAT 1+	CUTTHROAT 2+	CUTTHROAT 3+	RBT COHO 1+		DV	RMW	LN DACE	SCULPIN PRICKLY	AREA (M)2	TOTAL
Zc1	Coal Ck	0.50	0.60	0.00	0.75	1.11	1.44	1.19	0.00	0.00	0.00	48	5.590

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z1 REACH: 6 MAP#: 93 L/5 PHOTO: (2)#16 ACCESS: VEH DATE: Aug 27

SITE LOCATION: Zymoetz River just downstream of rock outcrop at 36.2 km on main haul road.
This site was moved upstream slightly (< 20 m) from the 1991 location.

S = SIDE / M = MAINSTEM: N SLOPE (%): N/A TEMP (C): 10.5 TDS (ppm): N/A pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Observed chinook spawning in the mainstem.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	31-62	48.6	26	3	29	29.4	0.8	0.234	1.92	1.39	0.33
Rbt	1+	82-93	87.7	3	0	3	3.0	0.0	0.024	0.20	8.05	0.19
Rbt	2+	111	111.0	1	0	1	1.0	0.0	0.008	0.07	16.08	0.13
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	78-83	81.0	3	1	4	4.5	1.5	0.036	0.29	8.65	0.31
Coho	all	61-71	64.3	3	1	4	4.5	1.5	0.036	0.29	3.45	0.12
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	101	101.0	1	0	1	1.0	0.0	0.008	0.07	11.68	0.09
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							43.4		0.346	2.84		1.17

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	7.7	LOD		POOL			25
3	8.9	COBBLE/BOULDER	100	RIFFLE	100		15
6	9.4	IN VEG		RUN			
9	6.8	OVER VEG		OTHER			
12		CUTBANK					
15							
18		TOTAL	80	D90/50:	8/3		
20				(cm)			
24							
	8.2						
AREA (M*M)	125.5	MARGIN (M)	15.3				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Excellent
RATIONALE: Shallow riffle habitat with clean cobble substrate.

STEELHEAD PARR RATING: Poor
RATIONALE: Limited by shallow depth and low velocity.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z2 REACH: 6 MAP#: 93 L/5 PHOTO: (2)#14 ACCESS: VEH DATE: Aug 27

SITE LOCATION: Zymoetz River sidechannel at 37.2 km on the main haul road.
This site was moved upstream approximately 1 km. Sampled a similar section of sidechannel/mainstem edge habitat.

S = SIDE / M = MAINSTEM: S SLOPE (%): <1 TEMP (C): 10.5 TDS (ppm): N/A pH: 7.4
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	36-56	47.1	24	5	29	30.3	1.8	0.146	1.27	1.27	0.19
Rbt	1+	85	85.0	1	0	1	1.0	0.0	0.005	0.04	7.32	0.04
Rbt	2+	99-102	100.5	2	0	2	2.0	0.0	0.010	0.08	12.00	0.12
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	62-76	71.0	6	1	7	7.2	0.6	0.035	0.30	5.40	0.19
Coho	all	48-70	57.8	15	3	18	18.8	1.3	0.091	0.79	2.52	0.23
Dolly Varden	0+	44-47	45.5	1	1	2	2.0	0.0	0.010	0.08	1.15	0.01
Dolly Varden	1+	83-97	90.0	2	0	2	2.0	0.0	0.010	0.08	8.46	0.08
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							63.3		0.306	2.66		0.84

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	3.1	LOD		POOL		40
3	5.7	COBBLE/BOULDER	100	RIFFLE	30	20
6	19.2	IN VEG		RUN	30	
9	11.3	OVER VEG		OTHER	40	
12	4.2	CUTBANK				
15						
18		TOTAL	80	D90/50:	50/15	
20				(cm)		
24						
	8.7					
AREA (M*M)	207.1	MARGIN (M)	23.8			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 70% Good 30% Moderate
RATIONALE: Good in shallow cobble substrate with low velocity. Limited on outer edge by deep sections with higher velocity.

STEELHEAD PARR RATING: 40% Good 40% Moderate 20% Poor
RATIONALE:

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z3 REACH: 6 MAP#: 93 L/5 PHOTO: (2)#15 ACCESS: VEH DATE: Aug 27

SITE LOCATION: Zymoetz River at 37.2 km on the main haul road. Adjacent to sample site Z2.
This site was moved downstream approximately 0.5 km, due to changes in stream channel.

S = SIDE / M = MAINSTEM: M SLOPE (%) 1 TEMP (C): 10.5 TDS (ppm): N/A pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	51-59	54.5	4	0	4	4.0	0.0	0.051	0.20	1.96	0.10
Rbt	1+	84-96	91.3	2	1	3	4.0	3.5	0.051	0.20	9.04	0.46
Rbt	2+	98-100	99.0	2	0	2	2.0	0.0	0.026	0.10	11.47	0.29
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	60-71	65.5	2	0	2	2.0	0.0	0.026	0.10	3.65	0.09
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	94-95	94.5	2	0	2	2.0	0.0	0.026	0.10	9.76	0.25
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							14.0		0.179	0.70		1.20

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	2.4	LOD		POOL		100+
3	4.9	COBBLE/BOULDER	100	RIFFLE	100	50+
6	4.2	IN VEG		RUN		
9	4.6	OVER VEG		OTHER		
12	3.5	CUTBANK				
15						
18		TOTAL	100	D90/50: 12/4		
20				(cm)		
24						
	3.9					
AREA (M*M)	78.4	MARGIN (M)	20.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 60% Excellent 10% Good 30% Poor
RATIONALE: Excellent in cobble substrate.

STEELHEAD PARR RATING: 25% Good 50% Moderate 25% Poor
RATIONALE: Good habitat in deeper sections with sufficient water velocity. Limited in other sections by shallow depth.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z4 REACH: 6 MAP#: 93 L/5 PHOTO: (2)#13 ACCESS: VEH DATE: Aug 27

SITE LOCATION: Zymoetz River sidechannel at 38.5 km along the main haul road.
Due to changes in stream channel, this site was moved upstream approximately 1 km to a newly–formed sidechannel.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1.5 TEMP (C): 9.0 TDS (ppm): N/A pH: 7.4
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Observed 1 chinook spawner.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN–M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	48–56	51.8	3	2	5	9.0	13.4	0.039	0.50	1.69	0.07
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+	98–121	109.5	2	0	2	2.0	0.0	0.009	0.11	15.45	0.14
Rbt	3+	153–158	156.3	2	1	3	4.0	3.5	0.018	0.22	44.11	0.77
Chinook	0+	70	70.0	0	1	1	1.0	0.0	0.004	0.06	5.13	0.02
Coho	all	67	67.0	1	0	1	1.0	0.0	0.004	0.06	3.90	0.02
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	93	93.0	1	0	1	1.0	0.0	0.004	0.06	9.31	0.04
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							18.0		0.079	1.00		1.06

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	13.6	LOD		POOL		60
3	9.8	COBBLE/BOULDER	100	RIFFLE	75	30
6	13.0	IN VEG		RUN	25	
9	12.8	OVER VEG		OTHER		
12	14.2	CUTBANK				
15						
18		TOTAL	100	D90/50:	80/18	
20				(cm)		
24						
	12.7					
AREA (M*M)	228.2	MARGIN (M)	18.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 40% Good 60% Moderate
RATIONALE: Limited in mid section of site due to greater depth with higher velocity.

STEELHEAD PARR RATING: 40% Excellent 30% Good 30% Moderate
RATIONALE: Large boulders with moderate depth and good current. Some small gravels cementing bed materials.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z5 REACH: 6 MAP#: 93 L/12 PHOTO: (2)#12 ACCESS: VEH DATE: Aug 26

SITE LOCATION: Approximately 50 m downstream of the Treasure Creek confluence.
Same area as 1991, but improved sample site.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1.5 TEMP (C): 12.3 TDS (ppm): 34.0 pH: 7.6
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Catch data from this site has not been found.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							0.0		0.000	0.00		0.00

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	3.6	LOD		POOL			35
3	5.2	COBBLE/BOULDER	100	RIFFLE	90		20
6	6.5	IN VEG		RUN	10		
9	7.3	OVER VEG		OTHER			
12	3.2	CUTBANK					
15							
18		TOTAL	100	D90/50:	7/6		
20				(cm)			
24							
	5.2						
AREA (M*M)	118.2	MARGIN (M)	22.9				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Moderate
RATIONALE: Good habitat in shallow cobble and boulder substrate.

STEELHEAD PARR RATING: 30% Good 60% Moderate 10% Poor
RATIONALE: Good habitat in fast water with boulder substrate. Poor in sections with shallow depth and low velocity.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z6 REACH: 6 MAP#: 93 L/12 PHOTO: (2)#11 ACCESS: VEH DATE: Aug 26

SITE LOCATION: Zymoetz River sidechannel just upstream of the Treasure Creek confluence.
Same location as 1991, but lower discharge in sample sidechannel.

S = SIDE / M = MAINSTEM: S SLOPE (%): 0.5 TEMP (C): 11.0 TDS (ppm): 28.0 pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 5 cfs in sample sidechannel. No deep slow sections present from 1991.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	44-56	49.2	9	0	9	9.0	0.0	0.104	0.43	1.44	0.15
Rbt	1+	83-88	86.3	3	0	3	3.0	0.0	0.035	0.14	6.97	0.24
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	36	36.0	1	0	1	1.0	0.0	0.012	0.05	0.73	0.01
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							13.0		0.150	0.62		0.40

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	3.5	LOD		POOL	10	40
3	3.7	COBBLE/BOULDER	100	RIFFLE	90	15
6	3.5	IN VEG		RUN		
9	3.8	OVER VEG		OTHER		
12	5.8	CUTBANK				
15	4.4					
18		TOTAL	90	D90/50:	60/12	
20				(cm)		
24						
	4.1					
AREA (M*M)	86.5	MARGIN (M)	21.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Moderate
RATIONALE: Clean cobble along edges.

STEELHEAD PARR RATING: 50% Good 50% Moderate
RATIONALE: Good in mid-channel sections with clean cobble / boulders with adequate flow. Moderate along margin.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z7 REACH: 6 MAP#: 93 L/12 PHOTO: (1)#23 ACCESS: HEL DATE: Aug 21

SITE LOCATION: Zymoetz River upstream of Treasure Creek approximately 200 m below unstable slump. Moved this site slightly downstream from the 1991 location due to low dishcarge.

S = SIDE / M = MAINSTEM: M SLOPE (%): 0.5 TEMP (C): 11.8 TDS (ppm): 32.5 pH: 7.5
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	34-46	40.2	14	3	17	17.8	1.4	0.160	0.89	0.79	0.13
Rbt	1+	81	81.0	0	1	1	1.0	0.0	0.009	0.05	6.35	0.06
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							18.8		0.169	0.94		0.18

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	5.3	LOD		POOL			20
3	6.0	COBBLE/BOULDER	100	RIFFLE	100		10
6	7.0	IN VEG		RUN			
9	5.5	OVER VEG		OTHER			
12	4.1	CUTBANK					
15							
18		TOTAL	60	D90/50:	60/5		
20				(cm)			
24							
	5.6						
AREA (M*M)	111.6	MARGIN (M)	20.0				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 75% Good 25% Moderate
RATIONALE: Good in shallow cobble. Moderate in sections with smaller bed material.

STEELHEAD PARR RATING: 90% Poor 10% Moderate
RATIONALE: Limited by shallow depth and small gravels.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z8 REACH: 6 MAP#: 93L/12 PHOTO: (1)#21,22 ACCESS: HEL DATE: Aug 21

SITE LOCATION: Approximately 6 km downstream from Red Canyon Creek.
Same approximate location as 1991.

S = SIDE / M = MAINSTEM: S SLOPE (%): 0.5 TEMP (C): 10.1 TDS (ppm): 31.4 pH: 7.6
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Estimated discharge in sample sidechannel is 50 cfs.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	43-51	43.0	26	6	32	33.8	2.2	0.335	1.76	0.96	0.32
Rbt	1+	66-87	80.2	6	0	6	6.0	0.0	0.059	0.31	6.17	0.37
Rbt	2+	117	117.0	1	0	1	1.0	0.0	0.010	0.05	18.78	0.19
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							40.8		0.404	2.13		0.87

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	3.1	LOD		POOL		25
3	6.6	COBBLE/BOULDER	100	RIFFLE	80	15
6	5.2	IN VEG		RUN	20	
9	6.0	OVER VEG		OTHER		
12	5.4	CUTBANK				
15						
18		TOTAL	100	D90/50:	40/10	
20				(cm)		
24						
	5.3					
AREA (M*M)	101.0	MARGIN (M)	19.2			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Excellent 50% Good
RATIONALE: Shallow cobble and boulder habitat.

STEELHEAD PARR RATING: 100% Good
RATIONALE: Site is generally shallow with good boulder cover and flow.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z9 REACH: 6 MAP#: 93 L/12 PHOTO: (1)#20 ACCESS: HEL DATE: Aug 21

SITE LOCATION: Approximately 6 km downstream from Red Canyon Creek.
Same general location as 1991, but different site.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 9.6 TDS (ppm): 33.0 pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Large debris jam located 100 m downstream.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	32-53	42.0	38	6	44	45.1	1.5	0.188	2.51	0.90	0.17
Rbt	1+	63-89	74.5	15	2	17	17.3	0.7	0.072	0.96	4.96	0.36
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+	64	64.0	1	0	1	1.0	0.0	0.004	0.06	3.72	0.02
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							63.4		0.265	3.52		0.54

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	10.5		LOD		POOL	10	60
3	17.8		COBBLE/BOULDER		RIFFLE	60	25
6	12.9		IN VEG		RUN	30	
9	12.0		OVER VEG		OTHER		
12			CUTBANK				
15							
18			TOTAL		D90/50:	70/15	
20					(cm)		
24							
	13.3						
AREA (M*M)	239.4	MARGIN (M)	18.0				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 40% Good 50% Moderate
RATIONALE: Good habitat along margin in shallow flats. Moderate in deeper sections with slightly higher velocity.

STEELHEAD PARR RATING: 60% Excellent 40% Moderate
RATIONALE: Excellent habitat in deep flowing sections with boulders. Moderate in shallow sections.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z10 REACH: 6 MAP#: 93 L/13 PHOTO: (1)#19 ACCESS: HEL DATE: Aug 21

SITE LOCATION: Approximately 2 km downstream from Red Canyon Creek.
Same general area as 1991, but different site.

S = SIDE / M = MAINSTEM: M SLOPE (%): 2.5 TEMP (C): N/A TDS (ppm): N/A pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	32-60	43.5	21	2	23	23.2	0.6	0.171	1.14	1.00	0.17
Rbt	1+	63-93	77.3	7	1	8	8.2	0.5	0.060	0.40	5.53	0.33
Rbt	2+	117	117.0	1	0	1	1.0	0.0	0.007	0.05	18.78	0.14
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	132	132.0	1	0	1	1.0	0.0	0.007	0.05	25.98	0.19
M. Whitefish	0+	50	50.0	1	0	1	1.0	0.0	0.007	0.05	1.22	0.01
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							34.4		0.253	1.69		0.84

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	6.2	LOD		POOL	5	25
3	6.7	COBBLE/BOULDER	100	RIFFLE	95	20
6	7.3	IN VEG		RUN		
9	8.2	OVER VEG		OTHER		
12	5.1	CUTBANK				
15						
18		TOTAL	100	D90/50:	90/60	
20				(cm)		
24						
	6.7					
AREA (M*M)	136.0	MARGIN (M)	20.3			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 5% Moderate 95% Poor
RATIONALE: Limited by high water velocity and deep sections.

STEELHEAD PARR RATING: 100% Excellent
RATIONALE: Large boulders with fast turbulent water providing good cover.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z11 REACH: 6 MAP#: 93 L/13 PHOTO: (1)#18 ACCESS: Hel DATE: Aug 21

SITE LOCATION: Approximately 2 km downstream from Red Canyon Creek.
Same area as 1991, but new site due to low discharge.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 8.2 TDS (ppm): 30.7 pH: 7.6
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Observed a minimum of 4 chinook spawning in this area.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	31-48	40.4	32	4	36	36.6	1.0	0.405	1.65	0.80	0.32
Rbt	1+	77-83	80.2	5	0	5	5.0	0.0	0.055	0.23	6.17	0.34
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	32	32.0	1	0	1	1.0	0.0	0.011	0.05	0.41	0.00
Dolly Varden	1+	80	80.0	1	0	1	1.0	0.0	0.011	0.05	5.99	0.07
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							43.6		0.483	1.97		0.74

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	4.3	LOD		POOL	10	25
3	2.8	COBBLE/BOULDER	100	RIFFLE	90	15
6	4.4	IN VEG		RUN		
9	0.8	OVER VEG		OTHER		
12	5.8	CUTBANK				
15	6.4					
18		TOTAL	80	D90/50: 25/8		
20				(cm)		
24						
	4.1					
AREA (M*M)	90.2	MARGIN (M)	22.1			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Moderate
RATIONALE: Good habitat in shallow cobble riffle sections. Moderate in sections with higher velocity.

STEELHEAD PARR RATING: 50% Moderate 50% Poor
RATIONALE: Moderate habitat in the outer half. Poor in sections with shallow depth and low velocity.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z12 REACH: 7 MAP#: 93 L/13 PHOTO: (1)#17 ACCESS: HEL DATE: Aug 20

SITE LOCATION: Approximately 2.5 km upstream from the Red Canyon Creek. 100 m downstream of a small inlet tributary. Same location as 1991, but discharge is considerably lower.

S = SIDE / M = MAINSTEM: S SLOPE (%): 2 TEMP (C): 13.5 TDS (ppm): N/A pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	32-50	41.6	15	3	18	18.8	1.3	0.190	1.20	0.87	0.17
Rbt	1+	71-91	79.7	3	0	3	3.0	0.0	0.030	0.19	6.05	0.18
Rbt	2+	97-110	103.5	2	0	2	2.0	0.0	0.020	0.13	13.08	0.27
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+	59-60	59.5	2	0	2	2.0	0.0	0.020	0.13	2.11	0.04
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							25.8		0.261	1.65		0.66

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	2.9	LOD		POOL			40
3	5.5	COBBLE/BOULDER	100	RIFFLE	100		30
6	6.7	IN VEG		RUN			
9	9.7	OVER VEG		OTHER			
12	6.8	CUTBANK					
15							
18		TOTAL	100	D90/50:	N/A		
20				(cm)			
24							
	6.3						
AREA (M*M)	98.6	MARGIN (M)	15.6				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 75% Moderate 25% Poor
RATIONALE: Limited by high velocity.

STEELHEAD PARR RATING: 100% Excellent
RATIONALE: Deep and fast flowing.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z13 REACH: 7 MAP#: 93 L/13 PHOTO: (1)#15 ACCESS: HEL DATE: Aug 20

SITE LOCATION: Approximately 4 km downstream from Coal Creek.
Altered site Z13 from the 1991 location due to low discharge.

S = SIDE / M = MAINSTEM: S SLOPE (%): 1 TEMP (C): 12 TDS (ppm): N/A pH: N/A
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	32-61	39.2	96	22	118	124.5	4.2	0.698	8.53	0.73	0.51
Rbt	1+	63-93	76.8	12	0	12	12.0	0.0	0.067	0.82	5.43	0.36
Rbt	2+	118	118.0	1	0	1	1.0	0.0	0.006	0.07	19.26	0.11
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	43-83	52.3	8	0	8	8.0	0.0	0.045	0.55	1.87	0.08
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+	42	42.0	1	0	1	1.0	0.0	0.006	0.07	0.72	0.00
M. Whitefish	1+	150	150.0	1	0	1	1.0	0.0	0.006	0.07	32.67	0.18
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							147.5		0.827	10.11		1.25

LOCATION	WIDTH (m)		SITE COVER (%)	SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	13.2	LOD		POOL		60
3	14.0	COBBLE/BOULDER	60	RIFFLE	50	10
6	17.8	IN VEG	5	RUN	50	
9	8.6	OVER VEG	25	OTHER		
12	7.5	CUTBANK	10			
15						
18		TOTAL	60	D90/50:	25/5	
20				(cm)		
24						
	12.2					
AREA (M*M)	178.4	MARGIN (M)	14.6			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Good 50% Poor
RATIONALE: Good habitat in shallow cobbles. Poor in deeper sections with higher velocity.

STEELHEAD PARR RATING: 15% Good 35% Moderate 50% Poor
RATIONALE: Good habitat in sections with higher velocity and cutbank cover.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z14 REACH: 7 MAP#: 93 L/13 PHOTO: (1)#16 ACCESS: HEL DATE: Aug 20

SITE LOCATION: Approximately 4 km downstream from Coal Creek.
Outside edge of mainstem near Z13. New location from 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): N/A TEMP (C): 13 TDS (ppm): N/A pH: N/A
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	31-46	37.2	27	14	41	56.1	14.3	0.855	2.94	0.62	0.53
Rbt	1+	63-81	70.3	2	1	3	4.0	3.5	0.061	0.21	4.20	0.26
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	93	93.0	1	0	1	1.0	0.0	0.015	0.05	9.31	0.14
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							61.1		0.931	3.20		0.93

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	2.4	LOD		POOL			15
3	3.2	COBBLE/BOULDER	100	RIFFLE	100		10
6	4.0	IN VEG		RUN			
9	4.8	OVER VEG		OTHER			
12	4.2	CUTBANK					
15	2.0						
18		TOTAL	90	D90/50:	30/4		
20				(cm)			
24							
	3.4						
AREA (M*M)	65.6	MARGIN (M)	19.1				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Good
RATIONALE: Shallow riffle habitat.

STEELHEAD PARR RATING: Poor
RATIONALE: Limited by water depth.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z15 REACH: 7 MAP#: 93 L/13 PHOTO: (1)#13 ACCESS: HEL DATE: Aug 20

SITE LOCATION: Approximately 1 km downstream from Coal Creek.
This site was moved downstream approximately 1 km from the 1991 location due to low discharge.

S = SIDE / M = MAINSTEM: S SLOPE (%): 0.5 TEMP (C): 9.9 TDS (ppm): 19.6 pH: 7.4
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 20 cfs in sample sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	31-48	40.5	32	11	43	48.8	5.2	0.351	2.55	0.80	0.28
Rbt	1+	68-92	80.7	3	4	7	7.0	31.7	0.050	0.37	6.28	0.32
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	40-73	54.3	5	1	6	6.3	0.8	0.045	0.33	2.09	0.09
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	99-116	103.8	2	2	4	4.0	0.0	0.029	0.21	12.85	0.37
M. Whitefish	0+	34-60	49.9	11	3	14	15.1	1.9	0.109	0.79	1.22	0.13
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							81.1		0.584	4.25		1.19

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	7.4	LOD		POOL	20	60
3	7.0	COBBLE/BOULDER	75	RIFFLE	40	5
6	7.3	IN VEG	25	RUN	40	
9	6.9	OVER VEG		OTHER		
12	7.8	CUTBANK				
15						
18		TOTAL	50	D90/50:	30/4	
20				(cm)		
24						
	7.3					
AREA (M*M)	139.0	MARGIN (M)	19.1			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 75% Moderate 25% Good
RATIONALE: Substrate is cemented with fines. Mid-section is limited by high water velocity.

STEELHEAD PARR RATING: 60% Good 40% Moderate
RATIONALE: Adequate water depth and velocity, but limited cover due to glacial fines cementing substrate.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z16 REACH: 7 MAP#: 93 L/13 PHOTO: (1)#14 ACCESS: HEL DATE: Aug 20

SITE LOCATION: Approximately 1 km downstream from Coal Creek, adjacent to site Z15.
This site was moved downstream approx. 1 km from the 1991 location due to low discharge.

S = SIDE / M = MAINSTEM: S SLOPE (%): 3 TEMP (C): 9.6 TDS (ppm): 20.3 pH: 7.4
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Estimate 40 cfs discharge in sample sidechannel.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	36-50	43.7	14	2	16	16.3	0.8	0.145	1.09	1.01	0.15
Rbt	1+	78-91	85.3	4	0	4	4.0	0.0	0.035	0.27	7.39	0.26
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+	38	38.0	1	0	1	1.0	0.0	0.009	0.07	0.68	0.01
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+	124	124.0	1	0	1	1.0	0.0	0.009	0.07	20.19	0.18
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							22.3		0.198	1.49		0.59

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	7.9	LOD		POOL			35
3	7.0	COBBLE/BOULDER	100	RIFFLE	100		10
6	6.8	IN VEG		RUN			
9	8.4	OVER VEG		OTHER			
12		CUTBANK					
15							
18		TOTAL	70	D90/50:	40/5		
20				(cm)			
24							
	7.5						
AREA (M*M)	112.9	MARGIN (M)	15.0				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 30% Moderate
RATIONALE: Limited in most of site due to high water velocity.

STEELHEAD PARR RATING: 15% Good 75% Moderate 10% Poor
RATIONALE: Fast turbulent water with some substrate compaction due to fines.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z17 REACH: 7 MAP#: 93 L/13 PHOTO: (2)#3 ACCESS: VEH DATE: Aug 24

SITE LOCATION: Approximately 250 m downstream from the Serb Confluence.
Site Z17 was moved downstream to a slightly different site containing some LOD and a small pool.

S = SIDE / M = MAINSTEM: M SLOPE (%): 1.5 TEMP (C): 11.6 TDS (ppm): 23.7 pH: 7.5
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	37-55	47.0	3	2	5	9.0	13.4	0.082	0.41	1.26	0.10
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	41-64	51.3	6	2	8	9.0	2.1	0.082	0.41	1.77	0.15
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all	44-95	65.9	10	1	11	11.1	0.4	0.102	0.51	3.23	0.33
TOTAL							29.1		0.267	1.32		0.58

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	2.8	LOD	10	POOL	30	45
3	4.1	COBBLE/BOULDER	90	RIFFLE	30	20
6	7.1	IN VEG		RUN	40	
9	7.6	OVER VEG		OTHER		
12	3.2	CUTBANK				
15						
18		TOTAL	75	D90/50: N/A		
20				(cm)		
24						
	5.0					
AREA (M*M)	109.1	MARGIN (M)	22.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 75% Moderate 25% Good
RATIONALE: Limited by poor cover due to small spaces in cobble substrate.

STEELHEAD PARR RATING: 50% Moderate 50% Poor
RATIONALE: Limited by shallow depth and poor cover, except around LOD.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z18 REACH: 7 MAP#: 93 L/13 PHOTO: (2)#3 ACCESS: VEH DATE: Aug 24

SITE LOCATION: Approximately 100 m downstream from the Serb confluence.
This site was moved 70 m downstream from the 1991 location.

S = SIDE / M = MAINSTEM: M SLOPE (%): N/A TEMP (C): 11.6 TDS (ppm): 23.7 pH: 7.5
M = MARGIN / F = FULL SAMPLE: M

SAMPLING COMMENTS: Although this site was moved slightly downstream, sampled similar riffle / gravel bar habitat.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	30-60	43.3	30	2	32	32.1	0.4	0.247	1.67	0.98	0.24
Rbt	1+	76-93	84.5	2	0	2	2.0	0.0	0.015	0.10	7.19	0.11
Rbt	2+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	44-66	51.3	7	1	8	8.2	0.5	0.063	0.43	1.77	0.11
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all	54-59	56.0	3	0	3	3.0	0.0	0.023	0.16	2.71	0.06
Prickly Sculpin	all	43-75	58.4	14	1	15	15.1	0.3	0.116	0.79	2.25	0.26
TOTAL							60.4		0.464	3.15		0.79

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	6.9	LOD		POOL			25
3	9.4	COBBLE/BOULDER	100	RIFFLE	100		15
6	8.7	IN VEG		RUN			
9	6.0	OVER VEG		OTHER			
12	2.9	CUTBANK					
15							
18		TOTAL	100	D90/50:	40/10		
20				(cm)			
24							
	6.8						
AREA (M*M)	130.2	MARGIN (M)	19.2				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 90% Good 10% Moderate
RATIONALE: Good in shallow cobble riffle sections. Moderate habitat in outer sections with higher velocities.

STEELHEAD PARR RATING: 10% Good 50% Moderate 40% Poor
RATIONALE: Shallow on inner sections. Serb Creek has heavy glacial influence during warm days.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Z19 REACH: 8 MAP#: 93 L/13 PHOTO: (2)#1 ACCESS: VEH DATE: Aug 24

SITE LOCATION: Approximately 75 m upstream from the main Serb confluence.
This site was moved 50 m downstream from the 1991 location.

S = SIDE / M = MAINSTEM: M SLOPE (%): 0.5 TEMP (C): 15.8 TDS (ppm): 36.4 pH: 7.6
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Due to last season's flood the Serb enters the Zymoetz River 100 m below the 1991 location.

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+	52-93	53.0	2	1	3	4.0	3.5	0.023	0.22	1.81	0.04
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+	97-123	109.3	3	0	3	3.0	0.0	0.017	0.17	15.37	0.26
Rbt	3+			0	0	0	0.0	0.0	0.000	0.00		0.00
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	37-72	51.3	9	1	10	10.1	0.4	0.057	0.56	1.88	0.11
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all	68	68.0	0	1	1	1.0	0.0	0.006	0.06	4.54	0.03
Prickly Sculpin	all	53-138	78.8	8	2	10	10.7	1.4	0.060	0.59	5.53	0.33
TOTAL							28.8		0.163	1.60		0.77

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	9.7	LOD		POOL			90
3	10.1	COBBLE/BOULDER	100	RIFFLE			30
6	10.2	IN VEG		RUN	100		
9	9.3	OVER VEG		OTHER			
12		CUTBANK					
15							
18		TOTAL	50	D90/50:	40/10		
20				(cm)			
24							
	9.8						
AREA (M*M)	176.9	MARGIN (M)	18.0				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 50% Moderate 25% Good 25% Poor
RATIONALE:

STEELHEAD PARR RATING: 50% Good 50% Moderate
RATIONALE: Good habitat in cobble/boulder substrate.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Zc1 REACH: 1 MAP#: 93 L/13 PHOTO: (2)#4 ACCESS: VEH DATE: Aug 24

SITE LOCATION: Coal Creel approximately 20 m downstream from the Forest Service bridge on the Br 7000 Road. Same location as 1991.

S = SIDE / M = MAINSTEM: M SLOPE (%): 2.5 TEMP (C): 12.2 TDS (ppm): 64.3 pH: 7.5
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS: Lower discharge than 1991. The Dvc at 127 and 138 mm were pre-spawners. Had some difficulty sorting Rbt and Ct fry (margin was incomplete).

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Ct	0+	36-50	43.0	5	4	9	25.0	60.0	0.517	1.57	0.96	0.50
Ct	1+	72-95	81.5	3	1	4	4.5	1.5	0.093	0.28	6.46	0.60
Ct	3+	146	146.0	1	0	1	1.0	0.0	0.021	0.06	36.11	0.75
Rbt	1+	69-87	79.2	9	0	9	9.0	0.0	0.186	0.57	5.94	1.11
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all	38-59	48.9	41	4	45	45.4	0.8	0.940	2.86	1.53	1.44
Dolly Varden	0+	46-53	50.5	3	0	3	3.0	0.0	0.062	0.19	1.56	0.10
Dolly Varden	1+	127-138	132.5	2	0	2	2.0	0.0	0.041	0.13	26.27	1.09
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							89.9		1.861	5.66		5.58

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)		MEAN DEPTH (cm)
0	3.9	LOD		POOL	30		40
3	4.0	COBBLE/BOULDER	75	RIFFLE	70		10
6	2.8	IN VEG		RUN			
9	2.1	OVER VEG	25	OTHER			
12	2.4	CUTBANK					
15							
18		TOTAL	100	D90/50:	35/15		
20				(cm)			
24							
	3.0						
AREA (M*M)	48.3	MARGIN (M)	15.9				

HABITAT COMMENTS:

STEELHEAD FRY RATING: 100% Good
RATIONALE: Low velocity water over cobble and boulder substrate.

STEELHEAD PARR RATING: Good
RATIONALE: Low discharge may limit use at this time of year.

ZYMOETZ RIVER STEELHEAD INDEX SITE 1992

SITE: Zt1 REACH: 1 MAP#: 93 L/12 PHOTO: (2)#10 ACCESS: VEH DATE: Aug 26

SITE LOCATION: Approximately 40 m below bridge crossing.
Same location as 1991. Due to low discharge all flow was confined to one channel.

S = SIDE / M = MAINSTEM: M SLOPE (%): 2 TEMP (C): 11.7 TDS (ppm): 50.1 pH: 7.7
M = MARGIN / F = FULL SAMPLE: F

SAMPLING COMMENTS:

POPULATION ESTIMATES:

SPECIES	AGE	FL RANGE	FL MEAN	PASS 1	PASS 2	U1+U2	NUMBER	S.E.	N/M*M	N/LIN-M	MEAN WT	BIOMASS (g/m*m)
Rbt	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Rbt	2+	97-106	102.0	2	1	3	4.0	3.5	0.036	0.22	12.54	0.45
Rbt	3+	142	142.0	1	0	1	1.0	0.0	0.009	0.06	33.27	0.30
Chinook	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Coho	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
Dolly Varden	1+	123	123.0	1	0	1	1.0	0.0	0.009	0.06	21.12	0.19
M. Whitefish	0+			0	0	0	0.0	0.0	0.000	0.00		0.00
M. Whitefish	1+			0	0	0	0.0	0.0	0.000	0.00		0.00
Longnose Dace	all			0	0	0	0.0	0.0	0.000	0.00		0.00
Prickly Sculpin	all			0	0	0	0.0	0.0	0.000	0.00		0.00
TOTAL							6.0		0.053	0.33		0.93

LOCATION	WIDTH (m)		SITE COVER (%)		SITE WATER TYPE (%)	MEAN DEPTH (cm)
0	5.2	LOD		POOL		50
3	6.3	COBBLE/BOULDER	100	RIFFLE	95	15
6	6.3	IN VEG		RUN	5	
9	5.1	OVER VEG		OTHER		
12	7.5	CUTBANK				
15	7.1					
18		TOTAL	90	D90/50:	70/8	
20				(cm)		
24						
	6.3					
AREA (M*M)	112.5	MARGIN (M)	18.0			

HABITAT COMMENTS:

STEELHEAD FRY RATING: 30% Moderate 70% Poor
RATIONALE: Only suitable along margin.

STEELHEAD PARR RATING: 75% Good 25% Moderate
RATIONALE: Good habitat in boulders with moderate water velocity. Moderate habitat in smaller bed material along edges.

Appendix 5. Summary of Total Dissolved Solids Readings from Fish Sample Sites 1992.

(ZYMOETZ)			(MORICE)			(SUSTUT)			(KITWANGA)		
SITE	DATE	TDS	SITE	DATE	TDS	SITE	DATE	TDS	SITE	DATE	TDS
Z1	AUG 27		M4	AUG 19	18.5	S1	SEP 11	46.6	K1	AUG 17	70.0
Z2	AUG 27		M11	SEP 22		S3	SEP 11	46.8	K2	AUG17	67.7
Z3	AUG 27		M12	SEP 22	22.2	S4	SEP 11	53.4	K3	AUG17	64.5
Z4	AUG 27		M13	SEP 22	22.4	S6	SEP 11	46.7	K4	AUG18	62.1
Z5	AUG 26	34.0	M14	SEP 22	21.4	S9	SEP 13	49.6	K5	AUG18	64.9
Z6	AUG 26	28.0	M15	SEP 22	21.5	S10	SEP 13	50.0	K6	AUG18	64.8
Z7	AUG 21	32.5	M16	SEP 22	21.8	S11	SEP 13	53.3	K7	AUG18	51.3
Z8	AUG 21	31.4	M17	SEP 21	21.8	S12	SEP 13	42.1			
Z9	AUG 21	33.0	M19	SEP 21	20.6	S13	SEP 13	41.9	AVG		63.6
Z10	AUG 21		M21	SEP 21	21.7	S14	SEP 13	43.3	MIN		51.3
Z11	AUG 21	30.7				S15	SEP 10	41.8	MAX		70.0
Z12	AUG 20		AVG		21.3	S16	SEP 10	41.8	COUNT		7
Z13	AUG 20		MIN		18.5	S17	SEP 10	41.3			
Z14	AUG 20		MAX		22.4	S19	SEP 10	42.5	K1	OCT 21	63.6
Z15	AUG 20	19.6	COUNT		9	S20	SEP 10	42.0	K2	OCT 21	59.4
Z16	AUG 20	20.3				S22	SEP 10	44.2			
Z17	AUG 24	23.7	Mo1	AUG 27	92.0	S24	SEP 8		AVG		61.5
Z18	AUG 24	23.7	Mo2	AUG 28	65.0	S25	SEP 8		MIN		59.4
Z19	AUG 24	36.4	Mo3	AUG 31	54.4	S26	SEP 8		MAX		63.6
						S27	SEP 8		COUNT		2
AVG		28.5	AVG		70.5	S28	SEP 12	39.3			
MIN		19.6	MIN		54.4	S29	SEP 9	39.5			
MAX		36.4	MAX		92.0	S30	SEP 14	39.9			
COUNT		11	COUNT		3						
						AVG		44.5			
Zt1	AUG 26	50.1	Ml1	SEP 25	57.0	MIN		39.3			
			Ml2	SEP 25	56.1	MAX		53.4			
Zc1	AUG 24	64.3	Ml3	AUG 19	34.0	COUNT		19			
			AVG		49.0	Ss1	SEP 14	40.5			
			MIN		34.0	Ss2	SEP 14	43.7			
			MAX		57.0	S33	SEP 14	64.5			
			COUNT		3						
						Sb1	SEP 11	37.8			
			ML3	OCT 16		Sb2	SEP 11	33.1			
			Mt1	AUG 25	55.0	AVG		35.5			
			Mt2	AUG 25		MIN		33.1			
						MAX		37.8			
			Mg1	OCT 16	30.4	COUNT		2			
			Mg2	SEP 23	42.7						
						Sj1	SEP 12	43.0			
			Ms1	AUG 25	26.1	Sj2	SEP 9	43.4			
			Ms2	AUG 25	24.5	Sj4	SEP 12	39.4			
						Sj7	SEP 12	39.6			
			AVG		25.3	Sj8	SEP 9	34.3			
			MIN		24.5						
			MAX		26.1	AVG		39.9			
			COUNT		2	MIN		34.3			
						MAX		43.4			
			BB3	AUG 31	84.4	COUNT		5			
						SUa1	SEP 14	19.0			
						SUb1	SEP 14	23.4			
						SUc1	SEP 14	29.7			
						Sjs1	SEP 9	35.0			
						Sjd1	SEP 9	30.8			

FILE = TDSSUM DISK = MOE STD ZYMOETZ

MACRONUTRIENT CONCENTRATIONS IN THE UPPER SUSTUT RIVER BRITISH COLUMBIA

Submitted to
D. Bustard & Associates
Smithers, B.C.

LIMNOTEK RESEARCH AND DEVELOPMENT INC.
Vancouver, B.C.

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February 11, 1993

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1.0 INTRODUCTION

As part of a steelhead population survey in the upper Sustut River, water samples were collected for the analysis of macronutrient concentrations. These data will contribute to hypotheses explaining low abundance of juvenile steelhead in the system. Available descriptive information is presently limited but it does implicate three factors:

- low spawner escapement due to steelhead interception in the commercial and native Skeena fisheries.
- temperature limitation to juvenile growth rates, culminating in low areal biomass.
- nutrient deficiency resulting in low trophic productivity.

This report provides an interpretation of macronutrient concentrations in water samples collected as part of field sampling in summer, 1992. Each of two sampling sites established on both the upper Sustut River and Johanson Creek, a headwater tributary of the Sustut, were sampled on four dates. This design facilitated a quantitative comparison of concentrations between the two headwater streams and a qualitative comparison to nutrient concentrations in other steelhead rivers. These comparisons were necessary to interpret the importance of nutrient deficiency as a factor determining steelhead population size in the upper Sustut system.

2.0 STUDY SITE

Four sampling sites were established in the Sustut headwaters:

- Sustut River upstream of the junction pool (S1)
- Sustut River upstream of the confluence with Moosevale Creek (S2)
- Johanson Creek at the outlet of Johanson Lake (J1)
- Johanson Creek upstream of the junction pool (J2)

These sites are near treeline in drainage originating mainly from snowmelt and icefield meltwater. Each stream has a headwater lake that may contribute to considerable warming of the mainstem Sustut in late summer. Drainage of both streams weathers complex volcanic rocks from the Jurassic and Triassic eras (GSC 1949). Andesitic and basaltic tuffs, agglomerates and pillow lavas are common around Sustut Lake. These rocks are layered on top of various lavas, tuffs, breccias, phyllites, schists, argillite, slate, chert and some limestone and dolomite. This

layer is characterized by abundant fossil remains. Cutting through this strata are "Omineca Intrusions" consisting of slowly weathered granodiorite, diorite, and allied rocks. Given the limited vegetation at the high elevation of the sampling sites, it is expected that these parent materials strongly influence the surface water chemistry without significant alteration from processes in organic matter.

3.0 METHODS

A water sample was collected from each site on June 9, July 29, September 12 or 15, and October 13, 1992. All samples were filtered in the field and shipped on ice to Vancouver for analysis of total alkalinity, total dissolved solids (TDS), nitrate (NO_3^-), ammonia (NH_4^+ plus NH_3 and shown as NH_4^+ in this report), total dissolved phosphorus (TDP), and soluble reactive phosphorus (SRP) within 48 hours of collection. pH measurements were completed in the field but were also determined in the lab as part of general procedures. On the first two dates, preservation procedures were used due to expected delays between the time of sample collection and analysis. However, the preservation produced wide variation in results and did not allow sufficiently low detection limits to be attained. With the exception of the alkalinity, data from June 9 and July 29 have not been included in this report to avoid lab errors affecting interpretations. Alkalinity data were not affected by the preservation procedures.

Alkalinity and TDS was determined using procedures in APHA (1985). All nutrient analyses followed ultrapure analytical procedures modified from Stephens and Brandstaetter (1983). All methods utilized high sample to reagent volume ratios and dedicated low-level autoanalyzers equipped with long path (50mm) flow cells. Colour, turbidity, and refraction blank corrections were included. SRP was determined as the blue phosphomolybdate complex after reduction by stannous chloride. TDP samples were re-filtered through a washed GFF filter, digested by hot alkaline persulfate, and analyzed as soluble reactive phosphorus with digestion blanks. NO_3^--N was reported as NO_3^--N plus NO_2^- and determined as an azodye after copper-cadmium reduction and reaction with sulphanilamide and NNED (N-(1 naphthyl ethylene-diamine dihydrochloride)). NH_4^+ was determined as indophenol-blue after alkaline reaction with phenol and hypochlorite catalyzed by nitroprusside.

Data from the two sites on each stream were combined to increase degrees of freedom for statistical comparisons between streams. A simple T-test was then used to determine if parameter concentrations differed by stream. The test was followed with the Tukey HSD test to protect from declaring pairs of means different when they could differ only by chance. All procedures were run in Systat application software (Wilkinson 1990).

3.0 RESULTS AND DISCUSSION

The upper Sustut River is a moderate to high alkalinity system having circumneutral pH and low inorganic N and P concentrations (Table 1). Total alkalinity, is an approximate measure of acid neutralizing capacity (ANC) and was between 20.7 and 41.8 $mg \cdot L^{-1}$ and there was no difference between streams ($P=0.10$). These are higher concentrations than are typically found in coastal streams of B.C. (near 10 $mg \cdot L^{-1}$) but lower than in streams draining limestone formations found, for example in the upper Columbia drainage (close to 100 $mg \cdot L^{-1}$). Although present in association with fossil remains near Sustut Lake, limestone exposure was relatively limited in the study area. However, the alkalinity levels were within the region of titration curves which describe smallest change in pH with acid loading (Galloway 1983), indicating high neutralizing capacity. The capacity to consume H^+ is due to the abundance of carbonate minerals which are the "building blocks" of limestone. Moderate TDS concentrations support these data. In a carbonate system, levels of bases, carbon dioxide species, and constituents weathered from calcareous minerals (ie. Ca^{++} and Mg^{++}) will dominate dissolved solids concentrations. Other chemical complexes remain relatively insignificant by weight. Like alkalinity, TDS levels were moderate suggesting that TDS was determined by the same system that controls ANC in the upper Sustut.

Table 1. Mean macronutrient concentrations and atomic N:P supply ratios in the upper Sustut River. Data from September 12 or 15 and October 13 were considered replicates for statistical calculations.

TDS = 0.72 (cond)
T.ALK = 0.38 (cond)
T. ALK ≈ 30 mg·L⁻¹ → 199 g/100 m²
cond = 89

Parameter	Johanson	Sustut	P
Alkalinity ($mg \cdot L^{-1}$ $CaCO_3$)	27.0 ± 3.2	33.8 ± 2.1	0.10
pH (lab)	6.9 ± 0.1	7.1 ± 0.2	0.27
TDS ($mg \cdot L^{-1}$)	43.5 ± 4.4	49.3 ± 0.9	0.32
NO_3^--N ($\mu g \cdot L^{-1}$)	3.8 ± 1.5	1.6 ± 0.5	0.20
NH_4^+-N ($\mu g \cdot L^{-1}$)	4.3 ± 0.8	4.0 ± 1.3	0.88
TDP ($\mu g \cdot L^{-1}$)	2.4 ± 0.1	3.6 ± 0.1	<0.001
SRP ($\mu g \cdot L^{-1}$)	1.7 ± 0.3	1.8 ± 0.2	0.81
N:P (atomic supply ratio)	10.4 ± 2.1	6.9 ± 0.9	0.18

NH_4^+-N concentrations were $<5\ \mu g \cdot L^{-1}$ at all sites. Ammonium levels are typically low in surface water since it is readily oxidized to nitrate. Only in conditions where high loads of organic matter cause an oxygen demand or at low temperatures that may inhibit rates of nitrification will higher levels of NH_4^+ be found. Again there was no difference in NH_4^+ concentrations between the two streams ($P=0.88$).

It is noteworthy that NH_4^+ concentrations were higher than NO_3^- levels. NO_3^- was barely detectable, particularly at the Sustut sites, which is among the lowest reported concentrations in virtually any stream of B.C. The same has been found only in high elevation transboundary lakes (Alaska-B.C.) and in the Finlay River which intersects similar parent material north of the Sustut (Slaney, BCMELP Fisheries Research, Vancouver, Pers comm.). Sources of nitrogen to high elevation aquatic systems is restricted to atmospheric fallout and the oxidation of organic matter, primarily derived from the riparian zones. Above treeline where organic matter inputs may be relatively minor, atmospheric inputs may become the most important if not the only source. This loading is considerably less than occurs at lower elevations where there is more organic matter, higher temperatures to enhance nitrogen fixation, and greater potential for input from subsurface drainage and groundwater. In the Sustut drainage, snowmelt may be the most important source of N since the nitrogen content of snow can be much higher than that of rain (Wetzel 1975). Atmospheric fallout will contain both NH_4^+ and NO_3^-, the former being particularly important with dry fallout since it is readily adsorbed to inorganic and organic particulates. Assuming contamination was negligible in the water samples both in the field and the lab, the higher NH_4^+ levels compared to NO_3^- concentrations may indicate a significant input of total N loading from dry fallout. However, the possibility of contamination cannot be ruled out given the importance of ammonia in air that may enter the samples at several stages before the final colourimetry, and could be proportionately important at the extremely low levels present in the Sustut samples.

Accompanying extremely low inorganic N levels, biologically available P concentrations (approximated by SRP) can be relatively high since growth of periphyton in streams and phytoplankton in lakes will be limited by available N. This relationship is particularly true where streams drain volcanic parent materials since lavas, basalts, tuffs, etc. have a high phosphorus content. The SRP data for the Sustut (Table 1) fit this hypothesis. Surface water is influenced by surrounding volcanic parent material. SRP concentrations were slightly less than $2\ \mu g \cdot L^{-1}$ in both streams which is high compared to that in streams known to be P-deficient. In the Thompson River, for example, SRP levels can be lower that $0.5\ \mu g \cdot L^{-1}$ (Bothwell 1989), which produces extreme P-deficiency at ambient inorganic N levels exceeding $100\ \mu g \cdot L^{-1}$. Carnation Creek on Vancouver Island also has concentrations of SRP $<1\ \mu g \cdot L^{-1}$ (Mundie et al 1991) and the Keogh River has equally low SRP levels (Perrin et al 1987). Both of these streams have inorganic N levels greater than $20\ \mu g \cdot L^{-1}$.

The apparent surplus of bioavailable P suggests that autotrophic production in both the Sustut River and Johanson Creek were N-limited. Rhee (1978) has shown that for a given species of algae there is a sharp transition between P-limited and N-limited growth. Whether or

not a species is N- or P-limited depends on the inorganic N and P supply ratio, when all other nutrients are in excess. At low ratios, N-limitation will occur, while at high ratios P-limitation will prevail. The particular ratio at which the transition from N-limitation to P-limitation will occur is species dependent, varying from as low as 7:1 for some diatoms (Rhee and Gotham 1980) to as high as 50:1 for some blue-greens (Healey 1985). In temperate cold water streams that have low nutrient levels, diatoms usually dominate the periphyton community since they are relatively efficient in sequestering available macronutrients. Since optimal ratios in diatoms are in the low to mid ranges, it is likely that the optimal ratio for the Sustut periphyton community is probably near 10 to 20. In streams in which the flow rates are high enough, and the periphyton biomass low enough such that the algae are ineffective in reducing the nutrient concentration, the inorganic atomic N:P supply ratio may be closely approximated by concentrations of NH_4^+-N plus NO_3^--N and SRP. Mean atomic N:P supply ratios were 6.9 and 10.4 in the Sustut and Johanson respectively (Table 1) which is in the range indicating potential N-deficiency for growth of many algal species. This rationale would suggest that trophic production in the upper Sustut drainage is potentially limited by inorganic N concentrations.

The degree of potential N-deficiency can be examined by comparison to tests of N-deficiency in the upper Nechako River, one system where ranges of inorganic N concentrations that cause N limitation has been examined. In a series of bioassay experiments, Perrin (1991) found that 78% of a maximum growth response occurs at an inorganic N concentration of 40 $\mu g \cdot L^{-1}$ added to ambient background levels, 65% occurs at 20 $\mu g \cdot L^{-1}$ added, and 42% at 5 $\mu g \cdot L^{-1}$ added when phosphorus is in surplus with respect to growth requirements. Background N concentrations during the experiments was <5 $\mu g \cdot L^{-1}$. These data are derived from the following model that resulted from in situ experiments in which all environmental variables were controlled, leaving N concentration as the only independent variable:

$$PB{:}PB_{maxN} = 0.188(\log(1+N)) + 0.081 \quad (1)$$

where $PB{:}PB_{maxN}$ is the peak biomass relative to the maximum that can be attained with N additions at surplus P and N is the N concentration in $\mu g \cdot L^{-1}$. Biomass was used in this model but we can discuss responses in terms of growth since growth determined biomass in the experiments. Since the experiments controlled for environmental variables, the model can be directly extrapolated to other rivers. If equation 1 is applied to the Sustut, we first subtract background N concentrations that occurred in the Nechako (about 3 $\mu g \cdot L^{-1}$) from concentrations found in the Sustut, giving mean values of 2.6 $\mu g \cdot L^{-1}$ at the Sustut sites and 5.1 $\mu g \cdot L^{-1}$ at the Johanson sites. By then applying equation 1 we find that periphyton biomass was limited to 32% and 42% in the Sustut and Johanson respectively of the maximum that may be attainable at surplus N and P. This approach suggests that Johanson Creek was marginally more productive than the Sustut but that autotrophic production in both systems was N-limited.

TDP analyses were included in sample analyses to examine potential P availability in case SRP concentrations were undetectable. This approach is often necessary for P-deficient streams

on the coast. With detectable SRP in the Sustut, the TDP data provided insight into the concentrations of complex dissolved P structures. TDP contains complexes of inorganic and organic P including colloids, dissolved organic P lost from riparian zones, polyphosphates, etc. Often, the concentration of this P mixture is much greater than that of SRP which approximates the phosphate ion. In the Sustut, however, levels were low, amounting to not more than the equivalent concentration of SRP. It is interesting that TDP in the Sustut was significantly greater than in Johanson Creek ($P < 0.001$). Since SRP levels were not different between streams, the difference was due to the more complex phosphates. Differences may have originated in the headwater lakes or there may have been larger inputs of organic P from the riparian zone in the Sustut.

For trout streams having low concentrations of NO_3^--N, Rosenau and Slaney (1983) developed a model that predicted standing crops of resident salmonids. Although it cannot be directly applied to steelhead fry, it can give a rough estimate of productive potential for salmonid streams when cover estimates for parr are known. The model estimates standing crop (SC) as:

$$SC = 190(C) + 13900(NO_3^-\text{-}N)^2 \quad (2)$$

where C is cover defined as area of cover used by 1+ and older aged trout divided by wetted area, and NO_3^--N is the nitrate-N concentration in $mg \cdot L^{-1}$. In this study, cover used by parr was estimated to be close to 30% in the vicinity of water sampling sites in the Sustut and about 50% in Johanson Creek. At the mean nitrate-N concentration of 1.6 $\mu g \cdot L^{-1}$ and 3.8 $\mu g \cdot L^{-1}$ in the Sustut and Johanson respectively, the model estimates trout standing crop of 57 kg/ha in Sustut and 95 kg/ha in Johanson Creek. These levels are some of the highest reported in a review of model applications to other rivers in B.C. (Rosenau and Slaney 1983). The calculation also supports the periphyton biomass model indicating that Johanson Creek was more productive than the upper Sustut.

Where these and other models (Binns and Eiserman 1979, Ptolemy 1992) fail is that despite their consideration of water quality parameters, they do not include temperature criteria. The models always assume optimum temperature conditions for trout growth but at high elevations, this is not a safe premise. Johanson Creek was significantly cooler than the upper Sustut due mainly to the influence of snowmelt tributaries. These temperature differences (refer to temperature data here) can easily offset model predictions and invalidate the results. Lower temperature alone in Johanson may offset nutrient, cover, and other water quality variables in determining productive capacity. Consequently it may be novel to apply models of productive capacity but they must be sensitive to variables that control abundance at particular sites of interest. Since the models cited here do not consider temperature as an independent variable, they are of little use in estimating productive capacity in the upper Sustut system.

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