File: 0140-6
Bulkley/Morice River

STOCK MONITORING REPORT

(Fisheries Improvement Unit)

PROJECT: Bulkley/Morice steelhead stock monitoring - 1986

REGION: 6

MANAGEMENT UNIT: 6-8, 6-9

LOCATION: Bulkley and Morice River systems

AIR PHOTO REFERENCE NO: N/A

MAP REFERENCE NO: N/A

REPORT DATE: February 1987

DATE SURVEYED: August 18-29, 1986

PERSONS PRESENT: Regional staff
(G. Schultze, T. Hopkins)

REPORT PREPARED BY: C. D. Tredger

PURPOSE: to monitor steelhead fry recruitment in the Bulkley and Morice River systems.

OBSERVATIONS: see attached.

PROPOSED ACTION: see attached.

PHOTOGRAPHS ATTACHED: YES ___ NO ✓ AVAILABLE: YES ___ NO ✓

CIRCULATE TO: A. F. Tautz, R. S. Hooton, M. Lough, G. D. Taylor, J. C. Wightman

SUGGESTED CONTACTS:

COMMENTS BY:

SEE ATTACHED SHEETS: YES ✓ NO ___

INTRODUCTION

Steelhead fry population monitoring has been conducted in the Bulkley/Morice River system since 1980. The first six years of monitoring (1980 to 1985) were done on a rather "piecemeal" basis, concentrating on several known important steelhead rearing areas (e.g. Owen, Lamprey, Buck, and McQuarrie creeks). For the first time in 1986 an attempt was made to cover the whole Bulkley/Morice system in a representative fashion. A total of 23 sample sites were located throughout the watershed, including sampling of previously established index sites where possible (Table 1). All sampling was carried out by regional staff, from August 18 to 29, 1986. The Fisheries Improvement Unit provided direction regarding sample site location and sampling methods, and conducted data analysis and report preparation.

METHODS

Juvenile steelhead population estimates were conducted at 23 sites in the Bulkley/Morice system. The 2-catch removal method was applied to all sites. Water depth and velocity transect data were collected at all sites for WUA analysis. Data analysis (Appendix 1) includes comparison of fish densities with previous sampling at index sites, where appropriate, and comparison of WUA adjusted fish densities with suspected saturation densities.

RESULTS

Analysis of 1986 data by stream is included in Appendix I. A summary of results is given in Table 2. Overall, the Bulkley/Morice system was seeded with steelhead fry to approximately 50 to 60 percent of its suspected capacity[1] in 1986. This percentage translates to roughly 81,000 smolts, using a fry-to-smolt "biostandard" of 5.5% survival.

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[1]Fry and smolt capacity remains in question; current estimates range from 130,000 to 160,000 smolts depending on maximum Bulkley River fry density (see Appendix I).

Table 1. Juvenile steelhead stock monitoring sample sites in the Bulkley/ Morice system, 1986.

Stream	Site Sampled	Years of Record
Bulkley River		
mainstem	5	3[1]
Canyon Creek	1	3
Trout Creek	1	4
Telkwa River		
Goathorn Creek	2	4[2]
Morice River		
mainstem	4	6
Owen Creek	3	7
Lamprey Creek	3	7
Upper Bulkley River		
Buck Creek	3	6
McQuarrie Creek	1	6

[1]2 of 5 Bulkley River sites had previous sampling.
[2]Data prior to 1986 was collected by a consultant.

Table 2. Steelhead fry population status in the Bulkley and Morice River systems, 1986.

Stream	Estimated Stream Capacity [1]		1986 Population	
	Fry	Smolt [2]	% Fry Capacity	Smolt Yield
Bulkley				
mainstem	500,000	28,000	50	
	(1,000,000)	(55,000)	(25)	
Trout Creek	16,000	880	16	
Canyon Creek	145,000	8,020	7	
Total Bulkley		48,000	35	16,960
		(75,000)	(23)	
Morice				
mainstem	300,000	18,000	100	
Owen Creek	150,000	7,650	100	
Lamprey Creek	140,000	6,900	100	
Total Morice		45,370	100	45,370
Upper Bulkley				
Buck Creek	300,000	16,250	40	
McQuarrie Creek	33,000	1,800	100	
Total Upper Bulkley		40,000	46	18,400
Total Bulkley/Morice		133,000	61	80,730
		(160,000)	(50)	

[1]Estimates from 2 sources:
Bulkley and Morice mainstem - WUA x saturation fry density = fry capacity
tributaries - from modified Slaney model (Tredger, 1982).
[2]Fry-to-smolt survival used was 0.055.

The Morice River and major tributaries were well seeded with fry in 1986. All three areas sampled (Morice mainstem and Owen and Lamprey creeks) had the highest fry densities among seven years of sampling data, representing 100 percent of fry capacity. The Upper Bulkley River system was seeded to roughly 50 percent of its fry capacity in 1986. The lower portions of Buck and McQuarrie creeks, two major recruitment areas, had fry densities near saturation levels. The upper portion of Buck Creek was well below saturation levels. The Bulkley River and tributaries were underseeded with fry in 1986, to roughly 23 to 35 percent of capacity. The mainstem Bulkley River had fry densities at 25 percent (or 50%) of saturation levels[2]. Two tributaries, Trout Creek and Canyon Creek, were at 16 percent and 17 percent of fry capacity, respectively.

DISCUSSION

Two of the main factors affecting the level of fry saturation, including escapement of adults (potential egg deposition) and survival from egg to fry, are discussed here. Preliminary data indicate escapement of Bulkley/Morice steelhead in 1985/86 was slightly greater than the recent average (1980 to 1984) and roughly two-thirds the estimated maximum (Table 3). The 1985/86 escapement may not have been enough to seed the entire Bulkley/Morice system to capacity[3].

Survival from egg to fry may have been severely affected by a major flood event on June 16, 1986. Flow records from WSC (Table 4) indicate severe flooding in most areas of the watershed, as 5 of 6 stations had flood flows in excess of 500 percent of mean annual discharge. The Morice River was not as severely flooded. On-site observations of physical habitat indicated that several of the index streams were severely affected by the flood (e.g. Canyon, Trout, and Goathorn creeks; G. Schultze, pers. comm.). Extremely low fry densities in Canyon, Trout, and Upper Buck creeks are

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[2]More data is required to verify saturation fry density in the Bulkley mainstem.

[3]130,000 smolts → .055 fry to smolt → 2,360,000 fry → 15% egg to fry → 15,800,000 eggs → 4,400 eggs/female → 3,600 females x 2 = 7,200 escapement.

Table 3. Estimated steelhead escapement and fry population status in the Bulkley/Morice system.

Year	Estimated Escapement[1]	% Fry Capacity[2]
1983/84	564	36
1984/85	8,637	80
1985/86	5,484	60
1963-1984 mean	2,911	
1980-1984 mean	4,863	

[1]1984/85 and 1985/86 data are preliminary at this time.
[2]Fry data for 1983/84 and 1984/85 are less "precise" than 1985/86 due to the limited number of sample sites and lack of WUA data.

Table 4. Estimates of June 15-16, 1987, flood flows in relation to mean annual discharge in Bulkley/Morice streams.

Stream	MAD (m^3/s)	June 15-16 Flows	
		Q(m^3/s)	% MAD
Canyon	2.2	43.2	1,964
Goathorn	1.8	20.3	1,128
Buck	4.4	39.2	891
Upper Bulkley	13.3	115.0	864
Morice	75.8	245.0	323
Bulkley (Quick)	137.0	721.0	526

thought to be related to this flood event. In Goathorn Creek, very small fry (fork length in comparison to past data) are thought to be the result of flooding, in that early redds were destroyed by the flood and fry observed were the result of unusually late spawning.

An attempt to relate 1984 to 1986 fry population data to percent fry capacity and adult escapement is given in Table 3. The 1984 and 1985 fry data is known to be less precise than the 1986 data due to fewer sample sites and lack of depth and velocity information. However, the relative levels of percent fry capacity do agree with relative estimates of escapement. The highest escapement, 1984/85, produced an August fry population estimated at 80 percent of capacity. The escapement required to completely saturate the fry habitat may be in the vicinity of 7,200 adults, but depends on factors such as average fecundity, spawner distribution, and environmental conditions. The fry population (percent capacity) required to provide maximum smolt yield may be quite variable as well, given "plasticity" (compensating factors) in survival rates. Only long-term monitoring can clarify these issues.

REFERENCES

Tredger, C. D. 1982. Skeena steelhead smolt yield estimates. Memo to A. F. Tautz, July 29, 1982.

_____. 1982. Upper Bulkley River reconnaissance with reference to juvenile steelhead carrying capacity. MS. Fish Habitat Improvement Section, Fish and Wildlife Branch, Victoria, B.C.

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_____. 1984. Skeena boat shocking program - 1983. Fish Habitat Improvement Section, Fish and Wildlife Branch, Victoria, B.C.

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Appendix 1. Analysis of steelhead stock monitoring data by stream.

Bulkley River - Mainstem

The mainstem Bulkley River was sampled at five sites in 1986, covering the stream from the Suskwa confluence, to Barrett. Fry densities were low at all sites (Table B1), with a mean density of 21 fry/100 m^2. Densities adjusted for WUA (depth and velocity) increased only slightly, to 23 fry/100 m^2. Comparative data is limited to two sites in each of 1984 and 1985. Mean density in 1986 was roughly equal to that of 1984, and less than that of 1985. At the one "consistent" site, Suskwa confluence, fry density was much lower in 1986 than both 1984 and 1985.

Sampling from all years indicates relatively low fry density values in comparison to other systems. "Calibration" fry densities per 100 m^2 in other similar sized systems include 145 in the Chilko River, 94 in the Chilcotin River, and 147 in the Kispiox River. While the mainstem Bulkley may be less "productive" than these systems, it does appear to be underseeded with steelhead fry. Significant flooding in mid-June may have affected mainstem incubation.

The mainstem Bulkley has never been investigated in terms of habitat availability and carrying capacity. Very rough estimates of fry numbers present and potential capacity were calculated for this report (Table B2). Sampling in 1986 revealed useable width for fry was roughly 7 m per m of stream edge. Assuming that only one half of total stream length is useable, then total useable area was roughly 1.08 million square metres. The 1986 population was therefore 250,000 fry (1.08×10^6 m^2 x 23 fry/100 m^2). Capacity of the stream is unknown at this time, but is probably in the range of 540,000 fry (if maximum density is 50 fry/100 m^2 useable area), and up to one million fry if the maximum density is closer to 100 fry/100 m^2 useable area (as in the Chilcotin River).

Table B1. Steelhead fry densities in the Bulkley River, August 1984, 1985, and 1986.

Site	1984	1985	1986		
	No./100 m^2	No./100 m^2	No./100 m^2	WUA	No. Useable 100 m^2
1. Suskwa	46	41	13(12-13)	.83	16
2. Trout Cr.	-	-	13(13-13)	1.00	13
2a. China Cr.	9	-	-	-	-
3. Smithers	-	-	26(22-30)	.98	27
3a. Tatlow	-	41	-	-	-
4. Quick	-	-	21(18-24)	.84	25
5. Barrett	-	-	47(40-55)	.98	48
mean	28	41	21(11-41)		23(12-44)

Table B2. Estimates of Bulkley River steelhead fry capacity and August 1986 population.

	Total Length (km)	Useable Width (m)	Useable Area (m^2)	Fry Density (No./100 m^2)	Estimated Number
1986 population	154	7	1,078,000	23	248,000
fry capacity[1]				50	540,000
fry capacity[2]				94	1,013,000

[1]using maximum Bulkley River density of 50 fry/100 m^2 useable habitat.
[2]using Chilcotin River calibration density of 94 fry/100 m^2 useable habitat.

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UNPUBLISHED DATA SUBJECT TO REVISION
Les données non publiées sont sujets a une revision

BULKLEY RIVER AT QUICK (MANUAL GAUGE STATION NO. 08EE004

(PRELIMINARY) DAILY DISCHARGE IN CUBIC METRES PER SECOND FOR 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	14.6 B	16.4 B	15.0 B	34.5 B	65.0	502	360	171 E	91.1				1
2	14.5 B	16.1 B	15.1 B	32.5 B	64.3	504	369	172	90.3				2
3	14.5 B	15.9 B	15.3 B	31.4 B	67.9	470	337	162	91.3				3
4	14.5 B	15.6 B	15.6 B	30.7 B	72.0	456	314	158	94.6				4
5	14.5 B	15.2 B	15.8 B	30.4 B	77.5	476	301	159	94.3 E				5
6	14.6 B	15.0 B	16.1 B	30.7 B	87.5	517	300	156	94.0				6
7	14.6 B	14.9 B	16.7 B	31.4 B	99.9	586	294 E	154	92.3				7
8	14.6 B	14.8 B	17.8 B	33.7 B	114	632	287	156	91.3				8
9	14.8 B	14.5 B	18.6 B	38.0 B	123	534	280	153	89.6				9
10	16.1 B	14.2 B	19.8 B	39.5 B	124	518	277	149	89.0				10
11	19.0 B	14.0 B	20.6 B	36.5 B	122	490	284	148	85.5				11
12	19.9 B	13.9 B	20.7 B	35.0 B	120	453	273	147	81.1				12
13	20.2 B	13.9 B	20.4 B	34.0 B	120	432	258	148	78.3				13
14	20.0 B	13.8 B	20.1 B	33.7 B	113	426	252	149	74.5				14
15	19.9 B	13.8 B	20.1 B	34.2 B	108	661	242	147	71.0				15
16	19.4 B	13.8 B	20.8 B	35.7	105	721	230	140	69.1				16
17	18.9 B	13.6 B	22.0 B	38.2	112	687	227	134	66.6				17
18	18.4 B	13.4 B	23.5 B	44.7	121	619	223	131	63.9				18
19	17.9 B	13.3 B	25.0 B	51.1	150	583	223	126	61.8				19
20	17.6 B	13.1 B	26.5 B	66.5	183	542	223	121	59.4				20
21	17.5 B	13.0 B	27.2 B	75.5	242	502 E	221	115	57.5				21
22	17.4 B	12.8 B	28.0 B	75.3	234	461	220	111	56.5				22
23	17.2 B	12.7 B	28.9 B	68.7	217	457	223	107	56.3				23
24	17.2 B	12.7 B	29.7 B	66.1	200	449	215	104	60.5				24
25	17.1 B	12.8 B	30.5 B	63.3 E	245	418	212	101	60.0				25
26	17.0 B	12.9 B	31.4 B	60.4	267	389	205	96.3	57.2				26
27	16.9 B	13.2 B	32.3 B	61.1	301	367	199	95.0	55.8				27
28	16.8 B	14.1 B	33.3 B	61.5	379	382	193	93.3	56.3				28
29	16.7 B		34.2 B	62.8	390	375 E	188	94.0	55.8	BY TELEPHONE FROM TERRACE			29
30	16.8 B		35.4 B	63.9	443	368	180 E	92.1	56.3	(DAVIN HARRIS) TODAY			30
31	16.6 B		36.3 B		494		171	91.6 E					31
TOTAL	524.7	393.4	732.7	1401.0	5561.1	14977	7781	4081.3	2202.9		NOV 6, 1986		TOTAL
MEAN	16.9	14.1	23.6	46.7	179	499	251	132	73.4				MEAN
DAM3	45300	34000	63300	121000	480000	1290000	672000	353000	190000				DAM3
MAX	20.2	16.4	36.3	75.5	494	721	369	172	94.6				MAX
MIN	14.5	12.7	15.0	30.4	64.3	367	171	91.6	55.8				MIN

B-ICE CONDITIONS
E-ESTIMATED

*** WARNING FROM THE UBC PLOT SUBROUTINE PACKAGE ***

POPULATION ESTIMATE RESULTS

STREAM NAME: BULKLEY SITE: 1 (Suskwa) SAMPLE DATE: 860818

SITE DIMENSIONS: AREA (SQ.M) 173.6 METHOD: E ENCLOSURE: P
LENGTH (M) 15.5

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CH	W	00	39	61	45.1	6.7	1.08	8	0		8.0	8.7	0.05	0.05	0.52
CO	W	00	38	64	46.8	5.5	1.28	84	11		96.7	124.2	0.56	0.72	6.24
DV	W	99	79	79	79.0	0.0	4.68	1	0		1.0	4.7	0.01	0.03	0.06
LNC	W	99	40	83	62.9	9.6	3.06	46	14		66.1	202.2	0.38	1.17	4.27
MW	W	99	40	51	46.3	4.6	1.38	2	1		4.0	5.5	0.02	0.03	0.26
RB	W	00	27	47	31.4	4.7	0.36	20	2		22.2	8.1	0.13	0.05	1.43
RB	W	01	53	85	67.4	7.3	3.49	18	2		20.2	70.6	0.12	0.41	1.31
RB	W	02	129	129	129.0	0.0	23.61	1	0		1.0	23.6	0.01	0.14	0.06

WUA = 0.83 for fry

95% confidence limits for fry

$\hat{N}$ = 22.2 (21.1 - 23.4)

glacial

POPULATION ESTIMATE RESULTS

STREAM NAME: BULKLEY SITE: 2 (Trout) SAMPLE DATE: 860819

SITE DIMENSIONS: AREA (SQ.M) 69.1 LENGTH (M) 14.4 METHOD: E ENCLOSURE: P

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CO	W	00	42	57	50.1	4.1	1.54	14	4		19.6	30.1	0.28	0.44	1.36
MW	W	99	30	52	42.4	5.6	1.08	31	13		53.4	57.9	0.77	0.84	3.71
RB	W	00	28	43	36.1	5.1	0.55	9	0		9.0	4.9	0.13	0.07	0.63
RB	W	01	62	62	62.0	0.0	2.62	1	0		1.0	2.6	0.01	0.04	0.07

WUA = 1.00 for fry

95% C.L. for fry

$\hat{N}$: 9.0 (9.0 - 9.0)

gforeand

POPULATION ESTIMATE RESULTS

STREAM NAME: BULKLEY SITE: 3 (Smithers) SAMPLE DATE: 860820

SITE DIMENSIONS: AREA (SQ.M) 51.6 METHOD: E ENCLOSURE: P
LENGTH (M) 15.4

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED TOTAL NUMBER	BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CH	W	00	53	67	60.0	7.0	2.47	2	0		2.0	4.9	0.04	0.10	0.13
CO	W	00	36	52	44.1	3.6	1.05	73	22		104.5	110.0	2.03	2.13	6.79
LNC	W	99	16	55	35.9	10.1	0.66	16	5		23.3	15.3	0.45	0.30	1.51
MW	W	99	39	54	47.9	4.5	1.52	8	4	.75	10.7	16.2	0.21	0.31	0.69
RB	W	00	26	36	30.2	2.4	0.31	11	2		13.4	4.2	0.26	0.08	0.87
RB	W	01	59	79	70.7	7.3	4.01	6	1		7.2	28.9	0.14	0.56	0.47

WUA = 0.98 for fry

95% C.L. for fry

$\hat{N}$ = 13.4 (11.5 - 15.4)

original

POPULATION ESTIMATE RESULTS

STREAM NAME: BULKLEY SITE: 4 (Quick) SAMPLE DATE: 860820

SITE DIMENSIONS: AREA (SQ.M) 94.0 METHOD: E ENCLOSURE: P
LENGTH (M) 16.5

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CO	W	00	39	57	46.1	4.3	1.21	24	11		44.3	53.4	0.47	0.57	2.69
LNC	W	99	28	79	49.0	12.3	1.62	26	10		42.2	68.3	0.45	0.73	2.56
MW	W	99	47	47	47.0	0.0	1.40	1	1	.75	1.3	1.9	0.01	0.02	0.08
RB	W	00	27	38	30.5	2.7	0.32	16	3		19.7	6.3	0.21	0.07	1.19
SU	W	99	80	80	80.0	0.0	10.24	1	1	.75	1.3	13.7	0.01	0.15	0.08

WUA = 0.84 for fry

95% C.L. for fry

$\hat{N}$ = 19.7 (17.2 - 22.2)

special

POPULATION ESTIMATE RESULTS

STREAM NAME: BULKLEY SITE: 5 (Barrett) SAMPLE DATE: 860820

SITE DIMENSIONS: AREA (SQ.M) 65.6 METHOD: E ENCLOSURE: P
LENGTH (M) 17.6

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CO	W	00	38	58	45.4	4.6	1.16	15	10		45.0	52.1	0.69	0.79	2.56
MW	W	99	28	44	34.0	4.2	0.56	11	6		24.2	13.4	0.37	0.20	1.38
RB	W	00	29	39	31.4	2.8	0.35	23	6		31.1	10.9	0.47	0.17	1.77

WUA = 0.98 for fry

95% C.L. for fry

$\hat{N}$ = 31.1 (26.0 - 36.3)

glacial

Canyon Creek

Steelhead fry density at the Canyon Creek index site was very low in 1986 (Table C1). Observations indicated severe flooding (June), and subsequent channelization may have affected the steelhead fry population (G. Schultze, pers. comm.). Size (mm fork length) of steelhead fry in 1986 was much smaller than 1984 or 1985; mean length in 1986 was 32.7 mm, compared to approximately 40 mm in 1984 and 1985.

The carrying capacity of Canyon Creek was roughly identified at 8,024 smolts in an earlier modelling effort (Tredger, 1982). Working this figure back to required fry, using a survival rate of 0.055, estimated fry "capacity" is 146,000. The 1986 fry population was therefore at roughly 7 percent saturation, taking the maximum sampled density (1985 - 119 fry/100 m^2) as being the fry "calibration density." In fry numbers, this 7 percent is in the order of 10,000 fish.

Table C1. Steelhead fry densities in Canyon Creek, August 1984 to 1986.

	1984	1985	1986		
	No./100 m^2	No./100 m^2	No./100 m^2	WUA	No./100 ^{2} usable area
Site 1	77	119	6	.79	8

WATER SURVEY OF CANADA
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VANCOUVER, B.C.

CANYON CREEK NEAR SMITHERS (MANUAL GAUGE STATION NO. 08EE014

(PRELIMINARY) DAILY WATER LEVEL IN METRES FOR 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1	1.599	1.075	1.889	1.266	1.061		0.822		0.209				1
2	1.615	1.087	1.853	1.241	1.065	1.468	0.800	0.299	0.207				2
3	1.705	1.088	1.897	1.154	1.083	1.439	0.775	0.290	0.227				3
4	1.783	1.081	1.917	0.951	1.131	1.444	0.754	0.291	0.325				4
5	1.919	1.083	1.891	1.141	1.107	1.499			0.306				5
6	1.689	1.071	1.857	0.997	1.116	1.525	0.741	0.288	0.287				6
7	1.598	1.070	1.653	1.111	1.158	1.556		0.272	0.262				7
8	1.602	1.071	1.849	1.052		1.476	0.712		0.247				8
9	1.611	1.069	1.837	1.036	1.154	1.420	0.706						9
10	1.871	1.061	1.861	1.019	1.125	1.379	0.705		0.251				10
11	1.821	1.057	1.843	1.012	1.127	1.338	0.715	0.220	0.252				11
12	1.788		1.817		1.130	1.321	0.702	0.209	0.246				12
13	1.754	0.932	1.815		1.123	1.319	0.689	0.208	0.234				13
14	1.663	0.971	1.796		1.109	1.404	0.678	0.201	0.231				14
15	1.555	0.977	1.781		1.108	1.940	0.676	0.203	0.229				15
16			1.752	1.001	1.109	1.870			0.227				16
17	1.421	0.919		1.021	1.131	1.766	0.651	0.189	0.225				17
18	1.424	0.855	1.732	1.032	1.151	1.429	0.642	0.235					18
19			1.704	1.079	1.192	1.225	0.631	0.250	0.222				19
20	1.391		1.671	1.144	1.326	1.101	0.630	0.214	0.215				20
21	1.374		1.645	1.139	1.334	1.056	0.615	0.230	0.209				21
22	1.349			1.114	1.281	1.018	0.605	0.215	0.155				22
23	1.324		1.490	1.103	1.235	1.017	0.591	0.225	0.354				23
24	1.307			1.089	1.228	0.934	0.573		0.414				24
25	1.256		1.409	1.067	1.287	0.878	0.569	0.255	0.455				25
26				1.074	1.381	0.844	0.566		0.356				26
27	1.134	1.125	1.385	1.069	1.399	0.835		0.207	0.324				27
28	1.112	1.819	1.355	1.081	1.407		0.564	0.199	0.454				28
29	1.111		1.348	1.080	1.437	0.846	0.559	0.196	0.516				29
30			1.332	1.057	1.495		0.309		0.469				30
31	1.099		1.331		1.523		0.300	0.187					31
TOTAL													TOTAL
MEAN													MEAN
MAX													MAX
MIN													MIN

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SUMMARY FOR THE YEAR 1986

MAXIMUM DAILY WATER LEVEL, 1.940 METRES ON JUN 15

MINIMUM DAILY WATER LEVEL, 0.155 METRES ON SEP 22
WATER LEVELS ARE REFERRED TO AN ASSUMED DATUM

POPULATION ESTIMATE RESULTS

STREAM NAME: CANYON SITE: 1 SAMPLE DATE: 860821

SITE DIMENSIONS: AREA (SQ.M) 47.5 LENGTH (M) 11.3 METHOD: E ENCLOSURE: P

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CO	W	00	62	65	63.5	1.5	3.08	2	1	.75	2.7	8.2	0.06	0.17	0.24
DV	W	99	49	132	88.0	34.1	9.47	2	1		4.0	37.9	0.08	0.80	0.35
LNC	W	99	94	97	95.5	1.5	10.02	2	0		2.0	20.0	0.04	0.42	0.18
RB	W	00	32	34	32.7	0.9	0.38	3	0		3.0	1.2	0.06	0.02	0.27
RB	W	01	61	83	73.1	5.5	4.37	9	2		11.6	50.5	0.24	1.06	1.02
RB	W	02	91	108	98.7	7.0	10.73	3	2	.75	4.0	42.9	0.08	0.90	0.35

WUA = 0.79 for fry

95% C.L. for fry

$\hat{N}$ = 3.0 (3.0 to 3.0)

Trout Creek

Steelhead fry density (wild) in Trout Creek was relatively low in 1986 (Table T1). Density adjusted for useable area (WUA) remained low. Some evidence of flooding was noted (G. Schultze, pers. comm.). Total useable area in the accessible portion of Trout Creek is roughly 7,000 m^2 (1.1 km x 8 m width x .8 WUA) under average summer conditions. The 1986 steelhead fry population was roughly 2,500, just 16 percent of the suspected fry capacity of near 16,000 (using 1984 as maximum).

Table T1. Steelhead fry densities in Trout Creek, 1983 to 1986.

	No./100 m^2	95% C.L.	WUA	No./100 m^2 usable area
1983	122	-	-	-
1984	226	213-240	-	-
1985	78	67-89	-	-
1986	29	0-114	0.83	35

POPULATION ESTIMATE RESULTS

STREAM NAME: TROUT SITE: 1 SAMPLE DATE: 860819

SITE DIMENSIONS: AREA (SQ.M) 31.4 METHOD: E ENCLOSURE: P
LENGTH (M) 11.2

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CO	W	00	41	60	49.7	5.0	1.52	22	2		24.2	36.7	0.77	1.17	2.16
RB	H	00	44	44	44.0	0.0	0.94	1	0		1.0	0.9	0.03	0.03	0.09
RB	H	01	69	70	69.5	0.5	3.69	2	0		2.0	7.4	0.06	0.24	0.18
RB	W	00	34	47	41.0	5.1	0.79	3	2		9.0	7.1	0.29	0.23	0.80
RB	W	01	63	83	73.9	7.5	4.57	7	1		8.2	37.3	0.26	1.19	0.73

WUA = 0.83 for fry

95% C.L. for fry

$\hat{N}$: 9.0 (0 - 36.0)

Goathorn Creek

Goathorn Creek, a tributary of the Telkwa River, was sampled at two sites in 1986 (Table G1), with comparative data available for 1983 through 1985. Fry density in 1986 ranged from 0 up to 94 per 100 m^2. The wide difference in fry densities at these two sites may be explained by (1) poor substrates in Site 2 and (2) unusually late fry emergence due to mid-June flooding (G. Schultze, pers. comm.). The fry in Goathorn were very small in 1986 (x FL = 26.2 mm), compared to a 1983 to 1985 mean of 38.8 mm. This may be due in part to the timing of the June 16 flood; timing of this event was such that early eggs were destroyed and late spawning was delayed even further. As the fry had obviously just emerged, distribution may not have occurred over the whole stream.

Table G1. Steelhead fry density in Goathorn Creek, 1983 to 1986.

Year	Site	No./100 m^2	(95% C.L.)	WUA	No./100 m^2 useable area
1986	1	94	0-206	0.91	1.03
	2	0	-	1.00	0
	x	47			.52
1985	x	26	-		-
1984	x	18	-		-
1983	x	22	-		-

POPULATION ESTIMATE RESULTS

STREAM NAME: GOATHORN SITE: 1 SAMPLE DATE: 860821

SITE DIMENSIONS: AREA (SQ.M) 26.6 METHOD: E ENCLOSURE: P
LENGTH (M) 7.6

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
RB	W	00	24	29	26.2	1.3	0.20	10	6		25.0	5.0	0.94	0.19	3.29
RB	W	01	81	81	81.0	0.0	5.85	1	0		1.0	5.8	0.04	0.22	0.13

WUA = 0.91 for fry

95% C.L. for fry

$\hat{N}$ = 25.0 (0 - 55.0)

POPULATION ESTIMATE RESULTS

STREAM NAME: GOATHORN SITE: 2 SAMPLE DATE: 860821

SITE DIMENSIONS: AREA (SQ.M) 34.8 METHOD: E ENCLOSURE: P
LENGTH (M) 8.7

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
DV	W	99	108	108	108.0	0.0	11.97	1	0		1.0	12.0	0.03	0.34	0.11
RB	W	01	59	72	64.8	5.0	3.05	6	0		6.0	18.3	0.17	0.53	0.69
RB	W	02	70	91	80.5	10.5	6.03	2	0		2.0	12.1	0.06	0.35	0.23
RB	W	03	108	121	114.5	6.5	16.67	2	1	.75	2.7	44.5	0.08	1.28	0.31

WUA = 1.00 for fry
95% C.L. for fry
$\hat{N} = 0$

WATER SURVEY OF CANADA
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SOATHORN CREEK NEAR TELKWA

PRELIMINARY COMPUTATION SHEET

UNPUBLISHED DATA SUBJECT TO REVISION
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STATION NO. 08EE008

JAN 1986			FEB 1986			MAR 1986			APR 1986		
DAY	GAUGE HT. METRES	DISCHARGE M3/S	DAY	GAUGE HT. METRES	DISCHARGE M3/S	DAY	GAUGE HT. METRES	DISCHARGE M3/S	DAY	GAUGE HT. METRES	DISCHARGE M3/S
1	1.172	0.619	1	1.044	0.154	1	1.045	0.155	1	1.080	0.201
2	1.172	0.619	2	1.045	0.155	2	1.043	0.153	2	1.078	0.196
3	1.168	0.589	3	1.044	0.154	3	1.042	0.152	3	1.083	0.205
4	1.160	0.529	4	1.044	0.154	4	1.045	0.155	4	1.092	0.224
5	1.159	0.526	5	1.044	0.154	5	1.044	0.154	5	1.136	0.474
6	1.164	0.558	6	1.041	0.151	6	1.043	0.153	6	1.353	4.950
7	1.167	0.580	7	1.039	0.150	7	1.038	0.149	7	1.780	-9999.999
8	1.170	0.597	8	1.039	0.149	8	1.037	0.149	8	2.134	-9999.999
9	1.174	0.628	9	1.036	0.148	9	1.037	0.149	9	2.141	-9999.999
10	1.176	0.648	10	1.040	0.150	10	1.039	0.150	10	2.054	-9999.999
11	1.169	0.596	11	1.041	0.151	11	1.039	0.149	11	1.525	-9999.999
12	1.157	0.512	12	1.039	0.149	12	1.039	0.150	12	1.204	0.901
13	1.145	0.442	13	1.037	0.148	13	1.038	0.149	13	1.155	0.501
14	1.131	0.366	14	1.036	0.148	14	1.041	0.151	14	1.143	0.427
15	1.124	0.330	15	1.031	0.146	15	1.040	0.150	15	1.141	0.414
16	1.115	0.292	16	1.033	0.146	16	1.040	0.150	16	1.148	0.458
17	1.106	0.258	17	1.031	0.146	17	1.040	0.150	17	1.250	1.900
18	1.099	0.239	18	1.029	0.145	18	1.042	0.152	18	1.614	-9999.999
19	1.089	0.218	19	1.026	0.143	19	1.047	0.157	19	1.971	-9999.999
20	1.081	0.202	20	1.027	0.143	20	1.051	0.161	20	2.012	-9999.999
21	1.076	0.192	21	1.032	0.146	21	1.057	0.167	21	1.929	-9999.999
22	1.069	0.179	22	1.035	0.147	22	1.057	0.167	22	1.795	19.100
23	1.064	0.174	23	1.041	0.151	23	1.055	0.165	23	1.331	2.690
24	1.060	0.170	24	1.046	0.156	24	1.057	0.167	24	1.227	1.100
25	1.057	0.167	25	1.046	0.156	25	1.056	0.166	25	1.235	1.200
26	1.055	0.165	26	1.052	0.162	26	1.062	0.172	26	1.193	0.780
27	1.051	0.161	27	1.052	0.162	27	1.056	0.176	27	1.194	0.790
28	1.048	0.158	28	1.047	0.157	28	1.085	0.225	28	1.192	0.777
29	1.047	0.157	29	-1111.111	-1111.111	29	1.073	0.187	29	1.189	0.748
30	1.048	0.158	30	-1111.111	-1111.111	30	1.078	0.197	30	1.185	0.748
31	1.045	0.155	31	-1111.111	-1111.111	31	1.079	0.198	31	-1111.111	-1111.111
TOTAL =		11.184	TOTAL =		4.221	TOTAL =		5.025	TOTAL =		-9999.999
MEAN =		0.361	MEAN =		0.151	MEAN =		0.162	MEAN =		-9999.999
DAM3 =		966.000	DAM3 =		365.000	DAM3 =		434.000	DAM3 =		-9999.999
MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE			MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE			MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE			MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE		
VALUE	UNITS	TIME DAY	VALUE	UNITS	TIME DAY	VALUE	UNITS	TIME DAY	VALUE	UNITS	TIME DAY
1.177	METRES	1812 10	1.056	METRES	16 2 26	1.148	METRES	1712 28	2.267	METRES	17 5 6
0.655	M3/S	1812 10	0.166	M3/S	16 2 26	0.459	M3/S	1712 28	22.600	M3/S	0 0 22
1.044	METRES	15 2 31	1.025	METRES	628 20	1.035	METRES	1440 8	1.076	METRES	1417 2
0.154	M3/S	15 2 31	0.143	M3/S	628 20	0.147	M3/S	1440 8	0.192	M3/S	1417 2

**** SEE LISTING OF DETECTED ERRORS ON THE NEXT PAGE **** NOTE THAT -1111.111 = NOT APPLICABLE, -9999.999 = MISSING DATA

GOATHORN CREEK NEAR TELKWA

STATION NO. 08EE008

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PRELIMINARY COMPUTATION SHEET

DAY	MAY 1986 GAUGE HT. METRES	MAY 1986 DISCHARGE M3/S	DAY	JUN 1986 GAUGE HT. METRES	JUN 1986 DISCHARGE M3/S	DAY	JUL 1986 GAUGE HT. METRES	JUL 1986 DISCHARGE M3/S	DAY	AUG 1986 GAUGE HT. METRES	AUG 1986 DISCHARGE M3/S
1	1.189	0.755	1	1.519	7.670	1	1.550	9.120	1	1.343	2.860
2	1.193	0.785	2	1.474	6.210	2	1.539	8.360	2	1.364	3.280
3	1.206	0.891	3	1.463	5.860	3	1.482	6.440	3	1.363	3.270
4	1.223	1.060	4	1.461	5.800	4	1.447	5.390	4	1.357	3.140
5	1.237	1.200	5	1.475	6.240	5	1.460	5.780	5	1.369	3.400
6	1.256	1.440	6	1.518	7.630	6	1.487	6.590	6	1.359	3.180
7	1.286	1.850	7	1.572	9.540	7	1.483	6.480	7	1.363	3.270
8	1.293	1.970	8	1.549	8.730	8	1.474	6.190	8	1.355	3.100
9	1.286	1.860	9	1.511	7.370	9	1.472	6.140	9	1.333	2.660
10	1.274	1.680	10	1.492	6.760	10	1.497	6.910	10	1.325	2.520
11	1.266	1.560	11	1.439	5.180	11	1.490	6.720	11	1.328	2.570
12	1.268	1.590	12	1.416	4.520	12	1.444	5.290	12	1.336	2.720
13	1.260	1.500	13	1.426	4.790	13	1.435	5.050	13	1.341	2.820
14	1.251	1.380	14	1.509	7.490	14	1.420	4.610	14	1.330	2.610
15	1.248	1.330	15	2.026	-9999.999	15	1.401	4.130	15	1.292	1.950
16	1.256	1.440	16	1.875	-9999.999	16	1.401	4.140	16	1.266	1.570
17	1.275	1.700	17	1.743	16.500	17	1.430	4.890	17	1.253	1.400
18	1.322	2.470	18	1.676	13.600	18	1.434	5.020	18	1.255	1.430
19	1.345	2.900	19	1.622	11.500	19	1.478	6.330	19	1.248	1.340
20	1.397	4.020	20	1.577	9.720	20	1.473	6.180	20	1.235	1.180
21	1.394	3.950	21	1.560	9.100	21	-9999.999	-9999.999	21	-9999.999	-9999.999
22	1.362	3.250	22	1.571	9.500	22	-9999.999	-9999.999	22	1.213	0.962
23	1.341	2.820	23	1.588	10.200	23	-9999.999	-9999.999	23	1.212	0.950
24	1.355	3.110	24	1.541	8.440	24	-9999.999	-9999.999	24	1.232	1.150
25	1.427	4.840	25	1.508	7.260	25	1.383	3.700	25	1.250	1.360
26	1.490	6.710	26	1.494	6.820	26	1.368	3.360	26	1.249	1.350
27	1.469	5.050	27	1.506	7.210	27	1.363	3.270	27	1.255	1.420
28	1.453	5.570	28	1.536	8.250	28	1.357	3.130	28	1.260	1.490
29	1.487	6.620	29	1.553	8.870	29	1.338	2.770	29	1.262	1.510
30	1.516	7.570	30	1.538	8.320	30	1.331	2.620	30	1.256	1.440
31	1.525	7.870	31	-1111.111	-1111.111	31	1.329	2.600	31	1.242	1.260
TOTAL =		91.741	TOTAL =		-9999.999	TOTAL =		-9999.999	TOTAL =		-9999.999
MEAN =		2.960	MEAN =		-9999.999	MEAN =		-9999.999	MEAN =		-9999.999
DAM3 =		7930.000	DAM3 =		-9999.999	DAM3 =		-9999.999	DAM3 =		-9999.999

MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE	VALUE	UNITS	TIME	DAY
MAY 1986	1.586	METRES	2317	29
	10.100	M3/S	2317	29
	1.178	METRES	739	1
	0.666	M3/S	739	1
JUN 1986	2.196	METRES	918	15
	20.300	M3/S	0	17
	1.409	METRES	1227	12
	9.350	M3/S	1227	12
JUL 1986	1.591	METRES	2157	1
	10.300	M3/S	2157	1
	1.324	METRES	2336	30
	2.510	M3/S	2336	30
AUG 1986	1.381	METRES	5	4 5
	3.630	M3/S	5	4 5
	1.211	METRES	648	23
	0.936	M3/S	648	23

**** SEE LISTING OF DETECTED ERRORS ON THE NEXT PAGE **** NOTE THAT -1111.111 = NOT APPLICABLE, -9999.999 = MISSING DATA

WATER SURVEY OF CANADA
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GOATHORN CREEK NEAR TELKWA

STATION NO. 08EE009

PRELIMINARY COMPUTATION SHEET

SEP 1986			OCT 1986		
DAY	GAUGE HT. METRES	DISCHARGE M3/S	DAY	GAUGE HT. METRES	DISCHARGE M3/S
1	1.266	1.570	1	1.248	1.330
2	1.283	1.810	2	1.273	1.680
3	1.296	2.030	3	1.328	2.570
4	1.371	3.430	4	1.330	2.610
5	1.328	2.590	5	1.368	3.440
6	1.291	1.930	6	1.410	4.360
7	1.264	1.540	7	1.358	3.170
8	1.248	1.330	8	1.318	2.390
9	1.235	1.180	9	1.288	1.890
10	1.232	1.150	10	1.269	1.600
11	1.220	1.030	11	1.251	1.380
12	1.207	0.902	12	1.238	1.210
13	1.196	0.805	13	1.233	1.160
14	1.186	0.728	14	1.228	1.110
15	1.182	0.696	15	1.249	1.350
16	1.180	0.683	16	1.243	1.260
17	1.178	0.661	17	1.227	1.100
18	1.172	0.612	18	1.213	0.956
19	1.166	0.574	19	1.208	0.912
20	1.165	0.562	20	1.206	0.892
21	1.162	0.544	21	1.202	0.856
22	1.161	0.534	22	1.198	0.822
23	1.226	1.160	23	1.193	0.783
24	1.267	1.580	24	-9999.999	-9999.999
25	1.255	1.420	25	-9999.999	-9999.999
26	1.239	1.220	26	-9999.999	-9999.999
27	1.224	1.070	27	-9999.999	-9999.999
28	1.216	0.989	28	-9999.999	-9999.999
29	1.253	1.420	29	-9999.999	-9999.999
30	1.261	1.500	30	-9999.999	-9999.999
31	-1111.111	-1111.111	31	-9999.999	-9999.999
TOTAL =		37.250	TOTAL =		-9999.999
MEAN =		1.240	MEAN =		-9999.999
DAM3 =		3220.000	DAM3 =		-9999.999

MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE

VALUE	UNITS	TIME	DAY
1.388	METRES	927	4
3.820	M3/S	927	4
1.160	METRES	0 3 23	
0.528	M3/S	0 3 23	

MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE

VALUE	UNITS	TIME	DAY
1.435	METRES	054	6
5.050	M3/S	054	6
1.191	METRES	0 0 24	
0.766	M3/S	0 0 24	

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Morice River

The mainstem Morice River was sampled at four sites in 1986. Mean steelhead fry density was 53/100 m^2, the highest yet recorded in six years of data (Tables M1 and M2). Fry density adjusted for WUA was 63/100 m^2. This adjusted density is quite low in comparison to some other systems (e.g. Chilcotin River = 94/100 m^2, Kispiox River = 147/100 m^2); however, it may represent saturation conditions given the low productivity (TDS ≃ 30) and high summer flow (summer flow greater than 100% of MAD) conditions. Assuming this represents saturation, then fry capacity of the Morice River is roughly 30,000 [1].

Table M1. Steelhead fry densities (No./100 m^2) and WUA estimates at 4 sample sites in the Morice River, August 1986.

Site	Density (No./100 m^2)	WUA	Adjusted Density (No./100 m^2)
(11) 3 Mile	66 (0-172)	.79	84
(1) Aspen	41 (26-55)	1.00	41
(2) Lamprey	67 (15-119)	.80	84
(4) 21 Mile	39 (22-56)	.89	43
mean	53 (32-82)		63 (31-112)

Table M2. Mean steelhead fry densities (No./100 m^2) in the Morice River, 1980 to 1986.

1980	1981	1982	1984	1985	1986
14	29	16	14	36	53 (32-82)

[1]length = 86.7 km; wetted width = 52 m; useable width (10%) = 5.2 m useable area = 450,000 m^2; fry capacity = 450,000 m^2 x (63 fry/100 m^2) = 284,000 fry.

MORICE RIVER NEAR HOUSTON

PRELIMINARY COMPUTATION SHEET

UNPUBLISHED DATA SUBJECT TO REVISION
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STATION NO. 08ED002

DAY	JAN 1986 GAUGE HT. METRES	JAN 1986 DISCHARGE M3/S	DAY	FEB 1986 GAUGE HT. METRES	FEB 1986 DISCHARGE M3/S	DAY	MAR 1986 GAUGE HT. METRES	MAR 1986 DISCHARGE M3/S	DAY	APR 1986 GAUGE HT. METRES	APR 1986 DISCHARGE M3/S
1	0.395	10.000	1	0.430	12.000	1	0.432	12.200	1	0.468	14.200
2	0.394	10.000	2	0.430	12.100	2	0.432	12.200	2	0.465	14.100
3	0.394	9.990	3	0.431	12.100	3	0.436	12.400	3	0.463	13.900
4	0.393	9.950	4	0.427	11.900	4	0.439	12.500	4	0.462	13.900
5	0.392	9.900	5	0.428	11.900	5	0.436	12.400	5	0.461	13.800
6	0.392	9.920	6	0.426	11.800	6	0.443	12.800	6	0.457	13.600
7	0.392	9.910	7	0.421	11.500	7	0.454	13.500	7	0.454	13.400
8	0.394	9.980	8	0.419	11.400	8	0.456	13.600	8	0.467	14.200
9	0.403	10.500	9	0.415	11.200	9	0.459	13.700	9	0.467	14.200
10	0.441	12.700	10	0.413	11.000	10	0.458	13.700	10	0.467	14.200
11	0.445	12.900	11	0.412	11.000	11	0.459	13.700	11	0.466	14.100
12	0.445	12.900	12	0.412	11.000	12	0.459	13.700	12	0.471	14.400
13	0.444	12.800	13	0.413	11.000	13	0.456	13.600	13	0.472	14.500
14	0.449	13.100	14	0.412	11.000	14	0.457	13.600	14	0.469	14.300
15	0.452	13.300	15	0.412	11.000	15	0.455	13.500	15	0.470	14.400
16	0.449	13.200	16	0.412	11.000	16	0.452	13.300	16	0.470	14.400
17	0.446	13.000	17	0.410	10.900	17	0.451	13.300	17	0.475	14.600
18	0.453	13.400	18	0.412	11.000	18	0.455	13.500	18	0.478	14.800
19	0.455	13.500	19	0.410	10.900	19	0.452	13.300	19	0.496	15.900
20	0.454	13.400	20	0.409	10.800	20	0.452	13.300	20	0.511	16.800
21	0.452	13.300	21	0.407	10.700	21	0.453	13.400	21	0.524	17.700
22	0.454	13.400	22	0.405	10.600	22	0.449	13.200	22	0.534	18.400
23	0.460	13.800	23	0.405	10.600	23	0.448	13.100	23	0.539	18.700
24	0.458	13.700	24	0.410	10.900	24	0.450	13.200	24	0.541	18.900
25	0.456	13.600	25	0.420	11.400	25	0.450	13.200	25	0.552	19.600
26	0.452	13.300	26	0.421	11.500	26	0.459	13.700	26	0.558	20.000
27	0.451	13.200	27	0.424	11.700	27	0.460	13.800	27	0.568	20.600
28	0.446	13.000	28	0.430	12.000	28	0.465	14.100	28	0.569	20.700
29	0.441	12.700	29	-1111.111	-1111.111	29	0.468	14.200	29	0.573	21.000
30	0.438	12.500	30	-1111.111	-1111.111	30	0.476	14.700	30	0.572	20.900
31	0.434	12.300	31	-1111.111	-1111.111	31	0.470	14.400	31	-1111.111	-1111.111
TOTAL =		379.150	TOTAL =		315.900	TOTAL =		414.800	TOTAL =		494.200
MEAN =		12.200	MEAN =		11.300	MEAN =		13.400	MEAN =		16.100
DAM3 =		32800.000	DAM3 =		27300.000	DAM3 =		35800.000	DAM3 =		41800.000
MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE			MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE			MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE			MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE		
VALUE	UNITS	TIME DAY	VALUE	UNITS	TIME DAY	VALUE	UNITS	TIME DAY	VALUE	UNITS	TIME DAY
0.461	METRES	21 9 23	0.434	METRES	346 28	0.481	METRES	1929 30	0.577	METRES	1237 29
13.800	M3/S	21 9 23	12.200	M3/S	346 28	15.000	M3/S	1929 30	21.300	M3/S	1237 29
0.391	METRES	1641 7	0.404	METRES	1948 22	0.426	METRES	0 0 1	0.453	METRES	1021 7
9.840	M3/S	1641 7	10.500	M3/S	1948 22	11.800	M3/S	0 0 1	13.300	M3/S	1021 7

NOTE THAT -1111.111 = NOT APPLICABLE AND -9999.999 = MISSING DATA

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NORTH RIVER NEAR HOUSTON

PRELIMINARY COMPUTATION SHEET

UNPUBLISHED DATA SUBJECT TO REVISION
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STATION NO. 08ED002

MAY 1986			JUN 1986			JUL 1986			AUG 1986		
DAY	GAUGE HT. METRES	DISCHARGE M3/S	DAY	GAUGE HT. METRES	DISCHARGE M3/S	DAY	GAUGE HT. METRES	DISCHARGE M3/S	DAY	GAUGE HT. METRES	DISCHARGE M3/S
1	0.574	21.000	1	1.622	140.000	1	2.046	210.000	1	1.603	136.000
2	0.578	21.400	2	1.698	152.000	2	2.044	209.000	2	1.592	135.000
3	0.585	21.800	3	1.754	161.000	3	2.029	207.000	3	1.590	135.000
4	0.587	21.900	4	1.811	170.000	4	1.991	200.000	4	1.585	134.000
5	0.592	22.300	5	1.879	182.000	5	1.954	194.000	5	1.580	133.000
6	0.603	23.000	6	1.977	198.000	6	1.942	192.000	6	1.573	132.000
7	0.616	24.000	7	2.095	218.000	7	1.933	191.000	7	1.571	132.000
8	0.635	25.400	8	2.183	234.000	8	1.926	189.000	8	1.571	132.000
9	0.653	26.600	9	2.225	242.000	9	1.920	188.000	9	1.561	130.000
10	0.667	27.600	10	2.250	246.000	10	1.924	189.000	10	1.558	130.000
11	0.682	28.700	11	2.246	245.000	11	1.931	190.000	11	1.557	130.000
12	0.707	30.600	12	2.217	240.000	12	1.926	190.000	12	1.557	130.000
13	0.720	31.800	13	2.184	234.000	13	1.911	187.000	13	1.563	130.000
14	0.728	32.500	14	2.174	232.000	14	1.890	183.000	14	1.562	130.000
15	0.733	33.000	15	2.224	241.000	15	1.858	178.000	15	1.532	126.000
16	0.738	33.400	16	2.246	245.000	16	1.825	172.000	16	1.498	121.000
17	0.750	34.500	17	2.240	244.000	17	1.807	169.000	17	1.465	116.000
18	0.765	35.900	18	2.230	242.000	18	1.798	168.000	18	1.431	111.000
19	0.795	38.600	19	2.210	239.000	19	1.793	167.000	19	1.397	107.000
20	0.839	42.700	20	2.174	232.000	20	1.797	167.000	20	1.360	102.000
21	0.872	45.900	21	2.134	225.000	21	1.808	169.000	21	1.323	97.400
22	0.902	48.700	22	2.116	222.000	22	1.819	171.000	22	1.296	94.000
23	0.925	50.900	23	2.125	224.000	23	1.820	171.000	23	1.272	91.000
24	0.957	53.900	24	2.129	224.000	24	1.817	171.000	24	1.247	87.800
25	0.998	57.900	25	2.106	220.000	25	1.795	167.000	25	1.226	85.200
26	1.064	65.600	26	2.069	214.000	26	1.775	164.000	26	1.207	82.900
27	1.136	74.300	27	2.040	209.000	27	1.756	161.000	27	1.195	81.400
28	1.216	84.100	28	2.028	207.000	28	1.735	158.000	28	1.188	80.600
29	1.307	95.400	29	2.036	208.000	29	1.703	153.000	29	1.187	80.500
30	1.413	109.000	30	2.044	209.000	30	1.650	146.000	30	1.177	79.300
31	1.521	124.000	31	-1111.111	-1111.111	31	1.625	140.000	31	1.169	78.300
TOTAL =		1386.400	TOTAL =		6499.000	TOTAL =		5511.000	TOTAL =		3470.400
MEAN =		44.700	MEAN =		217.000	MEAN =		178.000	MEAN =		112.000
DAM3 =		120000.000	DAM3 =		562000.000	DAM3 =		476000.000	DAM3 =		300000.000
MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE			MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE			MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE			MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE		
VALUE	UNITS	TIME DAY	VALUE	UNITS	TIME DAY	VALUE	UNITS	TIME DAY	VALUE	UNITS	TIME DAY
1.573	METRES	24 0 31	2.256	METRES	1929 10	2.050	METRES	1645 1	1.612	METRES	0 0 1
132.000	M3/S	24 0 31	247.000	M3/S	1929 10	211.000	M3/S	1645 1	136.000	M3/S	0 0 1
0.570	METRES	0 0 1	1.573	METRES	0 0 1	1.612	METRES	24 0 31	1.163	METRES	2227 31
20.600	M3/S	0 0 1	132.000	M3/S	0 0 1	138.000	M3/S	24 0 31	77.600	M3/S	2227 31

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MORICE RIVER NEAR HOUSTON

STATION NO. 08ED002

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PRELIMINARY COMPUTATION SHEET

DAY	SEP 1966 GAUGE HT. METRES	SEP 1966 DISCHARGE M3/S	DAY	OCT 1966 GAUGE HT. METRES	OCT 1966 DISCHARGE M3/S
1	1.165	77.800	1	0.824	41.300
2	1.168	78.100	2	0.827	41.600
3	1.176	79.200	3	0.840	42.800
4	1.183	79.900	4	0.860	44.700
5	1.180	79.600	5	0.903	48.600
6	1.178	79.400	6	0.966	54.700
7	1.172	78.700	7	1.023	60.800
8	1.163	77.500	8	1.060	65.100
9	1.153	76.300	9	1.076	67.100
10	1.143	75.200	10	1.070	66.400
11	1.110	71.300	11	1.062	65.500
12	1.079	67.400	12	1.047	63.600
13	1.054	64.500	13	1.033	62.000
14	1.034	62.100	14	1.026	61.100
15	1.003	58.300	15	1.018	60.200
16	0.979	56.000	16	1.006	58.700
17	0.954	53.700	17	0.997	57.700
18	0.938	52.100	18	0.979	56.000
19	0.923	50.700	19	0.964	54.600
20	0.905	49.000	20	0.953	53.600
21	0.890	47.600	21	0.943	52.600
22	0.878	46.400	22	0.931	51.500
23	0.874	46.100	23	0.920	50.400
24	0.874	46.100	24	-9999.999	-9999.999
25	0.865	45.200	25	-9999.999	-9999.999
26	0.860	44.700	26	-9999.999	-9999.999
27	0.850	43.800	27	-9999.999	-9999.999
28	0.841	42.900	28	-9999.999	-9999.999
29	0.842	43.000	29	-9999.999	-9999.999
30	0.837	42.500	30	-9999.999	-9999.999
31	-1111.111	-1111.111	31	-9999.999	-9999.999
TOTAL =		1915.100	TOTAL =		-9999.999
MEAN =		60.500	MEAN =		-9999.999
DAM3 =		157000.000	DAM3 =		-9999.999

MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE	VALUE	UNITS	TIME	DAY
	1.186	METRES	559	4
	80.300	M3/S	559	4
	0.828	METRES	24 0 30	
	41.700	M3/S	24 0 30	

MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE	VALUE	UNITS	TIME	DAY
	1.078	METRES	827	9
	67.400	M3/S	827	9
	0.821	METRES	112	2
	41.000	M3/S	112	2

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POPULATION ESTIMATE RESULTS

STREAM NAME: MORICE SITE: 11 SAMPLE DATE: 860822

SITE DIMENSIONS: AREA (SQ.M) 98.0 METHOD: E ENCLOSURE: P
LENGTH (M) 11.2

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CH	W	00	41	66	51.7	6.1	1.58	49	26		104.4	165.2	1.07	1.69	9.32
CO	W	00	45	60	54.7	5.9	2.04	4	0		4.0	8.1	0.04	0.08	0.36
LNC	W	99	61	66	63.7	1.9	2.99	3	1		4.5	13.4	0.05	0.14	0.40
MW	W	99	42	42	42.0	0.0	1.00	1	1	.75	1.3	1.3	0.01	0.01	0.12
RB	W	00	26	44	31.9	4.2	0.38	18	13		64.8	24.5	0.66	0.25	5.79
RB	W	01	62	73	67.0	4.4	3.35	3	2		9.0	30.2	0.09	0.31	0.80
RB	W	02	100	100	100.0	0.0	11.00	1	0		1.0	11.0	0.01	0.11	0.09

WUA = 0.79 for fry

95% confidence limits (fry)

$\hat{N}$ = 64.8 (0 - 169.0)

POPULATION ESTIMATE RESULTS

STREAM NAME: MORICE SITE: 1 SAMPLE DATE: 860828

SITE DIMENSIONS: AREA (SQ.M) 82.2 METHOD: E ENCLOSURE: P
LENGTH (M) 11.9

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CH	W	00	39	70	49.5	6.0	1.39	33	10		47.3	65.9	0.58	0.80	3.98
LNC	W	99	53	63	58.3	3.7	2.30	7	0		7.0	16.1	0.09	0.20	0.59
MW	W	99	47	50	48.5	1.5	1.54	2	1	.75	2.7	4.1	0.03	0.05	0.22
RB	H	01	80	80	80.0	0.0	5.63	1	0		1.0	5.6	0.01	0.07	0.08
RB	W	00	28	49	34.3	5.7	0.48	20	8		33.3	16.1	0.41	0.20	2.80
RB	W	01	63	74	68.5	3.9	3.57	6	0		6.0	21.4	0.07	0.26	0.50
RB	W	02	112	123	117.5	5.5	17.96	2	0		2.0	35.9	0.02	0.44	0.17

WUA = 1.00 for fry

95% confidence limits (fry)

$\hat{N}$ = 33.3 (21.6 - 45.1)

POPULATION ESTIMATE RESULTS

STREAM NAME: MORICE SITE: 2 SAMPLE DATE: 860828

SITE DIMENSIONS: AREA (SQ.M) 114.3 METHOD: E ENCLOSURE: P
LENGTH (M) 16.1

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CH	W	00	39	64	50.3	6.1	1.46	18	3		21.6	31.6	0.19	0.28	1.34
LNC	W	99	46	60	54.1	3.6	1.84	9	3		13.5	24.9	0.12	0.22	0.84
MW	W	99	45	45	45.0	0.0	1.23	1	1	.75	1.3	1.6	0.01	0.01	0.08
RB	W	00	28	45	33.7	3.6	0.44	29	18		76.5	33.4	0.67	0.29	4.75
RB	W	01	72	72	72.0	0.0	4.11	1	0		1.0	4.1	0.01	0.04	0.06

WUA = 0.80 for fry

95% confidence limits (fry)

$\hat{N}$ = 76.5 (17.3 - 135.1)

POPULATION ESTIMATE RESULTS

STREAM NAME: MORICE SITE: 4 SAMPLE DATE: 860828

SITE DIMENSIONS: AREA (SQ.M) 194.2 METHOD: E ENCLOSURE: P
LENGTH (M) 27.4

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CC	W	99	43	43	43.0	0.0	0.80	1	0		1.0	0.8	0.01	0.00	0.04
CH	W	00	40	62	50.2	4.6	1.42	40	10		53.3	75.9	0.27	0.39	1.95
CO	W	00	38	50	43.1	3.3	0.98	15	4		20.5	20.0	0.11	0.10	0.75
LNC	W	99	22	71	54.2	14.6	2.20	8	4	.75	10.7	23.5	0.05	0.12	0.39
MW	W	99	32	51	39.6	4.4	0.87	23	9		37.8	33.0	0.19	0.17	1.38
RB	W	00	31	43	35.4	2.8	0.50	37	19		76.1	37.9	0.39	0.20	2.78
RB	W	01	68	88	78.0	10.0	5.48	2	0		2.0	11.0	0.01	0.06	0.07

WUA = 0.89 for fry

95% Confidence limits (fry)

$\hat{N}$ = 76.1 (43.6 - 108.5)

Lamprey Creek

Lamprey Creek was sampled at three sites in 1986, including two sites in Lamprey Creek and one site in Pimpernel Creek (Table L1). Mean 1986 fry density was the highest among seven years of sampling data. Fry density adjusted for WUA was 121 fry/100 m^2, and since this represents the highest density yet on Lamprey Creek, it will be used as the calibration density (i.e. saturation density in useable habitat).

Estimated total fry population, based on extrapolated linear densities, relative to previous reconnaissance is summarized in Table L2. The 1986 estimated population was the largest yet sampled; however, confidence limits are quite wide. The 1986 estimate may be inflated due to extremely low flows when sampled, rendering riffles almost dry and reducing available habitat. This situation may occur in any extreme low flow year (e.g. 1985).

Table L1. Summary of steelhead fry densities (No./100 m^2) at Lamprey Creek sample sites, 1980 to 1986.

							1986		
Site	1980	1981	1982	1983	1984	1985	No./100 m^2	WUA	Adjusted
1. Lamprey 1	32	18	8	26	6	23	31 (0-92)	1.00	31
2. Lamprey 5/8	50	92	29	38	66	121	196 (116-264)	0.90	218
3. Pimpernel	51	-	97	130	99	-	110 (87-132)	0.97	113
mean (1,2+3)	44	-	45	65	57	-	112 (0-483)		121
mean (1,2)	41	55	19	32	36	72	114		

Table L2. Estimates[1] of total steelhead fry population in Lamprey Creek, 1980 to 1986.

1980	1981	1982	1983	1984	1985	1986
44,800	70,000	45,500	62,600	104,000	117,700	138,800 (180,000 -174,000)

[1]Estimated as:

mean density (No./m) x 2075 (Reach 1) = No. in Reach 1
x 7803 (Reach 2) = No. in Reach 2
x 4405 (Pimpernel) = No. in Pimpernel

Sampled Reach Total
x 1.35 (ratio of unsampled stream length)

Total Population

POPULATION ESTIMATE RESULTS

STREAM NAME: LAMPREY SITE: 1 SAMPLE DATE: 860826

SITE DIMENSIONS: AREA (SQ.M) 107.1 METHOD: E ENCLOSURE: P
LENGTH (M) 17.0

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CC	W	99	113	174	143.5	30.5	33.55	2	2	.75	2.7	89.5	0.02	0.84	0.16
CH	W	00	46	59	51.7	3.6	1.55	7	1		8.2	12.6	0.08	0.12	0.48
CO	W	00	41	73	53.9	6.5	1.97	37	31		228.2	448.7	2.13	4.19	13.42
LNC	W	99	35	61	46.8	8.9	1.31	8	2		10.7	13.9	0.10	0.13	0.63
MW	W	00	38	66	50.5	8.0	1.87	10	6		25.0	46.8	0.23	0.44	1.47
RB	W	00	30	53	42.6	6.2	0.91	10	7		33.3	30.2	0.31	0.28	1.96
RB	W	01	85	85	85.0	0.0	6.76	1	0		1.0	6.8	0.01	0.06	0.06
RB	W	02	106	120	113.0	7.0	16.05	2	1	.75	2.7	42.8	0.02	0.40	0.16
RB	W	03	150	150	150.0	0.0	37.12	1	0		1.0	37.1	0.01	0.35	0.06

$

WUA = 1.0 for fry

95% C.L. for fry

$\hat{N} = 33.3 \ (0 - 97.3)$

$\hat{N}/m^2 = 0.31 \ (0 - 0.92)$

$\hat{N}/m = 1.96 \ (0 - 5.72)$

POPULATION ESTIMATE RESULTS

STREAM NAME: LAMPREY SITE: 8 SAMPLE DATE: 860826

SITE DIMENSIONS: AREA (SQ.M) 87.5 METHOD: E ENCLOSURE: P
LENGTH (M) 15.7

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
LNC	W	99	32	87	47.1	12.7	1.50	21	12		49.0	73.7	0.56	0.84	3.12
LSU	W	99	58	58	58.0	0.0	3.90	1	0		1.0	3.9	0.01	0.04	0.06
MW	W	99	111	111	111.0	0.0	18.46	1	0		1.0	18.5	0.01	0.21	0.06
RB	W	00	27	58	40.9	4.5	0.78	98	42		171.5	133.8	1.96	1.53	10.92
RB	W	01	70	88	79.9	4.6	5.66	11	4		17.3	97.8	0.20	1.12	1.10
RB	W	02	91	132	111.2	13.5	15.81	7	2		9.8	154.9	0.11	1.77	0.62

WUA = 0.90 for fry

95% C.L. for fry

$\hat{N} = 171.5\ (140.4 - 202.6)$

$\hat{N}/m^2 = 1.96\ (1.16 - 2.64)$

$\hat{N}/m = 10.92\ (8.94 - 12.90)$

POPULATION ESTIMATE RESULTS

STREAM NAME: PIMPERNEL SITE: 1 SAMPLE DATE: 860826

SITE DIMENSIONS: AREA (SQ.M) 22.7 METHOD: E ENCLOSURE: P
LENGTH (M) 8.1

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
RB	W	00	38	59	47.5	5.1	1.22	18	5		24.9	30.4	1.10	1.34	3.08

WUA = 0.97 for fry

95% C.L. for fry

$\hat{N}$ = 24.9 (19.8 - 30.0)

$\hat{N}/m^2$ = 1.10 (0.87 - 1.32)

$\hat{N}/m$ = 3.08 (2.44 - 3.70)

Owen Creek

Steelhead fry densities at three sample sites in Owen Creek were the highest sampled in seven years of data (Table 01). Densities adjusted for WUA were very high, with a mean of 291 fry/100 m^2. Based on previous reconnaissance work, a population size of 150,000 may have been present in Owen Creek (Table 02). Confidence limits on this estimate are extremely wide.

Table 01. Summary of steelhead fry densities (No./100 m^2) in Owen Creek, 1980 to 1986.

Site	1980	1981	1982	1983	1984	1985	1986		
							No./100 m^2	WUA	Adjusted
1	78	173	114	73	88	100	281 (0-1011)	0.97	290
3	78	257	218	54	58	30	370 (338-402)	0.96	385
6(5)	16	71	14	211	32	-	-		
7	41	99	57	69	35	20	140 (101-179)	0.71	197
9	105	166	31	20	117	2	-		
mean	64	153	87	85	66	38	264 (49-723)		291

Table 02. Estimates[1] of total steelhead fry population in Owen Creek, 1980 to 1986.

1980	1981	1982	1983	1984	1985	1986
38,000	100,000	75,000	61,500	61,000	35,500	153,000 (100,500 -253,000)

[1]Estimated as:

mean density (No./m) x 4830 (Reach 1) = No. in Reach 1
x 7823 (Reach 5) = No. in Reach 5

Sampled Reach Total
x 1.26 (ratio of unsampled to to sampled stream length)

Total Population

POPULATION ESTIMATE RESULTS

STREAM NAME: OWEN SITE: 1 SAMPLE DATE: 860827

SITE DIMENSIONS: AREA (SQ.M) 72.8 METHOD: E ENCLOSURE: P
LENGTH (M) 20.8

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
DV	W	99	96	96	96.0	0.0	8.40	1	0		1.0	8.4	0.01	0.12	0.05
RB	W	00	32	59	45.3	5.7	1.07	32	27		204.8	219.1	2.81	3.01	9.85
RB	W	01	64	92	78.2	8.7	5.46	10	3		14.3	78.0	0.20	1.07	0.69
RB	W	02	108	108	108.0	0.0	13.86	1	0		1.0	13.9	0.01	0.19	0.05

WUA = 0.97 for fry

95% c.l. for fry

$\hat{N}$ = 204.8 (0 to 735.7)

$\hat{N}/m^2$ = 2.81 (0 to 10.11)

$\hat{N}/m$ = 9.85 (0 to 35.37)

POPULATION ESTIMATE RESULTS

STREAM NAME: OWEN SITE: 3 SAMPLE DATE: 860827

SITE DIMENSIONS: AREA (SQ.M) 51.4 LENGTH (M) 9.6 METHOD: E ENCLOSURE: P

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
DV	W	99	54	95	63.0	12.4	2.69	5	3		12.5	33.6	0.24	0.65	1.30
LNC	W	99	45	81	57.0	14.1	2.55	4	2	.75	5.3	13.6	0.10	0.26	0.56
RB	W	00	32	57	44.2	5.7	1.00	133	40		190.2	190.0	3.70	3.70	19.81
RB	W	01	73	100	82.9	7.1	6.42	18	0		18.0	115.5	0.35	2.25	1.88
RB	W	02	107	107	107.0	0.0	13.48	1	1	.75	1.3	18.0	0.03	0.35	0.14

WUA = 0.96 for fry

95% C.L. for fry

$\hat{N}$ = 190.2 (174.0 - 206.4)

$\hat{N}/m^2$ = 3.70 (3.39 - 4.02)

$\hat{N}/m$ = 19.81 (18.13 - 21.50)

POPULATION ESTIMATE RESULTS

STREAM NAME: OWEN SITE: 7 SAMPLE DATE: 860827

SITE DIMENSIONS: AREA (SQ.M) 66.4 METHOD: E ENCLOSURE: P
LENGTH (M) 14.6

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
DV	W	99	81	134	105.5	22.2	12.64	4	0		4.0	50.6	0.06	0.76	0.27
RB	W	00	30	61	43.6	5.8	0.96	51	23		92.9	89.3	1.40	1.34	6.36
RB	W	01	77	101	86.6	7.0	7.29	9	4		16.2	118.1	0.24	1.78	1.11
RB	W	02	108	116	112.3	3.3	15.63	3	0		3.0	46.9	0.05	0.71	0.21

WUA = 0.71 for fry

95% C.L. for fry

$\hat{N}$: 92.9 (67.2 - 118.6)

$\hat{N}/m^2$: 1.40 (1.01 - 1.79)

$\hat{N}/m$ = 6.36 (4.60 - 8.12)

Upper Bulkley

The Upper Bulkley system was sampled at four sites in 1986, including Buck Creek (three sites) and McQuarrie Creek (one site). Steelhead fry density in McQuarrie Creek was as high as previously sampled (Table UB1). Density in Buck Creek was relatively high at the lower site (Powerline), but was relatively low at the upper two sites (Table UB2). If 1985 sampling represents maximum densities (and WUA is assumed to be 1.0), then the 1986 adjusted densities represent 100 percent (Site 1), 23 percent (Site 2), and 10 percent (Site 3) saturation.

Flow records (WSC) indicate that Buck Creek was in flood in mid-June 1986, which may have had a detrimental effect on steelhead egg-to-fry survival. Summer flows were, as usual, quite low, at 0.27 m^3/sec (6% of MAD).

In terms of capacity, the Upper Bulkley has been estimated to potentially produce 40,000 steelhead smolts (Tredger, 1982). In Buck Creek (capacity = 16,250), Site 1 represents roughly 30 percent and Sites 2 and 3 represent approximately 70 percent of the total stream area (1981 data). Given the percent saturation values for steelhead fry in 1986, Buck Creek was at about 42 percent saturation[1] in 1986. McQuarrie Creek was at 100 percent saturation. Overall, the Upper Bulkley was at roughly 46 percent saturation[2] (of maximum potential fry population).

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[1]Site 1 = 100% saturation x 30% area = .30
Sites 2 & 3 = $\frac{(23 + 10\%\ \text{saturation})}{2}$ x 70% area = .12
Total = .42 or 42% saturation

[2][(42% x 16,250) + (100% x 1,800)] / 40,000 = 46%

Table UB1. Steelhead fry density at 4 sample sites in the Upper Bulkley system, August 1986.

Stream	Site	Fry Density (No./100 m^2)	WUA	Adjusted Density (No./100 m^2)
Buck	1	77 (43-112)	1.00	77 (43-112)
	2	22 (21-23)	.83	27 (25-28)
	3	18 (11-24)	.95	19 (12-25)
	$\bar{x}$	39 (4-216)		41 (5-195)
McQuarrie	1	180 (129-231)	.96	188 (134-241)

Table UB2. Comparison of rainbow fry densities (No./100 m^2) at 4 index sample sites, 1981 to 1986.

Stream	Site	1981	1982	1983	1984	1985	1986
Buck	1	13	17	26	17	79	77
	2	63	14	35	13	118	22
	3	9	18	61	13	185	18
	$\bar{x}$	28	16	41	14	127	39
McQuarrie	1	189	89	94	94	65	180

WATER SURVEY OF CANADA
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BUCK CREEK AT THE MOUTH

PRELIMINARY COMPUTATION SHEET

UNPUBLISHED DATA SUBJECT TO REVISION
Les données non publiées sont sujets a une revision

STATION NO. 08EE013

DAY	MAY 1986 GAUGE HT. METRES	MAY 1986 DISCHARGE M3/S	DAY	JUN 1986 GAUGE HT. METRES	JUN 1986 DISCHARGE M3/S	DAY	JUL 1986 GAUGE HT. METRES	JUL 1986 DISCHARGE M3/S	DAY	AUG 1986 GAUGE HT. METRES	AUG 1986 DISCHARGE M3/S
1	0.471	5.000	1	1.068	31.600	1	0.551	7.640	1	0.220	0.854
2	0.475	5.060	2	0.992	27.400	2	0.548	7.520	2	0.214	0.793
3	0.483	5.310	3	0.917	23.400	3	0.525	6.720	3	0.213	0.778
4	0.502	5.930	4	0.881	21.700	4	0.504	5.990	4	0.212	0.771
5	0.540	7.260	5	0.874	21.300	5	0.486	5.370	5	0.215	0.796
6	0.613	9.840	6	0.865	20.900	6	0.465	4.750	6	0.210	0.747
7	0.654	11.500	7	0.880	21.600	7	0.444	4.220	7	0.207	0.721
8	0.681	12.500	8	0.824	18.800	8	0.420	3.700	8	0.203	0.675
9	0.719	14.000	9	0.765	16.100	9	0.401	3.320	9	0.197	0.621
10	0.695	13.100	10	0.734	14.700	10	0.378	2.910	10	0.192	0.575
11	0.674	12.300	11	0.697	13.200	11	0.371	2.820	11	0.186	0.505
12	0.653	11.400	12	0.661	11.700	12	0.365	2.730	12	0.180	0.452
13	0.617	9.990	13	0.626	10.400	13	0.361	2.660	13	0.175	0.411
14	0.581	8.670	14	0.603	9.450	14	0.357	2.610	14	0.156	0.277
15	0.557	7.850	15	1.016	29.400	15	0.353	2.550	15	0.151	0.248
16	0.552	7.690	16	1.198	39.200	16	0.345	2.420	16	0.150	0.238
17	0.581	8.690	17	1.162	37.100	17	0.334	2.250	17	0.146	0.221
18	0.654	11.400	18	1.123	34.700	18	0.329	2.190	18	0.149	0.235
19	0.736	14.800	19	1.207	39.600	19	0.330	2.210	19	0.150	0.238
20	0.899	22.600	20	1.150	37.000	20	0.299	1.740	20	0.150	0.241
21	0.948	25.000	21	1.043	30.200	21	0.277	1.450	21	0.153	0.257
22	0.879	21.500	22	0.958	25.500	22	0.265	1.330	22	0.161	0.307
23	0.774	16.500	23	0.880	21.600	23	0.264	1.310	23	0.159	0.293
24	0.746	15.300	24	0.805	17.900	24	0.254	1.200	24	0.154	0.265
25	0.808	18.100	25	0.735	14.800	25	0.245	1.100	25	0.154	0.265
26	0.940	24.700	26	0.680	12.500	26	0.239	1.040	26	0.155	0.270
27	1.017	28.700	27	0.635	10.700	27	0.233	0.976	27	0.151	0.247
28	1.025	29.200	28	0.603	9.460	28	0.230	0.947	28	0.150	0.241
29	1.039	30.000	29	0.584	8.800	29	0.225	0.903	29	0.147	0.225
30	1.072	31.900	30	0.568	8.240	30	0.226	0.913	30	0.144	0.212
31	1.085	32.600	31	-1111.111	-1111.111	31	0.222	0.869	31	0.143	0.203
TOTAL =		478.390	TOTAL =		639.150	TOTAL =		88.358	TOTAL =		13.182
MEAN =		15.400	MEAN =		21.300	MEAN =		2.850	MEAN =		0.425
DAM3 =		41300.000	DAM3 =		55200.000	DAM3 =		7630.000	DAM3 =		1140.000

MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE	VALUE	UNITS	TIME	DAY
MAY 1986	1.088	METRES	1425	31
	32.700	M3/S	1425	31
	0.419	METRES	1415	1
	3.670	M3/S	1415	1
JUN 1986	1.224	METRES	1548	19
	40.800	M3/S	1548	19
	0.557	METRES	24	30
	7.860	M3/S	24	30
JUL 1986	0.557	METRES	0	1
	7.860	M3/S	0	1
	0.220	METRES	1644	31
	0.849	M3/S	1644	31
AUG 1986	0.226	METRES	2117	1
	0.906	M3/S	2117	1
	0.142	METRES	24	31
	0.199	M3/S	24	31

NOTE THAT -1111.111 = NOT APPLICABLE AND -9999.999 = MISSING DATA

WATER SURVEY OF CANADA
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BUCK CREEK AT THE MOUTH

STATION NO. 08EE013

UNPUBLISHED DATA SUBJECT TO REVISION
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PRELIMINARY COMPUTATION SHEET

SEP 1986			OCT 1986		
DAY	GAUGE HT. METRES	DISCHARGE M3/S	DAY	GAUGE HT. METRES	DISCHARGE M3/S
1	0.143	0.203	1	0.303	1.790
2	0.146	0.222	2	0.316	1.990
3	0.151	0.245	3	0.362	2.680
4	0.175	0.413	4	0.363	2.700
5	0.170	0.371	5	0.348	2.470
6	0.170	0.368	6	0.338	2.330
7	0.177	0.422	7	0.330	2.200
8	0.173	0.394	8	0.328	2.160
9	0.172	0.389	9	0.323	2.090
10	0.174	0.403	10	0.311	1.910
11	0.174	0.401	11	0.297	1.710
12	0.171	0.377	12	0.288	1.600
13	0.172	0.387	13	0.286	1.570
14	0.173	0.396	14	0.279	1.480
15	0.175	0.410	15	0.276	1.440
16	0.174	0.398	16	0.272	1.400
17	0.171	0.378	17	0.268	1.360
18	0.170	0.368	18	0.264	1.310
19	0.171	0.379	19	0.262	1.290
20	0.165	0.334	20	0.259	1.260
21	0.163	0.321	21	0.259	1.260
22	0.167	0.352	22	-9999.999	-9999.999
23	0.195	0.606	23	-9999.999	-9999.999
24	0.228	0.931	24	-9999.999	-9999.999
25	0.277	1.460	25	-9999.999	-9999.999
26	0.276	1.440	26	-9999.999	-9999.999
27	0.262	1.290	27	-9999.999	-9999.999
28	0.254	1.200	28	-9999.999	-9999.999
29	0.261	1.260	29	-9999.999	-9999.999
30	0.280	1.490	30	-9999.999	-9999.999
31	-1111.111	-1111.111	31	-9999.999	-9999.999
TOTAL =		17.628	TOTAL =		-9999.999
MEAN =		0.588	MEAN =		-9999.999
DAM3 =		1520.000	DAM3 =		-9999.999

MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE			MAX. AND MIN. INST. GAUGE HT. AND DISCHARGE		
VALUE	UNITS	TIME DAY	VALUE	UNITS	TIME DAY
0.304	METRES	2037 30	0.404	METRES	1051 3
1.800	M3/S	2037 30	3.380	M3/S	1051 3
0.141	METRES	437 1	0.257	METRES	0 0 22
0.196	M3/S	437 1	1.240	M3/S	0 0 22

UNPUBLISHED DATA SUBJECT TO REVISION
Les données non publiées sout sujets a une revision

$Q = .27\ m^3/s$ when sampled.

we get $\approx .193\ m^3/sec$

UNPUBLISHED DATA SUBJECT TO REVISION
Les données non publiées sout sujets a une revision

NOTE THAT -1111.111 = NOT APPLICABLE AND -9999.999 = MISSING DATA

WATER SURVEY OF CANADA
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BULKLEY RIVER NEAR HOUSTON (MANUAL GAUGE STATION NO. 08EE003

(PRELIMINARY) DAILY DISCHARGE IN CUBIC METRES PER SECOND FOR 1986

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DAY
1				4.40 B	16.1	110 E	25.6	2.27	0.368				1
2				4.41 B	17.8	105	23.6	2.24	0.370				2
3				4.70 B	18.2	88.1	21.2	2.21 E	0.368				3
4				4.85 B	20.0 E	77.7	19.8	2.18	0.398				4
5				5.00 B	21.8	71.1	18.5	1.90	0.525				5
6	UNPUBLISHED DATA SUBJECT TO REVISION			5.20 B	26.0	67.3	16.4 E	1.66	0.545				6
7	Les données non publiées			5.40 B	30.7	68.6	14.2	1.69	0.544 E				7
8	sont sujets a une revision			6.00 B	32.3	58.4	12.7	1.50	0.543				8
9				7.20 B	34.0	50.9	11.6	1.41	0.567				9
10				6.60 B	32.2	44.0	10.4	1.26 E	0.578				10
11				6.00 B	32.4 E	39.3	10.3	1.10	0.578				11
12				5.50 B	32.5	35.3	10.2	1.00	0.548				12
13				5.35 B	29.2	19.1 E	9.29 E	0.847	0.518				13
14				5.35 B	28.8	28.3	8.33	0.836	0.513 E				14
15				5.56	26.6	85.7	7.76	0.803	0.508				15
16				6.58	27.6	115	7.25	0.792	0.543				16
17				7.86	28.9	35.1	7.04	0.809 E	0.548				17
18				10.2	35.2	29.6	6.55	0.825	0.556				18
19				12.2	41.6	32.0	5.89	0.748	0.548				19
20			3.56 B	17.3 E	23.4	103	5.23	0.649	0.528				20
21				22.4	58.3	96.0	4.53	0.627	0.567				21
22				20.2	68.0	69.2	4.38	0.649	0.743				22
23	1.04 B			18.0	58.6	30.4	4.19	0.583	0.820				23
24				17.3	56.9	56.6	3.81	0.572 E	1.09				24
25		0.595 B		16.9	69.3	45.8	3.54	0.561	2.59				25
26				15.5	88.5	40.0	3.26 E	0.545	2.71				26
27				16.3 E	102	30.4	3.01	0.515	2.59				27
28				17.1	109	26.8	2.77	0.455	2.50 E				28
29				17.2	109	30.5	2.59	0.395	2.42				29
30				17.2	116	24.7	2.56	0.360	2.87				30
31					115		2.53	0.364 E					31
TOTAL				313.76	1505.9	1713.9	289.01	32.355	29.094				TOTAL
MEAN				10.5	48.6	57.1	9.32	1.04	0.970				MEAN
DAM3				27100	130000	148000	25000	2800	2510				DAM3
MAX				22.4	116	115	25.6	2.27	2.87				MAX
MIN				4.40	16.1	19.1	2.53	0.360	0.368				MIN

UNPUBLISHED DATA SUBJECT TO REVISION
Les données non publiées sont sujets a une revision

B-ICE CONDITIONS
E-ESTIMATED

*** WARNING FROM THE UBC PLOT SUBROUTINE PACKAGE ***

POPULATION ESTIMATE RESULTS

STREAM NAME: MCQUARRIE SITE: 1 SAMPLE DATE: 860822

SITE DIMENSIONS: AREA (SQ.M) 47.2 METHOD: E ENCLOSURE: P
LENGTH (M) 13.3

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
LNC	W	99	74	85	80.0	4.5	5.94	3	2	.75	4.0	23.8	0.08	0.50	0.30
RB	W	00	31	57	42.1	5.2	0.86	47	21		85.0	72.8	1.80	1.54	6.39
RB	W	01	73	100	83.7	8.5	6.65	16	9	.75	21.3	141.9	0.45	3.01	1.60
RB	W	02	109	116	113.8	2.6	16.24	5	3	.75	6.7	108.2	0.14	2.29	0.50

WUA = 0.96 for fry

95% confidence limits (fry)

$\hat{N}$ = 85.0 (60.9 - 109.0)

POPULATION ESTIMATE RESULTS

STREAM NAME: BUCK SITE: 1 SAMPLE DATE: 860825

SITE DIMENSIONS: AREA (SQ.M) 77.7 METHOD: E ENCLOSURE: P
LENGTH (M) 13.4

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
CH	W	00	69	73	70.7	1.7	3.89	3	2	.75	4.0	15.6	0.05	0.20	0.30
LNC	W	99	54	91	78.3	11.1	5.83	6	2		9.0	52.4	0.12	0.67	0.67
RB	W	00	29	56	43.3	5.9	0.94	30	15		60.0	56.5	0.77	0.73	4.48
RB	W	01	72	98	82.5	7.3	6.32	12	6		24.0	151.7	0.31	1.95	1.79
RB	W	03	149	149	149.0	0.0	36.39	1	0		1.0	36.4	0.01	0.47	0.07

Powerline site

WUA = 1.00 for fry

95% confidence limits (fry)

$\hat{N}$ = 60.0 (33.2 - 86.8)

POPULATION ESTIMATE RESULTS

STREAM NAME: BUCK SITE: 2 SAMPLE DATE: 860825

SITE DIMENSIONS: AREA (SQ.M) 64.6 METHOD: E ENCLOSURE: P
LENGTH (M) 9.5

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
LNC	W	99	40	105	72.0	17.3	5.02	26	8		37.6	188.5	0.58	2.92	3.95
RB	W	00	39	58	45.9	5.2	1.11	13	1		14.1	15.6	0.22	0.24	1.48
RB	W	01	78	103	85.3	7.6	7.00	10	3		14.3	99.9	0.22	1.55	1.50
SU	W	99	95	109	103.0	5.9	22.07	3	0		3.0	66.2	0.05	1.02	0.32

First Bridge on Buck Flat Rd.
WUA = 0.83 for fry
95% confidence limits (fry)
$\hat{N}$ = 14.1 (13.4 - 14.8)

POPULATION ESTIMATE RESULTS

STREAM NAME: BUCK SITE: 3 SAMPLE DATE: 860825

SITE DIMENSIONS: AREA (SQ.M) 30.4 METHOD: E ENCLOSURE: P
LENGTH (M) 7.6

SPECIES	ORIGIN	AGE	FORK LENGTH (MM) MIN	MAX	MEAN	S.DEV.	MEAN WT.(G)	FISH CAPTURES C1	C2	P	ESTIMATED NUMBER	TOTAL BIOMASS	CALCULATED DENSITY VALUES NUMBER/M^2	BIOMASS/M^2	NUMBER/M
LNC	W	99	22	108	73.1	17.2	5.19	23	7		33.1	171.7	1.09	5.65	4.35
RB	W	00	33	36	34.6	1.2	0.46	4	1		5.3	2.4	0.18	0.08	0.70
RB	W	01	74	90	81.2	5.6	5.98	10	4		16.7	99.6	0.55	3.28	2.19
RB	W	02	101	109	105.0	3.3	12.77	2	1		4.0	51.1	0.13	1.68	0.53
RB	W	03	148	148	148.0	0.0	35.66	1	1	.75	1.3	47.5	0.04	1.56	0.18

Second Bridge on Buck Flat Rd.
WUA = 0.95 for fry
95% confidence limits (fry)
$\hat{N}$ = 5.3 (3.3 - 7.3)