Stream Flow Monitoring in the Englishman River Watershed, 2003

as part of the

Englishman River Watershed Recovery Plan

Prepared for

Pacific Salmon Foundation
Vancouver, B.C.

By

H.M. Wright
BC Conservation Foundation
Nanaimo, B.C.

GREATER GEORGIA BASIN
STEELHEAD Recovery Plan
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ACKNOWLEDGEMENTS

James Craig and Brad Smith[1] provided key support preparing the proposal and completing fieldwork. Leonard Fong, Luke Downs and Carol Cornish[2] assisted with stream flow measurements. Melissa Andrews[3] provided technical support. Craig Wightman[4] supported the study.

[1] Fisheries Technicians, BC Conservation Foundation, Nanaimo, B.C.
[2] Parksville Streamkeepers, Parksville, B.C.
[3] Technician, Water Survey of Canada, Nanaimo, B.C.
[4] Senior Fisheries Biologist, Ministry of Water, Land and Air Protection, Nanaimo, B.C.

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1.0 Introduction

The Englishman River Watershed Recovery Plan, developed for and primarily funded by the Pacific Salmon Endowment Fund Society (PSEFS), is an initiative aimed at rebuilding wild salmon and steelhead stocks in the Englishman River. The Englishman River was selected for recovery by regional biologists from Department of Fisheries and Oceans (DFO) and Ministry of Water, Land and Air Protection (MWLAP) because it is a suitable size for habitat restoration activities and has a wide range of mostly wild anadromous fish species (Bocking and Gaboury 2001).

Following initial development of the Plan, Lough and Morley conducted a study to identify limiting factors to salmonid production and "identify opportunities to alleviate these constraints to fish production". Their study found "reduced summer rearing habitat caused by low summer flows" to be a major limiting factor. Additionally, a channel assessment identified potential for loss of surface flow through groundwater seepage, compounding the effects of low flows (nhc 2002).

In 2002, the BC Conservation Foundation (BCCF) completed an extensive stream flow and water quality monitoring project. Results included four recommendations:

1. re-assess mainstem discharge to confirm if potential loss of flow resulting from groundwater seepage is significant (2002 results were inconclusive);
2. determine the cause of water losses in Morison Creek;
3. maintain summer flow near 20% of mean annual discharge (2.76 m^3/s), with a short term minimum base flow no lower than 10% (1.38 m^3/s); and
4. initiate stream enrichment in the mainstem to increase primary productivity (Wright 2003).

This monitoring study addresses the first two recommendations listed above. Loss of flow resulting from groundwater seepage was re-assessed in 2003 with a series of discharge transects. Using a semi-permanent hydrometric station, a second year of flow data was collected in Morison Creek to confirm if unusual water losses observed in 2002 were atypical.

2.0 Study Area

The Englishman River enters the Strait of Georgia on the central east coast of Vancouver Island near the city of Parksville (Figure 1). It supplies water to residents of Parksville and the Parksville East Water District. The watershed originates on Mount Arrowsmith and has a total area of approximately 325 km^2 (Bocking and Gaboury 2001). Mean annual discharge (MAD), based on 23 years of Water Survey of Canada (WSC) data from 1915 to 2000, is 13.8 m^3/s.

A dam on the outlet of Arrowsmith Lake, in the headwaters of the Englishman River, has been augmenting low summer flows for fisheries and domestic purposes since 1999. The reservoir has a live storage volume of 9,000,000 m^3 of water. Approximately 50% of the storage is allocated for fisheries purposes (Regional District of Nanaimo website). The current water license requires that 1.6 m^3/s, (11.6% MAD), be maintained in the lower river (Provisional Operation Rule), as measured at the WSC gauge at the Highway 19A bridge in Parksville.

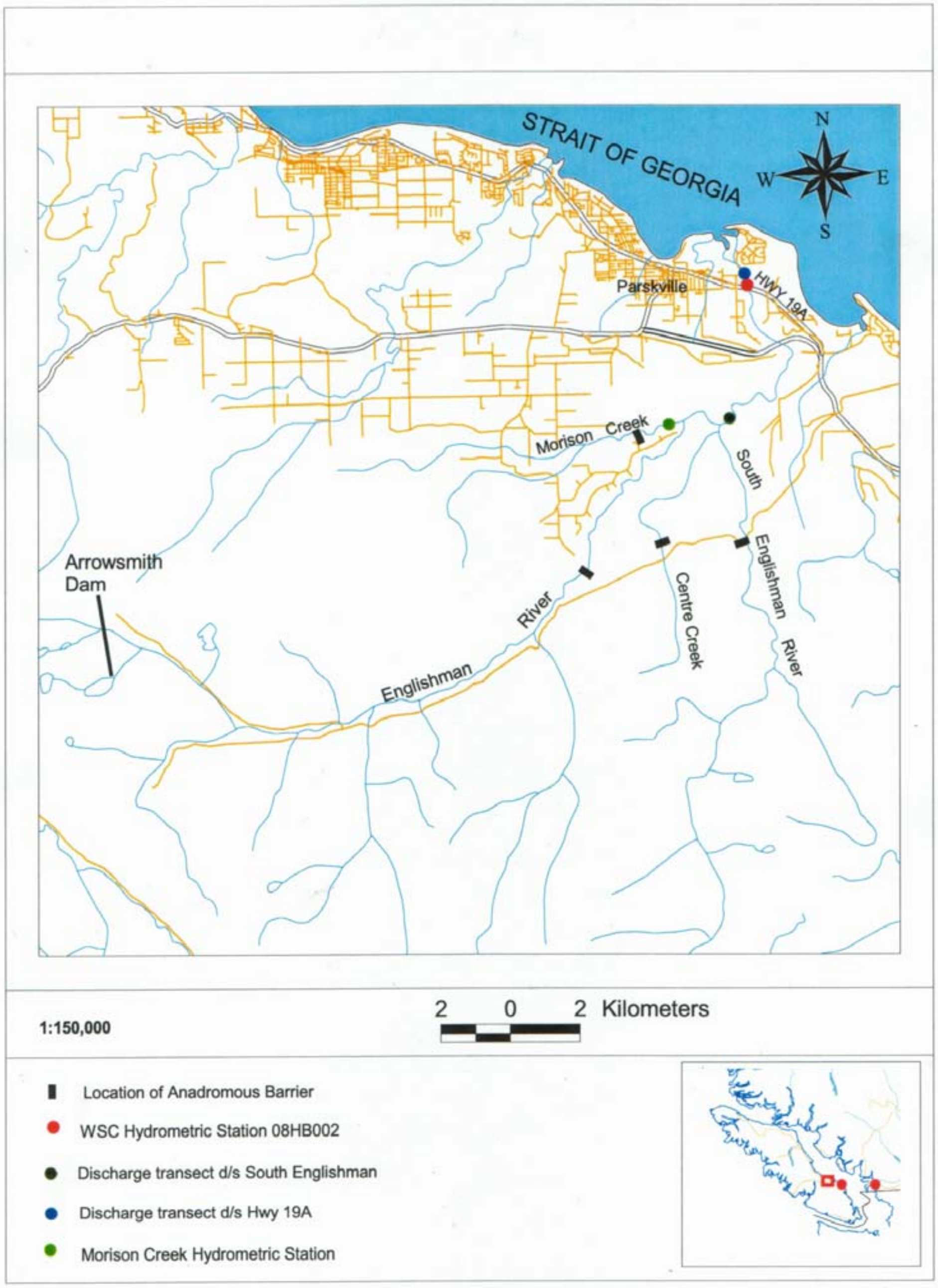

Figure 1. Englishman River watershed with stream flow measurement locations.

3.0 Methods

3.1 Mainstem

Discharge was measured in the Englishman River mainstem at a glide adjacent to the claybank 700 m downstream of the South Englishman River confuence, and at a glide 500 m downstream of the Highway 19A bridge (Figure 1). Sites were thus located located upstream and downstream of reach E3 (Lough and Morely 2002) where loss of flow stemming from groundwater seepage is suspected. Though the upstream site excludes flow diverted into the TimberWest side-channel[5] that enters the bottom of reach E3, locating the site downstream of the South Englishman confluence was seen to be more important.

Site selection and metering methodology was consistent with Resources Information Committee standards. Depth and velocity measurements were taken at a minimum of 20 stations equally spaced across the wetted width. Discharge was calculated by entering transect data into a standardized depth/velocity spreadsheet (Appendix A). Flows were measured at both sites every two weeks between mid-July and the end of September. On each day, the two sites were measured in succession to avoid significant time lapse.

3.2 Morison Creek

For continuous monitoring, a semi-permanent pressure transducer device was installed on Morison Creek approximately 200 m upstream of its mouth. Equipment was purchased from Edutech Technologies Corp. (Gibson's, B.C.) for the 2002 study. The instruments recorded hourly stage measurements while discharge at the site was manually measured bi-weekly to develop a rating curve (Appendix B). A staff gauge referenced to a benchmark was set to allow for correction and confirm the pressure transducer did not shift during the study period.

4.0 Results

4.1 Mainstem

Flow metering results indicate that discharge downstream of the Hwy 19A bridge was typically higher than downstream of the South Englishman confluence. On four of six dates, discharge was greater at the lower site by approximately 0.1 m^3/s. On July 14, the metered discharge was 0.4 m^3/s greater at the upper site, though rain showers through the day account for some of this change. On August 11, during a stable hydrograph, discharge was 0.03 m^3/s higher at the upper site, a difference of less than 2.5%.

[5] Flow in the side-channel is consistently in the range of 0.1 m^3/s during the summer.

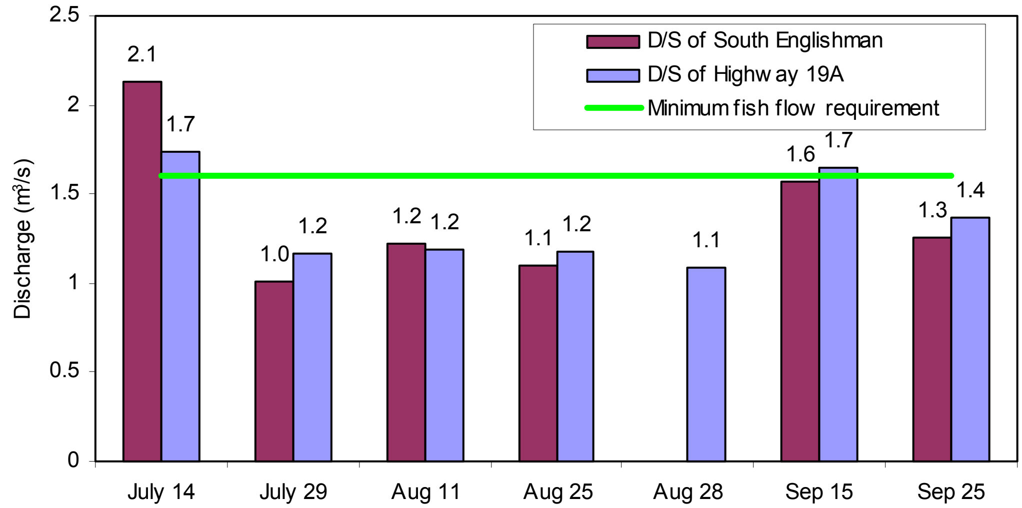

Figure 2. Comparison of Englishman River discharge values at locations above and below reaches suspected of groundwater loss, July 14 to September 25, 2003.

Results also suggest that minimum fish flow required under the current Provisional Operation Rule was not maintained (Figure 2). On August 28, test measurements were conducted with WSC staff to confirm metering results. Flows measured by WSC and BCCF personnel were 1.10 m^3/s and 1.093 m^3/s, respectively, confirming that flows were well below the required minimum of 1.6 m^3/s.

4.2 Morison Creek

Mean daily discharge derived from Morison Creek flow station data is displayed in Figure 3. Following installation on June 4, discharge decreased rapidly from 38 L/s to 15 L/s on June 10. After mid-June, flow decreased steadily until September 4, when the season's lowest measurement of 6.6 L/s was recorded.

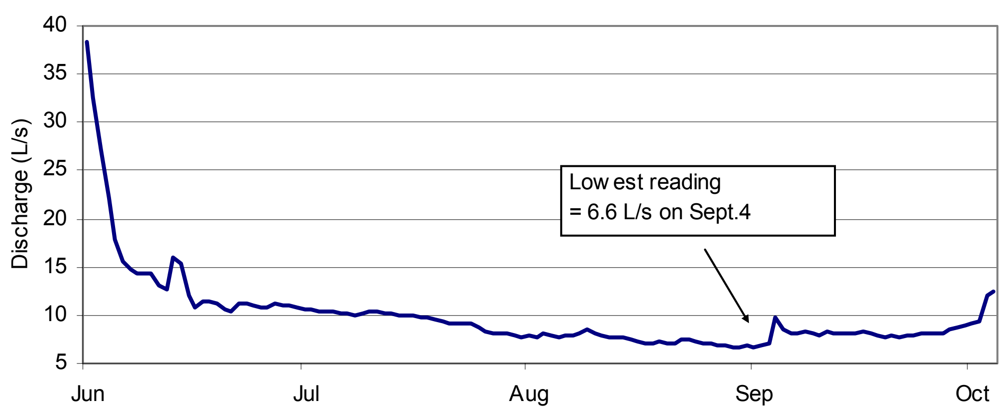

Figure 3. Mean daily discharge in Morison Creek, June 4 to October 2, 2003.

5.0 DISCUSSION/RECOMMENDATIONS

5.1 Mainstem

Loss of discharge through groundwater seepage in the lower Englishman was confirmed to be insignificant. As would be expected, discharge was typically higher at the lower transect site than it was downstream of the South Englishman confluence (Figure 2). The July 14th data point suggests otherwise (0.4 m^3/s loss of flow), but rain caused flow to increase throughout the day,[6] and the upper transect was completed approximately 1.5 hours later that the lower transect.

The upper transect site, downstream of the South Englishman, excludes water that is diverted into the TimberWest side-channel. Flow in the side-channel re-enters the mainstem upstream of the lower transect site. This diversion likely accounts for most if not all of the 0.1 m^3/s higher flow typically measured below Highway 19A.

Five of seven transects completed below the Highway 19A bridge indicate discharge values well below the 1.6 m^3/s minimum required under the current operation rule (Figure 2). Riffle hydraulic suitability and wetted width analysis in 2002 indicated significant habitat loss occurs when flows drop below 10% MAD, or 1.4 m^3/s (Wright 2003).

Releases from Arrowsmith Dam are managed by the City of Parksville to achieve 1.6 m^3/s or greater, based on discharge data emailed daily by WSC. Discharge data is preliminary and calculated using the most recent approved stage/discharge curve, which, in this case, was finalized in February 2003 (R. Gregory, WSC, pers. comm.).

The discrepancy between calculated and measured flows suggests that channel conveyance at the WSC station changed significantly by the summer of 2003. This is an inherent complication with hydrometric stations, as real-time stage data must be translated to discharge using curves that quickly become outdated due to channel dynamics. Operationally, WSC is not currently resourced to modify staff/discharge relationships continuously, despite the fact that changes are regularly monitored and noted, and that their mandate is to determine flows within +/- 5% (R. Gregory, WSC, pers. comm.).

WSC has suggested that an alternative to the present system that would alleviate some of the potential error from year to year. If necessary and adequately funded, preliminary shifts in the Englishman rating curve could be provided to Arrowsmith Water Service (City of Parksville) following each field measurement. The shift could be uploaded to the WSC database immediately and applied to obtain a preliminary corrected flow for Arrowsmith Water Service to better manage water releases from Arrowsmith Dam.

5.2 Morison Creek

Results from the Morison Creek hydrometric station show a steady hydrograph in 2003 (Figure 3). There were no sudden water withdrawals in the headwaters to cause drastic

[6] WSC data from the Englishman River hydrometric station indicate that flow steadily increased by 58% over the day.

loss of water. In 2002, there was a significant drop from 17 L/s to 4 L/s on August 4, likely due to agricultural withdrawals, though this was not confirmed. Low water in summer 2002 was exacerbated by an extremely dry fall, causing discharge to drop to 2 L/s in late October.

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Personal Communication

Andrews, M. Environmental Monitoring Technician, Nanaimo Sub Office, Environment Canada, Nanaimo, BC.

Gregory, R. Head, Nanaimo Sub Office, Environment Canada, Nanaimo, B.C.
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Appendix A

Depth/velocity spreadsheets used to derive discharge.

DEPTH/VELOCITY TRANSECT DATA ANALYSIS SPREADSHEET
(CALCULATES W.U.A. & DISCHARGE)

STREAM:	Englishman River
DATE:	14-Jul-03
TIME:	13:15
SAMPLE TYPE:	discharge
SITE NAME:	d/s Hwy 19A

MAIN/SIDE CHANNEL:	m
METERED/EST.:	m
MEAN/SURFACE:	m
TRANSECT WIDTH:	32.7 m
METER TYPE:	swoffer
SENSOR DEPTH (from bottom):	40 %
METERED DISCHARGE:	1.7421 m^3s^{-1}

HYDRAULIC TYPE:	glide
WIDTH : DEPTH RATIO :	100.41
TRANSECT TYPE:	total
STREAM WIDTH:	32.7 m
NO. OF STATIONS:	25

SITE WEIGHTED MEANS

MEAN DEPTH:	0.326 m
MEAN VELOCITY:	0.164 ms^{-1}
CROSS-SECT. AREA:	10.649 m^2

ADJUSTED USABLE AREAS

% USABLE BY RBT FRY	63 %
% USABLE BY RBT PARR	65 %
% USABLE BY CT FRY	72 %
% USABLE BY CT PARR	87 %
% USABLE BY CHINOOK	72 %
% USABLE BY COHO	73 %

DEPTH/ VELOCITY DATA FOR WEIGHTED USABLE AREA (WUA) CALCULATIONS

Transect Data																					
station length (m)	depth (m)	velocity (m/s)	substrate	cell width (m)	cell mean depth (m)	cell mean velocity (m/s)	cell prob. RBT	usable width Fry (m)	cell prob. RBT Parr	usable width RBT Parr	cell prob. CT fry	usable width CT fry	cell prob CT parr	usable width CT parr	cell prob. CH	usable width CH (m)	cell prob. CO	usable width CO (m)	cell area (sq. m)	cell discharge (cu. m/sec)
1.00	0.28	0.00		0.75	0.23	0	0.2	0.2	0.00	0	0.98	0.735	0.98	0.7	0.00	0.00	0.98	0.74	0.1725	0
2.50	0.64	0.00		1.5	0.64	0	0.022	0.033	0.00	0	0.15	0.225	1.00	1.5	0.00	0.00	1.00	1.50	0.96	0
4.00	0.53	0.16		1.5	0.53	0.16	0.22	0.33	0.78	1.17	0.29	0.435	1.00	1.5	0.84	1.26	0.88	1.32	0.795	0.1272
5.50	0.40	0.230		1.5	0.4	0.23	0.478	0.718	0.96	1.44	0.594	0.891	1.00	1.5	0.97	1.46	0.60	0.90	0.6	0.138
7.00	0.38	0.19		1.5	0.38	0.19	0.58	0.87	0.87	1.305	0.66	0.99	1.00	1.5	0.92	1.38	0.76	1.14	0.57	0.1083
8.50	0.44	0.19		1.5	0.44	0.19	0.4	0.6	0.87	1.305	0.5	0.75	1.00	1.5	0.92	1.38	0.76	1.14	0.66	0.1254
10.00	0.50	0.16		1.5	0.5	0.16	0.27	0.405	0.78	1.17	0.4	0.6	1.00	1.5	0.84	1.26	0.88	1.32	0.75	0.12
11.50	0.47	0.17		1.5	0.47	0.17	0.34	0.51	0.81	1.215	0.4	0.6	1.00	1.5	0.87	1.31	0.84	1.26	0.705	0.11985
13.00	0.52	0.21		1.5	0.52	0.21	0.223	0.335	0.92	1.38	0.261	0.3915	1.00	1.5	0.95	1.43	0.68	1.02	0.78	0.1638
14.50	0.46	0.20		1.5	0.46	0.2	0.36	0.54	0.90	1.35	0.4	0.6	1.00	1.5	0.94	1.41	0.72	1.08	0.69	0.138
16.00	0.36	0.18		1.5	0.36	0.18	0.65	0.975	0.84	1.26	0.66	0.99	1.00	1.5	0.89	1.34	0.80	1.20	0.54	0.0972
17.50	0.30	0.14		1.5	0.3	0.14	0.85	1.275	0.70	1.044	0.98	1.47	1.00	1.5	0.78	1.17	0.94	1.41	0.45	0.063
19.00	0.22	0.19		1.5	0.22	0.19	1	1.5	0.70	1.057	0.98	1.47	0.98	1.5	0.92	1.38	0.74	1.11	0.33	0.0627
20.50	0.20	0.22		1.5	0.2	0.22	0.94	1.41	0.71	1.058	0.882	1.323	0.85	1.3	0.92	1.38	0.60	0.90	0.3	0.066
22.00	0.25	0.24		1.5	0.25	0.24	0.89	1.335	0.89	1.338	0.882	1.323	1.00	1.5	0.98	1.47	0.56	0.84	0.375	0.09
23.50	0.30	0.18		1.5	0.3	0.18	0.85	1.275	0.82	1.235	0.98	1.47	1.00	1.5	0.89	1.34	0.80	1.20	0.45	0.081
25.00	0.31	0.19		1.5	0.31	0.19	0.82	1.23	0.85	1.279	0.85	1.275	1.00	1.5	0.92	1.38	0.76	1.14	0.465	0.08835
26.50	0.22	0.20		1.5	0.22	0.2	1	1.5	0.73	1.094	0.98	1.47	0.98	1.5	0.94	1.41	0.70	1.05	0.33	0.066
28.00	0.19	0.19		1.5	0.19	0.19	1	1.5	0.62	0.927	0.98	1.47	0.85	1.3	0.84	1.26	0.70	1.05	0.285	0.05415
29.50	0.12	0.08		1	0.12	0.08	1	1	0.19	0.189	1	1	0.36	0.4	0.22	0.22	0.70	0.70	0.12	0.0096
30.00	0.08	0.12		0.75	0.08	0.12	1	0.75	0.16	0.118	1	0.75	0.22	0.2	0.16	0.12	0.51	0.38	0.06	0.0072
31.00	0.10	0.10		1	0.1	0.1	1	1	0.18	0.182	1	1	0.27	0.3	0.19	0.19	0.61	0.61	0.1	0.01
32.00	0.09	0.07		1	0.09	0.07	1	1	0.12	0.116	1	1	0.27	0.3	0.12	0.12	0.56	0.56	0.09	0.0063
33.00	0.07	0.00		0.85	0.07	0	0.2	0.17	0.00	0	1	0.85	0.22	0.2	0.00	0.00	0.45	0.38	0.0595	0
33.70	0.00	0.00		0.35	0.035	0	0.12	0.042	0.00	0	1	0.35	0.03	0	0.00	0.00	0.20	0.07	0.0123	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
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				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0

This spread sheet is brought to you by Poul Bech, Ron Ptolemy, and Rob Knight, B.C. Environment, Fisheries Section, May 1994.
(Modified by Harlan Wright, British Columbia Conservation Foundation, July 2002).

DEPTH/VELOCITY TRANSECT DATA ANALYSIS SPREADSHEET
(CALCULATES W.U.A. & DISCHARGE)

STREAM:	Englishman River
DATE:	14-Jul-03
TIME:	15:00
SAMPLE TYPE:	Discharge Transect
SITE NAME:	d/s South Englishman

MAIN/SIDE CHANNEL:	m
METERED/EST.:	m
MEAN/SURFACE:	m
TRANSECT WIDTH:	22.5 m
METER TYPE:	swoffer
SENSOR DEPTH (from bottom):	40 %
METERED DISCHARGE:	2.1254 m^3s^{-1}

HYDRAULIC TYPE:	glide
WIDTH : DEPTH RATIO :	57.43
TRANSECT TYPE:	full
STREAM WIDTH:	22.5 m
NO. OF STATIONS:	24

SITE WEIGHTED MEANS

MEAN DEPTH:	0.392 m
MEAN VELOCITY:	0.241 ms^{-1}
CROSS-SECT. AREA:	8.816 m^2

ADJUSTED USABLE AREAS

% USABLE BY RBT FRY	41 %
% USABLE BY RBT PARR	71 %
% USABLE BY CT FRY	49 %
% USABLE BY CT PARR	87 %
% USABLE BY CHINOOK	72 %
% USABLE BY COHO	57 %

DEPTH/ VELOCITY DATA FOR WEIGHTED USABLE AREA (WUA) CALCULATIONS

Transect Data																						
station length (m)	depth (m)	velocity (m/s)	substrate	cell width (m)	cell mean depth (m)	cell mean velocity (m/s)	cell prob. RBT	usable width Fry (m)	cell prob. RBT Parr	usable width RBT Parr	cell prob. CT fry	usable width CT fry	cell prob CT parr	usable width CT parr	cell prob. CH	usable width CH (m)	cell prob. CO	usable width CO (m)	cell area (sq. m)	cell discharge (cu. m/sec)
23.10	0.00	0.00		0.55	0.025	0.035	0.32	0.2	0.00	0	1	0.55	0.03	0	0.01	0.01	0.12	0.07	0.0138	0.000481
22.00	0.10	0.07		1.05	0.1	0.07	1	1.05	0.13	0.139	1	1.05	0.27	0.3	0.14	0.14	0.61	0.64	0.105	0.00735
21.00	0.17	0.05		1	0.17	0.05	0.9	0.9	0.19	0.189	1	1	0.71	0.7	0.27	0.27	0.87	0.87	0.17	0.0085
20.00	0.25	0.03		1	0.25	0.03	0.8	0.8	0.16	0.164	0.98	0.98	1.00	1	0.22	0.22	1.00	1.00	0.25	0.0075
19.00	0.35	0.05		1	0.35	0.05	0.612	0.612	0.30	0.3	0.85	0.85	1.00	1	0.35	0.35	1.00	1.00	0.35	0.0175
18.00	0.36	0.10		1	0.36	0.1	0.65	0.65	0.55	0.55	0.66	0.66	1.00	1	0.63	0.63	1.00	1.00	0.36	0.036
17.00	0.40	0.09		1	0.4	0.09	0.52	0.52	0.50	0.5	0.66	0.66	1.00	1	0.57	0.57	1.00	1.00	0.4	0.036
16.00	0.48	0.25		1	0.48	0.25	0.267	0.267	1.00	1	0.3	0.3	1.00	1	0.99	0.99	0.52	0.52	0.48	0.12
15.00	0.55	0.27		1	0.55	0.27	0.142	0.142	1.00	1	0.16	0.1595	1.00	1	1.00	1.00	0.44	0.44	0.55	0.1485
14.00	0.50	0.24		1	0.5	0.24	0.24	0.24	0.98	0.98	0.36	0.36	1.00	1	0.98	0.98	0.56	0.56	0.5	0.12
13.00	0.53	0.26		1	0.53	0.26	0.18	0.18	1.00	1	0.218	0.2175	1.00	1	1.00	1.00	0.48	0.48	0.53	0.1378
12.00	0.55	0.25		1	0.55	0.25	0.155	0.155	1.00	1	0.218	0.2175	1.00	1	0.99	0.99	0.52	0.52	0.55	0.1375
11.00	0.53	0.30		1	0.53	0.3	0.15	0.15	1.00	1	0.102	0.1015	0.99	1	1.00	1.00	0.33	0.33	0.53	0.159
10.00	0.45	0.34		1	0.45	0.34	0.209	0.209	1.00	1	0.09	0.09	0.95	1	0.99	0.99	0.20	0.20	0.45	0.153
9.00	0.44	0.25		1	0.44	0.25	0.344	0.344	1.00	1	0.375	0.375	1.00	1	0.99	0.99	0.52	0.52	0.44	0.11
8.00	0.53	0.20		1	0.53	0.2	0.22	0.22	0.90	0.9	0.29	0.29	1.00	1	0.94	0.94	0.72	0.72	0.53	0.106
7.00	0.60	0.36		1	0.6	0.36	0.064	0.064	1.00	1	0.027	0.0273	0.92	0.9	0.97	0.97	0.14	0.14	0.6	0.216
6.00	0.58	0.39		1	0.58	0.39	0.057	0.057	1.00	1	0.013	0.0126	0.80	0.8	0.94	0.94	0.08	0.08	0.58	0.2262
5.00	0.42	0.48		1	0.42	0.48	0.083	0.083	1.00	1	0.005	0.005	0.40	0.4	0.80	0.80	0.00	0.00	0.42	0.2016
4.00	0.33	0.30		1	0.33	0.3	0.51	0.51	0.99	0.99	0.298	0.2975	0.99	1	1.00	1.00	0.33	0.33	0.33	0.099
3.00	0.30	0.21		1	0.3	0.21	0.825	0.825	0.90	0.902	0.882	0.882	1.00	1	0.95	0.95	0.68	0.68	0.3	0.063
2.00	0.23	0.07		0.9	0.23	0.07	1	0.9	0.34	0.306	0.98	0.882	0.98	0.9	0.46	0.41	0.98	0.88	0.207	0.01449
1.20	0.20	0.00		0.7	0.2	0	0.2	0.14	0.00	0	0.98	0.686	0.85	0.6	0.00	0.00	0.94	0.66	0.14	0
0.60	0.00	0.00		0.3	0.1	0	0.2	0.06	0.00	0	1	0.3	0.27	0.1	0.00	0.00	0.61	0.18	0.03	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0

This spread sheet is brought to you by Poul Bech, Ron Ptolemy, and Rob Knight, B.C. Environment, Fisheries Section, May 1994.
(Modified by Harlan Wright, British Columbia Conservation Foundation, July 2002).

DEPTH/VELOCITY TRANSECT DATA ANALYSIS SPREADSHEET
(CALCULATES W.U.A. & DISCHARGE)

STREAM:	Englishman River
DATE:	11-Aug-03
TIME:	13:30
SAMPLE TYPE:	discharge
SITE NAME:	d/s Hwy 19A

MAIN/SIDE CHANNEL:	m
METERED/EST.:	m
MEAN/SURFACE:	m
TRANSECT WIDTH:	32.1 m
METER TYPE:	swoffer
SENSOR DEPTH (from bottom):	40 %
METERED DISCHARGE:	1.1896 m^3s^{-1}

HYDRAULIC TYPE:	glide
WIDTH : DEPTH RATIO :	111.01
TRANSECT TYPE:	
STREAM WIDTH:	32.1 m
NO. OF STATIONS:	24

SITE WEIGHTED MEANS

MEAN DEPTH:	0.289 m
MEAN VELOCITY:	0.128 ms^{-1}
CROSS-SECT. AREA:	9.283 m^2

ADJUSTED USABLE AREAS

% USABLE BY RBT FRY	66 %
% USABLE BY RBT PARR	53 %
% USABLE BY CT FRY	82 %
% USABLE BY CT PARR	87 %
% USABLE BY CHINOOK	63 %
% USABLE BY COHO	85 %

DEPTH/ VELOCITY DATA FOR WEIGHTED USABLE AREA (WUA) CALCULATIONS

Transect Data																				
station length (m)	depth (m)	velocity (m/s)	substrate	cell width (m)	cell mean depth (m)	cell mean velocity (m/s)	cell prob. RBT	usable width Fry (m)	cell prob. RBT Parr	usable width RBT Parr	cell prob. CT fry	usable width CT fry	cell prob CT parr	usable width CT parr	cell prob. CH	usable width CH (m)	cell prob. CO	usable width CO (m)	cell area (sq. m)	cell discharge (cu. m/sec)
0.90	0.30	0.00		0.55	0.2	0	0.2	0.1	0.00	0	0.98	0.539	0.85	0.5	0.00	0.00	0.94	0.52	0.11	0
2.00	0.50	0.00		1.05	0.5	0	0.054	0.057	0.00	0	0.4	0.42	1.00	1.1	0.00	0.00	1.00	1.05	0.525	0
3.00	0.53	0.09		1.25	0.53	0.09	0.22	0.275	0.50	0.625	0.29	0.3625	1.00	1.3	0.57	0.71	1.00	1.25	0.6625	0.059625
4.50	0.44	0.160		1.5	0.44	0.16	0.4	0.6	0.78	1.17	0.5	0.75	1.00	1.5	0.84	1.26	0.88	1.32	0.66	0.1056
6.00	0.33	0.14		1.5	0.33	0.14	0.75	1.125	0.70	1.054	0.85	1.275	1.00	1.5	0.78	1.17	0.94	1.41	0.495	0.0693
7.50	0.34	0.14		1.5	0.34	0.14	0.71	1.065	0.71	1.065	0.85	1.275	1.00	1.5	0.78	1.17	0.94	1.41	0.51	0.0714
9.00	0.35	0.18		1.5	0.35	0.18	0.68	1.02	0.84	1.26	0.85	1.275	1.00	1.5	0.89	1.34	0.80	1.20	0.525	0.0945
10.50	0.35	0.17		1.5	0.35	0.17	0.68	1.02	0.81	1.215	0.85	1.275	1.00	1.5	0.87	1.31	0.84	1.26	0.525	0.08925
12.00	0.52	0.14		1.5	0.52	0.14	0.23	0.345	0.71	1.065	0.29	0.435	1.00	1.5	0.78	1.17	0.94	1.41	0.78	0.1092
13.50	0.45	0.15		1.5	0.45	0.15	0.38	0.57	0.75	1.125	0.5	0.75	1.00	1.5	0.82	1.23	0.91	1.37	0.675	0.10125
15.00	0.38	0.17		1.5	0.38	0.17	0.58	0.87	0.81	1.215	0.66	0.99	1.00	1.5	0.87	1.31	0.84	1.26	0.57	0.0969
16.50	0.30	0.13		1.5	0.3	0.13	0.85	1.275	0.66	0.985	0.98	1.47	1.00	1.5	0.74	1.11	0.96	1.44	0.45	0.0585
18.00	0.22	0.15		1.5	0.22	0.15	1	1.5	0.61	0.911	0.98	1.47	0.98	1.5	0.82	1.23	0.88	1.32	0.33	0.0495
19.50	0.21	0.12		1.5	0.21	0.12	1	1.5	0.49	0.737	0.98	1.47	0.98	1.5	0.70	1.05	0.95	1.43	0.315	0.0378
21.00	0.23	0.10		1.5	0.23	0.1	1	1.5	0.47	0.701	0.98	1.47	0.98	1.5	0.63	0.95	0.98	1.47	0.345	0.0345
22.50	0.21	0.17		1.5	0.21	0.17	1	1.5	0.63	0.948	0.98	1.47	0.98	1.5	0.86	1.29	0.80	1.20	0.315	0.05355
24.00	0.30	0.13		1.5	0.3	0.13	0.85	1.275	0.66	0.985	0.98	1.47	1.00	1.5	0.74	1.11	0.96	1.44	0.45	0.0585
25.50	0.20	0.11		1.5	0.2	0.11	1	1.5	0.44	0.664	0.98	1.47	0.85	1.3	0.64	0.96	0.94	1.41	0.3	0.033
27.00	0.18	0.12		1.5	0.18	0.12	1	1.5	0.42	0.633	1	1.5	0.85	1.3	0.60	0.91	0.89	1.34	0.27	0.0324
28.50	0.16	0.14		1.5	0.16	0.14	1	1.5	0.42	0.628	1	1.5	0.71	1.1	0.56	0.84	0.79	1.18	0.24	0.0336
30.00	0.06	0.00		1.5	0.06	0	0.2	0.3	0.00	0	1	1.5	0.13	0.2	0.00	0.00	0.40	0.60	0.09	0
31.50	0.06	0.02		1	0.06	0.02	0.7	0.7	0.02	0.019	1	1	0.13	0.1	0.02	0.02	0.40	0.40	0.06	0.0012
32.00	0.08	0.00		0.75	0.08	0	0.2	0.15	0.00	0	1	0.75	0.22	0.2	0.00	0.00	0.51	0.38	0.06	0
33.00	0.00	0.00		0.5	0.04	0	0.16	0.08	0.00	0	1	0.5	0.03	0	0.00	0.00	0.27	0.14	0.02	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0

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(Modified by Harlan Wright, British Columbia Conservation Foundation, July 2002).

DEPTH/VELOCITY TRANSECT DATA ANALYSIS SPREADSHEET
(CALCULATES W.U.A. & DISCHARGE)

STREAM:	Englishman River
DATE:	11-Aug-03
TIME:	15:00
SAMPLE TYPE:	discharge
SITE NAME:	d/s South Englishman

MAIN/SIDE CHANNEL:	m
METERED/EST.:	m
MEAN/SURFACE:	m
TRANSECT WIDTH:	21.9 m
METER TYPE:	swoffer
SENSOR DEPTH (from bottom):	40 %
METERED DISCHARGE:	1.2223 m^3s^{-1}

HYDRAULIC TYPE:	glide
WIDTH : DEPTH RATIO :	70.06
TRANSECT TYPE:	full
STREAM WIDTH:	21.9 m
NO. OF STATIONS:	24

SITE WEIGHTED MEANS

MEAN DEPTH:	0.313 m
MEAN VELOCITY:	0.179 ms^{-1}
CROSS-SECT. AREA:	6.846 m^2

ADJUSTED USABLE AREAS

% USABLE BY RBT FRY	49 %
% USABLE BY RBT PARR	60 %
% USABLE BY CT FRY	71 %
% USABLE BY CT PARR	84 %
% USABLE BY CHINOOK	64 %
% USABLE BY COHO	70 %

DEPTH/ VELOCITY DATA FOR WEIGHTED USABLE AREA (WUA) CALCULATIONS

Transect Data: station length (m)	depth (m)	velocity (m/s)	substrate	cell width (m)	cell mean depth (m)	cell mean velocity (m/s)	cell prob. RBT	usable width Fry (m)	cell prob. RBT Parr	usable width RBT Parr	cell prob. CT fry	usable width CT fry	cell prob CT parr	usable width CT parr	cell prob. CH	usable width CH (m)	cell prob. CO	usable width CO (m)	cell area (sq. m)	cell discharge (cu. m/sec)
2.00	0.00	0.00		0.5	0.018	0	0.04	0.0	0.00	0	1	0.5	0.03	0	0.00	0.00	0.05	0.03	0.0088	0
3.00	0.07	0.00		1	0.07	0	0.2	0.2	0.00	0	1	1	0.22	0.2	0.00	0.00	0.45	0.45	0.07	0
4.00	0.08	0.05		1	0.08	0.05	0.9	0.9	0.08	0.075	1	1	0.22	0.2	0.08	0.08	0.51	0.51	0.08	0.004
5.00	0.17	0.10		1	0.17	0.1	1	1	0.35	0.347	1	1	0.71	0.7	0.49	0.49	0.87	0.87	0.17	0.017
6.00	0.29	0.00		0.75	0.29	0	0.176	0.132	0.00	0	0.98	0.735	1.00	0.8	0.00	0.00	1.00	0.75	0.2175	0
6.50	0.25	0.07		0.5	0.25	0.07	1	0.5	0.36	0.182	0.98	0.49	1.00	0.5	0.46	0.23	1.00	0.50	0.125	0.00875
7.00	0.28	0.21		0.75	0.28	0.21	0.883	0.662	0.87	0.656	0.882	0.6615	1.00	0.8	0.95	0.71	0.68	0.51	0.21	0.0441
8.00	0.31	0.17		1	0.31	0.17	0.82	0.82	0.79	0.794	0.85	0.85	1.00	1	0.87	0.87	0.84	0.84	0.31	0.0527
9.00	0.40	0.18		1	0.4	0.18	0.52	0.52	0.84	0.84	0.66	0.66	1.00	1	0.89	0.89	0.80	0.80	0.4	0.072
10.00	0.47	0.19		1	0.47	0.19	0.34	0.34	0.87	0.87	0.4	0.4	1.00	1	0.92	0.92	0.76	0.76	0.47	0.0893
11.00	0.45	0.23		1	0.45	0.23	0.35	0.35	0.96	0.96	0.45	0.45	1.00	1	0.97	0.97	0.60	0.60	0.45	0.1035
12.00	0.45	0.16		1	0.45	0.16	0.38	0.38	0.78	0.78	0.5	0.5	1.00	1	0.84	0.84	0.88	0.88	0.45	0.072
13.00	0.49	0.21		1	0.49	0.21	0.281	0.281	0.92	0.92	0.36	0.36	1.00	1	0.95	0.95	0.68	0.68	0.49	0.1029
14.00	0.38	0.27		1	0.38	0.27	0.458	0.458	1.00	1	0.363	0.363	1.00	1	1.00	1.00	0.44	0.44	0.38	0.1026
15.00	0.41	0.13		1	0.41	0.13	0.48	0.48	0.67	0.67	0.5	0.5	1.00	1	0.74	0.74	0.96	0.96	0.41	0.0533
16.00	0.40	0.20		1	0.4	0.2	0.52	0.52	0.90	0.9	0.66	0.66	1.00	1	0.94	0.94	0.72	0.72	0.4	0.08
17.00	0.45	0.27		1	0.45	0.27	0.3	0.3	1.00	1	0.275	0.275	1.00	1	1.00	1.00	0.44	0.44	0.45	0.1215
18.00	0.52	0.24		1	0.52	0.24	0.205	0.205	0.98	0.98	0.261	0.261	1.00	1	0.98	0.98	0.56	0.56	0.52	0.1248
19.00	0.43	0.24		1	0.43	0.24	0.383	0.383	0.98	0.98	0.45	0.45	1.00	1	0.98	0.98	0.56	0.56	0.43	0.1032
20.00	0.29	0.20		1	0.29	0.2	0.88	0.88	0.87	0.873	0.98	0.98	1.00	1	0.94	0.94	0.72	0.72	0.29	0.058
21.00	0.18	0.07		1	0.18	0.07	1	1	0.27	0.268	1	1	0.85	0.9	0.39	0.39	0.89	0.89	0.18	0.0126
22.00	0.17	0.00		1	0.17	0	0.2	0.2	0.00	0	1	1	0.71	0.7	0.00	0.00	0.87	0.87	0.17	0
23.00	0.14	0.00		0.95	0.14	0	0.2	0.19	0.00	0	1	0.95	0.50	0.5	0.00	0.00	0.78	0.74	0.133	0
23.90	0.00	0.00		0.45	0.07	0	0.2	0.09	0.00	0	1	0.45	0.22	0.1	0.00	0.00	0.45	0.20	0.0315	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0

This spread sheet is brought to you by Poul Bech, Ron Ptolemy, and Rob Knight, B.C. Environment, Fisheries Section, May 1994.
(Modified by Harlan Wright, British Columbia Conservation Foundation, July 2002).

DEPTH/VELOCITY TRANSECT DATA ANALYSIS SPREADSHEET
(CALCULATES W.U.A. & DISCHARGE)

STREAM:	Englishman River
DATE:	25-Aug-03
TIME:	13:00
SAMPLE TYPE:	discharge
SITE NAME:	d/s Hwy 19A

MAIN/SIDE CHANNEL:	m
METERED/EST.:	m
MEAN/SURFACE:	m
TRANSECT WIDTH:	35.7 m
METER TYPE:	swoffer
SENSOR DEPTH (from bottom):	40 %
METERED DISCHARGE:	1.1797 m^3s^{-1}

HYDRAULIC TYPE:	glide
WIDTH : DEPTH RATIO :	146.82
TRANSECT TYPE:	
STREAM WIDTH:	35.7 m
NO. OF STATIONS:	27

SITE WEIGHTED MEANS

MEAN DEPTH:	0.243 m
MEAN VELOCITY:	0.136 ms^{-1}
CROSS-SECT. AREA:	8.681 m^2

ADJUSTED USABLE AREAS

% USABLE BY RBT FRY	77 %
% USABLE BY RBT PARR	48 %
% USABLE BY CT FRY	85 %
% USABLE BY CT PARR	73 %
% USABLE BY CHINOOK	57 %
% USABLE BY COHO	77 %

DEPTH/ VELOCITY DATA FOR WEIGHTED USABLE AREA (WUA) CALCULATIONS

Transect Data				cell	cell	cell	cell	usable	cell	usable	cell	usable	cell	usable	cell	usable	cell	usable	cell	cell
station length (m)	depth (m)	velocity (m/s)	substrate	width (m)	mean depth (m)	mean velocity (m/s)	prob. RBT	width Fry (m)	prob. RBT Parr	width RBT Parr	prob. CT fry	width CT fry	prob CT parr	width CT parr	prob. CH	width CH (m)	prob. CO	width CO (m)	area (sq. m)	discharge (cu. m/sec)
0.50	0.14	0.00		0.5	0.115	0.025	0.7	0.4	0.04	0.02	1	0.5	0.36	0.2	0.06	0.03	0.66	0.33	0.0575	0.001438
1.50	0.32	0.05		1	0.32	0.05	0.702	0.702	0.30	0.297	0.85	0.85	1.00	1	0.35	0.35	1.00	1.00	0.32	0.016
2.50	0.53	0.13		1	0.53	0.13	0.22	0.22	0.67	0.67	0.29	0.29	1.00	1	0.74	0.74	0.96	0.96	0.53	0.0689
3.50	0.52	0.160		1.25	0.52	0.16	0.23	0.288	0.78	0.975	0.29	0.3625	1.00	1.3	0.84	1.05	0.88	1.10	0.65	0.104
5.00	0.48	0.12		1.5	0.48	0.12	0.31	0.465	0.63	0.945	0.4	0.6	1.00	1.5	0.71	1.07	1.00	1.50	0.72	0.0864
6.50	0.32	0.11		1.5	0.32	0.11	0.78	1.17	0.58	0.876	0.85	1.275	1.00	1.5	0.67	1.01	1.00	1.50	0.48	0.0528
8.00	0.41	0.13		1.5	0.41	0.13	0.48	0.72	0.67	1.005	0.5	0.75	1.00	1.5	0.74	1.11	0.96	1.44	0.615	0.07995
9.50	0.42	0.12		1.5	0.42	0.12	0.46	0.69	0.63	0.945	0.5	0.75	1.00	1.5	0.71	1.07	1.00	1.50	0.63	0.0756
11.00	0.34	0.17		1.5	0.34	0.17	0.71	1.065	0.81	1.215	0.85	1.275	1.00	1.5	0.87	1.31	0.84	1.26	0.51	0.0867
12.50	0.32	0.16		1.5	0.32	0.16	0.78	1.17	0.77	1.158	0.85	1.275	1.00	1.5	0.84	1.26	0.88	1.32	0.48	0.0768
14.00	0.31	0.15		1.5	0.31	0.15	0.82	1.23	0.74	1.103	0.85	1.275	1.00	1.5	0.82	1.23	0.91	1.37	0.465	0.06975
15.50	0.28	0.16		1.5	0.28	0.16	0.91	1.365	0.74	1.112	0.98	1.47	1.00	1.5	0.84	1.26	0.88	1.32	0.42	0.0672
17.00	0.19	0.13		1.5	0.19	0.13	1	1.5	0.48	0.714	0.98	1.47	0.85	1.3	0.67	1.01	0.88	1.32	0.285	0.03705
18.50	0.22	0.10		1.5	0.22	0.1	1	1.5	0.45	0.668	0.98	1.47	0.98	1.5	0.63	0.95	0.97	1.46	0.33	0.033
20.00	0.21	0.18		1.5	0.21	0.18	1	1.5	0.66	0.983	0.98	1.47	0.98	1.5	0.88	1.32	0.76	1.14	0.315	0.0567
21.50	0.24	0.14		1.5	0.24	0.14	1	1.5	0.62	0.937	0.98	1.47	1.00	1.5	0.78	1.17	0.93	1.40	0.36	0.0504
23.00	0.17	0.23		1.5	0.17	0.23	0.92	1.38	0.60	0.907	0.9	1.35	0.71	1.1	0.76	1.13	0.52	0.78	0.255	0.05865
24.50	0.17	0.12		1.5	0.17	0.12	1	1.5	0.40	0.595	1	1.5	0.71	1.1	0.55	0.83	0.87	1.31	0.255	0.0306
26.00	0.13	0.19		1.5	0.13	0.19	1	1.5	0.40	0.6	1	1.5	0.36	0.5	0.46	0.69	0.56	0.84	0.195	0.03705
27.50	0.11	0.18		1.5	0.11	0.18	1	1.5	0.31	0.466	1	1.5	0.27	0.4	0.33	0.49	0.53	0.79	0.165	0.0297
29.00	0.09	0.10		1.5	0.09	0.1	1	1.5	0.16	0.239	1	1.5	0.27	0.4	0.16	0.25	0.56	0.84	0.135	0.0135
30.50	0.06	0.19		1.5	0.06	0.19	1	1.5	0.15	0.222	1	1.5	0.13	0.2	0.14	0.21	0.30	0.46	0.09	0.0171
32.00	0.04	0.11		1.5	0.04	0.11	0.8	1.2	0.05	0.08	1	1.5	0.03	0	0.07	0.10	0.27	0.41	0.06	0.0066
33.50	0.07	0.01		1.5	0.07	0.01	0.5	0.75	0.01	0.016	1	1.5	0.22	0.3	0.01	0.02	0.45	0.68	0.105	0.00105
35.00	0.14	0.13		1.25	0.14	0.13	1	1.25	0.34	0.427	1	1.25	0.50	0.6	0.43	0.54	0.75	0.94	0.175	0.02275
36.00	0.12	0.00		0.6	0.12	0	0.2	0.12	0.00	0	1	0.6	0.36	0.2	0.00	0.00	0.70	0.42	0.072	0
36.20	0.00	0.00		0.1	0.06	0	0.2	0.02	0.00	0	1	0.1	0.13	0	0.00	0.00	0.40	0.04	0.006	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0

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(Modified by Harlan Wright, British Columbia Conservation Foundation, July 2002).

DEPTH/VELOCITY TRANSECT DATA ANALYSIS SPREADSHEET
(CALCULATES W.U.A. & DISCHARGE)

STREAM:	Englishman River
DATE:	25-Aug-03
TIME:	14:30
SAMPLE TYPE:	discharge
SITE NAME:	d/s South Englishman

MAIN/SIDE CHANNEL:	m
METERED/EST.:	m
MEAN/SURFACE:	m
TRANSECT WIDTH:	21.8 m
METER TYPE:	swoffer
SENSOR DEPTH (from bottom):	40 %
METERED DISCHARGE:	1.1022 m^3s^{-1}

HYDRAULIC TYPE:	glide
WIDTH : DEPTH RATIO :	69.05
TRANSECT TYPE:	full
STREAM WIDTH:	21.8 m
NO. OF STATIONS:	26

ADJUSTED USABLE AREAS

% USABLE BY RBT FRY	51 %
% USABLE BY RBT PARR	56 %
% USABLE BY CT FRY	71 %
% USABLE BY CT PARR	82 %
% USABLE BY CHINOOK	60 %
% USABLE BY COHO	74 %

SITE WEIGHTED MEANS

MEAN DEPTH:	0.316 m
MEAN VELOCITY:	0.160 ms^{-1}
CROSS-SECT. AREA:	6.883 m^2

DEPTH/ VELOCITY DATA FOR WEIGHTED USABLE AREA (WUA) CALCULATIONS

Transect Data: station length (m)	depth (m)	velocity (m/s)	substrate	cell width (m)	cell mean depth (m)	cell mean velocity (m/s)	cell prob. RBT	usable width Fry (m)	cell prob. RBT Parr	usable width RBT Parr	cell prob. CT fry	usable width CT fry	cell prob CT parr	usable width CT parr	cell prob. CH	usable width CH (m)	cell prob. CO	usable width CO (m)	cell area (sq. m)	cell discharge (cu. m/sec)
1.00	0.00	0.00		0.5	0.035	0	0.12	0.1	0.00	0	1	0.5	0.03	0	0.00	0.00	0.20	0.10	0.0175	0
2.00	0.14	0.00		1	0.14	0	0.2	0.2	0.00	0	1	1	0.50	0.5	0.00	0.00	0.78	0.78	0.14	0
3.00	0.19	0.02		0.85	0.19	0.02	0.7	0.595	0.08	0.066	0.98	0.833	0.85	0.7	0.14	0.12	0.92	0.78	0.1615	0.00323
3.70	0.21	0.08		0.6	0.21	0.08	1	0.6	0.35	0.211	0.98	0.588	0.98	0.6	0.51	0.31	0.95	0.57	0.126	0.01008
4.20	0.15	0.14		0.65	0.15	0.14	1	0.65	0.39	0.254	1	0.65	0.50	0.3	0.49	0.32	0.76	0.49	0.0975	0.01365
5.00	0.33	0.21		0.9	0.33	0.21	0.728	0.655	0.91	0.82	0.765	0.6885	1.00	0.9	0.95	0.86	0.68	0.61	0.297	0.06237
6.00	0.40	0.25		1	0.4	0.25	0.447	0.447	1.00	1	0.495	0.495	1.00	1	0.99	0.99	0.52	0.52	0.4	0.1
7.00	0.55	0.18		1	0.55	0.18	0.18	0.18	0.84	0.84	0.29	0.29	1.00	1	0.89	0.89	0.80	0.80	0.55	0.099
8.00	0.47	0.24		1	0.47	0.24	0.303	0.303	0.98	0.98	0.36	0.36	1.00	1	0.98	0.98	0.56	0.56	0.47	0.1128
9.00	0.35	0.23		1	0.35	0.23	0.626	0.626	0.96	0.96	0.765	0.765	1.00	1	0.97	0.97	0.60	0.60	0.35	0.0805
10.00	0.48	0.14		0.75	0.48	0.14	0.31	0.233	0.71	0.533	0.4	0.3	1.00	0.8	0.78	0.59	0.94	0.71	0.36	0.0504
10.50	0.49	0.28		0.5	0.49	0.28	0.218	0.109	1.00	0.5	0.22	0.11	1.00	0.5	1.00	0.50	0.40	0.20	0.245	0.0686
11.00	0.43	0.21		0.75	0.43	0.21	0.417	0.313	0.92	0.69	0.45	0.3375	1.00	0.8	0.95	0.71	0.68	0.51	0.3225	0.067725
12.00	0.44	0.08		0.75	0.44	0.08	0.4	0.3	0.45	0.338	0.5	0.375	1.00	0.8	0.52	0.39	1.00	0.75	0.33	0.0264
12.50	0.41	0.15		0.5	0.41	0.15	0.48	0.24	0.75	0.375	0.5	0.25	1.00	0.5	0.82	0.41	0.91	0.46	0.205	0.03075
13.00	0.46	0.16		0.75	0.46	0.16	0.36	0.27	0.78	0.585	0.4	0.3	1.00	0.8	0.84	0.63	0.88	0.66	0.345	0.0552
14.00	0.44	0.12		1	0.44	0.12	0.4	0.4	0.63	0.63	0.5	0.5	1.00	1	0.71	0.71	1.00	1.00	0.44	0.0528
15.00	0.45	0.22		1	0.45	0.22	0.357	0.357	0.94	0.94	0.45	0.45	1.00	1	0.96	0.96	0.64	0.64	0.45	0.099
16.00	0.40	0.18		1	0.4	0.18	0.52	0.52	0.84	0.84	0.66	0.66	1.00	1	0.89	0.89	0.80	0.80	0.4	0.072
17.00	0.32	0.14		1	0.32	0.14	0.78	0.78	0.70	0.703	0.85	0.85	1.00	1	0.78	0.78	0.94	0.94	0.32	0.0448
18.00	0.25	0.16		1	0.25	0.16	1	1	0.71	0.71	0.98	0.98	1.00	1	0.84	0.84	0.88	0.88	0.25	0.04
19.00	0.31	0.00		1	0.31	0	0.164	0.164	0.00	0	0.85	0.85	1.00	1	0.00	0.00	1.00	1.00	0.31	0
20.00	0.15	0.07		1	0.15	0.07	1	1	0.22	0.22	1	1	0.50	0.5	0.29	0.29	0.81	0.81	0.15	0.0105
21.00	0.08	0.03		1	0.08	0.03	0.8	0.8	0.05	0.045	1	1	0.22	0.2	0.05	0.05	0.51	0.51	0.08	0.0024
22.00	0.06	0.00		0.9	0.06	0	0.2	0.18	0.00	0	1	0.9	0.13	0.1	0.00	0.00	0.40	0.36	0.054	0
22.80	0.00	0.00		0.4	0.03	0	0.12	0.048	0.00	0	1	0.4	0.03	0	0.00	0.00	0.20	0.08	0.012	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0
				0	0	0	0	0	0.00	0	0	0	0.00	0	0.00	0.00	0.00	0.00	0	0

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(Modified by Harlan Wright, British Columbia Conservation Foundation, July 2002).

DEPTH/VELOCITY TRANSECT DATA ANALYSIS SPREADSHEET
(CALCULATES W.U.A. & DISCHARGE)

STREAM:	Englishman
DATE:	28-Aug-03
SAMPLE TYPE:	discharge
SITE NAME:	d/s Hwy 19A

MAIN/SIDE CHANNEL:	M
METERED/EST.:	M
MEAN/SURFACE:	M
TRANSECT WIDTH:	32.0 m
METER TYPE:	Swoffer 2100
SENSOR DEPTH (from bottom):	40 %
METERED DISCHARGE:	1.0927 m^3s^{-1}

HYDRAULIC TYPE:	glide
WIDTH : DEPTH RATIO :	110.58
TRANSECT TYPE:	total
STREAM WIDTH:	32.0 m
NO. OF STATIONS:	25

ADJUSTED USABLE AREAS

% USABLE BY RBT FRY	70 %
% USABLE BY RBT PARR	50 %
% USABLE BY CT FRY	79 %
% USABLE BY CT PARR	86 %
% USABLE BY CHINOOK	60 %
% USABLE BY COHO	86 %
Generic Insect suitability	11 %

SITE WEIGHTED MEANS

MEAN DEPTH:	0.289 m
MEAN VELOCITY:	0.118 ms^{-1}
CROSS-SECT. AREA:	9.266 m^2

DEPTH/ VELOCITY DATA FOR WEIGHTED USABLE AREA (WUA) CALCULATIONS

Transect Data																							
station length (m)	depth (m)	velocity (m/s)	substrate	cell width (m)	cell mean depth (m)	cell mean velocity (m/s)	cell prob. RBT	usable width Fry (m)	cell prob. RBT Parr	usable width RBT Parr	cell prob. CT fry	usable width CT fry	cell prob CT parr	usable width CT parr	cell prob. CH	usable width CH (m)	cell prob. CO	usable width CO (m)	cell prob. Ins.	usable width Ins. (m)	cell area (sq. m)	cell discharge (cu. m/se
1.59	0.00	0.00		0.0	0.1	0.0	0.2	0.0	0.0	0.0	1.0	0.0	0.3	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0
1.6	0.39	0.00		0.7	0.4	0.0	0.1	0.1	0.0	0.0	0.7	0.5	1.0	0.7	0.0	0.0	1.0	0.7	0.0	0.0	0.3	0.0
3.0	0.56	0.08		1.5	0.6	0.1	0.2	0.2	0.5	0.7	0.2	0.3	1.0	1.5	0.5	0.8	1.0	1.5	0.1	0.1	0.8	0.1
4.5	0.44	0.12		1.5	0.4	0.1	0.4	0.6	0.6	0.9	0.5	0.8	1.0	1.5	0.7	1.1	1.0	1.5	0.1	0.2	0.7	0.1
6.0	0.42	0.11		1.5	0.4	0.1	0.5	0.7	0.6	0.9	0.5	0.8	1.0	1.5	0.7	1.0	1.0	1.5	0.1	0.2	0.6	0.1
7.5	0.35	0.16		1.5	0.4	0.2	0.7	1.0	0.8	1.2	0.9	1.3	1.0	1.5	0.8	1.3	0.9	1.3	0.2	0.2	0.5	0.1
9.0	0.34	0.12		1.5	0.3	0.1	0.7	1.1	0.6	0.9	0.9	1.3	1.0	1.5	0.7	1.1	1.0	1.5	0.1	0.2	0.5	0.1
10.5	0.38	0.11		1.5	0.4	0.1	0.6	0.9	0.6	0.9	0.7	1.0	1.0	1.5	0.7	1.0	1.0	1.5	0.1	0.2	0.6	0.1
12.0	0.42	0.18		1.5	0.4	0.2	0.5	0.7	0.8	1.3	0.5	0.8	1.0	1.5	0.9	1.3	0.8	1.2	0.2	0.3	0.6	0.1
13.5	0.46	0.15		1.5	0.5	0.2	0.4	0.5	0.8	1.1	0.4	0.6	1.0	1.5	0.8	1.2	0.9	1.4	0.2	0.2	0.7	0.1
15.0	0.41	0.10		1.5	0.4	0.1	0.5	0.7	0.6	0.8	0.5	0.8	1.0	1.5	0.6	0.9	1.0	1.5	0.1	0.2	0.6	0.1
16.5	0.33	0.11		1.5	0.3	0.1	0.8	1.1	0.6	0.9	0.9	1.3	1.0	1.5	0.7	1.0	1.0	1.5	0.1	0.2	0.5	0.1
18.0	0.20	0.15		1.5	0.2	0.2	1.0	1.5	0.6	0.8	1.0	1.5	0.9	1.3	0.8	1.2	0.9	1.3	0.2	0.2	0.3	0.0
19.5	0.21	0.09		1.5	0.2	0.1	1.0	1.5	0.4	0.6	1.0	1.5	1.0	1.5	0.6	0.8	1.0	1.4	0.1	0.1	0.3	0.0
21.0	0.24	0.15		1.5	0.2	0.2	1.0	1.5	0.7	1.0	1.0	1.5	1.0	1.5	0.8	1.2	0.9	1.4	0.2	0.2	0.4	0.1
22.5	0.20	0.19		1.5	0.2	0.2	1.0	1.5	0.7	1.0	1.0	1.5	0.9	1.3	0.9	1.3	0.7	1.1	0.2	0.3	0.3	0.1
24.0	0.24	0.14		1.5	0.2	0.1	1.0	1.5	0.6	0.9	1.0	1.5	1.0	1.5	0.8	1.2	0.9	1.4	0.1	0.2	0.4	0.1
25.5	0.25	0.12		1.5	0.3	0.1	1.0	1.5	0.6	0.9	1.0	1.5	1.0	1.5	0.7	1.1	1.0	1.5	0.1	0.2	0.4	0.0
27.0	0.21	0.08		1.5	0.2	0.1	1.0	1.5	0.4	0.5	1.0	1.5	1.0	1.5	0.5	0.8	1.0	1.4	0.1	0.1	0.3	0.0
28.5	0.16	0.09		1.5	0.2	0.1	1.0	1.5	0.3	0.4	1.0	1.5	0.7	1.1	0.4	0.6	0.8	1.3	0.1	0.1	0.2	0.0
30.0	0.09	0.01		1.5	0.1	0.0	0.5	0.8	0.0	0.0	1.0	1.5	0.3	0.4	0.0	0.0	0.6	0.8	0.0	0.0	0.1	0.0
31.5	0.07	0.10		1.3	0.1	0.1	1.0	1.3	0.1	0.1	1.0	1.3	0.2	0.3	0.1	0.1	0.5	0.6	0.0	0.1	0.1	0.0
32.50	0.06	0.04		0.8	0.1	0.0	0.9	0.6	0.0	0.0	1.0	0.8	0.1	0.1	0.0	0.0	0.4	0.3	0.0	0.0	0.0	0.0
33.0	0.03	0.00		0.6	0.0	0.0	0.1	0.1	0.0	0.0	1.0	0.6	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0
33.6	0.00	0.00		0.3	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

This spread sheet is brought to you by Poul Bech, Ron Ptolemy, and Rob Knight, B.C. Environment, Fisheries Section, May 1994.

(Modified by Harlan Wright, British Columbia Conservation Foundation, January 2003, using Febuary 2001 WUP HSI curves and Generic Insect curves from Stalnaker and Arnette, 1976).

DEPTH/VELOCITY TRANSECT DATA ANALYSIS SPREADSHEET
(CALCULATES W.U.A. & DISCHARGE)

STREAM:	Englishman
DATE:	15-Sep-03
SAMPLE TYPE:	discharge
SITE NAME:	d/s Hwy 19A

MAIN/SIDE CHANNEL:	M
METERED/EST.:	M
MEAN/SURFACE:	M
TRANSECT WIDTH:	36.4 m
METER TYPE:	Swoffer 2100
SENSOR DEPTH (from bottom):	40 %
METERED DISCHARGE:	1.6534 m^3s^{-1}

HYDRAULIC TYPE:	glide
WIDTH : DEPTH RATIO :	152.62
TRANSECT TYPE:	total
STREAM WIDTH:	36.4 m
NO. OF STATIONS:	38

ADJUSTED USABLE AREAS

% USABLE BY RBT FRY	78 %
% USABLE BY RBT PARR	63 %
% USABLE BY CT FRY	72 %
% USABLE BY CT PARR	82 %
% USABLE BY CHINOOK	74 %
% USABLE BY COHO	64 %
Generic Insect suitability	23 %

SITE WEIGHTED MEANS

MEAN DEPTH:	0.238 m
MEAN VELOCITY:	0.190 ms^{-1}
CROSS-SECT. AREA:	8.681 m^2

DEPTH/ VELOCITY DATA FOR WEIGHTED USABLE AREA (WUA) CALCULATIONS

Transect Data: station length (m)	depth (m)	velocity (m/s)	substrate	cell width (m)	cell mean depth (m)	cell mean velocity (m/s)	cell prob. RBT	usable width Fry (m)	cell prob. RBT Parr	usable width RBT Parr	cell prob. CT fry	usable width CT fry	cell prob CT parr	usable width CT parr	cell prob. CH	usable width CH (m)	cell prob. CO	usable width CO (m)	cell prob. Ins.	usable width Ins. (m)	cell area (sq. m)	cell discharge (cu. m/se
2.30	0.05	0.03		0.5	0.0	0.1	0.8	0.4	0.0	0.0	1.0	0.5	0.1	0.1	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0
3.3	0.12	0.09		1.0	0.1	0.1	1.0	1.0	0.2	0.2	1.0	1.0	0.4	0.4	0.2	0.2	0.7	0.7	0.1	0.1	0.1	0.0
4.3	0.14	0.16		1.0	0.1	0.2	1.0	1.0	0.4	0.4	1.0	1.0	0.5	0.5	0.5	0.5	0.7	0.7	0.2	0.2	0.1	0.0
5.3	0.18	0.27		1.0	0.2	0.3	0.8	0.8	0.7	0.7	0.6	0.6	0.9	0.9	0.9	0.9	0.4	0.4	0.3	0.3	0.2	0.0
6.3	0.16	0.12		1.0	0.2	0.1	1.0	1.0	0.4	0.4	1.0	1.0	0.7	0.7	0.5	0.5	0.8	0.8	0.1	0.1	0.2	0.0
7.3	0.16	0.18		1.0	0.2	0.2	1.0	1.0	0.5	0.5	1.0	1.0	0.7	0.7	0.6	0.6	0.7	0.7	0.2	0.2	0.2	0.0
8.3	0.15	0.18		1.0	0.2	0.2	1.0	1.0	0.5	0.5	1.0	1.0	0.5	0.5	0.6	0.6	0.6	0.6	0.2	0.2	0.2	0.0
9.3	0.17	0.11		1.0	0.2	0.1	1.0	1.0	0.4	0.4	1.0	1.0	0.7	0.7	0.5	0.5	0.9	0.9	0.1	0.1	0.2	0.0
10.3	0.23	0.17		1.0	0.2	0.2	1.0	1.0	0.7	0.7	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.2	0.0
11.3	0.26	0.28		1.0	0.3	0.3	0.7	0.7	0.9	0.9	0.5	0.5	1.0	1.0	1.0	1.0	0.4	0.4	0.4	0.4	0.3	0.1
12.3	0.21	0.27		1.0	0.2	0.3	0.8	0.8	0.8	0.8	0.5	0.5	1.0	1.0	1.0	1.0	0.4	0.4	0.3	0.3	0.2	0.1
13.3	0.19	0.27		1.0	0.2	0.3	0.8	0.8	0.7	0.7	0.5	0.5	0.9	0.9	0.9	0.9	0.4	0.4	0.3	0.3	0.2	0.1
14.3	0.17	0.29		1.0	0.2	0.3	0.7	0.7	0.6	0.6	0.4	0.4	0.7	0.7	0.8	0.8	0.3	0.3	0.4	0.4	0.2	0.0
15.3	0.18	0.42		1.0	0.2	0.4	0.3	0.3	0.7	0.7	0.0	0.0	0.6	0.6	0.8	0.8	0.0	0.0	0.6	0.6	0.2	0.1
16.3	0.17	0.28		1.0	0.2	0.3	0.8	0.8	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.3	0.3	0.4	0.4	0.2	0.0
17.3	0.21	0.26		1.0	0.2	0.3	0.8	0.8	0.8	0.8	0.7	0.7	1.0	1.0	1.0	1.0	0.5	0.5	0.3	0.3	0.2	0.1
18.3	0.25	0.29		1.0	0.3	0.3	0.7	0.7	0.9	0.9	0.3	0.3	1.0	1.0	1.0	1.0	0.4	0.4	0.4	0.4	0.3	0.1
19.3	0.17	0.19		1.0	0.2	0.2	1.0	1.0	0.5	0.5	1.0	1.0	0.7	0.7	0.7	0.7	0.7	0.7	0.2	0.2	0.2	0.0
20.3	0.14	0.11		1.0	0.1	0.1	1.0	1.0	0.3	0.3	1.0	1.0	0.5	0.5	0.4	0.4	0.8	0.8	0.1	0.1	0.1	0.0
21.3	0.15	0.11		1.0	0.2	0.1	1.0	1.0	0.3	0.3	1.0	1.0	0.5	0.5	0.4	0.4	0.8	0.8	0.1	0.1	0.2	0.0
22.3	0.14	0.17		1.0	0.1	0.2	1.0	1.0	0.4	0.4	1.0	1.0	0.5	0.5	0.5	0.5	0.7	0.7	0.2	0.2	0.1	0.0
23.3	0.17	0.29		1.0	0.2	0.3	0.7	0.7	0.6	0.6	0.4	0.4	0.7	0.7	0.8	0.8	0.3	0.3	0.4	0.4	0.2	0.0
24.3	0.21	0.29		1.0	0.2	0.3	0.7	0.7	0.8	0.8	0.3	0.3	1.0	1.0	1.0	1.0	0.3	0.3	0.4	0.4	0.2	0.1
25.3	0.27	0.31		1.0	0.3	0.3	0.6	0.6	0.9	0.9	0.2	0.2	1.0	1.0	1.0	1.0	0.3	0.3	0.4	0.4	0.3	0.1
26.3	0.38	0.22		1.0	0.4	0.2	0.5	0.5	0.9	0.9	0.6	0.6	1.0	1.0	1.0	1.0	0.6	0.6	0.2	0.2	0.4	0.1
27.3	0.28	0.17		1.0	0.3	0.2	0.9	0.9	0.8	0.8	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.3	0.0
28.3	0.23	0.17		1.0	0.2	0.2	1.0	1.0	0.7	0.7	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.2	0.0
29.3	0.25	0.18		1.0	0.3	0.2	1.0	1.0	0.8	0.8	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.3	0.0
30.3	0.24	0.19		1.0	0.2	0.2	1.0	1.0	0.8	0.8	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.2	0.0
31.3	0.26	0.2		1.0	0.3	0.2	1.0	1.0	0.8	0.8	1.0	1.0	1.0	1.0	0.9	0.9	0.7	0.7	0.2	0.2	0.3	0.1
32.3	0.42	0.18		1.0	0.4	0.2	0.5	0.5	0.8	0.8	0.5	0.5	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.4	0.1
33.3	0.32	0.17		1.0	0.3	0.2	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.3	0.1
34.3	0.33	0.15		1.0	0.3	0.2	0.8	0.8	0.7	0.7	0.9	0.9	1.0	1.0	0.8	0.8	0.9	0.9	0.2	0.2	0.3	0.0
35.3	0.41	0.16		1.0	0.4	0.2	0.5	0.5	0.8	0.8	0.5	0.5	1.0	1.0	0.8	0.8	0.9	0.9	0.2	0.2	0.4	0.1
36.3	0.5	0.12		1.0	0.5	0.1	0.3	0.3	0.6	0.6	0.4	0.4	1.0	1.0	0.7	0.7	1.0	1.0	0.1	0.1	0.5	0.1
37.3	0.44	0.13		1.0	0.4	0.1	0.4	0.4	0.7	0.7	0.5	0.5	1.0	1.0	0.7	0.7	1.0	1.0	0.1	0.1	0.4	0.1
38.3	0.5	0		0.7	0.5	0.0	0.1	0.0	0.0	0.0	0.4	0.3	1.0	0.7	0.0	0.0	1.0	0.7	0.0	0.0	0.4	0.0
38.7	0	0		0.2	0.3	0.0	0.2	0.0	0.0	0.0	1.0	0.2	1.0	0.2	0.0	0.0	1.0	0.2	0.0	0.0	0.1	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

This spread sheet is brought to you by Poul Bech, Ron Ptolemy, and Rob Knight, B.C. Environment, Fisheries Section, May 1994.

(Modified by Harlan Wright, British Columbia Conservation Foundation, January 2003, using Febuary 2001 WUP HSI curves and Generic Insect curves from Stalnaker and Arnette, 1976).

DEPTH/VELOCITY TRANSECT DATA ANALYSIS SPREADSHEET
(CALCULATES W.U.A. & DISCHARGE)

STREAM:	Englishman
DATE:	15-Sep-03
SAMPLE TYPE:	discharge
SITE NAME:	d/s South Englishman

MAIN/SIDE CHANNEL:	M
METERED/EST.:	M
MEAN/SURFACE:	M
TRANSECT WIDTH:	21.8 m
METER TYPE:	Swoffer 2100
SENSOR DEPTH (from bottom):	40 %
METERED DISCHARGE:	1.5683 m^3s^{-1}

HYDRAULIC TYPE:	glide
WIDTH : DEPTH RATIO :	63.24
TRANSECT TYPE:	total
STREAM WIDTH:	21.8 m
NO. OF STATIONS:	23

ADJUSTED USABLE AREAS

% USABLE BY RBT FRY	48 %
% USABLE BY RBT PARR	67 %
% USABLE BY CT FRY	60 %
% USABLE BY CT PARR	86 %
% USABLE BY CHINOOK	70 %
% USABLE BY COHO	64 %
Generic Insect suitability	20 %

SITE WEIGHTED MEANS

MEAN DEPTH:	0.345 m
MEAN VELOCITY:	0.209 ms^{-1}
CROSS-SECT. AREA:	7.515 m^2

DEPTH/ VELOCITY DATA FOR WEIGHTED USABLE AREA (WUA) CALCULATIONS

Transect Data																						
station length (m)	depth (m)	velocity (m/s)	substrate	cell width (m)	cell mean depth (m)	cell mean velocity (m/s)	cell prob. RBT	usable width Fry (m)	cell prob. RBT Parr	usable width RBT Parr	cell prob. CT fry	usable width CT fry	cell prob CT parr	ısable width CT parr	cell prob. CH	usable width CH (m)	cell prob. CO	ısable width CO (m)	cell prob. Ins.	usable width Ins. (m)	cell area (sq. m)	cell discharge (cu. m/se
1.70	0.07	0.00		0.4	0.1	0.0	0.2	0.1	0.0	0.0	1.0	0.4	0.1	0.1	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0
2.5	0.13	0.00		0.9	0.1	0.0	0.2	0.2	0.0	0.0	1.0	0.9	0.4	0.3	0.0	0.0	0.7	0.7	0.0	0.0	0.1	0.0
3.5	0.23	0.03		1.0	0.2	0.0	0.8	0.8	0.2	0.2	1.0	1.0	1.0	1.0	0.2	0.2	1.0	1.0	0.0	0.0	0.2	0.0
4.5	0.23	0.05		1.0	0.2	0.1	0.9	0.9	0.3	0.3	1.0	1.0	1.0	1.0	0.4	0.4	1.0	1.0	0.1	0.1	0.2	0.0
5.5	0.35	0.27		1.0	0.4	0.3	0.5	0.5	1.0	1.0	0.5	0.5	1.0	1.0	1.0	1.0	0.4	0.4	0.3	0.3	0.4	0.1
6.5	0.52	0.30		1.0	0.5	0.3	0.2	0.2	1.0	1.0	0.1	0.1	1.0	1.0	1.0	1.0	0.3	0.3	0.4	0.4	0.5	0.2
7.5	0.54	0.27		1.0	0.5	0.3	0.2	0.2	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.4	0.4	0.3	0.3	0.5	0.1
8.5	0.46	0.29		1.0	0.5	0.3	0.3	0.3	1.0	1.0	0.1	0.1	1.0	1.0	1.0	1.0	0.4	0.4	0.4	0.4	0.5	0.1
9.5	0.46	0.19		1.0	0.5	0.2	0.4	0.4	0.9	0.9	0.4	0.4	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.5	0.1
10.5	0.47	0.25		1.0	0.5	0.3	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.5	0.5	0.3	0.3	0.5	0.1
11.5	0.46	0.29		1.0	0.5	0.3	0.3	0.3	1.0	1.0	0.1	0.1	1.0	1.0	1.0	1.0	0.4	0.4	0.4	0.4	0.5	0.1
12.5	0.50	0.20		1.0	0.5	0.2	0.3	0.3	0.9	0.9	0.4	0.4	1.0	1.0	0.9	0.9	0.7	0.7	0.2	0.2	0.5	0.1
13.5	0.43	0.19		1.0	0.4	0.2	0.4	0.4	0.9	0.9	0.5	0.5	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.4	0.1
14.5	0.45	0.25		1.0	0.5	0.3	0.3	0.3	1.0	1.0	0.4	0.4	1.0	1.0	1.0	1.0	0.5	0.5	0.3	0.3	0.5	0.1
15.5	0.48	0.24		1.0	0.5	0.2	0.3	0.3	1.0	1.0	0.4	0.4	1.0	1.0	1.0	1.0	0.6	0.6	0.3	0.3	0.5	0.1
16.5	0.43	0.26		1.0	0.4	0.3	0.4	0.4	1.0	1.0	0.4	0.4	1.0	1.0	1.0	1.0	0.5	0.5	0.3	0.3	0.4	0.1
17.5	0.38	0.18		1.0	0.4	0.2	0.6	0.6	0.8	0.8	0.7	0.7	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.4	0.1
18.5	0.27	0.19		1.0	0.3	0.2	0.9	0.9	0.8	0.8	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.3	0.1
19.5	0.30	0.04		1.0	0.3	0.0	0.7	0.7	0.2	0.2	1.0	1.0	1.0	1.0	0.3	0.3	1.0	1.0	0.0	0.0	0.3	0.0
20.5	0.18	0.12		1.0	0.2	0.1	1.0	1.0	0.4	0.4	1.0	1.0	0.9	0.9	0.6	0.6	0.9	0.9	0.1	0.1	0.2	0.0
21.5	0.13	0.05		1.0	0.1	0.1	0.9	0.9	0.1	0.1	1.0	1.0	0.4	0.4	0.2	0.2	0.7	0.7	0.0	0.0	0.1	0.0
22.5	0.08	0.01		1.0	0.1	0.0	0.5	0.5	0.0	0.0	1.0	1.0	0.2	0.2	0.0	0.0	0.5	0.5	0.0	0.0	0.1	0.0
23.5	0.03	0.00		0.5	0.1	0.0	0.2	0.1	0.0	0.0	1.0	0.5	0.1	0.1	0.0	0.0	0.3	0.2	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

This spread sheet is brought to you by Poul Bech, Ron Ptolemy, and Rob Knight, B.C. Environment, Fisheries Section, May 1994.

(Modified by Harlan Wright, British Columbia Conservation Foundation, January 2003, using Febuary 2001 WUP HSI curves and Generic Insect curves from Stalnaker and Arnette, 1976).

DEPTH/VELOCITY TRANSECT DATA ANALYSIS SPREADSHEET
(CALCULATES W.U.A. & DISCHARGE)

STREAM:	Englishman
DATE:	25-Sep-03
SAMPLE TYPE:	discharge
SITE NAME:	d/s Hwy 19A

MAIN/SIDE CHANNEL:	M
METERED/EST.:	M
MEAN/SURFACE:	M
TRANSECT WIDTH:	35.5 m
METER TYPE:	Swoffer 2100
SENSOR DEPTH (from bottom):	40 %
METERED DISCHARGE:	1.3638 m^3s^{-1}

HYDRAULIC TYPE:	glide
WIDTH : DEPTH RATIO :	130.75
TRANSECT TYPE:	total
STREAM WIDTH:	35.5 m
NO. OF STATIONS:	26

ADJUSTED USABLE AREAS

% USABLE BY RBT FRY	72 %
% USABLE BY RBT PARR	53 %
% USABLE BY CT FRY	82 %
% USABLE BY CT PARR	78 %
% USABLE BY CHINOOK	62 %
% USABLE BY COHO	79 %
Generic Insect suitability	13 %

SITE WEIGHTED MEANS

MEAN DEPTH:	0.272 m
MEAN VELOCITY:	0.141 ms^{-1}
CROSS-SECT. AREA:	9.639 m^2

DEPTH/ VELOCITY DATA FOR WEIGHTED USABLE AREA (WUA) CALCULATIONS

Transect Data: station length (m)	depth (m)	velocity (m/s)	substrate	cell width (m)	cell mean depth (m)	cell mean velocity (m/s)	cell prob. RBT	usable width Fry (m)	cell prob. RBT Parr	usable width RBT Parr	cell prob. CT fry	usable width CT fry	cell prob CT parr	usable width CT parr	cell prob. CH	usable width CH (m)	cell prob. CO	usable width CO (m)	cell prob. Ins.	usable width Ins. (m)	cell area (sq. m)	cell discharge (cu. m/se
0.30	0.00	0.00		0.4	0.0	0.0	0.2	0.1	0.0	0.0	1.0	0.4	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
1.0	0.10	0.02		1.1	0.1	0.0	0.7	0.8	0.0	0.0	1.0	1.1	0.3	0.3	0.0	0.0	0.6	0.7	0.0	0.0	0.1	0.0
2.5	0.13	0.01		1.5	0.1	0.0	0.5	0.8	0.0	0.0	1.0	1.5	0.4	0.5	0.0	0.1	0.7	1.1	0.0	0.0	0.2	0.0
4.0	0.10	0.06		1.5	0.1	0.1	1.0	1.4	0.1	0.2	1.0	1.5	0.3	0.4	0.1	0.2	0.6	0.9	0.0	0.1	0.2	0.0
5.5	0.12	0.13		1.5	0.1	0.1	1.0	1.5	0.3	0.4	1.0	1.5	0.4	0.5	0.3	0.5	0.7	1.0	0.1	0.2	0.2	0.0
7.0	0.11	0.17		1.5	0.1	0.2	1.0	1.5	0.3	0.4	1.0	1.5	0.3	0.4	0.3	0.5	0.6	0.8	0.1	0.2	0.2	0.0
8.5	0.15	0.13		1.5	0.2	0.1	1.0	1.5	0.4	0.6	1.0	1.5	0.5	0.8	0.5	0.7	0.8	1.2	0.1	0.2	0.2	0.0
10.0	0.15	0.14		1.5	0.2	0.1	1.0	1.5	0.4	0.6	1.0	1.5	0.5	0.8	0.5	0.7	0.8	1.1	0.1	0.2	0.2	0.0
11.5	0.15	0.18		1.5	0.2	0.2	1.0	1.5	0.5	0.7	1.0	1.5	0.5	0.8	0.6	0.8	0.6	1.0	0.2	0.3	0.2	0.0
13.0	0.22	0.22		1.5	0.2	0.2	0.9	1.4	0.8	1.1	0.9	1.3	1.0	1.5	1.0	1.4	0.6	0.9	0.2	0.4	0.3	0.1
14.5	0.22	0.21		1.5	0.2	0.2	1.0	1.5	0.7	1.1	0.9	1.3	1.0	1.5	1.0	1.4	0.7	1.0	0.2	0.3	0.3	0.1
16.0	0.23	0.18		1.5	0.2	0.2	1.0	1.5	0.7	1.1	1.0	1.5	1.0	1.5	0.9	1.3	0.8	1.2	0.2	0.3	0.3	0.1
17.5	0.26	0.18		1.5	0.3	0.2	1.0	1.5	0.8	1.2	1.0	1.5	1.0	1.5	0.9	1.3	0.8	1.2	0.2	0.3	0.4	0.1
19.0	0.19	0.15		1.5	0.2	0.2	1.0	1.5	0.5	0.8	1.0	1.5	0.9	1.3	0.7	1.1	0.8	1.3	0.2	0.2	0.3	0.0
20.5	0.27	0.16		1.5	0.3	0.2	0.9	1.4	0.7	1.1	1.0	1.5	1.0	1.5	0.8	1.3	0.9	1.3	0.2	0.2	0.4	0.1
22.0	0.31	0.18		1.5	0.3	0.2	0.8	1.2	0.8	1.2	0.9	1.3	1.0	1.5	0.9	1.3	0.8	1.2	0.2	0.3	0.5	0.1
23.5	0.35	0.17		1.5	0.4	0.2	0.7	1.0	0.8	1.2	0.9	1.3	1.0	1.5	0.9	1.3	0.8	1.3	0.2	0.3	0.5	0.1
25.0	0.37	0.15		1.5	0.4	0.2	0.6	0.9	0.8	1.1	0.7	1.0	1.0	1.5	0.8	1.2	0.9	1.4	0.2	0.2	0.6	0.1
26.5	0.44	0.16		1.5	0.4	0.2	0.4	0.6	0.8	1.2	0.5	0.8	1.0	1.5	0.8	1.3	0.9	1.3	0.2	0.2	0.7	0.1
28.0	0.47	0.09		1.5	0.5	0.1	0.3	0.5	0.5	0.8	0.4	0.6	1.0	1.5	0.6	0.9	1.0	1.5	0.1	0.1	0.7	0.1
29.5	0.40	0.12		1.5	0.4	0.1	0.5	0.8	0.6	0.9	0.7	1.0	1.0	1.5	0.7	1.1	1.0	1.5	0.1	0.2	0.6	0.1
31.0	0.50	0.12		1.5	0.5	0.1	0.3	0.4	0.6	0.9	0.4	0.6	1.0	1.5	0.7	1.1	1.0	1.5	0.1	0.2	0.8	0.1
32.5	0.45	0.16		1.5	0.5	0.2	0.4	0.6	0.8	1.2	0.5	0.8	1.0	1.5	0.8	1.3	0.9	1.3	0.2	0.2	0.7	0.1
34.0	0.62	0.13		1.5	0.6	0.1	0.1	0.2	0.7	1.0	0.2	0.2	1.0	1.5	0.7	1.1	1.0	1.4	0.1	0.2	0.9	0.1
35.5	0.21	0.00		0.9	0.2	0.0	0.2	0.2	0.0	0.0	1.0	0.9	1.0	0.9	0.0	0.0	1.0	0.9	0.0	0.0	0.2	0.0
35.8	0.00	0.00		0.1	0.1	0.0	0.2	0.0	0.0	0.0	1.0	0.1	0.3	0.0	0.0	0.0	0.6	0.1	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

This spread sheet is brought to you by Poul Bech, Ron Ptolemy, and Rob Knight, B.C. Environment, Fisheries Section, May 1994.

(Modified by Harlan Wright, British Columbia Conservation Foundation, January 2003, using Febuary 2001 WUP HSI curves and Generic Insect curves from Stalnaker and Arnette, 1976).

DEPTH/VELOCITY TRANSECT DATA ANALYSIS SPREADSHEET
(CALCULATES W.U.A. & DISCHARGE)

STREAM:	Englishman
DATE:	25-Sep-03
SAMPLE TYPE:	discharge
SITE NAME:	d/s South Englishman

MAIN/SIDE CHANNEL:	M
METERED/EST.:	M
MEAN/SURFACE:	M
TRANSECT WIDTH:	22.4 m
METER TYPE:	Swoffer 2100
SENSOR DEPTH (from bottom):	40 %
METERED DISCHARGE:	1.2600 m^3s^{-1}

HYDRAULIC TYPE:	glide
WIDTH : DEPTH RATIO :	73.04
TRANSECT TYPE:	total
STREAM WIDTH:	22.4 m
NO. OF STATIONS:	24

ADJUSTED USABLE AREAS

% USABLE BY RBT FRY	51 %
% USABLE BY RBT PARR	60 %
% USABLE BY CT FRY	68 %
% USABLE BY CT PARR	80 %
% USABLE BY CHINOOK	64 %
% USABLE BY COHO	68 %
Generic Insect suitability	17 %

SITE WEIGHTED MEANS

MEAN DEPTH:	0.307 m
MEAN VELOCITY:	0.183 ms^{-1}
CROSS-SECT. AREA:	6.870 m^2

DEPTH/ VELOCITY DATA FOR WEIGHTED USABLE AREA (WUA) CALCULATIONS

Transect Data																								
station length (m)	depth (m)	velocity (m/s)	substrate	cell width (m)	cell mean depth (m)	cell mean velocity (m/s)	cell prob. RBT	usable width Fry (m)	cell prob. RBT Parr	usable width RBT Parr	cell prob. CT fry	usable width CT fry	cell prob CT parr	usable width CT parr	cell prob. CH	usable width CH (m)	cell prob. CO	usable width CO (m)	cell prob. Ins.	usable width Ins. (m)	cell area (sq. m)	cell discharge (cu. m/se
0.60	0.00	0.00	bc	0.5	0.0	0.0	0.1	0.1	0.0	0.0	1.0	0.5	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0
1.5	0.12	0.00	bc	1.0	0.1	0.0	0.2	0.2	0.0	0.0	1.0	1.0	0.4	0.3	0.0	0.0	0.7	0.7	0.0	0.0	0.1	0.0
2.5	0.14	0.01	bc	1.0	0.1	0.0	0.5	0.5	0.0	0.0	1.0	1.0	0.5	0.5	0.0	0.0	0.8	0.8	0.0	0.0	0.1	0.0
3.5	0.21	0.11	bc	1.0	0.2	0.1	1.0	1.0	0.5	0.5	1.0	1.0	1.0	1.0	0.7	0.7	1.0	1.0	0.1	0.1	0.2	0.0
4.5	0.33	0.13	bc	1.0	0.3	0.1	0.8	0.8	0.7	0.7	0.9	0.9	1.0	1.0	0.7	0.7	1.0	1.0	0.1	0.1	0.3	0.0
5.5	0.50	0.17	bc	1.0	0.5	0.2	0.3	0.3	0.8	0.8	0.4	0.4	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.5	0.1
6.5	0.45	0.18	bc	1.0	0.5	0.2	0.4	0.4	0.8	0.8	0.5	0.5	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.5	0.1
7.5	0.41	0.29	bc	1.0	0.4	0.3	0.3	0.3	1.0	1.0	0.2	0.2	1.0	1.0	1.0	1.0	0.4	0.4	0.4	0.4	0.4	0.1
8.5	0.47	0.26	cb	1.0	0.5	0.3	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.5	0.5	0.3	0.3	0.5	0.1
9.5	0.42	0.20	bc	1.0	0.4	0.2	0.5	0.5	0.9	0.9	0.5	0.5	1.0	1.0	0.9	0.9	0.7	0.7	0.2	0.2	0.4	0.1
10.5	0.43	0.28	bg	1.0	0.4	0.3	0.3	0.3	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	0.4	0.4	0.4	0.4	0.4	0.1
11.5	0.42	0.26	bg	1.0	0.4	0.3	0.4	0.4	1.0	1.0	0.4	0.4	1.0	1.0	1.0	1.0	0.5	0.5	0.3	0.3	0.4	0.1
12.5	0.35	0.24	cb	1.0	0.4	0.2	0.6	0.6	1.0	1.0	0.8	0.8	1.0	1.0	1.0	1.0	0.6	0.6	0.3	0.3	0.4	0.1
13.5	0.38	0.24	bc	1.0	0.4	0.2	0.5	0.5	1.0	1.0	0.6	0.6	1.0	1.0	1.0	1.0	0.6	0.6	0.3	0.3	0.4	0.1
14.5	0.47	0.19	bc	1.0	0.5	0.2	0.3	0.3	0.9	0.9	0.4	0.4	1.0	1.0	0.9	0.9	0.8	0.8	0.2	0.2	0.5	0.1
15.5	0.41	0.20	cg	1.0	0.4	0.2	0.5	0.5	0.9	0.9	0.5	0.5	1.0	1.0	0.9	0.9	0.7	0.7	0.2	0.2	0.4	0.1
16.5	0.49	0.10	bc	1.0	0.5	0.1	0.3	0.3	0.6	0.6	0.4	0.4	1.0	1.0	0.6	0.6	1.0	1.0	0.1	0.1	0.5	0.0
17.5	0.13	0.24	cb	1.0	0.1	0.2	0.9	0.9	0.5	0.5	0.9	0.9	0.4	0.4	0.5	0.5	0.4	0.4	0.3	0.3	0.1	0.0
18.5	0.13	0.09	gc	1.0	0.1	0.1	1.0	1.0	0.2	0.2	1.0	1.0	0.4	0.4	0.3	0.3	0.7	0.7	0.1	0.1	0.1	0.0
19.5	0.23	0.10	bc	1.0	0.2	0.1	1.0	1.0	0.5	0.5	1.0	1.0	1.0	1.0	0.6	0.6	1.0	1.0	0.1	0.1	0.2	0.0
20.5	0.21	0.05	bc	1.0	0.2	0.1	0.9	0.9	0.2	0.2	1.0	1.0	1.0	1.0	0.3	0.3	1.0	1.0	0.1	0.1	0.2	0.0
21.5	0.11	0.00	bc	1.0	0.1	0.0	0.2	0.2	0.0	0.0	1.0	1.0	0.3	0.3	0.0	0.0	0.7	0.7	0.0	0.0	0.1	0.0
22.5	0.06	0.00		0.8	0.1	0.0	0.2	0.2	0.0	0.0	1.0	0.8	0.1	0.1	0.0	0.0	0.4	0.3	0.0	0.0	0.0	0.0
23.0	0.00	0.00		0.3	0.0	0.0	0.1	0.0	0.0	0.0	1.0	0.3	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

This spread sheet is brought to you by Poul Bech, Ron Ptolemy, and Rob Knight, B.C. Environment, Fisheries Section, May 1994.

(Modified by Harlan Wright, British Columbia Conservation Foundation, January 2003, using Febuary 2001 WUP HSI curves and Generic Insect curves from Stalnaker and Arnette, 1976).

Appendix B

Stage/discharge relationship for Morison Creek semi-permanent flow station.

Stage (m)	Discharge (m^3/s)
0.242	0.0084
0.243	0.0101
0.255	0.0156
0.251	0.005
0.251	0.0075
0.246	0.0061
0.262	0.0066
0.268	0.0069
0.295	0.0075
0.436	0.3923
0.37	0.1406
0.307	0.0672
0.265	0.0188
0.248	0.0112