Detailed Fish Habitat, Riparian and Channel Assessment for Select Central Bulkley River Tributaries

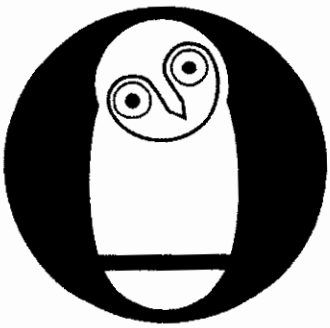
Appendices A-G

Prepared for:

Bulkley Morice Salmonid Preservation Group
c/o Community Futures Development Corporation of Nadina

Prepared by:

Greg Tamblyn
Resource Management Consultant
Smithers, BC.
&
Matthew Jessop
British Columbia Conservation Foundation
Smithers, BC.



February 29, 2000

APPENDIX A. OVERALL RATINGS AND RANKINGS FROM OVERVIEW ASSESSMENT AND DECISION MATRIX

Stream	Reach	Reach Length (m)	Matrix Score	Ranking	Comments
Helps	2	150	25.30	1	S3, CH and CO present, short reach, 2 crossings
Unnamed	1	1400	15.86	2	Steep gully, 6.2% gradient
Vanderven	1	1800	15.10	3	
McDowell	1	4200	14.95	4	CO present at Bulkley R., small creek, low priority
Unnamed	2	1200	14.67	5	Steep gully, 6% gradient
Thompson	1B	4300	14.00	6	Length for all of reach 1
Helps	3A	1200	13.70	7	Several crossings
Helps	6	2800	13.40	8	Heavily logged, no access
Deep Creek	1	5000	12.90	9	
de Jong	1B	600	12.20	10	
Stock	2	1000	12.00	11	Small creek, low priority
Coffin	1B	1950	12.00	12	Large channel through logged wetland
Edward	4	4200	12.00	13	Logged, but poor access
Helps	1	300	12.00	14	S2 classification, side/back channel of Bulkley R.
McDowell	2	2200	12.00	15	Small creek, low priority
Mathews	3	2100	11.90	16	S4 classification - low priority
Lemieux	5	3800	11.79	17	
Robin	2	4200	11.74	18	
Mathews	2	600	11.70	19	S4 classification - low priority
Deep Creek	2	5800	11.50	20	
Vallee	5A	2500	11.40	21	S4 - low priority
Coffin	1A	2950	11.40	22	Heavily logged
Lemieux	1	2400	11.25	23	
Stock	3	1500	11.20	24	
Unnamed	3	4600	11.00	25	Steep gully, 10.5% gradient
Stock	4	2600	11.00	26	S4 - low priority
Edward	2	2000	11.00	27	
Edward	3	7400	11.00	28	
Robin	3	400	11.00	29	
Thompson	2	6400	10.80	30	
Robin	1	2000	10.50	31	
de Jong	2A	960	10.50	32	
Vallee	2C	1200	10.30	33	
Gibson	3	1000	10.00	34	Heavily impacted riparian, access issues
Helps	7	1400	10.00	35	15% gradient, no access
Lemieux	3	1200	10.00	36	Heavily impacted riparian
Edward	1	1400	9.63	37	
McDowell	5	1600	9.63	38	
Vallee	1	4400	9.50	39	
Robin	6B	1200	9.50	40	
Stock	1	700	9.40	41	
Gibson	1	1800	9.00	42	
McDowell	3	2800	9.00	43	

Stream	Reach	Reach Length (m)	Matrix Score	Ranking	Comments
Vanderven	5	1800	9.00	44	
Mathews	1	1300	8.80	45	Small stream with little flow in summer
Vallee	2B	1600	8.60	46	
Helps	5	1600	8.60	47	
Deep Creek	4	1400	8.00	48	
Stock	5	600	8.00	49	S4 - low priority
Robin	6C	2050	8.00	50	
de Jong	3	6000	7.80	51	
Vanderven	2	4000	7.50	52	
Vanderven	6	2700	7.50	53	S4 - low priority
Deep Creek	3	1200	7.00	54	
Thompson	1A	4300	7.00	55	Length for all of reach 1
Vallee	2A	900	7.00	56	
Vallee	5B	1300	7.00	57	S4 - low priority
Lemieux	2	400	7.00	58	Pond/wetland
Lemieux	4	200	7.00	59	Pond/wetland
de Jong	2B	1700	7.00	60	
Gibson	2	1300	6.00	61	
Vallee	3	1000	6.00	62	Wetland
Robin	5	400	6.00	63	
Robin	6A	350	6.00	64	
Vanderven	4	900	6.00	65	
Coffin	1C	1500	5.00	66	Large channel through wetland
de Jong	1A	400	5.00	67	
Helps	3B	1800	4.00	68	Wetland
Helps	4	110	4.00	69	Lake/pond, no access
McDowell	4	400	3.00	70	Lake/pond
Robin	4	100	3.00	71	
Vallee	4	600	0.00	72	Lake
Vanderven	3	190	0.00	73	
Dahlie	1	268			Level 1 assessment by default
Dahlie	2	280			Level 1 assessment by default
Dahlie	3A	2300			Level 1 assessment by default

= Level 1 assessment conducted

APPENDIX B. SUMMARY OF KEY REACH CHARACTERISTICS

Stream	Reach	Riparian Function	LWD Function	Functional LWD/ Wb	Pool Frequency	Pool/Wb ratio	Comp Index
Robin	1	M-H	M	0.16	L		3.65
	2	L	L	0.09	L	12	3.14
	3	L	L	0.04	L	0	2.51
Lemieux	1	L	L	0.14	L	12	3.3
	3	L	L	0.25	M	9	3.39
	5	M-H	M	0.35	M	8.4	3.5
Vanderven	1	L	L	0.03	L	16.4	2.64
	2A	M	M	0.31	L	19	3.37
deJong	1	L-M	M	0.42	M	11	2.84
	2	H	M-H	0.42	L	20	3.1
Deep	1	L-M	M-H	0.66	H	4.3	3.2
	2	M-H	M	0.35	H	3.7	3.73
Thompson	1	L-M	L	0.36	H	7.8	3.51
	2	M	M	0.35	H	6.7	3.34
Helps	1	M	L				
	2	L-M	L	0.31	H	4.8	3.17
	3	M	L-M		H		3.85
Moan	1	M-H	M	0.43	H	5.5	3.84
	2	M-H	M	0.63	L	13.2	3.48
Coffin Lk	1	M-H	M	0.56	H	7.5	3.67

Level 1 - Habitat Summary Diagnosis Report

Form Number:	1
Forest District:	BULKLEY
Watershed Name:	COFFIN LAKE
Watershed Code:	460-472700-00000-00000-0000-0000-000-000-000-000-000-000
Survey Date:	99/09/20
Weather:	Partly cloudy
Survey Crew:	MJ,GT,GG,RH
Discharge:	0.6 (cubic meters per second)

Subsampling Fractions:

Riffles	Pools	Glides	Cascades	Other
1 IN 30	1 IN 20	1 IN 32	1 IN 36	0 IN 15

NTS Maps (1:50,000):	BCGS Maps (1:20,000):
93L10	93L055
93L11	93L056
	93L066

Detail No.	Sub Basin Name	Reach No.	Section No.	UTM Zone	UTM Easting	UTM Northing	Distance (m)	Habitat Unit Type	Habitat Unit Cat	Length (m)	Grad (%)	Air Temp (C)	Water Temp (C)	Mean Depth Bankfull (m)	Mean Depth Water (m)	Mean Width Bankfull (m)	Mean Width Wetted (m)	Pools Only Max Depth	Pools Only Crest (m)
1	COFFIN LAKE	1	A	9	634580	6054510	20	P	3	3	1			0.45	0.23	6.5	4.2	0.5	0.15

Comments :

Unit will be a back channel of the Bulkley during high flow, LWD is rootwad

2	COFFIN LAKE	1	A	9	634420	6054470	188	G	1	4	2			0.45	0.14	6.6	4.8		

Comments :

3	COFFIN LAKE	1	A	9	634420	6054460	197	R	1	2	2			0.5	0.18	6.3	1.8		

Comments :

Small, non-representative riffle.

4	COFFIN LAKE	1	A	9	634320	6054340	352	C	1	8	3			0.35	0.1	6.2	5.1		

Comments :

Directly upstream of Lawson Road culvert.

Form Number
1

Pools Only		Bed Material Type						Total	Functional LWD			Cover				Offchannel Habitat			Photo	Riparian Vegetation			Barriers
Residual	Pool Type	Dom	Sub-Dom	D (cm)	Comp-action	SG Type	SG Amt	LWD Tally	10 - 20cm	20 - 50cm	>50c	Cover Type 1	%	Cover Type 2	%	Type	Access	Length (m)	Roll/Frame	Type	Structure	Canopy Closure	
0.35	S	C	G	10	M	AR	N	1			1	LWD	50							D	YF	5	N
		C	G	15	M	AR	H	1			1	OV	20	LWD	5				G3-2,1	D	YF	5	N
		C	G	14	M	R	L	0				OV	25	C	5					D	YF	5	N
		C	G	14	M	AR	N	0				OV	10	B	10					S	SHR	1	N

Level 1 - Habitat Summary Diagnosis Report

5	COFFIN LAKE	1	A	9	634230	6054140	656	G	1	5	3		11	0.45	0.21	6.4	3.1		

Comments :

6	COFFIN LAKE	1	A	9	634170	6054160	680	R	1	6	3.5			0.35	0.22	6.2	3		

Comments :

7	COFFIN LAKE	1	A	9	634180	6053550	1147	P	1	3	2.5			0.5	0.28	4.9	3.5	0.5	0.1

Comments :

8	COFFIN LAKE	1	A	9	634180	6053550	1151	C	1	4	2.5			0.4	0.1	6	5.1		

Comments :

Cascade directly upstream of pool.

9	COFFIN LAKE	1	A	9	634170	6053570	1177	R	1	7	2.5			0.4	0.16	7.7	5.7		

Comments :

10	COFFIN LAKE	1	A	9	634330	6052820	2045	R	1	8	1.8		12	0.49	0.22	4.9	4.3		

Comments :

11	COFFIN LAKE	1	A	9	634330	6052820	2052	G	1	4	1.8		12	0.57	0.28	4.6	3.4		

Comments :

12	COFFIN LAKE	1	A	9	634400	6052680	2141	P	1	4	1.5		11	0.84	0.43	4.1	2.7	0.73	0.31

Comments :

13	COFFIN LAKE	1	A	9	634493	6052530	2505	R	1	3	2.3		12	0.56	0.2	3.9	3.1		

Comments :

14	COFFIN LAKE	1	A	9	634480	6052572	2532	G	1	4	2		12	0.71	0.32	4.7	3.6		

Comments :

		C	G	12	M	AR	L	0				OV	10	B	10				G4-22,21	M	MF	2	N
		C	G	16	M	AR	N	0				OV	15	B	15					M	MF	3	N
0.4	S	G	C	22	M	R	L	2	0	1	0	LWD	20	OV	5				G4-20,19	M	MF	4	N
		C	G	17	M	R	L	1	0	0	0	B	15	OV	5				G4-20,19	M	MF	1	N
		C	B	19	M	R	L	0				B	20	OV	15					M	MF	1	N
		C	G	28	H	A	L	4	1	0	0	B	25	LWD	5					C	MF	2	N
		C	B	25	H	A	L	2	0	0	0	B	30	OV	20					C	MF	2	N
0.42	S	C	B	21	H	AR	L	2	0	0	0	C	15	B	5					M	MF	3	N
		C	B	15	H	A	L	4	3	1	0	LWD	15	B	10					M	MF	1	N
		C	B	25	H	A	L	1	0	0	0	B	15	OV	10					M	MF	2	N

Level 1 - Habitat Summary Diagnosis Report

15	COFFIN LAKE	1	A	9	634284	6052079	3057	G	2	4	1.5		7	0.38	0.21	2.4	2.1		

Comments :

16	COFFIN LAKE	1	A	9	634220	6052180	3072	R	1	2	1.5		7	0.36	0.18	3.9	3.1		

Comments :

17	COFFIN LAKE	1	A	9	634074	6052112	3232	P	1	5	1		7	0.49	0.34	9.2	7.7	0.45	0.21

Comments :

		G	C	12	H	R	H	4	2	1	0	LWD	10	OV	5	SC	G	12		C	MF	2	N

		C	G	19	H	AR	N	3	1	0	0	SWD	20	B	10	SC	G	17		C	MF	1	N

0.23	D	G	C	14	M	AR	L	11	4	3	0	LWD	30	SWD	10					D	PS	2	N

Level 1 - Habitat Summary Diagnosis Report

Form Number:	Forest District:	BULKLEY
2	Watershed Name:	HELPS CREEK
	Watershed Code:	460-437000-00000-00000-0000-0000-000-000-000-000-000-000

Survey Date: 99/09/08 Weather: SHOWERS, 12C Survey Crew: GT, RH, MJ, GG

Discharge: 0.13 (cubic meters per second)

Subsampling Fractions:

Riffles	Pools	Glides	Cascades	Other
0 IN 1	1 IN 6	1 IN 7	0 IN 0	1 IN 5

NTS Maps (1:50,000):	93L10	BGGS Maps (1:20,000):	93L065
			93L055

Detail No	Sub Basin Name	Reach No	Section No	UTM Zone	UTM Easting	UTM Northing	Distance (m)	Habitat Unit Type	Habitat Unit Cat	Length (m)	Grad (%)	Air Temp. (C)	Water Temp. (C)	Mean Depth Bankfull (m)	Mean Depth Water (m)	Mean Width Bankfull (m)	Mean Width Wetted (m)	Pools Only Max Depth	Pools Only Crest (m)
1	HELPS CREE	2	A	9	628250	6059454	36	P	1	8	0.5	12	11	0.9	0.55	4.8	4.8	1	0.25

Comments :

Fence in centre of pool may impede adult fish migration.

2	HELPS CREE	2	A	9	628229	6059453	72	G	1	9	0.5	12	11	0.77	0.27	5.2	4.1		

Comments :

Gradient less than 0.5%

3	HELPS CREE	2	A	9	628155	6059323	170	O	1	10	0	12		0.9	0.3	7	2.8		

Comments :

D value is less than 1(too small to even measure).

4	HELPS CREE	3	A	9	628213	6059189	61	P	1	10	0.5	14		0.58	0.48	4.5	4.1	0.87	0.22

Comments :

Heavily braided willow wetland. D value less than 1. Gradient less than 0.5.

Form Number
2

Pools Only		Bed Material Type						Total	Functional LWD			Cover				Offchannel Habitat			Photo	Riparian Vegetation			Barriers
Residual	Pool Type	Dom.	Sub-Dom.	D (cm)	Compaction	SG Type	SG Amt	LWD Tally	10 - 20cm	20 - 50cm	>50c	Cover Type 1	%	Cover Type 2	%	Type	Access	Length (m)	Roll/Frame	Type	Structure	Canopy Closure	
0.75	S	G	S	1		AR	N	0				IV	30	C	15				G1-17	S	SHR	1	N
		G	S	8		AR	L	0				IV	60	OV	5				G1-16	S	SHR	1	N
		S		1		AR	N	1	0	1	0	IV	40	LWD	5	SL	P	10	G1-13	S	SHR	2	N
0.65	S	S	G	1		AR	N	0				IV	20	OV	10				G1-9	S	SHR	1	N

Level 1 - Habitat Summary Diagnosis Report

Form Number:	Forest District:	BULKLEY
3	Watershed Name:	THOMPSON CREEK
	Watershed Code:	460-517700-00000-00000-0000-0000-000-000-000-000-000-000

Survey Date: 99/09/21 | Weather: Sunny | Survey Crew: GT,MJ,GG,RH

Discharge: 0.06 (cubic meters per second)

Subsampling Fractions:

Riffles	Pools	Glides	Cascades	Other
1 IN 24	1 IN 22	1 IN 24	1 IN 24	1 IN 23

NTS Maps (1:50,000)	BGGS Maps (1:20,000)
93L10	93L056
93L07	93L057
	93L047

Detail No	Sub Basin Name	Reach No	Section No	UTM Zone	UTM Easting	UTM Northing	Distance (m)	Habitat Unit Type	Habitat Unit Cat	Length (m)	Grad (%)	Air Temp (C)	Water Temp (C)	Mean Depth Bankfull (m)	Mean Depth Water (m)	Mean Width Bankfull (m)	Mean Width Wetted (m)	Pools Only Max Depth	Pools Only Crest (m)
1	THOMPSON C	1	A	9	640050	6048080	7	P	2	2	1			0.5	0.25	7.1	3.9	0.4	0.1

Comments :

Entire area likely floods when Bulkley is high.

2	THOMPSON C	1	A	9	640100	6048140	131	R	1	2	0.5		10	0.25	0.05	5.2	2.8		

Comments :

Small habitat unit, covers half the wetted width.

3	THOMPSON C	1	A	9	640110	6048150	145	G	1	13	0.5			0.47	0.17	4.3	3.7		

Comments :

5 m. riparian zone on right bank.

4	THOMPSON C	1	C	9	640250	6048540	789	C	1	4	3.5		10	0.4	0.08	4.8	3.1		

Comments :

Time: 15:15

Form Number:
3

Pools Only		Bed Material Type						Total	Functional LWD			Cover				Offchannel Habitat			Photo	Riparian Vegetation			Barriers
Residual	Pool Type	Dom	Sub-Dom	D (cm)	Compaction	SG Type	SG Amt	LWD Tally	10 - 20cm	20 - 50cm	>50c	Cover Type 1	%	Cover Type 2	%	Type	Access	Length (m)	Roll/Frame	Type	Structure	Canopy Closure	
0.3	S	G	S	5	M	R	L	1	0	1	0	OV	20	LWD	5					S	SHR	1	N
		G		6	M	R	L	0				OV	5							D	SHR	1	N
		G	S	6	M	R	L	0				IV	5						G4-15,14	D	SHR	3	N
		C	G	19	M	AR	N	0				B	10	OV	5				G4-11,10	D	YF	3	N

Level 1 - Habitat Summary Diagnosis Report

5	THOMPSON C	1	C	9	640430	6048670	1050	G	1	5	2		8	0.3	0.05	7.1	4.5		

Comments :

Left bank riparian is a mature deciduous forest. Right bank is slumped into creek, bare due to CWD redirecting stream into bank.

6	THOMPSON C	1	C	9	640430	6048710	1075	R	1	9	0.75			0.35	0.1	4.3	3.3		

Comments :

Right bank riparian is a young deciduous forest.

7	THOMPSON C	1	C	9	640520	6048850	1230	C	1	4	3			0.3	0.15	6.1	2		

Comments :

Right bank riparian area is unvegetated.

8	THOMPSON C	1	C	9	640630	6048920	1361	G	1	2	2			0.4	0.15	4.1	2.4		

Comments :

Just downstream of farmer's road crossing.

9	THOMPSON C	1	C	9	640630	6048940	1381	P	1	5	1.5			0.3	0.23	3.5	2.3	0.45	0.05

Comments :

This section of stream meanders.

10	THOMPSON C	1	C	9	640680	6048960	1452	R	1	4	1.5		10	0.4	0.1	4.8	2.7		

Comments :

11	THOMPSON C	1	C	9	640700	6049030	1560	G	1	5	0.5			0.48	0.18	5.1	3.3		

Comments :

Stream is braided into two channels.

12	THOMPSON C	1	C	9	640720	6049100	1686	R	1	2	2			0.3	0.07	3.8	1.5		

Comments :

Fast, shallow riffle.

13	THOMPSON C	1	C	9	640760	6049200	1846	O	2	13	2			0.25	0.1	6.7	3.5		

Comments :

D value less than 1. Depth and width measurements are for full stream. Vegetated bar separating main channel and other.

14	THOMPSON C	1	C	9	640770	6049220	1862	P	1	6	1.5			0.75	0.5	5.3	3.5	0.7	0.15

Comments :

Saw large Western Toad.

		C	S	16	M	AR	N	0				B	15	OV	15				G4-7	N	INIT	1	N	
		G	S	14		AR	H	0				B	5	SWD	3					D	PS	3	N	
		C	B	26		AR	N	0				B	25	OV	5				G4-3,2	D	MF	1	N	
		C	G	19	M	AR	N	0				OV	25	B	10					S	SHR	4	N	
0.4	S	S	G	5		AR	L	1	1	0	0	OV	15	LWD	5					S	SHR	3	N	
		G	S	3		AR	H	1	0	1	0	LWD	5	SWD	5					S	SHR	2	N	
		S	G	1		AR	N	2	1	1	0	LWD	5	OV	5					S	SHR	2	N	
		G	S	5		R	L	1	0	0	0	OV	30	SWD	2					S	SHR	1	N	
		S		1		AR	N	1	1	0	0	OV	20	C	10	SC	G	13	G5-24,23	M	YF	1	N	
0.55	S	G	S	3		AR	N	7	1	4	0	LWD	10	OV	10				G5-22,21	M	YF	1	N	

Level 1 - Habitat Summary Diagnosis Report

15	THOMPSON C	1	C	9	640810	6049280	1965	G	1	6	1.5		7	0.6	0.12	5.6	4.9		

Comments :

16	THOMPSON C	1	C	9	640860	6049310	2021	R	1	2	0.5			0.3	0.07	4.6	2.2		

Comments :

Riparian is more open here than at last few sites. Shallow, fast riffle.

17	THOMPSON C	1	C	9	641050	6049420	2319	P	1	5	0.5			0.72	0.34	3.8	2.8	0.5	0.15

Comments :

18	THOMPSON C	1	C	9	641070	6049420	2338	G	1	5	0.5			0.38	0.18	3.3	2.3		

Comments :

Eastern aspect.

19	THOMPSON C	1	C	9	641120	6049420	2389	R	1	2	1.5			0.33	0.08	5.4	3.5		

Comments :

Northeastern aspect.

20	THOMPSON C	1	C	9	641320	6049450	2827	G	1	8	2		9	0.45	0.2	3.9	3		

Comments :

Photo of CT. N aspect. Time: 15:00

21	THOMPSON C	1	C	9	641400	6049550	2966	R	1	2	1		9	0.4	0.1	4.6	3.2		

Comments :

Shallow, fast riffle. SE aspect. Time: 15:30

22	THOMPSON C	1	C	9	641450	6049550	3104	C	1	2	1			0.6	0.12	4.1	2		

Comments :

SSE aspect. 16:00

23	THOMPSON C	1	C	9	641889	6049010	3592	R	1	4	1		9	0.41	0.09	4.8	3.6		

Comments :

12:00

24	THOMPSON C	1	C	9	641979	6048928	3710	G	1	15	1		9	0.41	0.18	5.25	4.6		

Comments :

		S	G	8	L	AR	L	8	5	0	0	OV	20	LWD	15						M	YF	1	N
		G	S	5	M	R	L	0				OV	10	C	5				G5-20,19		M	YF	1	N
0.35	S	G	S	7	M	AR	N	3	0	0	0	C	10	OV	5				G5-18		M	YF	4	N
		G	C	7	M	AR	L	2	0	0	0	OV	5	LWD	3				G5-17		M	YF	3	N
		G	C	14	M	AR	N	0				SWD	5	OV	5						M	YF	5	N
		C	G	9	M	AR	N	4	3	0	0	C	5	LWD	5				G5-14,13		M	YF	4	N
		G	C	8	M	AR	N	1	1	0	0	C	5								D	PS	5	N
		C	G	7	M	AR	N	2	2	0	0	OV	20								D	YF	5	N
		G	C	16	H	AR	L	1	0	0	0	OV	20	C	5						D	MF	3	N
		G	C	14	H	AR	H	4	1	0	0	B	25	OV	10				M3-6		D	MF	3	N

Level 1 - Habitat Summary Diagnosis Report

25	THOMPSON C	1	C	9	642098	6049137	3766	P	1	4	1		10	0.57	0.29	4.3	3.9	0.46	0.09

Comments :

14:00

26	THOMPSON C	1	C	9	642360	6048804	4166	R	1	4	1.25		8	0.56	0.08	4.6	2.7		

Comments :

27	THOMPSON C	1	C	9	642711	6048861	4608	P	1	3	1		9	0.78	0.47	5.3	2.6	0.61	0.07

Comments :

28	THOMPSON C	1	C	9	642711	6048861	4612	G	1	6	1		9	0.68	0.27	3.8	3.2		

Comments :

29	THOMPSON C	1	C	9	642797	6048553	4655	R	2	2	1		9	0.49	0.12	3.2	0.95		

Comments :

30	THOMPSON C	1	C	9	643151	6048331	5191	R	1	8	1		10	0.39	0.14	4.65	3.75		

Comments :

31	THOMPSON C	1	C	9	643191	6048346	5287	G	1	5	1		7	0.56	0.25	3.7	3.1		

Comments :

11:25

32	THOMPSON C	1	C	9	643219	6048248	5334	P	1	7	1		7	0.67	0.45	4.2	3.9	0.54	0.16

Comments :

11:30

33	THOMPSON C	1	C	9	643270	6048207	5473	R	1	3	1		8	0.54	0.12	2.9	2.3		

Comments :

12:15

34	THOMPSON C	1	C	9	643468	6048146	5616	G	1	8	1		8	0.41	0.19	5.8	3.1		

Comments :

0.37	S	S	G	9	M	AR	L	7	2	2	0	LWD	20	B	10					D	MF	3	N				
		G	C	13	H	R	H	1	0	1	0	OV	30	B	10					S	SHR	2	N				
0.56	S	S	G	7	M	R	L	3	1	0	0	SWD	25	DP	10	SC	G	2		C	MF	1	N				
		S	G	4	L	R	L	4	1	1	0	OV	20	C	5					C	MF	1	N				
		G	S	5	M	R	H	2	0	1	0	C	40	OV	10					C	MF	1	N				
		C	G	22	H	A	H	3	0	0	0	B	20	OV	10					D	YF	1	N				
		G	S	7	M	R	H	2	0	1	0	C	15	OV	5					D	MF	3	N				
0.38	S	G	S	6	L	R	H	1	0	1	0	C	20	OV	5	SC	P	12	M3-23	D	YF	1	N				
		G	S	11	H	AR	L	7	0	0	0	OV	5							D	YF	2	N				
		G	C	14	M	A	H	2	0	0	0	B	15	C	5				M4-1	D	PS	1	N				

Level 1 - Habitat Summary Diagnosis Report

35	THOMPSON C	2	A	9	643480	6048098	143	R	1	16	1		8	0.42	0.13	4.6	2.7	

Comments :

36	THOMPSON C	2	A	9	643501	6047983	159	G	1	9	1		8	0.36	0.12	4.6	4.1	

Comments :

37	THOMPSON C	2	A	9	643496	6047985	168	P	1	8	1		8	0.76	0.37	6.1	4.2	0.53	0.16

Comments :

38	THOMPSON C	2	A	9	643781	6047847	544	G	1	6	1.75		6	0.49	0.24	3.5	2.6		

Comments :

39	THOMPSON C	2	A	9	643761	6047673	586	R	1	7	1.5		6	0.52	0.18	5.3	4.4		

Comments :

40	THOMPSON C	2	A	9	643948	6047695	919	C	1	1	1.75		6	0.43	0.16	3.7	2.9		

Comments :

41	THOMPSON C	2	A	9	643996	6047643	952	G	1	16	1.25		6	0.57	0.22	2.8	2.1		

Comments :

42	THOMPSON C	2	A	9	643996	6047643	968	R	1	3	1.25		6	0.47	0.13	3.2	1.9		

Comments :

43	THOMPSON C	2	A	9	643798	6048682	1279	P	1	4	1.5		6	0.61	0.36	2.8	2.1	0.49	0.13

Comments :

44	THOMPSON C	2	A	9	643798	6048682	1286	G	1	4	1.5		6	0.59	0.22	3.1	2.2		

Comments :

		G	C	17	M	A	H	1	0	0	0	B	15	OV	15	SC	G	8	M4-5	D	PS	2	N	
		G	C	13	M	A	H	0				B	10	OV	5				M4-6	D	PS	1	N	
0.37	S	C	S	12	L	AR	L	2	0	0	0	OV	20	C	10					D	PS	3	N	
		C	B	18	H	A	L	0				B	15	C	5					D	PS	1	N	
		C	B	19	H	A	L	0				B	30							M	YF	2	N	
		B	C	23	H	AR	N	1	0	0	0	B	40							M	MF	1	N	
		C	G	17	H	A	H	1	1	0	0	B	15	OV	5					M	MF	2	N	
		C	B	19	H	AR	N	0				B	30	OV	10					M	MF	2	N	
0.36	S	C	S	13	H	AR	N	1	0	0	0	C	25	SWD	5					C	MF	3	N	
		G	C	14	H	AR	L	1	0	0	0	B	10	OV	10					C	MF	1	N	

Level 1 - Habitat Summary Diagnosis Report

45	THOMPSON C	2	A	9	643798	6048682	1291	R	1	1	1.5		6	0.45	0.14	3.2	2.6		

Comments :

46	THOMPSON C	2	A	9	644133	6046961	1701	G	1	5	2		6	0.21	0.24	4.2	2.9		

Comments :

47	THOMPSON C	2	A	9	644065	6046925	1772	R	1	3	1.75		6	0.52	0.09	3.8	1.6		

Comments :

48	THOMPSON C	2	A	9	644570	6046480	2392	R	1	3	1.5	8	6	0.31	0.06	5.3	2.2		

Comments :

11:50

49	THOMPSON C	2	A	9	644570	6046480	2396	G	1	2	1.5			0.38	0.13	5.7	2.2		

Comments :

50	THOMPSON C	2	A	9	644580	6046470	2422	P	1	6	1			0.78	0.38	7.4	5.9	0.6	0.05

Comments :

51	THOMPSON C	2	A	9	644730	6046190	2810	R	1	4	1			0.53	0.09	5.7	3.1		

Comments :

14:00

52	THOMPSON C	2	A	9	644740	6046180	2828	P	1	3	1	7	6	0.4	0.26	6.5	6.1	0.45	0.05

Comments :

53	THOMPSON C	2	A	9	644770	6046150	2890	G	1	4	1			0.5	0.1	4.5	2.3		

Comments :

54	THOMPSON C	2	A	9	644770	6046150	2892	O	2	13	0.5			0.27	0.07	1.7	0.9		

Comments :

Mix of mature conifers and wetland shrubs.

		B	C	17	H	AR	N	0				B	50							C	MF	1	N
		B	S	12	M	R	L	2	1	0	0	B	15	SWD	5					C	MF	2	N
		C	B	13	H	AR	N	2	0	0	0	B	10	IV	5					M	MF	1	N
		G	S	4	M	R	L	1	0	1	0	SWD	3						G5-10,9	M	MF	1	N
		S	G	2	L	AR	N	1	1	0	0	SWD	10	OV	5				G5-10,9	M	MF	1	N
0.55	S	S	G	1	L	AR	N	1	0	0	0	OV	5	C	5				G5-8	M	MF	1	N
		G	S	3	M	AR	H	2	2	0	0	OV	5							M	MF	1	N
0.4	S	S	G	2	L	AR	N	3	0	2	0	LWD	3	OV	2					M	MF	1	N
		G	S	3	M	R	L	2	1	0	0	OV	5	SWD	3					M	MF	1	N
		S		1	L	AR	N	6	2	0	0	OV	15	LWD	5	SC	G	13		M	MF	2	N

Level 1 - Habitat Summary Diagnosis Report

55	THOMPSON C	2	A	9	644800	6046050	3153	P	1	6	0.5			0.65	0.4	2.4	2	0.7	0.1

Comments :

56	THOMPSON C	2	A	9	644790	6045910	3357	R	1	3	0.5	4	4	0.35	0.09	3.6	1.1		

Comments :

09:45

57	THOMPSON C	2	A	9	644820	6045860	3437	G	1	2	1			0.5	0.18	4.2	3.3		

Comments :

58	THOMPSON C	2	A	9	644880	6045810	3523	P	1	3	0.5	4		0.5	0.28	3.4	2.3	0.45	0.1

Comments :

Right bank riparian is a mixed young forest.

59	THOMPSON C	2	A	9	644880	6045770	3670	O	3	2	0			0.5	0.12	2	1.4		

Comments :

Measurements do not include main channel. D value is less than 1.

60	THOMPSON C	2	A	9	644790	6045700	3777	R	1	3	0.5		5	0.33	0.08	4.2	3.4		

Comments :

11:50

61	THOMPSON C	2	A	9	644850	6045630	3978	G	1	3	1.5			0.35	0.11	3	1.6		

Comments :

Surrounding wetland area floods during high water periods. Discharge has decreased since last site.

62	THOMPSON C	2	A	9	644820	6045610	3990	P	1	5	0.5			0.5	0.3	4.8	3	0.45	0.05

Comments :

Creek floods into wetland at high flows.

63	THOMPSON C	2	A	9	644840	6045450	4257	R	1	3	0.5			0.4	0.06	2.2	1.3		

Comments :

Approx. 3-5 m riparian on each side.

64	THOMPSON C	2	A	9	644880	6045270	4457	P	1	5	0.5			0.53	0.28	4.4	3	0.45	0.1

Comments :

0.6	S	S	G	1	M	AR	N	2	2	0	0	OV	20	C	10				G5-6,5	S	SHR	1	N	
		G	S	4	M	R	H	0				OV	30						G5-2,1	M	YF	1	N	
		G	S	3	M	AR	N	2	0	2	0	OV	30	LWD	5					M	YF	5	N	
0.35	S	S	G	1	M	AR	N	2	0	1	0	OV	30	SWD	5					S	SHR	1	N	
		S		1	M	AR	N	1	0	1	0	OV	30	LWD	10	SC	G	2		S	SHR	5	N	
		G	S	4		AR	H	1	0	1	0	OV	15						G6-24,23	S	SHR	1	N	
		G	S	5		R	L	0				OV	70							S	SHR	5	N	
0.4	S	G	S	3		AR	N	1	1	0	0	OV	20							S	SHR	5	N	
		G	S	4		R	H	0				OV	5							S	SHR	5	N	
0.35	S	G	S	4		AR	N	0				OV	20	C	10				G6-20,19	S	SHR	3	N	

Level 1 - Habitat Summary Diagnosis Report

65	THOMPSON C	2	A	9	644890	6045220	4507	G	1	2	0.5			0.4	0.12	2.3	1.5		

Comments :

66	THOMPSON C	2	A	9	644980	6045170	4624	R	1	3	0.5			0.4	0.15	2.5	1.5		

Comments :

67	THOMPSON C	2	A	9	645000	6044930	4872	G	1	2	2			0.5	0.14	3.8	2.1		

Comments :

Right bank riparian is predominately shrubs.

68	THOMPSON C	2	A	9	645000	6044920	4880	P	1	4	2			0.54	0.31	3.4	2.2	0.5	0.1

Comments :

Right bank riparian is predominately shrubs.

69	THOMPSON C	2	A	9	645115	6044384	5611	P	1	3	1		4	0.59	0.37	4.1	2.4	0.52	0.13

Comments :

70	THOMPSON C	2	A	9	645137	6044431	5623	R	1	7	1			0.47	0.14	5.2	1.8		

Comments :

71	THOMPSON C	2	A	9	645137	6044431	5629	G	1	5	1			0.53	0.19	4.9	2.1		

Comments :

72	THOMPSON C	2	A	9	645270	6044190	5868	G	1	8	1.25			0.51	0.26	2.6	1.9		

Comments :

73	THOMPSON C	2	A	9	645270	6044180	5876	R	1	2	1.25			0.37	0.13	2.2	1.6		

Comments :

74	THOMPSON C	2	A	9	645238	6044075	5974	P	1	2	1			0.61	0.26	2.7	2.1	0.31	0.09

Comments :

		G	S	5		R	L	0				OV	50								S	SHR	4	N
		G	S	4		R	L	2	1	0	0	OV	70	LWD	5						S	SHR	4	N
		G	S	5		R	L	1	0	1	0	OV	20	LWD	10				G6-18,17	D	YF	5	N	
0.4	S	G	S	3		AR	N	0				OV	10	C	5					D	YF	5	N	
0.39	S	S	G	4	L	R	L	2	0	0	0	SWD	20	OV	15					D	PS	3	N	
		G	C	9	M	R	H	0				OV	10	C	5					D	MF	3	N	
		G	S	6	L	R	H	2	0	0	0	OV	30	IV	5					D	MF	3	N	
		G	S	5	H	R	H	0				OV	40	C	5					D	PS	4	N	
		G	C	11	H	R	L	1	1	0	0	OV	50	LWD	10					D	PS	3	N	
0.22	S	G	C	12	H	AR	L	3	3	0	0	LWD	10	SWD	5					D	YF	2	N	

Level 1 - Habitat Summary Diagnosis Report

75	THOMPSON C	2	A	9	645452	6043846	6264	R	1	4	1		6	0.46	0.09	3.8	1.2		

Comments :

76	THOMPSON C	2	A	9	645498	6043829	6426	G	1	5	1		6	0.54	0.22	2.4	1.9		

Comments :

77	THOMPSON C	2	A	9	645270	6043880	6607	P	1	2	1.25		6	0.59	0.26	2.7	2.1	0.32	0.08

Comments :

78	THOMPSON C	2	A	9	645592	6043676	6892	R	1	5	2		6	0.47	0.18	2.3	1.8		

Comments :

79	THOMPSON C	2	A	9	645800	6043500	7010	G	1	2	2		6	0.52	0.19	2.2	1.9		

Comments :

		G	S	7	H	A	H	0				C	5	OV	5				M4-14	D	SHR	2	N	
		G	S	5	M	R	H	4	2	0	0	LWD	20	OV	5					D	PS	2	N	
0.24	S	G	C	14	H	AR	L	0				SWD	10	OV	5					M	MF	3	N	
		C	B	21	H	AR	N	0				SWD	20	OV	20					C	MF	1	N	
		C	B	19	H	AR	N	1	0	1	0	OV	30	SWD	5					D	PS	3	N	

Level 1 - Habitat Summary Diagnosis Report

Form Number:	Forest District:	BULKLEY
4	Watershed Name:	"MOAN CREEK"
	Watershed Code:	460-458800-00000

Survey Date:	99/09/17	Weather:	CLOUDY	Survey Crew:	MJ,GG
Discharge:	0.07	(cubic meters per second)			

Subsampling Fractions:

Riffles	1 IN 36	Pools	1 IN 25	Glides	1 IN 24	Cascades	1 IN 30	Other	0 IN 2

NTS Maps (1:50,000):	093L10
	093L11

BGGS Maps (1:20,000):	093L055
	093L065
	093L066

Detail No	Sub Basin Name	Reach No	Section No	UTM Zone	UTM Easting	UTM Northing	Distance (m)	Habitat Unit Type	Habitat Unit Cat	Length (m)	Grad (%)	Air Temp (C)	Water Temp (C)	Mean Depth Bankfull (m)	Mean Depth Water (m)	Mean Width Bankfull (m)	Mean Width Wetted (m)	Pools Only Max Depth	Pools Only Crest (m)
1	"MOAN CREE	1	A	9	631035	6055852	15	P	1	4	2		6	0.87	0.38	4.3	3.9	0.55	0.12

Comments :

Plunge pool beneath railroad culvert

2	"MOAN CREE	1	A	9	630938	6055608	263	R	1	11	2.5		6	0.51	0.09	3.6	2.5		

Comments :

Culvert at railroad crossing is potential barrier to upstream migration from the Bulkley River.

3	"MOAN CREE	1	A	9	631020	6055770	309	G	1	3	2.5		6	0.39	0.16	3.6	2.3		

Comments :

4	"MOAN CREE	1	A	9	630929	6055499	585	C	1	1	3.25		6	0.62	0.21	4.1	3.2		

Comments :

Form Number
4

Pools Only		Bed Material Type						Total	Functional LWD			Cover				Offchannel Habitat			Photo	Riparian Vegetation			Barriers
Residual	Pool Type	Dom	Sub-Dom	D (cm)	Compaction	SG Type	SG Amt	LWD Tally	10 - 20cm	20 - 50cm	>50c	Cover Type 1	%	Cover Type 2	%	Type	Access	Length (m)	Roll/Frame	Type	Structure	Canopy Closure	
0.43	S	G	S	14	M	AR	L	2	0	0	0	C	10	DP	10				M2-15,16	S	SHR	3	N
		C	G	19	H	A	H	3	0	1	0	B	10	OV	5					M	MF	2	CV
		C	G	16	H	A	H	0				SWD	15	B	5					S	SHR	1	N
		B	C	31	H	AR	N	3	0	0	0	B	30							M	MF	3	N

Level 1 - Habitat Summary Diagnosis Report

5	"MOAN CREE	1	A	9	630716	6055491	765	P	1	2	3		6	0.72	0.31	6.8	2.3	0.43	0.08

Comments :

Lawson road culvert at 687 m is potential barrier to upstream migration.

6	"MOAN CREE	1	A	9	630716	6055491	769	R	1	4	3		6	0.39	0.11	7.6	2.4		

Comments :

7	"MOAN CREE	1	A	9	630636	6055323	966	G	1	3	3.25		7	0.61	0.23	3.7	1.9		

Comments :

8	"MOAN CREE	1	A	9	630498	6055264	1205	R	1	2	3.25		7	0.58	0.13	4.6	1.9		

Comments :

9	"MOAN CREE	1	A	9	630498	6055264	1207	P	3	1	3.25		7	0.69	0.24	4.3	2.1	0.32	0.04

Comments :

10	"MOAN CREE	1	A	9	632615	6053052	1403	C	1	3	3		7	0.53	0.21	2.9	1.1		

Comments :

11	"MOAN CREE	1	A	9	630281	6055100	1588	G	1	2	3		8	0.64	0.26	2.7	1.6		

Comments :

12	"MOAN CREE	1	A	9	630325	6054851	1687	P	1	3	2.75		8	0.71	0.39	4.2	3.7	0.55	0.08

Comments :

13	"MOAN CREE	2	A	9	630210	6054830	28	P	1	2	3		6	0.9	0.28	4.6	3.9	0.5	0.05

Comments :

Pool created by log jam. Left bank riparian is a mixed mature forest.

14	"MOAN CREE	2	A	9	630170	6054790	107	G	2	3	5			0.83	0.13	8.6	2.3		

Comments :

Site in a braided section of stream caused by a windfall.

0.35	S	S	G	12	M	R	L	6	1	2	0	LWD	40	C	10	SC	G	7		M	MF	3	CV
		C	G	16	H	A	L	1	0	0	1	B	5							M	MF	1	N
		C	G	21	H	AR	L	2	1	0	0	C	15	B	5				M2-21	M	MF	3	N
		C	B	24	H	AR	N	0				B	15	SWD	5					M	MF	2	N
0.28	S	S	G	4	L	R	H	2	0	1	0	C	10	OV	10					M	MF	2	N
		B	C	26	H	AR	N	0				B	15							M	MF	1	N
		C	G	15	H	AR	L	0				B	10	OV	5					M	MF	2	N
0.47	S	G	C	12	M	A	H	5	0	3	1	LWD	20	OV	5					D	PS	3	N
0.45	S	G	C	7		AR	N	9	0	2	0	OV	40	LWD	20				G3-21,20	S	SHR	1	N
		G	C	6		R	L	1	0	0	1	LWD	50						G3-19,18	M	MF	1	N

Level 1 - Habitat Summary Diagnosis Report

15	"MOAN CREE	2	A	9	630160	6054780	123	R	1	4	5.5		6	0.47	0.07	5.2	2.3	

Comments :

Left bank riparian is a mixed mature forest.

16	"MOAN CREE	2	A	9	630150	6054720	166	C	1	2	4			0.51	0.6	3.9	2.9	

Comments :

17	"MOAN CREE	2	A	9	630120	6054650	265	G	1	2	8		6	0.55	0.11	3.8	2.1	

Comments :

Left bank riparian is a deciduous young forest.

18	"MOAN CREE	2	A	9	630110	6054510	412	C	1	10	7		7	0.6	0.14	4.3	2.7	

Comments :

Moss on some rocks.

19	"MOAN CREE	2	A	9	629990	6054380	618	G	1	4	4.5			0.5	0.18	4.2	2.2	

Comments :

20	"MOAN CREE	2	A	9	629970	6054320	654	R	1	3	4			0.55	0.12	4.8	1.5	

Comments :

Braided at high water.

21	"MOAN CREE	2	A	9	629930	6054230	752	C	1	3	7.5		4	0.47	0.07	3.6	1.8	

Comments :

Sept. 29/99-Site is only place underneath powerline with greater than 10% canopy closure. Site is 60 m upstream of road crossin

22	"MOAN CREE	2	A	9	629810	6054090	1025	G	1	4	4		4	0.34	0.14	4.7	2.2	

Comments :

12:45

		C	G	11		R	L	2	1	1	0	OV	15	B	5					S	SHR	3	N
		C	G	17		AR	N	2	0	1	0	B	10	OV	5				G3-14,13	M	YF	4	N
		C	G	20	M	R	L	1	0	0	0	B	10	OV	5				G3-11	S	SHR	5	N
		C	B	22	M	R	L	2	1	0	0	B	15	LWD	5				G3-9,8,7	D	MF	5	N
		C	G	12	M	AR	H	3	1	0	0	OV	20	LWD	5					M	YF	4	N
		C	G	11	M	R	L	1	0	1	0	OV	20	B	5				G3-5,4	M	MF	4	N
		C	B	14		AR	N	1	0	0	0	OV	20	B	10				G6-16,15	S	SHR	3	N
		C	G	10		AR	L	1	0	0	0	LWD	10	OV	5				G6-13,12	M	MF	1	N

Level 1 - Habitat Summary Diagnosis Report

Form Number:	Forest District:	BULKLEY
5	Watershed Name:	ROBIN CREEK
	Watershed Code:	460-487900-00000-00000-0000-0000-000-000-000-000-000-000

Survey Date:	99/10/01	Weather:	PARTLY CLOUDY, COLD	Survey Crew:	MJ,GT,GG,RH
Discharge:	0.05	(cubic meters per second)			

Subsampling Fractions:

Riffles	1 IN 33	Pools	1 IN 20	Glides	1 IN 21	Cascades	0 IN 7	Other	0 IN 15

NTS Maps (1:50,000) :	093L10

BGGS Maps (1:20,000) :
093L066
093L067
093L076

Detail No	Sub Basin Name	Reach No	Section No	UTM			Distance (m)	Habitat Unit		Length (m)	Grad (%)	Air Temp (C)	Water Temp (C)	Mean Depth		Mean Width		Pools Only	
				Zone	Easting	Northing		Type	Cat					Bankfull (m)	Water (m)	Bankfull (m)	Wetted (m)	Max Depth	Crest (m)
1	ROBIN CREEK	1	A	9	637940	6052900	7	P	1	4	1	2	6	0.68	0.23	4.2	3.1	0.41	0.15
							Comments :												
2	ROBIN CREEK	1	A	9	638070	6053080	200	R	1	4	1		6	0.47	0.1	3.9	2.8		
							Comments :												
3	ROBIN CREEK	1	A	9	638110	6053120	278	G	1	11	1		5	0.48	0.26	5.8	2.1		
							Comments :												
4	ROBIN CREEK	1	A	9	638240	6053380	588	P	1	10	1.5		6	0.63	0.31	5.1	3.7	0.51	0.18
							Comments :												

D value is less than 1.

Form Number
5

Pools Only		Bed Material Type						Total	Functional LWD			Cover				Offchannel Habitat			Photo	Riparian Vegetation			Barriers
Residual	Pool Type	Dom.	Sub-Dom.	D (cm)	Compaction	SG Type	SG Amt	LWD Tally	10 - 20cm	20 - 50cm	>50c	Cover Type 1	%	Cover Type 2	%	Type	Access	Length (m)	Roll/Frame	Type	Structure	Canopy Closure	
0.26	S	G	S	6	M	AR	H	6	2	0	0	LWD	20	SWD	10					D	MF	1	N
		G	C	11	H	A	H	1	0	0	0	SWD	10	LWD	5					D	MF	3	N
		C	S	12	H	AR	L	4	0	0	0	C	15	OV	5					D	MF	1	N
0.33	D	S		1	L	AR	N	4	0	0	0	DP	30	B	5	PD	G	16		D	SHR	1	N

Level 1 - Habitat Summary Diagnosis Report

5	ROBIN CREEK	1	A	9	638310	6053600	820	G	1	4	1		6	0.41	0.13	3.8	3.2		

Comments :

6	ROBIN CREEK	1	A	9	638320	6053830	1108	R	1	2	1		5	0.42	0.14	4.7	4.3		

Comments :

Left bank riparian is deciduous shrubbery.

7	ROBIN CREEK	1	A	9	638308	6054165	2390	R	2	5	0.3		6	0.55	0.1	4.7	2.1		

Comments :

Fair rearing habitat. Some spawning habitat. 15:00

8	ROBIN CREEK	1	A	9	638421	6054435	2403	P	2	4	0.3			0.75	0.4	5.7	3.7	0.6	0.1

Comments :

D value is less than 1. Good rearing habitat.

9	ROBIN CREEK	2	B	9	638152	6054675	481	P	1	2	0.3		5	0.55	0.35	2.8	1.5	0.45	0.01

Comments :

D value is less than 1 cm.

10	ROBIN CREEK	2	B	9	638037	6054828	654	G	1	6	0.5			0.75	0.35	1.8	1.8		

Comments :

D value is less than 1 cm.

11	ROBIN CREEK	2	B	9	638041	6054760	697	R	1	4	0.5			0.58	0.11	2.9	1.8		

Comments :

Poor rearing habitat due to too many fines.

12	ROBIN CREEK	2	B	9	637856	6054902	888	P	1	4	0.5			0.7	0.35	3.6	2.9	0.55	0.15

Comments :

D value is less than 1 cm. Banks 2.5 m high.

13	ROBIN CREEK	2	B	9	637648	6055046	1054	G	1	5	0.5		6	0.84	0.24	3.5	2.2		

Comments :

14	ROBIN CREEK	2	B	9	637820	6055086	1150	R	1	6	0.5		7	0.7	0.12	3.1	1.8		

Comments :

Poor rearing habitat. 14:30

		G	C	6	H	AR	L	5	1	2	1	LWD	40	OV	30					D	SHR	2	N
		G	C	9	M	AR	L	0				B	5	OV	5					C	YF	1	N
		S	G	3		R	L	2	2	0	0	OV	30	LWD	5				G6-5,4	S	SHR	2	N
0.5	D	S		1		AR	N	0				OV	90	IV	15					S	SHR	5	N
0.44	D	S		1	L	AR	N	2	0	2	0	OV	70	LWD	10				G6-4,3	S	SHR	4	N
		S		1	M	AR	N	0				OV	50	C	15				G6-2,1	S	SHR	3	N
		G	S	2	M	AR	N	0				IV	5							S	SHR	1	N
0.4	S	S		1	L	AR	N	0				OV	5	C	3				G7-20,19	S	INIT	1	N
		S	G	2		AR	N	0				OV	5						G7-17,16	S	INIT	1	N
		G	S	3		R	L	0				IV	5							S	INIT	1	N

Level 1 - Habitat Summary Diagnosis Report

15	ROBIN CREEK	2	B	9	637766	6055369	1350	G	1	7	1.5			0.5	0.15	4.1	3.1		

Comments :

No spawning habitat due to clay beneath cobble and gravel.

16	ROBIN CREEK	2	B	9	637707	6055403	1472	P	1	6	0.5		6	0.85	0.55	4.5	3.8	0.8	0.1

Comments :

D value is less than 1 cm.

17	ROBIN CREEK	2	B	9	637672	6055460	1530	O	1	27	0			0.6	0.2	4	2		

Comments :

D value is less than 1 cm.

18	ROBIN CREEK	2	B	9	637670	6055503	1603	R	1	4	0.5		4	0.33	0.08	3.5	1.8		

Comments :

19	ROBIN CREEK	2	B	9	637508	6055817	2138	G	1	7	1.5		5	0.33	0.13	3.8	2.2		

Comments :

Left bank riparian consists of shrubs.

20	ROBIN CREEK	2	D	9	637023	6056320	2934	P	1	4	0.3			0.8	0.52	3.8	3.2	0.75	0.15

Comments :

D value is less than 1 cm.

21	ROBIN CREEK	2	D	9	637038	6056457	3260	O	1	40	0.3			0.5	0.3	5	3.5		

Comments :

D value is less than 1 cm.

22	ROBIN CREEK	2	D	9	637096	6056504	3327	R	1	4	1.25		6	0.23	0.08	2.5	1.6		

Comments :

15:15

23	ROBIN CREEK	2	D	9	637060	6056633	3428	G	1	9	0.75		6	0.23	0.08	3.8	2.1		

Comments :

16:00. Boonstra's field.

24	ROBIN CREEK	2	D	9	637222	6057185	3797	G	1	2	1.75			0.43	0.08	3.6	2.3		

Comments :

		G	C	6		AR	N	0				B	5	OV	3				G7-14,13	S	INIT	2	N				
0.7	S	S		1	L	AR	N	1	0	1	0	DP	15	OV	5				G7-12,11	S	SHR	1	N				
		S		1	L	AR	N	2	0	0	0	OV	5			SL	G	27		S	SHR	1	N				
		G	S	2	L	R	L	0				IV	30	OV	5				G7-10,9	S	SHR	2	N				
		G	C	5	L	AR	L	0				IV	30	C	15				G7-7,6	M	MF	1	N				
0.6	S	S		1		AR	N	1	0	1	0	OV	25	SWD	20					S	SHR	5	N				
		S		1		AR	N	1	0	1	0	OV	15	DP	10				G7-5	S	SHR	5	N				
		G	S	3		AR	H	0				OV	15							S	SHR	1	N				
		G	S	3		AR	H	0				OV	5						G7-4,3	S	INIT	1	N				
		G	C	8		A	H	0				OV	5							S	INIT	1	N				

Level 1 - Habitat Summary Diagnosis Report

25	ROBIN CREEK	2	D	9	637222	6057185	3799	R	1	3	1.75			0.35	0.1	3.6	2.4		

Comments :

26	ROBIN CREEK	2	D	9	637158	6057203	4217	G	1	3	1.25			0.34	0.14	2.9	1.9		

Comments :

Field on both banks. Sparse young deciduous.

27	ROBIN CREEK	2	D	9	637162	6057203	4250	R	1	6	1.25			0.37	0.06	2.7	1.8		

Comments :

Field on both banks. Sparse young deciduous.

28	ROBIN CREEK	3	A	9	636999	6057871	7	P	2	4	0.5			0.35	0.2	3	2.6	0.4	0.1

Comments :

D value is less than 1. Dam caused by willows and SWD.

		G	C	9		A	H	0				B	10	OV	5					S	INIT	1	N
		G	C	8		A	H	0				OV	20	B	5				G7-8	S	INIT	1	N
		G	C	12		A	H	0				OV	30	B	5					S	INIT	1	N
0.3	D	S		1	L	AR	N	1	1	0	0	OV	30	C	3				G9-1	M	YF	5	

Level 1 - Habitat Summary Diagnosis Report

Form Number:	Forest District:	BULKLEY
6	Watershed Name:	LEMIEUX CREEK
	Watershed Code:	460-487900-11100-00000-0000-0000-000-000-000-000-000-000

Survey Date:	99/10/02	Weather:	OVERCAST	Survey Crew:	MJ,RH
Discharge:	0.05	(cubic meters per second)			

Subsampling Fractions:

Riffles	1 IN 25	Pools	1 IN 21	Glides	1 IN 21	Cascades	0 IN 0	Other	1 IN 17

NTS Maps (1:50,000):	093L10	BGGS Maps (1:20,000):	093L066
			093L067

Detail No	Sub Basin Name	Reach No	Section No	UTM Zone	UTM Easting	UTM Northing	Distance (m)	Habitat Unit Type	Habitat Unit Cat	Length (m)	Grad (%)	Air Temp. (C)	Water Temp. (C)	Mean Depth Bankfull (m)	Mean Depth Water (m)	Mean Width Bankfull (m)	Mean Width Wetted (m)	Pools Only Max Depth	Pools Only Crest (m)
1	LEMIEUX CRE	1	A	9	638490	6054810	261	P	1	2	0.3		4	0.66	0.31	4.6	2.7	0.4	0.25

Comments :

D value is less than 1.

2	LEMIEUX CRE	1	A	9	638540	6054800	386	O	2	34	0.3		5	0.33	0.18	2.9	2.1		

Comments :

D value is less than 1.

3	LEMIEUX CRE	1	A	9	638610	6054890	508	G	1	11	0.5		5	0.56	0.21	2.6	2.2		

Comments :

Culvert is potential barrier to upstream migration.

4	LEMIEUX CRE	1	A	9	638580	6055030	707	P	1	3	0.5		5	0.54	0.22	3.2	1.8	0.45	0.09

Comments :

D value is less than 1 cm.

Form Number
6

Pools Only		Bed Material Type						Total	Functional LWD			Cover				Offchannel Habitat			Photo	Riparian Vegetation			Barriers
Residual	Pool Type	Dom.	Sub-Dom.	D (cm)	Compaction	SG Type	SG Amt	LWD Tally	10 - 20cm	20 - 50cm	>50c	Cover Type 1	%	Cover Type 2	%	Type	Access	Length (m)	Roll/Frame	Type	Structure	Canopy Closure	
0.15	D	S		1	L	AR	N	3	2	1	0	SWD	30	LWD	20					D	SHR	3	N
		S		1	L	AR	N	22	9	2	0	LWD	25	OV	20				M4-18	D	SHR	3	N
		G	S	3	M	R	H	1	1	0	0	C	35	OV	20				M4-20	D	PS	2	CV
0.36	S	S		1	L	R	L	0				C	10	OV	10					D	PS	2	N

Level 1 - Habitat Summary Diagnosis Report

5	LEMIEUX CRE	1	A	9	638590	6055040	731	R	1	2	0.5		6	0.38	0.15	1.8	0.9		

Comments :

6	LEMIEUX CRE	1	A	9	638610	6055060	893	G	1	17	0.3		7	0.41	0.23	2.1	1.7		

Comments :

7	LEMIEUX CRE	1	A	9	638610	6055170	1084	P	1	4	0.5		7	0.53	0.25	2.7	2	0.35	0.06

Comments :

8	LEMIEUX CRE	1	A	9	638620	6055270	1247	R	1	2	1		7	0.39	0.06	2.4	1.1		

Comments :

Left bank riparian is shrubbery.

9	LEMIEUX CRE	1	A	9	638630	6055410	1343	G	1	4	0.5		7	0.79	0.12	2.9	1.6		

Comments :

Left bank riparian is shrubbery.

10	LEMIEUX CRE	1	A	9	638763	6055283	1592	R	1	4	2		5	0.38	0.07	4.1	2.4		

Comments :

11	LEMIEUX CRE	1	A	9	638790	6055620	1638	G	1	3	2		5	0.38	0.12	3.9	2.2		

Comments :

12	LEMIEUX CRE	1	A	9	638800	6055520	1738	P	1	7	1		6	0.67	0.33	4.3	2.1	0.51	0.05

Comments :

D value is less than 1 cm.

13	LEMIEUX CRE	1	A	9	639347	6055054	2391	R	1	4	1.25		6	0.36	0.07	3.1	2.8		

Comments :

14	LEMIEUX CRE	1	A	9	639469	6055149	2633	G	1	4	1		6	0.62	0.26	2.7	2.1		

Comments :

D value is less than 1 cm.


G S 4 M R H 1 0 0 0 OV 5 D PS 3 N
S G 2 L R L 1 0 0 0 OV 40 C 20 M4-22 D PS 1 N
0.29 S S G 2 L R H 0 OV 35 C 10 D SHR 2 N
G S 3 M R H 0 OV 10 D SHR 1 N
S G 4 M R H 0 OV 20 B 5 D SHR 2 N
G C 9 M AR L 0 SWD 5 OV 5 M5-6 D SHR 1 N
G S 6 L R L 0 OV 10 D SHR 2 N
0.46 D S 1 L AR N 2 0 1 0 OV 30 C 15 D SHR 3 N
G C 7 M AR L 0 OV 20 IV 10 M5-9 D PS 2 N
S 1 L AR N 2 0 1 0 IV 80 LWD 5 M5-11 D SHR 1 N

Level 1 - Habitat Summary Diagnosis Report

15	LEMIEUX CRE	3	A	9	639111	6056369	181	P	1	3	1		2	0.41	0.26	3.9	2.1	0.53	0.05

Comments :

D value is less than 1 cm. Cattle watering area below beaver dam.

16	LEMIEUX CRE	3	A	9	639169	6056554	372	G	1	3	1		2	0.32	0.11	3.1	2.4		

Comments :

17	LEMIEUX CRE	3	A	9	639174	6056582	396	R	1	4	1.25		2	0.27	0.06	2.5	1.5		

Comments :

18	LEMIEUX CRE	3	A	9	638405	6056317	825	P	1	4	1.25		2	0.37	0.18	4.9	3.1	0.36	0.11

Comments :

Cattle watering hole.

19	LEMIEUX CRE	3	A	9	638801	6056889	954	G	1	11	1		2	0.34	0.19	1.9	1.1		

Comments :

D value is less than 1 cm.

20	LEMIEUX CRE	3	A	9	638725	6056766	1054	O	2	2	1		2	0.42	0.11	0.91	0.8		

Comments :

D value is less than 1 cm. Max depth of unit is 22 cm.

21	LEMIEUX CRE	3	A	9	638693	6056855	1194	P	1	3	1		2	0.51	0.23	3.6	3.2	0.43	0.11

Comments :

D value is less than 1 cm.

22	LEMIEUX CRE	3	A	9	638687	6056887	1224	R	1	5	1			0.41	0.06	4.3	2.1		

Comments :

Banks heavily damaged by cows.

23	LEMIEUX CRE	5	A	9	638799	6057734	15	P	1	3	0.75		3	0.59	0.32	2.9	2.7	0.45	0.5

Comments :

24	LEMIEUX CRE	5	A	9	638344	6057552	88	R	1	6	2		3	0.24	0.08	2.3	1.6		

Comments :

0.48	S	S		1		AR	N	1	0	0	0	DP	10						M8-1	M	YF	1	
		G	S	8		R	L	0				OV	2							S	SHR	1	
		G	C	12		A	L	0				OV	10	B	2					S	SHR	1	
0.25	S	G	S	14		AR	N	0				DP	5	OV	2					S	SHR	1	
		S		1		AR	N	5	1	2	0	IV	45	OV	20					S	INIT	1	
		S		1		AR	N	0				IV	30	OV	20	PD	P	2		S	SHR	1	
0.32	D	S		1		AR	N	3	1	0	0	DP	10	SWD	10					S	SHR	3	
		G	S	2		R	H	2	1	0	0	LWD	5	OV	5				M8-4	S	SHR	3	
0.4	S	S	G	3		R	H	4	1	0	0	C	20	LWD	10				M8-8	D	MF	3	
		G	C	8		R	H	1	1	0	0	OV	15	C	10					D	MF	4	

Level 1 - Habitat Summary Diagnosis Report

25	LEMIEUX CRE	5	A	9	638400	6057604	189	G	1	3	2.5		4	0.27	0.11	6.1	2.7	

Comments :

26	LEMIEUX CRE	5	A	9	638548	6057938	375	R	1	2	1.75		2	0.29	0.04	4.2	0.7	

Comments :

10:20

27	LEMIEUX CRE	5	A	9	638502	6058299	406	P	1	3	1.75		2	0.53	0.27	4.4	2.9	0.4	0.09

Comments :

28	LEMIEUX CRE	5	A	9	638504	6058225	550	G	1	6	2.5		2	0.44	0.19	3.4	1.6		

Comments :

29	LEMIEUX CRE	5	A	9	638590	6058054	683	R	1	7	3			0.25	0.06	4.2	1.7		

Comments :

30	LEMIEUX CRE	5	A	9	638590	6058054	685	O	2	15	3		2	0.27	0.07	4.7	1.2		

Comments :

31	LEMIEUX CRE	5	A	9	638295	6058186	835	G	1	3	3		2	0.36	0.15	3.5	1.3		

Comments :

32	LEMIEUX CRE	5	A	9	638707	6058563	1089	P	1	2	3.5		2	0.54	0.26	3.6	1.7	0.42	0.11

Comments :

33	LEMIEUX CRE	5	A	9	638750	6058522	1164	R	1	4	3.5		3	0.26	0.11	2.8	1.9		

Comments :

34	LEMIEUX CRE	5	A	9	639004	6058758	1427	G	1	3	3.25		3	0.37	0.07	3.4	1.6		

Comments :

		G	C	9		R	H	0				OV	5						M8-9	D	YF	3	
		G	C	4		R	H	1	0	0	0	OV	15							D	YF	3	
0.31	S	C	S	11		AR	L	1	0	1	0	OV	35	C	15				M8-11	D	SHR	2	
		G	C	12		AR	H	0				C	20	OV	15					D	MF	3	
		C	G	13		AR	L	4	1	1	0	OV	10	LWD	5	SC	G	15	M8-13	D	MF	2	
		C	G	11		AR	L	4	0	2	0	SWD	20	OV	10				M8-13	D	MF	2	
		C	G	13		AR	L	0				SWD	10	OV	5					D	YF	3	
0.31	S	C	G	16		AR	L	1	0	1	0	SWD	15	DP	5					D	MF	3	
		C	G	13		AR	L	0				B	5	OV	5					D	MF	3	
		G	C	12		AR	L	1	0	0	0	OV	15	B	5					D	MF	3	

Level 1 - Habitat Summary Diagnosis Report

35	LEMIEUX CRE	5	A	9	639171	6058765	1657	R	1	5	3.75		3	0.36	0.08	3.6	1.7		

Comments :

36	LEMIEUX CRE	5	A	9	639073	6058915	1777	P	1	5	4		4	0.57	0.36	4.9	4.3	0.55	0.06

Comments :

37	LEMIEUX CRE	5	A	9	639701	6059568	1885	C	1	2	6		2	0.47	0.07	3.9	1.4		

Comments :

10:30

38	LEMIEUX CRE	5	A	9	639471	6058993	2283	G	1	7	4		2	0.36	0.12	3.1	2.4		

Comments :

11:15

39	LEMIEUX CRE	5	A	9	639651	6059263	2491	P	1	2	6		2	0.77	0.24	4.6	2.1	0.45	0.09

Comments :

40	LEMIEUX CRE	5	A	9	639602	6059191	2534	R	1	3	5		2	0.38	0.08	4.4	1.8		

Comments :

12:15

41	LEMIEUX CRE	5	A	9	639895	6059363	2990	O	2	3	6.5		3	0.33	0.06	4.1	1.9		

Comments :

D value is smaller than 1 cm.

42	LEMIEUX CRE	5	A	9	639954	6059684	3127	P	1	5	6		4	0.52	0.31	2.5	1.7	0.53	0.11

Comments :

14:45

43	LEMIEUX CRE	5	A	9	639958	6059711	3169	G	1	4	6		4	0.48	0.12	3.6	2.2		

Comments :

44	LEMIEUX CRE	5	A	9	640047	6059654	3214	C	1	4	8			0.53	0.14	2.8	1.7		

Comments :

		C	B	12		AR	N	1	0	0	0	OV	20	B	5					M	YF	3	
0.49	S	G	C	17		R	H	1	1	0	0	OV	30	DP	10					M	YF	3	
		C	B	16		AR	N	1	0	0	0	C	10	B	5				M8-16	D	YF	2	
		C	G	15		AR	L	0				C	15	OV	15					D	MF	2	
0.36	S	C	G	19		AR	L	2	0	0	0	B	20	DP	5					M	YF	3	
		C	G	11		AR	L	0				B	10	OV	5					M	YF	2	
		S		1		AR	N	4	1	0	0	OV	30	SWD	20					M	YF	2	
0.42	D	S	C	8		R	L	2	0	0	0	OV	20	C	10					M	YF	3	
		G	C	16		AR	L	1	0	0	0	B	10	OV	10					M	YF	2	
		C	B	18		AR	N	0				B	10	OV	5				M9-3	M	MF	1	

Level 1 - Habitat Summary Diagnosis Report

45	LEMIEUX CRE	5	A	9	640112	6059838	3428	R	1	3	7			0.34	0.09	3.4	1.6		

Comments :

46	LEMIEUX CRE	5	A	9	640154	6060017	3566	P	1	2	8		4	0.52	0.35	2.5	2.6	0.49	0.06

Comments :

16:00

		C	G	8		AR	L	3	0	0	0	B	15	SWD	10					M	MF	2	

0.43	S	S	C	12		R	L	1	0	1	0	C	20	OV	20					C	MF	2	

Level 1 - Habitat Summary Diagnosis Report

Form Number:	Forest District:	BULKLEY
7	Watershed Name:	VANDERVEN CREEK
	Watershed Code:	460-487900-37600

Survey Date:	99/10/15	Weather:	PARTLY CLOUDY	Survey Crew:	GT,GG
Discharge:	0.01	(cubic meters per second)			

Subsampling Fractions:

Riffles	1 IN 34	Pools	1 IN 12	Glides	1 IN 34	Cascades	0 IN 7	Other	0 IN 3

NTS Maps (1:50,000): ENTER BGGS Maps (1:20,000):

Detail No	Sub Basin Name	Reach No	Section No	UTM Zone	UTM Easting	UTM Northing	Distance (m)	Habitat Unit Type	Habitat Unit Cat	Length (m)	Grad (%)	Air Temp. (C)	Water Temp. (C)	Mean Depth Bankfull (m)	Mean Depth Water (m)	Mean Width Bankfull (m)	Mean Width Wetted (m)	Pools Only Max Depth	Pools Only Crest (m)
1	VANDERVEN	1	A	9	637038	6058002	165	G	1	7	0.5			0.4	0.15	2	1.5		

Comments :

Creek channelized.

2	VANDERVEN	1	A	9	637037	6058012	176	R	1	25	0.5		4	0.35	0.1	2.1	1.3		

Comments :

13:30

3	VANDERVEN	1	A	9	636881	6058427	467	G	1	4	0.5			0.3	0.1	2.6	1.3		

Comments :

Bankfull width difficult to tell due to ditching creek.

4	VANDERVEN	1	A	9	636890	6058345	478	R	1	2	0.5			0.35	0.05	2.6	1.1		

Comments :

Form Number
7

Pools Only		Bed Material Type						Total	Functional LWD			Cover				Offchannel Habitat			Photo	Riparian Vegetation			Barriers
Residual	Pool Type	Dom	Sub-Dom	D (cm)	Comp action	SG Type	SG Amt	LWD Tally	10 - 20cm	20 - 50cm	>50c	Cover Type 1	%	Cover Type 2	%	Type	Access	Length (m)	Roll/Frame	Type	Structure	Canopy Closure	
		G	S	3	L	R	L	0				OV	3						G10-16,1	S	INIT	1	
		G	S	3	L	R	H	0				OV	3	IV	2				G10-16	S	INIT	1	
		G	S	2	L	AR	N	0				OV	3						G10-14	S	INIT	1	
		G	S	3	L	R	L	0				OV	3						G10-12	S	INIT	1	

Level 1 - Habitat Summary Diagnosis Report

5	VANDERVEN	1	A	9	636817	6058569	782	P	1	3	0.5			0.6	0.15	2.7	1.8	0.45	0.2

Comments :

Riparian conifers have been planted.

6	VANDERVEN	1	A	9	636808	6058904	1058	G	1	4	0.5			0.3	0.2	4.4	2.2		

Comments :

7	VANDERVEN	1	A	9	636759	6059082	1143	R	1	5	0.5			0.35	0.06	6.5	1.5		

Comments :

Bankfull width extra wide due to cattle trampling.

8	VANDERVEN	1	A	9	636808	6059110	1259	P	1	4	0.75			0.6	0.35	3.4	2.2	0.4	0.05

Comments :

Banks over 2 m high up to the field

9	VANDERVEN	2	A	9	636797	6059012	26	P	1	2	3		5	0.55	0.25	3.2	1.6	0.4	0.1

Comments :

10	VANDERVEN	2	A	9	636839	6059126	79	G	1	3	2.5			0.55	0.15	3.7	1.6		

Comments :

11	VANDERVEN	2	A	9	636839	6059126	82	R	2	1	2.5			0.3	0.05	4.2	1.6		

Comments :

12	VANDERVEN	2	A	9	636942	6059277	230	C	1	4	1.5		5	0.35	0.07	2.6	1.4		

Comments :

13	VANDERVEN	2	A	9	636954	6059263	280	G	1	3	2			0.45	0.12	2.6	1.9		

Comments :

The most bank erosion seen yet in this reach.

14	VANDERVEN	2	A	9	637042	6059611	362	R	1	6	3			0.45	0.07	4.1	1.6		

Comments :

Numerous caddis flies on rocks.

0.25	S	G	S	3	L	R	L	1	1	0	0	C	5	OV	3				G10-8	M	YF	1			
		S	G	2	L	AR	N	0				IV	10	OV	5				G10-9	S	INIT	1			
		G	S	3	L	R	H	0				OV	5						G10-7,6	S	SHR	2			
0.35	S	G	S	3	L	AR	N	1	1	0	0	OV	30	C	5				G10-4,3	S	SHR	3			
0.3	S	S	G	4	L	AR	N	2	0	1	0	C	30	OV	15				G10-2	S	SHR	5			
		G	S	5	M	R	L	0				OV	20	C	5				G10-1	S	SHR	4			
		G	C	6	L	AR	N	0											G11-24	S	SHR	5			
		G	C	11	L	AR	L	0				OV	20	B	5				G11-23	S	SHR	3			
		G	C	9	M	R	L	0				B	5	OV	3				G11-22	S	SHR	1			
		G	C	6	L	R	L	0				OV	15						G11-21	S	SHR	5			

Level 1 - Habitat Summary Diagnosis Report

15	VANDERVEN	2	B	9	637028	6059365	600	C	1	3	3.5			0.35	0.15	3.8	1.4		

Comments :

16	VANDERVEN	2	B	9	637028	6059365	603	G	1	3	3.5			0.35	0.15	3.7	1.6		

Comments :

		C	G	10	M	AR	N	0				B	5	OV	5				G11-20,1	D	YF	5	

		G	C	5	M	R	L	0				C	5	B	5				G11-20,1	D	YF	5	

Level 1 - Habitat Summary Diagnosis Report

Form Number:	Forest District:	BULKLEY
8	Watershed Name:	DEJONG CREEK
	Watershed Code:	460-487900-37900

Survey Date:	99/10/14	Weather:	PARTLY CLOUDY	Survey Crew:	GT,GG
Discharge:		(cubic meters per second)			

Subsampling Fractions:

Riffles	1 IN 60	Pools	1 IN 22	Glides	1 IN 39	Cascades	0 IN 7	Other	0 IN 4

NTS Maps (1:50,000) :	ENTER	BGGS Maps (1:20,000) :	093L066
	093L10		093L076

Detail No	Sub Basin Name	Reach No	Section No	UTM Zone	UTM Easting	UTM Northing	Distance (m)	Habitat Unit Type	Habitat Unit Cat	Length (m)	Grad (%)	Air Temp. (C)	Water Temp. (C)	Mean Depth Bankfull (m)	Mean Depth Water (m)	Mean Width Bankfull (m)	Mean Width Wetted (m)	Pools Only Max Depth	Pools Only Crest (m)
1	DEJONG CRE	1	A	9	637433	6058794	72	P	1	3	0.5			0.55	0.25	2.3	2.1	0.4	0.1
							Comments :												
2	DEJONG CRE	1	A	9	637433	6058794	75	R	1	1	0.5			0.35	0.1	2.2	1.6		
							Comments :												
3	DEJONG CRE	1	A	9	637422	6058810	93	G	1	3	0.5			0.4	0.15	1.9	1.2		
							Comments :												
4	DEJONG CRE	1	A	9	637550	6058890	402	G	1	3	0.5			0.35	0.15	2.3	1.4		
							Comments :												

Form Number
8

Pools Only		Bed Material Type						Total	Functional LWD			Cover				Offchannel Habitat			Photo	Riparian Vegetation			Barriers
Residual	Pool Type	Dom.	Sub-Dom.	D (cm)	Compaction	SG Type	SG Amt	LWD Tally	10 - 20cm	20 - 50cm	>50c	Cover Type 1	%	Cover Type 2	%	Type	Access	Length (m)	Roll/Frame	Type	Structure	Canopy Closure	
0.3	S	G	S	2		AR	N	0				C	10	OV	10				G9-16	M	YF	5	
		G	S	3		AR	N	0				OV	10						G9-15	M	YF	5	
		S	G	1		AR	N	1	1	0	0	C	20	OV	20				G9-14	M	YF	4	
		G	S	4		R	L	0				OV	15						G9-14,13	M	YF	4	

Level 1 - Habitat Summary Diagnosis Report

5	DEJONG CRE	1	B	9	637567	6058900	513	R	1	2	1			0.3	0.05	2.4	2.2		

Comments :

6	DEJONG CRE	1	C	9	637786	6059300	852	G	1	2	4			0.45	0.17	2.2	2.2		

Comments :

SB5dk07 riparian vegetation right next to creek.

7	DEJONG CRE	1	C	9	637730	6059313	895	P	1	4	3			0.45	0.25	3.2	2.1	0.4	0.1

Comments :

Triton site is 2 m upstream.

8	DEJONG CRE	1	C	9	637752	6059232	990	R	1	5	3		2	0.3	0.05	3	2.3		

Comments :

9:50. Valley approx. 50 m wide.

9	DEJONG CRE	2	A	9	637903	6059517	185	P	1	4	4			0.5	0.25	3	3	0.4	0.05

Comments :

No signs of cattle in this reach.

10	DEJONG CRE	2	A	9	637764	6059585	200	G	1	3	4.5			0.5	0.08	5.1	1.7		

Comments :

11	DEJONG CRE	2	A	9	637736	6059560	230	R	1	2	2.5			0.4	0.06	2.9	1.9		

Comments :

Large number of spruce in riparian area.

12	DEJONG CRE	2	A	9	637793	6059760	260	C	1	3	3.5		2	0.4	0.08	3	1.4		

Comments :

12:15

13	DEJONG CRE	2	A	9	637932	6059950	704	G	1	3	3			0.25	0.1	3.5	1.6		

Comments :

Fair rearing and spawning habitat.

14	DEJONG CRE	2	A	9	637932	6059950	707	R	1	2	3			0.3	0.06	2.2	1.3		

Comments :

Broad floodplain on right bank.

		G	S	5		R	L	0				OV	3						G9-12	D	YF	1		
		G	C	8		R	L	2	1	0	0	C	10	OV	5				G9-5	D	YF	5		
0.3	S	G	S	6		AR	N	1	0	0	0	C	5	OV	5				G9-4	D	MF	5		
		G	C	6		AR	H	0				OV	5						G11-10	M	YF	3		
0.35	S	C	B	6	H	AR	N	5	1	0	0	C	5	SWD	5				G11-8,7	M	YF	3		
		G	C	6	M	R	L	0				OV	3	B	2				G11-5	M	YF	2		
		G	C	4	M	AR	H	0				OV	3							M	YF	3		
		C	B	10	M	AR	N	1	0	0	0	B	10	OV	5				G11-4	M	YF	1		
		G	S	7	M	R	L	0				OV	5						G11-3	M	YF	4		
		G	C	8	M	R	L	0				OV	10						G11-3	M	YF	1		

Level 1 - Habitat Summary Diagnosis Report

Form Number:	Forest District:	BULKLEY
9	Watershed Name:	DEEP CREEK
	Watershed Code:	430-496100-00000-00000-0000-0000-000-000-000-000-000-000

Survey Date:	99/09/11	Weather:	SUNNY	Survey Crew:	MJ,GT,GG,RH
Discharge:	0.65	(cubic meters per second)			

Subsampling Fractions:

Riffles	1 IN 26	Pools	1 IN 18	Glides	1 IN 24	Cascades	0 IN 14	Other	1 IN 21

NTS Maps (1:50,000):	ENTER
	093L10

BGGS Maps (1:20,000):	093L056
	093L057
	093L066
	093L067

Detail No	Sub Basin Name	Reach No	Section No	UTM			Distance (m)	Habitat Unit		Length (m)	Grad (%)	Air Temp (C)	Water Temp (C)	Mean Depth		Mean Width		Pools Only	
				Zone	Easting	Northing		Type	Cat					Bankfull (m)	Water (m)	Bankfull (m)	Wetted (m)	Max Depth	Crest (m)
1	DEEP CREEK	1	A	9	638802	6050601	65	P	3	6	2.25		7	1	0.4	11	3.7	0.55	0.2
							Comments :												
2	DEEP CREEK	1	A	9	638753	6050932	223	R	1	19	1.25			0.85	0.15	15.4	5.1		
							Comments :												
3	DEEP CREEK	1	A	9	638911	6050669	297	G	1	17	1.75			1.03	0.32	19	3.9		
							Comments :												
4	DEEP CREEK	1	A	9	639199	6060703	748	P	1	9	1.5			1.25	0.52	17.8	6.1	0.71	0.18
							Comments :												

2 mature cottonwood in riparian zone.

Form Number
9

Pools Only		Bed Material Type						Total	Functional LWD			Cover				Offchannel Habitat			Photo	Riparian Vegetation			Barriers
Residual	Pool Type	Dom.	Sub-Dom.	D (cm)	Compaction	SG Type	SG Amt	LWD Tally	10 - 20cm	20 - 50cm	>50c	Cover Type 1	%	Cover Type 2	%	Type	Access	Length (m)	Roll/Frame	Type	Structure	Canopy Closure	
0.35	S	G	C	17		AR	L	1	0	0	0	C	15	OV	5					S	SHR	1	
		C	G	19		A	H	2	0	1	0	OV	5	LWD	2					S	SHR	1	
		G	C	12		AR	H	4	0	1	0	OV	20	C	5					S	SHR	1	
0.53	S	G	S	13		AR	H	4	0	2	0	OV	10	B	5					S	SHR	1	

Level 1 - Habitat Summary Diagnosis Report

5	DEEP CREEK	1	B	9	639606	6050967	1003	R	1	3	2			0.65	0.15	10.4	5.4		

Comments :

6	DEEP CREEK	1	B	9	639551	6051000	1319	G	1	8	2			0.8	0.21	9.9	6.5		

Comments :

Road approx. 5 m. from right bank. 10 mature cottonwood in riparian.

7	DEEP CREEK	1	B	9	639580	6051420	1709	R	1	4	1.5			0.67	0.12	10	5.4		

Comments :

8	DEEP CREEK	1	B	9	639620	6051510	1945	P	1	8	1			1.33	0.73	13	4.5	1.3	0.1

Comments :

9	DEEP CREEK	1	B	9	639700	6051600	2049	G	1	30	1.5			0.58	0.18	15.2	4.9		

Comments :

According to landowner, flood in 1997 took out left bank.

10	DEEP CREEK	1	B	9	639800	6051770	2427	O	1	8	0.3			0.89	0.22	1.15	0.69		

Comments :

D value is less than 1 cm. According to landowner, this unit is an old creek channel and the creek has been diverted by Hwy. 16

11	DEEP CREEK	1	B	9	639820	6051800	2491	R	1	13	1.25			0.5	0.1	9.4	7.2		

Comments :

Approx. 20 m downstream of highway. This is a braided section around a bar, this unit is part of the largest channel of the braidin

12	DEEP CREEK	1	B	9	639980	6052020	2819	G	1	6	0.75			0.79	0.22	8.7	7.3		

Comments :

13	DEEP CREEK	1	B	9	639980	6052100	2942	P	2	5	1.5		8	0.85	0.4	9.9	7.6	0.6	0.15

Comments :

Pool dimensions 4.7m X 2.4m

14	DEEP CREEK	1	B	9	640060	6052190	3052	R	1	7	1		8	0.5	0.32	6.8	2.9		

Comments :

		C	B	22		A	L	2	0	0	0	B	15	OV	5					M	YF	2	
		C	G	20		AR	H	0				B	10	OV	5					M	YF	3	
		C	B	9		AR	L	0				B	10	OV	5				G1-2	S	SHR	3	
1.2	S	G	C	8		AR	L	0				DP	10	C	5				G1-1	S	SHR	2	
		G	C	7		AR	H	0				B	10	IV	5				G2-23	S	SHR	1	
		S		1		AR	N	0				OV	5			SL	P	8		S	SHR	1	

onstruction.

		C	G	21		AR	L	0				OV	25	C	5					D	YF	3	
		G	S	9		AR	L	4	3	1	0	LWD	15	OV	5					M	MF	1	
0.45	S	G	S	10		AR	L	4	3	1	0	OV	20	LWD	5				G2-20	S	SHR	1	
		G	S	8		AR	L	2	1	1	0	LWD	5	OV	5				G2-19	D	YF	4	

Level 1 - Habitat Summary Diagnosis Report

15	DEEP CREEK	1	B	9	640120	6052380	3372	G	1	6	0.75			0.5	0.2	9.8	4.8		

Comments :

16	DEEP CREEK	1	B	9	640150	6052420	3548	P	3	6	1			0.9	0.45	11.2	7.3	0.75	0.25

Comments :

Pool caused by root wad. Pool size is 6m X 3m.

17	DEEP CREEK	1	B	9	640180	6052480	3618	R	1	11	2.5			1.1	0.1	3	3		

Comments :

18	DEEP CREEK	1	B	9	640434	6052398	4177	P	1	3	1.25		8	1.1	0.43	8.6	3.5	0.65	0.23

Comments :

13:30

19	DEEP CREEK	1	B	9	640434	6052398	4180	R	1	6	1.25			0.52	0.16	9.1	6.7		

Comments :

20	DEEP CREEK	1	B	9	640360	6052878	4506	G	1	15	1.5		9	0.72	0.34	7.8	6.2		

Comments :

14:45

21	DEEP CREEK	1	B	9	640740	6053264	4928	R	1	8	1.25			0.64	0.24	8.6	4.8		

Comments :

Riffle unit is located downstream of cattle crossing and watering area.

22	DEEP CREEK	1	B	9	640766	6053248	5216	P	1	10	1.25		9	1.45	0.48	7.3	5.7	0.65	0.18

Comments :

23	DEEP CREEK	1	B	9	641041	6053355	5593	G	1	9	2.25		7	0.66	0.3	8.6	3.3		

Comments :

24	DEEP CREEK	1	B	9	641174	6053366	5682	R	2	2	2		7	0.37	0.08	9.2	3.1		

Comments :

		G	C	7		AR	H	0				OV	15							S	SHR	1		
0.5	S	S	G	7		AR	N	1	0	0	1	LWD	25						G2-16,15	S	SHR	1		
		G	C	9		AR	L	0				SWD	5						G2-13,12	S	SHR	1		
0.42	S	G	C	9	H	AR	L	4	0	0	4	LWD	40	DP	5					M	YF	2		
		C	G	14	H	A	H	2	0	1	0	OV	5	B	2					M	YF	1		
		G	C	12	M	A	H	2	0	1	1	C	15	OV	5	SC	G	19		D	YF	1		
		C	G	16		AR	H	0				OV	40	C	10					D	YF	2		
0.47	S	G	S	7	L	AR	L	5	1	1	0	LWD	15	OV	5					D	YF	2		
		C	G	18	H	A	H	0				C	10	OV	5					D	MF	3		
		G	C	7	H	R	H	0				OV	5							D	YF	1		

Level 1 - Habitat Summary Diagnosis Report

25	DEEP CREEK	1	B	9	641408	6053619	6110	P	1	4	2		7	0.83	0.52	6.1	3.4	0.64	0.22

Comments :

26	DEEP CREEK	1	B	9	641639	6053631	6371	R	1	9	2.5		8	1.1	0.18	11.2	6.1		

Comments :

27	DEEP CREEK	1	B	9	641639	6053631	6379	G	1	7	2.5		8	1.2	0.23	11.5	6.3		

Comments :

28	DEEP CREEK	1	B	9	642020	6053782	6853	P	1	8	2.5		8	0.73	0.45	9.9	9.6	0.55	0.14

Comments :

29	DEEP CREEK	2	A	9	642077	6053769	529	R	1	3	3.75		9	0.87	0.26	6.7	4.9		

Comments :

30	DEEP CREEK	2	A	9	642077	6053769	569	G	1	7	3.5		9	0.92	0.38	6.1	5.2		

Comments :

31	DEEP CREEK	2	A	9	642643	6053951	753	P	1	10	3		9	1.14	0.43	16.3	4.1	0.67	0.21

Comments :

0.42	S	C	S	23	H	AR	L	3	0	0	0	OV	10	C	5					D	MF	3	
		C	G	26	H	AR	N	1	0	0	1	B	15	LWD	5				M2-8	S	INIT	1	
		C	G	23	H	AR	N	0				B	15						M2-8	S	INIT	1	
0.41	S	C	G	16	H	AR	H	3	0	0	0	SWD	15	B	10					D	PS	3	
		B	C	26	H	R	L	1	0	0	0	B	20	SWD	5					D	MF	2	
		B	G	28	H	R	L	1	0	0	0	B	15							D	MF	1	
0.46	S	R	S	17	M	R	L	5	0	2	0	LWD	10	SWD	5					D	YF	1	

Level 1 - Habitat Summary Diagnosis Report

Form Number:	10
Forest District:	BULKLEY
Watershed Name:	DAHLIE CREEK
Watershed Code:	460-373800-33200-00000-0000-0000-000-000-000-000-000-000
Survey Date:	99/10/29
Weather:	SNOWING, -1C
Survey Crew:	GT,MJ
Discharge:	(cubic meters per second)

Subsampling Fractions:

Riffles	0 IN 5	Pools	0 IN 11	Glides	0 IN 8	Cascades	1 IN 9	Other	0 IN 0

NTS Maps (1:50,000):	093L14	BGGS Maps (1:20,000):	093L075

Detail No	Sub Basin Name	Reach No	Section No	UTM Zone	UTM Easting	UTM Northing	Distance (m)	Habitat Unit Type	Habitat Unit Cat	Length (m)	Grad (%)	Air Temp. (C)	Water Temp. (C)	Mean Depth Bankfull (m)	Mean Depth Water (m)	Mean Width Bankfull (m)	Mean Width Wetted (m)	Pools Only Max Depth	Pools Only Crest (m)
1	DAHLIE CREE	1	A	9			103	P	1	3	1.5	0	1	0.6	0.31	2.9	2.1	0.52	0.1

Comments :

Most of the overveg. is willow that has fallen across the creek. 10:00

2	DAHLIE CREE	1	A	9			125	G	1	4	2			0.4	0.18	3.1	2.5		

Comments :

3	DAHLIE CREE	1	A	9			129	R	1	5	2			0.35	0.04	3.1	2.3		

Comments :

Foot bridge (1.6 m wide) provides most cover.

4	DAHLIE CREE	2	A	9			99	C	1	7	7			0.45	0.15	3.9	1.8		

Comments :

Form Number
10

Pools Only		Bed Material Type						Total	Functional LWD				Cover				Offchannel Habitat			Photo	Riparian Vegetation			Barriers
Residual	Pool Type	Dom.	Sub-Dom.	D (cm)	Compaction	SG Type	SG Amt	LWD Tally	10 - 20cm	20 - 50cm	>50c	Cover Type 1	%	Cover Type 2	%	Type	Access	Length (m)	Roll/Frame	Type	Structure	Canopy Closure	
0.42	S	G	S	4		AR	N	0				OV	60	SWD	5				G12-23,2	D	YF	1	
		S	G	2		R	L	1	1	0	0	OV	50	SWD	5				G12-20	D	YF	3	
		G	S	10		AR	H	0				OV	10	SWD	5				G12-19	D	YF	2	
		C	G	15	M	AR	N	1	0	0	0	OV	10	B	5				G12-11,1	D	MF	2	CV

Level 1 - Habitat Summary Diagnosis Report

5	DAHLIE CREE	3	A	9			85	G	1	7	1			0.45	0.18	2.2	2.2		

Comments :

6	DAHLIE CREE	3	A	9			476	G	1	6	0.5			0.5	0.2	2.4	1.7		

Comments :

7	DAHLIE CREE	3	A	9			533	R	1	7	1		3	0.4	0.1	3.4	2.1		

Comments :

Discharge less than d/s "tribs" or ditches. 16:00

8	DAHLIE CREE	3	A	9			544	P	1	4	1			0.72	0.41	2.4	2.1	0.48	0.2

Comments :

Pool tail out contains cobble from eroded adjacent bank.

9	DAHLIE CREE	3	A	9			1461	G	1	90	1	1	0	0.6	0.25	4	2.3		

Comments :

12:00

10	DAHLIE CREE	3	A	9			1836	P	1	6	1	0	0	0.65	0.4	5.4	2.7	0.55	0.13

Comments :

Most gravel >2cm. appears to be from railway crossing.

11	DAHLIE CREE	3	A	9			1963	R	1	14	1.75			0.25	0.1	4	1.4		

Comments :

Long riffle flowing beside road.

12	DAHLIE CREE	3	B	9			2285	G	1	8	1			0.35	0.2		2.1		

Comments :

Likely floods into swamp at high flows. No real banks. Unit in large swamp, channel unconfined. D value is less than 1.

		G	S	10	M	AR	N	0				OV	10	B	5				G12-6,5	S	SHR	1
		S	G	1	H	R	L	0				OV	20	C	2				G12-3	D	SHR	4
		G	C	10	H	AR	L	0				OV	15	C	5				G12-1	D	SHR	1
0.28	S	S	C	1	M	A	L	0				DP	20	C	10				G13-24	D	SHR	1
		S		4	L	AR	N	12	3	3	0	OV	30	DP	10				G13-17,1	D	SHR	2
0.42	S	G	S	3	M	R	L	0				OV	20	DP	5				G13-10,9	D	SHR	1	CV
		G	S	3	M	R	H	0				IV	15	OV	10				G13-7	D	SHR	2
		S		1	L	AR	N	0				OV	20	SWD	5				G13-5	D	SHR	3

Integrated RIAP/CAP Field Procedure- Channel Disturbance Level Report

Form Number: 5
Forest District: BULKLEY
Watershed Name: CENTRAL BULKLEY
Sub-Basin Name: ROBIN CREEK
Watershed Code: 460-487900-00000
Survey Date: 99/10/01
Crew: MJ,GT,GG,RH

Detail #	Reach	Section	Distance	Bank Type	Channel Type	Disturbance Level	S1	S2	S3	S4	S5	C1	C2	C3	C4	C5	B1	B2	B3	D1	D2	D3	Photo Roll/Frame
1	1	A	0	A321	RPgw	A1												P			P		
2	1	A	355	A12	L	S	P	P	P						P								
3	1	A	588	A24	RPgw	A1		P	P						P						P		
4	1	A	719	A12	L	S	P	P	P						P								
5	1	A	829	A123	RPgw	A1		P	P						P								
6	1	A	885	A12	L	S	P	P	P						P								
7	1	A	1061	A12	RPgw	A1		P	P					P	P								
8	1	A	1278	A12	L	S	P	P	P						P								
9	1	A	1418	A12	RPgw	A1	P		P					P	P		P		P	P			
10	1	A	1963	A12	RPgw	S									P					P			
11	1	A	2298	A12	RPgw	A1									P					P			
12	2	A	0	A12	L	S														P			
13	2	B	360	A12	RPgw	S	P													P			
14	2	B	451	A12	RPgw	A1								P				P			P		
15	2	B	785	A12	RPgw	A2								P				P			P		
16	2	B	1250	A123	RPcw	D2					P							P			P		
17	2	B	1375	A12	RPgw	D1					P										P		
18	2	B	1415	A12	RPgw	D2					P				P			P	P				
19	2	B	1455	A12	RPgw	A1								P	P								
20	2	B	1574	A12	RPgw	D1					P		P					P			P		
21	2	B	1700	A12	RPgw	A1							P		P						P		
22	2	B	1876	A12	L	S																	
23	2	B	2070	A12	RPcw	S															P		
24	2	B	2213	A12	L	S																	
25	2	B	2271	A12	RPgw	A1							P		P								
26	2	C	2350	A12	L	S																	
27	2	D	2880	A12	RPgw	S		P															
28	2	D	3050	A12	RPgw	A1							P					P			P		

29	2	D	3178	A12	RPgw	S							P		P							
30	2	D	3315	A12	RPgw	A2						P	P					P			P	
31	2	D	3750	A12	RPcw	A2						P	P	P	P	P		P			P	
32	2	D	4648	A12	RPcw	A1												P			P	
33	3	A	0	A12	RPgw	S									P							
34	3	A	52	A12	U	S																
35	3	A	247	A12	U	S																

Integrated FHAP/CAP Field Procedure- Channel Disturbance Level Report

Form Number: 6
Forest District: BULKLEY
Watershed Name: CENTRAL BULKLEY
Sub-Basin Name: LEMIEUX CREEK
Watershed Code: 460-487900-11100-00000-0000-0000-000-000-000-000-000-000
Survey Date: 99/10/02
Crew: MJ,RH

Detail #	Reach	Section	Distance	Bank Type	Channel Type	Disturbance Level	S1	S2	S3	S4	S5	C1	C2	C3	C4	C5	B1	B2	B3	D1	D2	D3	Photo Roll/Frame
1	1	A	0	A12	L	S	P								P		P				P		
2	1	A	200	A12	RPgw	S	P	P	P						P		P				P		
3	1	A	460	A12	RPgw	S	P	P	P												P		
4	1	A	920	A312	RPgw	A1		P	P	P				P				P			P		
5	1	A	1157	A123	RPgw	D1	P				P	P	P					P			P		
6	1	A	1250	A123	RPgw	A1		P										P			P		
7	1	A	1650	A12	RPgw	A1	P	P	P						P								
8	1	A	1830	A12	L	S									P								
9	1	A	2240	A12	RPgw	A1	P	P	P						P			P					
10	1	A	2663	A12	L	S																	
11	3	A	0	A12	L	S	P											P					
12	3	A	170	A12	RPgw	S	P	P										P			P		
13	3	A	192	A12	L	S	P											P					
14	3	A	280	A12	RPgw	A1		P	P									P			P		
15	3	A	530	A12	RPgw	S	P	P										P					
16	3	A	1160	A12	RPgw	A1		P	P					P				P					
17	5	A	0	A12	RPgw	A1		P		P				P	P								
18	5	A	190	A12	RPgw	A2		P	P	P		P	P	P							P		
19	5	A	500	A241	RPcw	A2				P		P	P	P	P	P		P	P		P		
20	5	A	1650	A234	CPcw	D1						P	P			P					P		
21	5	A	1850	A234	RPcw	A1						P	P	P	P			P			P		
22	5	A	2150	A234	CPcw	A1						P		P	P			P					
23	5	A	2800	A342	CPcw	D1						P	P			P							
24	5	A	3550	A324	RPcw	A1				P				P	P								
25	5	A	3700	A324	CPcw	D1						P	P			P							

Integrated FHAP/CAP Field Procedure- Channel Disturbance Level Report

Form Number: 7
Forest District: BULKLEY
Watershed Name: CENTRAL BULKLEY
Sub-Basin Name: VANDERVEN CREEK
Watershed Code: 460-487900-37600
Survey Date: 99/10/15
Crew: GT,GG

Detail #	Reach	Section	Distance	Bank Type	Channel Type	Disturbance Level	S1	S2	S3	S4	S5	C1	C2	C3	C4	C5	B1	B2	B3	D1	D2	D3	Photo Roll/Frame
1	1	A	0	A12	RPgw	S															P		
2	1	A	73	A123	RPgw	D2						P	P								P		
3	1	A	541	A123	RPgw	D2							P								P		
4	1	A	825	A123	RPgw	D1												P		P	P		
5	1	A	975	A12	RPgw	D2												P			P		
6	1	A	1097	A12	RPgw	A1							P	P	P						P		
7	1	A	1234	A12	RPgw	D1												P			P		
8	2	A	0	A123	RPgw	A2							P	P	P			P			P		
9	2	A	140	A1234	RPcw	D1								P		P		P			P		
10	2	A	270	A1432	RPcw	D2								P		P		P					
11	2	A	360	A3421	RPcw	A1				P													
12	2	A	420	A3421	CPcw	D2						P	P			P					P		
13	2	B	565	A3142	CPcw	D1						P	P			P					P		
14	2	B	631	A3142	CPcw	A1							P		P						P		

Integrated PHAI/CAP Field Procedure- Channel Disturbance Level Report

Form Number: 8
Forest District: BULKLEY
Watershed Name: CENTRAL BULKLEY
Sub-Basin Name: DEJONG CREEK
Watershed Code: 460-487900-37900
Survey Date: 99/10/14
Crew: GT,GG

Detail #	Reach	Section	Distance	Bank Type	Channel Type	Disturbance Level	S1	S2	S3	S4	S5	C1	C2	C3	C4	C5	B1	B2	B3	D1	D2	D3	Photo Roll/Frame
1	1	A	0	A12	RPgw	S														P			
2	1	A	200	A21	RPgw	A2			P				P					P		P			
3	1	A	335	A12	RPgw	A1			P				P		P								
4	1	A	426	A321	RPgw	A2								P	P						P		
5	1	B	485	A132	RPgw	D2					P	P	P					P			P		
6	1	B	610	A132	RPcw	D2					P	P	P						P		P		
7	1	C	841	A12	RPcw	D1					P	P	P			P					P		
8	1	C	905	A1243	RPcw	A1				P			P		P					P	P		
9	2	A	0	A1234	RPcw	A1			P				P		P	P		P	P		P		
10	2	A	560	A312	RPcw	A2			P	P			P		P						P		
11	2	A	660	A123	RPcw	A1			P						P						P		
12	2	A	870	A1243	RPcw	A1			P				P								P		

Integrated FHAP/CAP Field Procedure- Channel Disturbance Level Report

Form Number: 9
Forest District: BULKLEY
Watershed Name: CENTRAL BULKLEY
Sub-Basin Name: DEEP CREEK
Watershed Code: 460-496100-00000-00000-0000-0000-000-000-000-000-000-000
Survey Date: 99/09/11
Crew: GT,MJ,GG,RH

Detail #	Reach	Section	Distance	Bank Type	Channel Type	Disturbance Level	S1	S2	S3	S4	S5	C1	C2	C3	C4	C5	B1	B2	B3	D1	D2	D3	Photo Roll/Frame
1	1	A	0	A32	RPgw	A2				P								P			P		
2	1	A	120	A13	RPgw	A2			P	P				P				P			P		
3	1	A	188	A231	RPgw	A2		P		P				P				P			P		
4	1	A	390	A123	RPgw	A2				P				P			P	P			P		
5	1	B	780	A321	RPgw	A1							P					P			P		
6	1	B	1403	A231	RPcw	D1					P		P			P		P			P		
7	1	B	1604	A231	RPgw	A1							P					P			P		
8	1	B	1648	A31	RPcw	D1																	
9	1	B	1709	A13	RPgw	D1	P						P					P		P			
10	1	B	1945	A3421	RPgw	D1	P						P	P				P			P		
11	1	B	2166	A1	RPgw	D1								P			P	P					
12	1	B	2420	A1	RPgw	A1			P			P	P										
13	1	B	2540	A12	RPgw	A1						P	P					P		P			
14	1	B	2690	A1	RPgw	D1						P								P			
15	1	B	2926	A123	RPgw	A2			P	P		P					P	P	P	P			
16	1	B	3595	A123	RPgw	D2					P	P	P						P				
17	1	B	3620	NA	RPgw	S																	
18	1	B	3640	A32	RPgw	A3				P				P	P		P	P	P		P		
19	1	B	4038	A231	RPgw	A2								P				P			P		
20	1	B	4338	A231	RPgw	A3				P				P			P	P	P		P		
21	1	B	4544	A324	RPgw	A1						P	P					P			P		
22	1	B	4653	A32	RPgw	A3			P					P				P			P		
23	1	B	4964	A312	RPgw	A1						P		P				P			P		
24	1	B	5277	A342	RPgw	A1			P					P				P			P		
25	1	B	5390	A342	RPgw	D1	P					P	P	P		P		P			P		
26	1	B	5581	A231	RPgw	A2				P			P	P	P			P			P		
27	1	B	5721	A231	RPgw	A1								P							P		
28	1	B	5930	A231	RPgw	A2				P			P	P				P			P		

29	1			3	Pgw								P										
30	1	B	6214	A32	RPgw	A1			P	P				P	P			P			P		
31	1	B	6324	A32	RPcw	D1	P						P			P		P			P		
32	1	B	6941	A32	RPcw	A1								P	P			P			P		
33	2	A	0	A342	CPcw	A1						P	P	P		P		P			P		
34	2	A	57	A3425	CPcw	D1						P	P			P		P			P		
35	2	A	147	A321	RPgw	A2						P	P	P	P	P	P	P			P		
36	2	A	590	A432	CPcw	S						P	P								P		
37	2	A	700	A342	CPcw	A1						P	P	P	P						P		
38	2	A	890	A342	CPb	S						P									P		
39	2	A	1008	A342	CPb	A1						P		P	P						P		

Integrated FHAP/CAP Field Procedure- Channel Disturbance Level Report

Form Number: 3
Forest District: BULKLEY
Watershed Name: CENTRAL BULKLEY
Sub-Basin Name: THOMPSON CREEK
Watershed Code: 460-517700-00000-00000-0000-0000-000-000-000-000-000-000
Survey Date: 99/09/21
Crew: MJ,GT,GG,RH

Detail #	Reach	Section	Distance	Bank Type	Channel Type	Disturbance Level	S1	S2	S3	S4	S5	C1	C2	C3	C4	C5	B1	B2	B3	D1	D2	D3	Photo Roll/Frame
1	1	A	0	A1	RPgw	S																	
2	1	A	25	A123	RPgw	D1							P					P		P	P		
3	1	A	125	A12	RPgw	D1			P			P	P								P		
4	1	B	200	A12	L	S																	
5	1	B	500	A12	L	S																	
6	1	C	615	A1234	CPcw	D1						P	P			P		P		P	P		
7	1	C	937	A1234	CPcw	A1						P	P	P	P								
8	1	C	961	A1234	CPcw	D1						P	P				P	P					
9	1	C	1045	A1234	CPcw	D1						P	P		P	P		P					
10	1	C	1069	A231	RPgw	A1				P		P	P	P				P		P	P		
11	1	C	1135	A234	CPcw	D1						P	P					P		P	P		
12	1	C	1190	A231	CPcw	A1				P		P	P					P					
13	1	C	1230	A12345	CPcw	D1						P	P					P	P		P		
14	1	C	1370	A21	RPgw	S															P		
15	1	C	1420	A123	CPcw	D1																	
16	1	C	1452	A12	RPgw	A1									P					P			
17	1	C	1585	A21	RPcw	S						P	P							P	P		
18	1	C	1708	A12	RPgw	A1						P	P	P	P					P			
19	1	C	1950	A12	RPgw	A1				P		P	P	P	P			P					
20	1	C	2140	A1243	RPcw	D1						P	P					P			P		
21	1	C	2248	A12	L	A1																	
22	1	C	2275	A124	RPgw	A1						P	P										
23	1	C	2350	A124	RPcw	S					P	P	P		P			P					
24	1	C	2436	A12	RPcw	D1					P	P	P								P		
25	1	C	2750	A12	RPcw	S							P		P								
26	1	C	3034	A12	RPgw	D1					P	P	P										
27	1	C	3066	A1245	RPgw	A1								P	P					P			
28	1	C	3163	A41	RPcw	D1					P	P	P			P							

29	1			2	RPgw								P								
30	1	C	3510	A321	RPgw	S						P									P
31	1	C	3807	A123	RPgw	S															
32	1	C	3916	A12	RPgw	S															
33	1	C	4047	A123	RPgw	A1									P						P
34	1	C	4608	A231	RPgw	A2	P	P	P					P	P						
35	1	C	5091	A32	RPgw	A3				P		P	P	P	P	P		P			P
36	1	C	5216	A31	RPgw	A3				P		P	P	P	P		P	P			
37	2	A	0	A32	RPgw	A2				P		P	P		P			P			P
38	2	A	420	A324	RPcw	A1						P	P		P			P			P
39	2	A	600	A342	CPcw	A1			P				P	P	P			P			P
40	2	A	1000	A32	RPcw	A1			P				P	P	P						
41	2	A	1200	A342	CPcw	A1							P	P	P						
42	2	A	1300	A342	CPcw	A2		P	P	P			P	P	P	P		P			P
43	2	A	1936	A213	RPgw	A1							P	P	P						
44	2	A	2027	A125	RPgw	A1			P			P		P	P			P		P	
45	2	A	2231	A125	RPgw	A1			P	P				P	P			P		P	
46	2	B	2587	A12	RPgw	D1	P						P		P			P			P
47	2	B	2727	A12	RPgw	A1									P					P	
48	2	B	2877	A12	RPgw	A1	P						P		P						
49	2	B	2927	A12	RPgw	S									P						P
50	2	B	3162	A12	RPgw	S								P	P						P
51	2	B	3507	A12	RPgw	A1									P			P			P
52	2	B	3727	A1	RPgw	S								P	P						
53	2	B	3777	A12	RPgw	A1			P				P	P	P				P		
54	2	B	3977	A12	RPgw	D1					P							P			P
55	2	B	4159	A12	RPgw	S															P
56	2	B	4277	A12	RPgw	S						P	P					P			P
57	2	B	4437	A12	RPgw	D1						P	P					P			P
58	2	B	4577	A12	RPgw	A1						P	P								P
59	2	B	4657	A12	RPgw	D1					P	P	P		P			P		P	P
60	2	B	4757	A12	RPgw	S															
61	2	B	4927	A12	RPgw	A1						P	P	P	P						P
62	2	B	5247	A12	RPgw	D1					P	P	P								
63	2	B	5337	A321	RPgw	A1				P				P	P			P			P
64	2	B	5947	A231	RPgw	S												P			

65	2	B	6167	A231	RPgw	A2		P	P	P		P	P	P		P		P
66	2	B	6437	A23	RPgw	S										P		
67	2	B	6537	A324	RPcw	S												
68	2	B	6803	A324	RPcw	A1						P	P	P		P		P

Integrated FHAP/CAP Field Procedure- Channel Disturbance Level Report

Form Number: 2
Forest District: BULKLEY
Watershed Name: CENTRAL BULKLEY
Sub-Basin Name: HELPS CREEK
Watershed Code: 460-437000-00000-00000-0000-0000-000-000-000-000-000-000
Survey Date: 99/09/08
Crew: MJ, GT, GG, RH

Detail #	Reach	Section	Distance	Bank Type	Channel Type	Disturbance Level	S1	S2	S3	S4	S5	C1	C2	C3	C4	C5	B1	B2	B3	D1	D2	D3	Photo Roll/Frame
1	2	A	0	A1	RPgw	S																	
2	2	A	152	A34	RPgw	S												P					
3	2	A	161	A1	RPgw	S	P								P								
4	3	A	0	A1	RPgw	S									P								

Integrated FHAP/CAP Field Procedure- Channel Disturbance Level Report

Form Number: 4
Forest District: BULKLEY
Watershed Name: CENTRAL BULKLEY
Sub-Basin Name: "MOAN" CREEK
Watershed Code: 460-458800-00000
Survey Date: 99/09/17
Crew: MJ,GG

Detail #	Reach	Section	Distance	Bank Type	Channel Type	Disturbance Level	S1	S2	S3	S4	S5	C1	C2	C3	C4	C5	B1	B2	B3	D1	D2	D3	Photo Roll/Frame
1	1	A	0	A32	RPcw	A1						P	P					P			P		
2	1	A	194	A32	RPgw	A2				P		P	P	P				P			P		
3	1	A	386	A324	CPcw	A1						P	P					P			P		
4	1	A	613	A324	CPcw	A2				P		P	P	P				P			P		
5	1	A	633	A32	RPgw	A2				P		P		P	P			P			P		
6	1	A	800	A324	CPcw	A1						P	P	P				P			P		
7	1	A	1070	A312	CPcw	A2				P		P	P	P	P			P					
8	1	A	1360	A342	CPcw	A1						P		P				P					
9	1	A	1480	A342	CPcw	S																	
10	1	A	1539	A32	CPcw	A2				P		P		P	P		P	P			P		
11	1	A	1800	A324	CPcw	A1				P				P				P					
12	2	A	0	A1423	RPcw	D1			P			P	P										
13	2	A	50	A4321	RPcw	D1			P			P	P										
14	2	A	105	A2143	CPcw	A2			P	P		P	P	P	P								
15	2	A	155	A124	CPcw	D1						P	P			P							
16	2	A	215	A123	CPcw	A2			P	P		P	P	P	P								
17	2	A	295	A421	CPcw	A1						P	P										
18	2	A	365	A124	CPcw	D1					P	P	P										
19	2	A	450	A2143	CPcw	A2			P	P		P	P	P	P		P						
20	2	A	590	A2314	CPcw	A1			P			P	P	P	P		P						
21	2	A	684	A432	CPcw	D2					P	P	P			P					P		
22	2	A	770	A43521	CPb	A2						P	P	P	P								
23	2	A	860	A43521	CPb	S						P	P								P		
24	2	A	950	A432	CPcw	A1				P		P	P	P	P								
25	3	A	1115	A543	SPb	S																	

Integrated FHAP/CAP Field Procedure- Channel Disturbance Level Report

Form Number: 1
Forest District: BULKLEY
Watershed Name: CENTRAL BULKLEY
Sub-Basin Name: COFFIN LAKE
Watershed Code: 460-472700-00000-00000-0000-0000-000-000-000-000-000-000
Survey Date: 99/09/20
Crew: RH, GT, MJ, GG

Detail #	Reach	Section	Distance	Bank Type	Channel Type	Disturbance Level	S1	S2	S3	S4	S5	C1	C2	C3	C4	C5	B1	B2	B3	D1	D2	D3	Photo Roll/Frame
1	1	A	0	A1243	RPgw	A1						P	P					P		P			
2	1	A	50	A2134	RPcw	A1						P	P		P		P	P					
3	1	A	370	A21	RPcw	A1						P	P										
4	1	A	470	A21	RPcw	D1						P	P		P	P		P					
5	1	A	522	A21	CPcw	A1						P	P			P							
6	1	A	680	A214	CPcw	D1						P	P		P	P							
7	1	A	733	A214	CPcw	A1			P			P	P	P	P					P			
8	1	A	931	A4321	CPcw	D1						P	P			P		P					
9	1	A	1090	A4321	CPcw	A1						P	P					P	P				
10	1	A	1120	A4321	CPcw	D1						P	P					P					
11	1	A	1157	A431	CPcw	A1						P	P										
12	1	A	1200	A4321	CPcw	D1						P	P					P					
13	1	A	1330	A23	CPcw	A1			P			P	P										
14	1	A	1360	A453	CPcw	D1						P	P					P					
15	1	A	1450	A453	CPb	D1						P	P					P			P		
16	1	A	1547	A32	RPcw	S						P											
17	1	A	1690	A324	CPcw	A2						P		P	P			P					
18	1	A	1997	A324	CPcw	S							P								P		
19	1	A	2097	A32	CPcw	A2				P		P	P	P	P			P					
20	1	A	2387	A32	CPcw	A1						P	P	P									
21	1	A	2680	A32	CPcw	A2						P	P	P		P		P			P		
22	1	A	2746	A342	CPcw	D1						P	P			P		P			P		
23	1	A	2836	A324	RPgw	S							P	P							P		
24	1	A	2956	A342	CPcw	D1						P	P			P					P		
25	1	A	3014	A321	RPgw	A2						P	P	P	P								
26	1	A	3096	A321	RPgw	A1						P		P	P								

Integrated FHAP/CAP Field Procedure- Channel Disturbance Level Report

Form Number: 10
Forest District: BULKLEY
Watershed Name: CENTRAL BULKLEY
Sub-Basin Name: DAHLIE CREEK
Watershed Code: 460-373800-33200-00000-0000-0000-000-000-000-000-000-000
Survey Date: 99/10/29
Crew: GT,MJ

Detail #	Reach	Section	Distance	Bank Type	Channel Type	Disturbance Level	S1	S2	S3	S4	S5	C1	C2	C3	C4	C5	B1	B2	B3	D1	D2	D3	Photo Roll/Frame
1	1	A	0	A123	RPgw	A1	P						P								P		
2	1	A	90	A123	RPgw	A1							P								P		
3	1	A	189	A123	RPgw	A2		P	P				P	P	P						P		
4	2	A	0	A231	RPcw	A1							P	P							P		
5	2	A	42	A213	RPgw	A1							P	P	P						P		
6	2	A	99	A342	CPcw	D1						P	P			P	P				P		
7	3	A	0	A234	RPgw	A1							P								P		
8	3	A	85	A12	RPgw	D1	P						P								P		
9	3	A	469	A12	RPgw	D1					P		P					P			P		
10	3	A	715	A12	RPgw	S	P						P								P		
11	3	A	929	N2	RPgw	S	P						P								P		
12	3	A	985	A12	RPgw	D1	P	P					P								P		
13	3	A	1695	N2	RPgw	D2					P	P				P					P		
14	3	A	1743	N3	RPgw	D3	P						P								P		
15	3	A	1805	A12	RPgw	D1															P		
16	3	A	1843	N	RPgw	D2	P														P		
17	3	A	1879	A123	RPgw	S																	
18	3	A	1927	N	RPgw	S															P		
19	3	A	1946	A23	RPgw	A1						P	P								P		
20	3	A	2095	A21	RPgw	S	P						P								P		
21	3	B	2209	A1	RPgw	S	P								P						P		

APPENDIX E. RIPARIAN PLANTS

Site No: MG1

Species Name	Common Name	% Cover
	Unidentified Grasses	60
Lonicera involucrata	Black twinberry	5
Rosa acicularis	Prickly Rose	5
Taraxacum officinale	Dandelion	2
Salix sp.		1
Epilobium angustifolium	Fireweed	1
Vicea americana	American vetch	<1
Ribes lacustre	Black gooseberry	<1
Equisetum arvense	Common horsetail	<1
Heracleum lanatum	Cow parsnip	<1
Lathyrus ochroleucus	Creamy Peavine	<1
Aster modestus	Great northern aster	<1
Viburnum edule	Highbush cranberry	<1
Geum macrophyllum	Large leaved avens	<1
Alnus tenuifolia	Mountain Alder	<1
Palmate coltsfoot	Palmate coltsfoot	<1
Symphoricarpos albus	Snowberry	<1
Thalictrum occidentale	Western Meadowrue	<1

Site No: GT1

Species Name	Common Name	% Cover
Lonicera involucrata	Black Twinberry	25
Calamagrostis canadensis	Bluejoint Grass	10
Epilobium angustifolium	Fireweed	10
Cirsium arvense	Canada Thistle	5
Equisetum arvense	Common horsetail	5
Rubus idaeus	Raspberry	5
Populus tremuloides	Trembling Aspen	5
Rosa acicularis	Prickly Rose	2
Phalaris arundinacea	Reed Canary Grass	2
Alnus tenuifolia	Mountain Alder	1
Thalictrum occidentale	Western Meadowrue	1
Salix sp.		<1
Vicea americana	American Vetch	<1
Salix barclayi.	Barclay'sWillow – tentative ID	<1
Ribes lacustre	Black Gooseberry	<1
Heracleum lanatum	Cow Parsnip	<1
Lathyrus ochroleucus	Creamy Pea Vine	<1
Galeopsis tetrahit	Hemp nettle	<1
Viburnum edule	High Bush Cranberry	<1
Urtica dioica	Stinging Nettle	<1

Site No: GT2

Species Name	Common Name	% Cover
	Moss	60
Cornus canadensis	Bunchberry	20
Equisetum pratense and E. arvense	Horsetail (Meadow & Common)	20
Rosa acicularis	Prickly Rose	10
Linnaea borealis	Trailing Twin Flower	7
Ribes lacustre	Black Gooseberry	5
Petasites palmatus	Palmate coltsfoot	2
Cornus stolonifera	Red osier dogwood	2
Rubus pubescens	Trailing raspberry	2
Fragaria virginiana	Wild Strawberry	2
Calamagrostis canadensis	Bluejoint Grass	1
Mitella nuda	Common mitrewort	1
Rubus idaeus	Raspberry	1
Lonicera involucrata	Black twinberry	<1
Cirsium vulgare	Bull thistle	<1
Viburnum edule	Cranberry	<1
	Fern	<1
Aster ciliotatus	Fringed aster	<1
Geum macrophyllum	Largeleaved avens	<1
Galium boreale	Northern Bed Straw	<1
Amelanchier alnifolia	Saskatoon	<1
Aster conspicuus	Showy Aster	<1
Dryopteris expansa	Spiny Wood Fern	<1
Urtica dioica	Stinging Nettle	<1
Achillea millefolium	Yarrow	<1

Site No: GT3

Species Name	Common Name	% Cover
	Mosses	50
	Grasses	30-35
Lonicera involucrata	Twinberry	30
Rhytidiadelphus triquetrus	Electrified cat's tail moss	10
Petasites palmatus	Palmate coltsfoot	3
Symphoricarpos albus	Snowberry	3
Ribes lacustre	Black gooseberry	2
Viola canadensis	Canada violet	2
Epilobium angustifolium	Fireweed	2
Rosa acicularis	Prickly rose	2
Vicea americana	American vetch	1
Heracleum lanatum	Cow parsnip	1
Spiraeadouglasii spp. menziesii	Pink spirea (hardhack)	1
Ribes laxiflorum	Trailing black current	1
Achillea millefolium	Yarrow	1
Lathyrus ochroleucus	Creamy peavine	<1
Aster ciliolatus	Fringed aster	<1
Aster modestus	Great northern aster	<1
Lathyrus nevadensis	Purple peavine	<1
Sonchus arvensis	Sow thistle	<1
Galium triflorum	Sweet scented bedstraw	<1

Site No: GT4

Species Name	Common Name	% Cover
	Grasses	70
Spiraea douglasii spp. Menziesii	Pink Spirea hardhack	35
	Moss layer	25
Lonicera involucrata	Twinberry	20
Epilobium angustifolium	Fireweed	15
Rosa acicularis	Prickly rose	3
Aster ciliolatus	Fringed aster	2
Geum macrophyllum	Large leaved avens	<1
Galium boreale	Northern bedstraw	<1
Sonchus arvensis	Sow thistle	<1
Fragaria virginiana	Wild strawberry	<1
Achillea millefolium	Yarrow	<1

Site No: GT5

Species Name	Common Name	% Cover
Salix drummondiana	Drummond's willow – tentative ID	75
	Grasses	40
	Mosses	25
Carex sp.	Sedges	<5
Lonicera involucrata	Black Twinberry	1
Mitella pentandra	5 stamened mitrewort	<1
Heracleum lanatum	Cow parsnip	<1
Epilobium angustifolium	Fireweed	<1
Viburnum edule	Highbush cranberry	<1
Geum macrophyllum	Large leaved avens	<1
Urtica dioica	Stinging nettle	<1
Salix sp.	Unidentified willow	<1

Site No: GT6

Species Name	Common Name	% Cover
Lonicera involucrata	Black Twinberry	45
	Grasses – short	30
	Mosses	20
Rubus idaeus	Red raspberry	5
Ribes lacustre	Black gooseberry	2
	Grasses – Tall	2
Geum macrophyllum	Large leaved avens	2
Urtica dioica	Stinging nettle	1
Heracleum lanatum	Cow Parsnip	<1
Epilobium angustifolium	Fireweed	<1
Aster modestus	Great northern aster	<1
Angelica genuflexa	Kneeling Angelica	<1
Gymnocarpium dryopteris	Oak fern	<1
Petasites palmatus	Palmate coltsfoot	<1
Rosa acicularis	Prickly Rose	<1
Cornus stolonifera	Red-osier dogwood	<1
Symphoricarpos albus	Snowberry	<1

Site No: GT7

Species Name	Common Name	% Cover
Lonicera involucrata	Black Twinberry	30
	Moss bryophytes	20
Mitella nuda	Common mitrewort	10
	Short grass	10
Symphoricarpos albus	Snowberry	10
Equisetum arvense	Comon Horsetail	5
Salix lucida spp. lasiandra	Pacific willow	5
Aster modestus	Great Northern Aster	1
Geum macrophyllum	Large leaved avens	1
Ribes lacustre	Black gooseberry	<1
Cornus canadensis	Bunchberry	<1
Heracleum lanatum	Cow parsnip	<1
Aster ciliolatus	Fringed aster	<1
Galeopsis tetrahit	Hemp Nettle	<1
Ranunculus uncinatus	Little Buttercup	<1
Alnus tenuifolia	Mountain Alder	<1
Petasites palmatus	Palmate coltsfoot	<1
Rosa acicularis	Prickly Rose	<1
Osmorhiza purpurea	Purple sweet cicily	<1
Rubus idaeus	Red raspberry	<1
Urtica dioica	Stinging Nettle	<1
Galium triflorum	Sweet scented bedstraw	<1
Fragaria virginiana	Wild strawberry	<1

Site No: MJ1

Species Name	Common Name	% Cover
Rosa acicularis	Prickly Rose	5
Elymus glaucus	Blue wildrye grass	2
Symphoricarpos albus	Snowberry	2
Salix bebbiana	Bebbs Willow	1
Lonicera involucrata	Black Twinberry	1
Epilobium angustifolium	Fireweed	1
Petasites palmatus	Palmate coltsfoot	<1
Spiraea pyramidata	Pyramid spirea	<1

Site No: MJ2

Species Name	Common Name	% Cover
Cornus stolonifera	Red osier dogwood	10
Calamagrostis canadensis	Bluejoint	2
Orthilia secunda	One-sided wintergreen	2
Amelanchier alnifolia	Saskatoon	2
Rosa acicularis	Prickly rose	1
Lathyrus nevadensis	Purple peavine	1

Site No: MJ3

Species Name	Common Name	% Cover
Gymnocarpium dryopteris	Oak fern	5
Petasites palmatus	Palmate coltsfoot	3
Pleurozium schreberi	Red-stemmed feathermoss	2
Cornus canadensis	Bunchberry	1
Ptilium crista castrensis	Knight's plume	1
Rhytidiadelphus triquetrus	Electrified cat's-tail moss	<1
Rosa acicularis	Prickly Rose	<1
Rubus parviflorus	Thimbleberry	<1

Site No: MJ4

Species Name	Common Name	% Cover
Equisetum arvense	Common Horsetail	10
Alnus tenuifolia	Mountain Alder (>2m)	5
Rosa acicularis	Prickly Rose	5
Lonicera involucrata	Black Twinberry	4
Alnus teniufolia	Mountain alder (Short shrub)	4
Petasites palmatus	Palmate coltsfoot	3
Cornus canadensis	Bunchberry	1
Ptilium crista castrensis	Knight's plume	1

Site No: MJ5

Species Name	Common Name	% Cover
Rubus parviflorus	Thimbleberry	25
Cornus stolonifera	Red osier dogwood	20
Oplopanax horridus	Devil's club	15
Equisetum arvense	Horsetail	10
Lonicera involucrata	Twinberry	10
Brachythecium sp.	Ragged moss	5
	Leafy mosses	3
Alnus tenuifolia	Mountain Alder	3
Cornus canadensis	Bunchberry	1
Viburnum edule	High bush cranberry	1
Gymnocarpium dryopteris	Oak fern	1
Pleurozium schreberi	Red-stemmed feathermoss	1

Site No: MJ6

Species Name	Common Name	% Cover
Rubus parviflorus	Thimbleberry	10
Viburnum edule	Highbush cranberry	5
	Moss	5
Cornus stolonifera	Red Osier Dogwood	5
Acer glabrum	Douglas maple	4
Orthilia secunda	One-sided wintergreen	3
Alnus tenuifolia	Mountain alder	2
Lathyrus nevadensis	Purple peavine	2
Linnaea borealis	Twinflower	2
Epilobium angustifolium	Fireweed	1
Rosa acicularis	Prickly Rose	1
Ribes lacustre	Black Gooseberry	<1
Oplopanax horridus	Devil's club	<1
Smilacina racemosa	False soloman's seal	<1
Gymnocarpium dryopteris	Oakfern	<1
Shepherdia canadensis	Soopolallie	<1

Site No: MJ7

Species Name	Common Name	% Cover
Epilobium angustifolium	Fireweed	25
Lonicera involucrata	Twinberry	10
Cornus stolonifera	Rod osier dogwood	4
Rosa acicularis	Prickly rose	2
Brachythecium sp.	Ragged moss	1
Salix sp.		<1
Vicea americana	American vetch	<1
Sonchus arvensis	Perrenial Sow thistle	<1
Rubus idaeus	Raspberry	<1
Amelanchier alnifolia	Saskatoon Berry	<1

Site No: MJ8

Species Name	Common Name	% Cover
Cornus stolonifera	Red osier dogwood	20
Gymnocarpium dryopteris	Oak fern	5
Lonicera involucrata	Twinberry	5
Oplopanax horridus	Devil's club	3
Heracleum lanatum	Cow parsnip	1
Petasites palmatus	Palmate coltsfoot	1
Rhytidiadelphus triquetrus	Electrified cat-tail moss	<1
	Leafy mosses	<1

Deep Creek – Reach 1

Watershed level objective. To improve the overall health of the watershed and salmonid fish habitat by:

- altering land use practices on private land,
- restoring riparian function to stream, and
- decreasing sources of sediment to the stream.

Reach 1 of Deep Creek flows through private land. The impacts in this reach are chronic and arise from historic and current land use practices in the watershed. For rehabilitation to succeed, landowners need to be part of the solution. Therefore, the first step in rehabilitating Deep Creek is to contact the landowners within the watershed. The results of the fish habitat, channel and riparian assessments should be shared, after which landowner interest and willingness to co-operate in rehabilitation efforts should be gauged. Adoption of watershed stewardship principles including best management practices for cattle, and in some cases, altering present cattle grazing management, will be required in order for the processes that have been impacted in this watershed to recover. Solutions can usually be found that benefit both the landowners and the streams. A long-term plan addressing landowner concerns and clearly outlining objectives and strategies to rehabilitate the creek will be necessary to help ensure the health of the stream and land improves in the future. Landowners and government representatives should be involved in the planning process. Monitoring of water quality, riparian function, and possibly invertebrate populations should be a component of this plan.

Rehabilitation priorities:

1. Consultations with land owners. Information sharing and education. Landowners should be encouraged to keep existing riparian zones. There is a need to protect what remains because prevention of problems is much cheaper than restoration.
2. Cattle management to protect creek and riparian zone.
3. Bank stabilisation and riparian planting.
4. In-stream works.

The rehabilitation ideas outlined in this appendix and Appendix G address four of the six impact sites in the mainstem of Deep Creek (D6, D4, D3, D2). The remaining impacted sites may recover on their own (D1) or recover once cattle management issues are addressed (D5).

Deep Creek Reach 1

Rehabilitation Recommendation: Deep #1

- Note: To be implemented in conjunction with Riparian Rehabilitation Recommendation: Deep #1 (see Appendix G).

Location: Impact site D6. Upper part of reach 1. The lower end of the site is a fence located 1050 m upstream of the Wakefield Road Bridge. The upper extent is 240 m upstream.

Access: Wakefield Road from Highway 16 to a "Y" 300 m past the Wakefield Road Bridge. Proceed to the left through the gate (first obtain permission from Harold Kerr), and continue for another 500 m. Turn left into the first large clearing on the left and proceed down the cattle road to the creek.

Land Tenure: Private (Kerr Cattle Company)

TRIM/Forest Cover Mapsheet: 93L066

Forest Cover Polygon: 826, 812

Flightline and Air Photo Number: 30BCC 687 No. 79

Site Photo: Heavily grazed and cleared riparian area with eroding banks at the lower end of the site (Figs. 20H and I.)

Impact Description: Land clearing and cattle grazing has removed much of the riparian vegetation along this section of the creek. Large cottonwoods exist in part of the area, but understory vegetation is heavily grazed. Riparian function is severely impacted. Cattle trampling and lack of rooted vegetation is resulting in bank destabilisation and erosion.

Objectives:

- to rehabilitate the riparian zone and riparian function, and
- to reduce bank erosion and subsequent sediment loading from this site.

Biological Benefits:

- reduced sediment deposition downstream on spawning gravels and less sediment infilling of pools, thus increasing rearing and possibly overwintering habitat,
- improved water quality,
- improved overhead cover, shade, and source of small organic debris, and
- recruitment of LWD into the stream to increase stream complexity over the long-term.

Proposed Rehabilitation strategies:

A. Work with the Kerr Cattle Company to develop strategies to encourage cattle to congregate away from the riparian zone and the creek. Options include:
   - Improving livestock distribution:
     ⇒ off-channel watering,
     ⇒ salt lick placement in uplands away from riparian zone,
     ⇒ feed placement, and
     ⇒ temporary or permanent fencing.
   - Developing a grazing strategy (see Meehan 1991, Fitch and Adams, 1995 and contact district agriculturist for strategies appropriate for local conditions). Such a strategy should cover the private property and crown range areas leased to the Kerr Cattle Company.
   - Local sources of cattle impacts include 5+300 (right bank), 5+630 (right bank), 6+350 (both banks), 6+435 (right bank) and 6+814 (right bank).

B. Once cattle are removed from the riparian zone, much of the riparian zone at this site will re-establish on its own. Planting is required between 6+324 and 6+425 in an overgrazed clearing (see riparian rehabilitation recommendation #1).

C. At the current cattle ford, construct a hardened or geowebbed crossing to minimise bank erosion. Channel is currently degraded and cobble is the dominant bed paving material (D = 23 to 26 cm). Due to the solid substrate, we recommend geoweb be used on the approaches to the stream, but not in the stream bed. Gravel (size will be dependent on the size of the "cells" in the type of geoweb chosen) should be placed over the web to a total depth of thirty cm (including geoweb thickness). Approach slope should be 6H:1V to minimise drift of gravel into the stream. Banks of the approach should be sloped to 3H:1V and planted with native sedge or grass (*Carex mertensi* – Mertens' sedge, *Elymus glaucus* - Blue wildrye, or *Calamagrostis canadensis* - Bluejoint) to minimize erosion. Seeding densities should be approximately 3000 seeds / m^2. Seeds can be broadcast onto the slopes or raked in.

Survey and Design Work (Tasks/Costs)

Costs for improvements to cattle distribution will depend on option(s) chosen in consultation with the landowner combined with the level of volunteer effort available.

The cattle crossing is the only works for which a task breakdown and cost estimate is appropriate at this time. Design specifications, material sizing, and site surveys to ensure works will meet MELP durability requirements for a 1 in 50 year flood event. Plan, profile and cross-sectional diagrams will be produced by an engineer once the site is surveyed.

Workplan:

Duty	Worker	# Person Days	Rate	Cost
Project Planning & disc. w. landowner	Project coordinator	1	$500	$500
Site survey	Hydrol. or Engin Tech.	1	$350	$350
Drawings and Design	Engineer	1	$700	$700
Approvals / Permits	Project coordinator	1	$500	$500
Implementation	Backhoe + operator*	0.5	$600	$300
	Project coordinator	1	$500	$500
	Fish. Tech with gear	1	$350	$350
Final Report	Project coordinator	1	$500	$500
Monitoring + report	Project coordinator	2	$500	$1000
Total Labour				**$4,700**

Disbursements			
Item	**# units**	**$/unit**	**Cost**
Silt screen	1/5 roll	$500	$100
Mileage (km)	350	$0.38	$133
Geotextile	1/5 roll	$500	$100
Geoweb	2 rolls	$500	$1,000
Anchoring stakes			$100
Gravel / small cobble	10 yards		$100
Seed	<1kg		$200
Misc.			$500
Total Disbursements			**$2,233**

* Costs may be reduced marginally if the landowner volunteers a backhoe, straw bales and his time.

Total Cost Estimate: $6933.

Environmental Protection Measures:

- In-stream work measures outlined in *Skeena Region: In-stream work windows and measures* (1999) will be followed.
- A fisheries technician will act as environmental monitor and will be on-site at all times during in-stream work periods. This tech will be responsible for fish salvage and will net off the site to prevent fish from entering the site. This technician can help lay the geotextile and geoweb and save hiring an extra labourer.
- An environmental orientation will be conducted with all on-site personnel prior to work being started.
- All contractors/subcontractors will be required to carry their own spill response equipment, as per BC Environment guidelines. Machine operators will be required to ensure machines do not leak.
- Straw bales and silt fences will be used to mitigate sedimentation of stream.
- Work will stop in the event of heavy rain and exposed soil will be covered.

Approvals Required: Approvals from the following agencies should be sought starting 90 days prior to the commencement of work:

- DFO and MELP Habitat Protection Branch referral,
- Fish collection permit, MELP Habitat Protection Branch, DFO, and
- Water Act Section 9 notification and approval, MELP Water Management Branch.

Seasonal Timing: Coho and chinook salmon, rainbow trout and Dolly Varden char can be expected at the site. Fisheries Sensitive Zone in-stream work window for the salmon is June 1 to August 15, for Dolly Varden is June 1 to November 15, and for rainbow trout is September 1 to May 15. Thus no window exists for this work and special permission must be granted by the designated environmental officer.

Rehabilitation Recommendations: Deep #2

Location: Impact site D4. Approximately 500 m downstream of the Wakefield Road bridge, near the buildings on Tony Vandenberg's property (4+800 to 4+960 m).

Access: Wakefield Road from Highway 16. Travel east along Wakefield road for 1.3 km and turn right into driveway. Proceed down driveway to house. Contact landowner prior to accessing land.

Land Tenure: Private (Tony Vandenberg)

TRIM/Forest Cover Mapsheet: 93L066

Forest Cover Polygon: 812

Flightline and Air Photo Number: 30BCC 687 No. 79

Impact Description: Cattle grazing has removed much of the understory vegetation beneath mature cottonwoods along this section of the creek. Riparian function is heavily impacted. Cattle trampling and lack of rooted vegetation is resulting in bank destabilisation and erosion. Exposed soil at the main cattle ford is a source of sediment to the creek.

Objectives:

- to rehabilitate the riparian zone and riparian function, and
- to reduce bank erosion and subsequent sediment loading from this site.

Biological Benefits:

- reduced of sediment deposition downstream on spawning gravels and less sediment infilling of pools, thus increasing rearing and possibly overwintering habitat,
- improved water quality,
- improved overhead cover, shade, and source of small organic debris, and
- regenerated cottonwood which will be a source of future LWD.

Proposed Rehabilitation strategies:

Rehabilitation at this site will focus on low-cost, passive techniques.

A. Work with Tony Vandenberg to develop strategies to encourage cattle to congregate away from the riparian zone and the creek. Options include:
   - Improving livestock distribution:
     ⇒ off-channel watering,
     ⇒ salt lick placement in uplands away from riparian zone,
     ⇒ feed placement, and
     ⇒ temporary or permanent fencing.
   - Developing a grazing strategy is an option, but will likely not be necessary for this area (see Meehan 1991, Fitch and Adams, 1995 and contact district agriculturist for strategies appropriate for local conditions).
   - An existing bridge near the current cattle in-stream crossing could be used as an alternative crossing which will help keep cattle out of the creek. Use of the existing

bridge will not cost the landowner anything, but will require techniques to encourage the cattle to use the crossing.

B. Once cattle are removed from the riparian zone, the riparian zone will be left to re-establish on its own.
C. A water intake stand pipe located on an outside meander needs protection from erosion. It is currently partially protected with rock and tires. Options to help protect this water intake could be developed as part of the negotiations with the landowner to modify cattle practices.

Survey and Design Work (Tasks/Costs): Costs for improvements to cattle distribution will depend on option(s) chosen combined with the level of volunteer effort available.

Approvals Required: No approvals are required unless in-stream work to protect the water intake is undertaken. If in-stream work is proposed in the future, permits must be obtained from:

- DFO and MELP Habitat Protection Branch referral,
- Fish collection permit, MELP Habitat Protection Branch, DFO, and
- Water Act section 9 notification and approval, MELP Water Management Branch.

Rehabilitation Recommendation: Deep #3

Location: Impact site D3. Middle of reach 1 (3+593 to 3+725 m) on Gar Garton's property.

Access: Turn onto the driveway across from the Farewell Creek Road on the west side of Deep Creek. Follow the driveway to the house. Contact landowner prior to accessing land.

Land Tenure: Private (Gar Garton)

TRIM/Forest Cover Mapsheets: 93L056/66

Forest Cover Polygon: 139 (93L056) and 811 (93L066)

Flightline and Air Photo Number: 30BCC 687 No. 57

Site Photos: Avulsions and old channels (Figs. 20C, D, E, F) and cattle ford with exposed soil on banks (Fig. 20G).

Impact Description: Two significant avulsions within 120 m of one another occurred during floods in 1997. The result has been a straightening of the channel and an increase in the speed and erosional force of the creek. The large meanders which have been bypassed contain some good areas of fish habitat. These meanders may only contain water now during high waters. The lower avulsion may have been caused by the straightening of the channel and construction of a bridge which constricts water flow immediately upstream of the impact site. The formation of the new channels in conjunction with the bursting of beaver dams downstream in 1997 (Garton, pers. comm.) has resulted in significant amounts of aggradation for 670 m downstream. These new channels could be a significant source of sediment to the creek for many years as a new channel forms.

A cattle crossing at a ford at the upper end of the upstream avulsion (3+715 m) is another source of sediment to the creek. Cattle appear to have free access to the channel and sections of limited riparian vegetation exist.

Objectives:

- to restore original stream pattern in avulsed areas,
- to arrest erosion of banks in meanders in order to protect property,
- to rehabilitate the riparian zone and riparian function, and
- to reduce bank erosion and subsequent sediment loading from this site.

Biological Benefits:

- reduced sediment deposition downstream on spawning gravels and less sediment infilling of pools, thus increasing rearing and possibly overwintering habitat,
- recovered fish habitat lost due to avulsions,
- reduced the speed and erosive power of the creek and therefore, reducing loss of fish habitat,
- improved overhead cover, shade, and source of small organic debris, and
- improved water quality.

Proposed Rehabilitation strategies:

In all suggested strategies, the landowner must be involved and his concerns addressed.

A. Work with Gar Garton to determine concerns about restoring flow to the original channel. Property along the outside corners of the meanders was eroding property and getting close to buildings. The landowner may be hesitant to restore water flow back to where it may threaten his buildings. Should the landowner be willing to look at the option of restoring flow to the original channel, a level 2 assessment should be conducted for the site. Insufficient information is available from the level 1 assessment to determine the appropriate method of protecting the banks. Although details will be clarified following a level 2 site assessment, the general proposed prescription is to block and partially infill the new channels, redirecting the flow into the old meander channels. Depending on stability of the banks, the downstream ends the new channels could be left as off channel habitat to be used during times of high water. The outside meander bends will be stabilised using the appropriate technique given the cause of the erosion (hydraulic vs. geotechnical) and the type of instability in the system. Bank slopes and hydraulic forces at the site need to be calculated following a survey of the site. A method integrating rock placement and vegetation may be appropriate given the limited ability to regrade banks. Riffle structures could be installed upstream of both avulsion sites to diminish water energy and provide fish habitat once upstream sedimentation sources are mitigated.

B. Work with Gar Garton to develop strategies to discourage cattle use of the creek and riparian zone. Options include
   - Improving livestock distribution:
     ⇒ off-channel watering,
     ⇒ salt lick placement in uplands away from riparian zone,
     ⇒ feed placement, and
     ⇒ temporary or permanent fencing.
   - Developing a grazing strategy (see Meehan 1991, Fitch and Adams, 1995 and contact district agriculturist for strategies appropriate for local conditions).

C. Once cattle are removed from the riparian zone, we recommend passive riparian rehabilitation because the riparian zone at this site should re-establish on its own.
   - A bridge located 75 m downstream of the present cattle fording location could be used as a permanent cattle crossing. The trail to the present crossing should be blocked-off and replanted with grasses and shrubs.

Survey and Design Work (Tasks/Costs)

Costs for improvements to cattle distribution will depend on option(s) chosen combined with the level of volunteer effort available.

Costs and schedule for returning flow to the original channel will depend on method used. However, rough estimates for a level 2 assessment are presented on the next page.

Workplan:

Duty	Worker	# Person Days	Rate	Cost
Site Visit and prep	Geoscientist	1	$600	$600
Site visit	Biologist	1	$500	$500
Rough design options or detailed design for one option	Engineer	1.5	$700	$1050
Final Report	Geoscientist	1.5	$600	$900
Misc. disbursements				$250
Total				**$3,300**

The geoscientist should determine slope stability and erosion pattern of the site and discuss options or improving fish habitat with the biologist. The geoscientist and biologist can work together to survey the site in order to produce a map and calculate gradients. This will save having a separate survey crew come to the site at a cost of $100 / hr.

Environmental Protection Measures: Should in-stream work proceed following a level 2 assessment, the following measures should be considered:

- In-stream work measures outlined in *Skeena Region: In-stream work windows and measures* (1999) will be followed.
- A fisheries tech will act as environmental monitor and will be on-site at all times during in-stream work periods. This tech will be responsible for fish salvage and will net off the site to prevent fish from entering the site.
- An environmental orientation will be conducted with all on-site personnel prior to work being started.
- All contractors/subcontractors will be required to carry their own spill response equipment, as per BC Environment guidelines. Machine operators will be required to ensure machines do not leak.
- Straw bales and silt fences will be used to mitigate sedimentation of stream.
- Work will stop in the event of heavy rain and exposed soil will be covered.

Approvals Required: Approvals from the following agencies should be sought starting 90 days prior to the commencement of work:

- DFO and MELP Habitat Protection Branch referral,
- Fish collection permit, MELP Habitat Protection Branch, DFO, and
- Water Act section 9 notification and approval, MELP Water Management Branch.

Seasonal Timing: Coho and chinook salmon, rainbow trout and Dolly Varden char can be expected at the site. Fisheries Sensitive Zone in-stream work window for the salmon is June 1 to August 15, for Dolly Varden is June 1 to November 15, and for rainbow trout is

September 1 to May 15. Thus no window exists for this work and special permission must be granted by the designated environmental officer.

Risks: Should outside banks in meanders continue to erode following rehabilitation work, resulting in lost property, the company responsible for the restoration works may be held liable.

Rehabilitation Recommendation: Deep #4

- Note: To be implemented in conjunction with Riparian Rehabilitation Recommendation: Deep #3 (see Appendix G).

Location: Impact site D2. Reach 1 downstream of Highway 16. The site extends from in front of Kirsch residence upstream for 220 m on left bank.

Access: Turn south onto Farewell Creek road from Highway 16 and park on flat after passing barn. Contact landowner prior to accessing land.

Land Tenure: Private (Robert Kirsch).

TRIM/Forest Cover Mapsheet: 93L.056

Forest Cover Polygon: 127

Flightline and Air Photo Number: 30BCC 687 No. 57

Site Photo: Eroded left bank from 1997 flood. Landowner has "armoured" the bank with small cobble (Fig. 20B).

Impact Description:

Sections of a 220 m length of the left bank of the creek is eroding and is a source of sediments. Riparian vegetation was cleared to make a field and the remaining thin band of willows remaining were washed away during the high water of 1997.

Objectives:

- to rehabilitate the riparian zone and riparian function, and
- to reduce bank erosion and subsequent sediment loading from this site.

Biological Benefits:

- reduced sediment deposition downstream on spawning gravels and less sediment infilling of pools, thus increasing rearing and possibly overwintering habitat, and
- improved overhead cover, shading and small organic debris.

Proposed Rehabilitation strategies:
(Assuming 150 m of the 220 length of stream will need to be stabilised)

Install wattles and geotextile to stabilise banks. Use locally available willows growing along the creek as a source. Preferred species include Pacific willow (*Salix lasiandra)*, Drummond's willow (*S. drummondiana)* and Sitka willow *(S. sitchensis*). These species are common in exposed gravel bars and riparian thickets (SKR and Oikos 1999; Triton 1993). Collect live willows whips and conduct work in the spring before bud burst or in autumn after buds have set. Tie cuttings with butts alternating into bundles 15-20 cm in diameter and 3-5 m long. Bind every 40 cm, or at an appropriate distance to hold bundles together.

Re-contour bank to a 1.5H:1V slope using an excavator or backhoe and set wattles into trenches at the toe and the top of the bank. Place willow branches beneath the toe wattle facing out and downstream (Donat, 1995). Secure wattles with 60 cm long wooden pegs

driven through the centre of the wattle and spaced every 0.75 m. Cover the brush wattles with soil and walk on bundles while infilling to help pack soil in. Place biodegradable geotextile between wattles to minimise erosion until the plants root. Plant 0.8 m long willow whips spaced 1 m apart through slits cut in the geotextile. Whips should be buried in 55-60 cm soil, leaving a minimum of two buds exposed.

This technique is labour intensive, but is great for a community project. Once willows are collected, building and installing the wattles will take approximately 1 hr/m (Donat, 1995). The willows growing at the site may need pruning after 2 or 3 years. Planting of cottonwood and spruce behind the bank stabilisation project is outlined in Riparian Restoration Recommendation: Deep #3.

Workplan:

Duty	Worker	# Person Days	Rate	Cost
Project Planning & disc. w. landowner	Project coordinator	3	$500	$1,500
Assess site	Plant ecologist	0.5	$550	$275
	Geoscientist	0.5	$600	$300
Drawings and design	Engineer	1	$700	$700
Approvals / Permits	Project coordinator	1	$500	$500
Collect materials	Volunteers	20	$0	
Fish salvage and environmental monitoring	Fish. Tech with gear	3	$350	$1,050
Implementation	Backhoe operator*	1	$600	$600
	Project coordinator	3	$500	$1,500
	Volunteers	20	$0	
Final Report	Project coordinator	1	$500	$500
Monitoring + reporting for 3 years	Biologist or geoscientist	3	$500	$1,500
Total Labour				**$8,425**

Disbursements			
Item	**# units**	**$/unit**	**Cost**
Straw bales	20	$5	$100
Silt screen			$250
Mileage (km)	910	$0.38	$346
Geotextile	1	$500	$500
Wooden stakes (1"x2")	400	$0.65	$260
Photos	4	$25	$100
Misc.			$500
Total Disbursements			**$2,056**

* Costs may be reduced marginally if the landowner volunteers a backhoe, straw bales and his time.

Total Cost Estimate = $10,481

Environmental Protection Measures:

- In-stream work measures outlined in *Skeena Region: In-stream work windows and measures* (1999) will be followed.
- A fisheries tech will act as environmental monitor and will be on-site at all times during in-stream work periods. This tech will be responsible for fish salvage and will use a combination of straw bales and silt screens to stop silt from entering the stream.
- An environmental orientation will be conducted with all on-site personnel prior to work being started.
- All contractors/subcontractors will be required to carry their own spill response equipment, as per BC Environment guidelines. Machine operators will be required to ensure machines do not leak.
- Work will stop in the event of heavy rain and exposed soil will be covered.

Approvals Required: Approvals from the following agencies should be sought starting 90 days prior to the commencement of work:

- DFO and MELP Habitat Protection Branch referral,
- Fish collection permit, MELP Habitat Protection Branch, DFO, and
- Water Act section 9 notification and approval, MELP Water Management Branch.

Seasonal Timing: Coho and chinook salmon, rainbow trout and Dolly Varden char can be expected at the site. Fisheries Sensitive Zone in-stream work window for the salmon is June 1 to August 15, for Dolly Varden is June 1 to November 15, and for rainbow trout is September 1 to May 15. Thus no window exists for this work and special permission must be granted by the designated environmental officer.

Thompson Creek Reaches 1 and 2

Watershed level objective. To improve the overall health of the watershed and salmonid fish habitat by:

- altering land use practices on private land,
- restoring riparian function to stream, and
- decreasing sources of sediment to the stream.

Reaches 1 and 2 of Thompson Creek flow through private land. The impacts in this reach are chronic and arise from historic and current land use practices in the watershed. For rehabilitation to succeed, landowners need to be involved in developing solutions. Therefore, the first step in rehabilitating Thompson Creek, like Deep Creek, is to contact the landowners within the watershed. The results of the fish habitat, riparian and channel assessments should be shared, after which landowner interest and willingness to co-operate in rehabilitation efforts should be gauged. Adoption of watershed stewardship principles including best management practices for cattle, and in some cases, altering present cattle grazing management, will be required in order for the processes that have been impacted in this watershed to recover. Solutions can usually be found that benefit both the landowners and the streams. A long-term watershed plan addressing landowner concerns and clearly outlining objectives and strategies to rehabilitate the creek will be necessary to help ensure the health of the stream and land improves in the future. Landowners and government representatives should be involved in the planning process. Monitoring of water quality, riparian function, and possibly invertebrate populations should be a component of this plan.

Rehabilitation priorities:

1. Consultations with land owners. Information sharing and education. Landowners should be encouraged to keep existing riparian zones. There is a need to protect what remains because prevention of problems is much cheaper than restoration.
2. Cattle management to protect creek and riparian zone.
3. Bank stabilisation and riparian planting.
4. Improve fish passage at culverts.
5. Other in-stream works.

The rehabilitation ideas outlined in this appendix and Appendix G address four of the nine impact sites in the mainstem of Thompson Creek (T6, T7, T3 & T9). The remaining impacted sites may recover on their own (T8) or recover once cattle management issues are addressed (T1, T2, T4). Two sites (T5, T10) require culvert replacement or backwatering to improve fish passage.

Thompson Creek Reaches 1 and 2

Rehabilitation Recommendation: Thompson #1

- Note: To be implemented in conjunction with Riparian Rehabilitation Recommendation: Thompson #1 (see Appendix G).

Location: Impact sites T6 & T7 (upper part of reach 1 & lower part of reach 2). The lower end of the site T6 is located immediately upstream of the box culvert at 5+091 m. The upper end is located at 0+430 m in reach 2. The total length of the site is 955 m.

Access: Dieleman Road east off Highway 16, straight through the stockyard and the old homestead to the box culvert. For access to reach 2, turn east past the homestead and proceed through the field to the fence line. Contact landowner prior to accessing land.

Land Tenure: Private (William Dieleman).

TRIM/Forest Cover Mapsheet: 93L057

Forest Cover Polygons: 435, 439, 441

Flightline and Air Photo Number: 30BCB 91183 No. 42

Site Photos: Grazed and widening channel in T6 (Fig. 25D), old channel at reach break (Fig. 24F) and cleared land and bank failure in T7 (Fig. 27A)

Impact Description: Land clearing and cattle grazing has removed much of the riparian vegetation along this section of the creek. Large cottonwoods, spruce and willows exist in part of the area, but understory vegetation is heavily grazed. Riparian function is impacted, severely in some cases. Cattle trampling and lack of rooted vegetation is resulting in bank destabilisation, erosion and channel widening.

Objectives:

- to rehabilitate the riparian zone and riparian function,
- to reduce bank erosion and subsequent sediment loading from this site, and
- to eventually increase habitat complexity with the natural recruitment of LWD to the channel.

Biological Benefits:

- reduced sediment deposition downstream on spawning gravels and less sediment infilling of pools, thus increasing rearing and possibly overwintering habitat,
- improved water quality,
- improved overhead cover, shade, and source of small organic debris, and
- improved LWD recruitment into the stream to increase stream complexity over the long-term.

Proposed Rehabilitation strategies:

A. Work with the Dieleman family to develop strategies to encourage cattle to congregate away from the riparian zone and the creek. Options include:
   - Improving livestock distribution:
     ⇒ off-channel watering,
     ⇒ salt lick placement in uplands away from riparian zone,
     ⇒ feed placement, and
     ⇒ temporary or permanent fencing.
   - Developing a grazing strategy (see Meehan 1991, Fitch and Adams, 1995 and contact district agriculturist for strategies appropriate for local conditions). Such a strategy should cover the private property and crown range areas used by the Dieleman family.
   - Local sources of cattle impacts: Reach 2 - 0+200 m to 0+430 m (right bank) and 0+278 m (both banks).

B. Once cattle are removed from the riparian zone, much of the riparian vegetation at this site will re-establish on its own over time. Planting is required between 0+200 m and 0+430 m in reach 2 in an overgrazed clearing (see Riparian Rehabilitation Recommendation: Thompson #1).

   Along the eroded banks between 0+200 and 0+430 m, stabilise banks using wattles, live staking of willows and geotextile. Use locally available willows from the Bulkley Valley as a source. Preferred species include Pacific willow (*Salix lasiandra)*, Drummond's willow (*S. drummondiana)* and Sitka willow *(S. sitchensis*). These species are common in exposed gravel bars and riparian thickets (SKR and Oikos 1999; Triton 1993). Collect live willow whips and conduct work in the spring before bud burst or in autumn after buds have set (depends on timing of additional riparian planting, see Riparian Rehabilitation Recommendation: Thompson #1). Tie cuttings with butts alternating into bundles 15-20 cm in diameter and 3-5 m long. Bind every 40 cm, or at an appropriate distance to hold bundles together.

   Re-contour bank to a 2H:1V slope using an excavator or backhoe and set wattles into trenches at the toe and the top of the bank. Place willow branches beneath the toe wattle facing out and downstream (Donat, 1995). Secure wattles with 60 cm long wooden pegs driven through the centre of the wattle and spaced every 0.75 m. Cover the brush wattles with soil and walk on bundles while infilling to help pack soil in. Place biodegradable geotextile between wattles to minimise erosion until the plants root. Plant 0.8 m long willow whips spaced 1 m apart through slits cut in the geotextile. Whips should be buried in 55-60 cm soil, leaving a minimum of two buds exposed. Due to the large size of this site, the project could be done over two years with the first year acting as a trial.

   This technique is labour intensive, but is great for a community project. Once willows are collected, building and installing the wattles will take approximately 1 hr/m (Donat, 1995). The willows growing at the site may need pruning after 2 or 3 years.

Planting of cottonwood and spruce behind the bank stabilisation project is outlined in Riparian Restoration Recommendation: Thompson #1.

C. At the current cattle ford (0+278 m, reach 2), construct a geowebbed crossing to minimise bank erosion. Due to the gravel and cobble substrate, we recommend geoweb be used on the approaches to the stream, but not in the stream bed. Gravel (4 to 8 cm diameter) should be placed over the web to a total depth of thirty cm (including geoweb thickness). Approach slope should be 6H:1V to minimise drift of gravel into the stream. Banks of the approach should be sloped to 3H:1V and planted with native sedge or grass (*Carex mertensi* – Mertens' sedge, *Elymus glaucus* - Blue wildrye, or *Calamagrostis canadensis* - Bluejoint) to minimize erosion. Seeding densities should be approximately 3000 seeds / m^2. Seeds can be broadcast onto the slopes or raked in.

Survey and Design Work (Tasks/Costs)

Costs for improving cattle distribution and / or developing a grazing strategy will depend on option(s) chosen in consultation with the landowner combined with the level of volunteer effort available.

A rough task breakdown and cost estimate is presented on the next page for the cattle crossing and bank stabilisation project. Since cost savings exist by doing the projects together, we have combined the two projects into one. The costs assume the entire bank stabilisation work will be completed in one year. Design specifications, material sizing, and site surveys to ensure works will meet MELP durability requirements for a 1 in 50 year flood event. Plan, profile and cross-sectional diagrams will be produced by an engineer once the site is surveyed.

Monitoring: Structures should be checked at the end of the first three growing seasons or after major flood events. The landowners may also monitor the stability of the structures.

Workplan:

Duty	Worker	# Person Days	Daily Rate	Cost
Project Planning & disc. with landowner	Project coordinator	4	$500	$2,000
Assess site (bank)	Plant ecologist	0.5	$550	$275
	Geoscientist	0.5	$600	$300
Site survey (crossing)	Hydrol. or Engin Tech.	2	$350	$700
Drawings and Design	Engineer	2	$700	$1,400
Approvals / Permits	Project coordinator	1	$500	$500
Collect plant material	Volunteers	20 - 30	$0	
Fish Salvage / Env. monitor	Fish. Tech with gear	3	$350	$1,050
Implementation	Backhoe + operator*	2	$600	$1200
	Project coordinator	5	$500	$2500
	Volunteers	20 - 30	$0	$0
Final Report	Project coordinator	2	$500	$1000
Monitoring & reports for 3 years	Biol. / geoscientist	3	$500	$1500
Total Labour				**$12,425**

Disbursements			
Item	**# units**	**$/unit**	**Cost**
Wattles			
Wooden stakes	640	$0.65	$416
Silt screen (rolls)	1/5	$500	$100
Crossing			
Geoweb (rolls)	2	$500	$1,000
Anchoring stakes			$100
Gravel / small cobble	10 yards		$100
Seed	<1kg		$100
Both			
Straw bales*	40	$5	$200
Mileage (km)	1100	$0.38	$418
Geotextile (rolls)	2	$500	$750
Photos	4	$25	$100
Misc			$750
Total Disbursements			**$4,034**

* Costs may be reduced marginally if the landowner volunteers a backhoe, straw bales and his time.

Total Cost Estimate: $16,459.

Environmental Protection Measures:

- In-stream work measures outlined in *Skeena Region: In-stream work windows and measures* (1999) will be followed.
- A fisheries technician will act as environmental monitor and will be on-site at all times during in-stream work periods. This tech will be responsible for fish salvage and will ensure fish do not enter the site.
- An environmental orientation will be conducted with all on-site personnel prior to work being started.
- All contractors/subcontractors will be required to carry their own spill response equipment, as per BC Environment guidelines. Machine operators will be required to ensure machines do not leak.
- Straw bales and silt fences will be used to mitigate sedimentation of stream.
- Work will stop in the event of heavy rain and exposed soil will be covered.

Approvals Required: Approvals from the following agencies should be sought starting 90 days prior to the commencement of work:

- DFO and MELP Habitat Protection Branch referral,
- Fish collection permit, MELP Habitat Protection Branch, DFO, and
- Water Act Section 9 notification and approval, MELP Water Management Branch.

Seasonal Timing: Coho salmon, rainbow trout, cutthroat trout and Dolly Varden char can be expected at the site. Fisheries Sensitive Zone in-stream work window for the salmon is June 1 to August 15, for Dolly Varden is June 1 to November 15, and for rainbow trout is September 1 to May 15. Thus no window exists for this work and special permission must be granted by the designated environmental officer.

Rehabilitation Recommendation: Thompson #2

- Note: To be implemented in conjunction with Riparian Rehabilitation Recommendation: Thompson #2 (see Appendix G).

Location: Impact site T3. 1415 m upstream of the Bulkley River side channel, 1860 m downstream of Walcott Road. The impact site is 20 m long.

Access: Walcott Road from Highway 16. Travel south along Walcott Road for 1.7 km. Turn right at residence and ask landowner for precise directions to this crossing. Contact landowners prior to accessing land.

Land Tenure: Private (James Berkery) (Access may be via Lies Rouw's land).

TRIM/Forest Cover Mapsheet(s): 93L056

Forest Cover Polygon: 212

Flightline and Air Photo Number: 30BCB 91112 No. 90

Site Photo: Bridge and eroding banks at cattle crossing and watering area at 1+415 m (Fig. 25B).

Impact Description: Cattle use has removed the riparian shrubs and trees along this section of the creek. Riparian function is heavily impacted. Trampling and lack of rooted vegetation is resulting in bank destabilisation and erosion. Exposed soil at the main cattle ford and watering area is a source of sediment to the creek.

Objectives:

- to reduce bank erosion and subsequent sediment loading from this site and
- to rehabilitate the riparian zone and riparian function.

Biological Benefits:

- reduced sediment deposition downstream on spawning gravels and less sediment infilling of pools, thus increasing rearing and possibly overwintering habitat,
- improved water quality, and
- improved overhead cover, shade, and source of small organic debris.

Proposed Rehabilitation strategies:

A. Work with James Berkery and / or current lease holder (may be the Dielemans) to develop strategies to encourage cattle to congregate away from the riparian zone and the creek. Options include:

- Improving bridge at the site to enable cattle to cross. The bridge requires a full deck to be built prior to allowing cattle use and cattle will need to be encouraged to use the crossing. Prior to completing the bridge deck, an engineer should determine if the load rating of the bridge and that bridge construction is adequate to withstand the weight of cattle. The landowner should sign a waiver indicating that deck improvements will not affect the bridge's capacity to conduct water in any way in order to release people from any legal action should the bridge be washed away.

- Use the existing road in combination with the bridge for cattle migration. Some fencing may be required.
- Off-channel watering may be an viable option to provide water at the valley bottom without causing damage to the riparian zone.

B. Once cattle are removed from the riparian zone, the banks should be stabilised. We recommend a combination of brush mattress and tree plug planting with riprap at the toe to protect the bridge downstream. See Riparian Rehabilitation Recommendation: Thompson #2.

- Survey and design by a hydrologist / geoscientist/ engineer to verify material sizing and design specifications.
- Recontour slope with a backhoe to a slope of 3:1. Riprap (20 cm rock) should be placed along the outside stream bank to a depth slightly greater than bankful depth (a total of approximately 50 cm) for a linear distance of 10 - 15 m.
- Install a 1.5 - 2 m wide brush mattress consisting of willow on the bank above the riprap. For the remainder of the site upstream of the riprapped section, place a brush mattress with a live fascine at the base, extending to the bottom of the creek. Work will have to be done in the spring prior to bud-burst, or if the ground is frozen and stakes cannot be driven 0.8 to 1m into the ground, the project must be done in the autumn during plant dormancy. Vegetation, once grown, will help slow water during high flows through this area.
- Upslope of the brush mattress, plant aspen and spruce (see Riparian Rehabilitation Recommendation: Thompson #2).
- Fencing may be required to keep cattle out of the rehabilitation area.

Survey and Design Work (Tasks/Costs)

Costs for improving cattle distribution and / or developing a grazing strategy will depend on option(s) chosen in consultation with the landowner combined with the level of volunteer effort available.

The following tables show rough estimated costs for decking the bridge, riprapping and installing a brush mattress. Design specifications and material sizing, will ensure works meet MELP durability requirements for a 1 in 50 year flood event. Plan, profile and cross-sectional diagrams will be produced by an engineer once the site is surveyed. We suggest that collection of cottonwood and aspen cuttings be conducted at the same time as collections for the brush mat the time. However, the extra time to collect the cottonwood and aspen cuttings are not included in the workplan on the next page.

Workplan:

Duty	Worker	# Person Days	Daily Rate	Cost
Project Planning + disc. w. landowner	Project coordinator	2	$500	$1,000
Site survey / riprap sizing	Hydrol. / Engin Tech.	1	$350	$350
Assess bridge	Engineer	1	$700	$700
Approvals / Permits	Project coordinator	1	$500	$500
Collect plant material[1]	Volunteers	10	$0	
Implementation	Backhoe + operator[2]	0.5	$600	$300
	Project coordinator	1.5	$500	$750
	Environmental monitor	1	$350	$350
	Volunteers	5 to 10	$0	
Final Report	Project coordinator	1.5	$500	$750
Monitoring + reports for 3 years	Biol. / geoscientist	3	$500	$1,500
Total Labour				**$6,200**

Disbursements			
Item	**# units**	**$/unit**	**Cost**
Crossing			
3"x8"x16' planks	12	$31	$372
4"x4" cross brace	2	$8	$16
Bank stabilisation			
Straw bales	20	$5	$100
Rip rap (cubic yards)[2]	4		$100
stakes (1.2m)	48	$2	$96
Jute rope	2	$4	$8
Mileage (km)	700	$0.38	$266
Both			
Photos	3	$25	$75
Misc			$500
Total Disbursements			**$1,533**

1 Time estimate does not include collection of cuttings for live planting.
2 Costs may be reduced marginally if the landowner volunteers a backhoe, straw bales, armouring rock and his time.

Total Cost Estimate: $7,733.

Monitoring: Conduct walk-through assessment each year in the late summer, or following a large flood to determine the success of this bank stabilisation strategy and to determine cattle use of the bridge.

Environmental Protection Measures:

- In-stream work measures outlined in *Skeena Region: In-stream work windows and measures* (1999) will be followed.
- A fisheries technician will act as environmental monitor and will be on-site at all times during in-stream work periods. This tech will be responsible for fish salvage and will net off the site to prevent fish from entering the site. This technician can help lay the geotextile and geoweb and save hiring an extra labourer.
- An environmental orientation will be conducted with all on-site personnel prior to work being started.
- All contractors/subcontractors will be required to carry their own spill response equipment, as per BC Environment guidelines. Machine operators will be required to ensure machines do not leak.
- Straw bales and silt fences will be used to mitigate sedimentation of stream.
- Work will stop in the event of heavy rain and exposed soil will be covered.

Approvals Required: Approvals from the following agencies should be sought starting 90 days prior to the commencement of work:

- DFO and MELP Habitat Protection Branch referral,
- Fish collection permit, MELP Habitat Protection Branch, DFO, and
- Water Act Section 9 notification and approval, MELP Water Management Branch.

Seasonal Timing: Coho salmon, rainbow trout, cutthroat trout and Dolly Varden char can be expected at the site. Fisheries Sensitive Zone in-stream work window for the salmon is June 1 to August 15, for Dolly Varden is June 1 to November 15, and for rainbow trout is September 1 to May 15. Thus no window exists for this work and special permission must be granted by the designated environmental officer.

Rehabilitation Recommendation #3

- Note: To be implemented in conjunction with Riparian Rehabilitation Recommendation: Thompson #3 (see Appendix G).

Location: Impact site T9. Reach 2 (2+027 m to 2+157 m).

Access: From Highway 16, turn east onto McNeil Road. Drive approximately 800 m and turn left onto side road. Proceed past boulder if possible, or walk into field in field near old homestead 600 m from McNeil Road. Follow the edge of the clearing on the right to the creek. The bottom of the site is at the bridge. Contact landowner prior to accessing land.

Land Tenure: Private (William Dieleman).

TRIM/Forest Cover Mapsheets: 93L057

Forest Cover Polygons: 458, 451

Flightline and Air Photo Number: 30BC 91183 No. 42

Site Photo: Bank shear and cleared land on left bank at 2+027 m (Fig. 27D).

Impact Description: Land clearing on the left bank has removed riparian vegetation, resulting in reduced bank stability and stream cover. Cattle grazing the banks and watering in the stream have caused further bank weakening and erosion.

Objectives:

- to reduce bank erosion and subsequent sediment loading from this site,
- to narrow and deepen the channel over the long term, and
- to rehabilitate the riparian zone and riparian function.

Biological Benefits:

- improved bank stability,
- reduced sediment deposition downstream on spawning gravels and less sediment infilling of pools, thus increasing rearing and possibly overwintering habitat,
- improved overhead cover, shade, and source of small organic debris, and
- improved water quality.

Proposed Rehabilitation strategies:

Work with the Dieleman family to develop strategies to encourage cattle to congregate away from the riparian zone and the creek. Options include:

- Improving livestock distribution:
  - ⇒ off-channel watering,
  - ⇒ continue with salt lick placement in uplands away from riparian zone,
  - ⇒ feed placement, and
  - ⇒ temporary or permanent fencing. The fence at the upstream end of the site needs to be repaired and will help keep cattle out of the wet area upstream of the site.
- Planting will accelerate recovery of riparian vegetation at this site (see Riparian Rehabilitation Recommendation: Thompson #3).

In all suggested strategies, the landowner must be involved and his or her concerns addressed.

Survey and Design Work (Tasks/Costs)

Costs for improvements to cattle distribution will depend on option(s) chosen combined with the level of volunteer effort available.

Approvals Required: No approvals are required.

Monitoring: Conduct walk-through assessments each year for 3 years in the late summer to determine plant performance and survival, and cattle influence on the site. Manual brushing or thinning may be required.

Dahlie Creek Reaches 1, 2 and 3

We assessed Dahlie Creek to determine fish habitat quality and the feasibility of creating a public viewing area for spawning salmon. Our conclusion is that this stream would not be suitable for a salmon viewing facility. The primary reason is that a 150 m long section of the creek between Main Street and Victoria Drive has a gradient of 8-12%, and is a barrier to the migration of spawning salmon under all but perfect conditions. Some steelhead may be able to negotiate the steep climb, but their upstream movement would be hampered under most flow conditions by perched culverts. On the rare occasion, coho salmon do spawn in reach 3. Adult salmon were apparently seen in the stream approximately 20 years ago (Cobb pers. comm.) and juvenile coho salmon were found in the creek approximately a decade ago (Bustard, pers. comm.), prior to any juvenile releases to the stream. However, we can state with a high degree of confidence that the juvenile salmon we captured in reaches 2 and 3 were released by students from Chandler Park Middle School through the Salmonids in the Classroom program of the Department of Fisheries and Oceans.

Despite the lack of current salmon use of Dahlie Creek, resident rainbow trout and cutthroat trout are present and numerous opportunities exist to improve the general fish habitat and health of the creek. Due to its location within Smithers, community demonstration projects would have high educational values.

Priorities for rehabilitation:

- ensure that Land Development Guidelines for the Protection of Aquatic Habitat encouraging the growth of streamside (riparian) vegetation and development setbacks are incorporated into the Smithers Official Community Plan. A proactive approach to avoiding problems is much cheaper in the long run than restoring systems once they have been impacted,
- create fish passage through culverts and up steep reach,
- reduce sediment loading into the creek,
- create spawning habitat for resident fish, and
- restore riparian function to stream.

Additional creek based community projects:

- clean refuse from creek,
- install educational signs, and
- paint fish beside storm drains to draw attention to the connection of drains with the creek.

The scope of the study on Dahlie Creek does not include detailed rehabilitation recommendations. We instead have listed rehabilitation options starting on the next page. Should efforts to rehabilitate Dahlie Creek continue, all sites will have to be surveyed and engineering drawings be completed. Such efforts should be delayed until water quality and overwintering studies scheduled for 2000 are complete.

Table F-1. Options to improve fish access and habitat in Dahlie Creek.

Issue	Impact	Priority	Location	Options	Pros	Cons
Fish Passage	Perched culvert	H	Main St.	A. Backwater with riffle structure / weir	Relatively inexpensive, will help control erosion downstream of the culvert. Pool habitat will be created directly downstream of culvert.	Potential sedimentation if upstream sediment sources are not addressed.
				B. Replace culvert	Upgrade capacity to meet 100 year flood flows. Will provide good fish passage.	Expensive.
	Perched culvert	H	Victoria Dr.	See Main Street culvert.		
	Screened culvert	H	Hwy 16	A. Remove screens and replace with trash racks placed upstream of the culvert.	Technically simple and inexpensive. Will allow adult fish passage. Will prevent leaves and small debris from clogging the upper end of the culvert.	None.
				B. Replace culvert	Upgrade capacity to meet 100 year flood flows; best fish passage.	Very expensive; road delays on highway.
	Steep Reach	M	Between Main St. and Victoria Dr.	Create pools to provide resting areas to aid upstream adult fish migration and create rearing / overwintering habitat for juveniles.	Will aid with upstream migration of adult fish to recolonise stream.	On private property. Work will have to be done by hand due to difficult access.
	Perched culvert	M	Railway Ave.	Replace culvert	Allow fish passage, although very long. Will allow access to some areas of good upstream spawning and rearing habitat.	Very expensive. Questionable whether benefits would justify costs.

Table F-1 continued. Options to improve fish access and habitat in Dahlie Creek.

Issue	Impact	Priority	Location	Options	Pros	Cons
Sedimentation of stream	Sedimentation from Frontage Road Ditch wetland below Nadina Place	H	From Frontage Road, 200 m downstream.	Determine source of sedimentation and address this source.	May be the least expensive option. Preventing problems at the source is preferred to a "band-aid" approach.	
				Create a storage pond within the wetland to let sediment settle out.	Provide wildlife habitat; or off channel fish habitat.	Expensive
	Elks park stream banks	M-H	Elks Park	A. Riprap banks	Solid armouring will protect bank.	Expensive, provides minimal fish habitat
				B. Use plantings – wattles, live slope gratings OR integrate riprap or LWD and live planting together (Slaney and Zaldokas, 1997; Donat 1995)	More natural, will provide function to creek. Depending on method, may be relatively inexpensive. Good community project with education potential.	Integrated methods can be expensive. Some methods may not provide enough support on a steep slope.
				C. Construct plunge pool at downstream end of Railway Ave. culvert to slow water.	Will create fish habitat. May be a sediment storage location.	
				D. Replace or redirect 0.2 m concrete drainage pipe from Elks Park which is helping to erode bank.	May help stop erosion.	Unknown if pipe is still in use or what other drainage options exist for the fields.

Table F-1 continued. Options to improve fish access and habitat in Dahlie Creek.

Issue	Impact	Priority	Location	Options	Pros	Cons
Habitat complexity	Low quality spawning, rearing and overwintering habitat	M	Reach 3	A. Riffle structures	Will create spawning and rearing habitat and increase dissolved oxygen levels. Highly visible public project with education options.	Expensive. May not be of sufficient benefit in fish numbers to justify costs.
				B. Large woody debris / root wad structures	Will create rearing and possibly overwintering habitat. Highly visible public project with education options.	Expensive. May not be sufficient benefit in fish numbers to justify costs. LWD in channel may divert stream and cause erosion on municipal or private lands.
				C. Combination of riffles and LWD	Will create spawning, rearing and overwintering habitat and increase dissolved oxygen levels. Highly visible public project with education options.	Expensive. May not be sufficient benefit in fish numbers to justify costs.
Thinned out streamside (riparian) vegetation zone	Decreased vegetation function	M	Reach 3	Replant native streamside vegetation – willows, aspen, cottonwood, spruce.	Will help restore riparian function (bank stability, temperature control, LWD recruitment, addition of organic debris. Good community project with education potential.	Large trees may, in time, affect power lines, pipe lines, residential views. LWD in channel may divert stream and cause erosion on municipal or private lands.
Diversion		L-M	20 m upstream of Riverside Drive culvert	Remove rock weir and block diversion.	Will prevent fish from being stranded in pond. Road stability issues due to saturated soils may be partially addressed.	Will decrease potential fish habitat. Need to salvage fish from pond.
				Improve diversion	Allow fish to access and escape from pond in order to create off-channel habitat.	Continued road stability issues due to fill saturation.

Deep Creek Reach 1

+ back on

G

Riparian Rehabilitation Recommendation: Deep #1

- Note: To be implemented in conjunction with Rehabilitation Recommendation: Deep #1 (see Appendix F).

Location: Impact site D6 (6+324 – 6+425 m)

Land Tenure: Private (Kerr Cattle Company). Contact landowner to access land.

TRIM/Forest Cover Mapsheet: 93L066

Forest Cover Polygon: 826, 812

Flightline and Air Photo Number: 30BCC 687 No. 79

Closest riparian assessment sites: MJ2, MJ8

Site Series / structural stage: SBSdk08 / Herb, shrub

Soil type: Dystric Brunisol

Area to be treated: 100 m long * 10 m wide * 2 banks = 0.2 ha

Riparian Class: S2: RMA = 50 m, RRZ = 30, RMZ = 20m

Site Photo: Heavily grazed and cleared riparian area with eroding banks at the lower end of the site (see Figs. 20H and I).

Objectives:

- promote overhanging shrubs to provide bank stability, shade, small organic debris and surface filtering,
- provide source of long-term LWD, and
- stabilise stream channel by establishing deep rooting deciduous and coniferous species.

Overview:

A cleared area between 6+324 and 6+425 m will require riparian planting to rehabilitate riparian function. Width of the replanted area will depend on negotiations with the landowner. We will assume a 10 m wide riparian zone. Although this is much less than the 30 m riparian reserve zone required by the Forest Practices Code, re-establishing a wider zone may be impractical given the circumstances. Willow cuttings will be planted along the gravel bars, and at toes of banks. Preferred species include Pacific willow (*Salix lasiandra)*, Drummond's willow (*S. drummondiana)* and Sitka willow (*S. sitchensis*). These species are common in exposed gravel bars and riparian thickets (SKR and Oikos 1999; Triton 1993). This fast growing pioneer vegetation will help protect the stream banks from erosion, provide small organic debris and shade the creek. Roots will catch sediments which will help build the bank. Black cottonwood and hybrid spruce will be planted from 1 to 10 m from the creek bank to increase shading and provide a long-term source of LWD. Planting should be done to correspond with a year when floods are not expected to be high.

Risks: Frost, flooding, drought, voles. Consider using vole collars.

Monitoring: Perform a stocking and brush survey at the end of the first growing season to determine survival and tree performance. Permanent sample plots with monitoring at least once per year is recommended, especially if this site is a community pilot project. Cattle influence on the area should be assessed. Manual brushing may be required. Planted trees may require thinning after a decade.

Summary:

Distance from Creek	Net area / length	Species and size	Site prep	Timing	Spacing	Amount*
Gravel bars and toe of bank.	100 m	Dormant willow cuttings (80 cm with 3 cm butt diam.) Keep in water prior to planting. Plant to a depth of 55 cm leaning downstream.	None required. Cuttings to be inserted into manually driven pilot holes.	Early May prior to flooding. If site is too wet, plant in autumn once plants are dormant. Later spring may be an option if plants are collected prior to bud burst and stored in a freezer until used.	1 m apart	120
1-10 m	0.2 ha	Cottonwood cuttings 80 cm long with 3 cm diam. butt. Bury 55 cm into soil.	Manually spot scarify a $1m^2$ area (56 cm radius) and remove roots of competing vegetation; place 90 cm x 90 cm brush mats around planted cuttings.	Early May to correspond with willow planting.	1 m apart	To be determined with site visit and development of a prescription.
		Hybrid spruce styroblock stock. Plant on elevated microsites.	See cottonwood.		Spacing to be determined based presence of elevated microsites. Spruce should be 1-2 m from cottonwood.	To be determined.

* This estimate includes a 20% contingency for damaged stock.

Riparian Rehabilitation Recommendation: Deep #2

Reach: Deep Creek Reach 1

Location: Impact site D5 (5+630 to 5+805 m)

Land Tenure: Private (Kerr Cattle Company). Contact landowner to access land.

TRIM/Forest Cover Mapsheet: 93L066

Forest Cover Polygon: 812

Flightline and Air Photo Number: 30BCC 687 No. 79

Closest riparian assessment sites: MJ2, MJ8

Site Series / structural stage: SBSdk08 / Mature deciduous

Soil type: Dystric Brunisol

Area to be treated: 175 m long * 2 m wide * 2 banks = 0.07 ha

Riparian Class: S2: RMA = 50 m, RRZ = 30, RMZ = 20m

Objectives:

- promote overhanging shrubs to provide bank stability, shade, small organic debris and surface filtering, and
- stabilise stream channel by establishing deep rooting deciduous and coniferous species.

Overview:
The riparian area between 5+630 and 5+805 m has been heavily grazed by cattle. Mature cottonwood provide some riparian function, but the shrub / herb layer is sparse. Bank stability, small organic debris, and vegetation cover for fish is lacking. We suggest willow cuttings be planted along the gravel bars, and at the toes of banks. Preferred species include Pacific willow (*Salix lasiandra)*, Drummond's willow (*S. drummondiana)* and Sitka willow (*S. sitchensis*). These species are common in exposed gravel bars and riparian thickets (SKR and Oikos 1999; Triton 1993). This fast growing pioneer vegetation will help protect the stream banks from erosion, provide small organic debris and shade the creek. Roots will catch sediments which will help build the banks. Passive restoration is suggested for the remainder of the riparian zone as shrubs and herbs are expected to return naturally once cattle distribution issues are addressed (See Rehabilitation Recommendation Deep #1).

We suggest visiting this site while determining options for cattle management within the riparian zone with the Kerr Cattle Company. At this time, an accurate estimate of numbers of willows required can be made. A riparian assessment at this site will help determine the need to plant additional cottonwood and perhaps spruce in order to enhance long-term LWD recruitment.

Risks: Frost, flooding, drought, cattle grazing.

Monitoring: Conduct walk-through assessments for three years in the late summer to determine plant performance and cattle influence.

Summary:

Distance from Creek	Net area / length	Species and size	Site prep	Timing	Spacing	Amount*
Gravel bars and toe of bank.	175 m	Dormant willow cuttings (80 cm with 3 cm butt diam.) Keep in water prior to planting. Plant to a depth of 55 cm leaning downstream.	None required. Cuttings to be inserted into manually driven pilot holes.	Early May prior to flooding. Try to plan for year when floods are not expected to be high. If site is too wet, plant in fall once plants are dormant. Later spring may be an option if plants are collected prior to bud burst and stored in a freezer until used.	1 m apart	Up to 420.

* This estimate includes a 20% contingency for damaged stock.

Riparian Rehabilitation Recommendation: Deep #3

- Note: to be implemented in conjunction with Rehabilitation Recommendation Deep #4 (see Appendix F).

Reach: Deep Creek Reach 1

Location: Impact site D2 (1+700 to 2+290 m)

Land Tenure: Private (Robert Kirsch). Contact landowner to access land.

TRIM/Forest Cover Mapsheet: 93L056

Forest Cover Polygon: 127

Flightline and Air Photo Number: 30BCC 687 No. 57

Close riparian assessment sites: MG1

Site Series / structural stage: SBSdk08 / Herb, shrub

Soil type: Dystric Brunisol

Area to be treated: approximately 350 m long * 10 m wide *2 banks = 0.7 ha

Riparian Class: S2: RMA = 50 m, RRZ = 30, RMZ = 20m

Site Photo: Thinned or cleared riparian areas (see Figs. 19B and 20B).

Objectives:

- promote overhanging shrubs to provide bank stability, shade, small organic debris and surface filtering,
- provide source of long-term LWD, and
- stabilise stream channel by establishing deep rooting deciduous and coniferous species

Overview:

A cleared area with limited riparian vegetation between 1+700 m and the Farewell Road Bridge at 2+290 m will require riparian planting to rehabilitate riparian function. Width of the replanted area will depend on negotiations with the landowner. We will assume a 10 m riparian zone. Although this is much less than the 30 m riparian reserve zone required by the Forest Practices Code, re-establishing a wider zone may be impractical given the circumstances. Black cottonwood whips and hybrid spruce will be planted in a nurse-tree shelterwood system between 3 and 10 m from the bank to increase shading and provide a long-term source of LWD. Within 2 m of the creek bank, cottonwood cuttings will be interspersed with red osier dogwood (*Cornus stolonifera*) (on mid bench) or willow (on low bench) every 20 m. All cuttings should be made at a 45° angle and come from 1st or 2nd year growth. Preferred species of willow include Pacific willow (*Salix lasiandra)*, Drummond's willow (*S. drummondiana)* and Sitka willow (*S. sitchensis*). These species are common in exposed gravel bars and riparian thickets (SKR and Oikos 1999; Triton 1993). Bebb's willow (*S. bebbiana*) may also be an option if it is common along the creek. Willow species found growing in the area should be given preference. Scouler's willow (*S. scouleriana*) should be avoided as it requires special treatment to root (Triton 1993).

Horses in the area will have to be kept away from the planted areas.

In current areas of overstocked pole-saplings, thinning should be considered to proper stocking levels to release the growing trees.

Risks: Frost, flooding, drought, voles. Consider using vole collars.

Monitoring: Perform a stocking and brush survey at the end of the first growing season to determine survival and tree performance. Permanent sample plots with monitoring at least once per year is recommended for several years. Manual brushing may be required. Planted trees may require thinning after a decade.

Summary:

Distance from Creek	Net area / length	Species and size	Site prep	Timing	Spacing	Amount*
0-2 m	700 m	Cottonwood cuttings 80 cm long with a 3 cm butt. Bury ¾ (60 cm) into soil, leaving a minimum of two buds exposed. A five m section of ROD or willow should be planted every 20 m.	Where competing vegetation is not well developed, clear grasses and grass roots away prior to planting. In areas where undesired vegetation is thick, clear roots from a $1m^2$ area (56 cm radius) and remove roots of competing vegetation; place 90 cm x 90 cm brush mats around planted cuttings or use a continuous mat to avoid overlap. Use star drill or auger for holes and a rubber mallet to pound cuttings into place. If shrubs or well rooted herbs currently exist on site, these will be left as they are currently providing some riparian function.	Early May prior to bud burst. Cuttings can be collected anytime during preceding winter if kept in cold storage prior to planting.	1 m apart starting approximately 1 m back from the bank. Red Osier Dogwood and willow stems can be planted within 0.5 m of the bank and should be space approximately 1 m apart. Do not plant anything in areas with good existing shrub cover.	Willow – 90 ROD – 90 Cottonwood - 670
3-10 m	0.5 ha	Cottonwood cuttings 80 cm long with 3 cm diam. butt. Bury 60 cm into soil.	Manually brush and screef a $1m^2$ area (56 cm radius) using a grub hoe or shovel and remove roots of competing vegetation; place 90 cm x 90 cm brush mats around planted cuttings. In areas with little competing vegetation, brush mats may not be necessary.	Early May (see above)	In poorly stocked areas, a plant ecologist or forester should determine spacing for clusters.	To be determined with site visit and development of a prescription.
		Hybrid spruce styroblock stock.	See cottonwood. Plant spruce with a planting shovel. Brush mats may be required as spruce grow much slower than the cottonwood.	Early May (see above)	Spacing on mid-bench sites is to be determined based presence of elevated microsites. Spruce should be clustered on these sites. Numbers per site will be determined by a plant ecologist or forester. Spruce should not be planted on low-bench sites.	To be determined with site visit and development of a prescription.

* This estimate includes a 20% contingency for damaged stock. .

Thompson Creek Reaches 1 and 2

Riparian Rehabilitation Recommendation: Thompson #1

- Note: to be implemented in conjunction with Rehabilitation Recommendation Thompson #1 (see Appendix F).

Location: Impact site T7 (0+000 m to 0+430 m of reach 2)

Land Tenure: Private (William Dieleman). Contact landowner to access land.

TRIM/Forest Cover Mapsheet: 93L057

Forest Cover Polygon: 435, 439, 441

Flightline and Air Photo Number: 30BCB 91183 No. 42

Closest riparian assessment sites: GT1, MJ3

Site Series / structural stage: SBSdk07a or 08 / mix of mature forest and herb, shrub

Soil type: Dystric Brunisol

Area to be treated: 230 m long * 10 m wide * 1.5 banks = up to 0.35 ha in reach 2 requires extensive planting. The initial 200 m of the site may need fill planting. A stocking assessment should be conducted in the downstream 200 m of this site.

Riparian Class: S3: RMA = 40 m, RRZ = 20, RMZ = 20m

Site Photo: Cleared land and bank failure in upper section (Fig. 27A)

Objectives:

- promote overhanging shrubs to provide bank stability, shade, small organic debris and surface filtering,
- provide source of long-term LWD, and
- stabilise stream channel by establishing deep rooting deciduous and coniferous species.

Overview:
A cleared area from 0+200 to 0+430 m of reach 2 will require riparian planting in conjunction with slope stabilisation using live fascines (see Rehabilitation Recommendation: Thompson #1). Width of the replanted area will depend on negotiations with the landowner. We will assume a 10 m wide riparian zone along one entire bank and half of the other bank (0.65 ha). The landowners may agree to establish a wider zone equivalent to the 20 m riparian reserve zone required by the Forest Practices Code. A nurse tree shelterwood system will be used on this site to establish hybrid spruce. Hybrid spruce plugs will be planted between clustered cottonwood whips in a zone 1 to 10 m from the creek bank. Due to the easy access to this site, a tracked backhoe or small excavator can be used to dig the holes for the cottonwood. Spruce are to be planted after the cottonwood. Planting should occur soon after the bank stabilisation work with live fascines. However, because the bank stabilisation is a relatively time consuming project, the project coordinator may want to divide the work over two years, depending on availability of volunteers. The general state of the field in the spring (i.e. soft mud) should be discussed with the landowner. Should the field be subject to

soil disturbance when wet, planting should be done in the fall when the ground is harder and plants are dormant.

The area from the reach break to 0+200 m contains some young and mature trees. A stocking assessment is required in this area to determine planting requirements.

Risks: Frost, flooding, drought, voles (consider using vole collars), cattle grazing.

Monitoring: Perform a stocking and brush survey at the end of the first growing season to determine survival and tree performance. Permanent sample plots with monitoring at least once per year is recommended for several years. Cattle influence on the area should be assessed. Manual brushing may be required. Planted trees may require thinning after a decade. The landowner may be able to keep an eye on tree growth.

Summary:

Distance from Creek	Net area / length	Species and size	Site prep	Timing	Spacing	Amount*
Stream banks	230 m	See Rehabilitation Recommendation: Thompson #1.				
1-10 m (for 0+200 to 0+430 m)	0.35 ha	Cottonwood cuttings 200 cm long with 3 cm diam. butt.	Insert 5 cottonwood cuttings into a 140 cm deep hole dug by a tracked backhoe (wheeled if ground is hard), leaving 60 cm of cutting exposed. A deep hole will allow roots to access the water table and a 60 cm exposed stem will provide some protection from competing plants.	Depends on state of field. If too wet in early spring to allow backhoe access without damaging soil, plant in autumn after buds have set.	Clusters to be spaced 3 m apart.	1380 for one bank. 690 for the other bank assuming half will be planted.
		Hybrid spruce styroblock stock.	Use backhoe bucket to spot scarify a 1 m by 1 m area between the cottonwood clusters.	To be planted immediately after the cottonwood.	Spruce to be planted every 3 m (1.5 m from each cottonwood clusters.	276 for one side. 138 for the other bank assuming half will be planted. .

* This estimate includes a 20% contingency for damaged stock.

Riparian Rehabilitation Recommendation: Thompson #2

- Note: to be implemented in conjunction with Rehabilitation Recommendation: Thompson #2 (see Appendix F).

Reach: Thompson Creek Reach 1

Location: Impact site T3 (1+420 to 1+440 m)

Land Tenure: Private (James Berkery) (access may be via Lies Rouw's land). Contact landowners to access land.

TRIM/Forest Cover Mapsheet(s): 93L056

Forest Cover Polygon: 212

Flightline and Air Photo Number: 30BCB 91112 No. 90

Closest riparian assessment sites: N/A

Site Series / structural stage: Adjacent south-facing slope is SBSdk81. Site series for the creek edge is unknown. Structural stage is Initial.

Area to be treated: 20 m long * approx. 10 m wide * 2 banks = 0.02 ha

Riparian Class: S3: RMA = 40 m, RRZ = 20 m, RMZ = 20 m

Objectives:

- promote overhanging shrubs to provide bank stability, shade, small organic debris and surface filtering, and
- establish source of LWD in future.

Overview:
The riparian area between 1+420 and 1+440 m has been cleared and grazed by cattle. This site is also used as a cattle crossing and watering area. The banks are slumping and eroding. Shading, small organic debris, and vegetation cover for fish is lacking. Rehabilitation Recommendation: Thompson #2 outlines the placement of riprap and a brush mattress on the outside corner of the stream at this site. Upslope of the brush mattress and upslope of the opposite bank plant live cuttings from cottonwood and aspen. We suggest willow cuttings be planted along the toe of the bank on the inside corner. Preferred species include Pacific willow (*Salix lasiandra)*, Drummond's willow (*S. drummondiana)* and Sitka willow (*S. sitchensis*). These species are common in exposed gravel bars and riparian thickets (SKR and Oikos 1999; Triton 1993). This fast growing pioneer vegetation will help protect the stream banks from erosion, provide small organic debris and shade the creek. Roots will catch sediments which will help build the banks.

Risks: Frost, flooding, drought, competition from grasses and weeds such as Canada thistle (*Cirsium arvense*) and cattle grazing.

Monitoring: Conduct walk-through assessments for at least three years in the late summer to determine plant performance and cattle influence. Willows may require pruning. Planted trees may require thinning after a decade. The landowner could potentially keep an eye on tree growth.

Summary:

Distance from Creek	Net area / length	Species and size	Site prep	Timing	Spacing	Amount*
Gravel bars and toe of bank (Left bank)	20 m	Dormant willow cuttings (80 cm with 3 cm butt diam.) Keep in water prior to planting. Plant to a depth of 55 cm leaning downstream.	None required. Cuttings to be inserted into manually driven pilot holes.	Early May prior to flooding. If site is too wet, plant in autumn once plants are dormant. Due to the small area to be planted, later spring may be an option if plants are collected prior to bud burst and stored in a freezer until used.	1 m apart	50
Upslope of brush mat on right bank (3-10 m) and 1-10 on right bank.	0.2 ha	Cottonwood and aspen cuttings 80-120 cm long with 3 cm diam. butt (shorter nearer to stream). Bury ¾ of cutting length into soil.	Manually spot scarify a $1m^2$ area (56 cm radius) and remove roots of competing vegetation; place 90 cm x 90 cm brush mats around planted cuttings.	Early May to correspond with willow planting and brush mattress installation.	To be determined in site prescription	To be determined upon additional site visit. Plant cottonwood in lower areas and aspen further up on slope.

* This estimate includes a 20% contingency for damaged stock.

Riparian Rehabilitation Recommendation #3

- Note: To be implemented in conjunction with Rehabilitation Recommendation: Thompson #3 (see Appendix F).

Reach: Thompson Creek Reach 2

Location: Impact site T9. Reach 2 (2+027 m to 2+157 m)

Land Tenure: Private (William Dieleman). Contact landowner to access land.

TRIM/Forest Cover Mapsheet: 93L057

Forest Cover Polygons: 458, 451

Flightline and Air Photo Number: 30BC 91183 No. 42

Closest riparian assessment sites: GT2 (downstream) and MJ4 (upstream)

Site Series / Structural stage: SBSdk06 (GT2) / Initial (Left bank)

Soil type: Dystric Brunisol (at GT2)

Area to be treated: approximately 130 m long * 10 m wide *right bank = 0.13 ha

Riparian Class: S3: RMA = 40 m, RRZ = 20, RMZ = 20m

Site Photo: Bank shear and cleared land on right bank at 2+077 m (Fig. 27D).

Objectives:

- promote overhanging shrubs to provide bank stability, shade, small organic debris and surface filtering, and
- increase the potential for sources of long-term LWD, thus increasing cover and stream complexity.

Overview:
Cattle move down from an upslope pasture to water from the left bank of the creek between 2+027 m and 2+157 m. Through most of the site, trees are absent or rare, and the herb layer has been grazed or trampled and is functioning poorly as a sediment filter and bank stabilising agent.

Width of the replanted area will depend on negotiations with the landowner. We will assume a 10 m riparian zone. A wide riparian zone may be agreed upon. Along the bars and banks, plant willow where shrubs are no longer growing. Preferred species of willow include Pacific willow (*Salix lasiandra)*, Drummond's willow (*S. drummondiana)* and Sitka willow (*S. sitchensis*). These species are common in exposed gravel bars and riparian thickets (SKR and Oikos 1999; Triton 1993). Bebb's willow (*S. bebbiana*) may also be an option if it is common along the creek. Willow species found growing in the area should be given preference. Scouler's willow (*S. scouleriana*) should be avoided as it requires special treatment to root (Triton 1993). All cuttings should be made at a 45° angle and come from 1st or 2nd year growth. In a band one to 10 m from the bank, in areas with an initial stand structure, several clusters of hybrid spruce will be planted among planted trembling aspen (*Populus tremuloides*) to increase shading and to provide LWD in the future.

Risks: Frost, flooding, drought, voles (consider using vole collars), cattle trampling, and competition from other plants.

Monitoring: Conduct walk-through assessments each year for three years in the late summer to determine plant performance and survival and the cattle influence on the site. Manual brushing may be required. Planted trees may require thinning after a decade.

Summary:

Distance from Creek	Net area / length	Species and size	Site prep	Timing	Spacing	Amount*
Gravel bars and toe of bank.	130 m	Dormant willow cuttings (60-80 cm with 2-3 cm butt diam.) Keep in water prior to planting. Bury to a depth equivalent to ¾ of cutting length (lean downstream), leaving at least 2 buds exposed.	None required. Cuttings to be inserted into manually driven pilot holes.	Early May prior to flooding or in the in the autumn once plants are dormant. Later spring may be an option if plants are collected prior to bud burst and stored in a freezer until used.	In bundles of 3, 1 m apart.	470 willow whips.
1-10 m	0.13 ha	Rooted aspen from nursery.	Manually brush and screef a $1m^2$ area (56 cm radius) using a grub hoe or shovel and remove roots of competing vegetation; place 90 cm x 90 cm brush mats around planted cuttings. In areas with little competing vegetation, brush mats may not be necessary.	Early May (see above)	A plant ecologist or forester should determine spacing for clusters.	To be determined with site visit and development of a prescription.
		Hybrid spruce styroblock stock.	Spruce to be planted in clumps using a planting shovel. Place brush mats around the planted cuttings to discourage growth of competing plants.	Early May (see above)	Numbers per site will be determined by a plant ecologist or forester. Spruce should not be planted on low-bench or wet areas.	To be determined with site visit and development of a prescription.

* This estimate includes a 20% contingency for damaged stock.