Summary of Stream Restoration Activities at Site 3 in the Kitseguekla River South Sub-Basin to March, 1999

Prepared for the
Gitsegukla Band Council

by
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Introduction

BioLith Scientific Consultants Inc. was contracted by the Gitsegukla Band Council to prepare a summary of Stream Restoration activities as per Schedule A of the Standards Agreement with the Ministry of Environment. The following summary is based on first hand information derived from BioLith's involvement and on the information provided by the Band.

As a result of a Level I Overview Assessment of the Kitsegukla River watershed (Wild Stone 1995) and a subsequent Level I Detailed Field Assessment of the South Sub-Basin of the system (Giesbrecht and Grieve 1998), restorative works in and around the streams were prescribed for a number of sites, including Prescription Site 3 on Tributary 1 of the Kitseguekla River (see Figure 1).

This report summarizes the restorative works that were implemented by the Gitsegukla Band Council at those three sites in the 1998-1999 fiscal year.

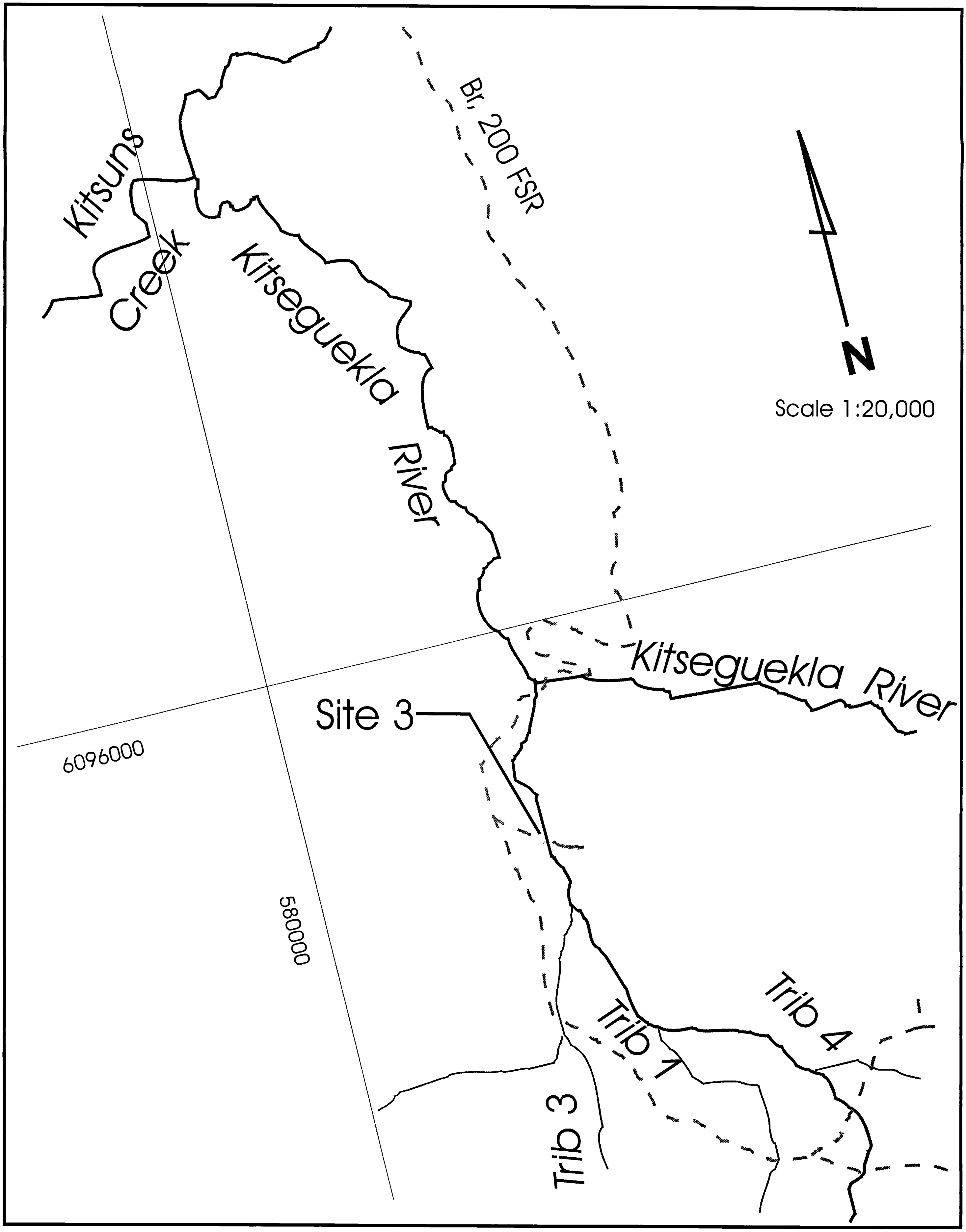


Figure 1. Map showing the location of Prescription Site 3 in the Kitseguekla River South Sub-Basin.

Final Summation for Site 3

Instream Work

Prescription Site 3 was located on Tributary 1 of the Kitseguekla River South Sub-Basin. The work involved a 100 m section of this stream around a collapsed bridge site. The bridge had been removed and the bridge approaches had been pulled back prior to the start of the work described in this summary.

The stream at this site featured

- significant bank erosion,
- channel instability,
- a general lack of LWD, habitat variety and cover, and
- there was evidence of more erosion associated with the previously pulled back bridge approach on the northeastern side (see Photos 1 and 2).

Photo 1. Looking upstream from the former road crossing on Site 3. Note that the road material on the far side was eroding despite earlier pull back of the slope.

Photo 2. Looking downstream from Photo Point 1.

The site was more than 50 m in length and was considered a Type II project. This site was visited by the Senior Biologist from BioLith and the Senior Fisheries Technician. The site was surveyed using a tape measure, clinometer and compass (see Appendix A) and labeled flagging was hung where restorative measures were prescribed. This information was used to produce a construction plan and drawing. The plan prescribed

- placement of one channel spanning log weir set into the stream bed,
- placement of approximately 14 complete trees with root wads and branches intact in various locations along the side of the channel. The primary purpose of these placements was to dissipate energy, protect banks and incipient vegetative growth on the bars and to incidentally produce more variety in habitat through scour.

Prior to construction, a site visit was scheduled for September 23, 1998 and local field, regional MoELP and DFO personnel were invited to attend this field trip one week in advance. This was attended by Glenn Grieve, from BioLith Scientific Consultants (BioLith) and Pat Walsh, from the Department of Fisheries and Oceans (DFO). The construction plans were discussed in detail during this meeting. The DFO representative suggested the inclusion of 'debris catchers', wooden pegs driven into the bank that point upstream. The purpose of these structures was to catch woody debris that would then help to protect the eroding northern bank from further erosion. This suggestion was incorporated into the revised construction plan (see Figure 2). The revised construction plans were sent to the concerned regulatory agencies and no comments were received prior to construction.

The construction plan was then implemented. Construction work was carried out under the supervision of the Gitsegukla WRP Project Manager, BioLith's senior biologist and the Senior Fisheries Technician on October 14 and 15, 1998, with assistance from two labourers and an excavator operator (see Photos 3, 4 and 5).

Photo 3. View looking downstream from Photo Point 1 after placement of LWD.

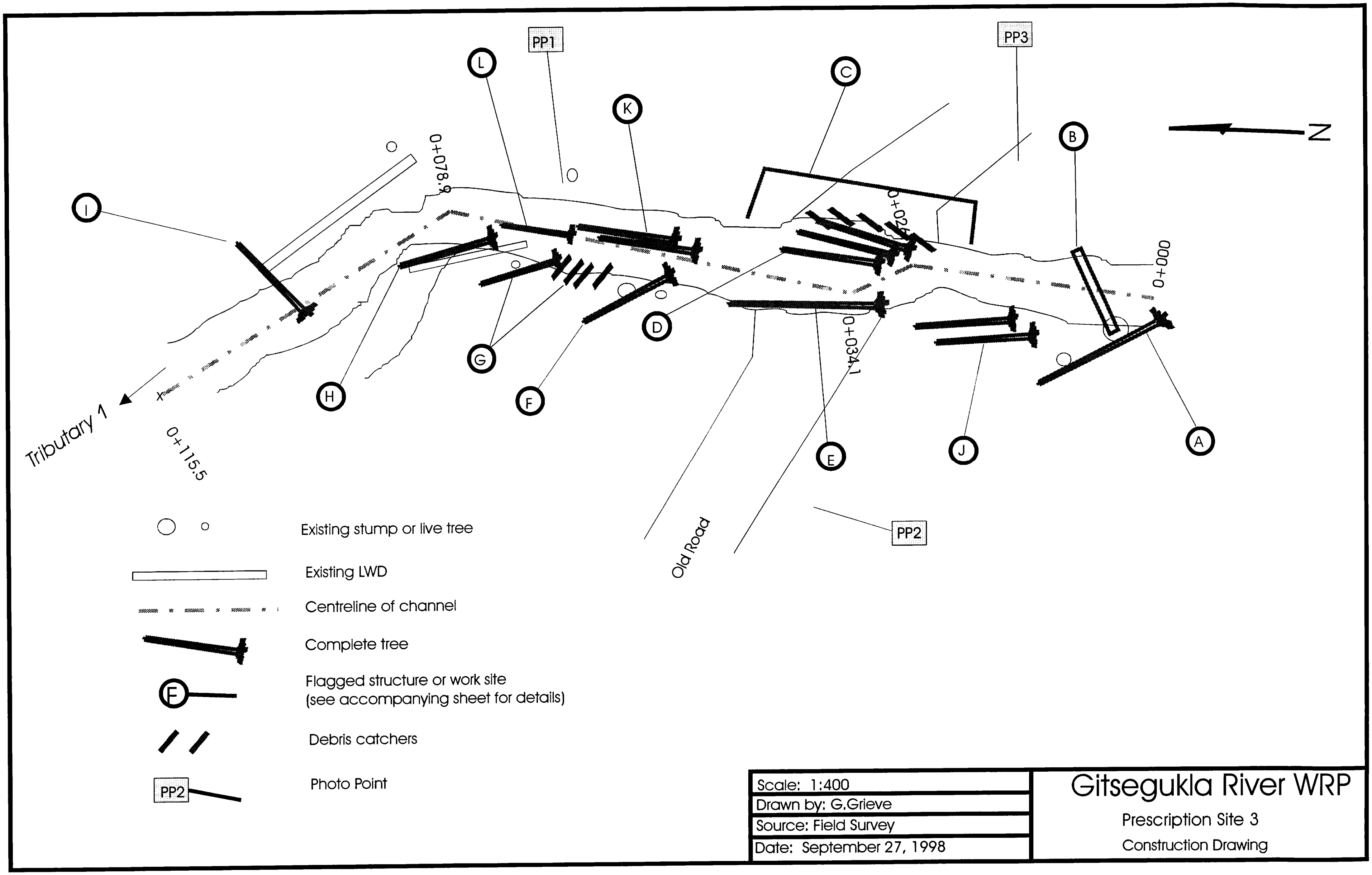
Photo 4. Looking southeast from Photo Point 1. Note the post placed in the bank to stabilize the LWD with root wad.

Photo 5. Looking upstream and southeast during transport of the logs and pullback of the bank.

After construction, the site was surveyed using a total station (see Appendix B). The locations of the restorative structures and modifications of the stream channel were determined and permanent photo points were established. A spike was driven into each end of each piece of LWD for use as reference points during the survey. A labeled metal tag was nailed to each piece in a position near the root wad so that it was not likely to be removed during movement of the LWD. The purpose of these tags was to uniquely identify each installed piece so that its origin could be determined if more than one piece moved downstream. This information was used to produce an 'as-built' drawing of the site (see Figure 3).

Riparian Assessment
The riparian area around Site 3 was assessed by Oikos Ecological Services Ltd. Their report (Recknell 1998) recommended treatment of the area immediately surrounding the former bridge site to accelerate the restoration the lost riparian function. The treatment recommended involved planting the floodplain area with willow whips and establishing a nurse tree shelterwood on the upland portions of the site. Suggested monitoring involved walking through the area after treatment once each month and standard regeneration survey methods.

Hydrological Assessment
Dr. Alan Gilchrist, from Hydroglyphic Terrain Analysts, conducted an assessment of Site 3 after the construction described above was finished. His report (Gilchrist 1998) contains verification of stability of the system, suitability for restoration, location and cause of sediment wedges and recommendations on the weight of the ballast/m of log length for various sizes of logs that should be used to anchor LWD in the stream. It further suggests that boulder clusters using boulders with a b dimension of at least 65 cm might be considered for the area.



Scale: 1:400	Gitsegukla River WRP
Drawn by: G.Grieve	Prescription Site 3
Source: Field Survey	Construction Drawing
Date: September 27, 1998	

Other Assessments
Jeff Lough and Darren Fillier, from the Ministry of Environment, Lands and Parks (MoELP), visited the site on November 12, after construction was complete. They have summarized their assessment of the work done at the site in the form of a letter dated March 8, 1999 (see attached copy). In this letter they expressed concern regarding the stability of the debris catchers, an inadequate silt fence and the lack of planted trees. They further observed that the LWD was placed parallel to the stream and that there were no rock weirs and that the LWD used was of good quality. They suggested that the LWD be anchored.

Site 3 was also visited during late September of 1998 before construction, by Jeff Lough and Darren Fillier from the MoELP, and Glenn Harkleroad, a Fisheries Biologist working with the U.S. Forest Service. In a summary of his observations (see attached copy), Mr. Harkleroad suggested that there was too much fine sediment from the former bridge approaches still present within the channel and that the rip rap used on the west side was too small.

Modifications During Implementation to Original Plans at Site 3

- A wood post was driven vertically into the western stream bank near the water's edge and downstream from the root wad of LWD Structure F on the construction plan. The purpose of this post was to stabilize the end of Structure F to prevent it from moving downstream.
- Since more LWD pieces were available than were required by the prescription, the two extra trees were placed along and on the tree specified in the construction plan as LWD Structure E. The purpose of these pieces was to add weight to the planned structures to make the entire structure more stable. A third, shorter tree was placed between the eastern end of prescribed log B and the upstream end of the prescribed debris catchers. The purpose of this piece was to further protect the previously eroding bank on the east side.
- Extra LWD pieces that resulted from some trimming of trees that were too long, were placed in the interstitial spaces of the LWD clusters.

Preliminary Monitoring Plan

The efficacy of the restorative treatments implemented can only be assessed through quantitative comparisons of parameters measured before and then after construction (see also Gilchrist 1998). The two most significant parameters to measure are changes to fish populations and changes to fish habitat. Only limited data on each of these characteristics is available from the Level I assessment, as that process involved sampling of representative parts of a much larger portion of the watershed. A reasonably valid assessment of efficacy will require a more intensive program of measurements. In particular, the construction site should be the subject of an intensive topographic survey of the stream's channel to determine its characteristics over time, along with an intensive fishing program to determine changes in the fish population over time.

Fish Habitat
The physical characteristics of samples of the stream, and the pre-construction and post-construction surveys provide some 'before' data. The as-built survey data is valid as 'before' data because there have not been any habitat-altering floods between the time of construction and the as-built survey. It is recommended that the stream channel should be the subject of an intensive topographic survey, using a total station, to quantify the shape of the channel before the spring freshet produces the first significant alterations. The Fish Habitat Assessment Procedure (FHAP) should be applied to this site and compared with similar data gathered during the original FHAP. A photographic record of the site should also be compiled over time using the photo points that were established during construction. In view of the concerns raised by others who visited the site, the stability of the installed structures should be monitored carefully through site visits every two weeks as the spring snow melt progresses. If there are signs of movement of the LWD then boulder anchors should be installed.

Fish
Fish data too is limited to that provided by sampling of the stream during the Level I field assessment. The site should be fished intensively to determine species composition, micro-distribution, and relative abundance. Relative abundance could best be determined through a mark-recapture program at each site. This work should be done before the spring freshet to get as much 'before' data as is possible.

Similarly intense repetitions of the methods used should be implemented each year, beginning after the spring freshet in 1999, and continuing for at least four years, in order to produce reasonably valid assessments of the efficacy of the treatments.

Recommendations
The design and placement of LWD was considered appropriate for this site. Many of the LWD pieces with root wads and branches were bound together and oriented such that they should resist movement. Their orientations, roughly parallel to and along the side of the stream were chosen to mimic a natural situation in an energetic stream. Bundling together and placing some on top of others was an attempt to increase their stability by increasing their above-flood-water mass, so that they were less likely to float, and thereby avoid the necessity of less natural anchoring means. The potential to experiment with this anchoring and placement method presented little risk at this very degraded site and was considered an excellent opportunity if monitored appropriately.

It is recommended that, if significant movement is observed during future monitoring, the LWD installed should be anchored to imported boulders >65 cm in their b axis, using steel cable >1.5 cm in diameter epoxied into 15 cm holes drilled into the rock using the Hilti system. Such boulders may be available along the Branch 400 FSR or along the Br. 200 FSR northeast of the Kitseguecla River bridge at ~ 16 km.

It is recommended that the left (southeast) bank at the old road crossing, be made more resistant to erosion at high water by placement of larger shot rock than is currently there.

References

Fillier, D. and J. Lough. 1999. Letter to Bill Fell. A copy is attached to this report as Appendix C.

Giesbrecht, S. and G. Grieve 1998. Level I detailed assessment of fish and fish habitat in the south Kitseguecla River and its tributaries. Report for the Gitsegukla Band Council, available at the Regional Library, Ministry of Environment, 3726 Alfred Ave., Smithers, B.C.

Gilchrist, A. 1998. Kitwanga River and Kitseguecla River Watershed Restoration Program: Hydrological and channel stability assessments of specific impact sites. Prepared for the Gitsegukla Band Council.

Harkleroad, G.R. 1998. British Columbia Stream Restoration Project Review Report, 1998. A copy is attached to this report as Appendix D.

Recknell, G. 1998. Riparian assessment and prescription development for selected sites on the south Kitseguecla River and south Kitwanga River. Draft, December 14, 1998. Prepared for the Gitsegukla Band Council.

Wildstone Resources Ltd. 1995. Level I Assessment of the Kitseguecla River Watershed. Prepared for Skeena Cellulose Inc. Available in the library, Ministry of Environment, 3726 Alfred Ave., Smithers, B.C., V0J 2N0

Appendix A. Pre-Construction survey data

Site 3 Kitsegukla Trib 1

Cross section at Sta 3 at d/s end of works... looking U/S

Sta	Desc	Slope Dista	Brg	% slope	VD	HD
A	Shot furthe	14.5	82	19	2.1558	30.2556
B		8.2	82	7	0.4506	24.1043
C		5.2	82	15	0.6112	21.0807
D		2.7	82	12	0.2541	18.6047
E	Sta 3	0		0	0.0000	15.9167
F		2.7	262	0	0.0000	13.2167
G		5.3	262	10	0.4158	10.6330
H		8.7	262	3	0.2050	7.2191
I	Shot furthe	16	262	13	1.6308	0.0000

Cross section at Sta 2 at the major road crossing

Sta	Desc	Slope Dista	Brg	% slope	VD	HD
A	Shot furthe	20.8	120	20	3.2538	39.8026
B		10.7	120	20	1.6738	29.8270
C		7.2	120	6	0.3392	26.4507
D	Sta 2	0	0	0	0.0000	19.2587
E		1.8	300	0	0.0000	21.0587
F		5.6	300	40	1.7305	13.9328
G		11.2	300	25	2.1850	8.2739
H	Shot furthe	19.7	300	27	4.1463	0.0000

Longitudinal Profile

Starting ~ 203.8 m above road site in Prescription site 3

0+000		0						
0+016		16	46	-6	-0.7537	15.9822	15.9822	-0.7537
0+058.9		42.9	38	-4	-1.3475	42.8788	58.8611	-2.1012
0+074.1		15.2	16	-5	-0.5967	15.1883	74.0494	-2.6980
0+113.5		39.4	352	-3	-0.9283	39.3891	113.4384	-3.6262
0+144		30.5	320	-3	-0.7186	30.4915	143.9299	-4.3448

0+173.6		29.6	346	-3	-0.6974	29.5918	173.5217	-5.0422
0+203.8	old Ppoc	30.2	352	-2	-0.4744	30.1963	203.7180	-5.5165
0+230.5		26.7	8	-3.5	-0.7339	26.6899	230.4079	-6.2504
0+237.9		7.4	336	-5	-0.2905	7.3943	237.8022	-6.5409
0+282.7		44.8	12	-2	-0.7037	44.7945	282.5967	-7.2446
0+319.3		22.6	328	-4	-0.7099	22.5888	305.1855	-7.9545
0+353.9		34.6	348	-2.5	-0.6793	34.5933	339.7789	-8.6338
0+381.4		27.5	36	-3	-0.6479	27.4924	367.2712	-9.2817
0+404.6		23.2	2	-2	-0.3644	23.1971	390.4684	-9.6461
0+435.2		30.6	292	-3	-0.7209	30.5915	421.0599	-10.3670
0+444.2		9	2	-4	-0.2827	8.9956	430.0554	-10.6497
0+471.1		26.9	326	-2	-0.4225	26.8967	456.9521	-11.0723
0+499.1		28	342	-2	-0.4398	27.9965	484.9487	-11.5121

Appendix B. As-Built survey data

Total Station Survey of 'As-Built' Site 3, Reach 1, Trib 1, South Kitsegukla River

BioLith Scientific Consultants Inc.

250-635-5378 | Date: Nov 8 1998 | Temp: 1

Crew: EW/GG

Pentax PCS 325-W | Error: <1cm | Barom Press.: 980 kPa

All measurements taken from BM#56.

Measurements to Large Woody Debris pieces taken with respect to nails driven into each end of the log. Debris catcher measurements were taken with respect to one nail driven into the highest point on the piece.

Measurements to photo points and reference posts taken to the top of the reference post or metal pipe.

Shot	Description	HA			Decimal Degrees	HD m	VD m	RH m	HI m	x	y	z
SP	metal tag #56								1.48	0.000	0.000	0.000
SP	Instrument set up on ne side of old road crossing. BM#56	209	37	50	209.631	34.12	0.59	1.925	1.48	-16.869	-29.658	0.145
1	this was the first shot on	227	6	45	227.113	26.18	-0.11	1.925	1.48	-19.182	-17.817	-0.555
2	bole end log 1	219	43	50	219.731	27.17	0.2	1.922	1.48	-17.366	-20.895	-0.242
3	root wad end log 2	219	13	25	219.224	25.95	0.17	1.922	1.48	-16.409	-20.103	-0.272
4	root wad end log 3	250	44	35	250.743	13.01	-1.24	1.922	1.48	-12.282	-4.291	-1.682
5	bole end log 3	250	9	55	250.165	16.17	-1.26	1.922	1.48	-15.211	-5.487	-1.702
6	bole end log 2	238	11	45	238.196	16.5	-0.76	1.922	1.48	-14.023	-8.696	-1.202
7	root wad end log 4	238	13	25	238.224	17.11	-0.64	1.922	1.48	-14.545	-9.010	-1.082
8	rootwad log 5	248	47	35	248.793	17.33	-0.85	1.921	1.48	-16.156	-6.269	-1.291
9	root wad log 6	284	35	40	284.594	13.53	-1.55	1.921	1.48	-13.093	3.409	-1.991
10	bole log 5	292	23	40	292.394	13.96	-1.28	1.92	1.48	-12.907	5.318	-1.720
11	bole log 6	295	37	10	295.619	14.59	-1.22	1.907	1.48	-13.156	6.309	-1.647
12	bole log 4	324	14	30	324.242	20.6	-1.17	1.907	1.48	-12.038	16.717	-1.597
13	root wad log 7	319	9	40	319.161	24.95	0.66	1.904	1.48	-16.316	18.876	0.236
14	bole log 7	336	49	5	336.818	25.8	-1.36	1.904	1.48	-10.156	23.717	-1.784
15	root wad log 8	336	13	55	336.232	26.68	0.04	1.518	1.48	-10.753	24.417	0.002
16	post	328	25	0	328.417	38.28	-0.21	1.518	1.48	-20.049	32.610	-0.248
17	bole log 8	338	49	45	338.829	27.68	-2.16	1.518	1.48	-9.997	25.812	-2.198
18	debris catcher 1	340	58	20	340.972	29.06	-1.71	1.517	1.48	-9.474	27.472	-1.747
19	dc 2	342	0	5	342.001	31.22	-1.4	1.517	1.48	-9.647	29.692	-1.437
20	dc 2											

21	root wad log 9	345	8	35	345.143	34.92	-2.4	1.517	1.48	-8.954	33.753	-2.437
22	bole log 9	345	4	55	345.082	51.33	-2.45	1.517	1.48	-13.214	49.600	-2.487
23	bole log 10	0	12	20	0.206	68.24	0.24	1.517	1.48	0.245	68.240	0.203
24	root wad log 10	351	35	10	351.586	55.06	-2.8	1.517	1.48	-8.057	54.467	-2.837
25	bole log 11	354	29	15	354.488	32.7	-2.14	1.517	1.48	-3.141	32.549	-2.177
26	bole log 12 on e	345	18	40	345.311	24.26	-2.29	1.517	1.48	-6.152	23.467	-2.327
27	bole log 13 on w	340	28	5	340.468	21.33	-2.14	1.517	1.48	-7.131	20.103	-2.177
28	root wad log 11	342	20	20	342.339	19.48	-1.54	1.517	1.48	-5.910	18.562	-1.577
29	root wad log 13	318	6	5	318.101	12.75	-1.25	1.517	1.48	-8.515	9.490	-1.287
30	root wad 12	318	20	10	318.336	11.87	-0.87	1.517	1.48	-7.891	8.868	-0.907
31	bole log 14	359	31	10	359.519	9.66	-1.11	1.516	1.48	-0.081	9.660	-1.146
32	bole log 15	356	1	50	356.031	6.82	-0.83	1.516	1.48	-0.472	6.804	-0.866
33	bole cross log 16	11	17	25	11.290	4.62	-0.14	1.516	1.48	0.905	4.531	-0.176
34	root wad cross log 16	245	52	20	245.872	9.22	-0.94	1.516	1.48	-8.415	-3.769	-0.976
35	root wad log 14	239	55	40	239.928	9.08	-0.89	1.516	1.48	-7.858	-4.550	-0.926
36	root wad log15	234	47	35	234.793	9.18	-0.88	1.516	1.48	-7.501	-5.293	-0.916
37	dc 4	224	25	10	224.419	10.24	-0.55	1.516	1.48	-7.167	-7.314	-0.586
38	dc 5	219	15	5	219.251	11.87	-0.57	1.516	1.48	-7.510	-9.192	-0.606
39	dc 6	216	24	40	216.411	14.07	-0.61	1.516	1.48	-8.352	-11.323	-0.646
40	dc 7	214	35	30	214.592	15.58	-0.6	1.516	1.48	-8.845	-12.826	-0.636
41	dc 8	212	32	5	212.535	17.61	-0.66	1.516	1.48	-9.471	-14.846	-0.696
42	dc 9	211	13	25	211.224	19.66	-0.63	1.516	1.48	-10.191	-16.812	-0.666
43	bole log 17	210	53	35	210.893	18.82	-0.8	1.516	1.48	-9.663	-16.150	-0.836
44	root wad log 17	207	31	30	207.525	25.27	-0.56	1.516	1.48	-11.678	-22.410	-0.596
45	e end cross log 18 weir	207	26	10	207.436	25.97	-0.78	1.516	1.48	-11.966	-23.049	-0.816
46	w end cross log weir	212	55	20	212.922	28.83	-0.76	1.516	1.48	-15.669	-24.200	-0.796
47	w.wetted edge u/s -- d/s	206	46	35	206.776	37.39	-0.51	1.516	1.48	-16.845	-33.381	-0.546
48	c/l	203	55	40	203.928	36.25	-0.7	1.516	1.48	-14.702	-33.135	-0.736
49	w. edge	210	11	15	210.188	32.59	-0.95	1.516	1.48	-16.387	-28.170	-0.986
50	c/l	207	43	55	207.732	32.04	-1.16	1.516	1.48	-14.909	-28.360	-1.196
51	w. edge below stump	213	21	0	213.350	27.22	-1.16	1.516	1.48	-14.964	-22.738	-1.196
52	c/l	210	36	25	210.607	26.85	-1.46	1.516	1.48	-13.671	-23.109	-1.496
53	channel bottom u/s weir l	210	42	10	210.703	29.24	-1.35	1.516	1.48	-14.929	-25.141	-1.386
54	"""	209	16	40	209.278	28.46	-1.39	1.516	1.48	-13.918	-24.824	-1.426
55	"""	208	47	30	208.792	27.84	-1.28	1.516	1.48	-13.408	-24.398	-1.316
56	channel bottom d/s of we	211	46	5	211.768	27.25	-1.35	1.516	1.48	-14.347	-23.168	-1.386
57	"""	209	50	40	209.844	26.1	-1.35	1.516	1.48	-12.989	-22.639	-1.386

58	w.wetted edge	214	38	55	214.649	24.35	-1.24	1.516	1.48	-13.844	-20.032	-1.276
59	"""""" at point	230	15	45	230.263	15.8	-1.58	1.516	1.48	-12.150	-10.100	-1.616
60	c/l	224	41	40	224.694	15.46	-1.74	1.516	1.48	-10.873	-10.990	-1.776
61	w.edge	242	55	20	242.922	18.33	-1.82	1.516	1.48	-16.321	-8.344	-1.856
62	""""	249	41	50	249.697	18.2	-1.82	1.516	1.48	-17.069	-6.315	-1.856
63	c/l	240	21	15	240.354	13.18	-1.78	1.516	1.48	-11.455	-6.519	-1.816
64	c/l	254	6	10	254.103	11.94	-1.87	1.516	1.48	-11.483	-3.271	-1.906
65	w.edge at bole end of log	289	41	10	289.686	14.24	-1.99	1.516	1.48	-13.408	4.797	-2.026
66	w edge below notch				0.000	14.61		1.516	1.48	0.000	14.610	-0.036
67	c/l by logs 5,6	275	19	20	275.322	13.26	-2.23	1.516	1.48	-13.203	1.230	-2.266
68	c/l u/s of rock weir	299	19	5	299.318	13.44	-2.23	1.516	1.48	-11.719	6.581	-2.266
69	"" "" "" "" "" "" falls	304	5	0	304.083	13.96	-2.5	1.516	1.48	-11.562	7.823	-2.536
70	w. edge d/s of notched lo	291	44	5	291.735	15.12	-1.99	1.516	1.48	-14.045	5.599	-2.026
71	w. edge	308	34	10	308.569	16.87	-2.28	1.516	1.48	-13.190	10.518	-2.316
72	w. edge	319	39	35	319.660	20.14	-2.4	1.516	1.48	-13.037	15.351	-2.436
73	w. edge d/d of dc 2	341	26	35	341.443	30.52	-2.82	1.516	1.48	-9.713	28.933	-2.856
74	w. edge @ rootwad of log 9, start of gravel				0.000			1.516	1.48	0.000	0.000	-0.036
75	gravel bar w. edge	346	7	15	346.121	38.97	-3.06	1.516	1.48	-9.348	37.832	-3.096
76	""""""""""	348	3	0	348.050	45.5	-3.21	1.516	1.48	-9.421	44.514	-3.246
77	w. edge opposite log 10	347	24	45	347.413	54.5	-3.69	1.516	1.48	-11.877	53.190	-3.726
78	c/l " " " " "" ""	349	13	10	349.219	54.55	-3.94	1.516	1.48	-10.203	53.587	-3.976
79	E edge below log 10	350	10	45	350.179	56.7	-3.85	1.516	1.48	-9.671	55.869	-3.886
80	E. edge	353	48	40	353.811	53.12	-3.4	1.516	1.48	-5.727	52.810	-3.436
81	""""""	354	9	50	354.164	44.24	-3.31	1.516	1.48	-4.498	44.011	-3.346
82	""""""	350	26	40	350.444	35.28	-2.95	1.516	1.48	-5.857	34.790	-2.986
83	C/L	348	1	40	348.028	35.61	-3.29	1.516	1.48	-7.387	34.835	-3.326
84	E. edge	341	39	20	341.656	24.07	-2.67	1.516	1.48	-7.576	22.847	-2.706
85	C/L	339	8	15	339.138	24.84	-2.79	1.516	1.48	-8.846	23.211	-2.826
86	E.edge	329	16	30	329.275	18.51	-2.46	1.516	1.48	-9.457	15.912	-2.496
87	C/L	326	54	10	326.903	19.42	-2.71	1.516	1.48	-10.605	16.269	-2.746
88	E.edge	314	4	0	314.067	13.48	-2.2	1.516	1.48	-9.686	9.375	-2.236
89	""""""	304	0	45	304.013	12.12	-2.17	1.516	1.48	-10.046	6.780	-2.206
90	""""""	260	16	50	260.281	10.34	-1.84	1.516	1.48	-10.192	-1.746	-1.876
91	""""""	241	10	50	241.181	8.05	-1.71	1.516	1.48	-7.053	-3.881	-1.746
92	E.edge N end of silt fenc	232	0	50	232.014	9.84	-1.61	1.516	1.48	-7.755	-6.056	-1.646
93	E edge S end of silt fenc	208	9	5	208.151	24.93	-1.16	1.516	1.48	-11.762	-21.981	-1.196
94	E edge	206	47	15	206.788	30.02	-0.98	1.516	1.48	-13.529	-26.798	-1.016

95	""""""	200	34	15	200.571	35.64	-0.5	1.516	1.48	-12.523	-33.368	-0.536
96	""""""	203	44	55	203.749	33.69	-0.77	1.516	1.48	-13.568	-30.837	-0.806
97	x sect. S E edge of road	177	6	20	177.106	20.85	2.47	1.516	1.48	1.053	-20.823	2.434
98	Photo Point # 3	178	42	0	178.700	21.25	3.88	1.516	1.48	0.482	-21.245	3.844
99	X sect	192	8	0	192.133	18.33	0.11	1.516	1.48	-3.853	-17.921	0.074
100	""""""	205	42	55	205.715	17.24	0.06	1.516	1.48	-7.480	-15.533	0.024
101	""""""	252	19	40	252.328	19.71	-0.36	1.516	1.48	-18.780	-5.983	-0.396
102	""""""	271	46	45	271.779	21.98	0.37	1.516	1.48	-21.969	0.682	0.334
103	Photo point # 2	292	55	55	292.932	24.99	4.38	1.516	1.48	-23.015	9.737	4.344
104	Post L 1	281	10	0	281.167	17.56	0.32	1.516	1.48	-17.228	3.401	0.284
105	Post L 2	252	23	35	252.393	19.66	-0.34	1.516	1.48	-18.739	-5.947	-0.376
106	Post # 4	202	38	55	202.649	26.75	0.12	1.516	1.48	-10.301	-24.687	0.084
107	Peg # 3	347	18	20	347.306	10.66	-1.22	1.516	1.48	-2.343	10.399	-1.256
108	Peg # 5	356	28	25	356.474	33.89	-2.43	1.516	1.48	-2.085	33.826	-2.466
109	PP	11	54	5	11.901	24.45	1.38	2.348	1.48	5.042	23.924	0.512
110	1M u/s rootwad	236	42	35	236.710	10.43	-0.93	2.386	1.48	-8.718	-5.725	-1.836
111	1M u/s rootwad	243	37	35	243.626	10.37	-0.77	2.508	1.48	-9.291	-4.607	-1.798
112	""""""""""	251	6	10	251.103	10.04	-0.9	2.37	1.48	-9.499	-3.252	-1.790
113	1 M out and d/s	257	48	50	257.814	8.7	-0.92	2.37	1.48	-8.504	-1.836	-1.810
114	edge of island	262	11	45	262.196	9.57	-0.89	2.37	1.48	-9.481	-1.299	-1.780
115	C/L of distrubution chann	292	34	35	292.576	6.05	-1.1	2.37	1.48	-5.586	2.323	-1.990
116	""""""	327	45	45	327.763	8.55	-1.29	2.37	1.48	-4.561	7.232	-2.180
117	""""""	333	3	40	333.061	10.09	-1.52	2.37	1.48	-4.571	8.995	-2.410
118	""""""	353	57	40	353.961	19.64	-1.38	2.37	1.48	-2.066	19.531	-2.270
119	""""""	358	31	35	358.526	29.29	-1.87	2.37	1.48	-0.753	29.280	-2.760
120	confluence	351	20	0	351.333	38.48	-2.23	2.37	1.48	-5.798	38.041	-3.120

Appendix C. Fillier and Lough Letter

BRITISH COLUMBIA

March 8, 1999

BCE File: 36780-30/Kitseguecla WRP
36780-30/Kitwanga WRP
Your File: Annual Agmt. 0000128
Activity 101462
Activity 12395

Bill Fell, Cedarvale Resources Ltd.
WRP Coordinator
Gitseguecla Band Council
36 Cascade Avenue
South Hazelton, BC V0J 2R0

Dear Bill Fell:

As stated in the letter dated 02/16/99, a technical review of instream rehabilitation work in the Kitwanga and Kitseguecla Watershed Restoration Program (WRP) projects were pending draft report submissions (not received to date). We are providing these preliminary comments in lieu of the draft report submissions. The purpose of this letter is to facilitate an estimate of percentage of work completed in the Kitseguecla and Kitwanga watersheds stream rehabilitation (SR) activities for 1998/99.

Site visits to the Kitseguecla and Kitwanga stream rehabilitation activity areas were conducted on November 12, 1998. In attendance for these field visits were both Jeff Lough and Darren Fillier. We delayed our comments until draft document changes for prescription alteration approval requests, "As-Builts" with supporting documentation, and Compendium Report submissions were submitted for our review.

Both Kitseguecla and Kitwanga Standard Agreements for WRP SR activity, and respective Schedule "A"s, outlined a pertinent course of action in dealing with substantive prescription changes. Specifically, Section 4.1 of the Aquatic Habitat Rehabilitation (Works) Schedule "A" delineates that changes to the prescription, stemming from a pre-work review, were to be incorporated, in writing, into the design and then submitted to the Technical Monitor for approval. This clearly did not occur.

Ministry of Environment, Lands and Parks
Environment and Lands Skeena Region
Mail Address: Kispiox Forest District, Bag 5000, Smithers, BC V0J 2N0
Location Address: 2210, Highway 62 W, Hazelton, BC
Telephone: (250) 842-7615
Facsimile: (250) 842-7676

Activity Number 12395 - SR - Restoration Prescription Implementation for Prescription Sites 14 and 15 Kitwanga River South Sub-Basin

Site 14 - Our first concern with this project is in regard to the pull back of the banks. This activity was not initially prescribed nor approved for work at the site. The pull back that was undertaken is of concern given its proximity to the highway and, specifically, within the road right of way. Was the Ministry of Highways consulted regarding this change?

Prescription implementation was to be as per the BioLith's 1997-98 report as delineated within the Water Act Regulations Section 9 Letter of Notification. Such prescription alteration and associated pull back to the suggested angle of repose must have been submitted for consideration by the Technical Monitor, or designate, prior to any work commencing at this site. Adherence with Section 4.1 of the Schedule "A" for Site 14 is paramount. Deviation from the prescription must follow the process as outlined within the Standard Agreement and the respective Schedule(s). Regardless of holding a Letter of Notification for specific in stream "timing windows" for work to be undertaken, the prescription alteration must be submitted for review and incorporation into a revised Letter of Notification. Clearly work should not have commenced without fulfilling all these requirements and, as such, violates Section 4.2 of the Schedule "A" and that is unacceptable to the Ministry.

Construction of the step pool system at Site 14 does not appear to be adequate to meet the goal of better facilitating fish access through the culvert. We are also concerned about the size and orientation of the materials used to construct the weirs (their long term stability is questionable). Close monitoring of this site at various flow levels, and associated modifications, will be required to fulfil the goal of creating long term fish access through the culvert.

Finally, the loss of the riparian low shrub and herb cover at Site 14 associated with the work undertaken last fall has increased surface erosion and will continue to deliver sediment into the Kitwanga River until inevitable revegitation takes place. On that note, the grass seeding that was planted seemed sporadic. In addition this surface erosion will not be mitigated by the silt fence given that its' installation was done incorrectly. This will require correction if not already done so. Again monitoring of this aspect of the project will be conducted this Spring after snowmelt.

Given the problems outlined above, no quality certificate will be issued until the site is monitored and appropriate changes are completed this Spring.

Site 15 - The Recipient provided a good source of Large Woody Debris (LWD) by species and by size. Root wad presence was good but it would be advantageous, in future, to leave branches and tops attached to the LWD pieces to increase their stability. If the objective of using rope to tie the structures together was to increase their stability, then we suggest rock anchoring would help better achieve your objective.

Sincerely,

Darren J. Fillier, RPF, RPBio.
Forest Ecosystem Specialist
Kispiox Forest District

Jeff Lough
WRP Fisheries Specialist
Skeena Region, MELP

DJF& JL/djf & jl

attachments

cc: Doug Johnston, WRP Coordinator, Skeena Region, MELP
Dionys deLeeuw, Senior Habitat Protection Biologist, Skeena Region, MELP
Brian Fuhr, Habitat Protection Section Head, Skeena Region, MELP
Bob Purdon, Skeena-Bulkley Region, Forest Renewal BC
Bert Mast, Skeena-Bulkley Region, Forest Renewal BC
Eero Karanka, Habitat Biologist, Department of Fisheries and Oceans, Smithers, BC
Darlene Morgan, Gitsegukla Band Council

Appendix D. Harkleroad Letter

DARREN FILLIER
Rec'd Nov. 12/98
D. Fillier

British Columbia Stream Restoration Project Review Report 1998

USFS Contact: Glenn R. Harkleroad, Fisheries Biologist

BC Contact: Jeff Lough, Fisheries Specialist

This report will be divided into two parts. The first part will be a review of the projects Jeff and I, as well as other Ministry personnel, reviewed while I was visiting in British Columbia the week of September 21 – 25, 1998. The second part of this report will be an overview of potential monitoring activities that could be used to evaluate instream restoration activities.

Photos of sites that were reviewed in the field have been forwarded to Jeff Lough.

Project Reviews

River System: Kitwonga Stream system: Tea Creek

Site review by: Jeff Lough, Darren Fillier, and Glenn Harkleroad

Project Background: This project consisted of 10 to 12 channel spanning weirs created by cement "lock-blocks" below a 1.5 meter culvert. The "lock-blocks" were placed to raise the level of the streambed with the intent of helping pass fish through the upstream highway culvert. The "lock-blocks" had been placed and re-enforced by rock riprap ranging in size from 15 to 60 cm. The "lock-block" weirs were placed approximately 4 to 5 meters apart and were placed perpendicular to the stream channel. The local highway authority had completed this work.

Stream Conditions: The stream passed through a 1.5 meter culvert below highway 16. The structures began immediately below the culvert and continued down stream approximately 30 meter. The stream was bordered on the right by a small access road. When this road was constructed the road cut/base material had been sidecast into the floodprone and bankfull stream channel. Most of the immediate stream side vegetation in the local area had been removed during highway and access road construction. Some vegetative recovery had occurred.

Restoration Design Concerns: While reviewing this site a number of project design concerns surfaced. These concerns included the following:

1) "Lock-block" weirs appeared to be placed too close together. The plunge created by the upstream weirs may have a scouring effect on weirs immediately downstream resulting in design failure.
2) The perpendicular placement of the weirs may result in channel widening, thereby increasing the localized channel width to depth ratio. This may eventually result in bank erosion and "end cutting" around the weir structures.

One other item that was discussed at this site was the alteration of road design to reduce channel diversion potential associated with culvert plugging. As the road is currently designed, if the culvert plugs, water will be diverted out the left side of the channel, down the road and will eventually cross the road approximately 25 meters from the stream channel (Figure 1). This would result in the loss of road fill and the potential to deliver road fill associated sediment to Tea Creek. Altering the road grade in the vicinity of the culvert could mitigate this concern. The creation of a dip above the culvert, would allow water and debris to pass over the road and directly back onto Tea Creek in the event the culvert became plugged. This would minimize potential sediment delivery to Tea Creek as well as reduce road repair cost since only the fill immediately above the culvert would have the potential to be lost. If this fill was made of primarily of large rock with a driving surface cap, fine sediment delivery and repair cost could be kept to a minimum.

River System: Kitwonga Stream system: un-named tributary #1 (Kitwanga Pres. site #15.)

Site review by: Jeff Lough, Darren Fillier, and Glenn Harkleroad

Project Background: This project site was an approximate 90 to 100 meter length of stream below a highway culvert that fed directly into the Kitwonga River. This area had been identified for large wood placement in order to improve juvenile salmonid rearing habitat. This relatively small project would also serve as a trial run project for a new contractor.

The proposed wood placement locations had been flagged and consisted primarily of placing single logs in more or less and alternating pattern down the length of the channel. The logs would be anchored to streamside trees with cable. Boulders and rootwads currently present within the stream would also be used to help stabilize the placed wood.

Project Comments: While in the field at this site we talked about a number of different design options. The first of these options was to consider experimenting with log anchoring techniques. The option of cable anchoring some logs, while just using channel features and streamside trees to stabilize other logs was discussed. If this is done during the project implementation, this project could serve as an area to compare the effectiveness of both techniques.

We also discussed specific project designs for the lower 20 to 25 meters of the stream channel. Figure 2 displays the project design that was discussed for this location in the field. The idea was to direct the water toward the right side of the channel with the idea of reducing the bank cutting / mass wasting which was occurring along the left bank. There would be some bank cutting expected along the right bank, but it would be expected to be fairly minor and well within the range of natural channel adjustment. The placement of a log complex along the left bank was recommended to further discourage cutting along this bank. The use of log complexes, instead of just single logs, was suggested to more closely mimic natural wood accumulation within the channel.

Recommendations: While at this site, we also discussed some potential monitoring items. These included photo points, topographic surveys of the channel, and sketching desired post-project channel conditions. Since this project would be completed by a relatively inexperienced contractor, I would recommend having him take photo points and having him sketch what he envisions the post-project channel will look like.

River System: Kitwonga **Stream system: un-named tributary #2** (Kitwanga Pass. Site #14)

Site review by: Jeff Lough, Darren Fillier, and Glenn Harkleroad

Project Background: This project was similar to the project proposed for un-named tributary #1 in that it was an approximate 30 to 35 meter length of stream below a highway culvert which fed directly into the Kitwonga River. This area had been identified for large wood placement in order to improve juvenile salmonid rearing habitat. This relatively small project would also serve as a trial run project for a new contractor. However the stream channel in this area was much higher gradient and lacked the channel diversity seen in the first tributary.

This project also involved trying to create a series of step pools for trying to raise the streambed, in order to pass fish through the highway culvert. Channel conditions and available habitat above the culvert were unknown.

Project Comments: The stream channel below the culvert was relatively steep and appeared to provide little fish habitat. Placing wood in this channel would be expected to have low chance of success for meeting the goal of increasing fish habitat. This is because the natural condition of this channel does not lend itself to providing good spawning or rearing habitat.

Passage at the culvert should be delayed until fish habitat values above the culvert are determined. Without this information, it is possible that time and money could be spent providing fish access to an area with very little habitat value.

Recommendations: I would recommend determining if there are other higher priority areas where work could be done. Initial field review of this project would suggest that it would be low priority.

River System: Kispiox **Stream system: un-named tributary #1** (Dale Ck).

Site review by: Jeff Lough, Darren Fillier, and Glenn Harkleroad

Project Background: This project consisted of two rows of "lock blocks" which were placed in a small tributary of the Kispiox River with the intent of raising the streambed level below two culverts. This was done in order to help facilitate fish passage through the culverts. We were reviewing this project because the design used was not authorized by Ministry fisheries personnel and was going to be changed.

The "lock block" weirs were placed approximately 6 to 7 meters apart and were arranged perpendicular to the stream flow. There were concerns that this design would increase the stream channel width to depth ratio and result in end cutting around the weirs. Excessive fine sediment deposition had already begun above the upper weir. This was resulting in the filling of the jump pool necessary for fish passage through the culverts. There was also a concern that the weirs were too placed close together and that the scour created by the upper weir would undermine the lower one.

While reviewing the project we also discovered that the inlets of both culverts were blocked by a log that had backed up sediment. making fish passage difficult during most flows..