Interior Watershed Assessment Update

MacKay Creek Watershed

1.0 WATERSHED DESCRIPTIVE INFORMATION

Table 1.1 Summary information – Biophysical

Size (km ²)	BEC Zones	Elevation Range	H ₆₀ Elevation	Stream Density	Distribution of slope gradients within the watersh (% of watershed)				
		(m)	(m)	km/km ²	<10% slope	10 to 30%	30 to 60%	>60% slope	
						slope	slope		
142.63	ESSFwk1	1020 -	1660	1.98	8.44	39.61	42.75	9.2	
	АТр	2540							

Table 1.2. Characteristics of main stream reaches – (assessment is based on a combination of air-photo interpretations, TRIM maps, helicopter over-flight and various reports).

Reach ID	Minimum	Maximum	Reach	Reach	Stream
	Elevation	Elevation	Length	Gradient	Dirturbance Assessment
	(m)	(m)	(m)	(%)	
Main-R1	1020	1099.3	2065	3.8	Slight instability
Main-R2	1099.3	1140.3	2967	1.4	Slight instability
Main-R3	1140.3	1199.4	3121	1.9	Slight instability
Main-R4	1199.4	1238.62	3888	1.0	Stable – boulder & bedrock controlled
Main-R5	1238.62	1240.21	1860	0.1	Stable – boulder & bedrock controlled
Main-R6	1240.21	1280.03	5109	0.8	Stable – boulder & bedrock controlled
Main-R7	1280.03	1320.17	1753	2.3	Stable – boulder & bedrock controlled
Main-R8	1320.17	2190.28	5815	14.9	Stable – boulder & bedrock controlled

RPg = Riffle-Pool gravel morphology

2.0 WATERSHED HARVESTING, ROADS AND LAND-USE HISTORY

 Table 2.1. MacKay Creek Watershed – (entire watershed)

						Peak Flo	ow Index	lex Road Density Active (km/km ²)		Stream Crossing density active (#/km ²)		Road Density De-active (km/km ²)	
Private	Total harvest 2002 (%)	Current ECA (%)	Planned Harvest (%)	Current ECA below H60 (%)	Current ECA Above H60 (%)	Current (2002) (%)	End of FDP (2007)(%)	Current (2002)	End of FDP (2007)	Current (2002)	End of FDP (2007)	Current (2002)	End of FDP (2007)
0	14.25	14.23	4.70	13.8	0.4	14.4	19.3	0.79	0.86	0.72	0.79	0.20	0.23

 Table 2.1. Upper MacKay Sub-basin (sub-basin only)

	T 1			C .		Peak Flo	ow Index	Road De (kr	Road Density Active (km/km ²)		Stream Crossing density active (#/km ²) Road Densi (km/		ty De-active /km ²)
Private	harvest 2002 (%)	Current ECA (%)	Planned Harvest (%)	Current ECA below H60 (%)	ECA Above H60 (%)	Current (2002)(%)	End of FDP (2007)(%)	Current (2002)	End of FDP (2007)	Current (2002)	End of FDP (2007)	Current (2002)	End of FDP (2007)
0	3.30	3.30	6.15	3.3	0.0	3.31	9.57	0.22	0.36	0.26	0.42	0.15	0.22

3.0 SUMMARY OF EXTENT OF RIPARIAN REMOVAL (agriculture and forestry)

Table 3.1. MacKay Watershed

Watershed name	Length (km) of riparian removal on small tributaries (<5m in width)	Length (km) of riparian removal on large tributaries (>5m)	% Riparian removal of all tributaries	Length (km) of riparian removal on mainstem	% Riparian removal of mainstem	Total length of all tributaries (from Trim) (km)	Total length of mainstem (km)
MacKay	24.81	1.69	9.89	0.62	3.27	267.92	19.08

Table 3.2. Upper MacKay sub-basin

Watershed name	Length (km) of riparian removal on small tributaries (<5m in width)	Length (km) of riparian removal on large tributaries (>5m)	% Riparian removal of all tributaries	Length (km) of riparian removal on mainstem	% Riparian removal of mainstem	Total length of all tributaries (from Trim) (km)	Total length of mainstem (km)
Upper MacKay	2.80	0.00	2.23	0.00	0.00	125.81	6.07

4.0 SUMMARY OF LARGE SEDIMENT SOURCES

Table 4.1. MacKay Watershed

Watershed Name	Large natural sediment sources		Large natura sources connected t	rge natural sediment sources directly nnected to a stream		Large land-use related sediment sources		Large land-use related sediment sources directly connected to a stream		Large sediment sources	
	number	density (#/km ²)	number	density (#/km ²)	number	density (#/km ²)	number	density (#/km ²)	number	density (#/km ²)	
MacKay	11	0.077	1	0.007	10	0.070	6	0.042	21	0.147	

Table 4.2. Upper MacKay Sub-basin

Watershed Name	Large natural sediment sources		Large natural sediment sources directly connected to a stream		Large land-use related sediment sources		Large land-use related sediment sources directly connected to a stream		Large sediment sources	
	number	density (#/km ²)	number	density (#/km ²)	number	density (#/km ²)	number	density (#/km ²)	number	density (#/km ²)
Upper MacKay	1	0.015	1	0.015	0	0.000	0	0.000	1	0.015

5.0 SUMMARY OF LAND-USE ACTIVITIES ON UNSTABLE TERRAIN

Table 5.1. MacKay Watershed

Watershed	Length of road on unstable terrain (km)		Area of cu unstable to	ut blocks on errain (km ²)	Road density on unstable terrain $(1 + 2)^{2}$	Source of information for stability assessment	
	Active	Proposed	Harvested	Proposed	(Km/Km)	-	
MacKay	0	0.53	0.005	0.014	0.0037	slope > 60%	

Table 5.2 Upper MacKay Sub-basin

Watershed	Length of road on unstable terrain (km)		Area of c unstable t	ut blocks on errain (km ²)	Road density on unstable terrain $(1 - 1)^{2}$	Source of information for stability assessment	
	Active	Proposed	Harvested	Proposed	(km/km ⁻)	-	
Upper MacKay	0	0.53	0	0.014	0.0082	slope > 60%	

6.0 SUMMARY OF ROAD RELATED SOURCES OF SURFACE EROSION

Table 6.1 MacKay Watershed - summary of stream crossing sediment source survey –									
Number of crossings surveyed	Estimated total # of crossings (TRIM maps)	Percentage surveyed	Watershed Size (km ²)						
56	106	52.83%	143						

Table 6.2 Summary of Water Quality Concern Ratings (WQCR) – MacKay Watershed										
No Co	oncern	Lo)W	Med	lium	High				
Number	Percentage	Number Percentage		Number	Percentage	Number	Percentage			
9	16.0	19	33.9	20	35.7	8	14.3			

Stream Width Class	Table 6.3 Summary of Water Quality Concern Ratings by Stream Size - MacKay Watershed									
	None		Low		Medium		High		streams	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	per class	
1	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	
2	0	0.00%	4	66.67%	1	16.67%	1	16.67%	6	
3	2	13.33%	4	26.67%	6	40.00%	3	20.00%	15	
4	6	23.08%	6	23.08%	11	42.31%	3	11.54%	26	
5	1	11.11%	5	55.56%	2	22.22%	1	11.11%	9	

Table 6.4 ESC Summary - MacKay								
WQCR	VQCR "Equivalent" number of stream							
	crossings							
No Concern	0.0							
Low	10.8							
Moderate	26.5							
High	15.1							
Total	54.2							

Table 6.5 Surface erosion hazard – MacKay Watershed							
Equivalent stream crossing density (xings/km ²)	Surface Erosion Hazard						
0.37	High						

Table 6.6 Upper MacKay Sub-basin - summary of stream crossing sediment source survey –							
Number of crossings surveyedEstimated total # of crossings (TRIM maps)		Percentage surveyed	Watershed Size (km ²)				
20	24	83.3	64.9				

Table 6.7 Summary of Water Quality Concern Ratings (WQCR) – Upper MacKay Sub-basin										
No Concern		Low		Medium		High				
Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage			
1	5.0	2	10.0	11	55.0	6	30.0			

Stream Width Class	Table 6.8 Summary of Water Quality Concern Ratings by Stream Size – Upper MacKay Sub-basin									
	None		Low		Medium		High		streams	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	per class	
1	0	0.00%	0	0.00%	0	0.00%	0	0.00%	0	
2	0	0.00%	1	50.00%	1	50.00%	0	0.00%	2	
3	0	0.00%	1	20.00%	2	40.00%	2	40.00%	5	
4	1	10.00%	0	0.00%	6	60.00%	3	30.00%	10	
5	0	0.00%	0	0.00%	2	66.67%	1	33.33%	3	

Table 6.9 ESC Summary – Upper MacKay								
WQCR	"Equivalent" number of stream							
	crossings							
No Concern	0.0							
Low	0.7							
Moderate	9.2							
High	7.2							
Total	17.7							

Table 6.10 Surface erosion hazard – Upper MacKay Sub- basin						
Equivalent stream crossing density (xings/km ²)	Surface Erosion Hazard					
0.26	Moderate					

7.0 SUMMARY OF MAINSTEM CHANNEL CONDITIONS

Reach ID	Reach	Reach	Length	% of	Level of	Probable cause
	Length	Gradient	disturbed	channel	channel	of disturbance
	(m)	(%)	(m)	disturbed	disturbance	
Main-R1	2065	3.8	804	39	Slight	Riparian harvest
Main-R2	2967	1.3	843	28	Slight	Riparian harvest
Main-R3	3121	1.9	982	31	Slight	Natural/ unknown
Main-R4	3888	1.0	0	0	None	N/a
Main-R5	1860	0.1	0	0	None	N/a
Main-R6	5109	0.8	0	0	None	N/a
Main-R7	1753	2.3	0	0	None	N/a
Main-R8	5815	14.9	0	0	None	N/a

Table 7.1. Extent of channel disturbance

8.0 SUMMARY OF FISHERIES RESOURCES IN THE WATERSHED

Table 8.1. Documented fish species presence

Category	Common Name	Latin Name	Species Code	Reference
Freshwater game species	Rainbow Trout	Oncorhynchus mykiss	RB	Fish Wizard ¹

¹Fish Wizard available at http://pisces.env.gov.bc.ca

9.0 SUMMARY OF HAZARDS FOR THE MACKAY WATERSHED

Watershed	Sub- basin	Increase in peak- flows (Current/ Proposed)	Reduction in riparian functions	Large logging related sediment sources	Road related sediment sources (field work)	Accelerated surface erosion from GIS (Current/ proposed)	Accelerated mass wasting	Generalized Channel Disturbance ¹
MacKay		VL/VL	L	VH	Н	VH/VH	L	4
	Upper MacKay	VL/VL	VL	VL	М	M/H	L	4

Table 9.1. Watershed assessment hazards

¹ Note: Generalized channel disturbance codes: 1 = no disturbance identified, 2 = localized channel disturbance, 3 = minor localized land-use related disturbance, 4 = moderate land-use related channel disturbance, 5 = extensive land-use related channel disturbance.

² Note: Hazard ratings: VL=very low, L=low, M=moderate, H=high, VH=very high

10.0 INTERPRETATIONS

10.1 Peakflow Hazards

The peakflow hazards for both the MacKay watershed as a whole and the upper sub-basin are **Very Low** (PFI=14.4% and 3.31% respectively). Planned forest development in these watersheds will not increase the hazard level into the next category. Consequently, there are no peakflow concerns for the MacKay watershed at the point of interest (Reach #1)or for the upper MacKay sub-basin at it's mouth.

10.2 Hazards Associated with a loss in Riparian Functions

There is only a small amount of riparian harvesting along the mainstem of MacKay Creek (Reach #2). It appears that this has caused some localized channel instability. There is no other riparian harvesting along the mainstem, but there has been extensive riparian harvesting along numerous reaches of smaller tributary watersheds such as Hawkley Creek, Cayuse Creek, Pegasus Creek and several unnamed tributaries. The amount of riparian harvesting, expressed as a percentage of all streams in the MacKay watershed, is not large (Table 3.1), and this is why the hazard is **Low**. However, there are probably some significant localized negative impacts where riparian harvesting is extensive at the sub-basin level such as Hawkley, Cayuse and Pegasus Creek. I believe that there is channel instability associated with riparian harvesting in Hawkley and Pegasus Creek (Photographs #1296 and #1313).

10.3 Hazards Associated with Large Sediment Sources

There are numerous large, logging related sediment sources in the MacKay watershed and most of them are directly connected to a stream channel (Table 4.1, Photograph #1317). This has resulted in a **Very High** hazard for this IWAP indicator. In the upper sub-basin the hazard is **Very Low**. Most of the logging related sediment sources (i.e. landslides and massive bank erosion on alluvial fans) have been addressed by the watershed restoration program. It is generally very difficult to fully stabilize a failing slope or an eroding streambank, but some serious efforts have been made although success has been mixed (Smith 2002). Continued efforts will be required for a few additional years to stabilize these slopes until they become fully revegetated.

10.4 Hazards Associated with Roads Related Surface Erosion

A little over 50% of the number of stream crossings identified on TRIM maps were surveyed for surface erosion concerns. As with the MacKuskey watershed, many of the old non-status roads are now inaccessible because of vegetation re-growth and are most likely not a sediment problem. Consequently, we actually surveyed much more than 50% of the stream crossings that are potential sediment producers.

Of the stream crossings that we surveyed, 50% had a medium or high Water Quality Concern Rating (WQCR) (Table 6.2). These were located mostly on smaller streams, but

many class 3 streams (1.5 to 5m in width) had crossings with a medium or high WQCR (table 6.3). The equivalent stream crossing density for this watershed is 0.37 crossings/km² and the overall surface erosion hazard is assessed as **High** (Table 6.5). For the upper sub-basin the hazard is a **Moderate** (Table 6.10).

10.5 Hazards Associated with Accelerated Mass Wasting (from logging on steep slopes).

There are very limited forestry activities on slopes greater than 60% in this watershed. This is why the hazard for this IWAP indicator has been assessed as **Low**. However, several logging related landslides have occurred in this watershed. Consequently, this must be viewed as a potentially serious issue despite the Low hazard rating. Continued site level slope stability assessments must continue so that the initiation of slope failures is minimized.

10.6 Watershed Cumulative Effects and Channel Stability

I believe that the extent of harvest in this watershed (i.e. ECA) is not a significant cumulative effects issue. However, the combination of accelerated landslides, surface erosion and localized riparian harvest are contributors to the degradation of water quality, fish habitat and channel stability. Current sediment sources (both large and small) must continue to be treated for erosion control and effective erosion control planning should be implemented to limit the production of new sources.

11.0 RECOMMENDATIONS

11.1) Recommendations for the Forest Development Plan (landscape level)

Since extent of harvest and peak flows are judged not to be an issue in this watershed, I have no landscape level type recommendations to make. However, there are site specific concerns and these are addressed in the next section.

11.2) Recommendations for Site Specific Activities (site level)

- 1. There are numerous stream crossings that received a moderate or high WQCR in this watershed. These have been mapped (Appendix C) and the accompanying database is provided in Appendix 3. These sites should receive more effective erosion and sediment control treatments. The review of these sites should also serve as a learning opportunity for planning erosion and sediment control at future crossings.
- 2. Restoration and stabilization efforts should continue on the logging related landslides that are contributing sediment to the stream network. These would include sites mostly located in Pegasus and Hawkley Creek sub-basins. It appears that efforts to date have has mixed results, but our increased knowledge about stabilization should improve future results.
- 3. Hawkley Creek, Caycuse and Pegasus Creek are unstable due do riparian harvest and landslides. It is very difficult to stabilize a stream after impacts of this magnitude. I believe that cumulative impacts in these watersheds are significant and no further forest harvesting activities should be planned until the channel stabilizes.
- 4. Similarly, As for the MacKuskey watershed, more effective erosion and sediment control should be implemented at small stream crossings. Some of these streams may seem insignificant in size, but they are numerous in the landscape and they could add up to cumulative effects problems.]
- 5. Maintain effective Erosion and Sediment Control plans for the MacKay watershed. This would include: a) Development of a plan with precise objectives and standards and clear operating procedures, b) clearly define the types of erosion and sediment control practices that need to be implemented, c) regular maintenance of any ESC structure that has been installed, d) regular field monitoring to evaluate the effectiveness of the plan.

ID	Channel	Stream	One or 2	Length of	Landuse
	Width	Туре	sided	RL (km)	
McKayRL-001	2	2	2	0.457	1
McKayRL-002	3	2	2	1.4439	1
McKayRL-003	4	3	2	0.3456	1
McKayRL-004	4	2	2	0.4435	1
McKayRL-008	2	2	2	1.2301	1
McKayRL-009	4	3	2	0.3604	1
McKayRL-007	4	3	2	0.4186	1
McKayRL-005	4	2	2	0.8386	1
McKayRL-010	4	2	2	0.9346	1
McKayRL-011	4	3	2	0.8578	1
McKayRL-012	4	2	2	0.3856	1
McKayRL-013	4	2	2	0.8688	1
McKayRL-014	4	2	2	0.7905	1
McKayRL-015	4	3	2	0.4997	1
McKayRL-017	4	2	2	1.0891	1
McKayRL-018	4	3	2	0.9564	1
McKayRL-019	2	1	1	0.6238	1
McKayRL-020	4	2	2	0.4195	1
McKayRL-021	4	2	2	1.6968	1
McKayRL-022	4	2	2	0.6	1
McKayRL-023	4	3	2	1.026	1
McKayRL-24	4	3	2	1.1678	1
McKayRL-028	4	2	2	0.8235	1
McKayRL-029	4	2	2	0.4376	1
McKayRL-030	4	2	2	0.32	1
McKayRL-025	4	2	2	0.3193	1
McKayRL-026	4	2	2	0.3549	1
McKayRL-027	4	2	2	0.2896	1
McKayRL-031	4	2	2	0.3157	1
McKayRL-032	4	2	2	0.3194	1
McKayRL-034	4	2	2	1.322	1
McKayRL-033	4	3	2	0.5663	1
McKayRL-035	4	2	2	0.4083	1
McKayRL-036	4	2	2	0.3877	1
McKayRL-037	4	2	2	0.5805	1
McKayRL-038	4	2	2	0.4221	1

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APPENDIX 1 – Database of disturbed riparian areas

ID	Channel Width	Stream Type	One or 2 sided	Length of RL (km)	Landuse
McKayRL-039	4	2	2	0.8848	1
McKayRL-040	4	2	2	0.8394	1
McKayRL-041	4	2	2	1.0761	1

ID	Туре	Cause	Deliverability	Degree of Revegetation	Activity Level
McKayLS-001	4	4	1	2	2
McKayLS-002	4	2	2	1	1
McKayLS-003	4	1	3	2	2
McKayLS-004	4	8	2	1	1
McKayLS-005	4	5	2	1	1
McKayLS-006	4	5	2	1	1
McKayLS-008	5	5	2	2	2
McKayLS-009	4	5	2	2	2
McKayLS-010	5	8	2	1(Snow?)	1
McKayLS-011	5	8	2	2	2
McKayLS-012	4	8	2	1(Snow?)	1
McKayLS-013	4	3	1	2	2
McKayLS-015	4	2	1	2	2
McKayLS-016	4	1	3	2	2
McKayLS-017	7	9	3	1	3
McKayLS-018	7	9	3	1	3
McKayLS-019	5	9	3	2	2
McKayLS-020	5	9	3	1	3
McKayLS-021	3	4	3	3	1
McKayLS-022	5	1	3	2	2
McKayLS-023	3	2	2	2	2

APPENDIX 2 – Database of large sediment sources

Sub Basin	Cros-	UTM	UTM	Structure	Size of	Crossing	WQCR	Stream	Stream
	sing ID	Easting	Northing	type	Culver	Erosion		width	gradient
					t	Score		Class	Class
Mackay	I100	658878	5803418	8		0.36	Low	3	3
Mackay	I102	658450	5803452	8		0.02	None	4	3
Mackay	I103	658088	5803582	4		0.02	None	3	5
Mackay	I104	657869	5803696	8		0.02	None	5	3
Mackay	I105	658182	5803583	8		0.02	None	4	2
Mackay	I106	658457	5803452	8		0.02	None	4	3
Mackay	I107	659038	5803368	8		0.02	None	4	1
Mackay	I108	659932	5802513	6		0.41	Med	3	3
Mackay	I109	661071	5800944	6		0.95	High	3	5
Mackay	I110	661007	5800999	6		0.19	Low	3	6
Mackay	I111	661061	5801285	6		0.04	Low	5	3
Mackay	I112	660051	5802662	5	1200	0.18	Low	2	6
Mackay	I113	660096	5802652	5	600	0.37	Low	4	4
Mackay	I114	660325	5802440	5	600	0.30	Low	5	3
Mackay	I115	661267	5801416	5	1000	0.19	Low	2	6
Mackay	I116	662623	5800267	5	1200	0.04	Low	3	6
Mackay	I117	663327	5799679	5	500	0.18	Low	4	4
Mackay	I118	664154	5799081	5	1000	0.19	Low	3	5
Mackay	I119	664213	5799009	1		0.64	Med	2	4
Mackay	I120	664981	5798467			0.02	s.pt		0
Mackay	I121	665051	5797780	8		0.02	None	4	3
Mackay	I122	666302	5797218	5	800	0.81	High	3	4
Mackay	I123	665512	5797968	5	800	0.86	High	3	6
Mackay	I01	668289	5795416			0.02	s.pt		0
Mackay	I02	667670	5796590	2		0.20	Low	2	3
Mackay	I03	667310	5797113	5	500	0.90	High	4	2
Mackay	I04	667261	5797177	5	500	0.90	High	5	2
Mackay	I05	666833	5797485	5	500	0.55	Med	5	2
Mackay	I06	666797	5797519	5	1200	0.72	Med	3	6
Mackay	I07	666770	5797564	5	900	0.70	Med	4	6
Mackay	I08	666714	5797650	5	500	0.52	Med	4	3
Mackay	I09	666001	5798445	5	500	0.60	Med	5	2
Mackay	I10	665895	5798521	5	500	0.41	Med	4	4
Mackay	I11	665811	5798623	2		0.41	Med	3	6
Mackay	I12	665262	5799141	5	500	0.95	High	4	2

APPENDIX 3 -	- Database of stream	crossing survey	(surface erosion)
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Sub Basin	Cros-	UTM	UTM	Structure	Size of	Crossing	WQCR	Stream	Stream
	sing ID	Easting	Northing	type	Culver	Erosion	-	width	gradient
			<u> </u>	<u> </u>	t	Score		Class	Class
Mackay	I13	665217	5799189	5	600	0.55	Med	4	4
Mackay	I14	665222	5799237	5	500	0.90	High	4	4
Mackay	I15	664912	5799514	5	500	0.61	Med	4	5
Mackay	I16	664911	5799530	5	500	0.62	Med	4	5
Mackay	I17	664215	5800263	2		0.51	Med	3	5
Mackay	I18	662898	5800808	5	500	0.38	Low	4	6
Mackay	I19	662847	5800917	5	600	0.46	Med	4	6
Mackay	I20	662685	5801170	5	600	0.32	Low	4	4
Mackay	I21	662661	5801218	5	900	0.61	Med	3	4
Mackay	I22	661168	5802290	5	500	0.23	Low	4	3
Mackay	I23	660462	5802708	5	600	0.02	None	4	2
Mackay	I24	660194	5802919	2		0.86	High	2	6
Mackay	I25	659980	5802903	2		0.38	Low	2	3
Mackay	I26	659844	5803187	5	450	0.48	Med	4	3
Mackay	I27	659669	5803553	5	500	0.48	Med	3	5
Mackay	I28	659672	5803565	5	450	0.22	Low	5	3
Mackay	I29	659383	5803752	5	500	0.13	Low	5	4
Mackay	I30	658946	5803959	5	500	0.43	Med	4	6
Mackay	I31	658458	5804235	5	600	0.22	Low	5	6
Mackay	I32	658321	5804334	5	900	0.02	None	3	5
Mackay	I33	658026	5804456	5	500	0.13	Low	4	4
Mackay	I34	657166	5804673	5	500	0.55	Med	4	2
Mackay	I35	656737	5804722	5	450	0.54	Med	4	2

ID	Length (m)	Instability	Source	Reach	
		level			
McKay-01	460.5	М	4	MR1	
McKay-03	1204.3	Н	1	Hawkley	
McKay-04	850.8	М	4	MR3	
McKay-05	399	Н	1	Peg	
McKay-06	205.3	М	3	MR2	
McKay-07	130.6	М	1	MR3	
McKay-02	638.6	L	1	MR2	
McKay-01b	344.5	L	1	MR1	

APPENDIX 4- Inventory of disturbed channel reaches

APPENDIX 5 – Selected photographs



Photograph #1296. Hawkley Creek sub-basin-unstable channel



Photograph #1313. Mouth of Pegasus Creek – unstable channel



Photograph # 1317. Slope failures in Pegasus watershed



Photograph #1345. Lower reach of MacKay – stable river.

APPENDIX 5 – Selected photographs



Photograph #1517. Site I-100, score = 0.36 (Low)



Photograph #1543. Site I-109, score = 0.95 (High)-



Photograph #1572. Site I-119, score = 0.64 (Med).



Photograph # 211-8, Site I-02, score = 0.20 (low)