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DAVIS CREEK

INTERIOR WATERSHED ASSESSMENT (IWAP)
LEVEL I

Prepared for:

Meadow Creek Cedar

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February, 1997

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APPENDICES:

1.0 INTRODUCTION

This watershed assessment report was prepared by Timberland Consultants Ltd for the purpose of evaluating the current and proposed hydrologic impacts that road building and timber harvesting activities will have on a sub-basin of the Davis Creek community watershed. This watershed is located within the Kootenay Lake Forest District, Nelson Region.

The Forest Practices Code Act of British Columbia requires that a Watershed Assessment be completed on all watersheds classified as Community Watersheds. Davis Creek is a community watershed and is the principal water source for the community of Lardeau, B.C., located 35 kilometers north of Kaslo, B.C.

2.0 OBJECTIVE

The purpose of this level I IWAP is to evaluate the current and proposed impacts of road building and timber harvesting on the watershed. The scope of this level I assessment will be limited to a sub-basin (North Davis Creek) of the Davis Creek community watershed. Timber harvesting and road construction are proposed within the next five years for the North Davis sub-basin, while the main Davis Creek watershed will remain free of activity during the same period. This level I IWAP will also provide detailed information on Equivalent Clearcut Areas (ECA), number of landslides, erodible soils and road density.

This report outlines a complete level I assessment and provides recommendations for future analysis.

The results of this assessment should be reviewed by a round table committee, to discuss the issues of concern and direct further field investigation (level II IWAP) if required.

3.0 DESCRIPTION OF THE DRAINAGE

3.1 Location

Davis Creek flows in a southwest/northeast direction into Kootenay Lake. The sub-basin under study (North Davis) flows in a similar pattern from the higher reaches of the watershed until it makes a sharp 90° turn to flow southeasterly to join with Davis Creek.

The elevation ranges from 900 m (confluence of Davis and North Davis) to approximately 2560 m on the ridges above the headwaters.

The watershed can be located on mapsheets 82K015 and 016, centering on latitude 50°09' and longitude 117°02'.

3.2 Geology and Geomorphology

The bedrock geology of the study area is predominantly composed of Paleozoic metasedimentary and sedimentary rocks of the Broadview Formation of the Lardeau Group. Grey and green phyllictic grit, and phyllite with lesser occurrences of interlayed bands of limestone, grey phyllictic limestone and grey phyllite, are the two primary rock types.

The topographic characteristics of the area are a result of erosional processes and the geomorphic and climatic history of the quarternary period, when smaller valley glaciers fed the main Kootenay Lake glacier. The surficial material types derived from those processes are dominated by till and colluvium. Some isolated pockets of glaciofluvial material may be present on the benches along North Davis Creek due to the interactions of the two glaciers.

The steeper slopes of the watershed are dominated by colluvium, while the till is mostly concentrated on the east facing slopes overlooking Kootenay Lake where the larger Kootenay Lake glacier dominated the landscape. Smaller glaciers (North Davis Creek) did, however, produce isolated pockets of till in the main valley.

The landform of the study area has a "V" shaped valley type with gullies and glaciated scoured ridges. Deep incised gullies and avalanche paths are common within the watershed.

3.3 Climatic Zone

The majority of the area is within the Interior Cedar Hemlock moist, warm biogeoclimatic zone (ICH mw2) followed by the wet, cold Engelmann Spruce Subalpine Fir zone (ESSF wc1, ESSF wc4 and ESSF wcp). Elevation, aspect and slope gradient controlled these distinct zones and their transitional areas.

3.4 Development History

3.41 Land

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The study area is located entirely on Crown Land. Only existing and proposed developments until the year 2001 were considered for the calculation of the different indices.

3.42 Timber

The timber harvesting operations within the watershed are primarily carried out by Meadow Creek Cedar Ltd. (Forest Licence #A30171) and by Slocan Forest Products Ltd. (Agreement Land).

3.43 Recreation

Limited existing and potential recreation opportunities exist in the watershed. However, the proposed road system may provide access for hikers, hunters and backcountry activities.

3.44 Water

No water intakes are located within the study area.

4.0 METHODOLOGY

The procedure for assessing the North Davis Creek watershed was consistent with the procedure recommended in the Interior Watershed Assessment Procedure Guidebook (1995).

The Level I IWAP consists primarily of office work, using air photo interpretation and computer generated indices.

A watershed assessment (Level I) examines thirteen impact indicators and calculates hazard index ratings for four main impact categories.

The four impact categories include:

1. Peak Flows
2. Surface Erosion
3. Riparian Buffers
4. Mass Wasting

The thirteen impact indicators include:

1. Peak Flow Index.
2. Road Density above H60 line.
3. Road Density (used for assessing peak flow changes).
4. Density of roads on erodible soils.
5. Density of roads less than 100 m from a stream.
6. Density of roads on erodible soils less than 100 m from a stream.
7. Density of stream crossings.
8. Road density (used for assessing surface erosion).
9. Portions of streams that have been logged to the streambank.
10. Portions of fish-bearing streams that have been logged to the streambank.
11. Density of landslides.
12. Density of roads on unstable or potentially unstable terrain.
13. Portion of streambanks that have been logged on slopes >60%.

All measurements were carried out using PAMAP V.4.2 geographical information system (GIS), air photos and various maps.

Forms were produced for the three watersheds using the thirteen impact indicators; these are located in Appendix 1.

4.1 Sub-Basins

The Davis Creek drainage was divided into one sub-basin. Table 1 lists the sub-basin and its respective size.

Table 1

Watershed	Sub Basins	Hectares
Davis	North Davis	1486

4.2 Unstable Slopes

The unstable slopes for the study area were identified from detailed terrain stability mapping (TSIL B). Polygons with a stability class of IV or V were defined as unstable.

4.3 Soil Erosion

Erodible soils were determined using the surface erosion classification map identified in the detailed terrain stability report (TSIL B).

4.4 Landslides

No landslides were identified in the study area.

Cutslopes/fillslopes, and avalanche chutes were not tallied as landslides.

4.5 Stream Channels

All stream channels were assessed as per the TRIM map location. All streams less than 20% gradient were deemed to be fish-bearing unless defined as non fish-bearing.

4.6 Roads

No roads or skid roads are present within the study area at this time as only proposed roads were included in generating the projected indices.

5.0 DETERMINATION OF IWAP HAZARD INDICES

5.1 Peak Flow Index

Timber harvesting operations located in a mid to high elevation in a watershed will have a greater impact on the peak flow than areas located in low elevation. Snow accumulation, snow interception and solar radiation are different at higher elevations than lower elevation. The hysometric (H60) line represents the elevation in a drainage where the area located above that line represent 60% of the total drainage area. The area above that line is deemed to have a higher impact on the peak flow than the area below it. The H60 line for the study area is 1611 m.

The Peak Flow Index is calculated using the Equivalent Clearcut Area (ECA) above or below the H60 line. In the Interior of British Columbia, the

peak flow of a specific drainage usually occurs in the springtime when snow packs are melting in mid to high elevations.

Vegetation on a site intercepts precipitation before it reaches the ground. That intercepted precipitation does not affect the peak flow of a drainage, as it is subsequently lost to the atmosphere. The removal of the vegetation cover (in the case of a timber harvesting operation) will directly affect the peak flow of a drainage for two main reasons; initially a lack of vegetation cover will cause an increase in snow accumulation on the ground in the winter months, and secondly, increased solar radiation will reach the ground and increase the rate of snow melt.

The Equivalent Clearcut Area (ECA) quantifies the area of natural or human-made disturbances within a drainage that acts like a clearcut. As vegetation grows from a disturbance, the effects on the peak flow are reduced (increased interception of precipitation). Previously harvested areas are given a percentage of recovery based on the height of the new forest. As new forest grows, the areas act less like clearcuts and hydrologically recover from the disturbance. Table 1 demonstrates the relationship between this hydrological recovery and the average height of a forest canopy. Partially cut stands are given a percentage of recovery as per Table 1A.

Table 1

Average Height of the Main Canopy (m)	% Recovery
0 - <3	0
3 - <5	25
5 - <7	50
7 - <9	75
9+	80

Table 1A

Percentage of Basal Area Removed	% Recovery
NSR	0
<30	100
30 - 60	50
>60	0

Burnt areas, large slides or hydro lines would be given a 0% recovery if encountered.

In determining the overall peak flow index, the ECA located above the H60 line is weighted by a factor (1.5 times) to account for the greater impact on the watershed.

Since the study area has no current natural or man-made areas that would affect the ECA, the overall ECA is calculated at 0. Proposed timber harvesting activities were given a 100% ECA.

5.2 Surface Erosion

The surface erosion indices are calculated by assessing the impact of roads on erodible soils, roads within 100 m of a stream, roads within 100 m of a stream on erodible soils and the density of stream crossings.

5.3 Riparian Buffers

The riparian buffers indices are calculated by assessing the impacts of previous harvesting right to the stream edge for fish and non-fish bearing streams.

5.4 Mass Wasting

The mass wasting indices are calculated by assessing the number of landslides in a sub-basin, the roads on unstable terrain and the streams whose banks have been logged on slopes greater than 60%.

6.0 WATERSHED CHARACTERISTICS

6.1 Land Use

Table 2 illustrates the different land uses for the watershed (if any).

Table 2

Watershed	Range use close to streams (Y/N)	Mining close to streams (Y/N)	All terrain vehicles close to streams (Y/N)
North Davis	No	No	No

6.2 Watershed characteristics

Table 3 and 4 describe the physical characteristics of the watersheds.

Table 3

Watershed	Sub-basin area km^2	Crown Land		Private Land		Operable Land	
		Area km^2	%	Area km^2	%	Area km^2	%
North Davis	14.86	14.86	100.0	-	-	8.65	58.2

Table 4

Watershed	Area with Unstable Slope (km^2)	Area with erodible soils (km^2)	Do DFO and /or MOF have temp. concerns (km^2)	Hydrological zone	Dominant bedrock geology	Are there glaciers in the sub-basin (Y/N)
North Davis	11.63	6.02	No	23	4	No

7.0 RESULTS

The hazard index scores for the four impact categories (peak-flow, surface erosion, riparian buffers, mass wasting) were converted as per Table I of the IWAP guidebook. Those converted scores range between 0.0 and 1.0.

7.1 Peak Flow

Table 5 shows the current and projected peak flow scores for the watershed.

Table 5

Watershed	Peak Flow	
	Current	Projected
North Davis	0	0.30

The IWAP guidebook recommends the performance of a level II analysis if the peak flow index is greater than 0.5.

7.2 Surface Erosion

Table 6 demonstrates the current and projected converted surface erosion scores for the watershed.

Table 6

Watershed	Surface Erosion	
	Current	Projected
North Davis	0.0	0.50

The IWAP guidebook does not require a level II analysis if the surface erosion is equal or greater to 0.5 and all other impact categories are less than 0.5.

7.3 Riparian Buffers

As there has not been any harvesting in the study area, the converted score for the riparian buffer is 0. Proposed harvesting activities will not likely increase this number due to strict regulations that govern harvesting close to streams (Forest Practices Code). Table 7 demonstrates this converted index.

Table 7

Watershed	Riparian Buffers	
	Current	Projected
North Davis	0	0

The IWAP guidebook recommends the performance of a level II analysis if the riparian buffers index is greater than 0.5.

7.4 Mass Wasting

Table 8

Watershed	Mass Wasting	
	Current	Projected
North Davis	0	0.05

The IWAP guidebook recommends the performance of a level II analysis if the mass wasting index is greater than 0.5.

8.0 RECOMMENDATIONS

8.1 North Davis Creek Watershed

The North Davis Creek sub-basin has all hazard indices below the 0.5 mark. As per the recommended procedure outlined in the IWAP guidebook, a level II analysis (channel assessment) is not required.

Proposed road building and harvesting activities within the study area will likely change after proper field layout and further refinement of future development plans have been completed.

Although the proposed development contains inaccuracies at this time, it does provide a benchmark for future development in the area. The proposed activities are those most likely to occur in the next five years and should, for the purpose of planning within the watershed, be considered accurate.

Since all hazard indices are low and have a wide margin before they reach the critical hazard mark (0.5), I concur with the procedure outlined in the IWAP manual and do not recommend a level II assessment.

9.0 CONCLUSION

This watershed assessment report was current as of February 1997 (1997 Development Plan). Events occurring after that period may affect the accuracy of the report and its recommendations Major changes in road location and/or timber harvesting will impact the generated indices and affect the validity of the recommendations.

The members of the round table committee should review the recommendations in light of the assumptions used in this report and evaluate if further field investigation is required.

10.0 REFERENCES

Interior Watershed Assessment Procedure - Level I analysis, Forest Practices Code of British Columbia, Ministry of Forests and Ministry of Environment, Lands and Parks, 1995. Province of British Columbia.

Banting, R.T. Engineering Ltd. Detailed Terrain Stability Report TSIL "B" North Davis Creek Watershed. February 1997.