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**CLASSIFICATION OF AVALANCHE CHUTES
IN THE ALBERT RIVER DRAINAGE**

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March 25, 2002

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EXECUTIVE SUMMARY

This report presents the results of avalanche chute mapping and habitat suitability rating for grizzly bear in the Albert River Watershed, using air photo interpretation. The Albert River Watershed is located in the Invermere Forest District, within the operating area of Slocan Forest Products Ltd. Prior to this project, no data existed that identified avalanche chute habitat that could be utilized for forestry and wildlife habitat management. Forest licences are required to consider grizzly bear habitat needs during forest development planning. The objective of this project was to map and classify grizzly bear avalanche chute habitat in a format useable by forestry planners and compatible with current Kootenay Region grizzly bear habitat guidelines (Kootenay Boundary Land Use Plan - KBLUP 1996).

Within the Albert River Watershed, 4,148 cover-type polygons were mapped within individual avalanche chutes and chute complexes. The area of high and medium priority habitat totaled 2286 hectares. Five hundred and thirty-five polygons totaling 339 hectares were classified as high priority grizzly avalanche chute habitat and 3613 polygons totaling 1947 hectares were classified as medium priority grizzly avalanche chute habitat. No avalanche chutes were rated as low priority.

We have recommended that all 4148 polygons classified as high and medium be considered for Avalanche Track Management Zones (ATMZ). Chutes receiving ATMZ status are required to have forest cover, where available, retained on both sides of the chute (KBLUP– Habitat Guidelines). These ATMZ areas may be included in landscape scale planning and can contribute to old seral targets established under the Kootenay-Boundary Higher Level Plan Order.

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INTRODUCTION

Purpose

Avalanche chutes in the Kootenay Region of southern British Columbia provide critical spring habitat for grizzly bears, especially in areas of high snowfall (see reviews in Jonkel 1987, LeFranc et al. 1987, Mowat and Ramcharita 1999). Some chutes provide important foraging and breeding habitat for grizzlies in spring and early summer. Certain parts of chutes are selected by grizzly bears more often than others, typically areas where preferred forage plants are available. Avalanche slide paths that produce grasses, forbs, sedges, and roots are a major source of spring and early summer food for grizzly bears (Mowat and Ramcharita 1999). Avalanche chutes also provide carrion for grizzlies following spring snow-melt, as a result of ungulates killed during winter avalanches.

Currently, interim habitat guidelines for grizzly bears in the Kootenay Region of British Columbia require that forest licensees retain forest cover on both sides of those avalanche chutes which have been designated as important to bears by a British Columbia Ministry of Water Land and Air Protection representative (Kootenay Inter-Agency Management Committee 1996). Levels of importance are generally assigned on the basis of the presence or extent of particular vegetation communities or cover types (Ferguson and Pope 2001, Mowat 2000). There are 10 cover types divided into high and medium habitat ratings. Wetland Herb and Upland Herb are high habitat rated. Alpine Herb, Wetland Shrub, Upland Shrub, Alpine Shrub, Wetland Conifer Open, Wetland Conifer Sparse, Upland Conifer Open, Upland Conifer Sparse are medium habitat rated.

If a chute is classified with a high or medium habitat rating, forest cover on both sides of the avalanche chutes is retained and termed Avalanche Track Management Zone (ATMZ). (With this approach, ALL avalanche chutes would receive ATMZs because there are no cover types rated as having low habitat suitability. The purpose of this study was to classify avalanche chutes within the Albert River drainage, and to identify important avalanche chute grizzly bear habitat.

Study Area

The study area, in the Invermere Forest District east of the Columbia River (Fig. 1), is in the Southern Park Ranges Ecosection, Western Continental Ranges Ecoregion, Southern Interior Mountains Ecoprovince (reference?). It grades through a number of biogeoclimatic zones including: the Montane Spruce dry, cool (MSdk) subzone in the valley bottoms up to about 1600 m; the Engelmann Spruce-Subalpine Fir dry, cool (ESSFdk) subzone up to about 2100 m; the Engelmann Spruce-Subalpine Fir dry, cool, parkland (ESSFdkp) subzone up to about 2600 m; and the Alpine Tundra (AT) subzone above 2600 m (Meidinger and Pojar 1991, Braumandl and Curran 1992). The boundaries between zones and subzones vary with aspect, with a general shift upwards on south and west-facing slopes. The MS and ESSF zones include a large variety of coniferous tree species: Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), Douglas fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), and western larch (*Larix occidentalis*). Engelmann spruce and subalpine fir dominate the higher elevations. Winter and summer temperatures are moderate and snowfall is high.

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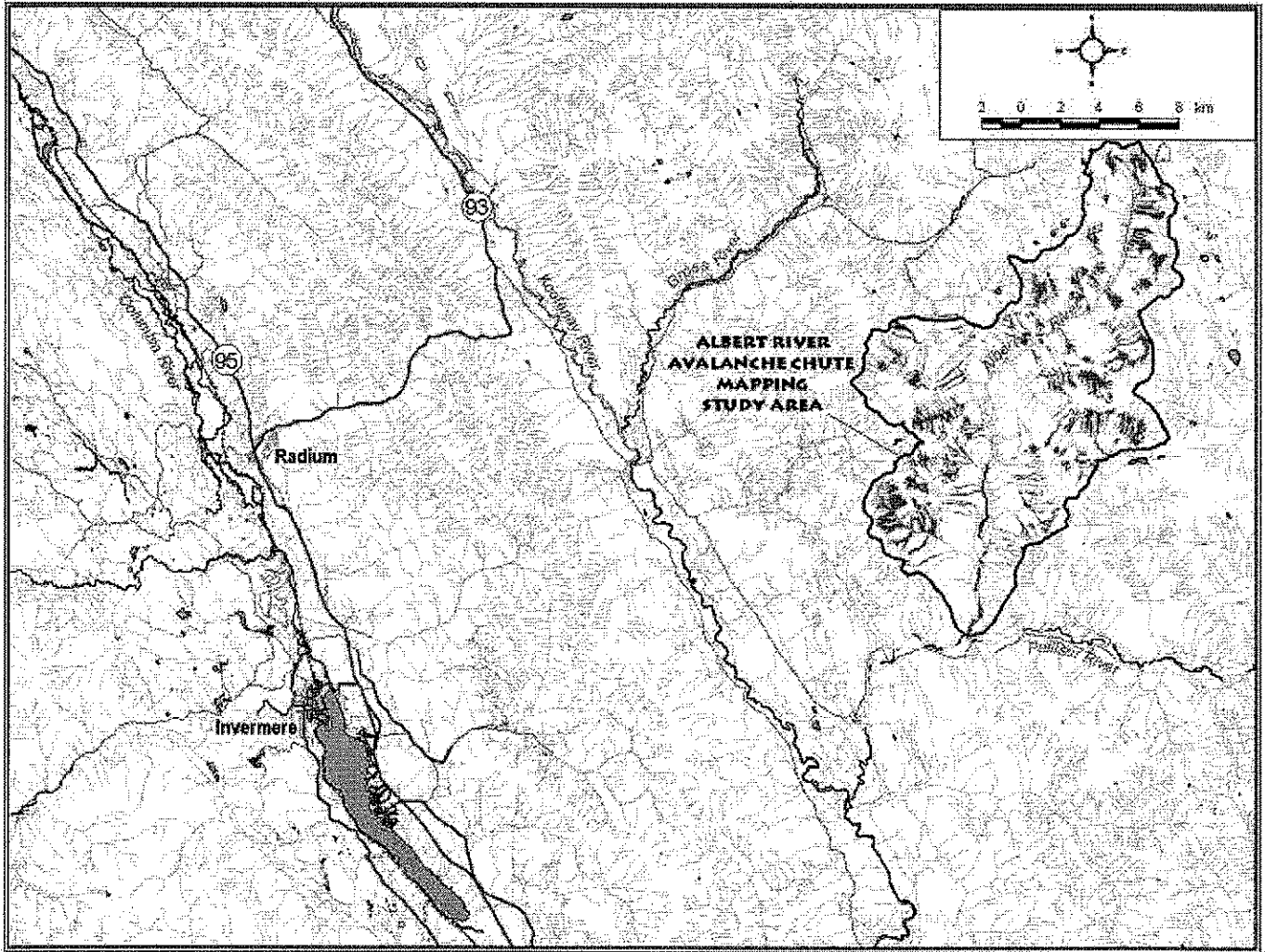


Figure 1. Location of the Study Area.

METHODS

We classified avalanche chutes using air photo interpretation on black and white 1991 1:15 000 photos. The chute classification is based on the vegetation cover classes outlined in the BC Vegetation Resources Inventory (BC Ministry of Forests 1999) and using the flow chart for intermediate level avalanche chute mapping detailed in Mowat 2000. This project was completed using the Level 5 VRI classification scheme:

Table 1:

<p>The B.C. Land Cover Classification Scheme Decision Chart</p> <p>Level 1 – Vegetated or not</p> <p>Level 1 Vegetated (has 4 further levels)</p> <p> Level 2 – Land Cover Type – Treed or Non-Treed</p> <p> Level 3 – Landscape Position – Wetland, Upland, or Alpine</p> <p> Level 4 – Vegetation Type (varies with Treed or Non-Treed Unit)</p> <p> Level 5 – Density Class</p>

Air Photo Interpretation

The assessment method we applied to this project utilized conventional aerial photos, transferring data via mono restitution digitizing.

The classification of avalanche chutes was then digitized from the air photos using mono restitution digitizing. Mono restitution converts photo-interpreted data from single annotated air photos into geo-referenced 3D digital data files.

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Avalanche Chute Classification and Importance Ranking

The classification of the avalanche chute habitat was based on the presence of particular vegetation cover types. We used an intermediate level of avalanche chute mapping (Mowat 2000) that separates herb, shrub, and open and sparse conifer units, classifies polygons as wetland, upland, or alpine, and attaches a habitat rating of high or medium. Avalanche chutes with a habitat rating of low were not identified on the air photos or mapped, as recommended by Garth Mowat (pers. comm.). Ten categories of high and medium rated habitat were applied to the mapping (Table 1). Wetland and upland herb categories received high priority rating. Alpine herb, wetland shrub, upland shrub, alpine shrub, wetland coniferous open, wetland coniferous sparse, upland coniferous open, and upland coniferous sparse received medium priority rating.

Within the medium and high habitat ratings of the avalanche chutes, ranking differences among individual chutes and polygons were considered. Avalanche chute characteristics that increase the importance of a high or medium rated chute over another, include such things as polygon size, percentage of herb versus shrub, proximity to other polygons/chutes, wetland classification, and aspect.

Table 2: Avalanche habitat (grizzly bear) categories

Category	Priority
1. Wetland Herb	High (1)
2. Upland Herb	High (1)
3. Alpine Herb	Medium (2)
4. Wetland Shrub	Medium (2)
5. Upland Shrub	Medium (2)
6. Alpine Shrub	Medium (2)
7. Wetland Conifer Open	Medium (2)
8. Wetland Conifer Sparse	Medium (2)
9. Upland Conifer Open	Medium (2)
10. Upland Conifer Sparse	Medium (2)

RESULTS AND DISCUSSION

The Albert River study unit contained 4148 high and medium priority avalanche slide polygons that encompass 2286 hectares of grizzly bear avalanche chute habitat. High rated (wetland herbaceous and upland herbaceous) grizzly habitat is found in 535 polygons totaling 339 hectares. Medium rated habitat (alpine herbaceous, upland shrub, alpine shrub, upland conifer open, and upland conifer sparse) is found in 3613 polygons totaling 1947 hectares. No wetland shrub, wetland conifer open, or wetland conifer sparse (medium priority) habitat was classified for this study area.

Table3: Avalanche habitat category results summary

Habitat Classification	# of Polygons	Area Sum	Area Ave. (ha.)	Standard Deviation (ha.)	Min. Area (ha.)	Max. Area (ha.)
1. wetland herb (high)	1	.82	.82		.82	.82
2. upland herb (high)	534	338.28	1.27	3.71	.06	56.23
3. alpine herb (medium)	501	505.46	3.03	5.37	.06	37.50
4. wetland shrub (medium)	0	0	0	0	0	0
5. upland shrub (medium)	1990	1209.32	3.04	5.32	.06	38.32
6. alpine shrub (medium)	1122	231.86	1.24	2.34	.04	23.96
7. wetland conifer open (med.)	0	0	0	0	0	0
8. wetland conifer sparse (med.)	0	0	0	0	0	0
9. upland conifer open (med.)	729	187.26	2.31	2.66	.12	18.69
10. upland conifer sparse (med.)	240	33.08	1.38	1.66	.29	7.85

A similar project completed for the Ministry of Forests Prince George Region (Park 2001) utilized a combination of mono restitution digitizing on conventional photos and 'heads up' digitizing from ortho rectified photos. The technique using ortho photos proved initially to be more time efficient, however due to the lack of clarity on the digital ortho photos as a result of scale, we do not believe it was as accurate as outlining the

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polygons directly onto the conventional air photos. The resulting question of accuracy required additional time spent on each photo to ensure polygon and chute assessments were being mapped correctly. The extra time required to ensure the accuracy negated the initial time saved by using digital ortho photos and Arcview. The experience gained during the Prince George project indicated that mono restitution and conventional photo interpretation proved to be the most time and cost effective, and the most accurate.

Therefore, for the Albert River project we outlined the chutes and habitat polygons directly onto air photos.

Management Implications

The Albert River exhibits significant area of high and medium priority grizzly bear avalanche slide habitat. High priority habitat is limited to small polygons most often adjacent to or encompassed by medium priority habitat. Avalanche slide habitat does not appear to be limited in the Albert River drainage. Most likely, timber associated with the slides (particularly wetland and upland herbaceous) will prove to be the limiting habitat value factor. Timber adjacent to slides provides cover for shade, bedding, and for travel between and amongst slides for bears during the time that they are frequenting the slides. The timber therefore, should be planned for accordingly, following current Avalanche Track Management Zone guidelines (KBLUP 1996). We recommend that high and medium priority chutes be designated as ATMZ's. Ministry of Water Land and Air Protection staff in the Habitat and Wildlife Branch should be consulted prior to delineating ATMZ's.

Critique of Methods

Limitations of the mapping presented in this report primarily will be classification error on the part of the photo interpretation technicians. Ground truthing a component of the mapped slides may prove useful in testing the accuracy of the photo interpretation work.

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APPENDIX A - AVALANCHE CHUTE CLASSIFICATION MAP

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