COLUMBIA MOUNTAINS INSTITUTE OF APPLIED ECOLOGY

Summary of Presentations
Forestry and Avalanches Workshop

Revelstoke BC
October 16, 1998

The workshop was hosted by:

Columbia Mountains Institute of Applied Ecology,
Box 2568, Revelstoke BC.
Phone (250) 837-9311 Fax (250) 837-4223
E-mail: cmi@junction.net

Presentations at this wrkshop were:

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   Dr. David McClung, University of British Columbia
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   Doug Sandilands, University of British Columbia
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    Doug Adama, Columbia Basin Fish and Wildlife Compensation Program
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    Matt Besko, Ministry of Environment, Lands and Parks

1. Overview of Avalanche and Forestry Interactions

Peter Jordan, Research Geomorphologist, Nelson Forest Region
Ministry of Forests
518 Lake Street, Nelson BC V1L 4C6
Phone: (250) 354-6242
E-mail: peter.jordan@gems4.gov.bc.ca

Problems and concerns about avalanches, in a forest management context, fall into these categories:

1. Safety - including worker safety, safety of recreational users of forest land, and safety concerns on highways below forest land;
2. Physical effects - loss of productive forest land to new avalanches, soil degradation, timber damage, and impacts on streams and water quality;
3. Silvicultural problems- regeneration in cutblocks affected by avalanches, and cutblocks adjacent to avalanche runout zones.

Several examples of avalanche incidents in the Nelson Forest Region were discussed:

- Slocan Lake, where a clearcut at the head of a gully created an avalanche and debris flow track which reached the highway in 1988;
- Frog Mountain (Slocan valley) in 1994, an avalanche which impacted a creek in a domestic-use watershed;
- Bull River (near Cranbrook), where a large bridge on a mainline logging road was destroyed by an avalanche in 1997;
- Nagle Creek (near Mica), where a clearcut avalanched in 1996, destroying six hectares of forest below.

Although large natural avalanche tracks are obvious, indications that a forested slope may be subject to avalanches following harvesting are often subtle, and difficult to detect on air photos or in the field. Most cutblocks that develop major avalanche problems are very steep, usually steeper than 70%. A problem is that in the past, forest development has "high-graded" the terrain, leaving most of the steeper slopes until later, so that now, a disproportionate amount of the timber remaining to be harvested is on steep slopes.

The Forest Practices Code, its regulations and guidebooks, and the various policies and procedures of the Ministry of Forests, contain no reference whatsoever to avalanches. However, the terrain regulations can be reasonably interpreted to include snow avalanches. The purposes of the terrain provisions of the Code are to ensure the safety of forest workers and the public, to protect water quality and stream habitat, and to prevent damage to the soil and to productive forest land. These concerns clearly apply to avalanches, as well as to landslides and soil erosion.

Forest Practices Code regulations (OPR 16 and 37) state that terrain stability field assessments must be done wherever required by the District Manager (in addition to other specified locations). The managers of individual Forest Districts have considerable discretion in requiring terrain assessments, and in requiring additional information to ensure that development plans "adequately manage and conserve the forest resources" (Forest Practices Code Act, section

41). It is reasonable for Forest Districts to require assessments of avalanche hazard, where they have reason to believe that avalanches are a significant constraint to forest development.

To be most affective, avalanche hazard assessments should be conducted on an entire development plan, including block layout and harvesting systems, rather than on individual cutblocks. This is because once the road access and general block layout have been determined, opportunities to make changes to the size, shape, and harvesting system of an individual block may be limited.

The revised "Mapping and Assessing Terrain Stability" guidebook (still in draft form but expected to be released soon) contains a brief section on snow avalanches, which includes the following:

> "For cutblocks where terrain stability field assessments are required and where snow avalanche hazard is identified as an issue, the terrain assessment should include a snow avalanche hazard assessment. It is also advisable in such areas to review Forest Development Plans to ensure that the layout of cutblocks is not likely to result in excessive avalanche hazard. At present, there are no specifications for doing such assessments, and there are very few if any guidelines for prescribing harvesting practices to reduce avalanche hazard. The recommended approach in the short term is for avalanche experts and foresters or terrain specialists to do assessments together, using local experience and judgment to try to specify the most suitable block configurations and harvesting methods. This has been identified as a subject requiring research and experimentation, and it is likely that in the next several years more specific guidelines will be developed.
>
> "There are very few consultants who are qualified in both terrain and avalanche assessment; therefore, two separate assessments may be required, or terrain consultants may have to subcontract the avalanche work to a qualified person. There is no requirement that avalanche consultants be registered professionals, but they should be recognized by the Canadian Avalanche Association or the Ministry of Forests as qualified to do avalanche hazard assessments."

Because the field of snow avalanche assessments for forestry is very young, it is difficult to set rigid rules for the qualifications required to do avalanche assessments. Specialized training programs are required (and are now being developed) to provide necessary training in some aspects of forest technology for avalanche technicians. It may also be desirable to develop training programs in avalanche science for engineers, geoscientists, and others who practice in the area of terrain stability assessments.

2.. Forestry Related Avalanches - Causes and Effects

Dr. David McClung, University of British Columbia
Department of Geography
1984 West Mall, University of BC Vancouver BC V6T1Z2
Phone: (604) 822-9157
E-mail: mcclung@geog.ubc.ca

(Summary not yet available)

3. Avalanche Initiation in Cutblocks

Doug Sandilands, University of British Columbia
c/o Dr. McClung, as above

(Summary not yet available)

4. Avalanches That Descend into Cutblocks

Peter Weisinger, University of British Columbia
c/o Dr. McClung, as above

(Summary not yet available)

5. Overview of the Canadian Avalanche Association

Bruce Allen, Director
Canadian Avalanche Association
Box 2759, Revelstoke BC
Phone: (250) 837-2435
E-Mail: canav@avalanche.ca

For information on the Canadian Avalanche Association, please visit their web site at: http://www.avalanche.com

6. Forest District Policy on Forestry in Avalanche Terrain

Bill Beard, Ministry of Forests
Columbia Forest District
Box 9158, RPO #3 Revelstoke BC V0E 3K0
Phone: (250) 837-7611
E-mail: bill.beard@gems3.gov.bc.ca

(Summary not yet available)

7. Forestry Considerations and Cutblock Design in Avalanche Terrain

Grant Statham
Chris Stethem & Associates Ltd.
120 McNeil, Canmore, AB T1W 2R8
Phone: (403) 678-2477
E-Mail: whipper@telusplanet.net

Recent years have seen an increase in the awareness of snow avalanche hazards which affect the forest industry of British Columbia. Snow avalanches have always affected operations which take place in steep, mountainous terrain – but several incidents in recent years have brought to

light a need for the industry to more diligently employ techniques to help reduce or mitigate the effects of avalanches.

Snow avalanches can cause a number of problems to forest companies. Some of these would include:

- danger to workers operating during the winter;
- road blockages causing down time;
- destruction of valuable timber;
- compromising water quality through deposition in creeks; and
- damage to silviculture work.

It is important for planners to recognize when they are planning operations in areas that are or can become avalanche prone. General guidelines for avalanche terrain would include all slopes between 50-100% incline, with inclines between 70-100% being the most common. Typical snowdepth required to produce avalanches is greater than 1 meter. Hazards are often most easily reduced or eliminated when they are addressed at the planning stage and not left until the last minute. Once a potentially hazardous avalanche problem has been recognized, it is important for the forest companies to employ a qualified avalanche protection specialist to assist them with their layout. This can involve road planning as well as help designing clearcuts to minimize the type of avalanche terrain they can create.

It is important to recognize that each different case will need to be dealt with on an individual basis. Avalanches occur as a result of many complicated variables, no one case is the same as the next. Therefore a 'one time only' approach will not work with different types of avalanche terrain. Initially the terrain in question must be well mapped and an inventory of the terrain made. Conventional 1:20 000 trim mapping and air photo analysis are suitable for identifying large scale features, but more often than not they are insufficient for smaller scale terrain features. When discussing avalanches starting in clearcut areas, it is the 'micro terrain' features which are of particular interest and which can dictate how each slope behaves with snowcover. The limitations of current mapping indicate the need for ground truthing to verify terrain features.

Once accurate mapping is in place, discussion can begin on the options for mitigating the avalanche problems. Often, simply relocating the block or road is an option that will work for all parties. When this is not possible then designs within the clearcut need to be employed. There are a number of options for cutting patterns available and the practicality of each one will be different depending on the techniques used for harvesting and their limitations. Options might include: selective cutting; group selection; vertical, horizontal or diagonal cable strips. At the present time there has been little research done into what spacing between trees will anchor the snow. What is true is that each case will always be different due to variations in terrain and snowcover, so there will never be a 'single magic number', which planners can employ universally in avalanche terrain.

Clearcutting on steep slopes in heavy snow climates WILL produce avalanche terrain. Forest companies need to realistically assess what the long and short term impacts of creating avalanche terrain will be. Recognize that each case is different, but techniques to help minimize the problems do exist. The solution will in most cases require a combination of the several different techniques.

8. Crestbrook Forest Industries' Snow Safety Program

Lawrence Redfern, CFI Snow Safety Program
Crestbrook Forest Industries
Box 4600, Cranbrook BC V1C 4J7
Phone: (250) 426-9281
E-mail: lredfern@crestbrook.com

Crestbrook Forest Industries' Snow Safety Program was implemented in recognition of the safety hazard to logging contractors and staff that logging at high elevations on steep ground in the winter presents. The program has three main thrusts: training of contractors and staff, monitoring of snow pack and assessment of stability, and active control when necessary. Crestbrook has also established formal rescue protocols for avalanche incidents, and completed an extensive signing program on all its roads; development of an avalanche atlas for all areas where avalanches may effect roads is an ongoing project.

9. Avalanche Likelihood Mapping

Doug Kelly
Par Terre Design
1220 Bewdley Avenue, Victoria BC V9A 5N3
Phone (250) 384-5974
E- mail: parterre@islandnet.com

Avalanche Likelihood Maps are 1:20,000 maps that provide forestry planners with an overview of potentially avalanche-prone terrain. The maps assume that all timber has been removed. Every location on a map is assigned to one of five avalanche likelihood classes: negligible, low, moderate, high, or very high. The classification is based on a consensus of expert opinion regarding the combined effect of four controls of avalanche likelihood. The four controls are:

- incline
- elevation
- slope curvature, and
- proximity to free-wind ridges

The maps are produced in ARC/INFO (GIS) from TRIM digital elevation models.

10. Avalanche Chutes and Bears

Roger Ramcharita, Faculty of Forestry
3rd Floor, Forest Sciences Centre, 3004-2424 Main Mall
University of British Columbia, Vancouver BC V6T 1Z4
Phone: (604) 822-4796
E-mail: kramchar@unix.ubc.ca

Many studies of grizzly bear habitat selection in mountainous areas have concluded that avalanche chutes are important habitat, especially in the spring and fall seasons. Foresters and wildlife biologists in the Columbia Mountains, B.C, have expressed concern that logging

practices such as timber removal adjacent to chutes and human use of roads running through chutes may be interfering with grizzly bear use of this important habitat. An examination of existing literature and reconnaissance of avalanche chutes in our study area indicated that avalanche chutes are extremely diverse in terms of slope, aspect, elevation and plant communities. It seemed likely that avalanche chutes are not all equally important and that research was required to determine which characteristics of chutes are selected by grizzly bears.

Our objective is to determine grizzly bear selection of habitat at two spatial scales using radio-collared individuals. At the larger scale, we are determining selection of plant communities, aspects, slopes, and elevations within avalanche chutes. At the smaller scale, we are determining which factors such as forage value, visual cover and various vegetational characteristics measured within a $100m^3$ area, influence where grizzlies feed and bed within avalanche chutes and the adjacent timber.

This three year project is currently in its final year. Preliminary results are presented.

11. Avalanche Track Mapping

Doug Adama, Columbia Basin Fish and Wildlife Compensation Program
Box 14D3, Athalmere BC V0A 1A0
Phone: (250) 342-3941
E-mail: adama@rockies.net

(Summary not available)

12. Avalanche Track Habitat Guidelines

Matt Besko, Ministry of Environment, Lands and Parks
401- 333 Victoria Street, Nelson BC V1L 5N5
Phone: (250) 354-6338
E-Mail: mbesko@nelson.env.gov.bc.ca

Grizzly Bear Guidelines - Kootenay-Boundary - 1998

Designed by a technical committee responsible for implementing Kootenay Boundary Land Use Plan (KBLUP) guidelines for Grizzly Bears through Memoranda of Understanding and other regional / district planning processes such as Landscape Unit Plans and Forest Development Plans.

Grizzly Bear Committee-Representatives & Advisors

- Matt Besko - MOELP (Chair)
- Frank Wilmer/R. Haas - MOF
- Tony Hamilton - MOELP
- Bruce McLellan - MOF
- Rick Heinrichs - MOELP
- Darcy Monchak - MOF
- John Bergenske - Environmental. Sector
- T.B.A - Industry
- Garth Mowat - Technical Advisor

Terms of Reference and Objectives

- To develop and/or refine grizzly bear management guidelines which provide opportunities to maintain suitable numbers of bears and ecosystems upon which they depend, considering bear biological requirements, needs of resource users, and government direction as per KBLUP Implementation Strategy and Provincial Grizzly bear Strategy.
- To provide/refine guidelines for Grizzly Bears in agreements between MOELP and MOF for Forest Development Plans.
- To provide/refine guidelines that are strategically and operationally feasible.
- To provide guidelines which are biologically suited to grizzly bears without incremental effect on short term wood supply.

Priority Issues and Constraints

- Identifying, mapping and ranking priority Grizzly Bear habitats.
- Avalanche track management
- Access management (open/closed zoning, de-activation, road density targets)
- Forage enhancement/protection (riparian, burns)
- Consistency with population management

Constraints to Management

- Guidelines cannot be incremental to seral targets in biodiversity guidebook.
- Cover requirements for bears must be met using available seral as per emphasis option (domino effect on access).
- Priority habitats cover most of region - must budget efficiently.

Existing Guidelines for Avalanche Tracks

- Use 1:250 000 priority map based on densities by ecosection (management on Priority 1and 2 habitats)
- Avalanche track management zones as identified by Forest Ecosystem Specialists using available seral as per BEC.
- Avoid planning blocks adjacent to High and Moderate value avalanche tracks*
- “High” is the herb/forb/grass dominated avalanche track.
- “Moderate” is the shrub dominated avalanche track.
- “Low” is relegated to those avalanche tracks that are dominated by regenerating conifers.

Considerations:

- Number of avalanche tracks per unit area
- Runout width
- Riparian interactions
- Proximity to other tracks - “complexes”
- Grizzly Bear use
- Landscape unit management - “connectivity”

Management Prescription for Avalanche Management Zones

1. Avalanche tracks (i.e., slide chutes), which are recognized by the District’s Forest Ecosystem Specialist as significant carnivore habitats should use Avalanche Track Management Zones (AMZs)
2. On slopes with avalanche tracks alternating with strips of forest (> 2 tracks/km or < 500 m between tracks), there should be AMZs 50 m in width (or as available) established on one side of the track, and

around the base of each avalanche track with 70% volume retention. On the other side of the track, a 'no harvesting' zone is maintained.
3. On slopes with tracks <2 tracks/km or > 500 m between tracks, a 100 m AMZ with 70% volume retention applies.

Future Requirements/Products

1. Develop a multi-scalar management system and guidelines based on Grizzly Bear use, landscape level track aggregates/complexes, stand level vegetative/structural rankings. (Research/Inventory driven)
2. Adopt a consistent, data-driven system of Avalanche Track Classification from current initiatives.
3. Inventory/classification methods - Satellite, SPOT, Air Photos, field assessments