INTERRELATIONSHIPS AND INTERACTIONS BETWEEN HELICOPTER SKIING, FORESTS AND THE FORESTRY INDUSTRY IN BRITISH COLUMBIA, CANADA

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ABSTRACT: Helicopter skiing is intricately intertwined with forested landscapes and the forestry industry. The study objective was to determine, describe and analyze the manners in which helicopter skiing, forests and the forestry industry are related and how helicopter skiing interacts with forests and the forestry industry in British Columbia. This was accomplished by examining the available literature related to the use of Crown land for helicopter skiing and for forestry purposes, by gathering information from stakeholders via telephone interview and questionnaire, as well as by comparing snow profiles from open and forested sites. Helicopter skiing often takes place on land managed by the forestry industry for timber production. Forested slopes are desirable to skiers because they may have beneficial impacts on the quality of the snow pack for skiing. Operators of helicopter skiing businesses depend upon forested terrain to provide stable and therefore safe snow packs with regard to avalanches and to allow for safe air transport during poor visibility. Forested land is used more frequently for helicopter skiing in the coastal region of western British Columbia than in the interior or eastern portion of the province. Some helicopter skiing businesses have engaged in efforts to form multi-use management projects with forestry businesses; however the majority of such projects have been unsuccessful in attaining the needs of both parties. Potential exists for helicopter skiing operators and forestry businesses to effectively work together, although socio-economic influences prevent multi-use management of forested Crown land from taking place.

KEYWORDS: forest, forestry, helicopter skiing, British Columbia, avalanche, land use.

1. INTRODUCTION

Approximately 94 per cent (ILMB 2007) of British Columbia's forested land is owned by the provincial government and is referred to as 'Crown Land' (Government of British Columbia 1996). The government grants harvesting rights for the timber on that land to forest companies and also grants use rights to recreational tourism businesses. Due to the overlapping nature of land use rights in the province, called tenure, helicopter skiing often takes place on land that is managed for timber production. British Columbia is both the birth place of helicopter skiing and home to nearly all, 95 per cent (Helicat Canada 2007), of the world's helicopter skiing businesses. However, forestry is the most influential and prosperous of all industries in the province of British Columbia. Since forestry is the most influential industry in British Columbia it takes precedence over helicopter skiing in government policies. This is the root of land use problems between some helicopter skiing operators and forest licensees, since foresters have different interests and management objectives than those held by helicopter skiing operators.

In addition to overlapping land use rights, another topic addressed in the literature is environmental impacts caused by helicopter skiing. Helicopter skiing negatively affects the growth and vitality of forest ecosystems. Such impacts include: reduced or ceased tree growth, reduced and relocated wildlife populations, and alterations to forest structure (BCHSSOA 2003).

While helicopter skiing negatively impacts forests, forests have both negative and positive impacts on helicopter skiing. A positive impact that forests have on helicopter skiing is decreased avalanche risk. One reason for decreased avalanche risk is that densely spaced trees act to anchor the snow pack in place and decrease the likelihood of slab avalanches initiating within forests (Stethem et al. 2003, McClung and Schaerer 2006, McClung 2001, Weir 2002). In

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addition to the stabilizing effect provided by tree stems, less snow accumulation resulting from interception of snow by tree canopies also decreases the risk of avalanches because snow load is a factor contributing to initiation (Miller 1955, McClung and Schaerer 2006). Forest canopies shelter the snow pack from radiation, causing less fluctuation in the air and snow temperature than would occur without the forest cover. Temperature moderation prevents the formation of two types of snow crystals associated with avalanche initiation, surface hoar and depth hoar, which develop under conditions of large temperature gradients (McClung and Schaerer 2006, Höller 2001).

Forests are also beneficial for helicopter skiing because the darkly coloured vegetation acts as a reference point for helicopter pilots during poor weather conditions (BCHSSOA 2003). Lastly, many helicopter skiing clientele are tourists wanting and expecting to see the visually pleasing surroundings of forested terrain (COTA 2007).

2. METHODOLOGY

After exploring the available literature, inadequacies in both the breadth and depth of information found were investigated via telephone interview, questionnaire and by conducting snow profiles. The following research questions were developed to guide the research effort: what are the manners in which helicopter skiing, forests and therefore the forest industry are related?; what are the reasons for the relatedness of helicopter skiing and forests?; how does helicopter skiing interact with forests?; and how do forests interact with helicopter skiing?. In order to formulate an appropriate and effective questionnaire, two telephone interviews were conducted to test possible questions. Following the telephone interviews, a questionnaire consisting of twenty open- and closed-ended questions was developed. The questionnaire was distributed via email to all helicopter skiing companies found to operate in British Columbia and forestry companies that were found to have tenure areas overlapping with those of helicopter skiing businesses. Questions posed within the questionnaire explored the type of terrain and forest composition used for helicopter skiing, how forestry licensees and helicopter skiing businesses impact each other and cooperate, as well as questions of demographics, geographic location and services provided by the business.

Since a thorough investigation of the textural differences in snow packs caused by forest canopies was surprisingly not found in the literature, snow profiles were conducted both in open and forested areas on a single slope to gain some knowledge regarding the effect of forests on snow layering. Field work was conducted in Austria during the 2008 winter season. This study was the master's thesis project of a student located in Vienna, Austria. Consequently, field work was carried out at a location different than that of the topic area, based upon the student's location and absence of funding.

The specific site chosen was Thomaseck, a north facing slope in the Gastein valley in the Austrian province of Salzburg. Measurements were taken between an altitudinal range of approximately 1800 to 2200 metres above sea level. Profiles representative of open areas were conducted above the timberline on a slope free of trees. Profiles representative of forested areas were conducted lower down on the mountain in sparsely spaced stands of Norway spruce and larch. The exposition of all profiles was north facing. Measurements of the following parameters were taken according to Colbeck (1985) for each layer found within the snow pack: layer depth, crystal form, crystal size, hardness, moisture content, temperature and density.

3. RESULTS

3.1 Interviews and questionnaires

Geographic location of a given operator was found to influence the proportion of time that forested terrain is used for helicopter skiing. It was found that the Alpine Tundra zone, as described by the BC Ministry of Forests (1991), is used more frequently in the coastal region than in the interior region. Forested terrain is used more frequently in the interior, 50-70 per cent of skiing time; than in the coastal region, 20-50 per cent of skiing time. In all parts of the province forested areas are used most frequently during times of poor visibility when helicopters can drop skiers below the timberline, but cannot reach the Alpine Tundra zone.

Characteristics of a particular forest, including species composition as well as silvicultural practices used within it, were found to influence its use or non-use for helicopter skiing.

The ideal tree species to ski through were found to be cedar, tamarack and larch. Hemlock was found to be least ideal; spruce was found to be neither good nor bad and fir was found to be slightly better than spruce. Old growth and sparse subalpine stands were found to be more ideal than

stands managed for timber production, with the following exceptions: a) during the first 10-15 years of regeneration when trees are covered by snow and b) when forests are mature enough for branches to be well above skiers head height.

Clear-cut harvesting is the most commonly applied silvicultural practice in forests that are used for helicopter skiing. Selective cutting is used in some areas, but is not common. Most existing clear-cuts are rectangular in shape and oriented horizontally on slopes (long sides at the top and bottom). This configuration does not easily facilitate skiing because ski runs are short in length and the forest below the clear-cut is often too dense to ski through. Clear-cuts which are oriented vertically (short sides at the top and bottom) better facilitate helicopter skiing because they offer ski runs of greater length and may be sufficiently long for skiers to be picked up at the bottom of the clear-cut; as a result, dense forests located below are less of a barrier. Areas managed for clear-cut harvesting can be used from the time of harvest until approximately 10-15 years after replanting. Selective harvesting is beneficial for helicopter skiing since it decreases the density of stands and can allow skiers to pass through forests easily. Stands in which selective harvesting occurs can potentially be used for longer periods of time than those managed for clear-cutting.

Forests composed of characteristics found to be ideal for skiing are used most frequently by helicopter skiing operators, however depending on the composition of forested terrain available to a particular operator least ideal forests are also used.

Helicopter skiing is related to the forestry industry by means of overlapping use rights for Crown land. Forestry companies' tenure areas overlapping with those of helicopter skiing operators was found to be a problem for some helicopter skiing businesses but was not found to be problematic for forestry businesses. Some helicopter skiing companies have discussed working with the forestry industry on a rotation plan that suits both interests. A topic frequently addressed in such projects is placing cut blocks on slopes in configurations that facilitate extended downward movement of skiers, such as long rectangles oriented with the short sides at the top and bottom as well as cut blocks that intersect at the corners. Temporal modifications to management plans is another topic that has been addressed, such as cutting new blocks or thinning blocks at times coordinating with previously harvested blocks that are maturing into stands that are no longer skiable. It was found that most multi-use management initiatives discussed by helicopter skiing operators and forestry licensees have not been successful at achieving management that is effective for both parties and were found to be particularly ineffective at achieving the goals of helicopter skiing operators.

3.2 Snow profiles

While the sample size used in the field study was not large enough to statistically correlate specific characteristics in the layering of the snow pack to the forested or open nature of the test sites, differences were observed in the quantity, texture and temperature of snow in forested and open sites. A general trend observed was that snow density was greater in the profiles at open sites than forested sites. An additional trend observed was a greater quantity of snow at the open test sites than at the forested test sites, likely attributable to the influence of snow drifting. Many differences were noticed in the stratigraphy of the snow pack in open areas compared to that in forested areas on the same slope. Although such differences cannot be proven statistically significant from this study, faceted crystals were found to be more prevalent in open areas than in forested areas.

4. DISCUSSION

The geographic location of individual operators was found to determine the extent of relationships and interactions between helicopter skiing, forests and the forestry industry. Helicopter skiing occurs on forested terrain more frequently in the interior and eastern region of the province than in the coastal region. This is likely due to a greater proportion of terrain above the treeline in the coastal region of British Columbia than in the interior region. Helicopter skiing, forests and forestry are more loosely related and therefore interact less on the west coast of the province than in the interior and eastern region.

Several respondents of the questionnaire suggested that the quality of snow is better for skiing in forests than in open areas because it is more powder-like, lighter and fluffier. However no scientific literature was found to support this concept. Although the field study carried out as part of this thesis project lacked sufficient sample numbers to rear statistically significant results, it did present some interesting findings that could be investigated more thoroughly in further studies. Forests were observed to influence the layering of

a snow pack. None of the snow profiles observed in forested areas exhibited faceted crystals, or depth hoar, as was observed in some open areas. Since depth hoar is known to act as a weak layer in the snow pack, this suggests that there is a potentially lower risk of avalanches initiating in forested areas than in open areas. In addition, it was found that the density of snow was greater in open areas than in forested areas, which supports the claim made by some helicopter skiing operators, that the snow is lighter and fluffier in forested areas than it is in open areas.

As reflected by current forest management policies, British Columbia's provincial government, and perhaps a large portion of British Columbian society, has made the decision that forests provide the greatest amount of economic and social benefits when managed in a manner that maximizes timber production for the forestry industry, rather than for use by multiple industries. That decision however, may not be benefiting helicopter skiing, or society as a whole, in the best possible way. Potential for multi-use management of British Columbia's forests does exist, but requires a concerted effort by the parties involved.

5. CONCLUSION

Helicopter skiing is related to and interacts with forest and the forestry industry in many different manners. The majority of, but not all, helicopter skiers pass through at least one forest along their descent. Most forested terrain in British Columbia that is used for helicopter skiing is managed timber production. Helicopter skiing is primarily related to forests by means of the forestry industry as a result of tenure areas granted to helicopter skiing operators overlapping with those granted to forest licensees for timber production. The degree to which helicopter skiing, forests and the forestry industry are related and interact is dependent upon geographic location, characteristics and composition of individual forested slopes in the vicinity of a given helicopter skiing operator, as well as overlap of land use rights on a given parcel of Crown Land.

The information gathered for this project, from a literature search, interviews, questionnaires and snow profiles supports the conclusion that Helicopter skiing in British Columbia, is intricately intertwined with forests and therefore the forestry industry mainly via forestry licensees who manage the forests within which helicopter skiing takes place. The relationship, however, was found to be unbalanced and biased toward the forest industry which is relatively unaffected by helicopter skiing while helicopter skiing is often carried out at the mercy of forest licensees who hold management rights for a given parcel of land. Multi-use forest management is a tool, which is currently underused, that could be further explored and implemented to share the benefits of forest resources in British Columbia amongst different user groups. Such a tool however, is unlikely to be effective until the current attitude toward forest management, the economic structure of the province and the political goals of both the citizenry and provincial government are re-evaluated.

A topic area currently lacking sufficient research is investigation into the textural and qualitative differences in snow within forests compared to that in open areas. The findings of future research in this area could influence policy objectives that guide forest regulations and could ultimately change the face of British Columbia's forested landscapes that are used for helicopter skiing.

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