Recreation Specialization, Avalanche Training, and Avalanche Safety Practices of Backcountry Skiers in the Canadian Mountain National Parks

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Abstract

Knowledge of demographics, avalanche training, and avalanche safety practices of backcountry skiers in the mountain national parks of Canada is of great importance to Parks Canada, the Canadian Avalanche Association, Canadian Avalanche Centre, and avalanche educators. The purpose of this paper was to obtain this information and to investigate if there was a relationship between recreation specialization level, avalanche training and avalanche safety practices. Investigating the usefulness of recreation specialization was also an important aspect of this research project. Questionnaires were used to measure the above variables. This project was conducted in cooperation with Parks Canada and was a continuation of a research project conducted by Parks Canada during the 2010 avalanche season.

This research project took place in Banff, Yoho, and Glacier National Parks. Questionnaires were administered at the Rogers Pass Visitor Centre, Lake Louise Visitor Centre, Yoho Visitor Centre, A.O. Wheeler Hut, Elizabeth Parker Hut, an avalanche awareness night in Banff, a Glacier National Park Winter Permit night in Golden, B.C., and a presentation by Chic Scott in Canmore, A.B.

Results indicate that there was a strong positive correlation between specialization level and level of avalanche training; a moderate to strong correlation between specialization and checking the avalanche bulletin and beacon practice; a weak correlation between specialization level and correct knowledge of current avalanche danger, minimum safety equipment and minimum safety practices.

Keywords: recreation specialization; backcountry skiing; avalanche training; avalanche safety practices

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List of Acronyms

ACC – Alpine Club of Canada
ACMG – Association of Canadian Mountain Guides
AST1 – Avalanche Skills Training 1 Course
AST2 – Avalanche Skills Training 2 Course
ATES – Avalanche Terrain Exposure Scale
CAA – Canadian Avalanche Association
CAC – Canadian Avalanche Centre
BNP – Banff National Park
GNP – Glacier National Park
YNP – Yoho National Park
RPDC – Rogers Pass Discovery Centre

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1.0 Introduction

1.1 The Research Problem

This research project examined the demographics, recreation specialization level, avalanche training, and avalanche safety practices of backcountry skiers in three of the seven mountain national parks in Canada. This research project was carried out in Banff, Yoho and Glacier National Parks; the other four mountain national parks are Jasper, Kootenay, Waterton, and Mount Revelstoke National Parks (Parks Canada, 2009b). In this research project mountain national parks refers to Banff (BNP), Yoho (YNP) and Glacier (GNP) national parks; the terms GNP and Rogers Pass often used interchangeably in the literature are also used interchangeably in this text. The main focus of this study was the relationship between recreation specialization level, avalanche training and avalanche safety practices of backcountry skiers. Such information is relevant for land use planners, Parks Canada, avalanche educators, the Canadian Avalanche Association (CAA) and Canadian Avalanche Centre (CAC). Expanding the concept of recreation specialization to backcountry skiing, avalanche training and safety practices also provides an important academic contribution.

This research project was conducted in cooperation with Parks Canada as a continuation to research conducted during the 2010 avalanche season on winter backcountry recreationists within the mountain national parks. The questionnaire used in this project is based on the original one developed during the 2010 avalanche season.

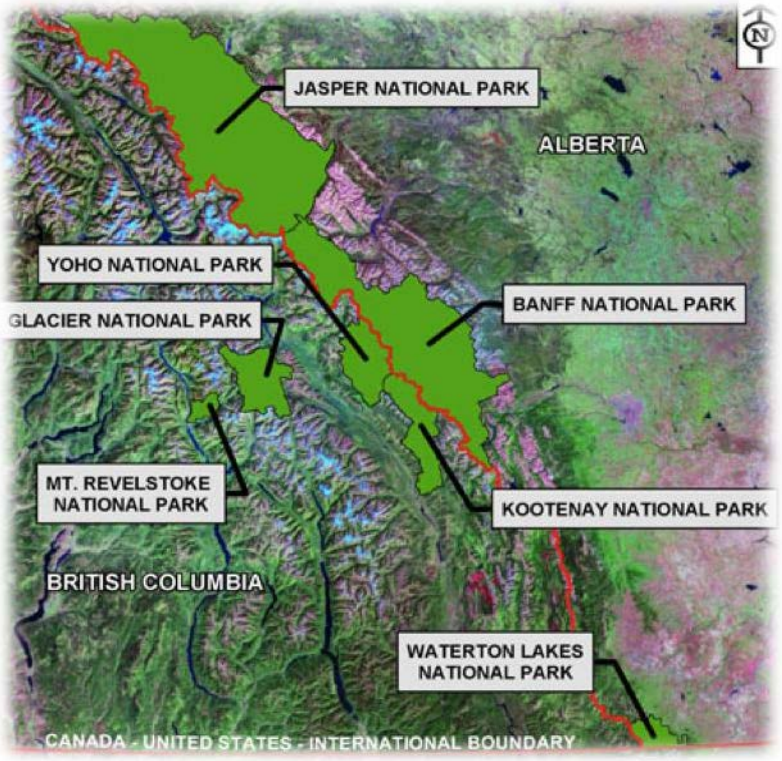

Figure 1.1: *Map of Canadian Mountain National Parks*

1.2 The Need for the Study

Recent studies (e.g. Longland, Haider, Haegeli, & Breadmore, 2005; Haegeli, 2005; Ham, McIntosh, van den Hoogen, & Rettie, 2010) have examined demographics of backcountry skiers; however, due to the remote nature of backcountry skiing the information from these studies is quite limited and in some cases contradictory. Parks Canada conducted a baseline study during the 2010 avalanche season that included surveys, trail counters, and interviews. The findings from the 2010 study provided the baseline information for this study (Ham et al., 2010). The goal of this project was to build and expand the 2010 study in the hopes of providing longitudinal data on backcountry skiers in the mountain national parks. Unfortunately, this research project did not include any longitudinal analyses as this is beyond the scope of the present analysis.

Although information on backcountry skiers is limited, previous studies and avalanche fatality information provide some information on these users. From 1970 to the end of the 2011 avalanche season there were 501 avalanche fatalities in Canada, an average of 11.9 per year, and over 90% of these were from recreational activities, such as snowmobiling and backcountry skiing (Jamieson, Haegeli, & Gauthier, 2010; CAC, 2011). During the ten years previous to my study, there was an average of 14.6 avalanche fatalities per year (CAC, 2010). However the number of avalanche fatalities specifically involving backcountry skiers has remained relatively static with a 30 year average of 4.4 fatalities per year and an average of 4.3 fatalities per year over the last 10 years (CAC 2008, 2009d, 2010, 2011; Jamieson et al., 2010; Jamieson & Goldsetzer, 1996). Although the number of avalanche fatalities of backcountry skiers has remained static over the past several years (Haegeli, Haider, Longland, & Beardmore, 2010), there were still many avalanche incidents with backcountry skiers, some injurious and others not (Bhudak Consultants Ltd., 2003). Reported avalanche fatality numbers thus do not accurately represent the number of incidents and rescues involving avalanches.

O‟Gorman, Hein, and Leiss (2003) suggested that the number of backcountry skiers in the mountain national parks was increasing based on the increase in sales of backcountry skiing equipment, higher usage of ACC huts in the winter, and an increasing use of the avalanche bulletin. Haegeli (2005), however, found different results from surveys completed by 18 avalanche professionals in British Columbia in 2005. The survey asked them to estimate the non-commercial winter backcountry trends in their respective areas over the last 25 years. It was found that the overall number of backcountry skiers had stagnated or slightly declined (Haegeli, 2005). However, this information cannot be taken as statistically valuable

as only 18 out of 75 potential individuals responded to the survey. It should also be noted that the results were based on the respondents‟ perceptions of trends (Haegeli, 2005).

The information obtained from the research described in this thesis provides greater insight into the Ham et al.‟s (2010) baseline study of winter backcountry recreationists in the mountain national parks. This study also provides additional information regarding the demography of backcountry skiers, previously studied by Haegeli (2005) and Longland, Haider, Haegeli, and Breadmore (2005). To the author‟s knowledge the application of recreation specialization to this activity and safety behaviours is novel.

Knowledge regarding the demographics, specialization, avalanche training, and avalanche safety practices of backcountry skiers can potentially help avalanche educators target groups who are most likely to lack proper avalanche training. This thesis includes a literature review of the theories and frameworks being used, the methods that were employed in this research project, and a selection of definitions that relate to the topic of this research project.

1.3 Purpose Statement

The purpose of this study was to determine the demographics, avalanche training, safety practices and recreation specialization levels of backcountry skiers and investigate whether or not there is a relationship between the recreation specialization level and level of avalanche training and the avalanche safety practices of backcountry skiers in the mountain national parks. Recreation specialization has been chosen as it has been successfully used to illustrate the differences that exist between recreationists within the same recreation activity (e.g. Dyck, Schneider, Thompson, & Virden, 2003). Recreation specialization level was measured using the dimension and indicators discussed in Chapters Two and Three. Level of

avalanche training was based on the courses offered by the CAA, and CAC; the CAA provides professional level avalanche training, and the CAC provides recreational level avalanche training (CAA, 2009d; CAC 2009a, 2009b). Avalanche safety practices were based on those outlined by the CAA, CAC, and Silverton, McIntosh and Kim (2007). To the author"s knowledge, this was the first research conducted that examined the relationship between recreation specialization, levels of training or certification, and safety practices; as well as the first study that took recreation specialization into consideration in examining the habits of backcountry skiers. The survey used in this study collected data to answer the following research questions:

1. What are the demographics of backcountry skiers in the mountain national parks?
2. What is the level of avalanche training of backcountry skiers in the mountain national parks?
3. What are the reported avalanche safety practices of backcountry skiers in the mountain national parks?
4. What is the relationship between the levels of specialization and the level of avalanche training of backcountry skiers in the mountain national parks?
5. What is the relationship between the levels of specialization and the avalanche safety practices of backcountry skiers in the mountain national parks?
6. Is recreation specialization a useful tool in understanding backcountry skiers in the mountain national parks?

1.4 Brief History of Backcountry Skiing In the Mountain National Parks

The origins of skiing in Western Canada date back to the late 19th century when the sport was introduced by Scandinavian immigrants (Scott, 2005). During this time almost all of the skiing took the form of ski jumping on hills in close proximity to towns, or cross-country skiing, usually occurring during winter carnivals (Scott, 2005). Although a few people participated in backcountry skiing in the mountain national parks during the 1900"s and 1910"s, it did not became popular until the late 1920"s and early 1930"s (Robinson, 2007). According to Lou Dawson (as cited in Scott, 2005) "the most exciting backcountry skiing in North America [is in] the Rocky and Columbia Mountains of Canada" (pg 184). BNP and YNP are located in the Rocky Mountains, while GNP is located in the Columbia Mountains. Below, I provide a brief history of backcountry skiing in each of these parks.

The history of skiing in BNP goes back to the late 19th century and skiing became increasingly popular through the turn of the century. Although Mac McCoubrey was skiing in the Lake Louise area in January of 1922 (Scott, 2005), March 4, 1929 is when backcountry skiing in BNP first received notable attention. On this date, Erling Storm and Marquis degli Albizzi led four clients from New England on a ski traverse from Banff to Mount Assiniboine (Robinson, 2007). From that point, backcountry skiing in BNP became increasingly popular, and BNP it is now known throughout the world for its backcountry skiing (Scott, 2003a).

YNP has a rich backcountry skiing history and is home to the Wapta Icefields, the most popular area for ski mountaineering in Canada, part of the Wapta Icefields is also located in BNP (Scott, 2005). The first ACC ski camp was held in YNP in 1937 at Lake O"Hara and many subsequent camps have been held here. Many early ski camps were also

held in the Little Yoho Valley, also located in YNP, and continue to be held there to this day (Scott, 2005).

Backcountry skiing in GNP dates back to the 1910"s and its start can be credited to Edward Feuz Jr. and Mac McCoubrey (Scott, 2005). During the first half of the 20th century backcountry skiing in GNP was quite limited because of difficulty accessing it and this was exacerbated by the closing of the Glacier House in 1925 (Scott, 2003b). In 1946, the ACC built the A.O. Wheeler Hut close to where the Glacier House once stood, however skiing in the area was still quite limited (Scott, 2005). Until the completion of the Trans-Canada Highway in 1962, the only access to Rogers Pass was by train; the completion of the highway helped increase the popularity and fame that Rogers Pass has today (Scott, 2003b). Popularity of backcountry skiing in GNP slowly grew throughout the 1960s, „70s, and „80"s, but exploded during the 1990"s and continues to gain in popularity today (Scott, 2005).

2.0 Literature Review

2.1 Recreation Specialization

2.1.1 Background information

Recreation specialization is used to examine the differences between segments of recreationists within the same activity (Scott, Ditton, Stoll, & Eubanks, 2005). Bryan (1977) first proposed the concept of recreation specialization in order to provide an understanding of the differences he observed in trout fly-fishing activities in Wyoming, Idaho, and Montana. Bryan (1977) recognized that there were conflicts between different recreation activities, but mostly wanted to understand conflicts within fly-fishing (Bryan, 2000).

From his analysis, Bryan (1977) defined specialization as "a continuum of behavior [sic] from the general to the particular, reflected by equipment and skills used in the sport, and activity setting preferences" (p. 175). This original construct of the continuum ranged from those with general involvement and low intensity to those with specific involvement and high intensity in a particular recreational activity based on behaviours, attitudes and preferences (Bryan, 1979; Scott & Shafer, 2001).

In 1979, Bryan published *Conflict in the Great Outdoors* detailing the construct of recreation specialization. In the book, Bryan (1979) applied recreation specialization to previous data pertaining to photography, hiking and backpacking, mountain climbing, skiing, canoeing, birdwatching, and hunting. Bryan determined specific recreation specialization continuums for each activity; however, these were were only based on secondary data from surveys administered to participants, and not specifically pertaining to recreation specialization or a specialization continuum (Bryan, 1979). Bryan (1977, 1979) proposed two main theories within recreation specialization; the first is a conceptual continuum where recreationists can be segmented into groups, representative of specific behaviours, attitudes and preferences. The second is that of progression; this theory conveys that all recreationists progress towards a higher specialization level, with all recreationists eventually becoming highly specialized (Bryan 1977, 1979).

Since these first studies by Bryan, recreation specialization has been used to look at a wide variety of recreational activities, including: angling (Anderson & Loomis, 2007; Bryan 1977; Chipman & Helfrich, 1988; Choi, Loomis, & Ditton 1994; Ditton, Loomis, & Choi, 1992; Fisher, 1997; Oh & Ditton, 2008; Galloway, 2008; Oh, Ditton, Anderson, Scott & Stoll, 2005; Salz, Loomis, and Finn, 2001); boating and sailing (Cottrell, Graefe, & Confer,

2004; Donnelly, Vaske & Graefe, 1986; Jett, Thapa, & Ko, 2009; Kuentzel & Heberlein, 1997; Kuentzel & Heberlein, 2006); camping (McFarlane, 2004; McIntyre, 1989; McIntyre & Pigram, 1992); canoeing, kayaking and whitewater activities (Bricker & Kerstetter, 2000; Ewert & Hollenhorst, 1994; Kuentzel & McDonald, 1992; McFarlane, Boxall, & Watson, 1998; Galloway, 2008; Wellman, Roggenbuck, & Smith, 1982); downhill skiing (Won, Bang, & Shonk, 2008); hiking and backpacking (Shafer & Hammit, 1995; Virden & Schreyer, 1988; Watson, Niccolucci, & Williams, 1994); hunting (Kuentzel & Heberlein, 1992; Miller & Graefe, 2000, Needham, Vaske, Donnelly, & Manfredo, 2007); mountaineering and rock climbing (Dyck, Schneider, Thompson & Virden, 2003; Ewert & Hollenhorst, 1994; Rapelje, 2004); SCUBA diving (Sorice, Oh, & Ditton, 2009; Thapa, Graefe, & Meyer, 2006); ultimate frisbee (Kerins, Scott, & Shafer, 2007); and wildlife viewing (Cole & Scott, 1999; Dyck & Baydack, 2004; Hvengard, 2002; Lemelin, Fennel, & Smale, 2008; Martin, 1997; McFarlane, 1994; McFarlane, 1996; McFarlane & Boxall, 1996; Scott, Ditton, Stoll, & Eubanks, 2005; Scott & Thigpen, 2003). Although there have been other studies examining downhill skiing and recreation specialization (Scorgie, 2008; Won et al, 2008), this study was largely influenced by Dyck et al."s (2003) study of mountaineers.

2.1.2 Continuum of recreation specialization

Bryan (1977) established four stages of specialization for anglers: occasional fisherman; generalists; technique specialists; and technique-setting specialists. Bryan (1977) did state that in some aspects there was little difference between the technique and technique-setting specialists and in some aspects they were quite similar. Based on this, Scott and Shafer (2001) stated that the stages of recreation specialization are difficult to define, since they do not always have a beginning and an end; nor can they be easily applied across

different activities. Scott and Shafer (2001) developed three stages of recreation specialization: novice or beginner; established; and, specialized. The continuum that theoretically exists within the recreation specialization framework, and the fact that the continuum evolves over time, has made it difficult to agree on how to define and where to demarcate boundaries within the continuum and how to refer to these differing levels of specialization (Scott & Shafer, 2001).

Many researchers use recreation specialization segments to compartmentalize user groups along a four-tier continuum similar to that established by Bryan, however they name the stages differently (McFarlane, 1994, 1996; McFarlane & Boxall, 1996; McIntyre & Pigman, 1992; Scott & Thigpen, 2003). On the other hand, some researchers have chosen to break the continuum into three stages (Bricker & Kersetter, 2000; Donnely et al., 1986; Dyck et al., 2003; Kerins et al., 2007; Lemelin et al, 2008; Martin, 1997; Wellman et al., 1982). Whereas Chipman and Helfrich (1998) established a six-tier continuum for their study of anglers, Fisher (1997) used a seven-tier continuum for establishing the stages of recreation specialization of anglers. Other studies do not break down user groups into specific stages or levels of specialization, but instead define specialization in broader terms, which is referred to as a continuous variable, from low to high, without any set levels. Many of these studies also compare specialization with other variables (Virden & Schreyer, 1988; McIntyre, 1989; Kuentzel & Heberlein, 1992; Ewert & Hollenhorst, 1994; Watson et al., 1994; Miller & Graefe, 2000). This includes many of the more recent publications relating to recreation specialization (Galloway, 2008; Jett et al., 2009; Oh & Ditton, 2008; Thape et al., 2006). For more information on the continuum of recreation specialization see Appendix 1. For the purpose of this study, the stages of recreation specialization of backcountry skiers were

determined after the data was collected and analysed. It was determined that using two unnamed stages was most appropriate; low and high.

2.1.3 Progression of recreation specialization

Scott and Shafer (2001) believed progression to be the integral element in Bryan‟s original definition of recreation specialization. Researchers argue that the idea of progressing from a lower specialization level to that of a higher specialization is inherent in much of the recreation specialization literature (Lee & Scott, 2004). In some studies, time spent participating in an activity is used as an indicator of recreation specialization level; the assumption being that the longer that one participates in an activity the higher one‟s specialization level becomes (Donnelly et al., 1986; McIntyre & Pigram, 1992; Miller & Graefe, 2000; Virden & Schryer, 1988). However, Scott and Shafer (2001) and Kuentzel (2001) questioned if progression is the integral element of recreation specialization and if progression actually occurs. When referring to a high level of specialization as the destination, Bryan (2001) went as far as stating that "specialization as destination was a moot point in early development of the theory" (p. 344).

Kuentzel and Heberlein (2006) were the first to empirically examine if progression occurred within the recreation specialization framework. Kuentzel and Heberlein (2006) studied sail and power boaters in the Apostle Islands National Lakeshore, in Wisconsin, over a 22 year period from 1975 to 1997. Participants were surveyed three times; once in 1975, 1985 and 1997, to determine their level of specialization at each study interval. Seven dimensions were used to determine level of specialization: boat ownership; frequency of boating on other Great Lakes; frequency of boating on oceans; participation in sailing regattas or races; self-perceived boating skills; self-rated measure of changing interest; and,

whether or not the participant had stopped boating (Kuentzel & Heberlein, 2006). They found that progression from one stage of specialization to a higher stage of specialization was uncommon and that the norm was for people to stay at their current level of specialization or in some cases decline to a lower level of specialization (Kuentzel & Heberlein). Kuentzel and Heberlein (2006) reported that this first examination of recreation specialization using longitudinal data was difficult to conduct and had a low overall response rate. Kuentzel and Heberlein (2006) encouraged more studies of this nature to be conducted to truly understand the progression of recreational specialization. Due to uncertainty towards the concept of progression in specialization, it was not included in this research. However, length of time participating in backcountry skiing as an indicator of level of specialization was included.

2.1.4 Dimensions for measuring recreation specialization level

The biggest area of uncertainty in the framework of recreation specialization is determining how to quantify it (Scott & Shafer 2001). That said, many different dimensions and indicators of these dimensions have been previously used to measure specialization (Scott et al., 2005). Bryan (1977) measured specialization level of anglers‟ based on their "fishing preference, orientation toward the stream resource, history of interest and activity in the sport and relationship of the leisure activity to other areas of life (family, career, other leisure activities)" (p.177). Wellman et al., (1982) measured specialization level of canoeists based on from their investments, past experiences, and the centrality of canoeing to their life. Donnelly et al. (1986) used participation, equipment, skill and boating related interests to measure boaters‟ specialization level. Chapman and Helfrich (1988) determined specialization level on resource use, experience, investments and centrality to life. Virden and Schreyer (1988) measured the specialization level of hikers based on their general

experience, recent experience, equipment and economic commitment, and centrality to lifestyle. McIntyre (1989) measured the specialization level of campers based on attraction, self-expression, and centrality to life. McIntyre and Pigram (1992) believed that specialization should be measured with three dimensions: cognitive, enduring involvement (previously referred to as affective) and behavioural. The cognitive dimension used setting attributes, skills, and knowledge as indicators (McIntyre & Pigram, 1992). Prior experience and familiarity with the activity were determined to be the indicators of the behavioural dimensions. Enduring involvement was measured using self-expression, enjoyment, importance, and centrality as indicators (McIntyre & Pigram). Ditton et al. (1992) measured specialization level of anglers based entirely on the number of days fishing in the last year. Kuentzel and Heberlein (1992) measured the specialization level of white-water kayakers and canoeists on past experience commitment and lifestyle. Ewert and Hollenhorst (1994) measured the specialization level of rock climbers and white-water boating on experience, use history, skill level, involvement and locus of control. McFarlane (1994, 1996) and McFarlane and Boxall (1996) measured the specialization level of birdwatchers" from past experience, economic commitment and centrality to lifestyle. Firsher (1997) measured the specialization level of anglers based on total years fishing, total days fishing a year, importance of number of fish caught, importance of size of fish caught, importance of catch disposition and importance of actually catching a fish. Cole and Scott (1999) measured the specialization level of wildlife viewers on level of skill, number of trips per year, number of days spent on wildlife viewing, yearly expenditures, bird feeders at home, and if they watch birds at home. Bricker and Kerstetter (2000) used level of experience, skill level and ability, centrality to life style, equipment and investments, and enduring involvement to measure the

specialization level of white-water rafters and kayakers. Miller and Graefe (2000) measured the specialization level of hunters based on level of experience, skill level and ability, equipment and investments. Scott and Shafer (2001) argued that specialization should be measured by focusing on behaviour, acquisition of skills and knowledge, and personal commitment; these dimension are very similar to those used by McIntyre and Pigram (1992). Hvenegard (2002) used only two dimensions, economic commitment and centrality to lifestyle, to measure the specialization level of birdwatchers. Dyck et al. (2003) measured the specialization level of mountaineers based on their past experiences, economic and equipment investments, skill level, and centrality to lifestyle. Scott and Thigpen (2003) measured the specialization level of birdwatchers based on behaviour, skill, and commitment; Scott et al. (2005) used theses same indicators to measure specialization level of birdwatchers as well. Thapa et al. (2006) used the dimensions of behavioural, cognitive and affective to determine the level of specialization of SCUBA divers. Kerins et al. (2007) used the same dimensions that Scott et al. (2005) used to study birdwatchers, but in this situation the study was of ultimate frisbee tournament players. Sorice et al (2009) also studied SCUBA divers, but used behaviour, skill and knowledge, and commitment as the dimensions to determine specialization.

These previous studies show that the dimensions for measuring level of specialization are context specific and are dependent on the researchers‟ opinion on what is most applicable to their particular study. The dimensions originally planned on being used for measuring level of specialization for this research project were behavioural, skill level, economic and equipment investment, and centrality to life. These dimensions are based on those used by Bricker and Kersetter (2000), Dyck et al. (2003), Lee and Scott (2004), Scott and Shafer

(2001) and Scott et al. (2005). Indicators used to measure these dimensions were based on the work of Bricker and Kersetter (2000), Dyck et al. (2003), Lee and Scott (2004), Scott and Shafer (2001), Scott et al. (2005) and Sourice et al. (2009). After analysis of the data, these dimensions where changed to centrality, skill/books/time and employment. This is discussed further in Chapter 3 and Chapter 4

2.1.5 Recreation specialization as an independent variable

Recreation specialization has consistently been used as an indicator of the level of intensity of participation in a recreational activity; many researchers have also used it as an independent variable to note intra-and inter-activity differences (Scott and Shafer, 2001). Some of these variables include: attitudes towards depreciative behaviours (Kuentzel & Heberlein, 1992); attitudes towards resource management (Kuentzel & McDonald; McIntyre & Pigram, 1992; Sorice et al., 2009; Oh & Ditton, 2006); compliance behaviours (Jett et al., 2009); environmental and conservation attitudes and behaviours (Oh & Ditton, 2008; Oh et al., 2009; Thapa et al., 2006); equipment preferences (Ewert & Hollenhorst, 1994); motivations (Galloway; 2008, Kuentzel & McDonald, kerins et al., 2007; 1992; McFarlane, 1994; Oh & Ditton, 2008); non-market values (Oh et al., 2005); perceptions of crowding (Kuentzel & McDonald, 1992); physical and social setting attribute preferences (Ewert & Hollenhorst, 1994; Galloway, 2008; Kuentzel & Heberlein, 1992; McFaralne, 2004; Won et al., 2008); place attachment (Bricker & Kerstetter, 2000); and, socialization influences (Kuentzel & Heberlein, 1997; McFarlane, 1996).

Levels of training and certifications have been used as an indicator for the cognitive dimension of recreation specialization (Sorice et al., 2009; Thape et al., 2006); however, to the author‟s knowledge no study has looked at the relationship between recreation

specialization and level of training or certifications and safety practices. Therefore, this study will not only segment backcountry skiers using recreation specialization, it will also examine the potential relationship between specialization, level of safety training or certifications, and safety practices.

2.2 Backcountry Skiers

While there is an extensive amount of peer-reviewed literature related to backcountry skiing that is relevant to this research, there is also a large amount that is outside of the scope of the present study. The latter includes, but is not limited to, avalanche formation, (Schweizer, 2008), avalanche forecasting (Jamieson, Geldsetzer, & Stethem, 2001), and decision making in avalanche terrain (Longland et al, 2005). Extensive non peer reviewed literature related to backcountry skiing can also be found in reports (e.g. CAC, 2008), guide books (Scott, 2003a), websites (e.g. www.skintrack.com; www.biglines.com), magazines (e.g. *Backcountry Magazine*, Cambridge, MA: Height of Land Productions), history books, (Scott, 2005) and instructional / safety manuals (Volken, Schell, & Wheeler, 2007). There is also literature regarding out-of bounds skiing. However, as the literature regards backcountry skiing and out-of-bounds skiing as separate activities, this research will not be included in this literature review (e.g. Gunn, 2010; McCammon, Haegeli, & Gunn, 2008). Literature relevant to this research project covers demographics, avalanche training, avalanche safety practices, and avalanche fatalities (e.g. Adams, 2005; Atkins & McCammon, 2004; Boyd, Haegeli, Abu-Laban, Shuster, & Butt, 2009; Longland et al, 2005; Ham et al, 2010; Tase, 2004; Pfeiffer and Foley, 2006).

2.2.1 Demographics of backcountry skiers

Silverton et al (2007, 2009) examined backcountry skiers and snowboarders, along with other backcountry winter recreationists in Utah, and found that the 75.2% of backcountry skiers and 93.3% of backcountry snowboarders were males, resulting in 79.3% of backcountry skiers, by definition of this research project, being males. Atkins and McCammon (2004) found similar results with 80.7% of their sample (i.e. avalanche recreationists and avalanche professional in the United States) being males.

Silverton et al (2007, 2009) found that the mean age of backcountry skiers was 38, similarly the mean age of backcountry snowboarders was 32. Atkins and McCammon (2006) found the median age of avalanche recreationists was 31 while the median age of avalanche professionals was 42.

Ham et al (2010), Tase (2004), and Sole and Emery (2008) provide demographic information for backcountry recreationists as a whole, however they fail to differentiate between backcountry skiers and other winter backcountry recreationists (e.g. ice climbing, crosscountry skiing, snow shoeing). Since the study by Ham et al. (2010) was conducted during the avalanche season previous to this research project and in the same location, the findings provide useful information regarding winter backcountry recreationists in general in the mountain national parks.

Ham et al (2010) found that 56% of winter backcountry recreationists were male, Sole and Emery (2008) found 75.2% were males; whereas Tase (2004) found that 90.6% of winter recreationists were males. Ham et al. (2010) found that the majority of respondents were between the ages of 19 and 35, with Tase (2004) and Sole (2008) finding similar results for their samples. The majority of backcountry winter recreationist in the mountain national

parks and Western Canada had a higher level of education and greater income than the national averages (Ham et al., 2010; Sole, 2008).

2.3 Avalanche Training and Backcountry Skiers

In Canada, the CAC and the CAA provide five levels of avalanche training: Avalanche Skills Training Level 1 Course (AST1); Avalanche Skills Training Level 2 Course (AST2); Avalanche Operators Level 1 (Level 1); Avalanche Operators Level 2 (Level 2); and, Avalanche Operators Level 3 (Level 3) (CAA, 2009d). Both the AST1 and AST2 courses are designed for recreationists and are organized through the CAC (CAC, 2009a; CAC, 2009b). Avalanche Operators Levels 1, 2 and 3 are designed for avalanche professionals, and are taught through the CAA (CAA, 2009d).

In recent years, there has been more focus on the human aspects of avalanches, resulting in increased research on avalanche training of backcountry skiers. Some of the said research examines if backcountry skiers have any avalanche training (Haegeli et al. 2010; Silverton et al., 2007; Ham et al. 2010; Tase, 2004), and the relationship between training and involvement in avalanche incidents (Atkins & McCammon, 2004; Sole & Emery, 2008; Tase, 2004). While researching the decision-making process of winter recreationist in Western Canada, Haegeli et al. (2009) found that 17% of backcountry skiers in their sample did not have any form of formal avalanche training. Silverton et al. (2007) found similar results with 14% of backcountry skiers in Utah not having any formal avalanche training. Tase (2004) found that an astonishing 36% of winter backcountry recreationists had no training at all. Ham et al. (2010) found 25% of winter recreationists in the mountain national parks had no avalanche training, while 47% of the sample had completed the AST1 course,

15% had completed the AST2 course, 9% had Level 1 training, 1% had Level 2 training and 3% had professional certification.

Atkins and McCammon (2004) found that avalanche professional (defined as those whose profession involves avalanches on a regular basis) and recreationist were relatively equal in their ability to identify and rank signs of instability and stability within the snowpack. However, this study found a drastic difference when looking at the number of avalanches triggered by the different groups; on average professionals triggered 31-40 avalanches whereas recreationists triggered 1-5 on average (Atkins & McCammon, 2004). Atkins and McCammon (2004) attributed this difference to a disparity in the amount of time that professionals spent travelling in avalanche terrain and the nature of their profession. Tase‟s (2004) findings confirm this theory, illustrating that as the level of avalanche training increased so did the involvement in avalanche incidents. Similarly, Sole and Emery (2008) found that those with recreational levels of training travelling in avalanche terrain were at greater risk of being involved in an avalanche incident than those without any training, and that those with professional level training were at further risk of being involved in an avalanche incident (Sole and Emery, 2008), validating the results from the two previously mentioned studies. Although the research demonstrates that those with avalanche training are more likely to be involved in an avalanche than those without training, many researchers question the significance of these results stating that those with training spend more time in avalanche terrain, and therefore are more likely to be involved in avalanches (Tase, 2004; Atkins & McCammon, 2004; O‟Gorman et al., 2003).

In the mountain national parks, avalanche training is not required by law for recreationists travelling in avalanche terrain. That being said, avalanche training is highly

recommended by many different groups and organizations, including Parks Canada (Eng et al., 2010; Parks Canada, 2005). In Canadian National Parks it is required that anyone working as a for-profit guide be certified as either a Ski Guide or Mountain Guide by the ACMG (O"Gorman et al., 2003). Becoming a certified ACMG Ski Guide requires completion of the Avalanche Operators Level 2 training and becoming a certified ACMG Mountain Guide requires competition of the ACMG Ski Guide certification (ACMG, 2010a; 2010b). Custodial groups (see page 102 for definition of „custodial group") travelling in Canadian National Parks are not required to have an ACMG Ski or Mountain Guide when travelling in simple terrain, as defined by the ATES. ACMG Ski or Mountain Guides are required for custodial groups travelling in challenging terrain, as defined by the ATES, and are not allowed to travel in complex terrain (Parks Canada, 2009a).

2.3.1 Recreational Avalanche Training

The AST1 is the entry-level avalanche skills training course provided by the CAC and is designed for people with basic avalanche knowledge and little winter backcountry travel experience. The purpose of AST1 is to provide an entry to the avalanche decision-making framework based on the most advanced and current knowledge available (CAC, 2009a). The CAC estimates that 9000 students took the AST1 course from the 2008 avalanche season to the 2009 avalanche season, with a steady increase in students over the last 10 years; not all of these are backcountry skiers (CAC, 2009d). Does this 9000 include on-line students as well as the on-site course?

The AST2 is the next level of training provided by the CAC that is designed for recreational users. The AST2 is designed for those with a moderate level of training and experience and provides an intermediate level decision-making framework based on the most

advanced and current knowledge available. The CAC estimates that just fewer than 1000 students took the AST2 course from the 2008 avalanche season to the 2009 avalanche season; again not all of these are backcountry skiers. Unlike the AST1 course, the number of students taking the AST2 course seems to have been stagnant over the past several seasons (CAC, 2009d). For more information pertaining to the different recreational avalanche training courses see Appendix 2.

2.3.2 Professional Avalanche Training

The Level 1 course is the first level of professional training for those seeking employment with avalanche risk management. The Level 1 is a prerequisite for the Level 2 and Level 3 as well as several other industry related course and programs (CAA, 2009a).

Unlike Level 1, which is referred to as a "course" (CAA, 2009a), Level 2 is referred to as a "program" and requires more commitment and training than the Level 1 course (CAA, 2009b). Level 2 is an advanced program for individuals working full time with avalanche safety and control operations (CAA, 2009b). It is important to note that the ">100 days of operational field experience in weather, snowpack & avalanche occurrence observation & analysis" (CAA, 2009b, para. 2) prerequisite for the Level 2 program "requires at least two years of active operational field work and experience under the mentorship of CAA Professional Members″ (CAA, 2009b, para. 2).

The Level 3 course is designed for individuals employed in avalanche forecasting, risk management, and / or planning positions and is the highest level of avalanche training (CAA, 2009c). Level 3 certification is required for all Avalanche Forecasters and Avalanche Planners (CAA, 2009c). For more information pertaining to the different professional avalanche training levels see Appendix 3.

2.4 Avalanche Safety Practices

According to Parks Canada, the CAC, avalanche educators and researchers, the minimum safety equipment for those travelling in avalanche terrain is a beacon, probe and shovel, and more importantly, proficiency in operating these tools (CAC, 2009c; Eng, 2010; Jamieson, 2000; Parks Canada 2011b). This entails consistently practicing with one‟s avalanche beacon. Parks Canada and many of the ski hills close to the research location of this project provide "beacon basins" for the sole purpose of said practice (Ham et al., 2010). Silverton et al. (2007) surveyed 353 winter backcountry recreationists and found that out of all user groups, backcountry skiers had the highest percentages carrying safety equipment with 98% carrying a beacon and a shovel, and 77% carrying a probe. Backcountry snowboarders had the next highest level of avalanche safety practices with 90% carrying a beacon and shovel, and 57% carrying a probe (Silverton et al., 2007). These are similar to the results from Tase (2004) where 90% carried a beacon, probe and shovel, and slightly lower than Ham et al. (2010) that found that 92%, 93%, and 92% carried a beacon, probe and shovel, respectively.

Of the 49 backcountry skiers who died from avalanches between the 1996 and 2007 avalanche seasons, 90% were carrying beacons (Jamieson, Haegeli, and Gauthier, 2010). Of the five backcountry skiing-related avalanche fatalities during the 2011 avalanche season, when this research was conducted, only three of those who perished were wearing beacons and beacon issues hindered the search for two of them (CAC, 2011). Ham et al. (2010) found that 18% of backcountry recreationists never practiced with their beacon, 5% had practiced in the last ten years, 24% had practiced within the last year, 29% had practiced last month, and 24% had practiced last week.

According to Parks Canada and the CAC it is also imperative to have knowledge of the current avalanche conditions and danger rating (Parks Canada, 2011a; CAC, 2009c), which are provided on a daily basis for BNP, GNP, and YNP in the avalanche bulletins (Parks Canada, 2011a). The avalanche bulletin not only provides the current avalanche conditions and danger ratings, but also a short synopsis of the snowpack in general. Therefore regular examination of the bulletin, even when not travelling in avalanche terrain on that particular day, is encouraged as it provides long-term knowledge of the season‟s snowpack (Parks Canada, 2011). Silverton et al., (2009) looked at the same survey group as Silverman et al., (2007); however the purpose of this study was to examine the ability of different user groups to accurately estimate the avalanche danger of their trip. They found that 90.6% of backcountry skiers correctly estimated or overestimated the avalanche danger, and 86.7% of backcountry snowboarders correctly estimated or overestimated the avalanche danger (Silverton et al., 2007). It should be noted that participants‟ responses in this study were only compared with the danger for the specific elevation bands they were travelling in and not all three elevation bands. It is also important to note that overestimating was grouped together with correctly estimating as overestimating leads to safer avalanche practices (Silverton et al., 2007). To the author‟s knowledge there is no other research that asks backcountry skiers about the avalanche danger rating on their day of travel.

Because companion rescues (i.e. being rescued by another member of the party) provided the greatest chance for surviving an avalanche burial, travelling alone in avalanche terrain is highly discouraged (Jamieson et al. 2010, Eng, 2010). Silverton et al. (2007) found that 9% of backcountry skiers and 14% of backcountry snowboarders travelled in avalanche

terrain alone. Tase (2004) found that 37% of winter backcountry recreationists travelled both alone and in groups and 1% travelled only alone.

For the purpose of this research, the following variables were used to measure the level of avalanche safety practices of backcountry skiers; whether or not they carried the minimum safety equipment (beacon, probe and shovel), how often they checked the avalanche bulletin, how often they practiced with their beacon, whether or not they possess the correct knowledge of the current avalanche danger, whether or not they travelled alone, and whether or not they practiced the minimum safety practice (defined as a combination of the following variables; carrying the minimum safety equipment, having avalanche training and correct knowledge of the current avalanche danger).

2.5 Avalanches

According to Daffern (1999, p.11), "Snow Avalanches are the greatest source of danger for mountain travellers in the winter" . Snow avalanches are mass movement natural hazards, that are in the same group as rock and ice avalanches, rockfalls, landslides, and debris torrents; they are termed mountain-slope hazards (McClung & Schaerer, 2006). Despite the very common occurrence of avalanches, most avalanche-prone areas are uninhabited (McClung & Schaerer, 2006). Schaerer (1984, as cited in Stethem, Jamieson, Schaerer, Liverman, Germain, &Walkler, 2003) estimates that there are at least 1.5 million avalanches a year in Canada that could negatively impact humans; however, only 2-5% of these avalanches occur in locations that could potentially impact humans. Unlike victims of the "big five" (e.g., earthquakes, floods, tropical storms, droughts, volcanic hazards) natural hazards for whom there is a long history of living in hazardous areas, backcountry skiers whom are victims of avalanches voluntarily expose themselves to avalanche hazard (Haegeli,

et al.,2009). Recent statistics show that 92% of avalanche fatalities are the result of an avalanche caused by a human trigger (Jamieson et al., 2010).

2.5.1 Avalanche formation

Simply put "A snow avalanche ensues when a pent up snow mass loses its hold and is discharged from the mountainside" (Seligman, 1936, p. 292, as quoted in Stethem et al., 2003, p.489). However, an avalanche is a multifaceted process that depends on many variables including slope angle, gravity, weather, and the snowpack (Stethem et al., 2003). An avalanche occurs when the forces applied to the snowpack are greater than the internal forces or cohesion of the snowpack (Daffern, 1999). The cohesion of a snowpack is dependent on slope angle, accumulation and deformation of a snowpack, and short-term fluctuations in weather (Stethem et al., 2003).

For the internal strength of a snowpack to be overcome, a triggering mechanism is needed (Daffern, 1999). The triggering mechanism can be thought of as the straw that broke the camel‟s back. Triggering mechanisms can either be natural or artificial. Examples of natural triggering mechanisms are precipitation, wind deposition (wind loading) of snow, temperature change, solar radiation, cornice fall, icefall and earthquake (Stethem et al., 2003). Some examples of artificial triggering mechanisms are snowmobilers, snowboarders, skiers, hikers, mountaineers, traffic, machinery, and explosives (Stehem et al., 2003). In the context of backcountry skiing the artificial triggering mechanism takes the form of backcountry skiers.

The slope angle is one of the determining factors for the shear strength of the snowpack and thus the likelihood of a potential avalanche (McClung & Schaerer, 2006). When the slope angle is 25° or less (McClung & Schaerer, 2006) the likelihood of an

avalanche is lowest; the only avalanches that tend to occur at these angles are wet slab avalanches (Jamieson, 2000). As the slope angle increases from 25° to 30° the likelihood of an avalanche slightly increases. Avalanches are most common when the slope angle is between 30° and 45°. Above 45° avalanches are infrequent, because the snowpack naturally and regularly sluffs, releasing some of the force placed on it (Jamieson, 2000).

As more snow accumulates and the depth and weight of the snowpack increases, so does the force being applied to it. If the amount of snow continues to increase the snowpack will fail and an avalanche may occur (Daffern, 1999). Deformation of the snowpack can be caused by many forces, but when it does happen, the snowpack can either become more or less cohesive which results in both a lower or higher avalanche danger, depending on specific conditions (McClung & Schaerer, 2006). Short-term weather fluctuations can cause loading of slopes, deformation in the snowpack and the creation of surface hoar, just to name a few. Short-term weather fluctuations can affect different slopes in different ways, resulting in variable avalanche conditions within relatively close proximity (McClung & Schaerer, 2006).

2.5.2 Types of Avalanches

There are two types of avalanches, loose-snow avalanches and slab avalanches; the type of avalanche depends on the snowpack and the slope angle (Daffern, 1999). A loose snow avalanche starts at a point when a small section of snow breaks loose (Daffern). This small amount of snow causes more snow to be released in a triangular pattern (Stethem et al., 2003). Loose-snow avalanches occur on steep slopes when the snow has little internal cohesion (Daffern, 1999). There are two types of loose-snow avalanches, dry and wet. Dry loose-snow avalanches occur in the winter months during or shortly after a snow storm, and are not as dangerous as the wet variety (Daffern, 1999). Wet loose-snow avalanches occur in

the spring or summer and are caused by warmer temperatures, rain or melt water. This type of avalanche can be extremely dangerous as the snow is extremely heavy and dense and can travel for long distances with extreme force (Daffern, 1999).

Slab avalanches tend to be larger and more dangerous than loose-snow avalanches (Stethem et al., 2003). A slab avalanche occurs when a cohesive section, or slab, of snow releases from the rest of the snowpack and slides downhill letting gravity do its work (Daffern, 1999). This is caused when "the shear stress exceeds the shear strength between snow grains" (Stethem et al., 2003, p. 489). The slab can consist of many different layers of snow or just the most recent layer of snow (Stethem et al., 2003).

Avalanches are classified into five size groups based on their potential destructive ability (Stethem et al., 2003). Table 1 provides information on the five classification sizes of avalanches.

Table 1.1

Canadian Snow Avalanche Size-Classification System and Typical Factors

Size	Description	Typical Size (tonnes)	Typical path length (m)	Typical impact pressures (kPa)
1	Relatively harmless to people	<10	10	1
2	Could bury, injure or kill a person	10^2	100	10
3	Could bury a car destroy a small building or break a few trees	10^3	1000	100
4	Could destroy a railway car, large truck, several buildings or a forest with an area up to 4ha	10^4	2000	500
5	Largest snow avalanche known; could destroy a village or a forest of 40ha	10^5	3000	1000

Note: Adapted from McClung and Schaerer (2006)

2.6 Avalanche fatalities

Historically, avalanche fatalities involved those in the transportation and natural resource industry who were involuntarily exposed to avalanche risks (Stethem et al., 2003). The first recorded avalanche fatality in Canada was in 1782. Since then there have been 758 avalanche fatalities, up to the 2011 avalanche season (Campbell et al., 2007, Jamieson et al., 2010; CAC 2008, 2009, 2010, 2011).

During the 225 year period from 1782 to 2007 there was an average of just three avalanche fatalities a year (Campbell et al., 2007). In the period between 1970 and 1996 there was an average of 8.5 avalanche fatalities a year. Later in the 1990"s this number increased to 12.5 (Stethem at al., 2003). From 1999-2009 there was an average of 14.4 avalanche fatalities a year (CAC, 2009d). Of the 139 recreational avalanche fatalities that occurred between the 1996 and 2007 avalanche seasons, 87.8% were males and 28.8% were between the ages of 20 and 29, with the median age being 33 (Jamieson et al., 2010). It is also estimated that approximately 75 people are injured from avalanches every year (Haegeli et al., 2009). The number of avalanche fatalities each year is dependent on many aspects; number of people travelling in avalanche terrain, weather, snowpack, and mitigation measures, just to name a few (McClung & Schaerer, 2006; Campbell et al., 2007; Stethen et al., 2003).

A 21-year study (1984 to 2005) conducted in British Columbia and Alberta examined 204 avalanche fatalities that included both avalanche data and mortality data (Boyd, et al. 2009). Asphyxiation was the cause of death in 75% of the fatalities with 24% being caused by trauma, and 1% being caused by hypothermia. It was also found that trauma was a contributing factor for 13% of those that died from asphyxiation (Boyd et al., 2009).

When caught in an avalanche, one has an 80% chance of survival if one remains completely on the surface, and a 40-45% chance of survival if one is partially or completely buried (McClung & Schaerer, 2006). For those who are completely buried, the probability of survival is almost completely dependent on the duration of burial (Radwin & Grisson, 2002). Duration of burial is often related to the depth of a complete burial, as the deeper one is buried the longer it takes to be dug out (McClung & Schaerer, 2006). When a buried person is recovered within 15 minutes, the likelihood of survival is 92% (Radwin & Grisson, 2002). After this, the likelihood of survival drops to 50% after 30 minutes and to 30% after 35 minutes. Therefore a quick recovery is extremely important. The proper use of avalanche safety equipment can help keep this recovery time low. The likelihood of surviving burial for longer periods of time is dependent on large air pockets being present around the individual (Radwin & Grisson, 2002).

2.6.1 Avalanche fatalities and Backcountry Skiing

The majority of backcountry skiing avalanche fatalities are the result of avalanches triggered by the skier him/herself or by another member of his/her group (Grimsdottir & McClung, 2006; Jamieson et al., 2010). During the thirty avalanche seasons (1981 to 2010) prior to this research project there were a total of 133 backcountry skiing avalanche fatalities in Canada resulting in an average of 4.4 fatalities per year. The average declined slightly to 4.3 fatalities per year during the ten avalanche seasons (2001-2010) prior to this research (Jamieson et al., 2010; Jamieson & Goldsetzer, 1996; CAC 08, 09, 10). During the avalanche season (2011) in which this research was conducted there were five backcountry skiing fatalities as a result of avalanches (CAC, 2011).

As noted above, Boyd et al. (2009) found that asphyxiation was the cause of death for 46 out of the 62 backcountry skiing fatalities, from 1984 to 2005. Some or all of these fatalities could have potentially been prevented if the buried victims had been recovered faster. One way of decreasing the time of recovery for buried victims is proper use of avalanche safety equipment, of which beacon practice is an integral part (CAC, 2009c).

3.0 Methods

A quantitative approach was chosen for this research project, as this is the dominant method used in research related to recreation specialization; it is also the best method to answer the six research question of this research project. According to Kalaian (2008), quantitative research is used for "testing theories and specific research hypotheses that consider finding differences and relationships using numeric data and statistical methods to make specific conclusions about the phenomena" (para. 3). As this is the specific aim of the researcher"s use of the survey tool, it is fitting that this method be used. Additionally, quantitative research is also a less expensive technique for collecting a large amount of data in a relatively short time (Kelley, Clark, Brown & Sitzia, 2003). A quantitative survey was deemed the best methodological choice for research because of the pragmatic limitations of this study, the reasons listed above, and that a large portion of the survey had already been designed by Parks Canada.

A questionnaire was administered on site to recruit survey respondents among backcountry skiers in the mountain national parks; this questionnaire surveyed respondents about their levels of specialization and avalanche training as well as their avalanche safety practices.

3.1 Interviewer-Initiated Self-Administered Questionnaires

An interviewer-initiated self-administered questionnaire was chosen as the data collection technique for this research project because it combined the advantages of both face-to-face interviews and self-administered questionnaires (de Leeuw & Hox, 2008). The advantages to having an interviewer initiate a self-administered questionnaire included allowing the interviewer, in this case the primary researcher, to personally approach the

potential respondents, inform them about the research, and, answer any questions pertaining to the study. Literature states that the personal approach used in interviewer initiated self-administered questionnaires results in higher response rates (de Leeuw & Hox, 2008) and can greatly limit the amount of item non-response bias compared to self-administered questionnaires (Dialsingh, 2008). In this study, the interviewer was also available to answer any questions regarding the actual questionnaire tool, which limits respondent error, while minimizing interviewer bias, which is a common concern with interview initiated self-administered questionnaires (Dialsingh, 2008).

The main disadvantages with interview-initiated self-administered questionnaires, are cost, time, and interviewer bias (Dialsingh, 2008; Vaske, 2008). The main issues pertaining to the cost of interviewer-initiated self-administered questionnaires is the cost of paying the interviewer to be in the field, providing them with housing, and providing them with transportation (Vaske, 2008). Since this research project was conducted in conjunction with Parks Canada, and Parks Canada provided housing in Rogers Pass, the costs for housing and transportation were minimal. In terms of time commitment, the survey instrument was limited to five pages so as not to make completion of the questionnaire too onerous. To limit the potential impact of interviewer bias, the interviewer interacted as little as possible with the respondent. To encourage potential respondents to partake in the questionnaire, all respondents, including those that did not complete the survey had their names entered for a prize provided by Parks Canada. To protect the identity and provide anonymity for the respondents their names and emails were kept separate from the questionnaires

Questionnaires were administered onsite with collection taking place after the surveys were completed. Having the surveys administered and collected onsite limited the amount of

non-response bias common with other forms of collection, such as mail-back surveys (de Leeuw & Hox, 2008).

3.2 Survey Instrument

As stated above, the data collection technique selected for this study was a questionnaire. The questionnaire (see Appendix 8) contained four sections. The first section of the questionnaire consisted of twelve questions; five of these questions were for the sole use of Parks Canada with the additional seven being used for this research project and by Parks Canada. The first question asked respondents what their favourite winter activities were. Two questions from this section were used as indicators for the behavioural dimensions of specialization; number of years participating and number of days a year participating (Sorice et al, 2009; Scott et al 2005). Level of avalanche training was determined in this section, along with three measurements of avalanche safety practices; how often the respondent checked the avalanche bulleting, how often the respondent practiced with their beacon, and if they travelled alone.

The second section of the questionnaire contained three questions revolving around avalanche risk; the first question had three parts, with the first part (a) being for the use of Parks Canada. The remaining two parts (b and c) contributed to the determination of the avalanche safety practices of the respondent.

The third section of the questionnaire contained five questions to determine specialization level with indicators for skill and commitment. The first question consisted of eight five-point Likert-scale sub-questions with the first of these being used as an indicator for the skill dimension of specialization (Scott & Shafer, 2001) and the following seven being used as indicators for the commitment dimension (Scott & Shafer, 2001; Dyck et al.

2003). The second question in this section asked respondents to rate their own backcountry skiing skills, this question was used as an indicator for the skill dimension (Dyck et al. 2003). The third question asked respondents what type of backcountry skiing terrain they preferred based on the ATES ratings; this question was used as an indicator for skill and is based on the work of Bricker and Kersetter (2000) with modifications to represent backcountry skiing. The fourth question was also used as an indicator for the skill dimension and asked respondents to rate their backcountry skiing skills relative to other backcountry skiers on a five point Likert-scale (Sorice, 2009). The final question of this section asked respondents how many books relating to backcountry skiing they owned; this was used as an indicator for the commitment dimension (Bricker and Kersetter, 2000).

The fourth section of the questionnaire contained eight questions, five were socio-demographic based, determined by Parks Canada, two were specialization based, and the final question was an open ended question asking respondents for additional comments. The first of the two specialization questions in this section asked respondents how much money they spent on winter backcountry activities in the last year (Bricker and Kersetter, 2000). The second question asked how much it would cost to replace all the respondents winter backcountry gear. Both were open-ended questions and served as indicators for the commitment dimension (Sourice 2009; Scott et al., 2005). The questionnaire used in this research project can be found in Appendix 8.

3.3 Location of Study

This study took place in the mountain national parks of Canada, and more specifically BNP, GNP, and YNP. BNP was established in 1885, making it Canada‟s first national park, and covers an area of 6641 square kilometres the Rocky Mountains and is located entirely in

Alberta (Parks Canada, 2009). As stated earlier, backcountry skiing in BNP is quite popular. Parks Canada operates two backcountry shelters inn BNP, Egypt Lake Shelter and Bryant Creek Shelter, for enthusiasts who wish to sleep inside while partaking in overnight backcountry ski trips (Parks Canada, 2007). Along with these two huts there are six ACC huts located throughout the park (Peyto Hut, Bow Hut, Balfour Hut, Neil Colgan Hut, Castle Mountain Hut, and the Abbot Pass Hut) operated by the ACC. Skoki Lodge, the original backcountry lodge in BNP (est. 1931) is still operating in the area behind the Lake Louise Ski Area (Scott, 2005). To encourage safe backcountry ski travel, Parks Canada has made available ATES ratings for 101 locations in BNP, and provides regular avalanche bulletins throughout the winter months (Parks Canada, 2005).

YNP is adjacent to BNP, and is located entirely in British Columbia. YNP was established in 1886 and covers 1310 square kilometres of the western flank of the Rocky Mountains (Parks Canada, 2009). Within the boundaries of YNP there are three ACC huts (Elizabeth Parker, Stanley Mitchell, and Scott Duncan) and one backcountry lodge (Lake O'Hara Lodge) that service backcountry skiers (Scott, 2003a). To encourage safe backcountry ski travel, Parks Canada has made available the ATES rating for 34 locations, in YNP and provides regular avalanche bulletins throughout the winter months (Parks Canada, 2005).

The Peyto, Balfour, Scott Duncan and Bow huts are all on the Wapta Icefields which spans sections of BNF and YNF, and the Stanley Mitchell hut, which is located in the Little Yoho Valley, provides access to the Wapta Icefields. Both the Wapta Icefields and Little Yoho Valley provide excellent skiing (Scott, 2005).

GNP was established in 1886 and covers 1350 square kilometres of the Columbia Mountains of south-eastern British Columbia, and is located approximately halfway between the towns of Golden and Revelstoke (Parks Canada, 2009). The name, GNP, stems from the fact that this park is home to over 400 glaciers that cover one tenth of its area (Parks Canada, 2009). Rogers Pass is located within GNP and is considered the birth place of mountaineering in Canada (Scott, 2003b); in much of the literature the terms Rogers Pass and GNP are used interchangeably (Scott, 2005). Rogers Pass was named for Major A.B. Rogers who was the first European to discover the pass in 1881 allowing the Canadian Pacific Railway to cross the Columbia Mountains, completing its transcontinental line. Receiving over ten meters of snowfall annually and providing up to 1500 vertical meters of skiable terrain (Scott, 2003b), the area has become "the mecca of backcountry skiing in North America" (Scott, 2005 pg. 163). There are four backcountry cabins/huts (A.O. Wheeler Hut, Asulkan Cabin, Sapphire Col Hut, and Glacier Circle Cabin) that service backcountry skiers in the winter, all of which are operated by the ACC (Scott, 2005).

The Trans-Canada Highway transects GNP from east to west. There are over 250 avalanche start zones, resulting in over 130 avalanche paths, threatening this 40 kilometre stretch of highway (Campbell et al., 2007). The Royal Canadian Horse Artillery is responsible for avalanche control of these avalanche paths through the use of 105mm Howitzers (Campbell et al., 2007). Parks Canada established the Winter Permit System to regulate entry into GNP during the winter and closes areas of GNP when avalanche control is going to be conducted in specific areas (Dafoe et al., 2008). Under the Winter Permit System there are five Winter Prohibited Areas, which are closed to all visitors, and 15 Winter Restricted Areas, which are opened and closed on a daily basis depending on the avalanche

control required for that particular day. Either an Annual or Daily Winter Permit is required to access the 15 Winter Restricted Areas. Annual Winter Permits allow holders to enter any Winter Restricted Area that is open on that particular day without checking in at the RPDC, to obtain an Annual Winter Permit, one must complete an orientation session. Daily Permits are obtained at the RPDC and are only valid for the day of issue and for the specific Winter Restricted Areas listed on the Permit (Parks Canada, 2011b). Along with the Winter Permit System, Parks Canada makes available to the public the ATES rating for 49 locations in GNP, and provides daily avalanche bulletins throughout the winter months (Parks Canada, 2005).

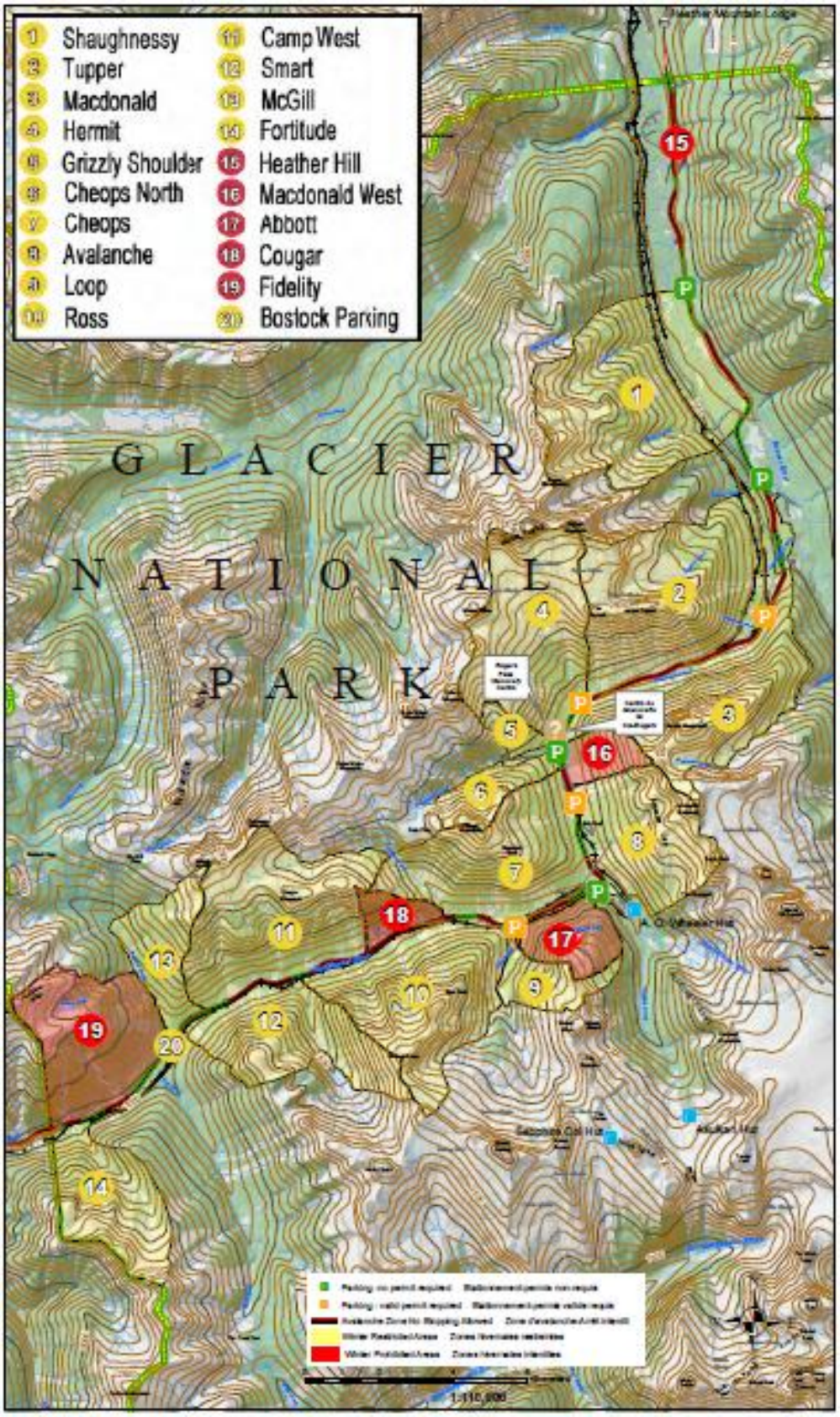

Figure 3.1: *Map of Winter Prohibited and Winter Restricted areas in GNP*

3.4 Data Collection Strategy

Trail-counters at 36 popular trailheads in Glacier, Banff, Yoho, and Kootenay National Parks have been used to monitor the users that are defined as all backcountry skiers in the mountain national parks in this study. (Ham et al., 2010). Because these trail counters measured recreationists from a wide range of winter activities, the primary researcher referred to three popular guide books (Scott, 2003a; 2003b; 2005) to identify trail counters that were located in areas where backcountry skiing was the primary activity. This resulted in 15 trail counters being used to estimate the population size: eight in GNP (Asulkan 1, Asulkan 2, Balu Upper, Balu Lower, Bostock, Hermit, Loop Brook, and NRC Gully), two in YNP (Sherbrooke, and Yoho Valley Road), four in BNP (Bow Hut approach, Bow Summit, Healey Pass, and Peyto Hut approach) and one in KNP (Chickadee Valley). These trail counters had a combined count of 38,621, representing approximately 19,311 round-trip visits (Ham et al., 2010). Despite its inherent limitations, this number was used in this study as representative of the population size of backcountry skiers in the mountain national parks.

To have a confidence level of 95% and confidence interval of five for data from a population of 19,311, the sample size should be 377 according to the *Sample Size Calculator* provided by Creative Research System (2010). This minimum sample size however was not reached; however, a usable sample size of 369 was obtained. Respondents were selected using convenience sampling due to the many limitations associated with sampling a small population in a large geographical area (Battaglia, 2008). Respondents were contacted at the RPDC, an Annual Winter Permit Night in Golden, BC, an Avalanche Awareness night in Banff, AB, and the Elizabeth Parker and A.O. Wheeler huts . Respondents were contacted on most weekends during the winter season, as weekends are the most popular time for

backcountry skiers to visit the mountain national parks (K. Rettie, personal communication, August 19, 2010). Respondents were also contacted on select weekdays to obtain a more representative sample (Battaglia, 2008). In addition to the 81 days on which respondents were contacted, the primary researcher spent an additional 25 days in mountain national parks during the 2011 avalanche season.

3.5 Data Analysis

The two most common methods for analysing survey data to assign respondents to stages of recreation specialization are an additive or composite index and a cluster analysis (Lee & Scott, 2004; Kerins et al., 2007). The additive index adds up the scores from the multiple indicators and assigns this score to the particular person, who is then placed on a linear continuum (Virden and Schreyer, 1998). This linear continuum is then either treated as a continuous variable (Galloway, 2008), or divided into discrete categories (Lemelin, et al., 2008). Conventionally, the values assigned to demarcate the boundaries of each category are chosen such that each of the groups contains an equal number of respondents (Dyck et al., 2003; Ditton et al., 1992). However, some researchers have assigned values that create discrete categories with different-sized groups (Shafer and Hammitt, 1995; Lemelin et al., 2008). The main complaint about this technique is that it assumes that the indicators and dimensions for example, do not co-vary (Scott et al., 2005). This was demonstrated in the Lee and Scott (2004) study of birders. Thus, a cluster analysis approach, which assumes and allows for indicators to co-vary (Scott et al. 2005) was chosen for this study. A K-mean cluster analysis was run using two, three, four, five and six groups to determine specialization level. A K-mean cluster analysis with two levels of specialization provided the greatest heterogeneity between levels and enough respondents in each group for further

analysis. Trial analyses with differing levels of specialization confirmed that use of two levels provided the greatest information. Thus respondents were divided into two levels of specialization for this study.

A principal component analysis with varimax rotation was run on the indicators for specialization level to determine which dimensions they served as indicators for in this research project; reliability, that is, internal consistency of these indicators was tested using Cronbach‟s alpha, this was based on previous studies of recreation specialization (Lee & Scott 2004; Kerins et al 2007). The relationship between specialization level and avalanche training and all measurements of avalanche safety practices were measured using Kendall‟s tau-c two-tailed correlation analysis. This correlation was chosen over more common methods of analysis as it is designed for determining the correlation between two ordinal scales, which have a different number of values between the variables, and have many ties between values (Elifson et al., 1990; Singh, 2007).

3.6 Data Treatment

Several questions from the questionnaire (see Appendix 8) were omitted from analysis because they were for exclusive use by Parks Canada and outside the scope of the present study. For example, question one was omitted since this study only included questionnaires from those who selected *backcountry skiing, backcountry snowboarding,* and/or *ski touring* as a favourite backcountry activity. On this basis, six questionnaires were excluded. Question three asked respondents whom they travelled with most often, giving five choices. Although this information is of importance to Parks Canada, this study was only concerned with the proportion of respondents who selected solo skying. Questions 11 and 13 (a) were excluded from analysis because they were for the exclusive use of Parks Canada.

Two additional questions (number 25 and 26 – amount of money spent in a year on the activity, and cost of replacing all equipment respectively) were also omitted due to the high number of non-responses.

Questions four, five and 20, which asked the number of years participating in the sport, number of days per year participating in the sport, and number of books owned, respectively, allowed for written responses. These open-ended responses were coded into four roughly equal groups using a median split method (Scott et al. 2005). This method was selected due to the wide range of values reported for these questions. This approach entails dividing the values into two groups based on the median of the entire sample; these two groups are then divided again using the same method. This resulted in four quartiles; those within the lowest quartile were assigned a value of 1, those in the highest quartile were assigned a value of 4, with those in the middle two quartiles being assigned values of 2 and 3.

Responses to question 13 (b) (current avalanche danger rating according to most current avalanche bulletin for each of three elevation bands) were coded in multiple steps. First, if the danger rating for one, two or all three of the elevation bands was unanswered, the response was coded as blank (1). This step was then repeated for those that responded not knowing the current danger rating for one or more of the elevation bands, and if so were coded as did not know (2). Next, questions providing hazard ratings for all three zones were analyzed. The respondent‟s ratings were compared with the actual avalanche bulletin posting for that particular day; if any one of the responses for the three elevation bands was under the actual rating the entire answer was coded as underestimated (3) (e.g., the respondent reported the danger as LOW while the actual danger according to the bulletin was MODERATE). This step was then repeated with the remaining questionnaires, for respondents that reported

the danger as being higher than the actual bulletin rating; these were coded as overestimated (5) (e.g., respondent reported the danger as MODERATE and the actual danger according to the bulletin was LOW). Next, all respondents that reported the current avalanche danger correctly, for all three elevation bands, were coded as correct (4) (e.g., the respondent reported the danger as MODERATE for all three elevations and the actual danger according to the bulletin was MODERATE). Finally, all blank (1), not known (2), and underestimated (3) responses were coded as being incorrect (0), and all correct and overestimated responses were coded as being correct (1). This is similar to the methods used by Silverton et al. (2009) but changed to represent all three elevation bands.

Because more than one response was sometimes given to question 10 (level of avalanche training), the responses were coded using the highest level of training selected. In particular, it was common for respondents to select both CAA Level 2 and Professional Certification. This is probably because completion of the CAA Level 2 is a prerequisite to becoming an ACMG Ski and Mountain Guide (ACMG, 2010a; 2010b). The respondents who wrote in their certification as AAIRE Level 2 were coded as CAA Level 1, although they are not exactly the same (B. White, personal communication, July 26, 2011). The following coding scheme was used for avalanche training; none = 0, AST1 = 1, AST2 = 2, CAA Level 1 = 3, CAA Level 2 = 4, and Professional Certification = 5.

Multiple responses to questions 17 and 19 (backcountry skiing skill, and backcountry skiing skill related to others) were coded to the lowest level selected. Multiple responses to question 18 (preferred backcountry skiing terrain) were coded to the highest level of terrain selected; simple was coded as 1, challenging as 2, and complex as 3. This was due to many

responses selected multi terrain and then wrote in depending on conditions and the particular situation.

3.7 Data Storage

While this research was being conducted, completed questionnaires were kept in a locked cabinet in the primary researcher‟s residence. The data were entered into a password-protected computer that only the primary researcher had access to. After completion of this research project, all data will be given to the faculty supervisor, Dr. R. Harvey Lemelin, to be stored for five years, as directed by the Lakehead University Research Ethics Board.

4.0 Results

This chapter presents the results from the research that was conducted from December 2010 to May 2011 in the Canadian mountain national parks. This chapter addresses the six research questions. The total number of respondents in the sample was 369, with the majority, 236, from GNP (65%), 59 (16%) from BNP, 18 (5%) from YNP, and 56 (15%) from the communities of Golden, BC (N 40, 11%) and Canmore, AB (N 16, 4%).

4.1 Sample Demographics

Table 4.1 summarizes the demographics of the sample. The majority (65%) of the respondents in the sample were males. Almost half (48.5%) of the respondents were in the 26 to 35 year age-bracket with the 36 to 45 year age-bracket representing the next largest percentage of the sample (16.8%). With respect to the highest level of education, approximately two-thirds (65.9%) of the sample had a university or college degree, 22% had a post-graduate degree, and the remainder of the sample had not completed postsecondary education. Seventy-two-point-one percent of the sample were employed, 11.9% were retired, 10.0% were students, and the remainder of respondents were unemployed (for this study it should be noted that respondents who selected both student and employed were coded as students). More than three-quarters (76.4%) of the sample were Canadian, of whom 43.4% were from Alberta and 36.9% were from British Columbia. The United States was home to 12.5% of the sample. Australians represented 3.3% of the sample. Europeans, who made up 7.3% of the sample, were from the following nations: Norway, Switzerland, Germany, United Kingdom, Sweden, France, Ireland, Luxemburg, Denmark, Austria, and Spain.

Table 4.1

Sample Demographics

Characteristic	Number (n)	Percentage (%)
Gender		
Male	240	65
Female	129	35
Age		
19-25	60	16.3
26-35	179	48.5
36-45	62	16.8
46-55	38	10.3
56-65	22	6.0
>65	8	2.2
Education		
High School	45	12.2
College or University	243	65.9
Post-Graduate Degree	81	22.0
Employment		
Employed	266	72.1
Unemployed	22	6
Retired	44	11.9
Student	37	10.0
Country of Origin [a]		
Canada	281	76.4
USA	46	12.5
Europe	27	7.3
Australia	12	3.3
South Africa	1	0.3
New Zealand	1	0.3
Province of Origin [b]		
Alberta	121	43.4
British Columbia	103	36.9
Ontario	34	12.2
Quebec	15	5.4
Other Prairies [c]	3	1.1
Maritimes [d]	2	0.7
Territories	1	0.4

[a] 368 respondents, one did not give a country of origin
[b] 279 respondents, two gave multiple home provinces
[c] Two from Saskatchewan, one from Manitoba
[d] One from Nova Scotia and one from New Brunswick

4.2 Level of Avalanche Training

Respondents that had completed the AST 1 as their highest level of training were the most predominate group in the sample representing 40.1%, followed by those respondents with no formal training at 17.1%. Table 4.2 summarizes the avalanche training of the sample. Level of training was rank from highest to lowest in the following order, Professional Certificate, CAA Level 2, CAA Level 1, AST 2, AST 1, and none.

Table 4.2

Level of Avalanche Training

Level of Training	Number (n)	Percentage (%)
None	64	17.3
AST 1	148	40.1
AST 2	54	14.6
CAA Level 1	63	17.1
CAA Level 2	11	3.0
Professional Certificate	29	7.9

4.2.1 Avalanche training and age

When avalanche training and the age group of respondents were compared some interesting results were found. Approximately one-quarter of the respondents in the 19 to 25 year, 46 to 55 year, and 56 to 65 year age categories did not have any training. In contrast, only 14.5% and 11.3% of respondents in the 26 to 35 year and the 36 to 45 age categories, respectively, did not have any training. All eight respondents over the age of 65 years had training. Comparing this with the age demographics (Table 4.1), it can be seen that the age group with the largest sample size (26-35 age group, 48.5% of the sample) had not only the highest percentage with training, but also the highest percentage with a Professional Certificate.

Table 4.3

Level of Avalanche Training and Age Group [a]

Level of Training	Age Group					
	19-25	26-35	36-45	46-55	56-65	>65
None	25.0	14.5	11.3	26.3	27.3	0.0
AST 1	45.0	40.2	22.6	42.1	59.1	75.0
AST 2	10.0	15.6	19.4	15.8	4.5	12.5
CAA Level 1	20.0	16.2	24.2	10.5	9.1	12.5
CAA Level 2	0.0	5.6	1.6	0.0	0.0	0.0
Professional Certificate	0.0	7.8	21.0	5.3	0.0	0.0

[a] Reported as percentage of age group

4.2.2 Avalanche training and gender

When comparing gender and avalanche training, it was found that nearly a quarter (24%) of females did not have any training, whereas only 13.8% of males did not have training. On the other end of the training spectrum, 25 males(10.4%) had Professional Certification compared to 4 females (3.1%).

Table 4.4

Level of Avalanche Training and Gender [a]

Level of Training	Male	Female
None	13.8	24.0
AST 1	38.3	43.4
AST 2	15.0	14.0
CAA Level 1	18.3	14.7
CAA Level 2	4.2	0.8
Professional Certification	10.4	3.1

[a] Reported in percentage of gender

4.3 Avalanche Safety Practices

The responses to the question pertaining to safety equipment indicated that the vast majority of the sample carried a beacon (88.9%), a probe (88.3%) or a shovel (87.5%). Eighty-six point seven percent of the sample carried all three, which is considered to be the

minimum safety equipment as established by the CAC (CAC, n.d.). Almost half (46.6%) of the sample said they checked the avalanche bulletin every time they were planning a trip, 3% said they never checked the avalanche bulletin, 9.8% of the sample also stated that they never practiced with their beacon. Only 59.6% were aware of the avalanche danger for the day: 38.5% of the sample knew the correct avalanche danger rating for the day and 21.1% overestimated the avalanche danger for the day. The 40.5% of the sample that were unaware of the current avalanche danger included those that underestimated the danger (22.0%), did not know the danger (3.3%) or provided no response (15.2%). Table 4.5 summarizes the avalanche safety practices of the sample.

In regards to this research project, a person was considered to meet minimum safety practices if he/she carried minimum safety equipment (beacon, probe, and shovel), had avalanche training, and had correct knowledge of the avalanche danger. Although respondents were asked if they partook in backcountry skiing solo, they were not queried whether they travelled solo on the day of the survey. Therefore a requirement for group travel was not included as a requirement to meet minimum safety practices. It was found that 51.2% of the sample met the minimum safety practices. The results are displayed in Table 4.5.

Table 4.5

Avalanche Safety Practices

Safety Practice	Number	Percent
Safety Equipment Carried		
Beacon	328	88.9
Probe	326	88.3
Shovel	323	87.5
Emergency Communication	141	38.2
Extra Clothing	299	81.0
First Aid Kit	242	65.6
Extra Food	264	71.5
Snow Analysis Kit	119	32.2
Repair Kit	187	50.7
Minimum Safety Equipment		
Yes	320	86.7
No	49	13.3
Check the avalanche bulletin		
Never	11	3.0
Once a month	5	1.4
Every time I am planning a trip	172	46.6
Whenever a new bulletin is posted	41	11.1
Every day, even if I am not headed into the backcountry that day	140	37.9
Practice with your beacon		
Never	36	9.8
Once a season	82	22.2
Once every second month	67	18.2
Once every month	102	27.6
Every second week	51	13.8
Once a week	31	8.4
Most often travel with [a]		
Family	73	19.8
Friends	342	92.7
Clients	25	6.8
Organized group/club	49	13.3
Solo	31	8.4
Relation to Bulletin [b]		
Incorrect	149	40.4
Correct	220	59.6
Minimum Safety Practices		
Yes	189	51.2
No	180	48.8

[a] Multiple responses were allowed
[b] Blank, don"t know and under-reported coded as incorrect; correct and over-reported coded as correct

4.4 Recreation Specialization

Although the sixteen indicators and subsequent dimensions used to measure specialization were based on previous studies, a principle component analysis with varimax rotation that was conducted on the fourteen indicators (two indicators were deleted due to a high number of unusable answers) identified three dimensions, which varied from the typical dimensions of behaviour, skill, and commitment (centrality) (Scott & Shafer, 2001). The three dimensions resulting from the principal component analysis were termed centrality, skill/books/time, and employment. The reliability of the new dimensions were tested using Cronbach‟s alpha, which resulted in two indicators being deleted as they lowered the internal reliability of the dimensions. The resulting twelve indicators resulted in a Cronbach‟s alpha of .858 that explained 64.9% of the variance. The indicators deleted as a result of the above analysis were “the importance of developing the participant‟s backcountry skiing skills” and the participants “preferred backcountry skiing terrain”. Table 4.6 displays the results of the principal component analysis. Table 4.7 displays the mean, median, and standard deviation values of the indicators that were used to measure specialization.

Table 4.6

Principle Component Analysis With Varimax Rotation of Specialization

	Centrality	Skill/Books/Time	Employment
Years	-.013	**.734**	-.151
Days a year	.216	**.612**	.197
Skill reported	.143	**.770**	.341
Skill related to others	.222	**.767**	.209
Books	.213	**.687**	.092
Employment related	.013	.175	**.862**
Employment allows time to go ski	.394	.059	**.726**
Live in location	**.565**	.082	.435
General importance	**.844**	.330	.077
Importance to lifestyle	**.830**	.331	.133
Other activities not of interest	**.576**	.196	.145
Ski over anything else	**.663**	.184	.303
% of Variance	25.161	23.750	15.957
Cronbach"s alpha	.838	.800	.689

Table 4.7

Specialization Indicators

Indicator	Mean	Median	Std. Deviation
Years [a]	10.98 (2.47)[b]	8.0 (2)[b]	9.81 (1.111)[b]
Days a year [a]	36.61 (2.43)[b]	28.0 (2.0)[b]	31.39 (1.118)[b]
Skill reported [ca]	2.53	2.0	0.86
Skill related to others [ad]	3.19	3.0	1.07
Books [a]	4.99 (2.46)[b]	3.0 (2.0)[b]	5.64 (1.122)[b]
Employment related [ef]	2.82	3.0	1.562
Employment allows time to go ski [ef]	3.60	4.0	1.321
Live in location [fg]	4.01	4.0	1.196
General importance [fg]	4.16	4.0	1.006
Importance to lifestyle [fg]	4.08	4.0	1.076
Other activities not of interest [fg]	3.39	3.0	1.240
Ski over anything else [fg]	3.5	4.0	1.140

[a] Skill/Books/Time dimension
[b] Values after median split into four categories
[c] Based on 1=beginner, 2= intermediate, 3 = advance, 4 = expert
[d] Based on a scale from 1 to 5 with 1= less skilled, 3= average and 5= more skilled
[e] Employment dimension
[f] Reverse coded from a 5 point Likert-scale with 1= strongly agree and 5 = strongly disagree
[g] Centrality dimension

A K-Means Cluster Analysis resulted in the formation of two specialization levels; low and high. Table 4.8 shows the mean values for the indicators of these two specialization levels. Over half (54.7%) of the sample was placed in the high level of specialization group with the remaining 45.3% representing the low specialization level. This information is summarized in Table 4.9. For all the indicators, those reporting the highest level of specialization had the highest means and those reporting the lowest level of specialization had the lowest means.

Table 4.8

Means for Indicators of Specialization Level

	Specialization Level	
Indicator	Low	High
Years	2.11	2.78
Days	1.83	2.92
EmployRelated	2.01	3.51
EmployTime	2.73	4.33
LiveInLocation	3.26	4.63
GeneralImportance	3.48	4.74
Lifestyle	3.31	4.72
NotInterest	2.85	3.85
SkiAnything	2.84	4.06
Skills	2.01	2.96
SkillsRelatedOthers	2.61	3.68
Books	1.86	2.96

Table 4.9

Classification of Participants into Specialization Level

	Specialization Level	
	Low	High
Number	167	202
Percent	45.3	54.7

Gender appeared to play an important role in the level of specialization with 60.1% of male respondents being in the high specialization group and 39.1% being in the low specialization group. This is in contrast to female respondents of whom 43.9 % were in the high specialization group and 56.1% were in the low specialization group. This difference is illustrated further by looking at each specialization level individually; 56.3% of the low specialization level, and 72.3% of the high specialization level were males. This is similar to the results found by Lee et al. (2007) showing that males tended to be more specialized in certain activities than females. Table 4.10 summarizes the demographic information of the different levels of specialization.

Table 4.10

Specialization Level and Demographic Characteristics

	Specialization Level	
Characteristic	Low	High
Gender		
Male	94 (56.3%)	146 (72.3%)
Female	73 (43.7%)	56 (27.7%)
Age		
19-25	30 (18.0%)	30 (14.9%)
26-35	73 (43.7%)	106 (52.5%)
36-45	26 (15.6%)	36 (17.8%)
46-55	22 (13.2%)	16 (7.9%)
56-65	12 (7.2%)	10 (5.0%)
>65	4 (2.4%)	4 (2.0%)
Education		
High School	16 (9.6%)	29 (14.4%)
College or University	107 (64.1%)	136 (67.3%)
Post-Graduate Degree	44 (26.3%)	37 (18.3%)
Employment		
Employed	121 (72.5%)	145 (71.8%)
Unemployed	12 (7.2%)	10 (5.0%)
Retired	20 (12.0%)	24 (11.9%)
Student	14 (8.4%)	23 (11.4%)

4.5 Recreation Specialization and Avalanche Training

The fourth research question asked if there was a relationship between the specialization level and level of avalanche training of backcountry skiers. Table 4.11 displays the comparisons between the different levels of specialization and levels of avalanche training. The relationship between the two variables was tested using a two-tailed Kendall‟s tau-c correlation, and it was found that there was a positive correlation of .561 with a level of significance of $p < .05$. This demonstrates that as the level of specialization increased, the level of avalanche training also increased. Table 4.12 shows the results of the correlation analysis.

Table 4.11

Specialization Level and Avalanche Training

	Specialization Level	
Level of Training	Low	Medium
None	52 (31.1%)	12 (5.9%)
AST 1	85 (50.9%)	63 (31.2%)
AST 2	19 (11.4%)	35 (17.3%)
CAA Level 1	10 (6.0%)	53 (26.2%)
CAA Level 2	0 (0.6%)	11 (5.4%)
Professional Certificate	1 (0.6%)	28 (13.9%)

Table 4.12

Correlation Between Specialization Level and Avalanche Training

Correlation Value	Significance
.561	.000

4.6 Recreation Specialization and Avalanche Safety Practices.

The fifth research question asked if there was a relationship between the specialization level and level of avalanche safety practices. Avalanche safety practices were measured using several variables; checking the avalanche bulletin, avalanche beacon

practice, travelling alone, knowledge of the current avalanche danger, carrying of minimal safety equipment, and minimal safety practices. Table 4.13 illustrates the comparisons between the different levels of specialization and different safety practices.

These relationships were tested using a two-tailed Kendall‟s tau-c correlation, and it was found that increasing specialization was positively correlated, with a level of significance $p < .05$, with all but one of the safety practices mentioned above. The positive correlation values were 0.468 for checking the avalanche bulletin, 0.434 for beacon practice, 0.125 for correct knowledge of the current avalanche danger, 0.150 for carrying of minimal safety equipment, and 0.212. for minimal safety practices. See table 4.14 for the results of these correlation analyses. One of the variables, travelling alone, was found to have a negative correlation of -0.033 with a significance level of $p = 0.244$. Because the p value is greater than 0.05, it can be concluded that there is not a significant correlation between specialization level and the likelihood of travelling alone. See table 4.14 for the results of this correlation analysis.

Table 4.13

Specialization Level and Avalanche Safety Practice

	Specialization Level	
	Low	High
How often do you check the bulletin		
Never	10 (6.0%)	1 (0.5%)
Once a month	4 (2.4%)	1 (0.5%)
Every time I am planning a trip	109 (65.3%)	64 (31.7%)
Whenever a new bulletin is posted	18 (10.8%)	23 (11.4%)
Every day, even if I am not headed into the backcountry that day	26 (15.6%)	113 (55.9%)
How often do you practice with your beacon		
Never	31 (18.6%)	5 (2.5%)
Once a season	45 (26.9%)	37 (18.3%)
Once every second month	35 (21.0%)	32 (15.8%)
Once every month	45 (26.9%)	57 (28.2%)
Every second week	10 (6.0%)	41 (20.3%)
Once a week	1 (0.6%)	30 (14.9%)
Relation to bulletin		
Incorrect	79 (47.3%)	149 (40.4%)
Correct	88 (53.7%)	220 (59.6%)
Travel alone	11 (6.6%)	20 (9.9%)
Safety equipment carried		
Beacon	136 (81.4%)	192 (95.0%)
Probe	135 (80.8%)	191 (94.6%)
Shovel	133 (79.6%)	190 (94.1%)
Emergency communication	46 (27.5%)	95 (47.0%)
Extra clothing	127 (76.0%)	172 (85.1%)
First aid kit	88 (52.7%)	154 (76.2%)
Extra food	114 (68.3%)	150 (74.3%)
Snow analysis kit	29 (17.4%)	90 (44.6%)
Repair kit	49 (29.3%)	138 (68.3%)
Minimum safety equipment [a]	131 (78.4%)	189 (93.6%)
Minimum safety practices [b]	66 (39.5%)	123 (60.9%)

[a] Defined as carrying beacon, probe, and shovel

[b] Defined as meeting the minimum equipment requirement, having avalanche training, and correct knowledge of the current avalanche danger

Table 4.14

Correlation Between Specialization Level and Avalanche Safety Practices

	Correlation Value	Significance
Correlation Between Specialization Level and Checking of Bulletin	.468	.000
Correlation Between Specialization Level and Practicing with Beacon	.434	.000
Correlation Between Specialization Level and Knowledge of Current Avalanche Danger	.125	.013
Correlation Between Specialization Level and Travelling Solo	-.033	.244
Correlation Between Specialization Level and Minimum Safety Equipment	.150	.000
Correlation Between Specialization Level and Minimum Safety Practices	.212	.000

Although the variables of carrying an emergency communication, extra clothing, first aid kit, extra food, snow analysis kit, and a repair kit were not analyzed beyond descriptive statistics, it can be seen that the percentages of respondents who carried these items were higher for those with a high specialization level than for those with a low specialization level.

4.7 Key Specialization Findings

Results from this research project provide strong evidence that as specialization of backcountry skiers increases so does their level of avalanche training and the awareness of avalanche dangers. However the same cannot be said for all avalanche safety practices. As previously discussed, there was a strong relationship between increasing specialization level and how often participants checked the avalanche bulletin and practiced with their beacon. There was a slight relationship between increased specialization and participants‟ knowledge of the current avalanche danger, carrying of minimum safety equipment and use of minimum safety practices. There was no significant relationship between increased specialization and if

the participant travelled alone in avalanche country. These finding will be further examined and discussed in the next chapter.

5.0 Discussion

The 2011 avalanche season was a very interesting season in the Canadian mountain national parks with below average snow packs early in season followed by above average snow packs lasting well into the summer months (CAC, 2011); the last avalanche bulletin for GNP, issued on June 8, 2011, reported the snow depth to be 210 cm at an elevation of 1905 m (Parks Canada, 2011). There were 11 avalanche fatalities during the avalanche season, 5 of whom were backcountry skiers; none of these fatal accidents took place in the mountain national parks. This chapter provides an in-depth discussion of the results reported in Chapter 4, including a brief discussion of field notes where appropriate, regarding the six research questions presented in Chapter 1. The limitations of the research project are also discussed.

5.1 Research Question 1

This research project found that roughly two-thirds (65%) of backcountry skiers in the sample were male, which is nine percent higher than previous studies conducted in Parks Canada in the same locations during the 2010 avalanche season (Ham et al., 2010). However, these findings are still somewhat lower than those of Silverton (2007) of backcountry skiers in Utah, and Tase (2004) and those of Sole and Emery (2008) of winter recreationists.

Almost half (48.5%) of the respondents in the sample in this research project were between the ages of 26-35 years. This is slightly higher than found in previous research conducted by Ham et al. (2010) but similar to the finding of Tase (2004) that the majority of winter backcountry recreationists were between the ages of 25-34. It should be noted that in the Ham et al. (2010) study, as in the current study, that the next two largest age groups were above and below the previously discussed age group. This demonstrates with some certainty that the large majority of the population of backcountry skiers is between the ages of 19-45.

Due to the similarities in results between the previously mentioned studies it can be stated with some confidence that these results can be generalized across backcountry skiing in the mountain national parks.

The sample from this research project was fairly well educated with 65.9% of the population having completed college or university, 22% having a post-graduate degree and the remaining 12.2% having completed high school. This is almost the exact same distribution obtained by Ham et al. (2010) in the previous avalanche season.

Due to concerns over the survey‟s length decisions to excluded certain questions like income, ethnicity, environmental values, and motivations were omitted. Had income and ethnicity been included there is a possibility that they could have provided more in-depth demographic information and the ability to conduct further analysis. Field observations suggest that there is a wide range of incomes among backcountry skiers. A question regarding income should be included in future research as it would be interesting to see if there actually is a wide range of income or if these differences have more to do with lifestyle choices (i.e., choosing to live near the parks for recreational opportunities). Similar to income, asking respondents about their ethnic background could have potentially provided more insight into the demographics of backcountry skiers and allowed for further analysis. However, from the primary researcher‟s experience while this research was being conducted, it appeared that the vast majority of backcountry skiers were Caucasian and that visible minorities were not very common. Although this information could be of possible use to Parks Canada, its contribution to the present study was minimum, and was therefore not included.

5.2 Research Question 2

The second research question of this research project was to find out what was the highest level of avalanche training that backcountry skiers in the mountain national parks had completed. It was found that 83.7% of the sample had at least one of the five levels of training listed: AST 1, AST 2, CAA Level 1, CAA Level 2, or a Professional Certificate. Seventeen percent of the sample selected "none" when asked what level of training they had. This is very similar to the result found by Haegeli et al. (2009) and slightly higher than that obtained by Silverton et al (2007), but much less than the 25% found by Ham et al (2010). Although 17.3% is a relatively small proportion of the population, it still means that nearly one-fifth of participants are travelling in avalanche terrain with no official avalanche training.

When comparing gender and avalanche training within the sample it was found that nearly one quarter (24%) of females did not have any training, whereas only 13.8% of males did not have any training. This information is also potentially useful to the CAC and Parks Canada when designing avalanche training courses and advertising of said courses.

When comparing those respondents with no avalanche training with their age categories, two distinct age groupings emerged. In the 56-65 age category, 27.3% of respondents did not have any training; this is similar to both the 19-25 and 46-55 age categories with 25% and 26.3% without any training, respectively. Only 11.3% and 14.5% of respondents in the 36-45 and 26-35 age categories, respectively, were without any training; everyone 65 years of age and older had training. This information has potential to be very useful to both the CAC and Parks Canada when designing avalanche training courses as well as advertising said courses, as there is potential for courses to be specifically tailored to these age categories.

5.3 Research Question 3

The purpose of the third research question was to determine the avalanche safety practices of backcountry skiers in the mountain national parks. This was determined using several dependant variables.

5.3.1 Minimum Safety Equipment

The first variable that was used to determine avalanche safety practices was whether or not the respondents carried a beacon, probe and shovel with them when travelling in avalanche terrain. In this sample, 88.9% carried a beacon, 88.3% carried a probe, 87.5% carried a shovel and 86.7% carried all three items. These results are similar to those found in previous studies and these findings can be generalized to state that roughly 85% to 90% of backcountry skiers carry the minimum safety equipment, that is a beacon, probe, and shovel. As far as age goes, the results demonstrate that the CAC and Parks Canada need to pay special attention to those over 56 when determining how to disseminate information pertaining to safety equipment. As far as carrying minimum safety equipment and gender are concerned there is a slight variation with 89.6% of males and 81.4% of females carrying a beacon, probe and shovel.

5.3.2 Checking the Avalanche Bulletin

Respondents were asked how often they checked the avalanche bulletin based on five options: never, once a month, every time I am planning a trip, whenever a new bulletin is posted and every day, even if I am not headed into the backcountry that day. It was found that only 4.4% of respondents did not check the avalanche bulletin before planning or undertaking a trip. This illustrates that Parks Canada and the CAC are successful at informing the public of the importance of checking the avalanche bulletin to the public.

These findings are supported through the dramatic increases in the number of Avalanche Bulletin requests over the past 20 avalanche seasons (CAC, 2011).

5.3.3 Beacon Practice

Respondents were asked how often they practiced with their avalanche beacon, based on the following six choices: never, once a season, once every second month, once every month, every second week, and once a week. It was quite unsettling, but not surprising, to find that almost 10%of the sample reported that they never practiced with their beacon, which is substantially higher than the 1% found by Tase (2004), however, much lower than the 18% found by Ham et al. (2010). Only 8.4% of the sample reported that they practiced with their beacon on a weekly basis, with another 13.8% stating they practiced every other week. One issue with beacon practice is the difficulty in creating practical scenarios for practice. However, many ski hills and Parks Canada have established beacon basins for beacon practice giving every backcountry skier a reasonable opportunity to practice with their beacon.

5.3.4 Travel Partners

Respondents were asked whom they most often travelled with in the backcountry and were given the following choices: family, friends, clients, organized group/club, and solo. The main importance of this question was to find the proportion of respondents in the sample that travelled alone in avalanche terrain, a practice that is highly discouraged by Parks Canada. Over 90% of participants stated that they travel with friends and almost 20% stated that they travel with their family. Less than 10% of respondents reported traveling alone. While a minority, the fact that these individuals chose to expose themselves to a higher amount risk is of concern.

5.3.5 Knowledge of Avalanche Bulletin

Proper knowledge of the current avalanche danger is an extremely important aspect of safe travel in avalanche terrain (Jamieson, 2000). Due to the safety issues and possibility of death and serious injury, it was unsettling to find that 40.5% of the sample either did not respond to the question regarding the current avalanche danger, did not know the current danger, or under-estimated the current danger. This is somewhat surprising given the fact that the number of requests for the avalanche bulletin from the CAC has increased over 1600% over the last 15 years (1997- 2011) (CAA, 2011). Further, avalanche bulletin are physically available at three separate locations at the RPDC; it also physically available at all Parks Canada visitor centres, and via the internet, fax, and telephone. The coding strategy that was used may have led to an underestimate of those knowing the current danger (22.0%). This coding method was used instead of the method used by Silverton et al. (2009) as many of the participants did not indicate where they were going and those that did only gave a general area and not a specific location or elevation level. Based on this result, Parks Canada and the CAC may wish to address how people are reviewing the bulletin. For example, are they skimming the information or absorbing the information?.

5.3.6 Minimum Safety Practices

As previously mentioned for this research project, minimum safety practices were defined as carrying the minimal safety equipment, having avalanche training and correct knowledge of the current avalanche danger. It was found that almost half (48.8%) of the sample did not follow minimum safety practices. It should be noted that this is most likely higher than the actual percentage of the sample that falls within this category due to the nature of the questions and the coding approach. Nonetheless, it shows that additional work

needs to be done on educating backcountry skiers on the importance of following minimum safety practices.

Several assumptions can be made in regards to nearly 50%of the respondents that did not meet the minimum safety practices from the observations made by the primary researcher while conducting research and backcountry skiing in the mountain national parks during the 2011 avalanche season. First, the primary researcher noticed that the majority of backcountry skiers coming into the RPDC read the avalanche bulletin prior to skiing ; it is difficult for the primary researcher to make any assumptions in regards to avalanche safety gear as it is usually kept inside a backpack. From this, the primary researcher assumes that this 48.8% did not retain the information from the bulletin, although they had read it moments before completing the questionnaire. This lack of responsibility was also noticed in how some backcountry skiers travelled in avalanche terrain. While in the field, the primary researcher noticed that many parties of backcountry skiers travelled in ways that are highly discouraged by avalanche educators (i.e. multiple backcountry skiers crossing avalanche paths at once, multiple backcountry skiers on a slope, and stopping in terrain traps, just to name a few).

5.4 Recreation Specialization and Avalanche Training

The fourth research question was to see if there was a relationship between specialization level and levels of avalanche training. A correlation value of 0.561 ($p < .05$) was found to exist between the two variables. Although this correlation value is not exceptionally high, it is significant, especially when one takes into account the conservative correlation technique used in this research project. These findings demonstrate that as level of specialization increased so did the level of avalanche training. Examining Table 4.11 provides a greater understanding of these two variables and provides some interesting

findings. One can see that all but one of the respondents with a professional certificate is in the high specialization group. These results were expected because the time, overall devotion, and financial commitment required for a skier to reach the higher levels are demanding, all of which are closely related to the underlying theories of specialization.

5.5 Recreation Specialization and Avalanche Safety Practices

The fifth research question of this research project was to see if there was a relationship between specialization levels and avalanche safety practices. Because avalanche safety practices were measured using several different variables the relationship between specialization level and each variable will be discussed individually.

5.6.1 Recreation Specialization and Minimum Safety Equipment

The first variable used to measure avalanche safety practices was if the respondent carried the minimum safety equipment. A slightly positive correlation was found between the two. The descriptive statistics provided in table 4.11 provide insight into why this correlation might be so low. It was found that 93.6% of the respondents in the high specialization level carried the minimum safety equipment and 78.4% of the respondents in the low specialization level carried the minimum safety equipment. This increase can most likely be attributed to those respondents in the high specialization level having a better understanding of the importance of carrying the minimum safety equipment compared to those respondents in the low specialization level. These results show that Parks Canada and the CAA should focus their attention on those backcountry skiers that are less specialized when expressing the importance of carrying a beacon, probe, and shovel.

5.5.2 Recreation Specialization and Checking the Avalanche Bulletin

The second variable used to measure avalanche safety practices was how often the respondent checked the avalanche bulletin. A moderate to strong positive correlation between specialization levels and checking of the avalanche bulletin was found. The results of the cross tabulation for this comparison, found in Table 4.13, provides a greater level of insight into the relationship between the two variables. The most interesting result was that a majority (55.9%) of the respondents in the high specialization level reported that they checked the avalanche bulletin every day. In comparison, although the majority (65.3%) of respondents in the low specialization group stated that they checked the bulletin every time they were planning a trip, only 15.6% reported that they checked it every day. These results demonstrate to Parks Canada and the CAA that those backcountry skiers that are less specialized are less likely to check the avalanche bulletin than those that are highly specialized. This information can be used to stress those new to the sport or less specialized the importance of checking the bulletin on a regular basis to can an in-depth knowledge of the snowpack

5.5.3 Recreation Specialization and Beacon Practice

Avalanche safety practices were also measured by asking respondents how often they practiced with their avalanche beacon. A moderate to strong positive correlation between this and specialization levels was found to exist. The cross tab comparison of these two variables provides some interesting results. One of the most significant result is that that less than 3% of respondents in the highly specialized group and less than 20% of the low specialized group reported never practicing with their beacon. On the opposite end of the spectrum, 14.9% of those with a high level of specialization reported that they practiced with their

beacon once a week compared with 0.6% of those with a low level of specialization. These results demonstrate that the vast majority of those who did not practice with their avalanche beacon are in the low specialization group and hence that more attention needs to be paid to the low specialization level when advocating the importance of avalanche beacon practice.

5.5.4 Recreation Specialization and Knowledge of Current Avalanche Danger

An important measure of avalanche safety practices was the respondents‟ correct knowledge of the current avalanche danger rating at all three elevation bands. A weak correlation was found between specialization level and correct knowledge of avalanche danger. There was only a 5.9% increase of those correctly knowing the current avalanche danger from the low to high levels of specialization. This illustrates that attention needs to be paid to all specialization levels when demonstrating the importance of knowing the current avalanche bulletin.

5.5.5 Recreation Specialization and Travelling Alone

No significant correlation was found to exist between specialization level and respondents who reported that they travelled alone while backcountry skiing. As with the other variables used to measure avalanche safety practices, the descriptive statistics produced by the cross tabulations provide some insight into this relationship. A small percentage in each specialization level reported that they travelled alone, 6.6% in the low specialization level and 9.9% in the high specialization level. This finding describes that as respondents increased their level of specialization they were more likely to travel alone and ignore the recommendations from the CAA and Parks Canada.

5.5.6 Recreation Specialization and Minimum Safety Practices

The final variable used to measure avalanche safety practices was a combination of the three previously discussed variables, carrying the minimal safety equipment, having avalanche training and the awareness of the current avalanche danger. This combination was defined as the minimum safety practice. A weak to moderate correlation was found between recreation specialization and minimum safety practices. This weak correlation was expected because of the general lack of awareness of avalanche danger.

5.6 Recreation Specialization

The final research question determined if recreation specialization was a useful tool for segmenting backcountry skiers, a group of recreationists that had not yet been assessed using specialization. The primary goal of this research question was to determine which indicators and dimensions would be useful to determine specialization.

Because this was the first study of its type, a wide range of indicators were tested for their usefulness in determining specialization level. All these indicators were chosen based on their demonstrated applicability in previous recreation specialization studies, but altered to represent backcountry skiing. As previously mentioned, two of these indicators were removed after reliability testing. Both of these were indicators of skill: the importance of developing the participant‟s backcountry skiing skills and the participant‟s preferred backcountry skiing terrain. The first of these indicators was included based on the suggestion of Scott and Shafer (2001) that the desire to improve one‟s skill and knowledge is an important aspect of recreation specialization. This research questions the value of this indicator. In regards to this distinct sample, the vast majority (92.1%) of the sample placed a high importance on developing their skills, selecting either 4 or 5 on a five point Likert-scale.

The unreliability of the second indicator that was deleted (preferred terrain) was most likely, in the opinion of the primary researcher, because of the nature of backcountry skiing in general. From the beginning of this research project, it was foreseen that measuring the skill level of respondents was going to be difficult due to the lack of standard ratings pertaining to skill in backcountry skiing. There was a possibility that insight into skill level might be obtained by asking respondents to indicate their preferred type of terrain. However this was not the case. One speculation for this finding is that terrain type is not as important as avalanche conditions and other considerations when determining where to go. This can be seen by the fact that several respondents specifically wrote in their surveys that their preferred terrain type changed daily with the conditions, group members and their desired ski terrain for that specific day.

This research project originally planned on measuring recreation specialization based on four dimensions: behaviour, skill, economic and equipment investment, and centrality to life. However this was altered after a principal component analysis with varimax rotation was conducted on the indicators. The three dimensions that resulted differed slightly from the typical dimensions previously reported, and were named centrality, skill/books/time, and employment. These results are consistent with the findings and discussion presented in Chapter 2 that state that the concept of measuring recreation specialization varies from activity to activity and that more focus needs to be placed on determining a consistent way of measuring recreation specialization across activities.

The results from the cluster analysis were as expected with the high specialization level having higher means than the low specialization level on all indicators. However, as previously stated, cluster analyses were also conducted with three, four, five, six and seven

groupings and all were found to be ineffective based on indicator mean values and numbers in each group. In conclusion, this illustrates that there are two distinctive specialization levels of backcountry skiers. It is not clear whether the use of additional or less indicators might lead to greater segmentation amongst the sample or whether the population of backcountry skiers is too homogeneous to be segmented using specialization. Further studies are required.

5.7 Summary

The results from this research project support the finding of Scott and Schafer (2001) that the indicators and dimensions used to determine recreation specialization are activity specific. If recreation specialization is to be applied to backcountry skiing in future research, more research needs to be conducted to better define these indicators and dimensions. Although positive correlations were found between specialization level, avalanche training, checking of avalanche bulletin, practice with avalanche beacon, knowledge of current avalanche danger, minimum safety equipment and minimum safety practices, it is impossible to make any predictive statements regarding specialization level and the dependent variables discussed earlier. However it can be stated that in most cases, as specialization increases the overall safety practices increase, and therefore Parks Canada and the CAA need to pay more attention to this particular population when disseminating information regard the importance of safety in avalanche terrain. The descriptive statistics from this research project provide the greatest amount of insight into the sample and the population; and when compared with the results of previous research on backcountry skiing allow for some generalization about backcountry skiers, as previously discussed.

5.8 Limitations

The ability to extend the findings of this study to the entire backcountry skiing population in the Canadian mountain national parks is limited by the sampling technique that was used. Although a sufficient sample size was obtained, the use of convenience sampling makes it difficult to say if this sample is truly representative of the entire population. Intercept surveys at several trailheads in GNP were attempted on several days, but due to the nature of backcountry skiing, the weather and time constraints. The sites at which surveys were administered were also determined by which permit areas were open on certain days. This greatly impacted the opportunity to randomize survey administration at different trailheads.

Parks Canada has trail counters at several of the popular trails in the mountain national parks and the counts from these trail counters were the basis for determining the population size of this study. However, it has come to the attention of the primary researcher that these trail counters did not entirely provide accurate data on the usage of these trails. The absence of a reliable estimate for the actual population, impacts the calculation of the sample size required for this study.

Distribution of the sample was heavily skewed towards visitors of GNP relative to the other National Parks, again limiting the ability to generalize the findings to the backcountry skiing population of the mountain national parks as a whole. Due to Parks Canada regulations, the primary researcher was only able to administer questionnaires at two ACC huts (Wheeler and Elizabeth Park) within the Parks; the ability to access more of the huts would have provided additional data on overnight backcountry skiers.

Potential respondents were also recruited at a GNP Annual Winter Permit Night in Golden, BC and at an Avalanche Awareness Night in Banff, AB. Although these respondents fell within the define population in this study (i.e., skiers), the inclusion of these individuals might have resulted in some of the findings (i.e., lack of avalanche knowledge), simply because these respondents might not have been in the backcountry on that day.

One would assume that when the RPDC was full of backcountry skiers there would be a greater number of respondents, however this was not the case. When the RPDC was crowded, there was a sense of urgency that you had to get out on the trails before the others did or they would ski the run first and there would be no fresh snow left. In contrast, on days when the RPDC was almost empty and the number of visitors was low, most of them were willing to partake in the research and there was no sense of urgency that someone else would ski their run before they did. This realization made the implementation of a sampling structure even more difficult.

Because this research project was a cooperative initiative with Parks Canada, two separate questionnaires were combined. This resulted in a lengthy survey that many seemingly interested potential participants declined to complete on becoming aware of its length. Originally the survey was going to be provided in both French and English, and include the Parks Canada logo; however, the time required by Parks Canada to complete the translation could have delayed the field work by 4 – 6 weeks. Because the questionnaire was not in both official languages, this may have resulted to a non-response by some participants.

6.0 Conclusion

This research provides a great deal of useful information for both Parks Canada and the CAC in regards to demographic information, avalanche training levels and avalanche safety practices of backcountry skiers in the Canadian mountain national parks; however, it also raises concerns with recreation specialization and its usefulness in segmenting backcountry skiers.

Although the demographic information from this research is limited, it does provide Parks Canada with valuable information regarding user profiles. As expected, the majority of backcountry skiers were males in their mid-twenties from Alberta and British Columbia. It is interesting to note that backcountry skiers have a higher education level and a lower unemployment average than Canadians as a whole.

The most important results from this research are related to avalanche training and avalanche safety practices. These results inform Parks Canada and the CAC which demographic groups should be targeted for training courses and the dissemination of important data. In regards to avalanche training, this study found that the demographic groups with the highest percentages without training are the 19-25 and 46-65 age-brackets and females. As far as avalanche safety practices are concerned, it still seems that the messages alerting skiers to the importance of carrying minimum safety equipment, being diligent with beacon practice, and not travelling alone are not being heeded by everyone. The most disturbing finding from this research was the number of backcountry skiers that did not know the current avalanche danger rating at all three elevation bands. It is hard to determine from this research as to why this was the case as many of the respondents completed the

questionnaire at the RPDC where multiple copies of the avalanche bulletin were posted and they appeared to have examined the bulletin prior to completing the survey.

This research project provides strong evidence that as specialization of backcountry skiers increases so does the level of avalanche training. As specialization increased, so did adherence to several of the avalanche safety practices. Further, research however in different context and with other recreationalists is required to examine the contributions of specialization on avalanche safety practices.

Determining the effectiveness of recreation specialization to segment backcountry skiers was an important aspect of this research project, and although it was determined that it is effective it is not clear to what level. This is based on the differences between the indicators and dimensions used in this study and the predominant indicators and dimensions used in previous studies.

6.1 Recommendations

This research project clearly shows that more research is needed to help formalize recreation specialization and the indicators and dimensions used to measure it. Although much of the previous literature uses many of the same indicators and dimensions, they were not completely effective when applied to backcountry skiers. More research could be conducted on the relationship between recreation specialization and training/safety practices, With respect to backcountry skiing and avalanches, a more standardized idea of which safety practices are most important and how they might be measured should be explored. Qualitative research should be undertaken to examine why people (in this case of a certain age or gender) do not have training, and do not carry the minimum safety equipment with them in avalanche terrain Perhaps most importantly, we need to have a better understanding

of why so few people – just over half based on this research – know the correct avalanche danger rating for the day(s) they are in the backcountry.

7.0 References

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Appendix 1

Definitions

Avalanche Beacon: is a small, hand size, electronic device, worn while travelling in avalanche terrain. It has two modes, transmit and receive/search. In transmit mode the avalanche beacon is constantly transmitting a signal, that is stronger close to the avalanche beacon. When in receive/search mode the beacon picks up the signal from transmitting avalanche beacons (Jamieson, 2000). Avalanche beacons are also referred to as avalanche transceivers, beacons, and transceivers; in this paper they will be referred to as beacons.

Avalanche Bulletins: include the avalanche danger rating for the day issued, and the next two days; bulletins are issued for the following elevation bands, below treeline, treeline, and alpine. It also includes a discussion from Avalanche Forecast on why they decided the rating they did and other public safety information. Avalanche bulletins are also called avalanche forecasts and avalanche advisories (Campbell et al., 2007).

Avalanche Danger Ratings: is a five point colour coded scale describing the probability of an avalanche occurring, and the potential cause of an avalanche in a given mountain range. It is based on weather forecasts, avalanche-occurrence data, snowpack information, and the terrain. The five levels are, low (green), moderate (yellow), considerable (orange), high (red), and extreme (black) (Campbell et al., 2007).

Avalanche Probe: Avalanche probes are sectional pieces of metal that snap together, similar to tent poles. They are used to pinpoint the exact location of person buried under the snow. They should be between 240cm and 320cm. They can also be used for snow analysis (CAC, 2009c).

Avalanche Terrain Exposure Scale (ATES): is a three point scale that measures the landscapes impact on avalanche hazard. The three levels of the scale are simple, challenging and complex. Simple refers to low angle or primarily forest terrain with no glaciers. Challenging refers to terrain that includes defined avalanche paths, terrain traps, starting zones, and simple glacier travel; options do exist to mitigate the previously stated dangers. Complex refers to terrain with the following dangers; multiple overlapping avalanche paths, multiple starting points, multiple terrain traps, wide open steep areas, and complicated glacier travel; there are little to no options to mitigate the above dangers (Campbell, Bakermans, Jamieson & Stethem, 2007).

Avalanche Season: is "the period from 1 October to September 30. For example, an avalanche that occurred in December of 1999 would be in the 2000 season/winter" (Jamieson et al., 2010 pg. 405)

Avaluator™: is a decision making tool that uses the avalanche terrain exposure rating, avalanche danger rating, information from the avalanche bulletin, and on-site observations to determine if travel in a certain area is safe (Campbell et al., 2007**)**.

Backcountry Skiing: is downhill skiing, telemarking, and snowboarding that is entirely self-propelled and takes place away from lift-serviced ski areas, completely in the backcountry (Boyd, Haegeli, Abu-Laban, Shuster, & Butt, 2009).

Custodial Group: In the context of Parks Canada a custodial group is defined as "a group affiliated with an institution, where at least one person is below the age of majority and that minor is not in the company of his/her parent or legal guardian . Institutional groups

include but are not limited to school groups, Scout/Guide groups, church groups, cadet groups and community youth groups" (Parks Canada, 2009, para. 5).

Appendix 2

Recreation Specialization Studies with Distinct Specialization Levels

	Author	Activity	Names of Levels
3 Levels	Bricker & Kersetter (2000)	White-water rafters and kayakers	1. Low 2. Medium 3. High
	Donnely et al. (1986)	Boaters	1. Day Boaters 2. Overnight Cruisers 3. Racers
	Dyck et al. (2003)	Mountaineers	1. Low 2. Moderate 3. High
	Kerins et al. (2007)	Ultimate Frisbee	1. Low 2. Medium 3. High
	Lemelin et al. (2008)	Polar Bear Viewers	1. Novices 2. Enthusiasts 3. Connoisseurs
	Martin (1997)	Wildlife Viewers	1. Novices 2. Intermediates 3. Specialists
	Wellman et al. (1982)	Canoeing	1. Low 2. Specialists 3. High Specialists
4 Levels	Bryan (1997)	Angling	1. Occasional Fisherman 2. Generalists 3. Technique Specialists 4. Technique-Setting Specialists
	McFarlane (1994,1996)	Birdwatching	1. Casual 2. Novice 3. Intermediate 4. Advanced
	McFarlane & Boxall (1996)	Birdwatching	1. Casual 2. Novice 3. Intermediate 4. Advanced

	McIntyre & Pigman (1992)	Vehicle-Based Campers	Unnamed
	Scott & Thigpen (2003)	Birdwatching	1. Casual 2. Interested 3. Active 4. Skilled
6 Levels	Chipman & Helfrich (1988)	Angling	1. Occasional 2. Generalist 3. Experienced Generalists 4. Committed Generalists 5. Specialists 6. Advanced Specialists
7 Levels	Fisher (1997)	Angling	Unnamed

Appendix 3

Results not Included in Chapter 4

	Number	Percentage
How do you choose your destination [a]		
Weather	235	63.7
Access	142	38.5
Terrain and distance match my ability	195	52.9
Avalanche conditions	278	75.3
Pre-trip research	78	21.1
Group members and skill level	142	38.5
Distance from home	86	23.3
Costs	41	11.1
My Equipment	26	7.0
Recommended by a friend	68	18.0
Media ads	4	1.1
Advice of group leader or guide	27	7.3
Other	9 [b]	2.4
What are your pre-trip planning resources [c]		
Consult guide books	242	65.6
Check the CAA website	246	66.7
Check avalanche bulletin	323	87.5
Call a friend	142	38.5
Consult other website/blogs	154	41.7
Check the weather forecast	341	92.4
Check the Parks Canada website	155	42.0
Hire guide	12	3.3
Stop in at a Parks Canada visitor centre	193	52.3
Which best describes your pre-trip planning steps	257	69.4
Always use them	90	24.4
Sometimes use them	1	0.3
Never use them	21	5.7
I rely on others to do pre-trip-planning	3	0.8
Other		

Appendix 4

Recreation Avalanche Training (CAC Training)

	Recreation Avalanche Training (CAC Training)	
Avalanche Training	Avalanche Skills Training Level 1 (AST1)	Avalanche Skills Training Level 2 (AST2)
Requirements	• Minimum of six classroom hours • Minimum one of day in the field	• Minimum of eight classroom hours • Minimum of three days in the field • Completion of AST1 is recommended
Skill Acquired	• Understand the basics of avalanche formation and release. • Identify avalanche terrain; • Know the steps required to plan and carry out a trip. • Use the Avaluator™ as a decision-making tool in areas where trips are rated using the Avalanche Terrain Exposure Scale (ATES) and where Avalanche Danger Ratings and Avalanche Bulletins are available. • Find resources for obtaining ATES terrain ratings if their trip is not rated. • Find resources for obtaining Avalanche Danger Ratings and Avalanche Bulletins if these are not available. • Use appropriate travel techniques in avalanche terrain. • Carry out a companion rescue. • Understand the limits of their training. (CAC, 2009a)	• Use the Avaluator™ as a filtering tool to determine when additional planning and travel techniques are required to travel safely. • Be familiar with Avalanche Danger Ratings verification techniques for personal use on a local scale. • Be familiar with the ATES technical model as a means to develop personal, local terrain ratings. • Use route finding to take advantage of nuances in terrain to manage personal risk. • Use travel techniques in avalanche terrain appropriate to the avalanche conditions. • Proficiently carry out a companion rescue. • Understand the limits of their training. (CAC, 2009b)

Appendix 5

Professional Avalanche Training (CAA Training)

	Professional Avalanche Training (CAA Training)		
Avalanche Training	Operators Level 1	Operators Level 2	Operators Level 3
Prerequisites	• A minimum of an Avalanche Skills Training Level 1 - AST 1 or equivalent training. Participation on an AST 1 course before your Level 1 is acceptable for those that don't have AST 1 at time of registration. For those with training and experience similar to the AST program (e.g. from another country) you can apply for exemption using one of our Prior Learning Assessment Review; (PLAR) forms • Advanced backcountry travel skills in either skiing or snowboarding including proficiency with touring bindings, skins, and split boards if applicable	• CAA Avalanche Operations Level 1 certification or equivalent • Thorough working knowledge of the CAA Observation Guidelines & Recording Standards (OGRS 2007) • >100 days of operational field experience in weather, snowpack & avalanche occurrence observations & analysis • Advanced backcountry skiing, boarding or snowmobiling skills • A minimum of 2 letters of reference from CAA Professional Members • Participation on at least 2 operational avalanche rescue scenarios (CAA, 2009b)	• CAA Avalanche Operations Level 2 certificate(or equivalent training/experience) • CAA Introduction to Weather Skills for Avalanche Workers certificate (or equivalent training/experience) • >3 seasons experience of employment in avalanche work after completion of the CAA Operations Level 2 course (5 seasons total minimum) prior to application; and, • 2 letters of reference from current avalanche industry employer (if applicable) and/or a professional reference from a CAA professional member. (CAA, 2009c)

	• Proficient & consistent multiple burial transceiver skills (2 beacons buried at least 70 cm deep found in under 5 minutes in a 30mx 30m area) • 19 years of age or older (CAA, 2009a)		
Skills Acquired	Understanding of the avalanche phenomenon including mountain snowpack formation & characteristics, terrain identification & classification, weather date collection & basic interpretation, essential companion & organized rescue skills, snow-profile data collection, basic snow stability analysis including InfoEx interpretation and a look at risk management principles in avalanche risk management operations. (CAA, 2009a)	The Level 2 Program is divided into three modules. Module 1 focuses on decision making, advanced snow science concepts and operational risk management principles in a four-day theory-based classroom environment. Modules 2 and 3 are all field-based programs that involve the application of Module 1 principles into real-life operational decision making and risk management. Module 2 is a three and ½-day field course in an evaluation-free setting. Module 3 is a seven-day course where students‟ skills and competency in both technical knowledge and practical application of Level 2 concepts is evaluated. Successful completion of Module 3 results in a Level 2 certification by the CAA. (CAA, 2009b)	The course discusses the components of avalanche hazard and risk; describes the structured processes for analyzing, assessing, and forecasting avalanche hazard; presents the link between operational decision modes and avalanche risk management; and identifies cross sector options for risk management and introduces benefits/costs of these options (CAA, 2009c)

Appendix 6

Information Letter

Dear Potential Participant:

I am a Master‟s of Environmental studies in Nature Based Recreation and Tourism in the School of Outdoor Recreation, Parks and Tourism at Lakehead University in Thunder Bay, Ontario. I would like to invite you to participate in a ten to fifteen minute questionnaire about your winter backcountry activities. This research is being conducted in cooperation with Parks Canada and is part of a multiyear study.

The intent of this research project is to gain a better understanding of who the winter backcountry recreationists are within the mountain national parks, and more importantly what their level of avalanche training is and what their avalanche safety practices are. To accomplish this goal, I ask you complete a questionnaire concerning your participation in winter backcountry activities, your avalanche training, your avalanche safety practices, and some information about yourself.

The title of this research project is "Recreation Specialization, Avalanche Training, and Avalanche Safety Practices of Backcountry Skiers in the Canadian Mountain National Parks," and is being conducted under the supervision of Dr. Raynald Harvey Lemelin, Associate Professor, Lakehead University SSHRC Research Chair, Coordinator MES in Nature-Based Recreation and Tourism Program, School of Outdoor Recreation, Parks and Tourism; and Dr. Kathy Rettie, Park Canada Agency.

Participation in this study is completely voluntary and you may withdraw from participation at any time or decline to answer any questions in the questionnaire that you do not wish to answer. There is no foreseeable risk associated with participating in this research project.

Although there are little to no direct benefits to your participation in this study; your participation will benefit avalanche educators and Parks Canada by providing them a better understand of winter backcountry recreationists. Information from this study could be published in academic journals and most likely will be published in a Parks Canada report.

No personal information will be kept with the completed questionnaires making them completely anonymous. Completed questionnaires will be kept in a secure location for five years at Lakehead University and at Parks Canada and only I and the two supervisors will have access to them.

If you have any questions, comments or concerns, or would like to receive a final copy of the report please do not hesitate to contact me at jcattie@lakeheadu.ca, or the research supervisor Dr. Lemelin at harvey.lemelin@lakeheadu.ca. Dr. Kathy Rettie at Parks Canada can also be reached at kathy.rettie@pc.gc.ca. For any ethic concerns regarding this research project please do not hesitate to contact the Lakehead University Research Ethics Board at 1-807-343-8283 or http://research.lakeheadu.ca

Thank you for your time and cooperation,
Sincerely,

John Cattie
Master‟s of Environmental Studies in Nature Based Recreation and Tourism
School of Outdoor Recreation, Parks, and Tourism
Lakehead University

Appendix 7
Consent Letter

Dear Potential Participant:

By signing this document you, are indicating that you have read and understand the information letter and are indicating you willingness to participate in this study and understand and agree to the following conditions:

1. Your participation in this research is voluntary and that you are free to withdraw at any time.
2. You have a right to anonymity and you acknowledge that no personal or identifying information is being gathered without your consent.
3. You have the right to not answer any question in the questionnaire.
4. You have the right to request and receive copies of publications from this research.
5. The data generated in this research will be kept at Lakehead University and Parks Canada for 5 years.

I have read the above information and hereby declare to freely consent to this questionnaire.

_____

Signature

Appendix 8
Questionnaire

Winter Backcountry Enthusiasts

We are interested in learning more about you!

Please take a few minutes to complete this survey.

Date: .....
Location: .....

Part 1: We would like to start by asking some questions about your backcountry activities.

1. **What are your favourite winter backcountry activities/sports?**
   (Check all boxes that apply)
   - ☐ Backcountry skiing
   - ☐ Cross Country skiing
   - ☐ Backcountry snowboarding
   - ☐ Ski touring (overnight)
   - ☐ Snow Shoeing
   - ☐ Ice climbing
   - ☐ Other .....
2. **How do you choose your destination?**
   (Check your top 3 only)
   - ☐ Weather
   - ☐ Access
   - ☐ Terrain and distance match my ability
   - ☐ Avalanche conditions
   - ☐ Pre-trip research
   - ☐ Group members and skill level
   - ☐ Distance from home
   - ☐ Costs
   - ☐ My equipment
   - ☐ Recommended by a friend
   - ☐ Media ads
   - ☐ Advice of group leader or guide
   - ☐ Other .....
3. **Who do you most often travel with in the backcountry?**
   (Check all boxes that apply)
   - ☐ Family
   - ☐ Friends
   - ☐ Clients
   - ☐ Organized group/club
   - ☐ Solo
4. **How many years have you participated in winter backcountry sports?**
   .....
5. **How many days per year do you participate in winter backcountry sports?**
   .....
6. **What are your preferred locations for winter backcountry sports?**
   .....
   .....

7. **What are your pre-trip planning resources?**
(Check all boxes that apply)
   - ☐ Consult guide books
   - ☐ Check the CAA website
   - ☐ Check avalanche bulletin
   - ☐ Call a friend
   - ☐ Consult other website/blogs
   - ☐ Check the weather forecast
   - ☐ Check the Parks Canada website
   - ☐ Hire a guide
   - ☐ Stop in at a Parks Canada visitor centre

8. **Which best describes your pre-trip planning steps?**
   - ☐ Always use them
   - ☐ Sometimes use them
   - ☐ Never use them
   - ☐ I rely on others to do pre-trip planning
   - ☐ Other _____

9. **How often do you check the avalanche bulletin?**
(please check one)
   - ☐ Everyday, even if I am not headed into the backcountry that day
   - ☐ Whenever a new bulletin is posted
   - ☐ Every time I am planning a trip
   - ☐ Once a month
   - ☐ Never

10. **What is your level of training?**
   - ☐ None
   - ☐ Introductory 1-2 day course (Avalanche Skills Training 1)
   - ☐ Advanced 3-5 day course (Avalanche Skills Training 2)
   - ☐ CAA Level 1
   - ☐ CAA Level 2
   - ☐ Professional certification

11. **Did you receive avalanche training in the last five years?**
   - ☐ Yes ☐ No

   If yes, please indicate what year _____.

12. **How often, during the winter, do you practice with your beacon?**
   - ☐ Once a week
   - ☐ Every second week
   - ☐ Once every month
   - ☐ Once every second month
   - ☐ Once a season
   - ☐ Never

Part 2: The following questions are about your perception of risk according to avalanches.

13. If you are (were) in the backcountry today: _____location

a. What is the level of risk you will be (were) exposed to today?

- ☐ High
- ☐ Medium
- ☐ Low
- ☐ I am unsure

b. What is (was) the posted avalanche hazard rating? (CAA rating)

- Alpine: .....
- Treeline: .....
- Below treeline: .....

c. What safety equipment are you carrying (did you carry)?

☐ Beacon	☐ Emergency communication	☐ Extra food
☐ Probe	☐ Extra clothing	☐ Snow analysis kit
☐ Shovel	☐ First aid kit	☐ Repair Kit

14. When travelling in avalanche terrain have you ever witnessed any avalanche activity? (yes/no)
If yes, did this cause you to change your travel plans? (yes/no)

15. When travelling in avalanche terrain do you perform any of your own snow analysis? (yes/no)

Part 3: If backcountry skiing (including snowboarding or telemarking), is your primary winter backcountry recreation activity please fill out the following section. If not please continue to Section 4

16. For each of the following statements, circle the number that best describes your level of agreement.
(please circle one: 1-Strongly Agree; 3- Neither Agree or Disagree; 5- Strongly Disagree)

It is important to me to develop my backcountry skiing skills.	1	2	3	4	5
I chose my employment because it is related to backcountry skiing.	1	2	3	4	5
I chose my employment because it allows sufficient time to go backcountry skiing.	1	2	3	4	5
I chose where I live so I could be close to backcountry skiing locations.	1	2	3	4	5
In general backcountry skiing is very important to me.	1	2	3	4	5

Backcountry skiing is very important to my lifestyle	1	2	3	4	5
Other winter activities do not interest me as much as backcountry skiing	1	2	3	4	5
I would rather go backcountry skiing than do almost anything else	1	2	3	4	5

17. **How would you rate you backcountry skiing skills?**
(Please circle one)
Beginner Intermediate Advanced Expert

18. **What type of backcountry skiing terrain do you prefer to ski?**
(Please circle one)
Simple Challenging Complex

19. **What are your backcountry skiing skills related to other backcountry skiers?**
(please circle one)

Less skilled		Average		More skilled
1	2	3	4	5

20. **How many backcountry skiing related books do you own?**
.....

Part 4: To conclude could you please answer some questions about yourself.

21. **What is your gender?**
- ☐ Male
- ☐ Female

22. **What is your age?**
- ☐ < 18
- ☐ 19-25
- ☐ 26-35
- ☐ 36-45
- ☐ 46-55
- ☐ 56-65
- ☐ > 65

23. **What is your highest level of education?**
- ☐ High School
- ☐ College or University
- ☐ Post-Graduate degree

24. **What is your current employment status?**
- ☐ Employed
- ☐ Unemployed
- ☐ Retired

- ☐ Student

25. **How much money did you spend on winter backcountry activities in the last year?**.....
26. **How much would it cost to replace all your backcountry equipment?**
    .....
27. **Where are you from?**
    Home town: .....
    State/Province: .....
    Country: .....

28. **Do you have any additional comment you want to raise?**
    .....
    .....
    .....

Thank you very much for taking part in this research!

If you are interested in entering a draw for guide books, videos and equipment; To qualify, please provide your name and email address

Name: .....
Email address: .....

Please note that you may be contacted by Parks Canada and student-researchers for further studies. Your email addresses will be held in confidence by Parks Canada and will not be distributed elsewhere.