Ski Operations Managers' Decision Making Under Uncertainty

By

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Author's Declaration for Electronic Submission of a Thesis

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

This study explores decision making amongst ski area management. In particular, it examined how ski area managers are challenged by the risk and uncertainty as a result of weather and visitor activity patterns. Prospect theory suggests that response to uncertain conditions may not result from the application of rational thought processes (Tversky & Kahneman, 2000). Instead, decision makers may fall victim to any number of seemingly arbitrary rules or processes as they attempt to deal with uncertainty.

Ski operations in southern British Columbia were chosen for study because of the importance of ski operations to the economy of this region as well as the challenging and variable weather events they have recently experienced. For example, this area hosts international and regional visitors as well as major events like the Vancouver 2010 Olympics and Paralympic Games events. As a result, there is considerable interest in creating ski conditions that are of international calibre. However, the Vancouver and the Coast Mountains faced a weather anomaly of warm, wet weather in January 2005. Nearby regions experienced equally problematic weather conditions the following December. The task here was to discover how ski area managers were coping with the uncertainty created by variable weather patterns.

This study utilized qualitative methods. In total, 16 ski area managers participated in semi-structured interviews between the months of November 2006 and March 2007. Interviews were conducted within three British Columbia tourism regions: Vancouver and Coast Mountains, Thompson Okanagan, and Kootenay Rockies.

The most common weather disturbances to selectively or entirely impact ski operations were high winds, cold temperatures, avalanche hazards, and lightning. Managers used both rules and tools to deal

with the uncertainty created by weather conditions. In terms of rules, they often relied upon heuristic strategies (cognitive rules of thumb) to help with decision making. They tended to open and close at the same time each year for example. Often these heuristics were based on historical weather data and skier visitation rates. Many managers reported being unaffected by existing biases in their decision making or falling victim to escalation of commitment (often reported in decision making studies). These managers also relied on a variety of tools to reduce uncertainty during decision making. These tools included the use of management teams, reliance on experience and individual expertise, historical weather and skier data, and reliance upon business models. For example, most of those interviewed reported extensive efforts to enhance operational sustainability. They focused on diversification (of winter products and year round activities), slope development (summer grooming), snowmaking, and environmental sustainability initiatives. In each case, the goal seemed one of reducing uncertainty in an inherently uncertain situation. Industry and market trends were impacted by improved ski technology and the increasing popularity of internet and last minute holiday bookings.

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I would like to extend my appreciation to all the individuals who participated in my research. This study would not have been possible without the willingness and cooperation of the sixteen participants, ski area management, who volunteered their time and shared their thoughts and experiences. In addition, I appreciated the efforts of one individual who was unable to participate due to schedule and time constraints, but helped me by organizing many interviews with participants from his ski area.

Thank you to my family and friends for your encouragement and support. Particularly, I would like to thank my dad, Ross Keltie, for his support and Aeroplan miles. Additionally, I would like to thank Brian and Laureen Cowie for letting me use their vehicle and chalet while I was in the Vancouver and Coast Mountains area.

Finally, I would like to thank Andrew Wheelhouse, who has been there every step of the way. He has been my editor, caregiver, motivator, IT specialist, and best friend. Without his love, encouragement and patience over the last two years, I would not have overcome computer crashes and a broken leg to complete my thesis and this degree.

Dedication

I would like to dedicate my research to my Grampy, Ian George Secord Keltie. My grandfather, a Spitfire pilot, Distinguished Flying Cross recipient, and my hero.

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"Decision making under risk can be viewed as a choice between prospects or gambles" (Kahneman & Tversky, 1979, p. 263).

1 Introduction

Ski industry managers often operate under conditions of uncertainty. They are uncertain if clients will choose skiing over other leisure activities. They are uncertain if weather will render travel difficult to their locations. Paramount among their concerns is weather and its effect on snow conditions on their respective hills. Much of this concern has been brought on by climate variability and more recently climate change. As one industry insider noted recently, "Climate change is the most pressing issue facing the ski industry today" - Aspen Skiing Company President and CEO Pat O'Donnell (Erickson, 2005). Concern over weather has been reiterated in many news articles amongst other sources (see Table 1-1). It suggests the importance of weather and potential challenges that future changes in climate could create.

Table 1-1 Media Headlines Relating to Concerns with Weather and Climate

Headlines	Source	Publication Date
Global meltdown hits skiing	Denver Post	October 16, 2005
Ski group takes no chances on climate change	Financial Times.com	July 16, 2005
Global warming could hurt Colo. ski industry	Longmont FYI	March 28, 2005
Global warming: our problem, our solutions	Aspen Times	March 18, 2005
Schussing on slush	Globe and Mail	March 9, 2005
New campaign combats global warming	KSL.com	February 27, 2005
Whistler loses its cool (resort town gets plenty of rain)	Globe and Mail	January 22, 2005
Rising temperatures put chill on ski area operators	The Vancouver Sun	December 26, 2004
65 resorts take on global warming	Transworld Snowboarding.com	March 29, 2004
Let it snow. Let it snow! Oh, Please… Let it snow!	WBAY TV	January 9, 2004
Warm temps melt ski plans	Denver Post	October 22, 2003
The white stuff returns	North Shore News	February 26, 2003
Ski resorts get creative to battle global warming	Environment News Service (ENS)	February 20, 2003
El Nino throws curve at ski areas	The News Tribune (Tacoma)	February 2, 2003
Global warming concerns resorts	Tahoe Daily Tribune	January 15, 2003
Wet weather breaks record	JuneauEmpire.com	January 6, 2003
Warm dry weather hampers skiing	The Daily Inter Lake	December 17, 2002

Even prior to climate change theories and predictions, weather presented a challenge for ski operations. Ski area operation relies on regular snowfall and favourable temperatures. Such weather variability challenges managers. The uncertainty of the weather challenges managers as they aim to

break-even and increase profits. For example, if seasonal operations cease too early, revenue will be lost. However, if they close too late, ski conditions will deteriorate and volume will be reduced with the attendant loss of revenue (with the added cost of increased operating expenditures). As operators cannot be certain of the weather in advance, operational decisions remain difficult. This thesis deals with that difficulty.

1.1 The Process of Decision Making Under Uncertainty

Traditional research on decision making under uncertainty has focused on choices involving monetary outcomes and specified probabilities. These choice-patterns are often explained using normative models (such as expected utility theory), as well as descriptive models (including prospect theory) (Kahneman & Tversky, 1979). This research tends to rely heavily on experimental design and solicits reports of preference and in standard economic analyses. It typically utilizes formal modeling, which associates a numerical value with specified options and asks participants to make choices that will maximize returns (Shafir, Simonson & Tversky, 1993). For this reason, it is often referred to as a "value-based" approach.

A second approach has been based on more informal, reason-based analysis (Shafir et al., 1993). This less pervasive approach focuses less on the results (numerical values) of decision making but more on various reasons and arguments thought to influence decision making. It explains choice in terms of the balance of reasons for and against alternatives. This approach has been useful in explaining non-experimental data, particularly in terms of unique historic, legal and political decisions (Shafir et al., 1993).

These two approaches are not incompatible. Reason-based accounts may often be translated into formal models. Similarly, formal analyses can generally be paraphrased as reason-based accounts. Both traditions suggest that decision making under uncertainty evaluates two attributes: the desirability of possible outcomes and their likelihood of occurrence (Tversky & Fox, 1995; Shafir et al., 1993). The

challenge for the decision maker is establishing both desirability and the likelihood of occurrence. In order to do this, decision making often involves compromises between different choice attributes (Tversky & Fox, 1995; Shafir et al., 1993). However, as such compromises are reached, conflict can arise over how much of one attribute (e.g. savings) is preferred over another (e.g. potential profit).

In addition, the exact consequences of the decision maker's actions tend to be uncertain (Tversky & Fox, 1995; Shafir et al., 1993). In the context of this study, ski operators can never be certain of future conditions such as weather or visitation patterns. An otherwise sound decision to remain open may be compromised by an unexpected rain storm or a sudden increase in the cost of gasoline. Consequently, decision making often represents a multi-factor, multi-dimensional process requiring the processing of large amounts of information (Nwogugu, 2005).

There is a great deal of research specifically addressing decision making under uncertainty. Over several decades, theories related to decision making have been collected, debated, and assessed. Prospect theory (PT) is one of the more prevalent theories of decision making under risk and has been applied in a variety of contexts (Fennema & Wakker, 1997).

Originally, PT was created to improve upon and explain situations that did not fit within the expected utility theory (Kahneman & Tversky, 1979). It "departs from the tradition that assumes the rationality of economic agents" (Tversky & Kahneman, 2000, p. 65). In other words, it suggests that response to uncertain conditions may not result from the application of rational thought processes. Instead, decision makers may fall victim to any number of seemingly arbitrary rules or processes as they attempt to deal with uncertainty. Tversky and Kahneman listed several such processes. Three are of particular interest to this study. They are framing effects, risk seeking, and loss aversion.

First, framing relates to the way in which a choice scenario is phrased or introduced to a decision maker. Tversky and Kahneman (1986, 2000) reported that variations in the framing of options (in terms of gains or losses) generated systematically different responses. This was the case even though the options were identical in terms of their consequences. They differed only in the way they

were presented to the individual decision maker. They concluded that negative or positive framing of questions and issues will influence subsequent decision patterns.

Next, risk seeking behaviour tends to emerge under two classes or kinds of decision problems (Tversky & Kahneman, 2000). First, people often prefer a large prize over the expected value of that prize or prospect. For example, the prize of a snowboard worth $500 often represents a more preferable prize than simply winning the $500 outright. Of greater interest to this study, risk seeking is also prevalent when people must choose between a sure loss and a substantial probability of a larger loss. They often attempt to avoid the certain (smaller) loss by risking a less certain but larger loss. For example, ski operators who have not achieved their annual profit goals (they have experienced a certain but known loss) may act in a risk seeking manner by choosing to stay open into the spring shoulder season (thereby creating the possibility for even more losses). They do so to forestall the certain loss hoping that their fortunes will change, profits will be generated, and no loss will be incurred.

Such risk seeking behaviour is encouraged by loss aversion. Loss aversion refers to the tendency for losses to loom larger than equivalent gains (Tversky & Kahneman, 1986). In other words, decision makers fear losses more than they enjoy gains. Thus, fear of losses has a larger impact on decision making. For example, concern over a course of action that has the possibility of losing money (staying open into the spring given the potential of poor weather) is often greater than any positive hopes that the same action might generate additional revenues. In such cases, decision makers would rather prevent losses despite the possibility of increasing revenues.

The effects of these processes are further influenced by decision makers' application of heuristics and biases. Decades ago Kahneman and Tversky (1974) argued that people bias statistical inferences and judgments by using cognitive short cuts (called heuristics). Heuristics represent "rule of thumb" simplifications that help decision makers decide upon optimal courses of action. For example, a shopper who infers that price indicates quality is applying a heuristic to make sense of the marketplace. Heuristics have been noted as early as the 4th Century A.D. (Covello & Mumpower, 1985) and as Kahneman and Tversky suggest, they are likely to be used by anyone making decisions.

All of these studies suggest that decision making under uncertainty is prone to a variety of effects. These effects can, in systematic ways, alter decision making patterns and perceptions. This has implications for anyone hoping to understand decisions under uncertainty. For example, a manager may focus more on losses to be avoided rather than gains to be enjoyed when making a decision. As a result, this manager is likely to be risk averse and his/her decision making will reflect this perspective. The more uncertain the choice is, the more likely these effects are likely to influence the final outcome.

1.2 Climatic Uncertainty in Leisure and Tourism Settings

Ski operators face risks from uncertainty in weather. Winter sports are dependent upon climatic resources and weather (Scott, 2006a,b; Gomez Martin, 2005). Without snow or cold temperatures for snowmaking, the development of ski resorts would not have been possible. Additionally, winter sports are sensitive to climate and weather in terms of, among other things, sun hours, temperature, snow, and wind. For example, Gomez Martin speculates that skiers prefer sunny weather and pleasant temperatures. However, overcast skies and low temperatures would better maintain the surface layer of snow. Additionally, daily weather variations make it impossible to guarantee good weather that will be favoured by all guests.

Ski area operation has traditionally been dependent on snowfall. Cold weather or the absence of rain helps maintain appropriate conditions. Today, the use of snowmaking technology is a dominant adaptation strategy within the industry (Scott, McBoyle, & Mills, 2003). The use of this climate adaptation varies amongst regions. For example, the majority of Ontario and Quebec ski areas depend upon snow production. Ski areas within alpine regions in western Canada have utilized this strategy mainly on lower terrain or high traffic areas where bare spots are more predominant. While this technology can aid ski areas by lengthening ski seasons and helping guarantee suitable conditions, the operation of snowmaking technology does incur operational costs from energy and water usage (Scott et al., 2003; Breiling & Charamza, 1999; Koenig & Abegg, 1997). Although resorts in North America

have been challenged by poor conditions and rising operation costs as early as 1980 (Robbins, 1980), they continue to appeal to skiers and have found ways to prosper. The challenge is to do so consistently despite the inherent uncertainty of weather.

This challenge is not an easy one. Scott et al. (2006 in press) report interviews with managers of Quebec ski areas indicate considerable weather dependency. Any of the following climatic conditions could suggest closure: snow depth less than 30cm; maximum temperature greater than 15°C; and if two-day liquid precipitation exceeded 20mm. This suggests how narrow their window of opportunity can be. Operators must constantly make decisions about staying open or closing at times of the year when temperatures are uncertain.

1.3 Statement of the Problem

This study focused on decision making under uncertainty within selected ski resorts in western Canada. This research examined how ski area managers are challenged by the risk and uncertainty of variability in weather and vulnerability in visitor activity patterns. It was guided by themes in the decision making, climate change, leisure and tourism literatures. More specifically, decision making themes relate to: loss aversion, risk attitudes, framing effects, and heuristics and biases. Thus, this research will add to the existing "decision making under uncertainty" literature through an exploration of decision making processes. Interviews will be conducted with ski area operators and managers. These interviews will focus on themes identified within the decision making literature. Additionally, information will be collected regarding decision makers' perceptions about climate, the industry, variability in weather, vulnerability of activity patterns, and risk management.

1.4 Research Questions

The intent of this study was to:

- Understand how ski area managers make decisions when dealing with the weather-based uncertainty.
- Identify the operational strategies and adaptations ski area management use under the uncertainty and risk associated with climate variability.
- Uncover any financial strategies instituted to minimize the effects of unforeseen circumstances.

Several research questions guide this study. They are:

1. What procedures are used to make decisions when weather-based probabilities and outcomes are uncertain?
2. What is the effect of climate variability on ski area operation decision making?
3. What weather specific risk management policies and procedures have been instituted to deal with uncertainty?
4. What is the adaptive capacity of ski areas regarding climate change risk, threats and opportunities?
5. How do trends within the evolving ski industry and ski market influence management decision making?

1.5 Definition of Terms and Concepts

In this thesis, numerous terms were used to describe decision making and business practices. To provide a clear understanding of the central study phenomenon, Creswell (2003) stated the importance of outlining general working definitions or understandings of major terms. Thus, key terms and concepts adopted in this study are defined here. These relate to the umbrella research areas of: management decision making under uncertainty, climate variability, and the ski industry.

Sustainability or *sustainable tourism development*: According to the World Tourism Organization (WTO, 2004, emphasis from the original), "sustainability principles refer to the **environmental, economic and socio-cultural aspects** of tourism development, and a **suitable balance**

must be established between these three dimensions to guarantee its long-term sustainability." For this concept to prove successful, stakeholders must monitor the impacts and be prepared to introduce preventive and or corrective measures. This is the goal of the ski industry along with many others in the tourism industry.

Climate: refers to the "average" weather. It considers means of relevant quantities of temperatures, precipitation, and wind over specific time periods (IPCC, 2001). Additionally, climate is usually measured over a period of 30 years. In comparing climate to weather, climate "comprises the totality of weather" (Schneider, 1996, p. 27).

Weather: refers to "the state of the atmosphere in a particular time or over a fairly brief period with special emphasis on short-term changes" (Allaby, 2002, p. 624). Additionally, special emphasis relies on the "local and short-term variations of temperature, wind, cloudiness, precipitation, and humidity" (Schneider, 1996, 127).

Climate Change: According to the Intergovernmental Panel on Climate Change (IPCC, 2001), the overarching concept of climate change is defined in the Framework Convention on Climate Change (UNFCCC) Article 1 as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (p. 788).

Climate variability: refers to

> "variations in the mean state and other statistics, such as standard deviations and the occurrence of extremes, of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability)" (IPCC, 2001, p. 789).

The next chapter will outline the conceptual framework for this study and will review related research themes and insights.

2 Literature Review

This chapter provides a review of decision making under uncertainty. It also explores related themes in recreation and tourism and climate change literature. It includes literature relating to the influences for ski area management. A model is presented (see Figure 2-1) which outlines selected (and key) issues and processes that are present as ski area managers make operational decisions. The model has seven components. Each is described here. The three larger issue areas are those relating to decision making, the industry, and climate. The interactions among these three issues create the three more specific areas of interest. They are risk and uncertain outcomes, vulnerability in activity patterns, and variability in weather. Together they all combine to create the need for risk management as represented in the centre of the model.

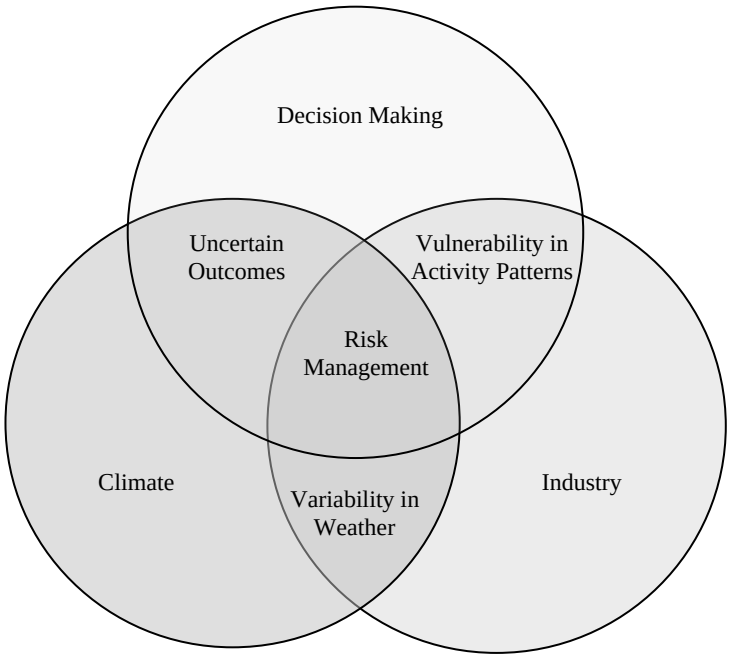

Figure 2-1 A conceptual framework outlining the relationship between management decision making, the industry, and climate.

This chapter begins with a discussion of climate because it sits at the heart of the decision. This discussion will include material on climate sensitivity within the ski industry. Accumulated literature on

climate change will focus on explaining previous research and future predictions to the ski industry. Additionally, descriptions of weather anomalies from the media will be presented.

The next section provides contextual information intended to paint a picture of issues faced by ski operators. It will begin with a description of the vulnerability of ski operations due to variability in skier activity patterns. After all, participants' behaviours guide operators' decisions. This will lead into a description of the ski industry as well as management and business strategies it has adopted to deal with uncertainty both in weather and in the marketplace. For example ski operators have learned that spreading business over many activities enables ski areas to reduce the effects of poor weather conditions. Through such means, ski operators work towards creating certainty in their operations. These risk management strategies increase business opportunities.

Finally, decision making will be discussed. This section will focus on the main tenets of prospect theory. This theory assumes that decision makers possess limited information processing capacity. It assumes as well, that decision makers lack complete knowledge as they make decisions. This role played by such uncertainty is a central theme throughout the chapter.

2.1 Climate

Climate is a resource exploited by tourism. Skiing would not be possible without snow and the temperatures necessary to maintain it. Thus, the sport is weather dependent. Ski operators face uncertainty from the variability of weather and the recent warming patterns. This creates ongoing uncertain probabilities for success (outcomes). Thus, decision making is often difficult and challenging for operators.

This section will discuss the extent of the weather problem for ski hill operators. It details previous evidence of climate change, climate variability and weather anomalies. It will include presenting implications for the ski industry in western Canada based on findings from research in North America and the European Alps. To date, research within Canada is not comparable to the multitude of

studies from the Alps. Thus, findings will be presented and some will be generalized. As Scott and Jones (2005) found, the North American skiing industry is affected by climate and experiences considerable inter-annual variability in operating conditions. Finally, weather anomalies described within BC and western Canada will compare perceptions of the past few ski seasons.

2.2 Climate Sensitivity

Weather and climate constitute the natural resource-base of a place for many recreation and tourism activities (de Freitas, 2003). Weather and climate are not necessarily determinants of tourism, but are important factors in financial terms for tourism operators and the personal experiences of tourists. Every location has "tourism potential" and "appeal" depending on its climate (Figure 2-2). The climate potential of a particular location is a function of its climate and of the risks (to safety and profit-making) that weather may impose. Weather and climate set limits on the potential and appeal. For many tourist activities, there are limits beyond which there is increasing risk of one sort or another. For example, too much snow at once can increase chances of hazardous avalanches. Similarly, wind at high altitudes can render operations unsafe. Both of these instances can generate high risks at one extreme of a climatic range. This can create closures of chairlifts, terrain or entire resorts. At the other end of the climate range extreme could be warm temperatures which would result in poor snow conditions. This would be less appealing, particularly to more advanced skiers who rate conditions as of utmost importance.

Scott (2006b) suggested that fluctuations in snow cover and temperature are results of climate variability that inevitably affect the ski industry. Weather extremes can dramatically hinder business operations (Scott). For example, snow is a prerequisite for skiing so too little snow is problematic. The unreliability of adequate snowfall has led to the invention of snowmaking technology. The capacity to make snow has been one effort to accommodate operational requirements and satisfy participants.

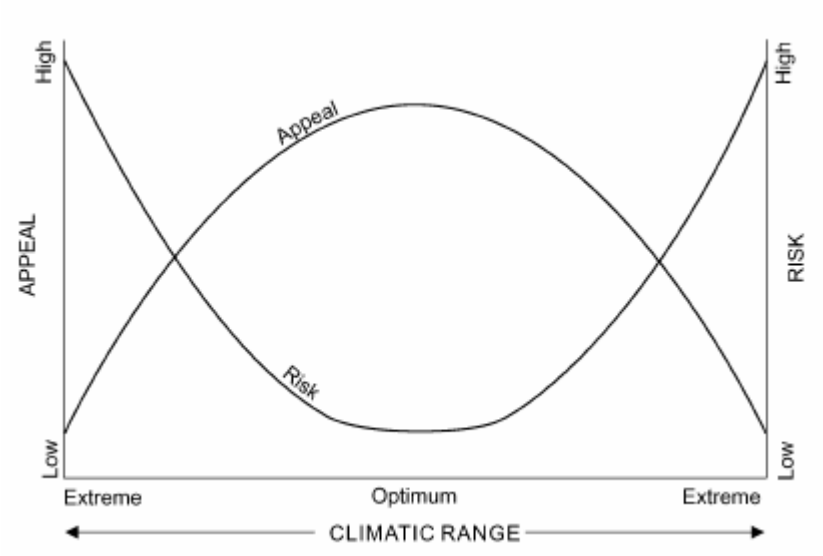

Figure 2-2 A schematic representation of relationships between a climatic range and tourism potential.

(Adapted from de Freitas, 2003, p. 46)

However too much snow can disrupt transportation systems and thus, prevent skiers from travelling to ski areas. It can increase avalanche hazards and put skiers at risk. Similarly, very cold temperatures reduce skier demand, but temperatures above freezing affect snow conditions and prevent snowmaking operation. Additionally, wind can render ski lift operation unsafe and cause closures, especially on high alpine terrain. All of these weather conditions create uncertainty for ski operators.

2.2.1 Experiences of BC Weather Anomalies

Various news sources have commented on weather and the anomalies being experienced recently on the Pacific Northwest United States and British Columbia coast. Starting with Tolme (2005), the 2004-2005 winter in the Pacific Northwest US was labelled as ‘disastrous’. The rain and warm temperatures melted the ski slopes. Similar weather was experienced in Whistler Blackcomb and around Vancouver, BC. The wet and warm 2004-2005 season was a ‘skier’s nightmare’ (Efron, 2005; Vogler, 2005). Although Whistler is known for its mild winters, the season was warmer than usual

which reduced lower ski slopes to mud. Such poor weather is not new. Similar occurrences were reported during ski racing events in 1975 and 1979, and can be expected on the West Coast given its location both in a rainforest and within the path of El Nino currents (Vogler). However, an environmental resource manager, Arthur DeJong, claimed that this is a 'one-in-25' year for the resort (Efron).

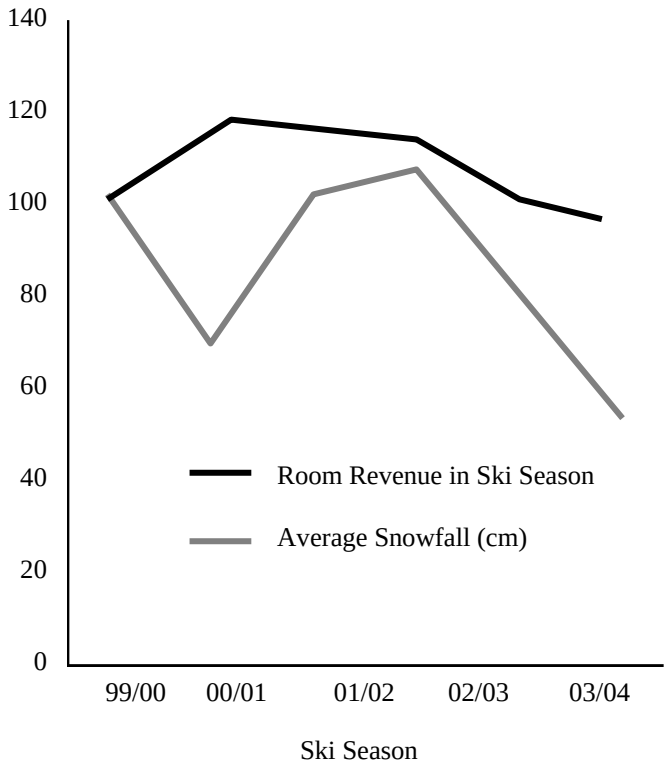

Figure 2-3 Ski Season Room Revenue Correlated with Total Snow Fall

(Adapted from BC Stats, 2005, p. 3)

The 2004-2005 ski season proved to be a difficult one at the Whistler resort (BC Stats, 2005). Room revenues dropped 8.3% to a six-year low. The all time high was recorded in the millennium year, when revenue reached $145 million. After 2000-2001, room revenues decreased for four consecutive years. One major reason for the downturn was low snowfall. Snowfall was only 640cm in the 2004-2005 ski season in Whistler, 34.4% less than the previous season (975cm), which was already 20.7% lower than the year before (1,230cm). Other factors such as accommodation and ski facility development in the resort and weather conditions in competing resorts might also have affected skier

visits and room revenue in Whistler. However, a clear correlation seems to exist between ski season room revenue and snowfall (see Figure 2-3), with the exception of the millennium year. On the other hand, Whistler resort attracted more visitors during the summer months in 2004 off-season (May to November). Room revenue totalled $51.0 million, up 12.0% over the 2003 level. This partially offset the slowdown in the ski season.

In terms of ski terrain, Luckman and Kavanagh (2000) found glacier fluctuations provided the most dramatic evidence of climate change in alpine environments. Losses occurred between 1951 and 1993. The losses were attributed to warming in the winter rather than during the spring and summer. In an effort to fight back against this weather dependency, Whistler is trying to grow back its glaciers in order to improve skiing opportunities (Efron, 2005). Arthur DeJong says that they are trying to conquer this problem with the addition of snowmaking equipment and have built snow fences to stop wind erosion. In the future, this resort could follow European resorts which have started testing ice blankets on glaciers (Zwingle, 2006). They are experimenting to find the most effective material to reflect solar radiation and reduce summer melting.

However, ski areas on Vancouver's North Shore are reported to be in a riskier position than those located further inland. For example, Mount Seymour does not have snowmaking equipment. It's top elevation (4,125feet/1,250metres) is lower than other resorts within the province and the Canadian Rockies (Efron, 2005). This resort closed for several weeks and staff members were laid off in the 2004-2005 season as a result of the warm weather.

2.2.2 Climate Change Implications for the Ski Industry

Opportunities for success within the ski industry could be diminished if weather patterns warm over the next few decades. Increasingly, ski insiders are writing articles in trade journals, such as *Ski Area Management*, that reveal concern over weather patterns (Masia, 2006). Research has been considering the possible role of climate change in winter recreation and tourism settings (Scott,

2006a,b; Scott et al., 2006 in press; Wolfsegger, Gossling & Scott, 2006 in press; Scott & Jones, 2005; Scott, McBoyle & Schwartzentruber, 2004; Scott et al., 2003; Beniston, Keller, Koffi, & Goyette, 2003; de Freitas, 2003; Breiling & Charamza, 1999; Koenig & Abegg, 1997; Lipski & McBoyle, 1991; McBoyle & Wall, 1987). Of the early climate change research, McBoyle and Wall (1987) used climate change scenarios to predict future operations in eastern Canada. This early research seemed limited (Scott, 2006a) given flawed definitions of a skiable day and the omission of snowmaking as a climate adaptation strategy. Scott's research has corrected this by creating a more appropriate definition and including snowmaking technology. Little research exists to date on climate change and skiing in western Canada, except that published by Scott and Jones (2005). They analyzed the situation in Banff National Park and the possible future implications for the ski industry. As a result, this section contains findings from Scott and Jones (2005) and other comparable findings from geographic regions worldwide.

Starting with western Canada, Scott and Jones (2005) focused on Banff National Park and three ski areas within the park. Each ski area has invested different amounts of snowmaking technology according to the availability of natural snow. Trends observed in the late 20th century of reduced snowfall and higher melt-rates from warmer temperatures are projected to reduce the natural snow pack at lower elevations (1600m and below) in the 2020s. Projected changes in temperature will minimally affect higher altitudes by the 2050s even with the warmest scenario. Advanced snowmaking capacities can lengthen ski days from 76 to 167 at base areas (1600m) and from 179 to 211 at summit areas (2600m). This analysis suggests it would be difficult for ski areas to function without snowmaking as the viable ski days decrease from 50% to 57% at base areas by 2020 and 66% to 94% at summit areas by 2050.

All of these projected conditions will economically and ecologically affect the ski industry in Banff (Scott & Jones, 2005). However, the degree of impact depends on adaptations operators are able to employ at lower elevations (where warm weather will hit hardest). Further investments may be required for this region to continue keeping operations up to today's standards. Of the three areas, Lake

Louise naturally receives more snow and has a much greater snow depth throughout the winter season. Hence, a competitive advantage could be created as it will rely on snowmaking less than the other two ski areas in the Banff region.

Table 2-1 Climate Change and Ski Tourism Research

Country	Researchers	Findings
Austria	Breiling and Charamza (1999)	• Good winter seasons with adequate snow cannot be relied on as was the case before the 1995 season when climate variability became apparent • As altitude increases, snow is less vulnerable to warming • At 2 degrees warming, almost half of the annual values will remain in the range of 1965 to 1995 values • Additional investments in snowmaking equipment and other supportive measures are necessary • Not all ski areas are suited to this adaptation for financial or ecological reasons
Switzerland	Beniston, Keller, Koffi and Goyette (2003)	• Temperature increase will likely lead to a reduction in duration of snow covered ground despite the expected precipitation increase in the Alps • Although the amplitude of change is reduced with increases in altitude, the change at all elevations is significant • Strong warming at low elevations will lead to the removal of almost all the snow pack whereas high elevations will experience a more modest snow reduction. • Amplitude of change is damped with altitude, but change at all elevations is significant and corresponds roughly to a reduction in snow cover duration of 15-20 days for each degree of winter warming
	Koenig and Abegg (1997)	• Dependence on snowfall became apparent for some areas during three snow-deficient and warm winters between 1987/88 and 1989/90 • Unfavourable snow conditions had direct impacts on demand for ski tourism • The losses for the entire tourism industry were smaller than those of the transport companies (i.e. cable-cars, T-bars, and chair-lifts) • Some regions will be able to maintain winter tourism with suitable adaptations, whereas others will lose out as the snowline rises • As demonstrated in this example, climate variability will increase competition amongst winter sports destinations and have the potential to increase the environmental impacts in higher areas • Glacier ski resorts, above 3000 metres, that offered an earlier start and more reliable conditions fared better than other lower elevation resorts as more ski tourists frequented these areas

In addition to Canadian research, the vast amount of research from the Alps, Austria and Switzerland, could help provide an insight into general challenges faced by the ski industry. Numerous research findings from the Alps, particularly Switzerland and Austria, are reported in table (Table 2-1). This reveals how many conditions present in European findings are also found in Banff (Scott and Jones, 2005).

As in Canada, winter tourism is an important source of income for alpine regions in the Alps. Swiss researchers from Koenig and Abegg (1997) and Beniston et al. (2003) did find conditions similar to those reported at Canadian ski resorts. This suggests the truly international nature of the problems being discussed in this thesis (Breiling & Charamza, 1999). In Europe, as in Canada, the rising snowline challenges the ski industry.

2.3 Vulnerability in Activity Patterns

Ski operators attempt to discover their skiers' needs and wants so that they can attract the largest market share. The following section focuses on the Canadian ski market. The discussion will then explore ski tourists from Canada and from the international community. Overall, this type of information can be used to help managers better understand activity patterns and help them adopt measures that will attract these guests in spite of the weather fluctuations.

2.3.1 Skier Segmentation

Skier segmentation has been studied around the world. Researchers hope to discover more effective skier segments to improve marketing to participants. As part of this effort, Carmichael (1996) generated six segments amongst short and long trip travellers. During interviews conducted in Victoria, BC, Carmichael (1996) found snow conditions to be the most important attribute for the majority of skiers indiscriminate of trip length. However, response patterns varied among six segments (Table 2-2). Among the short trip travellers, for example, the largest group demonstrated the need for snow and access. Whereas, the largest cluster within the long trip was concerned with snow, value and variety.

Table 2-2 Skier Segmentation for Short and Long Trips

Trip Type	Segment	Description
Short Trip	Variety Lovers	Younger higher skiing ability, strong need for accomplishment
	Value Lovers	Need to escape from routine
	Snow Lovers	Need to enjoy the thrill of skiing
	Access Lovers	Lower skiing ability
Longer Trip	Variety Lovers	Advanced skiers, moderate need for competition, strong need to escape, little need to be with family
	Snow Lovers	Need to enjoy the thrill of skiing

2.3.2 Canadian Ski Market

Within Canada, the average alpine skier is male, in his 30s, lives in the Montreal or Toronto area, has teenagers, and works full-time to earn a high household income (CSC, 2005). Currently, the BC regional market for Alpine Skiers is expected to grow at 21% over the next two decades, increasing from 526,000 now to 637,000 by 2026 (Research Resolutions & Consulting Ltd., 2004a). An increasing concentration of older Canadians and British Columbians is expected to generate fewer tourists interested in downhill skiing.

The number of reported visits to ski hills has recently fluctuated. Despite a record high of close to 20 million skier visits in 2003-2004, the Canadian ski industry recorded a decrease of 7% in the 2004-2005 season (CSC, 2005). At that time, Quebec and Ontario experienced increases (5% and 4% respectively). However, BC experienced a substantial decrease (33%) as a result of snowfall shortages.

2.3.3 Ski Tourists

Similar to the CSC findings above, Canadian alpine ski tourists are more likely to be men (58%) rather than women (42%) and about 36 years old (Research Resolutions & Consulting Ltd., 2004a). The majority of skiers (87%) were born in Canada. Accessibility to ski slopes is likely to influence the socio-demographic characteristics of skiers across Canada. Those with more immediate access to world-class downhill slopes – residents of BC and Alberta – do not have to travel as far to ski

as do residents of Ontario or Quebec. This makes the sport more financially accessible to a wider spectrum of western Canadians.

On the other hand, the American market segment was concentrated in Northern US cities and California's major urban areas (Research Resolutions & Consulting Ltd., 2004b). Over a two-year period, BC attracted approximately 1.8 million Alpine Skiers from the U.S.A. of a possible 20.6 million and 424,000 of a possible 3.9 million Californians. These numbers suggest that BC receives a small portion of the total US market.

Further, a recent worldwide survey of the winter sport business found that international ski and snowboard travel is relatively small (Lazard, 2002). Most individuals stay within their own country instead of travelling abroad. Travellers were affected by four factors: time, money, interest and availability of facilities. Additionally, the average lift ticket price in the U.S. is double that of France. Such variations discourage overseas visitors from traveling to North American locations because they must not only pay more for transportation, but also for lift tickets upon arrival. Therefore, although Lazard acknowledged that opportunities for future growth exist, they may be limited as a result of structural constraints.

2.3.4 Concluding Comments on Canada's Ski Market

By understanding skier activity patterns, managers will hopefully be able to make more informed decisions. Managers could use this information to examine sources of variability in activity patterns. For example, managers who understand limitations on overseas ski travel might target North Americans and advertise within Canadian and American cities. They could target those with less distance to travel. In addition, different promotions and products could be used to attract guests from different countries. For example, Americans were found to spend much more for hard and soft goods than Europeans, which leaves them with less money to spend at the resort (Lazard, 2002). All of these findings will be

considered in the following section on the ski industry. As participation patterns are evolving, so too is the ski industry.

2.4 Ski Industry

Within Canada, 244 ski areas exist (CSC, 2005). Since 2000, skiing facilities have reported increasing revenues which have grown from $668.9 million to $809.1 million in 2004 (see Appendix A; Statistics Canada, 2006). Despite increasing operating expenses during the same time period (from $589.4 million to $717.9 million), profit margins were consistently between 11% and 12%, except for the 2003 season when they fell slightly to 9.3%.

On a larger scale, the National Ski Areas Association (NSAA) reported the 2004-05 season positively (Daly, 2006). Despite the season not increasing skier days, financial performances were solid. This might be the result of the increase in season pass holders by 6% in the preceding ten years. Additionally, resorts have increasingly started to control operating expenses relative to revenue. However, rising energy costs, which are associated with snowmaking technology (Williams, 2006), are what ski area managers and owners need to watch carefully.

Over the past few decades, the ski industry as a whole has evolved from its original form. The ski industry in North America has become dominated by business consolidation and corporations. Corporations have gained power and have the capital to invest in new activities, area expansions, and improvements to facilities.

To expand on the summary above, the succeeding sections will present the ski industry in greater depth. Business strategies will be described. Then examples of adaptations will be discussed. For example, ski areas are increasingly using adaptations, such as snowmaking, to maintain snow cover and extend seasons. All of these issues will be discussed in turn below.

2.5 Risk Management

In addition to all of the considerations within the ski industry business operations, uncertainty is further compounded by its weather dependency. This impacts all areas of business operations and challenges managers on a daily basis. Thus, risk management is necessary. This section will focus on risk management, which is located within the centre of the conceptual framework (see Figure 2-1). This element is used to manage all the other elements within the conceptual framework. Risk management will deal with decision making, climate and the industry. It will also be used to guide operations involving uncertain outcomes, vulnerability in activity patterns and lastly, the variability in weather. However, this section will not focus on how to conduct a risk management analysis. Overall, this section will begin with a brief introduction before the conceptual framework relationships are illustrated.

Risk management has evolved over time. As early as 1985, Covello and Mumpower found that risk analysis and risk management activities had become increasingly politicized. Virtually every major health, safety, and environmental decision is subject to lobbying by various interest groups. Additionally, the scientific sophistication and modes of operations have grown substantially. This combination of changes affects decision makers. They have a variety of stakeholders interested in decisions. Each has varying needs. Decision makers must consider all this in decision making.

The following definitions of two types of risk, individual and collective, have been generated by Colby and Cory (1989). Despite the research focus on valuing amenity resource under the uncertainty of environmental services, these definitions are applicable to the research context of interest. First, collective risk refers to an uncertain situation in which all affected parties will end up in the same state of the world. Examples include ski areas facing "hot" or "cold" states of nature, or skiers enjoying "good" or "poor" visibility. In contrast, individual risk typifies uncertain situations where state probabilities vary across individuals.

These definitions apply to the context of ski operations. For example, ski operators will face collective risk through variability in weather and vulnerability in activity patterns. These two factors produce uncertain outcomes. In contrast, individual risk is created by different factors, such as location. Location could influence where facilities are located. Additionally, location could create opportunities for growth or limit expansion. Another risk faced individually could be activity patterns. This relates to where individuals prefer to ski. Would they rather ski at a large resort like Whistler Blackcomb? Or would they rather stay closer to their home and settle for a smaller hill?

Overall, knowledge of potential risks is essential for managers to make decisions. Situations need to be analyzed regarding the research areas focused on within this literature review. Other sources support this focus. According to the World Meteorological Organization (2006), "managing risk and decision making in relation to climate change requires consistent treatment of uncertainties" (p. 6). Thus, managers need to stay current. They need to keep collecting information to aid in decision making. Additionally, they need to analyze the risks to their business operations. If managers work towards sustainability, they could reap the rewards. Operations could function more easily.

Additionally, risk management encourages operators to manage their risks to create the greatest business opportunities. Thus, business and adaptation strategies have been created to overcome risk. These aim at overcoming uncertainty.

2.5.1 Business Strategies

Ski operators follow a number of business strategies to serve their client groups. Strategy alternatives are often discussed in terms of Ansoff's matrix (McCarville, 2002). The matrix is an attempt to establish strategic alternatives open to decision makers (Ansoff, 1988). This figure shows how the matrix might be used to decide between various strategic options in terms of old and new market segments and products (Figure 2-4).

		Product	
		Old	**New**
Market	**Old**	Market penetration	Service development
	New	Market development	Diversification

Figure 2-4 Example of Ansoff Matrix

(Adapted from Ansoff, 1988, p. 83)

Many ski operations are now beginning to, as the matrix suggests, offer more to existing client groups (service development). The trend is now to offer more than a simple bed for a night for their guests (Dorward, 1990). Instead they hope to offer more services in an attempt to satisfy the constantly fragmenting marketplace with more specialized facilities and services. Guests are now requesting longer seasons, more attractions, and increased comfort and facilities. Consequently they have expanded their operations. For example, they now offer high speed detachable quad chairlifts with the addition of bubbles over chairs (Kunczynski, 1992). Additionally, Hudson suggests that providers are attempting to appeal to existing clients by using more innovative marketing techniques. Some North American destinations offer new terrain, early booking incentives, and more flights from regional airports. Additionally, more resorts have started to offer regional ski passes which would attract skiers more interested in variety of runs and snow conditions. The three ski areas in Banff National Park already offer a regional pass through a third party that offers discounts when purchasing multi-day tickets.

There is also a trend to offer new programs to new client groups (diversification). By doing so they are hoping to extend their operations beyond the winter months, thereby reducing reliance on snow conditions. Such strategic decisions can create year-round business opportunities (Hudson et al., 2004) and diversify the product offering at resort destinations.

Such diversification efforts are intended to appeal to a greater number of potential clients. For example, winter activities have expanded to include skating, sledding, dog sledding, snowmobiling and tubing. A couple could have a romantic weekend getaway at a ski resort without having to be avid

skiers. Additionally, snow tubing can attract those unable to ski or act as an après ski activity to entertain children. During traditional off seasons, educational activities include bear and wolf viewing. Additionally, resorts have begun to build golf courses. Some popular summer activities are: lift accessed bike parks, hiking, and sightseeing (Scott, M., 2006); amusement parks with wrestling rings and ropes courses (staff 2006), and gravity sports with bungee trampolines (Kahl, 2006). (All of the lift accessed activities listed above are offered at Whistler Blackcomb.) Needham and Rollins (2003) found that these activities were perceived positively by summer guests. Amusement parks and gravity sports have been well received by both business clients and guests. These activities offer spectacles that interest guests and produce significant cash flow for a relatively small investment (Kahl, 2006). Overall, resorts are hoping to attract more business and new guests.

2.5.1.1 Adaptation Strategies

Scott (2006b) outlines the variety of ways in which managers might adapt to uncertainty over weather. Although Scott has identified these as climate change adaptations, they may also be used to pursue good business practice. Scott's inventory is comprised of three main categories. They are hard technical developments, soft business practices, and government and industry policy (Table 2-3). Each individual ski area will no doubt find some developments more beneficial than others.

One of the most popular and widely used adaptations, snowmaking, will be described next.

Table 2-3 Types of Climate Change Adaptation Options Available to the Ski Industry

Hard technological developments • Snowmaking systems and additives • Slope development • Energy and water systems • Cloud seeding • Improved climate prediction • Artificial ski slopes
Soft business practices • Ski area operations • Market and revenue diversification • Marketing and public education • Industry consolidation and regional diversification • Private insurance and weather derivatives • Industry-wide income sharing programme
Government and industry policy • Government environmental regulatory frameworks • Government energy policies • Government subsidies • Ski industry climate change policy

(Adapted from Scott, 2006b, p. 265)

2.5.1.2 Snowmaking Technology

As the industry has become competitive and the impacts of climate change have become more evident, ski areas have had to adapt their operations and business to continue operations. Snowmaking is the most widespread of these adaptations (Scott, 2006b). Scott's research suggests that snowmaking usage varies across Canada. Ontario's snowmaking covers 100% of skiable terrain. Quebec covers 50-90% of skiable terrain. Higher elevation, alpine regions in western Canada differ in this regard. Only 50-75% of ski areas have snowmaking in this region. Additionally, the proportion of skiable terrain is typically 25-50%.

Scott et al. (2003) undertook a study exploring the importance of snowmaking as a technical adaptation. They wanted to see how vulnerable the ski areas in southern Ontario were to climate change. Well-capitalized ski areas in Southern Ontario have made million dollar investments in snowmaking. The extent of projected climate change impact was reduced considering the snowmaking adaptation. This is relative to previous studies which did not consider this adaptation.

Additionally, Scott et al. (2003) predicts that climate change is likely to alter the competitive relationship between ski areas in the region. Extra costs are involved with making additional amounts of snow at warmer average temperatures. This increases the energy use and cost. Thus, the overall costs of snowmaking may reach a threshold that renders it nonviable in economic terms. As well, some areas may not be able to access the required increase in water resources.

With predicted climate change, some ski areas will be climatically advantaged at higher elevation, with north-facing slopes, and lower average humidity (Scott et al., 2003). Whereas others will be better able to adapt with more advanced and efficient snowmaking system, more diversified business operations, and better sources of capital.

2.5.2 Concluding Comments on the Ski Industry

This research considers the supply-side choice or firms' decisions. This will aid in understanding the nature of interactions among firms, their clients and their competition (Erdem et al., 2005). These business strategies reveal how ski area managers are trying to introduce certainty into an otherwise uncertain situation. They are looking for opportunities to ensure their business continues despite unpredictable weather. They do so by offering products that are less demanding (than skiing) in terms of snow requirements. They also attempt to improve snow conditions when possible. Use of snowmaking equipment represents one such example. It enables operators to accumulate snow on slopes even when natural snow is lacking. This can lengthen ski seasons and improve the quality of the ski experience throughout the extended season.

The next section will discuss decision making. The focus will be on both processes and the results of those processes. Prospect theory (PT) will again form the basis of this discussion.

2.6 Decision Making Under Uncertainty

Bazerman (1994) reported that PT represents the single most important advance in decades in our understanding of decision making. As stated earlier, PT was developed by Kahneman and Tversky to address the inadequacies of traditional normative theory. Normative theory suggested that individuals acted in a predictably rational manner. Yet these researchers observed that such assumptions were inaccurate under conditions of uncertainty (Kahneman & Tversky, 1979). They developed PT as an alternative model of decision making. It suggests that decisions and choices are comprised of two separate phases: an early phase of edition and a subsequent phase of evaluation. First, the editing phase consists of a preliminary analysis of the available prospects. This yields a simple representation of these prospects to facilitate further evaluation. In the second phase, the edited prospects are evaluated. During this phase, the prospect of highest value is chosen. During this process, gains and losses are considered in a non-symmetrical fashion. Generally, potential losses are thought to be more compelling than are comparable gains. In other words, decision makers often fear losses more than they enjoy gains of the same magnitude.

Within PT (Kahneman & Tversky, 1979), the editing phase consists of four major operations. It starts with coding. People normally perceive outcomes as gains and losses rather than as final states of wealth or welfare. In other words, these gains and losses are defined relative to some neutral reference point. This can be affected by the formulation of the offered prospects and by the expectations of the decision maker. For example, a decision maker may be less worried about total profits than about meeting a specific quota. This quota serves as the reference point.

Next, prospects are simplified by the combination of probabilities associated with various outcomes (Kahneman & Tversky, 1979). Consider the issue of night skiing. It is probable that temperatures will be colder at night so less energy is required. However, night skiing terrain is limited to lighted areas so it is also probable that fewer skiers will take part after dark. In this case, these probabilities offer conflicting direction to the decision maker rendering the decision more difficult.

Segregation is the third operation employed. Some prospects contain a risk free component, which is segregated from the risky component in the editing phase. In the night skiing example the colder temperatures at night may convince the operator to open even though it is less probable that sufficient numbers will arrive to make the opening worthwhile.

Generally, these three operations (editing, simplifying, and segregating) are applied separately to each prospect. The fourth operation, cancellation, is applied to a set of two or more prospects. Cancellation discards components that are shared by the offered prospects. For example, if ski operators are choosing between options that shared some identical conditions, they would eliminate those overlapping conditions from their decision making and focus on perceived differences. For demonstrative purposes, a staff member might recommend that the resort stay open beyond a given date because (s)he has observed that conditions have been favourable after that date for the past four years running. The manager might consider possible losses and gains if the resort stays open or closes. The manager might then learn that Environment Canada is predicting that weather after than date will be unseasonably warm. All the issues around cost etc are identical so it is the issue of probability that will come to the forefront. The manager will focus on the viability of the staff members observations (from past experience) and from Environment Canada's predictions.

In addition to the four operations described above, Kahneman and Tversky (1979) also discuss simplification and detection. Simplification involves simplifying prospects by rounding probabilities or outcomes. This renders the decision making process more straight forward for the individual making the decision. Even though portions of April are cold and others are warm, the decision maker may simply decide that April weather is too variable so (s)he will close at the end of March. This suggests the influence of simplification.

Secondly, detection involves the scanning of offered prospects to detect dominant alternatives, which are rejected without further evaluation (Kahneman & Tversky, 1979). For example, if a decision maker once experienced a great loss as a result of staying open longer than planned, (s)he may decide to

ignore that option from that point forward. All his or her strategies would then fail to consider that possibility.

One study by Andersson, Rustad and Solberg (2004) used PT within a tourism context to explore individuals' monetary evaluation of sports events. The context was a downhill ski championship in Norway. The researchers believed that willingness to accept (WTA) giving up something one already has is given a higher value than willingness to pay (WTP) for acquiring something one does not have. This is consistent with the notion that losing something is more problematic than gaining something of comparable value. Their study used framing such that questions were framed differently for those in favour of and against the event. Overall, they found a higher ratio between WTA and WTP for residents in favour of the event than for residents against the event. This is suggested by PT's findings.

Similarly, McDermott (2004) applied PT within a political setting. He noted that other contextual factors like sunk costs, escalating commitment, and momentum effects may also play a role in decision making. For example, people appear willing to pay additional costs in order to justify or recover sunk costs. Such factors may also influence ski operator's decision making.

Some additional factors may be influential within the process of decision making. As introduced earlier, these include framing effects and heuristics and biases. Descriptions in greater depth are included below. Heuristics and biases like those described by McDermott (2004) will be discussed. The section will conclude by describing how biases and other factors can escalate a manager's commitment. This material will focus on non-rational escalation.

2.6.1 Framing Effects in Decision Making

The tenets of PT suggest that decision makers are susceptible to effects like framing. Gross & D'Ambrosio (2004) explain framing simply as the act of making certain features of an event salient, or by making certain aspects of a policy visible. In turn, this guides individuals' thinking about the event

or issue in predictable ways leading to predictable conclusions. Additionally, predispositions, such as values, principles, and beliefs, may mediate the effect of frames on an emotional response. For example, if a frame resonates with prior values and predispositions, effects are more likely. Conversely, prior opinions and values may serve as a resource for resisting framing attempts.

Evidence for framing effect has been discovered in hundreds of studies. For example, during the development of PT, Kahneman and Tversky conducted a long term and systematic investigation of the effects of value, certainty, and probability of choice (McDermott, 2004). They demonstrated that framing can influence how individuals approach choice problems. This can affect the substance of the choices that individuals make, often in non-normative directions. Others like Petrinovich and O'Neill (1996) have followed up with more recent efforts to support the general idea that responses to dilemmas are influenced by wording and question order. The term "framing effects" is now used to refer to all such influences.

2.6.2 The Role of Heuristics and Biases in Decision Making

Early research on heuristics and bias introduced three general heuristics (Tversky & Kahneman, 1974). They are availability, representativeness, and anchoring and adjustment. The availability heuristic refers to how readily available are the frequency, probability, or likely causes of an event held in one's memory (Tversky & Kahneman, 1974). Recent events may be more memorable that those that took place in the distant past. Events that come more readily to mind are more likely to influence subsequent decisions.

Next, the representativeness heuristic assesses the likelihood of an event's occurrence. This is compared to the similarity of the occurrence to stereotypes of similar occurrences. Thus, managers would predict the likelihood of an event based on similar events from their past. For example, if a manager lost money by staying open in April at some point in the past, then (s)he may label all Aprils as poor months for making profit.

Last, anchoring and adjustment involves making assessments by starting from an initial value. As suggested earlier, if a manager must meet a quota, then (s)he will evaluate the season on the basis of that quota. Thus, even though profits may be high, if (s)he fails to meet the quota, the manager may feel as if (s)he is "losing" money because (s)he has failed to reach the reference point represented by the quota. Tversky and Kahneman (1974) concluded that such heuristics naturally influence judgment without being used deliberately or strategically.

Table 2-4 Summary of 13 Bias Resultant of Judgemental Heuristics

Bias	**Description**
Summary of Biases Emanating from the Availability Heuristic	
1 Ease of recall	Individuals judge events that are more easily recalled from memory, based upon vividness or recency, to be more numerous than events of' equal frequency whose instances are less easily recalled.
2 Retrievability	Individuals are biased in their assessments of the frequency of events based upon how their memory structures affect the search process.
3 Presumed associations	Individuals tend to overestimate the probability of two events co-occurring based upon the number of similar associations that are easily recalled, whether from experience or social influence.
Summary of Biases Emanating from the Representiveness Heuristic	
4 Insensitivity to base rates	Individuals tend to ignore base rates in assessing the likelihood of events when any other descriptive information is provided - even if it is irrelevant.
5 Insensitivity to sample size	Individuals frequently fail to appreciate the role of sample size in assessing the reliability of sample information.
6 Misconceptions of chance	Individuals expect that a sequence of data generated by a random process will look "random," even when the sequence is too short for those expectations to be statistically valid.
7 Regression to the mean	Individuals tend to ignore the fact that extreme events tend to regress to the mean on subsequent trials.
8 The conjunction fallacy	Individuals falsely judge that conjunctions (two events co-occurring) are more probable than a more global set or occurrences of which the conjunction is set.
Summary of Biases Emanating from Anchoring and Adjustment	
9 Insufficient anchor adjustment	Individuals make estimates for values based upon an initial value (derived from past events, random assignment, or whatever information is available) and typically make insufficient adjustments from that anchor when establishing a final value.
I0 Conjunctive and disjunctive events bias	Individuals exhibit a bias toward overestimating the probability of conjunctive events and underestimating the probability of disjunctive events.
11 Overconfidence	Individuals tend to be overconfident of the infallibility of their judgments when answering moderately to extremely difficult questions.
Summary of Two More General Biases	
12 The confirmation trap	Individuals tend to seek confirmatory information for what they think is true and neglect the search for disconfirmatory evidence.
13 Hindsight and the curse of knowledge	After finding out whether or not an event occurred, individuals tend to overestimate the degree to which they would have predicted the correct outcome. Furthermore, individuals fail to ignore information they possess that others do not when predicting others' behaviour.

(Adapted from Bazerman, 1994, p. 46)

A bias (or cognitive bias) refers to inappropriate applications of heuristics in reaching a decision (Bazerman, 1994). In advice to managers, Bazerman encourages them to distinguish between appropriate and inappropriate use of heuristics. In his view, they need to analyze decisions and discover biases. The following summary table lists biases emanating from the three heuristics and two more general biases (Table 2-4). Within the summary table, the bias is identified for each heuristic. Bazerman notes that the last two general biases are broad so a dominant heuristic could not be identified. Although this table is presented in literature review, not all of these heuristics and biases will be explored in this research.

Such heuristics may result in any number of systematic deviations from "rational" decision making. One common deviation is that of escalation of commitment. This is discussed in greater detail below.

2.6.3 Escalation of Commitment within Decision Making

Initial commitment to a decision can lead to an irrational escalation of commitment (Figure 2-5). Bazerman (1994) states that such escalation occurs for several reasons. He included four causes in the diagram adapted below. These include biases, perceptual and judgemental, along with impression management and competitive irrationality. Bazerman suggests these causes are not mutually exclusive and indeed, they can be additive. When they act together, they increase a decision maker's irrational tendency to continue with a previous mistake. For example, a decision maker might continue committing to a decision despite losses or the decision not working. The logic seems one of "In for a penny, in for a pound". Hence, instead of dropping the commitment, they continue to devote resources to a course of action that seems doomed to failure.

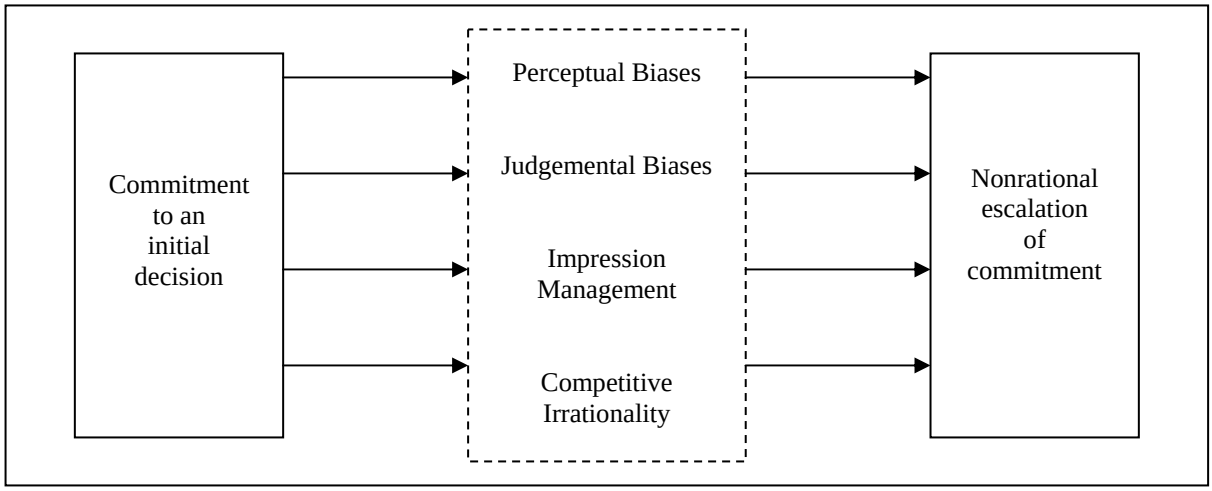

Figure 2-5 Four Causes of Escalation of Commitment

(Adapted from Bazerman, 1994, p. 89)

To describe the figure (Figure 2-5), perceptual biases involve filtering information selectively to support decisions (Bazerman, 1994). It is a type of self-fulfilling prophecy. Managers will intuitively seek confirming evidence to support the decision they have already made. Thus, they ignore evidence that goes against that decision or commitment.

Second, judgement biases emerge when initial decisions systematically distort judgement towards continuing courses of action (Bazerman, 1994). In a way, this is a type of "self framing". It is the manager who provides his own frame. The third element is impression management. This is managing other's impressions (Bazerman, 1994). For example, despite losses, a manager might increase commitment to preserve the image of consistency. Finally, the last element is competitive irrationality. This refers to a situation in which two parties engage in an activity that is irrational in expected outcomes (Bazerman, 1994). For example, two resorts may be competing for clients and each may adopt a strategy of staying open longer than the other. Each is afraid that when they close, avid skiers will be displaced to the competitor thereby helping the competitor's profit margins. Each might lose money using this strategy, but still be forced to carry through on this potentially disastrous trajectory. As a result, many 'opportunities' can actually be traps unless all actions are considered.

2.6.4 Loss Aversion

Loss aversion relates to one's strong favouring of the avoidance of risks (Tversky and Kahneman, 2000; Kahneman and Tversky 1979, 2000). It affects decision making in numerous ways (Kahneman & Lovallo, 1993; Kahneman et al. 1991). For example, it favours inaction over action. As well it favours the status quo over any alternatives. Hence, the disadvantages of these alternatives are evaluated as losses. Therefore, they are weighted more than their advantages.

2.6.5 Risk Attitudes of Decision Makers

Any decision under risk is undertaking a gamble (Kahneman & Tversky, 2000). Unfortunately, individual's perceptions of the risk associated with a gamble are often inaccurate (Slovic, 1986). Further, risk judgments are influenced by the ability to remember the past and imagine future events. For example, as noted in the discussion of heuristics and biases, a managers' previous winter experience may unduly influence future judgements.

While furthering risk research and improving theories, specific terms were generated by Tversky and Fox (1995) relating to expected utility theory. These terms help explain attitudes and behaviours toward risk. First, risk aversion is defined as a preference for a sure outcome over a prospect (Tversky & Fox, 1995). It has an equal or greater expected value. Risk aversion is prevalent in choices between favourable prospects with known probabilities (Kahneman & Lovallo, 1993). Within studies of insurance, risk adverse individuals confronted with sizable hazards will pay a more diversified insurer to bear the risk (Johnson, Herskey, Mesaros, & Kunreuther, 2000). In turn, the reservation price is raised. For example, ski operators might pay more for insurance premiums to help reduce the risk of low snowfall despite the higher costs of those premiums. Second, risk seeking is exhibited if a prospect is preferred to a sure outcome (Tversky & Fox, 1995). This outcome should be of equal or greater

expected value. For example, a resort operator may seek to stay open into April even though snow conditions and temperatures are normally less promising once March is over.

These two attitudes are also part of a larger risk theory. Through their research on weighting, Tversky & Kahneman (2000) found that small probabilities received too much weight, whereas large probabilities receive too little weight. They found this created a fourfold pattern of risk attitudes. Research suggested that the overweighting of small probabilities increases the appeal of low-probability lottery tickets, and increases the aversion to low-probability risks. This pattern is valid for explaining risk seeking attitudes relating to gains and risk aversion relating to losses (Figure 2-6). This illustrates the relationships between risk seeking for gains and risk aversion for losses of low probability combined with risk aversion for gains and risk seeking for losses of high probability (Tversky & Wakker, 1995). Tversky and Wakker found that risk seeking for low probabilities of gains is consistent with common observation of gambling and risky ventures.

	Gain	Loss
Low Probability	Risk Seeking	Risk Aversion
High Probability	Risk Aversion	Risk Seeking

Figure 2-6 The Fourfold Pattern of Risk Attitudes

(Adapted from Tversky & Wakker, 1995, p. 1256)

On the other hand, risk seeking for high-probability losses is consistent with the tendency to accept a risk to avoid a sure loss. For example, this could result from managers continuing operations longer despite poor snow conditions. Managers are trying to overcome the sure loss and hoping to make more profit by operating over a longer season.

However, more complex findings exist. Kahneman and Lovallo (1993) found that a decision maker who is risk averse in some situations and risk seeking in others ends up paying a premium to avoid some risks and a premium to obtain others. Bazerman (1994) suggested a similar finding. Thus, risk attitudes are not always predictable. They change from decision to decision. PT predicts that the manner in which an environmental risk reduction is framed affects how the reduction is valued. In other

words, the ways in which managers think about problems and solutions may influence their subsequent willingness to accept risk.

2.6.6 Concluding Comments on Decision Making Processes and Results

Over the years, PT has been identified as one of the best decision making theories. It helps make clear the processes decision makers go through as they struggle with uncertainty. Many factors may influence subsequent decision quality. For example, when decision makers become risk adverse, biases set in. These biases then cloud heuristics. Biases can also irrationally escalate commitment to a decision. In such ways, sub optimal decisions are made. The evidence that decision makers lack stable values and preferences is not confined to discussions of PT. Shafir et al. (1993) found that preferences are actually constructed during elicitation. They concluded that decisions are often reached by focusing on reasons that justify the selection of one option over another. Influences on decision arose from different frames, contexts, and elicitation procedures.

2.7 Concluding Comments on the Accumulated Literature

Many researchers conclude climate change discussions by stating future research areas. Some research exists in the area of skiing or winter sports utilizing updated modeling methods. From the accumulation of knowledge reviewed, very little research has been conducted in western Canada, especially relating to climate sensitivity of ski operators. However, a recent study examined climate change, risk awareness, and adaptive responses of stakeholders in the Austrian ski industry (Wolfsegger et al., 2006 in press). This research suggests that climate change is not perceived to be a serious threat to operations because of faith in adaptations being implemented by resort operators. Operators believe that the use of technical adaptations, especially snowmaking, will enable them to continue regardless of small climatic changes. They may be revealing a bias in this regard. They have invested considerable

sums in making these adaptations and may wish to express complete faith in the commitment they have already made. However, we know that visitation to BC resorts has been affected by poor snow conditions during the 2004-2005 season (CSC, 2005).

The next (methodology) chapter will outline how this study was undertaken among ski resort operators in BC.

3 Methodology

This chapter explains the approach and techniques used in this research project. The chapter is divided into the following sections: 1) Theory Justification and Applicability; 2) Data Collection; 3) Sample; 4) Location; 5) Data Analysis; 6) Ethical Considerations; and Sample; 7) Limitations.

Although much of the emphasis on decision making research focuses on the individual decision maker, individual choice and action are greatly influenced by context and situation (McDermott, 2004). Consequently, this study focussed on the organizational contexts in which these decision makers found themselves. This study utilized qualitative methods to interview key informants. The goal was to uncover response patterns to real life situations. Themes identified within the conceptual framework (specifically loss aversion, risk attitudes, the role of heuristics and biases, and the escalation of commitment) were explored through interviews.

3.1 Theory Justification and Applicability

The challenge in this study was to select the best approach for addressing the process of decision making. Much of the existing research on decision making has relied on testing formal, value-based models. Such models have the advantage of rigor. Researchers can alter single elements of the models and monitor changes in decision making patterns. For example, a researcher hoping to study the effect of uncertainty in decision making may offer decision makers hypothetical scenarios while altering probability levels for various outcomes. Resulting patterns in decision making could then be monitored.

However, such methods are not without their own particular limitations. They are, for example, limited in their ability to explain reaction to complex, real world decisions. As pioneers in decision making research Tversky & Kahneman (1986) suggest these approaches assume an idealized decision maker rather than the behaviour of real people. Consequently, much of our understanding of decision

making under uncertainty often fails to capture significant aspects of people's deliberations (Shafir et al., 1993).

This study attempts to deal with these issues by asking decision makers (ski operators) about real world decisions. Specifically, they were asked about decisions they make as they manage and operate various ski hills in Western Canada. They were asked “how” in an effort to better understand “why” they made the decisions they did. Additionally, they were asked to describe why one alternative was chosen over another. Shafir et al. (1993) recommend this “reason-based” approach to choice because it has several attractive features. First, a focus on reasons seems to approximate the way in which decision makers normally think about and discuss choices. We know, for example, that decision makers often fail to use well-established values when making decisions. Instead, as Shafir et al. (1993) found that decisions are reached by focusing on reasons that justify the selection of one option over others. Influences of decision from different frames, contexts, and elicitation procedures emphasize different aspects of the options. Therefore, they bring forth different reasons and considerations for and against each option rather than estimating their overall values.

Second, reason-based choices provide a way to understand the conflict that characterizes decision making. Decisions tend to favour one course of action over another. One option is chosen and the benefits of other options are forgone. Such choices place the decision making on the horns of a dilemma and emotional conflict often results. Discussion of reasons may help make the nature and extent of that conflict more clear.

In addition, reason-based analysis can also accommodate framing (Tversky & Kahneman, 1986) and elicitation effects (Tversky, Sattath, & Slovic, 1988). Asking about reasons can reveal preferences which are sensitive to the ways options are described (i.e. in gains or losses), and to the methods through which preferences are elicited (i.e. pricing versus choice). Last, a conception of choice based on reasons may incorporate comparative considerations (such as relative advantages or anticipated regret). Overall, reason-based analyses may closely capture the psychology that underlies decision making (Shafir et al., 1993).

3.2 Data Collection

This study utilized a semi-structured interview format. An interview guide was created to ensure that the same basic lines of inquiry were pursued with each person interviewed (Patton, 2002). These interviews included a series of structured questions supported by probes (Rothe, 1993). Patton suggests that questions should be open-ended, neutral, singular and clear. Probes were used to help guide those being interviewed and to gain greater depth in response patterns. The interview guide may be found in Appendix B.

This interview guide and procedure were pre-tested with ski operators in Ontario. Two interviews were conducted with individuals involved in ski operations decisions. The results of these interviews were assessed in three ways. First, the general procedures were assessed to ensure that they could be used to recruit and interview operators for the main study. The length of the interviews was monitored as were incidents or questions that might suggest confusion or misunderstanding on the part of participants. Ease of understanding and smooth question flow were considered paramount. Second, responses were monitored to ensure that they offered insight into the study's original research questions. The goal was to ensure that the questions being asked were focusing directly on the issues under consideration. Finally, participant responses were monitored to ensure that those holding positions of interest were able to answer the questions being asked. The pre-test suggested that the interview procedures were performing as hoped and that the interviewees seemed to face operating challenges similar to those operators the researcher hoped to contact in BC. Consequently, no changes were necessary to the interview guide prior to interviews in BC.

Primary data collection took the form of key informant interviews. Most interviews were conducted in person, while one occurred by telephone. All key informant interviews were audio taped, and took place between the months of November 2006 and March 2007. Interviews in the Coast Mountains region were conducted first, which included nine interviews. Then one interview was

conducted in the Kootenay Rockies followed by two interviews in the Thompson Okanagan region. Finally, the remaining interviews were conducted in the Kootenay Rockies region. As difference existed between regions and resort size, the interview questions were refined over time to relate to the local situation. While this means that not all interviews were conducted in exactly the same way, this process of evolving interview questions can be considered part of the nonlinear path that characterizes qualitative research (Neuman, 2003). The interview guide that appears in Appendix B represents the original instrument. Some changes to the guide are noted in brackets and in italics below a couple sections.

Semi-structured interviews were conducted to the point of redundancy. In other words, interviews were undertaken until consistent themes began to emerge on a consistent basis. The interviews took place in the participants' places of employment. This is a space where the individuals were comfortable. This provided less disruption for the interviewees because, for them, travel was unnecessary. Each semi-structured interview was audio-taped with the participant's informed consent. Interviews averaged 30 to 40 minutes in length, but a few lasted 60 minutes. In addition, I took notes during the interviews.

The data collected was taken and built on in an iterative approach meaning that each stage of the research built on to the next stage. Personal notes recorded general impressions that the researcher formed regarding each person interviewed as well as any important points that may not have been captured because they were discussed before or after the taping session. These notes provided context and grounding to the study.

The interviews asked key informants about the areas and themes identified within the conceptual framework. As noted above, the interview guide is provided in Appendix B. It begins with background questions about the individual and his/her previous work experience. Questions then probed, more directly, issues of decision making under uncertainty. The interviews included questions about how decisions are made. Follow up questions explored how and why decisions were reached. The goal was to discover issues that resonate with the respondents and how they affect subsequent decision making.

Table 3-1 Summary of Research Questions, Themes and Interview Questions

Research Questions	Research Themes
1. What procedures are used to make decisions when outcomes are uncertain?	▪ Decision making **Related Interview Questions** • Who is involved in decision making? • Would you describe decision making as being more individual or collective in operations management? • How long does it take to make an operational decision? • What is your area's decision making process for short-, mid-, and long-range business planning? • What are the main individual and collective risks that your ski operations face? • Have you ever continued to commit yourself to a choice despite its poor outcome?
2. What is the effect of variability on ski area operation decision making?	▪ Climate ▪ Variability in weather **Related Interview Questions** • How do you deal with unforeseen weather events? • Does the time period in the season (early, mid or late) affect the measures taken?
3. What weather specific risk management policies and procedures have been instituted to deal with uncertainty?	▪ Risk management ▪ Climate **Related Interview Questions** • What weather specific risk management policies and procedures have been instituted to deal with uncertainty? • Have any financial strategies been instituted to ameliorate the effects of unforeseen circumstances? • Have past experiences affected your decisions?
4. What is the adaptive capacity of ski areas regarding climate change risk, threats and opportunities?	▪ Ski industry ▪ Climate **Related Interview Questions** • Has your ski area implemented any adaptive measures or practices to help sustain itself in the past? • Can you describe any new adaptations for the upcoming season.
5. How do trends within the evolving ski industry and ski market influence management decision making?	▪ Vulnerability in activity patterns ▪ Ski industry **Related Interview Questions** • What trends have the largest influence on ski participation recently? • What trends have the largest influence on ski operations recently?

Table 3-1 links the study's research questions with research themes within the conceptual framework (Figure 2-1) and related interview questions. Please note that some questions within the interview guide (Appendix B) are not included in the table (Table 3-1). They are background questions that do not specifically relate to a particular research question. Overall, this summary reveals the relationship and connection between the conceptual framework and data collection.

3.3 Sample

Each ski area in the Vancouver and Coast Mountains region as well as those on Vancouver Island was invited to participate. Snowball sampling was then utilized to try to recruit more participants in this region. Palys (1997) and Neuman (2000) refer to nonprobabilistic sampling or snowball sampling as:

> Snowball sampling (also called network, chain referral, or reputational sampling) is a method for identifying and sampling (or selecting) the cases in a network. It is based on an analogy to a snowball, which begins small but becomes larger as it is rolled on wet snow and picks up additional snow (Neuman, 2000, p.199)

This type of sampling is typically used when researchers are interested in a specific network of people or organizations (Neuman, 2000). Neuman presents snowball sampling as a multi-stage process of sampling where the researcher begins with a few key people and gathers a larger sample from there based on links to the initial individuals. In this study, I was interested in talking to decision makers involved in the management and operations of ski area. Consequently, this sampling technique was employed at the end of each interview to identify any other knowledgeable individuals (Neuman, 2003) who could provide valuable information on management strategies and operations.

Many participants suggested contacting other ski areas in the interior of BC as they would be accustomed to weather patterns different from those closer to the coast. As a result, it was considered likely that they also faced different types of operational challenges from those along the coast. An additional seven participants were recruited from two other southern BC regions.

Sixteen qualitative interviews were conducted. Based on Tourism BC regions, four ski areas are located in Vancouver and the Coast Mountains region, one in the Thompson Okanagan, and two in the Kootenay Rockies. Four additional individuals from different ski areas were approached to participate; however, they declined. Two individuals, one from Vancouver Island and another from Thompson Okanagan regions, declined due to time and scheduling constraints. Two other individuals, from the

Coast Mountains and Thompson Okanagan regions, were unavailable for participation at the scheduled interview time.

Key informants ranged in areas of managerial focus. Many participants were general managers, mountain managers, and mountain operations managers. Some managerial positions were more focused on one area, such as Events Manager, Mountain Planning Manager, Safety Manager, and Avalanche Forecaster.

3.4 Location

These data were collected in southern British Columbia. The initial sample area included Vancouver, Coast and Mountains, and was selected for several reasons. First, the region contains ski areas in a relatively small geographic area. These areas represent a variety of corporate structures and thus are diverse in their operations and management techniques.

Second, this area experienced considerable climate variability within the past few winters. For example, during 2004-2005 they experienced record rainfall and warmer temperatures in January and fresh snow in March and April. In contrast, the following season experienced record snowfall in January. Such variability introduces considerable uncertainty and this may in turn have influenced decision making processes among these operators.

Third, ski areas around Vancouver will continue to be significant for international and regional tourism and as event hosts for the Winter Olympics Games and Paralympic Games in 2010. Therefore, this destination will be of significance in up-coming years as they prepare for the Olympic Games.

As suggested above, those contacted early in the interview process were asked about other operators who might also participate in this study. Participants suggested contacting other ski areas within interior BC to compare results. Thus, ski areas from two additional tourism regions were included: Thompson Okanagan and Kootenay Rockies. These areas are differentiated in the map of British Columbia (see Figure 3-1).

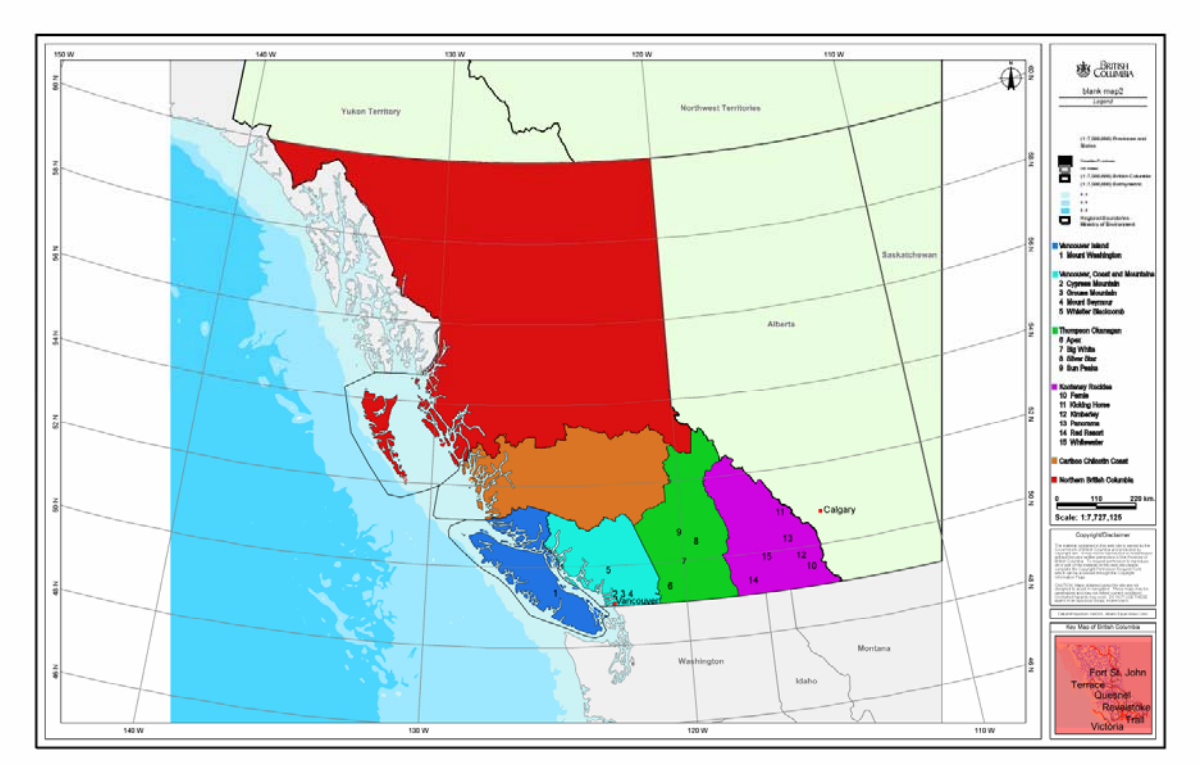

Figure 3-1: Map of Downhill Skiing Facilities in Southern British Columbia

(Reprinted with permission of the Province of British Columbia, 2007 – see Appendix C)

3.5 Data Analysis

Throughout the data collection process, audio-taped interviews were transcribed verbatim in order of occurrence. Then the texts were read and reread multiple times to code for emerging themes. A form of content analysis was undertaken. As described by Neuman (2000), latent coding was utilized to look for underlying, implicit meaning in the context of a text. This form of coding seeks meaning communicated through many ways in which it can be implicitly stated which manifest coding. The analysis was driven by my five research questions. Although my research questions and subsequent analysis were guided by themes emerging from the decision making, climate change and tourism literatures, I remained open to emergent themes that I had not previously considered.

The coded interview transcripts were my main source of data. Verbatim quotations from the key informants were used to illustrate the emergent themes throughout the analysis process. This study sought to uncover, question and explore decision making processes and strategies adapted by ski operators. Through this research project, I hope to gain a better understanding of decision making under uncertainty.

Throughout this study, any information provided by an individual participant as a result of his/her participation in a study was considered confidential and was not released unless otherwise contracted with the participant or required by law. Names associated with raw data were replaced at the first opportunity by a numerical coding system. All reports used a coded system of references; no identifying information, which could directly or inadvertently breach confidentiality was used. Participants were aware of the arrangements in place to ensure confidentiality of data, the length of time the data will be retained and the purpose(s) for which the data is being used.

3.6 Ethical Consideration

To ensure the ethical treatment of the participants in this study, the interview process and questions were submitted to the University of Waterloo's Office of Research Ethics. Full approval to proceed with this study was given on October 25, 2006.

I foresaw no harm or risk coming to my participants. No deception was used. Participants were notified of my research purpose from the outset. Additionally, throughout the data collection period, all interview tapes, transcripts, and written notes were kept in a secure location. This data was accessible only to me and my faculty supervisor. This information will be kept in a secure location following the completion of this research study and will be destroyed after five years.

3.7 Limitations

Research such as that reported here is limited in that information is filtered through the interviewees and they decide what is appropriate to relate to the interviewer (Creswell, 2003). For example, respondents may be unwilling to discuss private business practices due to competitive concerns. In addition, a researcher's presence might bias the responses. Decision makers may wish to present a positive image of themselves and their operations so they may be unwilling to freely discuss challenges and problems.

Further, this research relied on snowball sampling. Neuman (2003) suggests that participants like those who took part in this study existed "within an interconnected web of linkages" (p. 214). Consequently, I relied upon these key informants to help me recruit others to take part in the study. Thus, the pool from which these names were selected was sometimes determined by the key informants themselves. The quality of this pool was determined by the quality of their input.

3.8 Conclusion

This chapter has provided an outline of the methods used by the researcher during the process of data collection. This research was guided by issues and themes identified within the literature review. The issues of loss aversion, risk attitudes, framing effects and heuristics are of particular interest. The study context will relate to weather anomalies and their effects on ski area business and operations. Ski area managers are challenged by the uncertainty of weather.

The findings will be examined in Chapter four where the results of the data collected during the research process will be discussed. Emergent themes will be presented. This will offer a greater understanding of the issues related to management decision making amongst ski area operations.

4 Findings

Chapter four reports the research findings from a series of qualitative interviews. The first section will reveal the climate data for the specific regions where participant ski areas were located. This will introduce some weather challenges which participants describe in the following sections. The subsequent sections provide findings from the interviews. The interviews were analyzed to respond to the research questions stated in Chapter one. Several themes emerged. These themes were organized under the appropriate research questions.

As an introduction, this section will briefly describe ski area clientele. The first four ski areas were located within the Vancouver and Coast Mountains area. Most of their clients and season pass holders were from Vancouver, the lower mainland, Squamish, and Washington. The one ski area within Thompson Okanagan reported the season pass base as local (within 60 – 100km). The rest of their clients are from BC, Alberta and the rest of Canada. Additionally, they have guests from north western US, Australia, New Zealand, Germany, and the United Kingdom. The two ski areas in the Kootenay Rockies reported the majority of clients travel from Alberta, specifically Calgary. Additionally, people come from Ontario, Saskatchewan, BC, US, United Kingdom and Germany. The ski areas within the Thompson Okanagan and Kootenay Rockies were all resort destinations which was not the case in Vancouver and the Coast Mountains.

4.1 Regional Climate Data

After completing the interviews, a quantitative element of research was added. This involved using Canadian Climate Normals from 1971-2000 (Environment Canada, 2004) and Daily Data Reports (Environment Canada, 2005a,b). In addition to differentiation for tourism, the differentiation of these regions signifies different physical environments and climates. First, this section will detail and describe climate norms from Environment Canada Stations that are located at or nearby ski areas.

Second, two separate weather challenges mentioned in the interviews are described in more detail because both provide context for subsequent decision making.

4.1.1 Climate Normals From 1971 - 2000

Although some ski areas did have Environment Canada weather stations, many did not have one at the resort itself. Thus, weather stations closest in latitude, longitude and elevations were chosen to represent the ski area. However, some stations are located in towns or cities which are at considerable lower elevations. The stations are detailed in Table 4-1 below.

Table 4-1 Environment Canada Stations for Climate Normals from 1971-2000

	Ski Area Elevations		Environment Canada Station	Station Information		
	Base	Summit		Latitude	Longitude	Elevation
Ski Areas	(m)	(m)		(N)	(W)	(m)
Grouse Mountain	1128	1250[a]	N Vanc Grouse Mtn Resort	49°22'	123°4'	1127.8
Whistler Blackcomb	675	W 2182[b] B 1609	Whistler	50°7'	122°57'	657.8
Big White	1508	2319[c]	Joe Rich Creek	49°51'	119°7'	874.8
Silver Star	1555	1915[d]	Vernon	50°13'	119°16'	556.0
Sun Peaks	1255	2152[e]	Kamloops Afton Mines	50°40'	120°30'	701.0
Fernie	1068	1925[f]	Fernie	49°29'	115°4'	1001.0
Kicking Horse	1190	2450[g]	Golden A	51°18'	116°58'	784.9
Panorama	1200	2400[h]	Kootenay NP West Gate	50°37'	116°3'	899.2

From the stations in the table above, the daily average temperatures were compared in the graph below (Fig 4-1). Hence, participants from Vancouver and the Coast Mountains (North Vancouver

[a] Grouse Mountain Resorts Ltd. (2002). *Facts & Statistics*. Retrieved June 9, 2007, from http://www.grousemountain.com/cominf_oursto_facsta.cfm
[b] Whistler Blackcomb (2007). *Mountain Stats*. Retrieved June 9, 2007, from http://www.whistlerblackcomb.com/mountain/stats/index.htm
[c] Big White Ski Resort (2006). *About Big White: Fast Facts.* Retrieved June 9, 2007, from http://www.bigwhite.com/index.php?fuseaction=home.showSection&ID=10
[d] Silver Star Resort (2006). Silver Star my mountain: Fast facts. Retrieved June 9, 2007, from http://www.skisilverstar.com/home_showSection_ID_71.html
[e] Sun Peaks Resort Corporation (2007). *Mountain Stats & Hours of Operation*. Retrieved June 9, 2007, from http://www.sunpeaksresort.com/winter/mountainstats.aspx
[f] Fernie Alpine Resort (2007). *The Mountain.* Retrieved June 9, 2007, from http://www.skifernie.com/the-mountain.aspx
[g] Kicking Horse Mountain Resort (2007). *Mountain Stats: Everything you need to know* [Winter Stats]. Retrieved June 9, 2007, from http://www.kickinghorseresort.com/mountain/stats/winter/
[h] Panorama Mountain Village (2007). *Mountain Statistics*. Retrieved June 9, 2007, from http://www.panoramaresort.com/mountain/Statistics/index.htm

Grouse Mountain Resort and Whistler) experienced warmer daily average temperatures than those in other regions in January and February. In contrast, stations in the Thompson Okanagan (Joe Rich Creek, Vernon, and Kamloops Afton Mines) experienced daily average temperatures which were colder than Vancouver and the Coast Mountains. Finally, the three stations in the Kootenay Rockies, Fernie, Golden A, and Kootenay NP West Gate, often experienced colder daily average temperatures between November and February. Despite these differences, the daily average temperatures were approximately 3°C difference in October, November and March. The largest differences were in December and March with approximately 7 and 8°C.

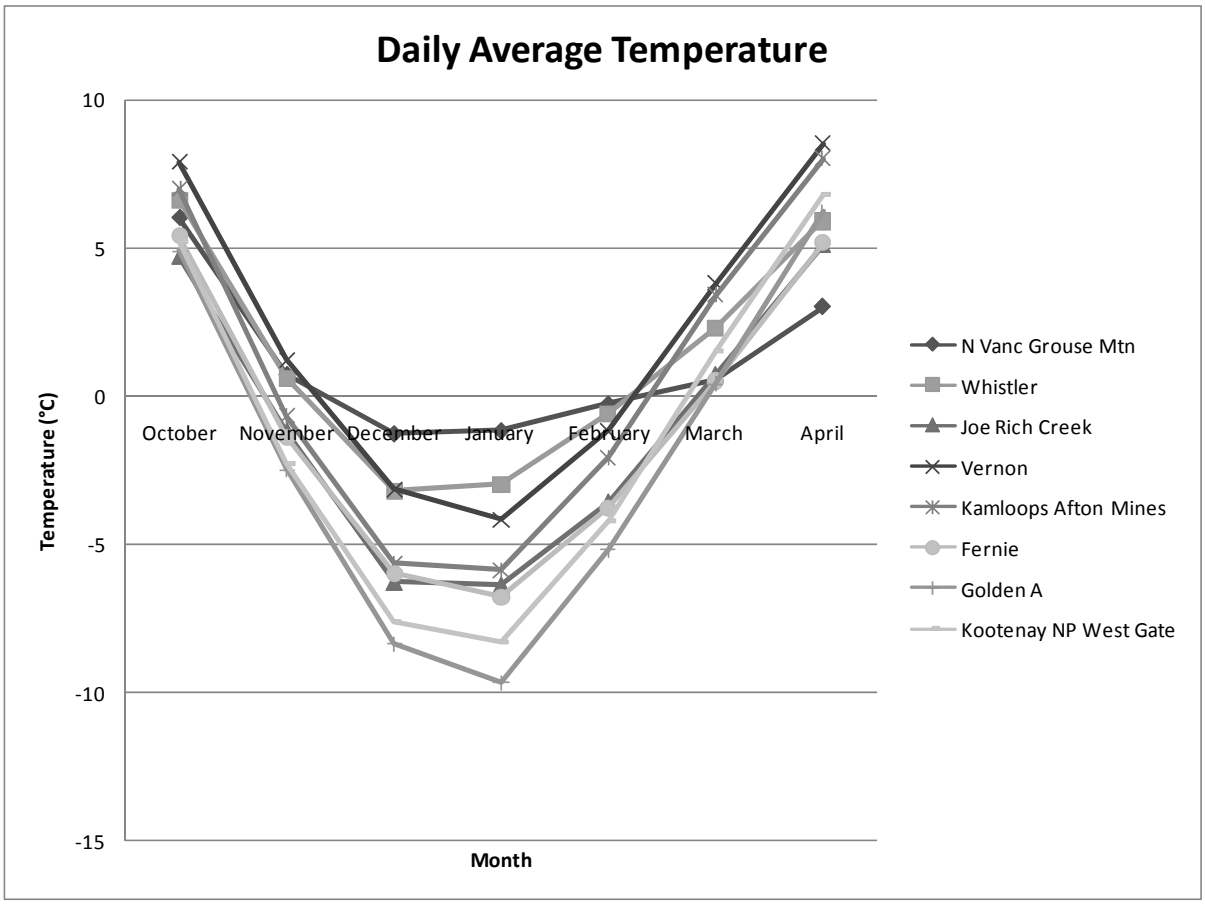

Figure 4-1 Daily Average Temperature

Two types of precipitation, rainfall and snowfall, were utilized to compare locations. These are shown in Fig 4-2 and 4-3. In both graphs, the stations are compared over the October to April period.

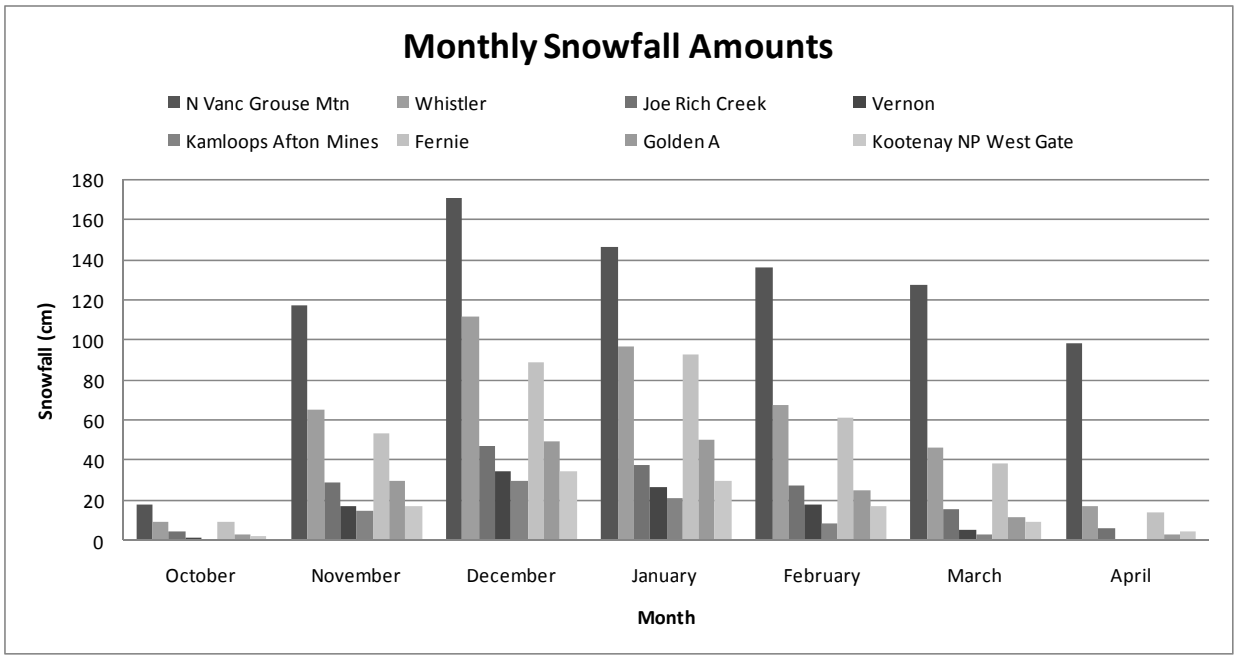

Figure 4-2 Monthly Snowfall Amounts

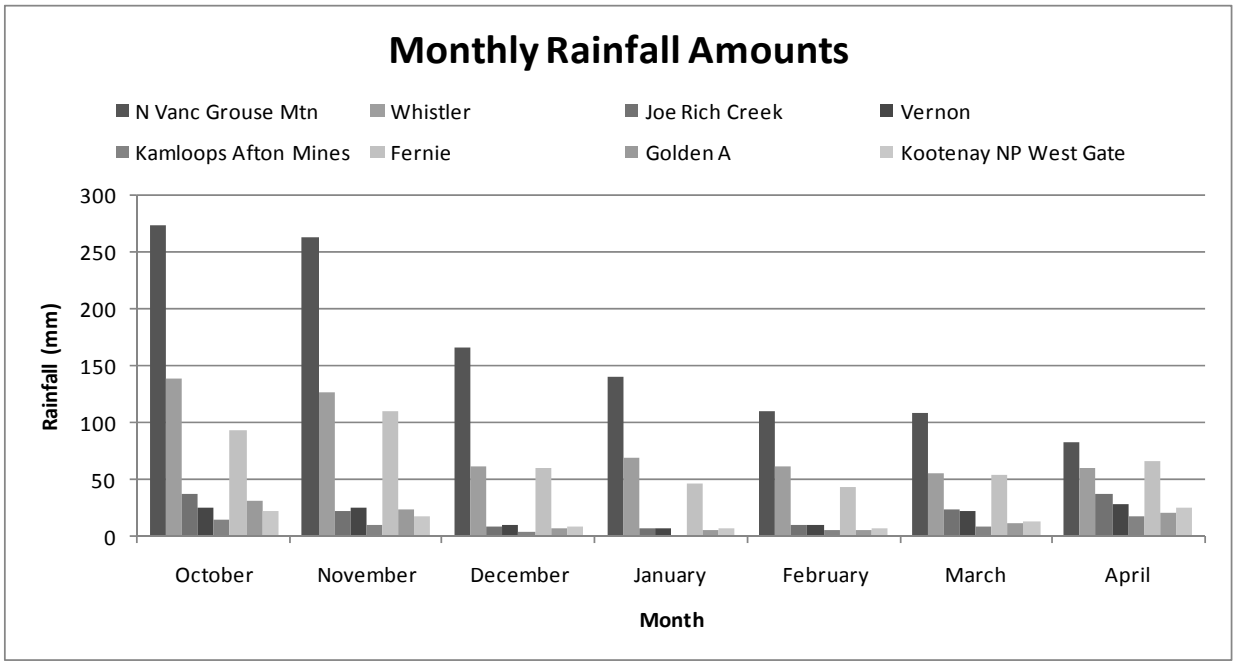

Figure 4-3 Monthly Rainfall Amounts

From the Kootenay Rockies, Golden A and Kootenay NP West Gate were ranked sixth and seventh with 99.5mm and 93.4mm respectively. Of the remaining Thompson Okanagan stations,

Kamloops Afton Mines experienced the lowest amount of rainfall with 58.5mm. Joe Rich Creek and Vernon ranked lower in rainfall at fourth and fifth with 139.5mm and 121.2mm.

Regardless of exact location, many operators described their geographic location as unique. This was apparent in the memories they reported and in their descriptions of challenging weather events in recent seasons.

4.1.2 January 2005

Many participants described the 2004-2005 season as a weather challenge. Despite the average start to the season, the weather drastically altered in January 2005. The following description will focus specifically on Daily Data Reports gathered from Environment Canada (2005a)– specially the stations detailed in Table 4-2.

Table 4-2 Environment Canada Stations for January 2005 data

	Ski Area Elevations		Environment Canada Station	Station Information		
	Base	Summit		Latitude	Longitude	Elevation
Ski Areas	**(m)**	**(m)**		**(N)**	**(W)**	**(m)**
Grouse Mountain	1128	1250	N Vanc Grouse Mtn Resort	49°22'	123°4'	1127.8
Whistler Blackcomb	675	W 2182 B 1609	Whistler	50°7'	122°57'	657.8
Big White	1508	2319	Joe Rich Creek	49°51'	119°7'	874.8
Silver Star	1555	1915	Vernon Silver Star Lodge	50°21'	119°3'	1572.0
Sun Peaks	1255	2152	Sun Peaks Mountain	50°54'	119°54'	1813.9
			Sun Peaks Upper	50°54'	119°55'	2030.0
Fernie	1068	1925	Fernie	49°29'	115°4'	1001.0
Kicking Horse	1190	2450	Golden A	51°18'	116°58'	784.9
Kimberley	1230	1982	Kimberley PCC	49°37'	115°57'	889.0
Panorama	1200	2400	Kootenay NP West Gate	50°37'	116°3'	899.2

Starting with Vancouver and the Coast Mountains, Grouse Mountain started to experience warmer temperatures on January 15th when the maximum temperature reached 3°C and stayed above 0°C until the end of January. The extreme monthly maximum temperature of 13°C was experienced on the 26th. Similarly, the minimum temperature rose and peaked at 6°C on the 19th. The monthly averages temperatures were 3.1°C (maximum), -1.7°C (minimum) and 0.7°C (mean). There was no rain until

January 16 when there was 27mm and continued in various amounts until the end of the month. The total rain peaked at 142mm on January 18th. While various amounts of snowfall were recorded before the 16th, no additional snowfall occurred in the rest of January. Overall, the sum of the total rain and snowfall at this station in January 2005 were 607.7mm (estimated) and 62cm, respectively. Although a considerable amount of data was missing, the estimated snow on the ground was 139cm on January 8 and decreased to 68cm on the 31st.

According to the Whistler station 17m below the base elevation, the maximum temperature rose above 0°C until January 17th with the monthly extreme maximum temperature of 7.8°C on January 23rd. After the 18th, both the maximum and minimum temperatures did not drop below 0°C. The monthly temperature averages were -1°C (maximum), -6.6°C (minimum) and -3.8 (mean). In terms of precipitation, despite the largest recorded snowfall of 8.3cm that fell on January 17th and minimum amount on the 18th, only rainfall occurred for the rest of the month. The rainfall peaked at 64.4mm on the 18th. The sum of the total rainfall and total snowfall for January was 221mm and 19.1cm, respectively.

While this first BC region was hit hard, other regions were not impacted as negatively. While stations in the Thompson Okanagan experienced a rise in temperature, no rain was reported at either Vernon Silver Star Lodge or either Sun Peaks' stations in January 2005. Vernon Silver Star Lodge reported a maximum temperature of -18°C and a monthly extreme minimum temperature reached -28°C on January 14th. However, the temperature rose to 1°C within three days. The temperature stayed at or above 0°C for the rest of the month and reached a monthly extreme of 11°C on the 25th. The minimum temperatures rose and stayed around 0°C from January 19th to 24th. After this time, they remained below -1°C. The average monthly temperatures were -3.8°C (maximum), -11.2 (estimated minimum) and -7.6°C (estimated mean). Overall, the sum of total snow for Vernon Silver Star Lodge was 80cm.

Sun Peaks Mountain and Upper stations reported similar findings. The lowest maximum temperatures at both stations were approximately -21°C on January 13th and the monthly extreme

minimum temperatures occurred the next day at approximately -27°C. On January 17th and continuing afterwards, maximum temperatures stayed above 0°C until January 27th at both stations. Temperatures fluctuated for the duration of January. Temperatures did decrease after January 27th and the Upper station experienced lower temperatures than those at the Mountain level. The minimum temperature at the Upper station did not rise above 0°C. The monthly extreme maximum temperature reached 3.5°C at the Mountain station and 4.5°C at the Upper station. The sums of total snow for Sun Peaks Mountain and Upper stations were both 57cm. Sun Peaks Mountain station reported monthly averages at -5.3°C (maximum), -10.4 (minimum) and -7.8 (mean). Similarly, Sun Peaks Upper station reported monthly averages within 1°C of the Mountain station. Although the amount of snow on the ground fluctuated at both stations, the amount on the ground did not decrease more than 5cm at either station.

The final station within this BC region is Joe Rich Creek which is close to Big White. Unlike the other stations within this region, this station did report rainfall within January. Rain was recorded after January 17th and the month's sum equalled 13.6mm. Up to and including January 17th, snow was recorded. The peak was 18.4cm on January 6th. The sum of daily total snow was 44cm. Regarding temperature change, January 17th recorded a maximum temperature increase to 1°C. The maximum temperature peaked on the 19th at 9.5°C. The minimum temperature peaked on January 19th at 1°C. The minimum temperature fluctuated slightly during the rest of the month but never fell below -4°C. The monthly extremes were 9.5°C and -34°C. Overall, the monthly temperature averages were -2.7°C (maximum), -11°C (minimum) and -6.8°C (mean).

Within the third and final BC study regions, the results varied from the other regions. The station in the town of Fernie, located 67m below the ski area base, reported a similar warm wet weather pattern. Despite maximum and minimum temperatures peaking at -21°C and -37°C (respectively) on January 15th, the maximum temperature rose to 2°C on January 17th and continued throughout the month with a peak at 15°C on January 23rd. The minimum temperatures did fall between -1°C and -5°C from January 25th to 29th. The monthly temperatures averaged -1.7°C (maximum), -11.3°C (estimated minimum) and -6.3°C (estimated mean). The monthly snowfall peaked on January 17th at 15cm and no

snowfall was recorded past that point. In contrast, the total rain peaked on January 18th at 63mm and smaller amounts were recorded until January 22nd when it halted until January 23rd with another 9mm. The sums for the total rain and snow for Fernie were 149mm and 33cm (estimated) (respectively).

The timeline of events at the Golden A station was similar to Fernie. Despite a low temperature peak on January 15th at -21.2°C, the maximum temperature rose to O°C and above on the 19th. The maximum temperature peaked on the 31st at 6.7°C. Despite a rise in the minimum temperature from January 21st to 26th, the temperature never rose higher than 0.5°C during the highest temperature period. The monthly averages were -5.9°C (maximum), -13.1°C (minimum) and -9.5°C (mean). In terms of precipitation, rain was recorded between January 19th and 24th. Snowfall was recorded before this time with a peak on the17th at 23cm. However, after an additional 8.4cm on the 18th, no snow was recorded for the rest of January. Overall, the sums of the total rainfall and snowfall were 34.6mm and 41cm, respectively.

The Kootenay NP West Gate station reported cold temperatures early in January which peaked on the 15th at -22°. However, data for the 17th and 18th was reported missing so the maximum temperature and total rain are unknown. The maximum temperature started to rise and was 6°C on the 19th with a high of 7.5°C on the 26th. While the minimum temperatures reached -32° before mid-January, they ranged from 1°C to -4°C for the latter part of the month. The average temperatures were estimated to be -5.2°C (maximum), -12.5 (minimum) and -8.9°C (mean). On the 17th, the last snow of the month occurred with 3.4cm reported. The sum of the total snow and rain were 23.6cm and 7mm, respectively.

According to Kimberley PCC, temperatures below 0°C were reported until January 18th when the maximum temperature reached 1°C. The monthly extreme maximum temperature occurred on the 24th at 12.5°C. Similarly, the minimum temperatures did increase from lows on the 14th and 15th at 33°C and 33.5°C (monthly extreme). On the 20th, the minimum temperature reached 1°C and did not drop below -5.5 for the duration of January. The average temperatures were -2.7°C (maximum), -13.4°C (minimum) and -8.1°C (mean). While the largest snowfall of 11.6cm was reported on the 17th, no snow

was recorded after that day. From January 18th to 22nd, rain was recorded every day. Overall, the sum of the total snow and total rain were 40.5cm and 8.5mm, respectively.

4.1.3 December 2005

December 2005 was described as a weather challenge by some participants. These participants were mostly in the Vancouver and Coast Mountains region. Some were forced to halt operations due to warm wet weather. The following description provides data gathered from the following Environment Canada (2005b) in the three regions and are listed in Table 4-3 below.

Table 4-3 Environment Canada Stations for December 2005 data

	Ski Area Elevations		Environment Canada Station	Station Information		
	Base	Summit		Latitude	Longitude	Elevation
Ski Areas	(m)	(m)		(N)	(W)	(m)
Cypress Mountain	910	1520[i]	Cypress Bowl North	49°24'	123°12'	953.0
Grouse Mountain	1128	1250	N Vanc Grouse Mtn Resort	49°22'	123°4'	1127.8
Whistler Blackcomb	675	B 1609	Blackcomb Mountain Base	50°7'	122°57'	659.0
		W 2182	Whistler Mountain High Level	50°4'	122°57'	1640.0
Silver Star	1555	1915	Vernon Silver Star Lodge	50°21'	119°3'	1572.0
Fernie	1068	1925	Fernie	49°29'	115°4'	1001.0
Kimberley	1230	1982	Kimberley PCC	49°37'	115°57'	889.0

Starting with the Cypress Bowl North station, located 43m above the ski area base, the extreme minimum monthly temperature was -8.8°C on December 1st. In contrast, the extreme maximum monthly temperature peaked to 9.6°C on the 11th. The monthly temperatures were 2.4°C (maximum), -2°C (minimum) and 0.2°C (mean). Unfortunately, the daily total rain and snow data were reported missing. While total precipitation was reported early in December, there was no precipitation from the 5th to 18th. The total monthly precipitation was 501.7mm. The snow on the ground decreased from a peak of 102cm on December 5th to 44cm on the 31st.

[i] Cypress Mountain (2007). *2007/08 Lifts, Runs, Capacity, Elevation and More!* Retrieved June 9, 2007, from http://www.cypressmountain.com/info.html

Similar results were reported at the North Vancouver Grouse Mountain Resort station which is 174m higher. Lower temperatures were experienced at the start of December. The extreme minimum temperature of -7.5°C was reached on the 1st and 3rd. After the 5th, the maximum temperatures were not recorded below 0°C. The extreme maximum temperature was reached two days, December 10th and 11th. Regarding precipitation, the majority of snowfall occurred in the first half of December (12.5cm). During the latter half of the month, the sum of the total rainfall reached 299.1mm. The sum of the total snow was 16.5cm despite missing several days of data.

Blackcomb Mountain Base reported an extreme temperature maximum of 11°C and minimum of -10.1°C (estimated). The average temperatures were 1°C (maximum), -4.3°C (estimated minimum), and -1.6°C (estimated mean). Similar to the Whistler station, the majority of the total rain and total snow data was missing. The sum of the monthly total precipitation was estimated at 146.4cm. Based on the data recorded, the snow on the ground was always below 10cm of at this station.

The final (and highest) station in this region was Whistler Mountain High Level. This station reported the average maximum temperature was 0.2°C. Temperatures fluctuated throughout the month with an extreme maximum temperature of 9.1°C. In contrast, the average minimum temperature was -5.5°C (estimated) and reached an extreme minimum of -14.7°C (estimated). Unfortunately, the majority of the total rain and total snow data was missing. Only one day was missing from the total precipitation which summed up to 206.6mm. In addition, the snow on the ground did increase from 60cm on December 1st to 100cm on the 31st.

Within the Thompson Okanagan region, Vernon Silver Star Lodge reported data missing until December 20th. However, the minimum temperature data and the monthly average were -9.1°C with an extreme of -17°C. From the data recorded, only trace amounts of rain fell. In contrast, an approximate amount of 53cm of snow fell. During this month, the snow on the ground first fluctuated and then increased. The snow was reported at 76cm on December 1st and reached 92cm by the 31st.

Within the Kootenay Rockies, data daily reports were included for two stations: Fernie and Kimberley PCC. However, the data was incomplete as data was missing for several days from both

stations. Thus, all the results are estimated. Although colder temperatures were reported in the first half of December, around the 21st and 22nd the temperature began to rise. The minimum temperature never rose above 0°C in Kimberley, whereas it did rise up to 5°C at Fernie. Both stations reported estimated extreme maximum temperature of 7°C. Kimberley's estimated extreme minimum was -22.5°C whereas Fernie reached -25°C. Fernie reported the estimated monthly average temperatures of -3.3°C (maximum), -12°C (minimum) and -7.6°C (mean). Kimberley reported similar temperatures of -4.1°C (maximum), -11.9°C (minimum) and -8°C (mean). Regarding precipitation, Kimberley reported the estimated sum of the total rain was 2mm and total snow was 18.8cm. In contrast, Fernie estimated total sums to be 40.5mm of rain and 24cm of snow.

These many patterns suggest the inherent uncertainty that operators face as they attempt to manage their various ski operations. Weather may be ideal one day then decline rapidly for days and even months. An operator at one hill may be reporting conditions favourable to snow making while a nearby operator may be experiencing warm temperatures and rain. Such conditions introduce considerable uncertainty to decision making for ski operators. There are many other sources of uncertainty not directly related to weather with which operators must also contend. The mountainous terrain that comprises ski settings is notoriously difficult to control. The ongoing threat of avalanche and difficult, often hostile, terrain all characterize the facilities with which they must work. How do they deal with the many uncertainties they face while making daily decisions?

4.2 Management Decision Making

The findings in this section and subsections respond to Research Question 1, which asks: "What procedures are used to make decisions when weather-based probabilities and outcomes are uncertain?" The following themes were identified. First, team decision making was a prominent method of decision making. Under this theme, there are multiple sub-themes including reliance on experience and expertise as well as use of historical data and rules of thumb. The rules of thumb are broken down

into three sections: opening, closing and snowmaking procedures. This leads to a discussion on the potential experiences of management when escalation of commitment has occurred. Finally, the last section is entitled, financial feasibility and business models. This section relates to how participants utilized business models to aid in decision making.

Given the uncertainty that characterized many of these operators' decision contexts, most reported relying on team decision making to make major operational decisions (such as choosing the appropriate opening and closing dates). Often roundtable discussions enabled management team members to share their experience and expertise. One participant states, "We have a senior leadership team. And those people come together with me [General Manager] and make those types of operating decisions" (Gen Mgmt 4). This general manager reported that the team was comprised of six team members. Other participants described similar decision making processes that included "five key executives" (Gen Mgmt 3) or "four people" (Mtn Ops Mgmt 3). Another participant within mountain operations management stated that,

> We've got a great senior management team that really crunches the numbers. It's definitely three key players on that side of things. And then under that, we've got a good management group of about ten of us that will get together and have a roundtable discussion on whether we're able to open the operation (Mtn Ops Mgmt 7).

One ski area involved additional stakeholders to aid in the decision making process. They especially relied upon these stakeholders when decisions had implications for their respective operations. As one mountain operations manager reported:

> There's the stakeholders that we have to consider as well. And that's the restaurants like the sushi restaurant at the base that, the lodge owners, the hotel operators, and all that. But there's a core group of about thirteen to fifteen people that will say yes we can do it or listen this is not going to go well. And the biggest, the biggest thing is the staff. Are the staff ready? Are we setting the staff to have a good experience at the resort? Are we setting the guests up to have a good experience? And if the answer is 'no' to one of those, then you really want to look at your decision (Mtn Ops Mgmt 7).

In each case, the operators are seeking to gather additional information, perspective, and expertise to make their decisions. By doing so, they hope to reduce uncertainty and improve decision making processes.

This team approach theme emerged at several operational levels of decision making. For example, team decision making was utilized in actual terrain inspections. The number of team members did vary. One mountain operations manager stated “two” team members since they “don’t need a committee” (Mtn Ops Mgmt 4). Whereas other participants used slightly larger teams, for example, one mountain manager stated “probably six” (Mtn Ops Mgmt 2). Another manager stated, “with this size of operation, it would usually be three to four people. I [Mountain Operations Manager] would lead it and I would involve my operations manager, my sales and marketing manager, and the one other person we have that works in marketing would be media and special events manager” (Mtn Ops Mgmt 2). Another participant stated a similar team strategy, “there’s a group of people that are going to look at the runs. So it’s the director of operations, the mountain managers, it’s the safety managers, it’s the patrol manager, the grooming manager. We’re going to go and look and see what we’ve got for a product before we open” (Mtn Mgmt 5). Again, the emphasis is on gathering together several sources of information and expertise before decisions are made. This theme is explored in greater detail below.

4.2.1.1 Experience and Expertise

Decision making teams relied on team members’ experience and expertise from employment in ski operations, the ski industry, or other areas of business management. As one general manager stated, “we just rely on people’s experience and expertise around the table. We do a lot of communicating and talking and kind of make decisions together” (Gen Mgmt 4). Similarly, another general manager stated,

> The decision making process is one where our senior management team will sit together and will simply use their collective experience in judgement to decide what is the best to open and how to open it. There aren’t many real formal policies (Gen Mgmt 3).

One general manager explained how the decision making team relied on the director of mountain operation’s opinion.

> Our Director of Mountain Operations would come to the table with kind of an overview of the situation and then his recommendations. And we would talk about it. And more times, well way more often than not, we just go with what the Director of Mountain Operations’ recommendation is (Gen Mgmt 4).

With decisions on opening terrain, one general manager described his team method of physical terrain inspections, “it’s usually going out and skiing if you’re talking about opening terrain. Terrain is usually you know, patrol and [the Director of Mountain Operations] and myself skiing and determining whether or not it’s safe” (Gen Mgmt 4).

Overall, experience from managing ski area operations was seen to be most important. One mountain manager stated, “you can’t account for the time, can’t make up for time; the experience. A lot of this job is based on experience. It’s hard to teach it” (Mtn Mgmt 3). In addition, other participants stated similar beliefs that “it’s just a learning process” (Mtn Ops Mgmt 1) and that “you learn from every different circumstances” (Gen Mgmt 1).

The necessary expertise seemed to be based on the accumulation of experience/historical perspective as well as the ability to understand various data sources that were available to the decision maker. One such source was that of historical data.

4.2.2 Historical Data

Teams often reviewed historical data to assist with decision making regarding opening and closing dates for ski areas. The historical data included skier visitation from previous seasons and weather data. As one mountain manager stated,

> Our opening and closing dates are based on historical data. Opening in particular, we know that that by mid November, we will have natural snow and enough natural snow to open particular areas. So with the added advantage of snowmaking, we can, you know, be a little bit more confident that those dates can be met. It’s very rare that we can’t open one of the mountains or both by the third week of November (Mtn Mgmt 5).

Another noted that “if you go back and look at opening day history, you’ll find that that two week window is what the average is” (Mtn Mgmt 1). Still another stated, “we do look at history I guess, skier visits. Sometimes we’ll use that as a guide” (Mtn Ops Mgmt 2).

Such predetermined dates played an important role in many of these managers' decisions. For example, participants stated the opening dates were "fairly consistent" (Gen Mgmt 1; Gen Mgmt 3; Mtn Ops Mgmt 3) or "closing dates are very consistent" (Gen Mgmt 2). Another participant stated that he, "knew dates already – always set" (Mtn Ops Mgmt 3). There were several reasons for this consistency. In some cases, operators assumed that client demand would be present after a given date. As one manager indicated, in terms of an opening date, his staff always followed historical precedent, "We don't change. We always open up for American Thanksgiving… It's all market trends" (Mtn Mgmt 3). Marketing departments in particular were interested in historical data. They were keen to understand past behaviour patterns. As one participant in mountain operations management explained,

> We do look back through the paper records every once in a while and see how we compare to a previous year. And most of that looking back is at the request of sales and marketing when they're looking at historical data to tell people what's going on (Mtn Ops Mgmt 6).

At other times, set dates were important simply because they introduced a bit of certainty into budgetary planning. As one participant explained, opening and closing on the same dates each year were best "fairly consistent for budgetary purposes. We usually state a December 1st opening. But again, we'll open as early as we can in November based on conditions. And closing we are fairly consistent with mid-April" (Gen Mgmt 1).

These explanations seem to suggest how and when opening/closing dates were set each year. Although there was some acknowledgement of climactic variation, operators generally opened and closed at the same times each year. As one participant pointed out "[Opening and closing] over the past five years has been very consistent (except for two years ago [2004-2005] which was a terrible season)" (Mtn Ops Mgmt 2). As well, another participant stated, "rarely do we deviate from the set date" (Mtn Mgmt 3). Another participant revealed the actual time period, "first week in December and second week in April" (Mtn Ops Mgmt 5). Only one of those interviewed stated that opening was determined, not by precedent, but rather by the weather. He noted only that "our opening date is really driven by the snowmaking" (Gen Mgmt 4).

4.2.3 Rules of Thumb

Rules of thumb are often created and utilized to simplify decisions in business operations. Some participants denied the application of these heuristic strategies. For example one operator indicated that “There aren’t rules of thumb” (Gen Mgmt 3). Another responded “No, I don’t think so” (Gen Mgmt 4) and another stated flatly, “We don’t” (Mtn Mgmt 3). Although they did not believe they used any rules of thumb, their statements and descriptions of operational procedures often revealed that the opposite was the case. For example, the previous discussion of opening dates indicated that many of these operators assumed that weather conditions would be favourable if they waited until a given date to open their ski operations. This reliance on a given date suggests the use of a heuristic strategy. Time of year proved a very important gauge for many decisions. Many managers felt that you typically wouldn’t plan events in the valley early or late season. These strategies or “rules” emerged largely from past experience suggesting that at such times there were “not enough days of cold to make snow for the events” (Mtn Mgmt 2).

Other rules of thumb were utilized in an Avalanche Protection Program. For example, they followed the premise that “Once we’re past 20cm of snow overnight, we know that that coupled with a little bit of wind we know that we’re going to have some serious issues. But there’s no fixed number just because of the variation” (Mtn Ops Mgmt 6).

Other rules of thumb extended into general operational guidelines. Many referred to the amount of groundcover needed to open. One participant stated, “We need probably about 125cm to open up the bulk of our resort” (Gen Mgmt 3). Another participant stated,

> We have opened on 50cm, just with this little [chairlift], which we have out in front here. I would say 100cm is about average opening. That would give us good coverage, enough to fill in the creek beds and just that sort of thing (Mtn Ops Mgmt 2)

Still another reported favouring 100cm of snow before opening (Gen Mgmt 2) in coverage. This number was popular among the participants. As one explained:

> When we have a metre of snow at our snow plot, that’s a pretty good indication that we should be able to open virtually all of the runs in the mid-mountain area cause that snow stake is sort

> of upper mid on both mountains. By two metres on that snow stake, we should have runs to the alpine and runs to the valley open. And even the runs where people choose to ski in the trees, which is usually off-piste. Those usually have enough of a base to be able to ski those as well (Mtn Mgmt 5).

A few were less specific. One stated, a "rule of thumb is that if we have the snow, we'll open. If we don't have the snow or the snow is marginal, we'll delay opening" (Mtn Ops Mgmt 4).

A few offered general operational procedures that suggested standard approaches if not specific rules of thumb. For example one participant noted that:

> Most times mid-mountain will open first because it's the smoothest ground cover and it usually gets a fair bit of snow to begin with. Then the alpine which is a rougher ground cover and needs a lot of snow. And then the valley runs which need a lot of snow even though they are smooth. Those would usually open later. So mid-mountain first, then mid-mountain to the valley by mid-December. And our plan is to normally have everything open by Christmas break. So by December 20th. (Mtn Mgmt 5).

4.2.4 The Search for Flexibility

As the previous discussion suggests, many operators utilized rules of thumb regarding opening and operating procedures. For example, they intended to open at the same time each year and made plans to do so. However, they were also careful not to be restricted by such practices. They recognized that such dates offered no guarantee that weather would cooperate. Instead, they made their best effort to be ready on the dates they had selected and hoped that weather conditions would be favourable at that time. As one participant observed: "We are gearing up all of our staffing requirements for November 11. So any time after November 10th... we are ready to go" (Gen Mgmt 1).

Another participant pointed out the importance and unpredictability of the weather in their planning:

> Internally, we make November 11 the date at which we have to have all of our equipment ready to go, all of our staff up and trained. And everything just basically ready to move forward if we have snow and if we open… We typically open anywhere between the last week of November and the first week of December. Of course its weather dependent. Cycles change all the time. Last year we opened middle of November (Mtn Mgmt 1).

Again, there seemed a universal recognition that these rules of thumb provided only a starting point for planning. They would schedule their opening date in advance and work toward that date. However, they would be ready for variations in the weather that might influence their plans:

> Our target opening day is always the first Friday of December. And we schedule that you know, a year in advance. And then all of our department managers work towards that date to be ready to operate. If we're hit with earlier snow, then we simply need to readjust and meet that earlier opening date. Keeping in mind that the mid-week volume is still fairly low until we get into December (Gen Mgmt 2).

Another participant confirmed that their target date was conditional at best:

> When we're deciding the dates specifically, it's always set for the Thursday prior to the US Thanksgiving. So we've got a very fixed date in the calendar that we always set as a goal for an opening date. And then, that one, we've opened on a single lift, a single beginner lift. So as soon as we are able to open any particular area, we generally open. We've never made the decision to leave an area closed, even though it had the snow, but because it doesn't economic sense and traffic volumes weren't there. In general, because we have such a large pass holder base in our local market when they come up on weekends, they expect as much to be open as possible. They can fill up the resort quickly (Gen Mgmt 3).

This was a recurring theme:

> We look for a date to open. And that date, dependent on snowpack, will depend on how much of the area we open. So we use a date around American Thanksgiving which is about November 20, 21st as a start date. Some years we'll open everything, some years we'll open one slope or two slopes, dependent on snowpack (Mtn Ops Mgmt 4).

> There's a date at which we need to be ready to go and that will be kind of mid-November to actually early November we'll be ready to go. And its just weather dependent at that point. And if we get the weather, we'll go, but if we don't, we wait for it (Gen Mgmt 4).

Some operators were open to moving the actual opening earlier if the snow permitted. According to one participant, "Our official opening for this year [2006] for both mountains would be November 23rd, American Thanksgiving. But with enough snow, we will open one of the mountains earlier. In this case, this year, [ski area] on the 18th" (Mtn Mgmt 5). Thus, some ski areas were often fairly certain that they can open before the official date.

Given uncertainty over weather conditions, however, many were cautious over opening early however promising the snow conditions:

> The last thing we want to do is have a very minimal opening followed by some very warm weather or rain that washes us out. Once we open we want to stay open. We don't want to open, close, open, close (Mtn Mgmt 5).

4.2.5 Closing Procedures

Some ski operators decided on a closing date before the season got underway. For example, several used the Easter weekend or mid-April as a projected year end date. Easter was particularly important for operation because of the high demand associated with the Easer holiday weekend. As a participant stated, “we have to have Easter in there” (Mtn Ops Mgmt 5).

While Easter was financially important it also signalled the end of the season for many of these operators. When asked when he planned to close, one operator simply stated, “Easter weekend traditionally” (Mtn Ops Mgmt 7). Another participant explained how Easter was a guideline since its dates varied, “if Easter is in March, sometimes it is according to the moon, we won’t go too far into April. But if Easter is near the end of April, we’ll go as long as it takes to get Easter” (Mtn Ops Mgmt 5). The rationale provided by these operators was partially one of weather (and snow) conditions: “We close around Easter, but once again, that is sometimes affected by the weather and you know, in conjunction with the traffic flow” (Mtn Mgmt 1). Another participant described how the terrain was impacted by the weather,

> ...and then in the springtime, we know that we’re going to lose the lower part of the mountain first, in late spring. It may continue to snow in the alpine even in the springtime. So the high alpine generally stays good mid-mountain until the end of our season (Mtn Mgmt 5).

However, closing dates were also influenced by demand patterns. One participant stated, “right around April the 15th... that seems to be when people lose interest in skiing and the weather gets nice and they turn their attention to golf or tennis” (Mtn Ops Mgmt 2). This observation was generally supported by many of these operators. Another manager stated,

> We close either a week past Easter or two weeks past Easter. But we usually shoot for the middle of April. We try not to go beyond that. There’s too much, and that isn’t lack of snow, it’s always lack of interest in the locals (Mtn Ops Mgmt 4).

This suggests a sort of heuristic operating among users. This operator is suggesting that many skiers tend to use Easter as a sort of guide or form of shorthand. The arrival of Easter is used as a signal to

move to other leisure pursuits. As another operator suggested, “closing for the season is more just date specific. It’s never really snow related” (Gen Mgmt 4) and “we close with our best base of the year” (Gen Mgmt 3). Another participant further explained his similar belief that,

> As far as the end of the season’s concerned, usually we have an incredible snow base to work. And it really is the interest that we lose before snow. To put that in perspective, I mean, most years we can operate until the end of May. But we have a difficult time holding interest after the end of March (Gen Mgmt 2).

Another participant stated, “if we were to continue to operate, there would be nobody here anyway. So we just pick a date and close. We’ve always got snow on the mountain when we close” (Gen Mgmt 4). Overall, participants found that:

> Closing is a time of year. It’s a seasonal change where it’s a mindset, that from past experience it rapidly declines involvement in boarding and skiing, after that mid-April time. But it is based, you know, on experience and traffic patterns (Gen Mgmt 1).

Overall, most participants found that “There’s always good snow. It’s great skiing” (Mtn Ops Mgmt 5), but it’s the participants that are lacking, “There’s just no one” (Mtn Ops Mgmt 5).

Every year, skier visits decrease as spring weather begins. Other sports and activities come to the forefront and skiing cannot compete. As one participant stated, “You tend to see when the golf courses open, suddenly the visitations drop a little bit. And people are just starting to make different decisions about different activities” (Mtn Ops Mgmt 7).

As skiers change their focus, some ski areas begin preparations for their spring and summer operations while continuing skiing where the terrain is adequate. As one participant stated, “in the summer, we have a lot of summer operations as well; the bike park and so forth... comes a point when people lose interest. And put their skis away and pulling their bikes out. There’s certainly a cost” (Mtn Ops Mgmt 1). In addition, he described the overlap between the winter and summer operations the previous year. He stated that,

> This last year, I think it was June 5th was our last day as far as skiing goes. The bike park was open sometime in May. You just can’t ski to the bottom, but you can still ski in the top two-thirds. So we try to accommodate both. See right now mountain bikers are putting their bikes away and waxing their skis. We’ll be open in a week or two (Mtn Ops Mgmt 1).

4.2.5.1 Snowmaking Procedures

Some general rules of thumb used by ski operators included, “the trick is to make as much snow as you can as low as you can” and “make snow every opportunity. In the coastal’s, it’s fleeting” (Mtn Ops Mgmt 1). Another participant revealed the rationale behind these rules as,

> We’ll always make snow if we can, provided that it’s not going to blow away. So our windows aren’t like in the Rocky Mountains where they have a longer window, you know a greater length of time in cold temperatures. So we have to make it when we can. And that means sometimes we make it during our operating hours (Mtn Mgmt 5).

Snowmaking technology operation “is based on weather” (Gen Mgmt 1) and “completely weather dependent” (Gen Mgmt 2). One of these participants added that, “you want to make sure that you have a couple solid weeks of a front in that is sustainable, at zero or below in temperature. So you do have to look at the forecast” (Gen Mgmt 1).

There was a consensus among participants that, “the colder the better” (Mtn Ops Mgmt 4) for snowmaking operation. Some participants quantified their optimal temperature for snowmaking operations. One participant stated, “It’s most efficient and it works best for everybody between -10 and -15[°C]” (Gen Mgmt 4). Whereas another stated that at their ski area, “its -8 below” (Gen Mgmt 3). Some ski areas quantified the temperature and or time period, “-3 to 0[°C]” as the temperature at which, “we’ll shut it down” (Gen Mgmt 4). Another participant’s operation required a “six to eight hour period” at “-3 to -5[°C]” (Mtn Ops Mgmt 3). Another participant agreed and added in the influence of wind, “usually -3[°C] or colder without high winds, means that we’re going to be able to pump out some snow” (Mtn Mgmt 5). As well, another participant’s decision was influenced by humidity levels. As one mountain manager stated, “the best temp -10, -8 Celsius. Low humidity” (Mtn Mgmt 3). Another mountain manager stated,

> -2[°C] is typically what we use as a rule of thumb to turn on our snowmaking. And that’s you know depending on the humidity as well. -2[°C] and below with the lower the humidity the better. We have made snow up to about 4 or 5°[C] above zero with a very low humidity. But ideally we typically will not turn on the snow guns until it’s about -2[°C] (Mtn Mgmt 1).

Note that although the laws of physics generally determine whether or not snowmaking will succeed, each operator has a slightly different rule of thumb in terms of when snowmaking is appropriate. There are also times when they ignore current temperatures and humidity levels because of traditional seasonal weather patterns. As one participant explained,

> You don't want to make snow in October, because, you know, a week later, it could be warm. And the energy and the power and man power that is put into that effort is wasted. So you want to make sure that you are making snow when the entire weather patterns are changing and it can be sustained (Gen Mgmt 1).

Some participants based their decisions on the historical weather data for consistently colder temperatures. One general manager stated, "no earlier than November 1st, because there's still a chance we will get a warm spell up here until then. But that could differ" (Gen Mgmt 2). Another participant from mountain operations management stated, "we make snow from end of October, so early November until about December 5" (Mtn Ops Mgmt 4). Another manager stated, "there are guidelines, but end of October, beginning of November is when we start. And then we'll go 'til the end of January" (Mtn Mgmt 3).

In addition to the historical data, some operators considered the short-term forecast. For instance, one participant stated,

> November 1st is a day that we usually look at as the first go date. We won't start up snowmaking if it looks like its going to be cold for 12 to 24 hours. But if we see, you know, a window of three plus days, well then yeah, we'll go for it. I mean, we started making snow yesterday [November 1]. We will be making it all night. We'll actually be making some right now. A lot of this is you know this helps us with the training of our crew and making sure all the equipment is running well (Mtn Mgmt 1).

Another participant further explained the factors that influence the decision, but stated what his preferences were,

> I wouldn't make it any warmer than -4[°C]. But some people have gone into zero in hopes that it's going to get colder. The trouble is that you have to shut down and restart the plant and that takes a lot of work to do that. And then you have to shut down all the guns. The warmest time of day is 4 o'clock in the afternoon. So you just watch the temperature rise and if you think you can, it's only going to go to zero for a little while at 4 o'clock then you'll run it and make crappy snow in hopes that it'll turn around and get cold (Mtn Ops Mgmt 5).

In contrast, another ski operator used dates, between "October 15th and January 15th" (Mtn Ops Mgmt 5) as a guideline. He stated two reasons,

> That's when it's historically cold enough and we've had enough snow. And the other reason is, has to do with BC Hydro. We have an agreement with them and they will come and give us a different rate for using hydro. And it goes a month at a time. So if you start on October the 7th, it will go for one month. So you might want to hit January 7th (Mtn Ops Mgmt 5).

4.2.6 Escalation of Commitment

Participants were asked about how initial commitments to a new endeavour might influence subsequent decisions (thereby escalating commitment). Many participants in the interviews were unable to provide examples of this type of behaviour. However, one general manager indicated that "our general culture is not one to do that. We don't allow sunk costs to force us into a program" (Gen Mgmt 3).

Others were quite candid indicating that sunk costs could often encourage them to commit to courses of action that were less than successful:

> The one thing that I would probably put into that category is night skiing here. I am not sure how critical it is, but it's become expected. And our costs are already [high], with lighting, you know and those costs are out there. I wouldn't continue to operate it based on we've invested dollars in lighting, but its there so we keep on doing it. But it really doesn't end up to anything. (Gen Mgmt 4)

Another indicated that the introduction of a mountain bike operation created conditions that encouraged ongoing commitment to an unsuccessful enterprise:

> We did two years ago when we ran a mountain bike operation in the summer time. It's something that we'd invested heavily in. And we decided it wasn't making money. There wasn't a lot of people showing up. But we wanted to stick with it, just to make it. We'd invested so much in it that we decided, well lets just go for it, there's only another month or whatever. (Mtn Ops Mgmt 2)

In the end, the operation was ceased due to a terrain expansion planned within the same area. "We only have one detachable chair which is adaptable to mountain bike operation it's all on the same side" (Mtn Ops Mgmt 2).

Another mountain operations manager explained how his ski area attempted to avoid becoming committed to given courses of action (especially when the initial decision was proving unprofitable):

> If you do start that and you don't find that it's working, then you try and figure out a way to fill that. So what we do is say our night skiing, as an example. We do night skiing. There's not a whole lot of users of the product. But now we have school program, not an official school program, but a school program that that helps us to fill those nights. [It] gives them a program that's very successful in town. So that kind of thing happens. You start to look at other avenues and be a little more flexible in how you don't just try one thing and then give up. Try a few different things. (Mtn Ops Mgmt 4)

4.2.7 Financial Feasibility and Business Models

Decision making at these various operations was generally guided by financial priorities. Financial feasibility of ski operation was important to all participants. Some explained their use of business models to justify operational decisions. As stated by one mountain operations manager,

> Got to do a cost-benefit analysis on it and make sure your return, yeah its business. Make sure of your return on investment because you can spend an awful lot of money because you think something is a great idea. But if no one else thinks it's a great idea, then all you've done is spend an awful lot of money. (Mtn Ops Mgmt 7)

He further explained, "look at your business units and how they are operating. And you know, for an investment on an attraction or anything like that, it's what your return on investment is. Is this a wise investment to make?" (Mtn Ops Mgmt 7). This sentiment was repeated throughout the interviews. Financial gain guided decisions ranging from when to open to how many trails to open. In terms of the former, one mountain operations manager stated,

> Mountain conditions are one thing. What we really look for is how the bookings are going. If you know the sales team, if the demand is there for the product and it's cost effective to open the business, then we will definitely open the business. This year was a great example. We had a scheduled opening date of December 13th. But conditions were so fantastic that we opened three weeks early. So we had an unbelievable December and we didn't see the initial traffic right off the bat, but what we saw and what was a very good decision is the product was good in December that February and March bookings. We booked out. Rather than having you know, a 65-75% occupancy rate, it translated into the 100% occupancy rate for the later periods and very good decision to open early. (Mtn Ops Mgmt 7)

In terms of the latter, another participant gradually opened terrain as skier visitation increased. He noted that:

> When we open in the third week of November, we've only got so many acres open. There's not enough snow to ski everywhere. So that small ski area that we are offering is busy enough. And then as it grows, our business seems to be growing as we are expanding our ski area. So, I don't, I find that kind of times, we don't, we don't really get to the point where we're really slow. We kind of manage our business so that we are maximising it. (Mtn Mgmt 4)

However, this is not to suggest that all these management decisions were immune to various contextual influences. For example, one manager indicated that past experience was going to influence future decision making. "I would say that after last year's experience opening so early and seeing the results of the visits we encountered, we are probably more cautious of when we open to ensure that we are opening such that we can be fiscally strong, that it's economically worthwhile" (Mtn Mgmt 4). In other words, the loss experienced last season will continue to provide a cognitive frame for subsequent decision making.

Other decisions were more straightforward. For example, snowmaking was likely to cease when costs suggested that this activity was no longer profitable:

> We make the decision based on how much it will cost and what you think its going to bring. You know and usually by that if it's that bad by that point in time, you're just throwing good money after bad because you can make a little more snow. But it's not really going to change the outcome of your year. (Gen Mgmt 4)

Decisions also seemed more straightforward when indicators of success (or failure) were easy to measure. In terms of closing procedures one participant from general management stated, "closure is simply an economic decision because the skiers aren't coming anymore" (Gen Mgmt 3). He added, "We've never closed earlier and in fact only extended if there were some fantastic conditions, and it was just too good to resist. We might have extended by a few days" (Gen Mgmt 3). In such cases, decisions were typically based on easy-to-measure variables like attendance, "towards the end of the season, you really look at the visitations" (Mtn Ops Mgmt 7). This manager went on to indicate that:

> It's a big part of that is really analyzing how your numbers are looking inside the business units themselves. And we could have great conditions and we will probably have fantastic conditions. But if there's only 100 people coming here, you know we could ski here quite easily until May. But sometimes you just got to, say we got to close. We've got a lot to do in the summer and the earlier we start on the summer work, the better off we're going to be (Mtn Ops Mgmt 7).

Reliance on such numbers seemed to reduce uncertainty for these managers. They knew that "typically the volume declines to the point that it isn't cost effective to operate at the end of the season. Really the only advantage is we would see more visits overall, but it would be at a cost to the company" (Gen Mgmt 2).

There were times in which they were willing to ignore these basic financial priorities and experiment with different closing dates. However, as was the case throughout these interviews, participants wished to reduce the risk that might emerge with any given course of action. For example, one manager indicated that "if there was ever a time to experiment, it's after a really strong season" (Gen Mgmt 2). A strong season would bring increased profits and high levels of interest expressed by skiers. Both would reduce the possible negative effects of staying open beyond traditional dates and times.

4.3 Weather Dependent Industry

The findings in this section and subsections further explore Research Question 2, which asks: "What is the effect of climate variability on ski area operation decision making?" As suggested above, although decision making processes were informed and guided by team members, historical data, and rules of thumb, weather had an ongoing influence on the way in which these carried out their daily operations. Indeed, weather was one of the major daily operational concerns for decision makers. As one mountain manager stated, "[the ski industry] is very much a weather influenced industry. You have to have, you know, your set of guidelines, but you have to be flexible to react to the weather and the environmental cards that are being dealt your way" (Mtn Mgmt 1). Another participant stated, "there's one thing that we can't control, it's the weather" (Mtn Ops Mgmt 7).

The weather challenges operators and ski area operation. "Weather is something that should be understood as a day-to-day operational challenge," (Mtn Ops Mgmt 7). Another participant stated,

"Any period, any period from November 1st through Easter. Nothing changes. We do everything we can to maximize the weather opportunities, and manage the weather challenges" (Mtn Mgmt 4).

On the whole, the weather created challenges to operation on daily and weekly time frames, which were unique to individual and collective ski area locations. Ski operations required diligent daily weather forecasting. Weather required planning from decision makers. In addition, weather was the major concern in preparing budgets.

4.3.1 Weather Challenges

As suggested above, these mangers attempted to create certainty under inherently uncertain conditions. They hoped to open at the same time each year, and remain open until Easter. They wanted to maintain the quality of the experience for their visitors during each day in between. Yet weather often conspired against them. Operators reported, for example, that weather could reduce and or halt ski area operations. As one mountain manager explained, "severe weather whether it's high winds, warm temperatures, cold temperatures can all create hazards of their own" (Mtn Mgmt 5). Another participant stated, "each day is treated the same. We're open until the weather closes us" (Mtn Ops Mgmt 4). In addition this manager described his ski area's challenges as "high winds and really really bad visibility" (Mtn Ops Mgmt 4).

Many participants described weather as the greatest challenge to their operations. Some of these challenges are simply a function of the time of year. As one participant described, "early season, there's always challenges. Like I said, we're always waiting for the snow. Can't make snow if that's when a warm spell comes. But we don't get warm spells mid-season typically that would cause any significant melt downs" (Gen Mgmt 3). Another participant in mountain operations stated,

> We have early season challenges with just temperatures cold enough to start the snowmaking program in October. Because we're such a big area for race training pre-season, we don't open to the public until the second week in December. But before that we're open for a month or more of race training and all the world cup teams will come here. So that's a real going

> concern. If we have a warm dry fall that could really really affect business levels and the start to our season (Mtn Ops Mgmt 6).

Recent variations in winter weather presented even more demanding challenges to ski area operations in southern BC. For example, in January 2005, there was a rain incident which many described as an "anomaly" (Gen Mgmt 2). One participant stated, "in terms of our historic weather data, it was a 1 in 25 year event. So the good news is that we only see historically, we don't know the future" (Mtn Mgmt 4). Some participants reported, "We sort of went through three seasons in one" (Mtn Mgmt 1). One participant reported, "We opened and closed probably 3 times over the winter. And that was for like open for a couple of weeks, closed for 3 weeks. When the next snowfall came, opened again. It was just a yo-yo ball" (Mtn Ops Mgmt 2). Another ski area reported a similar experience,

> I think we closed as of January the 14th. It started to rain and when it stopped, there wasn't anything left and that was at the end of January. We didn't open for those 2 weeks. And we re-opened in February for 10 days and then shut down and re-opened at the end of March for about 2 weeks (Gen Mgmt 2).

Still another reported, "We had to close down for I think 19 days or something like that. But we were very lucky in that we did have snowmaking, and we were able to sustain our season a lot longer than many other hills" (Gen Mgmt 1). Another participant admitted that they "certainly didn't meet our financial target" (Mtn Mgmt 1).

The situation for another participant was made worse as the media was at a ski event when they experienced rainy conditions. The participant described, "We were right in the middle of our [sporting] event when that happened. So we had the world's media here which was probably, you know, the toughest thing" (Mtn Mgmt 3). He added, "The world thought we were closed the next day" and "We took a large hit as a business" (Mtn Mgmt 3). He further explained:

> All our competitors were happy to say that [ski area] was closed, except for all the people that live here and have to make a living, right. So we fought tooth and nail to, to offer the best product, offer the best experience to our guests when that happened (Mtn Mgmt 3).

It should be noted that weather could create a wide variety of challenges for these operators. While most of their responses dealt with weather's effect on the slopes, weather could also affect travel

patterns of their users. Inclement weather could close roads; thus, hindering guests who travel from different provinces, states and cities. According to one general manager,

> It's a combination of snow and wind that's been a big problem. And it's just not the quantity of snow. We're having the thaw freeze cycles right now, which increase avalanche risk. So that's what closed the Alberta roads, is the avalanches and avalanche risk (Gen Mgmt 3).

Another ski area manager faces a similar geographic challenge, "In this area, it's a heavy storm cycles that come through that affect our ability to draw business" (Mtn Ops Mgmt 7). Their unique location was,

> Subject to closures due to avalanche closures in the winter and some mudslide activity which has been happening in the past. So the challenge isn't so much how to deal with the weather when it's at the resort. It's how it affects our surrounding business in order to draw guests to the resort and their decision making skills on that (Mtn Ops Mgmt 7).

The uncertain conditions even influenced staffing levels. One participant stated, "We had obviously issues retaining staff. We couldn't keep everyone employed. So we had some layoffs. We made a conscious decision not to scale back our operation" (Gen Mgmt 4). In contrast, another participant reported extending the snowmaking production. He described,

> We certainly kept snowmakers on a longer shift that year than normal. Because we had to make snow whenever we could. Normally the snowmakers are all laid off once we have a good snowpack. But because we found by the normal layoff time still didn't have a good snowpack (Mtn Mgmt 5).

Not surprisingly uncertainty, as a result of weather conditions, was a constant concern. Once the operations were open for the season, operators then became concerned with staying open. They were particularly interested in making profit during traditionally peak periods but even then uncertainty was problematic. For instance, one general manager described this challenge at Christmas time the previous season,

> The greatest challenge is experiencing inclement weather during traditionally peak periods. Examples would be inclement weather on weekends, especially when we're hosting events or during weekends in December or January which are traditionally very busy times, are you know, very timely, because our primarily challenge last year was that we lost Christmas entirely. So we started off right at this time of year mid-November, terrific start to the season. The fourteen, fifteen day period over Christmas was a complete washout. We've had to cancel all of our programs. That was an anomaly. But economically a real challenge (Gen Mgmt 2).

While this concern was echoed by operators in each of the regions under study, it seemed most problematic in the coastal region. One coastal mountain operations manager complained that the region seemed to "[hover] around the freezing mark all the time which makes it challenging to make snow" (Mtn Ops Mgmt 2). Another coastal mountain ski area manager reported,

> We see, being in the coastal mountains, every type of weather whether it be summer, spring, fall or winter. So in the winter, you know, we could have very cold temperatures and we're making a lot of snow. And then it can rain to the top for a week straight at any time of the season. So we expect every type of weather that you could possibly expect I guess. Just through our experience over the years (Mtn Ops Mgmt 1).

Another participant from the same region described similar experiences,

> Being on the south coast close to the ocean, our temperature and wind is a factor. We don't have snowmaking right now. It's generally not cold enough for snowmaking. But the wind is a factor. We basically have two separate mountains here… And as the wind comes through it speeds up and goes between the mountains… And it's always a crosswind across the chairlifts. So it makes it hazardous for running lifts in high winds. So it's very challenging the weather (Mtn Ops Mgmt 2).

There was some concern that conditions might become even more uncertain as time passed. One participant from mountain management gave an in-depth description of how his ski area is affected by environmental factors,

> That's a jet stream. Actually turns on or positions on us in a way that starts sucking up similar to what you've just seen, starting sucking up a long line all the way down to the south pacific to the Hawaiian island area, pulling subtropical air out, and that's got, I mean, some scientists say that the jet stream does that, repositions itself because of climate change. But that is speculation because they don't really know if the factor of a jet stream aligning us in the worst possible way. It's almost like a November event happening mid-winter, but it's prolonged. So it and the point is, maybe because of climate change the overall temperature is still warmer by .5°C or a degree. But even if it was cooler by .5 or a degree, for example what's happened in the last few days, we still would have gotten rain to the top. So it's when the jet stream goes into a specific dynamics, we get this rain and it's not a direct consequence of climate change (Mtn Mgmt 4).

However, operators in regions with more predictable weather patterns were less concerned with occasional inclement weather events. As one operator in the Kootenay Rockies explained

> A rain event should always be assumed it can happen, especially living where we live. We know we get rain. We know we get, you know what's called the pineapple express coming in from Hawaii, which will send a warm air current right through. And I think if you plan for that to happen, it's something that can be dealt with (Mtn Ops Mgmt 7).

It seems that with greater certainty, weather challenges become less burdensome.

4.3.2 Operator Response

The question of greatest interest to this study relates to how these operators attempted to provide certainty for their clients in the face of uncertain weather. For these many reasons, operators constantly sought to create certainty in uncertain conditions. The intent was to preserve ski conditions for visitors in spite of what the weather offered the operators. One mountain manager stated, "We stand on our heads to open. Whether that means running our snowmaking plant overtime; whether it means trucking snow around. Whatever it takes to get open, we do it" (Mtn Mgmt 3). For one general manager, producing a consistent season proved a challenge. He stated,

> Sometimes the season might start a little bit later and might run into spring conditions. We like to be able to deliver US Thanksgiving regularly. And right now we are not able to do that. But I don't know that we'll ever make any changes by adding snowmaking or anything like that or do more summer grooming to accommodate that. (Gen Mgmt 3)

Hence, he admitted considering new operating procedures if weather inconsistencies continue, "We might just decide that we are consistently ready to go by December 1st instead" (Gen Mgmt 3). In other words, he was willing to consider a new rule of thumb when deciding upon a fall opening date.

Others noted that operators must be ready to use any means at their disposal to help maintain acceptable conditions on their slopes. One participant explained,

> Major decisions are you know, you know prioritizing your runs, prioritizing you know what you do, to what extent you do to stay open… we moved snow by a helicopter. We picked up snow from certain areas and dropped it in other areas. We did everything, we shovelled snow. We did everything we could at that time to extend and maintain our season for our pass holders (Gen Mgmt 1).

Another participant described a similar strategy,

> We had to make the most of what we had and really be smart about, what we could do to make snow, move snow, preserve snow, provide our guests with as much information on where the best snow is going to be (Mtn Mgmt 5).

A third shared his ski area's strategy,

> This is where we did a lot, a lot of snow farming. Mainly sacrificing certain runs in order to solidify one run from bottom to top. I think what it really did was open the eyes of the resort to

> how important your summer product is in terms of slope grooming in order to satisfy your winter product (Mtn Ops Mgmt 7).

Perhaps the most innovative strategy was adopted by an operator who reported "spending more money on what we would call animation. So that would be entertainment in the lift lines in the valley and on some of the busier lifts we'd have musicians and entertainers of different types" (Mtn Ops Mgmt 2).

Others focussed their efforts on communication. For example, one operator reported

> We believed that the perception out there was actually far worse than it actually was. So we worked hard on our website and through emails, etc to make sure people knew what the skiing was really like and how much snow we had (Gen Mgmt 4).

These operators feared that if they didn't take extraordinary steps to maintain the quality of visitors' experiences, they would suffer what they termed a "hangover affect". As one participant stated,

> What happens in, in those situations, is you don't suffer so much at the time, you know, there'll be a hangover from weather. You know, if we don't have good early season conditions, then we won't get, get bookings early season, the next, the following year. It might take a couple years depending on what happens with the weather (Mtn Mgmt 3).

Another agreed reporting that after a poor year, "a lot of people were tentative to buy a ski pass the following year" (Mtn Ops Mgmt 2). This participant continued, "definitely, on pass sales, there was a significant drop" (Mtn Ops Mgmt 2).

4.3.3 Variability Adds to Uncertainty

One of the most striking findings to emerge from this study is the inconsistency both among weather patterns from region to region and the effect of these conditions from operation to operation. For example, a poor season had one operator reconsidering their entire operating structure.

> A year like that will then force us to go back and then re-evaluate a lot of our systems. Our systems and dealing with weather, our systems on efficiency to see how we can be more efficient with our staff in some areas. Typically, I think any difficult year within a company will always force its directors and staff to look back and re-evaluate how we conduct business and I would say that was our experience coming out of that year or two years (Gen Mgmt 2).

Yet nearby operations suffered little during that same season. Another participant found his resort did not suffer negatively as some others. This participant stated, “[Operations] were affected, but not badly” (Mtn Ops Mgmt 4). He continued, “this area is slightly different than an awful lot of areas. Its very consistent snowfalls. We won’t get the most and we won’t get the least” (Mtn Ops Mgmt 4). He further described the conditions, “this is what it’s like in a bad year and a good year, they’re all very consistent” (Mtn Ops Mgmt 4). In addition, he stated the historical weather patterns,

> “if you go back, you can go back 25 years and you’ll find this area has been one of the most consistent. Doesn’t have effect like the coastal mountains. Doesn’t have the effect of the Rockies. Our average temperature is -6[°C] for the five months that we’re open virtually. It doesn’t vary a lot from that” (Mtn Ops Mgmt 4).

While the 2005-2006 season ran smoothly for some ski areas, others were challenged by the weather again. One participant stated, “it was awesome, which is average” (Mtn Ops Mgmt 1). Whereas, some participants stated, “Christmas was quite disappointing” (Mtn Mgmt 1). Some ski areas missed Christmas in 2005. One participant described,

> November we were getting some great numbers, we had great conditions then we have a lot of warm wet weather through the end of December and through Christmas break. And then starting middle of January, the weather turned around and we started getting some incredible snow and we ended up having a great season (Mtn Mgmt 1).

Although one manager couldn’t recall the actual dates, this participant stated their general practices in the midst of a low snow year. For example, he stated, “if we are in a serious situation, we’ll rent equipment” and “you’ll rent generators or compressors” (Mtn Ops Mgmt 1). Additionally, he explained, “we were maximising our snow gain. I mean we’re typically, the snowmaking operations wind down late January. But in that particular year, whole production right through ‘til March” (Mtn Ops Mgmt 1).

“[Operations] were affected, but not badly” (Mtn Ops Mgmt 4). He continued, “This area is slightly different than an awful lot of areas. Its very consistent snowfalls. We won’t get the most and we won’t get the least” (Mtn Ops Mgmt 4). He further described the conditions, “This is what it’s like in a bad year and a good year, they’re all very consistent” (Mtn Ops Mgmt 4).

Another observed that in "over 40 years, in all those years, they have never missed a Christmas. So there's always natural snow here by Christmas" (Gen Mgmt 3). This manager continued, "we do very little contingency planning around the weather" (Gen Mgmt 3). Again, predictable weather patterns seem to create a degree of complacency while less predictable weather variations are consistent with more creative responses by managers. More on this topic is offered in the next section.

4.3.4 Dealing With Weather – Making Predictions

These operators first response to uncertainty over weather was to better understand weather patterns. They did this in two ways. The first was that of tracking historical weather data. The second was an ongoing focus on weather forecasting. In terms of the former mountain operations manager stated,

> We know that December is generally a very cold month with a moderate amount of precipitation, but not heavy amounts of precip. And we will do our best to showcase the upper mountain product in that time and just try and establish a main ski way down to the bottom. December is when we will do the majority of our snowmaking. In the months of January and February, we see a great amount of snowfall and worrying about weather related events such as that is not such an issue. As we get into March and April, we will not make more snow. We just tend to move snow around and see how it packs out. But you know we tend to deal with rain a little bit in April and possibly March. And not such a major issue at all. I think the key on that is establishing a historical weather atlas that you can refer to year after year (Mtn Ops Mgmt 7).

In terms of forecasting activities, many participants stated the importance to daily operations of reviewing the weather forecasts and having diligent weather forecasting. As one participant in general management stated, "with the respect to the operation itself, on a day-to-day basis, we obviously watch the weather very closely" (Gen Mgmt 2). As well, a mountain manager stated, "We watch the forecast really carefully. We try and get ahead of things. So that if we expect some cold temperatures, we're going to get the word out to warn our staff and to warn our guests to be prepared" (Mtn Mgmt 5).

As a member of mountain operations management stated,

> A good chunk of our day-to-day is monitoring weather. You can see up on the wall there's two months worth of the time profile sheets that we track the height of snow at three stations, what the surface of crystal conditions are, what the max min temperatures are, what the wind

> direction, speed and how much snow we receive on a daily basis. Those things are done twice a day at all the stations up and down the mountain. We also have an electronic weather gathering up on all over the mountain (Mtn Ops Mgmt 6).

In addition, this participant discussed forecast analysis, "a good chunk of our day is forecast analysis. So in the morning and evening we are looking at all kinds of web-based products that have to do, you know with the weather. And so the big thing for us is you know precipitation amounts and temperature fluctuations" (Mtn Ops Mgmt 6).

Participants expressed the importance of forecasting and creating a weather atlas. A participant from mountain operations management stated,

> I think with diligent forecasting and a pretty good history of weather, you can plan for weather-related disturbances. But you just really have to roll with it… Either summer or winter weather disturbances have to be forecasted and budgeted for (Mtn Ops Mgmt 7).

Additionally, this participant explained the importance of creating a weather atlas, "It's key that you have a pretty detailed weather atlas to draw from and to base on your experiences and really learn from what's been happening in the year's past" (Mtn Ops Mgmt 7).

4.3.5 Dealing With Weather – Making Plans

These operators also attempted to plan such that good weather conditions might be capitalized upon and the effects of poor weather minimized. At one ski area, a mountain manager described planning an operational calendar as a team decision.

> We plan our operating calendar and it's not just me. I mean, it's based on a whole lot of research. It's based on our marketing, our sales and marketing team and how things are going, how the market is going, where business is at. But you know we pretty much plan out our whole year planned out, day-to-day almost, as far as what we are going to offer in September. So we probably have a good idea before that. We kind of finalize it. And then you know, we change it as we need to (Mtn Mgmt 3).

Some participants complained about the uncertainties of planning around the weather. As one general manager explained,

> The greatest challenges you face are, you know, again this discrepancy between how you plan to run your business and how you actually have to run your business. If you have a decent snow

> year and the weather is okay, you just roll with your plan. If you don't, the amount, the degree to which you have to vary your business is significantly greater than it's ever has been before. Because the business volume impact associated with bad weather is significantly greater than it's ever has been before. So I think that's the biggest issue that you're forced to deal with, is adjusting to a lack of snow, because the down side seems to be significantly greater than it was even three, four, five years ago (Gen Mgmt 4).

These managers acknowledged that regardless of their planning efforts, the weather may throw their plans into disarray. One participant stated that, "You still wanna have a decent product. So it wouldn't matter if it happened anytime. You'd still do what you had to do" (Mtn Ops Mgmt 5).

In the specific example of event planning, management plans the events based on elevations and financial resources. As one mountain management participant described,

> There's always the possibility that an event could be cancelled. Bigger level, higher level events, both from a financial perspective and from a I guess international perspective, marketing perspective, you would take sort of greater precautions against safeguarding against weather than you would against a grass roots level event (Mtn Mgmt 2).

Budgets are created knowing the weather dependency of this industry. As one general manager stated, "It's understood that there is varying weather conditions from year to year. We accept that. And we budget for that accordingly" (Gen Mgmt 2). As another participant explained his experience the two pervious season, "you look at the 2003-2004 season and you look at last season, where we opened, you know, weeks earlier than we had in past years and we had more snowfall in January than we had in many many years" (Mtn Mgmt 2).

Overall, the uncertainty of the weather has challenged managers and operational planning as last minute internet bookings have increased. As one general manager stated,

> The uncertainty around weather really has turned our business into a much more reactive one than it's ever been before. Previously, you know, in years past, kind of put your plans together, go to market, get a good percentage of your on the books before you even start your year. And that's just becoming increasingly difficult to do certainly for those resorts who don't have overwhelming demand or some of the larger resorts. So, you know, the uncertainty of weather is kind of changing the business in a fundamental way. It's becoming much much more volatile and fluid and far more dependent upon what actually happens than in the past, you know your weather would be your weather. It had less impact on what actually to your year in terms of business volumes. Now it's almost everything. You got good snow, you're gonna have a good year. If you don't, you're going to have a bad year. In the past, you could isolate yourself from that. Just right now, it's almost impossible (Gen Mgmt 4).

4.4 Risk Management Policies and Procedures

Research Question 3 focussed on weather specific risk management policies and procedures that had been instituted to deal with the uncertainty. Many participants described both emergency and ongoing procedures and policies intended to ameliorate the effects of weather extremes. In each case, they were attempting to manage risks (both physical and financial) resulting from weather. Although few participants utilized formal insurance policies, many noted that their own efforts (like snowmaking) acted as a form of insurance. They noted, for example, that snowmaking could guarantee openings and create more durable terrain in high traffic areas. In this sense they sought to maintain control of their own insurance and risk minimization strategies. In a way, such efforts introduce some sense of certainty into their planning processes.

4.4.1 Emergency Procedures and Policies for Weather

One mountain manager offered his perspective on the uncertainties of weather on a ski hill. "This business is a lot like farming and you need to, you know, be prepared for all kinds of different weather scenarios" (Mtn Mgmt 2). As a result, many participants described policies and procedures in place for weather disturbances, such as high winds, cold temperatures, and lightning. One operator described a typical policy for wind and electrical storms

> Safety of the staff comes first and foremost. Then obviously safety of the guests. If the weather forecast is not conducive to operating the lifts, we will shut the lifts down. If the weather forecast is not conducive to operating certain parts of terrain, those terrain features will be closed. There's quite a detailed process to go through where we will achieve safety clearance first. Then we will achieve maintenance clearance on our lifts. And we will open the mountain in zones (Mtn Ops Mgmt 7).

Another operator stated

> We have winds. If winds get over a certain point, so we start shutting different lifts. We don't run in high wind. And we have a cold policy for our night skiing. So we hit certain temperature, we shut down… We actually use -17[°C] at night. In the day, we generally are never affected (Mtn Ops Mgmt 4).

A third participant described his ski area's procedures for lightning, "which is a serious hazard. So we have closures, we have evacuation procedures. And then we move into guest recovery mode" (Gen Mgmt 3). In addition, this manager stated that excessive winds

> Cause selective closures because we cover three sides of the mountain here. The winds generally don't hit all three sides. They are not all three wind affected. So in that case it usually involves shifting traffic patterns, closing access runs as we close down the affected area and try to shift the traffic into the unaffected areas (Gen Mgmt 3).

The "snow surface" was only noted as a risk by one participant (Mtn Ops Mgmt 5). He provided the following rationale, "if that turns so hard that it's dangerous to ski down, then well we'll close it. And that's happened maybe once or two, once or twice since I've been here. Not very common" (Mtn Ops Mgmt 5).

While these policies typically dealt with the immediate dangers posed by weather and its effects, a few operators also developed policies to deal with guest reaction to closures resulting from weather conditions. One participant discussed a "guest recovery mode" which is utilized when hill operations are suspended.

> We move into a guest recovery mode fairly quickly. The first thing we need to deal with is their ski tickets. So we have a snow check program it's called. We satisfy a list of their value for the investment that day so they can get a voucher that's good for another full day skiing. That's good I think. We give them up to five hours in a ski day before we issue the snow checks, or sorry after which we won't issue the snow checks. If we close down an hour early, for instance, we won't issue the snow checks. Unless somebody just happened to buy an afternoon pass, then we'll help them out. So yeah, first thing we do is go into guest recovery mode. We make sure they are satisfied as to the value of the ticket that they purchased. Then the next thing we do because we have a lot of guests in house, you know, on any given day almost half the guests will continue to stay within the resort, so immediately we jump into offering some indoor events – kids carnivals, movie nights, things like that. We're giving free tubing, snow tubing tickets, free skating tickets if we can. To keep them active, to keep them interested in the resort (Gen Mgmt 3).

4.4.2 Managing Ongoing Risk

While some of the risk management carried out by the operators dealt with conditions emerging from emergency weather events, most of the ongoing risk management arose from day-to-day conditions on the ski hills. It was these everyday risks that demanded most of their attention. For

example, one participant in mountain management observed that “if we don’t have very much snow, we have much more congestion and much more congestion on those slopes that are open.” (Mtn Mgmt 5). He added, “it’s much safer when we have a good snowpack and as much terrain open as we can” (Mtn Mgmt 5). In addition, warmer temperatures limit the amount of terrain open throughout the season. To overcome risk from warmer temperatures, this participant managed risk levels through snowmaking, “We need to make sure we have lots of snowmaking on those lower elevations when we do have those windows to make it” (Mtn Mgmt 5). Additionally, this manager described a similar situation utilized in decision making during poor weather conditions. He stated,

> Normally, I am a risk manager, you know, we are balancing the risk. And so I like to be deter-ative[sic]. But on a year like that, what’s better decision. Is it better to have more people on several runs with poor snow cover, or one run with good snow cover? So you have to sort of balance that congestion issue with the fact that if fewer people on some runs with not so great cover at least they aren’t feeling pressured by crowds and they can sort of take their time and pick their way through the runs rather than sort of being caught in the stampede (Mtn Mgmt 5).

In addition, some managers revealed a reluctance to open with marginal conditions or poor snow cover. One manager was adamant in his belief and stated, “if the snowpack isn’t thick enough, if we can’t open anything, then we don’t open that weekend. The norm is though to open that weekend” (Mtn Ops Mgmt 4). Another participant agreed.

> It’s dependent on what my patrol leader says from a risk management point of view and safety management point of view. If the skiing is terrible, we won’t open. If we can open something safely, with two runs off of a major lift, then we’ll do that. And we’ll put hard closures on the mountain. We pretty much fence people off to the runs we want them on (Mtn Ops Mgmt 4).

In order to manage the risk of opening with not enough snow cover, one participant described a conditional opening policy,

> We announce the season opening date and it’s always subject to snow conditions. And once the snow is here, we will announce an opening. Typically we’ve made a promise to our season pass holders that we will open on the opening date or as soon as physically possible. So we won’t defer until Christmas time if it makes economic sense because we made a promise to our season pass holders that we will get them as many days on their season pass as we can (Gen Mgmt 3).

Other participants described general improvements and revisions to business operations to manage risk. One participant from mountain operations management stated how they implement

"safeguards acquired based on our experience" (Mtn Ops Mgmt 1). His example was, "if we increase our snowmaking for instance, we can guarantee earlier start dates, and secure more terrain, we can keep terrain open later" (Mtn Ops Mgmt 1). Another mountain manager explains,

> We continue to improve our infrastructure through the points I just made about maximizing higher innovations, maximizing our snowmaking, summer grooming. I mean that's what assures us that we can go through more challenging weather with the success that we had historically. In terms of risk management, that's how we're managing risks (Mtn Mgmt 4).

Another participant in mountain operations stated, "most of the focus is snowmaking to make sure there's enough base down" (Mtn Ops Mgmt 5). Thus, his ski area managed risks through, "every year we add more [snowmaking], buy more guns and try to improve on it" (Mtn Ops Mgmt 5).

Snowmaking was not the only technique used however. One participant described how his ski area reinvests money into a variety of operational initiatives:

> We've spent $350,000 on just sort of cutting the grass, covering the ditches, summer grooming, right. Brush cutting everything, you know, we've been doing that for the last five years every summer. We've got a guy out there, drives a special off-road mower up and down the mountain and cuts our grass all summer. Provides the best, you know, you know, trail crew that's around there just picking rocks. So they are, they're operating. We invest a lot of money in snowmaking" (Mtn Mgmt 3).

4.4.3 Insurance

I noted above that these operators relied little on insurance when dealing with the uncertainties of weather. Many participants simply stated "no" (Gen Mgmt 3; Gen Mgmt 4; Mtn Ops Mgmt 7) when asked if they had insurance against inadequate snowfall. Many were uncertain if such insurance even existed. "I don't know anybody who would offer insurance for something like that" (Mtn Ops Mgmt 4). Another participant added, "I don't think you can get that through the insurers" (Mtn Ops Mgmt 7).

Others assumed that weather was so unpredictable that costs for such insurance would be unreasonable high. "If we did, the deductible would be so high" (Mtn Ops Mgmt 5). "It would be really expensive" (Mtn Ops Mgmt 4). However, while they did not insure against general weather conditions one operator did have insurance against very specific business disruptions resulting from weather. This

mountain operations manager stated, “We do have insurance for business disruptions based on weather events. But those events would be issues like lightning hitting the facilities, lightning hitting the lifts. You have insurance for stuff like earthquakes that could totally throw off the alignment of a lift and render it totally inoperable” (Mtn Ops Mgmt 7).

In recent years, a new type of insurance has emerged. This specific insurance type targets skiers rather than operators. It is a type of season’s pass insurance which can be purchased “when you buy a season’s pass” (Mtn Ops Mgmt 7). Ski areas are “obligated to guarantee a certain amount of skier days” (Mtn Ops Mgmt 2). If the operations cannot provide the required number of ski days, the skier is offered some amount of reimbursement.

4.5 Industry Potential Regarding Climate Change

This section explores participants’ insights into Research Question 4: what is the adaptive capacity of ski areas regarding climate change risks, threats and opportunities? First, participants’ beliefs about climate change were gathered. It was considered likely that their respective views might influence their approach to dealing with the challenge offered by weather variability.

In general, the many participants did not attend meetings on climate change and had no risk management policies regarding climate change. However, some participants did report attending discussions and meetings “definitely about the low snow, but not about climate change” (Mtn Mgmt 2). Another participant reported similar meetings regarding “snow science and thin snowpack” (Mtn Ops Mgmt 3). Additionally, another manager stated, “it’s discussed at a micro level all the time” (Mtn Mgmt 3). He continued, “No, we haven’t sat down and said climate change what are we going to do about it, we are kind of chipping away at it all the time. It’s underlying right” (Mtn Mgmt 3).

4.5.1 Climate Change Risks and Threats

Many participants realized that climate change does present a risk and threatens the ski industry. However, some admitted ignoring the issue of climate change and potential industry challenges. One individual was happy with the present conditions, as he stated, “this is the best snow that we’ve had. So life is good. I’m sure the climate is changing, it changes all the time. But in the grand scheme of things, I know that the glaciers are melting” (Mtn Ops Mgmt 5). He additionally stated that, “After seeing all the snow this year and last year, I think everything’s good to go. But if David Suzuki was sitting here, he would tell me I’m a fool” (Mtn Ops Mgmt 5). Another participant indicated that “It’s something that has crossed my mind” (Mtn Mgmt 2). However, he continued, “We try not to think about it, because what would we do if it never snowed again? So yeah, it’s in the back of my mind I think. But every time you think about that, it snows” (Mtn Mgmt 2)

Clearly, some participants were sceptical about climate change and its potential impacts. One participant stated, “In our resort, we’re a little bit sceptical about it because we haven’t seen significant climate change in the 40 odd years that people have been tracking records up here” (Gen Mgmt 3). However, this general manager did realize that other places could be impacted,

> From a more global perspective, we believe that that weather patterns could be changing in other regions more dramatically than they’re changing here. It seems the coastal regions that are primarily affected. So we do believe that there are shifts out there, but are not particularly concerned about them in our region as they are fairly stable. We also have the ability to withstand some changes to our average temperature could rise a couple degrees and we’d probably still get the same quality and quantity of the snow (Gen Mgmt 3).

In addition, this participant described another unique feature of their location, “lake effect snow,” he explained as:

> A lot of our snow comes in off coastal weather patterns and those can change if we get a dry spell or a wet spell. But we do also get snow that generates specifically in the interior. And presumably our lake isn’t going anywhere and so we’ll probably continue to get some lake effect snow as well. So, don’t anticipate any big impacts on us (Gen Mgmt 3).

Other participants seemed to appreciate the potential importance and influence of the changing climate on their ski operations. Despite the lack of “formal” climate change discussion at his particular

ski area, one participant reported that “I’ve certainly had discussions with some other staff about what it means for skiing here in the long term and whether the trends are going to be such that it affects me in my lifetime or its two generations out” (Mtn Ops Mgmt 6).

One general manager stated how upper management had discussed the issue among trends affecting the industry:

> We’ve discussed it at the higher level when we’re talking about our trends, macro trends within our industry, when we’re sharing that within our executive group and with our managers at large. But as in terms of whether or not we’ve ever discussed those things affect us here, no never had those kinds of discussions (Gen Mgmt 3).

Some participants had a more thorough understanding of climate change and its potential future impacts. As one participant stated, “changing weather patterns concern us, absolutely. We have very proactive program for climate change” (Mtn Mgmt 4). This participant continued and shared his thorough knowledge of the importance of climate change to more than the ski industry, as “It is a central issue to our species and our globe, our way of life. And so it’s not just the ski industry affected. If we are losing snow, more importantly, people are losing water supply, so it’s a broader issue” (Mtn Mgmt 4). Additionally, this participant shared his belief that “climate change is the greatest threat to our industry without question” (Mtn Mgmt 4). Despite travel trends which can impact resort visitation, such as “the economics, the increasing value of the dollar and how it becomes less attractive to come here, and terrorists and SARS and all those things. Those are bumps on the road. Climate change is the edge of the cliff. So it is a very serious issue here” (Mtn Mgmt 4). He continued, “For us to make a living, we need snow and it will be our greatest challenge in the future” (Mtn Mgmt 4).

Again, the issue is one of uncertainty. The exact risks and threats to the industry are not known or quantifiable. Some participants questioned the concept since, “How that’s going to manifest itself in our area? There’s quite a wide range of debate there. Whether it’s going to be just a general warm trend or whether we’re going to get more extreme weather” (Mtn Ops Mgmt 6). In his experience, he stated, “we’re seeing more extreme warm patterns, but we haven’t seen the other end of the scale in quite a long time. Like the big weather anomalies that I remember when I first worked here, were extreme cold

events" (Mtn Ops Mgmt 6). Then he compared another weather event, "The fact that we have a wet event in March is not unheard of, but January and that was a bit odd" (Mtn Ops Mgmt 6).

Another participant mentioned the UN's Intergovernmental Panel on Climate Change in explaining his ski area's perspective. This knowledgeable participant stated that,

> We don't think in the short term there will be significant negativities. But as per the UN's Intergovernmental Panel on Climate Change, the sort of the universal body of experts on climate change, that predict by mid to late century the climate is likely to change, they don't know how much it is changing. But they are saying by mid- to late century, it could be anywhere from 1.5°C warmer up to over 5°C warmer. So in the long term, when I say long term, I'm talking mid- to late century, there are significant challenges not just for us, but mankind (Mtn Mgmt 4).

4.5.3 Climate Change Opportunities and Adaptations Strategies

Although climate change presents potential risks and threats in the ski industry, many participants identified potential opportunities for their respective operations. Participants offered several adaptation strategies. Within soft business practices, the strategies utilized were diversification and environmental sustainability or stewardship.

4.5.3.1 Diversification

In terms of diversification, a few operators were thinking of expanding their operations into seasons other than the winter months. When doing so however they understood that competing programs would also compete for financial resources. As one operator mused, "If you're going to invest $10 million in something you know, do you want to invest it all into a winter operation or should you start thinking about your summer operation and what that experience is?" (Mtn Mgmt 3). He continued, "We're going to arm wrestle for where we're going to spend our money for the future of the business" (Mtn Mgmt 3).

While diversification may require that operators think about their operations (and investments) in different ways, many seem willing to do so. Many ski areas have realized the potential to utilize their facilities more effectively throughout the winter and year-round. As one participant stated, “One thing that is really important is diversifying your operation. Not just focusing strictly on skiing or snowboarding. That obviously is the catalyst of your winter business” (Mtn Mgmt 1). Another participant stated, “We are looking at alternatives. Not just from a climate change perspective, but just sort of in the name of diversification” (Gen Mgmt 2).

In terms of winter products, one mountain manager stated, “You need to provide options for, you know, non skiers, snowboarders, as well as options for skiers and snowboarders when the season is a little bit suspect and maybe the skiing snowboarding conditions aren’t ideal” (Mtn Mgmt 1). Some of the newer winter products that are being offered include: “snow play, tobogganing and tubing, and snowshoeing” (Gen Mgmt 2). Another participant described, “We also have 8000 room square foot ice rink on top of the mountain, and that is cooled by a compressor. But you know its natural cooling plus a compressor” (Gen Mgmt 1). In addition, this general manager described a Christmas promotion, “We do have a December promotion called Peak Christmas that attracts a number of tourists and families” (Gen Mgmt 1). The goal was, as this manager stated, to “get them still up on the mountain and enjoying different winter sports” (Mtn Mgmt 1).

In regards to diversifying into year round product offerings, some participants discussed the potential in summer operations which use the same facilities. As one mountain manager found, “In the past few years, certainly summer has been growing. Mountain biking has been huge… And so that, downhill mountain biking has really grown” (Mtn Mgmt 2). In addition, this participant described expansion, “more trails for sightseeing, more winter sightseeing, snowshoeing” (Mtn Mgmt 2). Another participant stated the expansion was, “it’s cultural, its mountain biking, its summer activities, it’s golfing, it’s the whole, its spas, it’s everything … Its conferences” (Mtn Mgmt 3). One resort had taken diversification further. Managers had identified the location as a resort destination rather than a ski area,

> We've diversified our product so that we are able to be successful. Not as successful if, you know, if weather strikes in terms of a poor weather season. But we are a resort destination that is four seasons. We are open 365 days of the year. And we have diversified our product so that our summer business is basically 65% of our total of business. So our winter product of skiing and boarding is about 35% (Gen Mgmt 1)

At the time of this study, some participants had yet to diversify their ski area into a four season resort. However, as one general manager stated, "As far as the seasonality of our business, we are looking at alternatives to fill in the year" (Gen Mgmt 2). He noted that "we have a tremendous amount of capital tied up in our operation. And only need to use it four or five months of the year. Doesn't really seem to be overly effective although very effective for those months" (Gen Mgmt 2). For instance, "the cost of doing business in [this] area is very high and with the opportunity of being in this resort and having the facilities that we have, it just makes sense to use it more regularly" (Gen Mgmt 2). Regarding the ski area site, he stated, "We're looking at opportunities like mountain biking, guided hiking, and potentially camping. Things that we have tried to this point have been to take a department we currently have which we call outdoor education formerly our snowshoeing program" (Gen Mgmt 2). This participant described initially testing programs using their facilities on a smaller scale. To date, their shoulder season programs "are fairly small in numbers. The economic impact is fairly low. But its taking something we already have and trying to bridge it to you know a season that we're not as familiar with" (Gen Mgmt 2). In addition, this ski area has an affiliation with BC parks and described another opportunity, "We have recently engaged in a camping contract we have with them in the sea to sky corridor" and "we operate all of those parks. There's nine in total" (Gen Mgmt 2).

It seemed clear that these participants were diversifying not only to expand profit making potential, but also to become less dependent on the presence of snow. As one participant stated, "We have diversified our winter product. But more importantly, we have diversified our year round product, so we are less dependent on weather" (Gen Mgmt 1). This participant from general management continued, "When you annualize, it still takes a hit. You lose business. But we also have our other areas of operations that are open" (Gen Mgmt 1). In addition, he concluded, "It's all about diversifying your product. Relying less on the weather conditions" (Gen Mgmt 1).

Diversification seemed to be an important issue for virtually all of these operators. One participant recommended, “Being a four season resort is definitely is really a direction that all areas that have the ability and the client base should really look at doing. Because that helps you financially” (Mtn Mgmt 1). In addition, he noted the benefits within staffing, “That helps you to maintain staff year round so it helps reduce overturn. It’s ultimately getting you a bigger pile of stronger people because they know your operation year round” (Mtn Mgmt 1).

4.5.3.2 Environmental Sustainability and Stewardship

Many ski operators reported becoming increasingly involved in programs focussing on environmental sustainability and stewardship. As one participant from mountain management stated, “The really good decisions make themselves since they make financial sense, right. For the most part. So if you can figure out a smart thing to do that makes environmental sense, it’s going to happen” (Mtn Mgmt 3).

There were many examples of the ‘good’ decisions. Some participants listed using more efficient equipment. As one participant stated, “Our snowcats are like new and we swap them out after so many hours” (Mtn Mgmt 3). Another participant describing switching grooming fleets to biodiesel, “it will be starting this year. We changed from diesel to biodiesel” (Gen Mgmt 1).

Other larger environmental sustainability endeavours have also been undertaken. For instance, the installation of new chairlifts has been focused around environmental sustainability. One participant in mountain management described the process,

> When we started working on I didn’t want to drive skidders over the alpine and tear, tear the thing apart. So we used this, we worked in the snow, in the spring and drove around on the snow for as long as we could. Then when we had to cut trees, we used the helicopter to pull the trees out instead of a skidder. It didn’t kick back the ground as much. We installed a little run off the river project to get power to the bottom of the lift. And for the washrooms and stuff. For all the lighting and heating and stuff down there. You know we milled our own wood. Cut down, you know the cedars that we cut down; we milled it and used it to build the huts (Mtn Mgmt 3).

From another participant's perspective, he stated, "We built a ski experience inside an ecosystem as opposed to changing the ecosystem. Meaning we minimized tree removal and ground disturbance" (Mtn Mgmt 4).

Another initiative was expanding into renewable energy generation which a few ski areas in the United States have installed. As one participant described the process,

> We are doing studies on large renewable energy generation, specifically wind. Expect a met tower in the next couple weeks. A met tower is used to record winds and it will verify whether in fact we can technically set up a wind farm here or not (Mtn Mgmt 4).

In the meantime, the manager stated, "We are continuing to apply a number of conservation initiatives throughout our operating plant" (Mtn Mgmt 4).

4.5.3.3 Slope Development

Other strategies focussed more on hard technological developments emphasizing the importance of slope development and snowmaking. For example, many participants were in the midst of installing and utilizing these strategies to increase efficiency of business operation. Their goal was to install equipment that would create snow as needed but only do so where snow conditions were optimal. As one participant described, the "lower end of our mountain only represent about 5% of our terrain" (Mtn Mgmt 4). Thus, he intended to focus the ski area's efforts on the "ski experience up to our higher elevations. Over 50% of our terrain located above the tree line" (Mtn Mgmt 4). He then described how:

> With the massive snowmaking that we're putting in, we are spending over $25 million in two years to improve our snowmaking and prepare for [future sporting events]. We spend several million dollars a year on summer grooming. We're opening up higher lifts (Mtn Mgmt 4).

Others focussed on the importance of summer grooming and snowmaking to the future of ski operations. As one mountain manager stated, "You will see a lot more ski areas investing in snowmaking and in slope grooming" (Mtn Mgmt 1). As a participant in general management stated, "I believe with technology, snowmaking and summer grooming that in itself is taking some of the risk out

of skiing and boarding and is attracting customers in itself. Because, you know, less risk more passes" (Gen Mgmt 1). Another participant described the importance of slope development. He stated, "You can have the best snowmaking product in the world, but if the terrain underneath the snow doesn't support that, then you're going to be having one of the most inefficient snowmaking systems in the world" (Mtn Ops Mgmt 7).

These operators viewed summer grooming as a positive investment for the future. As one participant described, "Summer grooming is trying to set up your mountain and your runs in the summer time" (Gen Mgmt 1). Another participant in mountain management stated, "The smoother your slope, the less snow it takes to open up your trail" (Mtn Mgmt 2). In other words, such efforts help ameliorate the effects of reduced snow cover. This was especially important early in the ski season. "Summer grooming is, at most resorts, an on-going thing. The more you can do, the better off you are at the beginning of the season" (Mtn Ops Mgmt 4).

Summer grooming and slope development were explained by some participants. One participant gave an in-depth description of his ski area's improvements, "Through brushing and clearing bringing in the earth or dirt and seeding and building the building the grass content of our ski runs up. Our terrain areas are continually being modified through landscaping and through brush clearing again" (Gen Mgmt 2). Another manager tried some different measures, "We did a lot of work with excavators out on the ski runs. Just further buffing the surface. They go in and dig everything up and then put everything back and smooth it all out. And seed the area and put hay back on it" (Mtn Mgmt 1). In addition, this manager used the aid of a "big hydraulic rock camera that we put on the end of our excavator and we went around to nubs of rocks on certain runs that have been sticking up" (Mtn Mgmt 1). Then the job was finished as, "We smashed the heck out of a lot of rock and smoothed it all out" (Mtn Mgmt 1).

Overall, these participants realized the importance of slope development and summer grooming. As one mountain manager stated, "that's really going to be done to try and you know, ward off as many of the concerns with changing weather patterns as possible" (Mtn Mgmt 1).

4.5.3.4 Snowmaking

As suggested above, in addition to investing in slope development, many participants reported focusing on snowmaking abilities. As one general manager stated, “We are continually investing in our snowmaking abilities” (Gen Mgmt 1). With snowmaking, some participants explained, “You can open earlier, you can stay open, and in poor times, and you can stay open later. And you have more terrain open” (Gen Mgmt 1) and “they provide the foundation too” (Mtn Mgmt 3). Another participant stated that snowmaking “increases the skiable vertical of the mountain over a longer period of time” (Mtn Mgmt 2). Many participants revealed that, “snowmaking is very important” (Gen Mgmt 1; Mtn Mgmt 1) and “it’s very important especially at lower events” (Mtn Mgmt 2). Similarly, another participant revealed that, “If we didn’t have snowmaking, some years we wouldn’t be open” (Mtn Ops Mgmt 5). At another participant’s ski area, he stated, “We don’t have snowmaking on all our runs. But you know, the ones that do have it, those are sort of our core runs that get us open” (Mtn Mgmt 3).

One participant described a large snowmaking investment undertaken to ensure adequate snow cover in the lower mountain. As one participant described,

> [For] larger, international events… you need to be able to access by a road for all the television considerations. So that means having the events finish in the valley. So the lower you go, you know, the more important your snowmaking becomes. So that’s why there’s millions of dollars being spent for [sporting events] to ensure that there will be snow in the valley (Mtn Mgmt 2).

At the time of this study, two ski areas were in the midst of installing snowmaking systems within the next year. The reasons for this installation differed from one to the next. For example, one ski area required snowmaking to prepare to host sporting events, but their location has provided a challenge to operation, “they are planning on putting snowmaking in, but one of the challenges is finding enough water to support that system” (Mtn Ops Mgmt 2).

The second ski area was planning to install snowmaking to improve the product offered to the client. This participant stated, “Our decision was based on historical data” and “We really need to ensure that we have the top to bottom product” (Mtn Ops Mgmt 7). The manager rationalized, “We

have a sensational alpine product. Lower mountain is subject to later season snowfalls; we didn't have the accumulations, and also earlier season melt-outs" (Mtn Ops Mgmt 7).

4.6 Industry and Market Trends

The findings in this final section and subsections respond to Research Question 5: "How do trends within the evolving ski industry and ski market influence management decision making?" From participant reports, trends that influenced ski area management were broken down into three areas: skier market, ski industry, and travel trends.

4.6.1 Trends within the Skier Market

The following section will present influential demographic trends. Then other trends which were more widely reported to influence operations, such as improved ski technology. The last section will focus on internet technology and bookings.

4.6.1.1 Demographic Trends

Demographics were described to be influential within the ski industry relating to the two markets. First, one manager reported the largest influence to be the "youth market and snowboarding and a desire for terrain parks" (Mtn Mgmt 3). Another manager stated a rationale for this group, as "the youth market is at an all time high right now. And they're coming from families that traditionally skied" (Gen Mgmt 2). In addition, one participant reported that "there's a whole crew of young, young kids that like [snow conditions] stormy" (Mtn Mgmt 3).

On the other hand, another participant reported that the youth market seemed unresponsive to the product he offered.

> Youth and youth culture is my mind very urban right now and very electronic. And it's not about the outdoors in an environment like this and how you can fully participate in a sport in this natural setting, environment. It's more about your IPOD and your XBOX and you know music and media and that's making it more difficult for us to engage and retain youth in our sport (Gen Mgmt 4).

Second, another participant identified a very unique youth group that was very interested in this product offering:

> A lot of new Canadians from the Asia Pacific area that come here without any skiing background at all, but a strong desire to live the Canadian lifestyle. And they are very very eager to make sure that their children have that opportunity (Gen Mgmt 2).

4.6.1.2 Improved Ski Technology

Snow sport equipment has evolved considerable over the past several decades. For example, the introduction of snowboarding attracted skiers and new participants to the sport. One manager observed that "snowboarding has changed the ski industry. It's refined the skis. So now skiing is more popular again. Snowboarding is actually on a decline. Skiing is on an incline" (Mtn Ops Mgmt 4).

Many study participants shared the belief that "Technology has made it a lot easier to ski and snowboard. It keeps getting better all the time" (Mtn Mgmt 2). With the "advent of the new shaped skis" (Mtn Ops Mgmt 2), many participants described positive benefits. For example, participants described how, it's now "more fun to learn" (Gen Mgmt 4). In addition, many believed that newer ski technology has "retained" (Mtn Ops Mgmt 5) skiers and "It's getting more people into skiing" (Mtn Mgmt 1). Hence, "Some people that do come back and revisit the sport again find it easier because of the skis" (Mtn Ops Mgmt 2).

As ski technology has improved, one participant in mountain management described a new trend in "the resurgence of freestyle skiing" (Mtn Mgmt 2). As shaped skis has emerged and twin tips were created,

> The style of skiing and snowboarding as the two have come closer together in terms of the tricks and the styling, and the addition of the terrain parks and things like that, has brought people that, might not necessarily appeal to a winter sport, but like the idea of a freestyle sport. I mean, certainly, the boarding culture is a big part of it and that crosses over into skiing too (Gen Mgmt 3).

Other trends within the skier market were related to one unique ski area as "[they] kind of had a whole combination of stuff going on" (Mtn Mgmt 3). As one manager noted another trend, as "the Olympics is creating a resurgence and interest in alpine ski racing" (Mtn Mgmt 2). This manager identified many trends that related to extreme skiers,

> And all along the way, we'd always had sort of big mountain skiing here, and the local legends, mountaineers, really, they were really mountaineers. They weren't, you know, considered like rock stars like kind of today. They climbed everything and then skied it. We had, you know, local legends all through this area (Mtn Mgmt 3).

4.6.1.3 Internet Technology and Bookings

Many participants reported the influence of internet technology on bookings. Participants described the skier market as "more educated", "little more sophisticated" and "smarter skiers" (Mtn Mgmt 3). As this manager added, "If it's not snowing and we don't have good conditions, they're going to know about it" (Mtn Mgmt 3). Another general manager stated, "Time is becoming more of a precious commodity for everybody" (Gen Mgmt 4). This manager continued, "[clients'] tolerance for frustrating experiences that waste their time is diminishing" (Gen Mgmt 4). Thus, they are going to research ski areas before making a decision.

In addition, weather information is available more freely. Many ski areas utilize webcams and chart temperature, snowfall and snow base for guests on the internet. One manager compared this situation to earlier ski travel. He stated, "Fifteen years ago, you didn't know when you jumped on that plane to go to Europe what the, what the skiing in the Alps was like" (Mtn Mgmt 3). Many participants revealed how,

> [Guests] won't book in until a weekend before they travel now. They don't need to. Cause it's so easy to book and travel and make your decision. If snow is what it's about and weather when you are going on your holidays, then why would you book three months in advance? You know, you're going to book a week out or two weeks out. You're looking at the weather (Mtn Mgmt 3).

The entire cost of a ski vacation can be expensive. Another participant explained how this factors into trip planning,

> Certainly snow conditions when you're committing to spending what it really costs to go on a ski trip with lift tickets, rentals, accommodations, snow conditions are a big factor in that. And if the snow is good, our bookings go through the roof. If the snow is not good, everything drops right off. Now that, I think that is industry wide (Mtn Ops Mgmt 7).

However, this new technology challenged operators and created uncertainty. As one general manager stated,

> Uncertainty is becoming increasingly difficult in today's age of kind of transparency, consumer transparency, because people are less willing to commit you know, their free time, their money, their choices in advance of the season. And so, the uncertainty around weather is forcing us all to respond much closer into the conditions that we've been delivered and the market conditions out there. And everything's becoming much tighter now in terms of when the consumer will make a decision, how they make a decision, they're all, everybody's waiting to see where the snow's going to be (Gen Mgmt 4).

4.6.2 Ski Industry Trends

As the skier market has evolved, ski area operations have responded. As one participant stated, "It's a very competitive business" (Mtn Mgmt 3). Thus, improvements have been made in many areas. One trend mentioned by a few participants was the potential within new snow and sliding activities. As one participant stated, "More types of sliding devices we'll see on the hill these days" (Mtn Mgmt 1). Examples of devices were "snow bikes [and] snow limos" which "helps to bring people out that you know might have had an injury that doesn't allow them to ski or snowboard" (Mtn Mgmt 1). Another mountain manager stated, that "Every year we try two or three different toys and maybe one will catch on" (Mtn Mgmt 4).

4.6.3 Travel Trends

Many ski areas were destination resorts or four-season resorts. In addition, many reported plans to expand the skier market. As one participant described, "As [ski area] is growing, we're reaching further and further out into different markets. So we're starting to attract international travellers as our reputation is growing" (Gen Mgmt 3). He described how they are "spending lots of time in the UK

market, that's a growing area" (Gen Mgmt 3). Another manager stated, "we spend our entire summer, well even last spring, right, putting together, you know, directions for marketing pieces" and they "go on the road, go to Europe, you know, go to England ski shows" (Mtn Mgmt 3). As some skiers are travelling internationally, one manager has discovered that,

> We're getting much more demanding customers out of the European traveller. They've travelled a long way and have invested a lot in their vacation. Same with the Australians and the New Zealanders and some of the North American urban markets are also much more demanding (Gen Mgmt 3).

Some participants reported challenges attracting guests as a result of distance from large urban area. One manager reported,

> Our challenge again when you look at how time constrained individuals are, we're a long way from a major market. And as time becomes more precious, it becomes, you know, a little bit more difficult for us to convince people to come and stay (Gen Mgmt 4).

Overall, the travel market has influenced operations and business. One participant listed many influential trends in the travel market which have impacted his ski area. As he states, "since 2000, terrorism, SARS, the increasing value of the Canadian dollar, less competitive airlines, perception of value by the regional market, perception of value by the international market, decline in the international market" (Mtn Mgmt 4). Despite the decline in the international market at this ski area, this manager reported that, "we've also seen that tremendous resurgence of our regional market. And this past summer, was our busiest summer on record" (Mtn Mgmt 4).

At a different ski area, a participant reported "Weather patterns seem to have the biggest effect on [business]" (Mtn Ops Mgmt 7). One example he expanded on was the impact of poor snow conditions elsewhere, such that "If we look to what they were in Europe this season, the trend is for our overseas visitation to come right to the top of the chart" (Mtn Ops Mgmt 7). A broader travel trend related to driving traffic, since "If we look in the past five years, 9/11 had an effect on our traffic. We saw an incredible amount of Americans visitors come up across the border rather than deciding to hop on that airplane to take an overseas flight" (Mtn Ops Mgmt 7).

4.7 Conclusion

This chapter has offered a look into the various ways in which decision makers are dealing the challenges they face while operating ski areas. These operators face many such challenges and weather is perhaps the most pervasive among them. If ski areas want to succeed they must deal with weather on an ongoing basis. The adaptation strategies described here are intended to introduce certainty into their daily operations. In this way, they are better able to respond to the evolving trends within the ski industry, skier and tourism markets.

Chapter five will provide discussion and conclusions that have been drawn from these findings.

5 Discussion

This chapter discusses the findings reported in Chapter four. As was the case with Chapter four, this discussion will be organized around the five research questions. The findings will be examined and integrated with the literature to better understand and describe decision making procedures, how operators are overcoming weather challenges, their risk management methods as well as their efforts to increase certainty in spite of climate change and changing trends within their client groups.

Following the discussion, the final sections of this chapter will present the conclusion and significance of this research. Several limitations of the study are also addressed. Finally, recommendations for future research are presented.

5.1 Decision Making Procedures

This first research question dealt with procedures these operators used to make decisions when weather-based probabilities and outcomes were uncertain. The managers discussed strategic responses and several methods to solve operational challenges including: management teams, reliance on experience, expertise, historical data, rules of thumb, and business models. Each of these elements informed decision making. Each element will be discussed in more detail below.

First, management team size varied between ski areas. Most teams had between two and six members. Regardless of size, team members relied on their previous experience and individual expertise to make decisions. Within these teams, members from the marketing and sales departments determined opening and closing dates based on skier visitation and historical weather trends. This ensured that the necessary level of visitation would be present at the resorts when they opened. For ski areas with set opening dates, management was certain that some terrain would be able to open due as a result of snowfalls or with the aid of snowmaking. Prior to opening, teams would inspect the slopes to decide where the best conditions were and which slopes were ready to open. In addition, many resorts

expanded terrain as the skier volume increased to its peak at Christmas. Historical data was utilized regarding weather and skier visitation to decide about opening and closing dates and snowmaking procedures. In addition, managers used specific guidelines to simplify decisions surrounding opening and closing dates and snowmaking procedures.

Within the decision making processes, managers were asked if they used heuristics to simplify decisions. A contradiction was found between when managers said they did not use any rules of thumb, but then reported doing just that. In some cases, heuristics were utilized to aid in routine operational decisions, such as snowmaking production. Heuristics related to many of the more routine operational decisions. For example, they used heuristics to establish the optimal temperatures to begin snowmaking and temperatures at which to halt production. Additionally, there was a reliance on heuristics to decide on opening and closing dates. Often these were based on historical weather data and skier visitation rates. Thus, these fell within the representativeness heuristic. For example, managers based snowmaking start and stop dates on historical weather data. Hence, they would plan to start snowmaking operations at the coldest recorded time which commonly was October or November. Similar strategies were utilized to set opening and closing dates. For example, some managers used American Thanksgiving or the first Friday in December as official starting dates.

In another case, one participant did rely on recent experiences (unusually poor weather conditions) when making operational decisions. In this case, the individual was ignoring traditional weather patterns in favour of conditions experiences the previous year. This is an example of using the availability heuristic.

The literature review suggested the tendency for decision makers to fall victim to escalation of commitment. In other words, they commit to a given course of action even when they are no longer well served by that commitment. Several of these participants noted that they actively resisted such escalation. For example, several described how initial decisions or products were not as successful as hoped. All these courses of action had been abandoned. Only one participant admitted that he was continuing to devote resources to a program (night skiing) that seemed unsuccessful. However, he was

cautious in doing so (did not increase the resources he placed into the program), but felt compelled to continue doing so because the program was valued by guests. In this case the program was not abandoned due to the commitment of the guests, not of the operator. However, it is questionable if more ski areas have had similar experiences and did not relate these during interviews or label instances of escalating commitment as such.

Overall, these managers used rules (heuristics) backed up by tools. The tools included use of teams, experiences and expertise, and historical data on skier visitation and weather. When decisions were simple, managers relied on rules of thumb. For example, past opening and closing dates determined future dates. However, with more complex and less straight forward decisions, teams were utilized.

5.2 Overcoming Weather Challenges

This next is concerned with Research Question 2 which questions the effect of climate variability on ski area operation decision making. This study supports the notion that the ski industry is weather dependent. Ski areas need snowfall and cold temperatures to ensure appropriate conditions. Hence, a variety of weather challenges were described by participants. For example, some participants faced early season challenges. Some have overcome this initial challenge through snowmaking efforts. However, many participants reported planning and budgeting for weather challenges.

Most ski areas were challenged by the weather in the 2004-2005 season. Some Vancouver and Coast Mountains ski areas had to shut down operations for periods of time. Some newspaper articles picked up the story about a “skier’s nightmare” (Efron, 2005; Volger, 2005). The climate data for January 2005 confirmed the unusual event’s occurrence. Different regions and ski areas had experienced very different weather patterns. For example, some Environment Canada stations reported rainfall and warmer temperatures, whereas other stations did not record any rainfall. Managers’ responses reflected these differences. Several ski areas in the Vancouver and Coast Mountain area were

forced to close for a period. In contrast, the ski areas in the Thompson Okanagan and Kootenay Rockies regions continued operations with minimal interruptions. However, these other ski areas discussed the negative consequences to their operations when poor conditions are reported in the Coast Mountain by the media nationally and internationally. Skiers hear that these ski areas on the Coast are suffering and assume that all BC ski areas are suffering despite the vast distances between ski area locations and climatic variations between mountain ranges. As a result, ski areas that reported having favourable ski conditions did not benefit when other ski areas, their direct competition, suffered poor conditions or temporary closures. Thus, media play an important role in influencing skier perceptions and behaviour patterns.

In addition to ski area operation itself, some participants were challenged by road conditions. Guest access is restricted due to road closures of major highways as avalanche risk or mudslide risk occurs.

Diligent weather forecasting was very important to daily operations. In addition, some participants stated the importance of creating a weather atlas. This resource enables manager to draw from and base experience on each year's experiences. In addition to forecasting, another manager discussed the need to plan an operational calendar where each day is laid out, but able to be changed if necessary. Budgeting was planned in a similar method. Historical weather data helped operators budget for snowmaking. Overall, many managers realized that the weather does vary and budgeted accordingly. Such budget planning enabled managers to overcome challenges presented by closures in January 2005 and December 2005. As noted by one participant, they were stable financially, but poor winters reduced the likelihood of large investments or improvements to facilities after suffering closures, missing a Christmas or other business interruptions in previous seasons.

5.3 Risk Management and Methods of Increasing Certainty

The following section responds to Research Question 3 which questions weather specific risk management policies and procedures to deal with uncertainty. Many ski area managers had emergency policies and procedures for weather disturbances such as high winds, cold temperatures, and electrical storms. In most cases, operations were shut or partially closed down, such that skiers were moved into areas which are not affected by the disturbances. While such measures seem necessary, one manager thought them insufficient. He discussed moving into a guest recovery mode when disturbances closed mountain operations. During such events, his staff gave out snow checks for another ski day, offered indoor events and entertainment, such as movie nights and kids carnivals, and gave free tickets for snow tubing or ice skating.

Throughout all operations, management works towards managing risk. Snowmaking was one of the major means through which this was accomplished. Snowmaking helped managers increase the skiable terrain thereby reducing the risks associated with crowding, injury, and unhappy clients. Some referred to snowmaking as a safeguard in all conditions.

No participants had insurance for inadequate snowfalls nor did they know any other ski area which had it. They all believed that the premiums would be too high for ski areas. One ski area did have insurance for business disruptions from weather events. For example, the insurance covered lightning hitting facilities and earthquakes. In recent years, season's pass insurance was created for skiers to purchase. This insurance guarantees a certain number of skier days within a season. Again, snowmaking was described as insurance, a guarantee or tool by many within ski area management. While some ski areas utilized snowmaking within a specific area or were installing it as such, other ski areas utilized more snowmaking in lower elevation or high traffic areas.

5.3.1 Risk Attitudes and Loss Aversion

Many participants described their behaviour towards snowmaking as aggressive. They wanted to ensure opening on pre-established dates and to have adequate terrain cover before peak business periods. By doing so, many managers exhibited risk aversion. Kahneman and Tversky (2000) described loss aversion as the avoidance of risk. These operators preferred to undertake snowmaking rather than to rely on nature. According to Tversky and Fox (1995), they preferred a certain outcome (manmade snow) when faced with an uncertain prospect (variable amounts of natural snow). Some managers discussed how they would rather risk the cost of snowmaking to avoid the sure cost of no snow or visitors. In other words, they were willing to accept the certain cost of snow making over the uncertain costs of poor weather.

5.4 Climate Change and Business Adaptations

The following section responds to Research Question 4: What is the adaptive capacity of ski areas regarding climate change risk, threats and opportunities? Although some ski areas discussed potential future climate change impacts at their individual area or within the industry, many managers had not participated in these discussions. Additionally, no ski areas reported policies relating to climate change. There was only one participant who was knowledgeable on climate change, his ski area's current initiatives and future plans, and potential implications based on his area's location. Managers were more likely to admit that they were ignoring the issue until more was known and the impacts more apparent. They were content with the current situation and did not question potential challenges in the future.

However, many of these managers may be preparing for climate change without being aware of doing so. In addition to skiing and snowboarding, many resorts were expanding into other offerings ranging from snow tubing and ice skating to snowshoeing, and other snow-based activities. While they considered these activities as simple diversification of operations (a means to build capacity) Scott

(2006b) also identifies such measures as climate change adaptation (see Table 2-3). The additional activities could reach out to skiers and snowboarders thereby acting as a means of adaptation as well as a means of diversification.

Some participants were also expanding their operations into shoulder seasons or year-round activities. Often activities were chosen for reasons of efficiency (they utilized the same facilities as winter activities). Examples included lift assisted hiking, sightseeing, and downhill mountain biking. However, some ski areas began to diversify into cultural events, conferences, golfing, and spas. One ski areas was using an affiliation with BC Parks to offering camping and manage campsites along the Sea to Sky Highway. In general, many participants diversified at least one aspect of operations. Some participants were still exploring ways to diversify. To date, only one ski area changed the focus of its business so 65% of its business occurred during the spring, summer and fall. As Scott et al. (2003) found, business diversification helped off-set the costs of winter operations. One manager reported that the loss of a July was more problematic than a poor winter.

While diversification helps to increase the revenue for ski areas, other methods of "hard technological developments" (Scott, 2006b) were also being introduced to overcome weather challenges. In particular, many participants utilized snowmaking and slope development or summer grooming. These participants reported that snowmaking is not effective without good slope development and summer grooming. Thus, investments were made into both areas to ensure effectiveness.

Snowmaking enabled ski areas to open earlier, open with more terrain, to stay open in poor times, and to stay open longer at the end of the season. This is consistent with Scott et al. (2006) conclusions on snowmaking in eastern North America. Seasons in the east were extended from 55 to 106 days during their baseline period (1961-90).

Larger ski areas did not have snowmaking on all runs. The reliance on snowmaking differed amongst participants. While some relied on snowmaking for an early opening, others only used snowmaking in particular high traffic areas, at lower elevations, or as backup to their natural snowfall.

In contrast, one ski area had not installed snowmaking as it was not financially feasible and it would be difficult to install without a water sources nearby. These findings on snowmaking are consistent with research from Scott (2006b; Scott et al, 2003). Although his study focused on southern Ontario, Scott's prediction of climate change altering the competition between ski areas seems to resonate here. The extra costs of operating snowmaking equipment could alter the competition amongst those without snowmaking or with small budgets.

Overall, ski area management reported increasing efforts towards environmental sustainability. This included updating to more efficient equipment and switching to biodiesel fuels. In addition, one ski area focused on environmental sustainability when planning new terrain and facilities thinking of the future. Thus, one ski area installed a new chairlift to access terrain higher on the mountain. A conscious effect was made to leave as little impact on the ecosystem as possible and to reuse materials when applicable. One manager described how his ski area was open to try new environmental sustainability tactics and that good decisions made financial sense. Overall, these findings on environmental sustainability and stewardship are similar to conclusions from Todd and Williams (1996). They found that many large North American ski areas are currently involved in a wide variety of initiatives to protect and enhance their environmental resources.

No ski area reported use of government of industry policies. As Scott (2006b) suggested, this could relate to the limited role of government within this ski industry as it differs from other economic sectors, such as agriculture and forestry.

Although ski areas were undertaking climate change adaptations and many were planning for the future, many managers did not describe the link between guests' travel and the effect on the environment. Carbon emissions from airline travel from international tourism or even eastern Canada can only perpetuate climate change. Hence, an increase in international clientele could improve business at present, but the long term environmental implications are troubling.

5.5 Trends Influencing Management Decision Making

This section discusses findings regarding the final research question: How do trends within the evolving ski industry and ski market influence management decision making? Many influential trends were reported by ski area management. Development is ski technology have brought new interest to various forms of skiing and snowboarding. New clients groups have expressed interest in skiing and managers are attempting to serve these groups as best they can.

Overall, managers will continue to be challenged by the popularity of internet bookings and last minute holiday decisions. A ski holiday can be expensive and guests want to ensure that the snow conditions are adequate. Thus, they will continue to check conditions and webcams prior to holidays instead of signing up months ahead of time or before Christmas. To show off the best product available, managers will need to locate webcams where the best conditions are located, which could mean moving webcams to higher elevations in the early or late season.

5.6 Conclusion and Significance of the Study

This research sought to uncover management decision making procedures and processes in the ski industry in western Canada. Many interesting insights were uncovered about decision making in the weather dependent ski industry. Managers are challenged by the uncertainty of weather, vulnerability of skier activity patterns, and the potential risks, threats and opportunities of climate change.

First, this research is noteworthy because of the context it studies. It is concerned with the relationship between climate change and the ski industry in western Canada. Presently, very few studies exist on climate change and the ski industry in Western Canada (Scott & Jones, 2005). It is also significant because of its findings. They offer insight into the effect of uncertainty on decision making within the ski industry. Thus, ski area management across Canada and North America can profit from this study by gaining an understanding of how these ski areas plan for the future and manage risks presented by weather.

5.7 Limitations of the Study

Now that the research is complete, the researcher would like to point out a few things that could have been done differently. First, the interviews should be completed before operators become busy with seasonal demands. If repeating this study, I would complete the interview process before November or between January and February. Many participants were busy in November preparing equipment and conducting staff training programs for the upcoming season. In addition, Christmas is a peak time for ski areas. Conversely, many ski areas experience slower times in January which would be more favourable to scheduling interviews. Thus, the interview process could be condensed to a shorter timeframe.

Second, due to time constraints of interviewees and the researcher, interviews were limited to approximately one hour. Some participants could only allocate half an hour for interviews. Thus, limitations resulted from time constraints. In some interviews, some questions or issues were not addressed or were limited in depth.

Third, the present study was limited to the experiences of managers from ski areas that participated in this study. As no list of ski area managers exists, it was difficult to contact potential interviewees over the phone or obtain email addresses to set up interviews.

Directions of future research beyond this study are discussed in the following section.

5.8 Recommendations for Future Research

Among the sixteen participants, some divergent processes, meanings, experiences, and motivations were found. Extending the interview process to be more inclusive of all potential decision makers and stakeholders may provide more insight. For instance, interviews might include individuals from sales and marketing, destination marketing, and other departments. This group is less concerned

with the operational challenges that weather uncertainty offers and more concerned with client behaviours and decision making. Its members may take a very different view of the nature and extent of the challenged posed by weather. Whereas operational managers may focus on snow conditions marketers may focus on perceptions and preferences of clients.

Additionally, a future study of this magnitude would benefit from examining the managers themselves in more depth. For example, managers should be asked about their education and training, previous experience, and/or personalities and how these personal elements might influence their decision making processes.

This study suggests the complexity of decision making under the uncertainty that ski area managers face. While these managers displayed many of the adaptation strategies suggested by Scott (2006b) more study might discover the relative success of these strategies. More research into this area should be conducted to understand which adaptations are practical.

Another future area to investigate is the skier market and psychological triggers for participants. Many participants found that skier interest dwindled each spring even though snow conditions were good at that time. Future research could examine what decision making triggers exist among user groups and if these triggers vary from one sport to the next, from one group to the next, from one region to the next. Understanding psychological triggers and how skier's minds shift would help the ski industry with product and service development.

Finally, future studies should examine the issue of climate change within other recreation and tourism sectors. Climate change does present a considerable challenge in the future to our way of life, as well as tourism and recreation. There would be a benefit for future research to look more closely as the risk, threat and opportunities which climate change presents to the ski industry and other recreation and tourism sectors.

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Appendix A – Summary statistics for arts, entertainment and recreation by North American Industry Classification System (NAICS)

Table 361-0002

Survey or program details:
Annual Survey of Arts, Entertainment and Recreation **– 2425**

Geography=Canada

North American Industry Classification System (NAICS)=Skiing facilities [71392]

Summary Statistics	Operating revenue (dollars x 1,000,000)	Operating expenses (dollars x 1,000,000)	Salaries, wages and benefits (dollars x 1,000,000)	Operating profit margin (percent)
2000	668.9	589.4	201.2	11.9
2001	713.5	628.9	250.2	11.9
2002	767.8	680.5	250.2	11.4
2003	789.0	715.7	241.8	9.3
2004	809.1	717.0	270.0	11.3

Source: Statistics Canada, 2006

Appendix B – Semi-structured Interview Questions and Probes

This semi-structured interview guide is developed to collect information about and insight from the selected interviewees. After gaining the initial background information, situation questions will ask the interviewee to answer questions regarding one specific situation at a time. This section will be repeated twice to gain a greater understanding of the phenomena.

Background

1. What is your position within this organization?
2. What are your responsibilities?
3. How many years have you been with this organization?
4. How many years have you worked within the ski industry?
5. How does uncertainty over weather effect your operations?
    a. Can you give us an example?
6. What is the greatest challenge you face over the uncertainty from weather?
    a. Could you describe that in more detail for me?

The Industry and Vulnerability in Activity Patterns

The next couple of questions ask about clients and their preferences.

7. Who are your clients?
    a. Where do the majority of your clients travel from?
    b. Is the client base more demanding than before? What are they seeking?
    c. What are their skiing patterns?
    d. How dependent is their participant on snow conditions?
    e. What is perceived as ideal conditions by your resort guests? Has this changed over the years?
    f. When are the slow periods? (Least popular times to participate – dates?)
8. What recent trends have the largest influence on ski participation?
    a. Which trend is most prominent?
9. How are you responding?
    a. Do you foresee any new trends on the horizon?
10. How stable is your existing climate base?
    a. What strategies are you using to keep them coming back?
11. Are you attempting to attract new clients?
    a. If yes, who are they?
    b. What are their interests?
    c. How do you appeal to them?

These next few questions deal with operational trends that affect how you do business.

12. What trends have had the largest influence on ski operations recently?
    a. Which trend is most prominent?
    b. How long has each trend existed?
13. How are you responding?
    a. Do you foresee any new trends starting this upcoming season?

Climate and Variability in Weather

14. How important is snowmaking to your operation?
    a. Is there a certain temperature at which you prefer to make snow at? What is it?
    b. Have you specified dates of operations starting and finishing?

15. How do you deal with unforeseen weather events:
    a. Rain incidents
    b. Unexpected snowfall
    c. Warm temperatures
    d. Climate variability
16. Does the time period in the season (early, mid or late) affect the way you deal with these types of events?
    a. How?
17. Do you have any new adaptations for the upcoming season?
    a. Can you describe the adaptations in more detail?

Risk Management and Uncertain Outcomes

18. What weather specific risk management policies and procedures have been instituted to deal with uncertain weather conditions?
19. Do you have insurance against losses due to inadequate snowfall?
    a. If yes, do you feel the premiums are worth the money?
20. What conditions do you look for to open or close for the season?
    a. When do you normally open and close?
    b. Do you close at a certain time each season? How consistent is this?
21. Would you ever change a decision and stay open later in the season?
    a. Under what conditions would you stay open longer than planned?
    b. If you had not met your financial targets of the ski season, would you try to stay open longer?
    c. What if demand had been steady throughout the season and seemed to be extending into the time you usually close?
    d. What if you planned to stay open for an extra four weeks but experienced disappointment in the first two? What would you do?
22. How does past experience with the weather affect the way you deal with opening and closing dates?
    1. Have you become more cautious?
    2. Has it caused to you to take more risks?

<u>Escalation of Commitment</u>

23. Have you ever decided to stay with a cause of action because of money already invested in a decision or operation?
    a. Could you tell me more about that?

<u>Risk Aversion</u>

24. Do you evaluate whether you will open early or close later, or simply open and close at the same time each year?
    a. Why?

Operations Situational Questions A

Answer the following questions with the decision of <u>choosing the appropriate opening day</u> in mind:

25. When in the year or ski season is this decision typically made?

<u>Heuristics and biases</u>

26. What information was collected and used to make this decision?
    a. Do you use information from within your organization?
    b. Do you gather any information from outside your organization?

27. Do you use any rules of thumb in making this operational decision? (i.e. do not open before a certain day)
    a. If yes, can you give some examples of rules that help you make such decisions?

Loss Aversion

28. What are your major concerns when you think about whether or not to make snow?
29. What makes this decision more or less challenging?

Operations Situational Questions B

Answer the following questions with the use of snowmaking technology in mind:

30. When in the year or ski season is this decision typically made?

Heuristics and biases

31. What information is collected and used to make this decision?
    a. Do you use information from within your organization?
    b. Do you gather any information from outside your organization?
32. Do you use any rules of thumb in making this operational decision? (i.e. do not operate snowmaking technology after a certain day)
    a. If yes, can you give two or three examples of rules that help you make such decisions?

Loss Aversion

33. What are your major concerns when you think about whether or not to make snow?
34. What makes this decision more or less challenging?

[Note: if ski areas did not have snowmaking or minimal snowmaking capacity, participants were asked if they have considered this option]

Weather Questions

Answer the following questions based the unpredictable winter weather experienced in the 2003-04 season.

35. How were operations affected?
    a. What did you do? How did you deal with the weather?
    b. Did you make more snow?
    c. Were extra maintenance hours required?
    d. Were any aspects of operations changed because of weather conditions?
    e. Was the profitability or operating expenses affected?
36. How long did it take to recover from that winter?
37. How did this impact skiing visitation rates?
    a. Has demand changed since that time?
    b. Was there a decline in numbers of skiers that year? For example, did people cancel holidays that year?
    c. Was there a lingering effect on the business?
    d. Did skier visitation change the following year? Did advance bookings change?
    e. Have operation procedures changed in anticipation?
38. Did business practices change?
    a. Was marketing increased or decreased or stopped at this time?
    b. Were any additional programs offered to entertain guests?
    c. Anything else?

Think about any major decision you have made during or since the 2003-04 season in order to deal with conditions being imposed on you by the weather.

39. What was the decision?
40. Who was involved in this decision?
41. Was it made by one individual or were several people involved in making this decision?
42. If it was a collective decision, how many people were involved and what were their roles?
43. How long did it take to make this operational decision?
44. Is your ski area better able or prepared to handle another year with similar weather?
    a. Were any strategies changed to improve or prepare for the possible warmer winters in the future?
    b. What would happen if this warmer winter occurred every other year by 2050? Would your operations still be successful?
45. Do you think that was the worst year faced to date?
    a. Was the worst you have seen in this region?

[Note: this section was deleted as interviews were time constrained in later interviews]

Climate Change Questions

46. There was discussion in the media that the winter of 2003-04 was evidence of climate change. Do you agree?
    a. Are you concerned about climate change impacts?
    b. Has your company had any internal meetings on climate change?
    c. Has this organization discussed risk management practices regarding climate change?
47. Is there anything you would like to know about climate change?
    a. Would you like to learn about the climate change scenarios?

Concluding Questions

48. Is there anything else you would like to add?
49. Can you recommend me to anyone else that could be helpful to interview in this organization?
50. Can you recommend me to anyone in the industry that could be helpful to contact about an interview?

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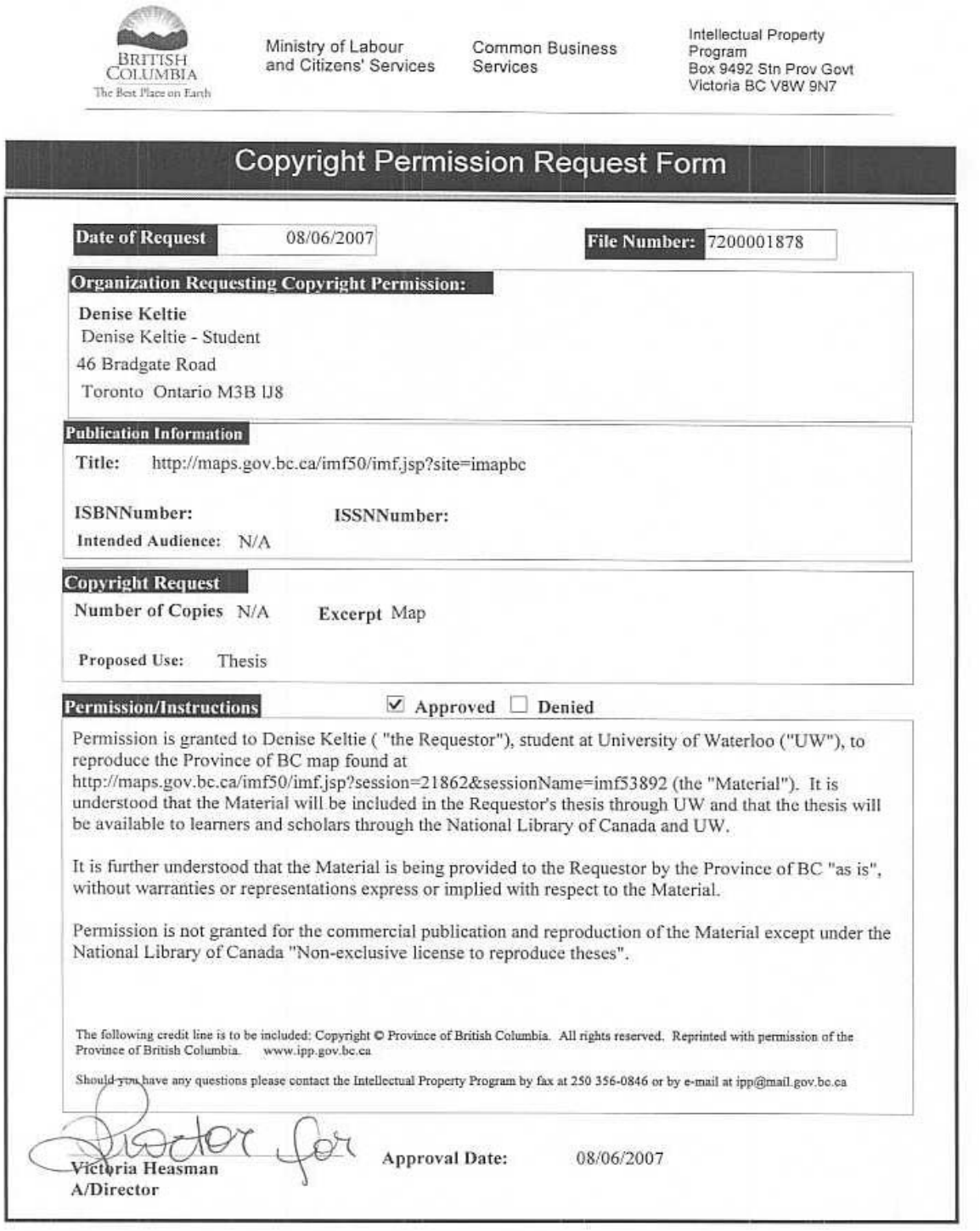

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