

# The use and effect of hazard warning signs

Managing visitor safety at Franz Josef and Fox Glaciers

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# Abstract

The management of visitors to New Zealand's protected natural areas is increasingly complex, with continued diversification in activity style, visitor type and origin, and heightened expectations of quality from both the tourism industry and the visitors themselves. Central to the visitor management challenge is maximising the safety of visitors, while preserving the unique and individual significance of the outdoor experience.

As the majority of New Zealand's visitor attractions are located in largely unmodified natural environments, visitors potentially face a number of natural hazards. While the inherent risks may be evident to managers and more experienced visitors, the extent to which casual visitors perceive natural hazards has important influence over (and implications for) both individual visitor behaviour, and the hazard management style adopted at specific visitor sites.

This study examines the extent to which visitors to Fox and Franz Josef Glaciers demonstrate an awareness of hazards, and the effectiveness of both existing and introduced hazard warning signs on visitor awareness and behaviour. Results suggest that hazard awareness among visitors is only modest, and a consequence of a variety of factors. These include: ambiguous hazard warning signs; unrealistic visitor goals and expectations; moderately high visitor perceptions of safety; a low level of visitor centre use *prior* to glacier access; and the phenomenon of social facilitation. Awareness of hazards, and behaviour compliant with management restrictions, was observed to increase in the presence of pictorial (introduced) signs. This finding implies that management can play a further role in advancing visitor awareness and perception of hazards in the Glacier valleys.

## 1. Introduction

Natural attractions form the basis of New Zealand's promotion as a tourist destination. Hundreds of thousands of people visit this country's protected natural areas each year, many of whom are likely to lack knowledge of, or experience in, such environments. Visitor safety is, therefore, a critical aspect of protected natural area management, and one which is likely to grow in significance as greater proportions of visitors originate from countries outside New Zealand.

Despite increasing numbers of international visitors, little is known about how these people perceive risks, or the extent to which they assume responsibility for their own safety. These factors, in combination with what is a loosely co-ordinated tourism industry, and the possible idiosyncrasies of tourists, represent the potential for accidents, dissatisfaction, and legal or moral dilemmas for visitor management agencies.

Visitor management in natural areas is increasingly complex in New Zealand, with continued diversification in activity style, visitor type and origin, and heightened expectations of quality from both the tourist industry and the visitors themselves.

Mandated with the guardianship of nearly one third of New Zealand's total landmass, encapsulating the nation's premier visitor attractions, the Department of Conservation has become something of a reluctant provider of tourism experiences. Furthermore, the New Zealand economy in general, and (more pertinently) the economic and social fate of many small 'tourist towns', is highly dependent on the vagaries of the tourist market. This reliance creates considerable pressure for the Department of Conservation to accommodate and facilitate visitor access and enjoyment in natural resource areas.

Compounding this situation is the current focus on accountability in health and safety. This is experienced by all institutions, agencies and employers in New Zealand, but still under scrutiny for its role in the tragic incident at Cave Creek in 1995, the Department of Conservation is more aware than many of the saliency of safety issues. The Department is, therefore, naturally interested in the best available visitor management practices and, to this extent, is currently involved in an investigation into the level of visitor hazard awareness at Fox and Franz Josef Glaciers.

## 1.1 THE STUDY SITES

The Fox and Franz Josef Glaciers are among the most popular of New Zealand's natural attractions. These neighbouring tourism icons on the South Island's West were largely responsible for both the initial developments in tourism, and the continuation of a strong, rapidly expanding tourism industry in the region. An estimated combined total of 400 000 visits to the Glaciers per annum (the consequence of increased national and international promotion, and the maintenance of relatively easy foot access to within close proximity the ice) has created within the nearby townships an increasingly significant economic dependency on tourism.

## 1.2 AIMS AND STRUCTURE OF THE REPORT

This report has been commissioned by the West Coast Conservancy of the Department of Conservation (DOC). The study concept emerged from an on-going research project undertaken by the report's author, and management concerns about visitor perception of hazards, and associated behaviour, at both Fox and Franz Josef Glaciers.

The specific terms of reference for this project were to determine:

1. The general level of hazard perception among visitors to the Glaciers.
2. The specific hazards to which visitors believe they were exposed.
3. Any differences in hazard perception between visitors to the Fox Valley and the Franz Valley, or among visitors from different countries.
4. The effectiveness of the current hazard sign system in communicating the actual hazards to visitors.
5. The types and numbers of signs most effective in communicating the hazards to which visitors are exposed (to be assessed using an alternative sign type to that currently employed by DOC).
6. Basic visitor characteristics and use patterns for the two glacial valleys.

This report begins by briefly reviewing some of the important themes in contemporary literature relating to the subject of hazard management. This review locates the current study in the broader context, and has instructional value through informing visitor management practices. Following this, the research methods are described, including ethical considerations and limitations of the study. The section on results is the most expansive section, and for this reason it has been divided into five smaller components, each of which addresses a specific aspect of the study. The results section also includes a brief summary and discussion that integrates the various aspects. The report concludes following recommendations based on the outcomes of the study.

## 2. Literature review

*To non-risk-seeking visitors, hazards are impediments to an optimal experience. Managers often cannot control hazards, but by managing visitor behaviour, they can reduce risks (McCool & Braithwaite, 1992: 294–295).*

### 2.1 INTRODUCTION

In addition to primary research, it is also highly valuable to review previous research relating to hazard awareness and perception, and the experiences of other visitor management agencies. To this extent, this component of the report addresses a variety of key concepts and issues including: risk (real and perceived); communicating risks and hazards; individual and agency responsibility for risk and safety; and behavioural factors affecting risk management. As the nature of this review may be too detailed for some readers' purposes, a summary of key points has been provided at the end of this section.

### 2.2 A BRIEF DEFINITION OF TERMS

Hazards and hazard perception are best understood within the broader context of risk management. A considerable body of literature now exists in the field of risk studies, some of which is useful in informing hazard management practice. Notwithstanding the complexities of defining risk (some of which are discussed below), for the purposes of this report the term will refer to *the potential to lose something of value*. Hazards are considered to be *conditions which increase the possibility of loss occurring*. Finally, the report often refers to *tourists* and *visitors*. These terms will often be used synonymously, owing to the fact that the majority of people who visit areas such as the Fox and Franz Josef Glaciers are tourists of one sort or another (domestic and international).

## 2.3 RISK

Risk and risk-taking are inescapable aspects of all human existence and involve choices or trade-offs between positive and negative consequences. Risk is variously defined, and has therefore been difficult to operationalise. For instance, a traditional understanding of risk is articulated by Priest & Baillie (1987), when they define it as the potential to lose something of value. Conversely, Roehl & Fesenmaier (1992:17) state that '[a] situation where the only possible outcome is a sure loss... is not risk. [...] A choice involves risk when the consequences associated with the decision are uncertain and some outcomes are more desirable than others'.

As suggested, the theories which seek to explain risk and risk-taking are many and varied. For instance, Douglas & Wildavsky (1982) imply that risk taking is best understood within a cultural paradigm of social acceptability. At the other end of the spectrum, Trimpop (1994: xiv) states that risk is an essential behaviour in human evolution, possessing '...a physiological and genetic predisposition...'. Although these two approaches to risk are different, they are not mutually exclusive. For instance, while there may be a genetic predisposition to risk-seeking behaviour, the risk itself can be viewed as socially or culturally constructed. What is risky in one culture or at one particular time in history may not be risky in another. Trimpop (1994: xiv) goes part of the way towards this multidisciplinary definition of risk taking when he describes it as '...a concept combining individual, situational, physiological, emotional and cognitive factors..., each of which in itself is insufficient to describe the complete concept of risk taking accurately'.

Risk is commonly considered as a compound measure of the probability of an event occurring and the magnitude of its consequence. Consistent with this approach to risk, Yates (1990; 1992, cited in Trimpop, 1994: 6) identified three major components in the risk construct:

1. loss
2. the significance of loss
3. the uncertainty associated with loss.

Despite disagreement on the nature of risk and how it can be assessed, it is more or less accepted that risk can be differentiated into a number of different forms. Drawing on research in consumer behaviour, for instance, Cheron & Ritchie (1982, cited in Roehl & Fesenmaier, 1992; Brannan, et al., 1992) have identified seven components of risk, all of which can be applied to the visitor experience. These include: financial, functional, physical, psychological, social, time and satisfaction.

The significance of any particular 'type' of risk is likely to vary depending on the context. For instance, in their population-based study evaluating the risk perceptions of recreation activities, Brannan et al. (1992: 151) found that, overwhelmingly, '...the most commonly predictive components of perceived risk were physical and psychological, indicating that respondents considered these two components to most commonly contribute to their overall risk perceptions'. It is note-worthy that most definitions of risk are stated in negative terms only (see Johnston, 1989).



## 2.4 RISK PERCEPTION

Irrespective of the actual presence of risk (or its definition for that matter), it is the perception of risk that will govern the behaviour of individuals. This individual awareness is likely to be affected and influenced by a range of factors including previous experience (either personal or learnt/reported), cultural conditioning (and social acceptability), and personality traits (general disposition).

According to Priest & Baillie (1987: 18), perceived risk refers to '...an individual's subjective assessment of the actual amount of danger involved in an adventurous setting'. Conversely, Douglas & Wildavsky (1982:80) appear to down play the *individual* nature of risk perception, by stating that, in risk perception '... humans act less as individuals and more as social beings who have internalised social pressures and delegated their decision-making processes to institutions'. Developing another angle after their review of a number of studies, Roehl & Fesenmaier (1992: 17-18) suggest that 'risk perceptions are situation specific', and that in any given circumstance the individual will pay more attention to some risk factors than others because these factors are perceived to be the most important by the decision maker.

The measurement of risk perception has taken various forms. For instance, in the outdoor recreation literature, many studies have assessed changes in the risk perceptions of participants in adventure leisure experiences (Morgan et al., 1997b); Priest & Carpenter, 1993; Carpenter & Priest, 1989; Priest & Bunting, 1993). These authors have been interested in the pre and post activity perceptions of risk, and have generally concluded that perceived risk is reduced as competence in the activity (experience) increases.

In another recreation study, Levine & Gorman (1994) assessed skiers' perceptions of danger as a function of their knowledge of danger. The researchers found that knowledge of fatalities in skiing was an important factor in increasing skiers' ratings of the dangerousness of the sport. The authors also noticed a decrease in self-reported risky behaviour when knowledge of previous accidents was high. The results of this study add credence to the postulate that an individual's risk perception is likely to be informed by his or her awareness of the history of an activity (or, we can assume, the history of a place).

## 2.5 COMMUNICATING RISK AND HAZARD

*'...serious repercussions are likely to result from situations in which risk is present but not perceived'* (Bean, 1989).

The issue of risk and hazard communication is a widely debated and controversial topic. Opinions on how best to inform visitors of risks, and manage risk taking behaviour in natural settings are part of a broader debate about direct and indirect management techniques (see Manning, 1986). With a growing emphasis on safety and agency accountability (see Spengler & Hronek, 1995; Gold 1994), some authors have urged caution in becoming too involved in what is essentially the visitor's experience (Devlin, et al., 1996; Griswold, 1989; McAvoy & Dustin, 1990). Far from insulating the visitor from the potential consequences of their experiences, other authors advocate almost complete individual responsibility (Hardin, 1969).

Despite the range of views, McCool & Braithwaite (1992) contend that very little is known about the effectiveness of messages presented to visitors in protected natural areas. For instance, these authors (1992: 320) ask: 'What are we telling visitors about hazards? [...] Are these messages correct? Are messages from different agencies and personnel consistent with each other?'. What influences perceptions of messages on site? The way in which risk is presented or communicated to visitors to protected natural environments is of interest in this study. For instance, do visitors pay attention to or avoid warning messages (e.g. signs) in natural settings? What influence do safety messages have over visitor perceptions and behaviours?

Adherence to, or awareness of messages in tourism and recreation settings has wider implications than risk management. Studies in North America (e.g. Vander Stoep & Gramann, 1987) have looked at reducing inappropriate visitor behaviour (such as vandalism) via a range of indirect management techniques. Another more recent study looked at the effects of personality and situation on intentions to obey rules in outdoor recreation areas. This laboratory study found that '...subjects were more willing to comply with regulations when they were told of the reasons for the rule, as well as the negative consequences ... of not obeying them' (Gramann, Bonifield, and Yong-geun, 1995: 340). In other words, specific examples detailing the consequences of risks are often more effective than vague suggestions that certain activities are dangerous.

Another important factor in successful hazard communication appears to be visitor perception of source credibility. The source of the message is thought to exert a powerful influence over message acceptance, and on resulting behaviour. Attractiveness and expertise are key features of increasing credibility (McCool & Braithwaite, 1992).

Finally, research in behavioural science has found that the presence of uniformed authority figures increased subjects' compliance with regulations in a variety of settings. For instance, a recent North American study found the presence of uniformed park employees to be a significant deterrent to off-trail hiking in a major national park (Swearingen & Johnson, 1995). Importantly, these researchers also found that visitors accepted the presence of park staff where there was a perceived need for management action related to information dissemination, visitor safety, and resource damage. The authors emphasise that the park staff need not assume a confrontational, authoritarian stance, since '...the mere presence of the uniformed employee may dramatically reduce non-compliance' (Swearingen & Johnson, 1995: 80).

## 2.6 RISK AND RESPONSIBILITY

Whether visitors to protected natural areas 'are actively seeking out risk through adventure activities, or simply wishing to see or experience a spectacular natural environment in which risk inheres, the managers of recreation lands carry legal and moral responsibilities for public safety' (Haddock, 1995: 7). For instance, under the provisions of the Occupiers Liability Act (1962) and the Health and Safety in Employment Act, (1992), those responsible for the management of protected natural areas are required to take all possible steps to ensure the safety of visitors to their sites. Furthermore, while the legislation emphasises the need for safety compliance, the Accident Rehabilitation and Compensation Act (1992) denies injured persons the right to seek damages against those responsible.

A legal framework exists with the intention of protecting citizens and institutions against harm. While this legal context may reflect the general morality of the society, many of the contracts held are more or less tacit arrangements based in expectation and assumption. In this sense, Social Contract Theory may provide a useful framework through which to gain an understanding of the relationships between producers and consumers in tourism.

It is interesting to explore the changing nature of social contracts during a time of significant social restructuring. In New Zealand, for instance, the changing political orientation of the 80s and 90s has engendered an attitude of individual responsibility—a key ideological feature of modern post-industrial western nations. Individuals are now encouraged to take more responsibility for themselves (as illustrated by increases in private health insurance, retirement savings schemes, educational funds for children, etc.). At the same time, we expect greater agency accountability than has been the case in the past. Referring to North Americans, Rogers (1980, cited in Hanna, 1991: 4) notes: 'The public of today is less and less likely to accept misfortune as a fact of life and is more inclined to look to the courts for compensation'. In other words, this new individualism is juxtaposed with a reduced individual responsibility—or greater agency responsibility for risk and safety. This might be more accurately described as a lower tolerance of exposure to risk (of any sort).

Acknowledgement of this lack of tolerance in Canada has led Parks Canada to initiate a Public Safety Communication Plan, one of the goals of which is to '...increase awareness that safety is a *shared responsibility* when visiting heritage areas' (Parks Canada, 1997: 3). The document also states that the long term goal of Parks Canada is to '...encourage visitors to be more *self reliant*, so that they take responsibility for their safety...' (*ibid*).

Experience suggests that in New Zealand domestic visitors currently (and certainly in the past) assume a greater responsibility for their safety in natural settings than their Canadian counterparts. This may be attributed to several things, including a cultural identity supporting 'do it yourself' lifestyles, and low-key, 'she'll be right' attitudes (e.g. down-playing danger). In addition, New Zealand's ACC legislation has protected agencies from court action, and compensated individuals for accidents and injuries. Griswold (1989), writing about his visit to New Zealand's natural attractions, summarised the risk management approach using a sign he'd encountered which read: 'fall in—no come back', implying that visitors were more or less on their own in that particular setting.

The degree to which visitors accept responsibility for their own safety in protected natural areas is crucial to how these lands are managed. International visitors present an especially interesting and important case as many may well arrive in tourism settings with assumptions and expectations about risk and safety that are very different from those of their hosts and local counterparts.

## 2.7 TOURIST BEHAVIOUR AND THE RELEVANCE OF RISK

*The visitor to the glacier valleys can encounter hazards that may never have been encountered before. Often he or she is going from a well managed environment to a difficult, and at times hazardous natural environment (Tourism Resource Consultants, 1995: 5)*

New Zealand's tourism industry is built upon its natural attractions, yet little is known of the risks (perceived or real) faced by visitors to these areas.

Tourists today, unlike their predecessors—the travellers, have a solid sense of security based on the controlled, predictable and urban communities in which most people now live, and manifest in the relative comfort in which they travel (e.g. coaches and rental cars provide warm, controlled, and stable modes of travel). In contrast, the natural attractions to which tourists to New Zealand are invited are often *not* entirely controlled or predictable—or, at least, they have the potential to become inhospitable or dangerous. This has implications for safety, risk and liability in New Zealand's tourism 'product'.

From a tourist motivation perspective, it is evident that tourists change their behaviour while travelling, doing things they would not do while in their home environments. This may include undertaking risks which they would not normally consider. One possible explanation for this is that there is a perception of safety in being a tourist; some feeling of invincibility may be present in the minds of those who travel for pleasure. Furthermore, because some activities and events undertaken as tourists (or visitors) are more organised or planned than at home, the responsibility for safety may be displaced onto the agency or industry thought to be responsible for providing the experience.

Despite a lack of documented evidence, it does seem plausible that as tourists people behave differently from how they might behave when not tourists. Kruhse-MountBurton (1995), and Ryan & Kinder (1996), both reporting on the deviant tourist, suggest that some tourists justify their indulgence in the sanctioned margins of behaviour because they are not at home. In addition, Ryan et al. (1996) suggest from their study of New Zealand and British university students on holiday, that some tourists are more likely to engage in risky behaviours while away.

People on holiday may have a perception that what they are taken (or led) to is 'presented' to them in some organised, coherent, co-ordinated form. In tourism, examples of this include the information centre and brochures about places; travel maps; signposts; bus trips; uniformed guides; operators and managers; viewing platforms, roadside lookouts, etc. In reality, the industry is loosely co-ordinated and, in particular, the link between the promotion and marketing information on protected natural areas, and its management and delivery (DOC) is tenuous to say the least. There is an incongruity between the image of the insulated touristic experience presented and promoted, and the reality of what that experience can become.

In their review of the theoretical aspects of crime and its relationship with tourism, Tarlow & Muehsam (1996: 20) emphasise the 'make-believe' character of the tourist's trip. As a result of the tourist state, the authors here suggest that a number of social phenomena can occur.

- Tourists often let down their guard making them easy prey for criminals.

- Tourists will often de-differentiate neighborhoods, thus entering into areas in which locals might dare not go.
- Tourists may often confuse good luck with caution or proper planning. Thus, when tourists pass on their travel tales to their relatives and friends, unrealized risks that do not result in dire consequences by pure chance, may influence others to try the same. Others who repeat these risks may not be fortunate enough to escape unscathed.

These characteristics of the tourist's nature can also be applied to other aspects of human exposure to risk, such as risk in protected natural areas.

Whether or not perceived risk is high among all tourists, recent research indicates that tourists *are* very aware of safety when making destination choices. For instance Sirakaya, Sheppard and McLellan (1997) used a scenario method to study how people are affected by information regarding a destination's safety. These researchers found that perceptions of low safety had a detrimental effect of much greater magnitude than a perceived perception of high safety. According to the authors, the implication of this finding is '...if safety is not being discussed with respect to a given destination—be quiet!' (Sheppard, 1997 pers. comm.). This result contradicts previous studies which have suggested that visitors do not necessarily alter travel plans because of safety concerns (Crystal, 1993, cited in Pinhey & Iverson, 1994).

Finally, an on-site study of tourists' perceptions of safety was undertaken by Pinhey and Iverson (1994). In their examination of the safety concerns of Japanese visitors to Guam, the researchers asked respondents to describe how safe they felt in a variety of situations (e.g. sightseeing, water sports, night spots, driving, crossing the road). The findings suggested that respondents felt '...less safe when participating in activities that required movement away from their hotel...' (Pinhey & Iverson, 1994: 89). Those visitors who were older, and those who felt they were easily able to communicate with local people reported feeling the safest while visiting Guam.

## 2.8 FOX AND FRANZ JOSEF GLACIERS

While there is a growing body of information about the real risk and hazards to which visitors are exposed at the glaciers in South Westland (see Tourism Resource Consultants, 1995; Davis, 1998), very little is known about how visitors to these attractions *perceive* risk and safety. Information relating to visitor awareness and perception will ultimately assist management in targeting appropriate levels of risk management and hazard communication. Both will be complemented by an improved understanding of the extent to which visitors accept responsibility for their own safety.

Fox and Franz Josef Glaciers provide excellent study sites to examine concepts of risk, hazard and safety perception. As key components of the South Island tourism trail, the Glaciers attract a broad cross section of the visitor market, but the predominant user groups are Short Stop Travellers (SST) and Day Visitors (DV) (DOC, 1995; 1998). To this extent, visitors can be described as inexperienced, and therefore have '...a greater reliance on the Department to provide dependable and timely risk management services' (DOC 1998: 12).

As the majority of visitors are short term, and often from outside of New Zealand, it is valuable for management to appreciate more clearly the extent to which such visitors are aware of risks and hazards. Furthermore, in the interests of delivering quality experiences in a safe and dependable manner, it is helpful to understand the effectiveness of signs in communicating the risks and hazards to visitors.

## 2.9 SUMMARY OF THE LITERATURE REVIEW

1. Definitions of risk and hazard are similar, but it is important to distinguish between them. A hazard is a set of circumstances which may cause harmful consequences. Risk is the likelihood of becoming harmed by a hazard.
2. Risks and hazards are accepted at different levels by different societies and cultures.
3. *Real* risk is calculated as a compound measure of the probability of an event occurring and the magnitude of its consequence. *Perceived* risk is an individual's subjective assessment of the level of danger in a setting.
4. Visitor risk perception will be influenced by previous experience, cultural conditioning, and personality traits. The level of perceived risk is known to decrease as activity competence increases.
5. Research suggests that visitors are less likely to engage in risky behaviours when knowledge of previous accidents is high.
6. How best to communicate hazard and risk is an on-going management debate. Research suggests that visitors are more likely to adhere to regulations when they are told of the reasons for the rule, and the negative consequences of disobeying it.
7. According to recent research, visitor compliance with management regulations is likely to be increased through the on-site presence of uniformed park staff.
8. There are legal and moral responsibilities for public safety, some of which may need debate and reinterpretation.
9. The public of today has a lower tolerance of exposure to risk and hazard than in the past.
10. The degree to which visitors accept responsibility for their own safety in protected natural areas is crucial to how these lands are managed.
11. Owing to the highly contrived and predictable nature of modern living (travel included), many visitors to natural attractions will be mentally and physically unprepared for potentially hazardous situations.
12. There is some evidence to suggest that people behave differently when away from their home environments. Tourists are known to engage in risky behaviours.
13. As major visitor attractions in which very real physical risks inhere, Fox and Franz Josef Glaciers represent excellent study sites to examine risk and hazard perceptions.

# 3. Methods

This study combined two main methods to obtain data. These were (1) an interviewer-applied survey; and (2) direct behavioural observations.

## 3.1 THE SURVEY

### 3.1.1 Aim and implementation

A questionnaire was designed for specific use at the Glacier valley sites. The main aim of the survey was to determine, using semantic differential scales, three aspects of visitor attitude: 1) the extent to which visitors were aware of hazards in the area visited; 2) the extent to which visitors felt safe in the area visited; and 3) the extent to which visitors felt responsible for their own safety while at the site. Randomly selected respondents used a seven-point scale to show extent of agreement or attitude.

The survey also assessed awareness of existing and introduced hazard signage, and self reported behaviour on-site. Other aspects included typical demographic and visitation information.

All questionnaires were administered by interviewers, with the exception of those completed by visitors whose preferred language was Japanese or German. These respondents self-completed questionnaires provided in their own language on-site and returned them to the researcher or his assistant. Questionnaire completion times varied between five and ten minutes. Interviewing took place at fixed placements at each of the glacier sites. At Fox Glacier, the interviews took place at the top of the small incline above the current carpark (adjacent to the 1960s moraine). At Franz Josef, interviewing was undertaken on the riverbed immediately following the point at which the current track leaves the bush. All interviews were carried out as visitors *returned* from their walks.

The survey was implemented in two phases over a total of 14 days which spanned late January, February and March. The initial and preferred method had been to survey visitors at the two glacier valleys concurrently. Owing to the closure of the Franz Valley access track in mid January, this method had to be revised, and a consecutive implementation plan adopted. A comparison was made possible with the reopening of the access track in March.

### 3.1.2 Response rate

Over the sampling period, a total of 428 visitors were approached for interviews. Of these, 88.3 % complied. When responses at the two visitor sites were compared, Franz Josef had the higher rate of compliance (92.6%). The majority of those visitors who declined to take part in the study cited reasons relating to time (64%), weather (16%), or language (12%). The overall response rate of nearly 90% is considered very good (Babbie, 1989; Singleton et al., 1992) and is an important component in the representative nature of the results.

### **3.1.3 Introduction of hazard signs**

One aspect of the study involved an assessment of the current, and any alternative signage, in terms of its effectiveness in conveying hazards to visitors to the Glaciers. In order to do this, surveys and behavioural observations were undertaken during times when different numbers and types of signs were in place. At all times, the current Department of Conservation signage remained in place (see limitations). The maximum number of introduced signs at either site was five, and the minimum was zero.

There are three categories of hazard which have been used in designing and selecting signs:

1. hazards which were currently both present and identified in DOC signage;
2. hazards which were currently present but unidentified in DOC signage; and
3. hazards which were currently neither present nor identified in DOC signage.

The third category (the spurious signs) were an important methodological inclusion. Without such signs, it would be difficult to determine if visitors were reporting hazards which were evident to them, or hazards about which they had been warned via the signage. Examples of the signs, including brief details of their dimensions are on page 27.

The choice of hazard signs was made following various pre-visits by the researcher, and in consultation with the Department of Conservation management. During implementation, signs were erected along sections of access tracks in both the Fox and Franz valleys as per the limitations of weather and terrain. A schedule was constructed detailing the employment of particular signs, behavioural observation times and questionnaire distribution.

## **3.2 BEHAVIOURAL OBSERVATIONS**

An important component of this study was attempting to observe how visitors behaved while at the glacier sites. This component evolved out of concern about the way visitors were thought to ignore safety or hazard warnings issued by the Department of Conservation, thus exposing themselves to danger. During the fieldwork phase of this study, many observations were made, both formal and informal. In order to quantify these impressions, a structured set of observations was made at the terminal face at each of the sites. The glaciers' terminal faces were chosen as appropriate places from which observation data could be collected for the following reasons:

1. these are natural end points for many visitors, and logical and convenient places at which to locate observers;
2. the terminal face is identified in both valleys as a hazard of significant magnitude;
3. there is a history of behavioural problems at the terminal face on both access tracks; and
4. the presence of such features at both sites allows strong comparisons to be made.



Behavioural observations were planned for each day of the study period. While weather or access conditions did not always allow this, a consistent procedure was used throughout. The observer located him or herself in a pre-determined place, from which a good view of the glacier's terminal face and approaching visitors could be gained. At both sites, this position was approximately ten metres back from the rope closure erected by the Department of Conservation aimed at restricting access to the unstable terminal face. As the observations were covert, the observer was required to sit, or act in such a way that it would appear to others that he or she was simply another visitor admiring the view or eating lunch. Discrete recordings were made of the total number of visitors who reached the terminal face, and of those visitors who entered the restricted areas (i.e. those who proceeded beyond the rope closure, and ignored warning signs). Observations were usually for a period of between one and two hours.

### 3.3 ETHICAL CONSIDERATIONS

Ethics are an important consideration in modern social science research, and this study is not excepted from this. Efforts were made to stay within the commonly accepted practices of current social research, and respondents were given opportunities to withdraw their participation at any stage of the survey (including up to two weeks after). The use of mild deception (as employed in the introduction of 'bogus' signs) was carefully considered and designed to minimise the negative effects on visitors' experiences. Covert observations involved the collection of no personal details, and while currently out of favour in some social science circles, the technique was believed to be unharmed, and crucial to the collection of accurate data.

The entire project was reviewed by the Department of Conservation, and a formal application to Lincoln University's Human Subjects Ethics Committee was approved.

### 3.4 DATA ANALYSIS

The survey data were entered onto a spreadsheet (Lotus 123 '97), and analysed using the Statistical Package for Social Scientists (SPSS) for windows. Three scales have been used in the analysis, each having been subjected to separate reliability analysis.

## 4. Limitations of the research

Every attempt has been made to ensure that the data collected are as robust as possible. However, it is an inevitability of all research that limitations exist. It is sound methodological practice to at least allude to these.

1. The results of this study are limited to summertime users of the specific sites surveyed. While some generalisation to other seasons and sites is possible, this can only be tentative. The data collection was originally divided in order to more

accurately represent the summertime visitation pattern. Data collection was scheduled to occur concurrently at the two sites on two separate occasions. However, following the closure of the Franz Josef access track between January and March 1998, a consecutive approach was adopted. While not affecting the total data set, the result of this non-concurrent data collection method is that the comparison between sites is less precise.

2. Because of the need to ensure visitor safety, manipulation of the existing hazard signage was not possible. Manipulation was limited to the introduction and removal of alternative signs only. It is, therefore, not possible to attribute modification in perception or behaviour to the introduced signs alone. Effects could be the cumulative consequence of additional signs, rather than the effects of the sign content or form.
3. Observers, while covert, may have influenced the behaviour of visitors under observation. This is described as social facilitation, a process whereby people respond to the behavioural cues of others. For instance, by remaining seated outside of the restricted access area, the observer may have influenced others to do the same, thereby affecting the results. The only way to avoid this is to hide the observer from view, or use video surveillance. Neither strategy was considered to be practical nor appropriate.
4. While the sample size generated is considered sufficient for this initial, exploratory study, it is important that the work is replicated at either the Glaciers or at other natural attractions.
5. Undertaking research in field settings is naturally distinct from the laboratory environment in which the majority of intervening variables can be controlled. Natural attractions make complex settings for quasi-experimental research methods as utilised in the current study. Several unpredictable variables remain outside of the researcher's control, including the weather, access conditions, and urgent hazard management decisions. While efforts have been made to minimise the effects of these factors, it is impossible to completely remove their influence on the results.

## 5. Results and discussion

This section presents the results of the Glacier Visitor Survey, implemented in two phases between January and March 1998. The data are drawn from the responses of 378 visitors to Fox and Franz Josef Glaciers, and observations of on-site visitor behaviour. The survey responses represent a compliance rate of nearly 90%.

The Results section is divided into five broad sections for ease of interpretation. The first of these describes the sample in terms of visitor characteristics, and general visitor information, including age, gender, origin, group composition and so on. Sections 5.2 through 5.4 examine the three main attitude dimensions under consideration in this study. Respectively, these are: 1) hazard awareness; 2) perception of safety; and 3) individual responsibility. The fifth and final section of the results concentrates on aspects of visitor *behaviour* (both self-reported and observed) with special regard to hazards in the two glacier valleys.

Figure 1. Visitor origin.



## 5.1 CHARACTERISTICS OF THE SAMPLE

### 5.1.1 Visitor origin

Consistent with the general trend evident in other recent visitor studies of New Zealand's natural attractions (Espiner, 1995; Horn, 1998; New Zealand Tourism Board and Department of Conservation, 1993), the majority (80.4%) of visitors to the Glaciers were from overseas (Figure 1). The most common visitor origin was Australia (21.8%), followed closely by New Zealand (19.6%), and the United Kingdom (17.2%). Visitors from Asia were conspicuous by their absence from the glacier sites, comprising only 5.3% of the overseas visitors. On a nation-wide scale, Asians make up nearly 20% of the New Zealand international visitor market (New Zealand Tourism Board, 1998). The poor representation of Asian visitors may be explained by recent economic turbulence experienced in several Asian countries (notably Korea, Taiwan, and Japan), and the more difficult foot access to the Glaciers during this period.

When the two visitor sites were compared, the most striking difference was the proportion of Australian visitors recorded at the Glaciers. At Fox Glacier, Australian visitors comprised 13.6% of all respondents, compared with 29% of respondents at Franz Josef. While this may reflect a genuine preference for Franz Josef among Australian visitors, it is more likely that the difference is the consequence of the slightly different data collection periods (see limitations).

Of New Zealand visitors (19.6%), the majority (44.6%) originated from the North Island, although nearly one third (31.1%) were from Canterbury (Figure 2). When Fox and Franz Josef Glaciers are compared (Fig. 2), a slightly different trend is evident. For instance, while over half (55.3%) of all visitors to Franz Josef originated from the North Island, these visitors represented only a third (33.3%) of visitors to Fox Glacier. Visitors from Canterbury (41.7%) clearly dominate at Fox, but account for only one in every five (21.0%) visitors to Franz Josef.

Figure 2. Visitor age groups.



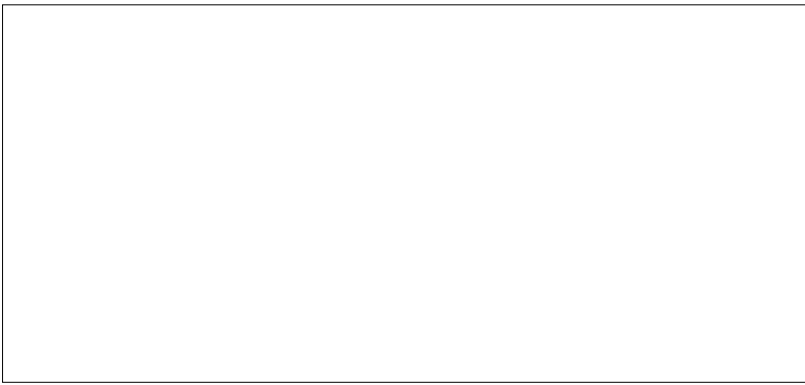


Figure 3. Visitor age groups.

### 5.1.2 Age

At both glaciers, the most common visitor age group was 25–29 years (16.5%). The smaller proportion of visitors aged between 35 and 49 years (20%) is represented by a prominent dip in the centre of Figure 3 (bimodal distribution). Members of this age group are more likely to have dependant children and are therefore both less likely to travel, and less likely to explore natural areas. This is supported by the further finding that only a small proportion (7.2%) of visitors were accompanied by children for whom they were responsible. It is typical of both the nature of the attraction and the age structure of tourists in general that nearly 40% of visitors to the Glaciers were aged fifty years or older. When compared in Figure 3, it is apparent that Fox Glacier has a slightly younger visitor age profile than its northern counterpart—a difference which may be attributed to the separate data collection periods.



Figure 4. Gender by glacier site.

### 5.1.3 Gender

As is common in many visitor surveys undertaken on site (see Espiner, 1995), men (55%) were slightly over-represented in the results (compared with Census information and travel statistics) (see Figure 4). This may be attributable to what has been described as the male leader bias (Devlin et al., 1995). However, attempts were made to reduce this effect. Other visitor studies at national parks and outdoor recreation areas (see Espiner, 1995; Devlin et al., 1995) have found a male: female ratio similarly close to 60:40. The effect is more pronounced at Fox Glacier (58.2% male and 41.8% female) than at Franz Josef (52.8% men and 47.2 women).

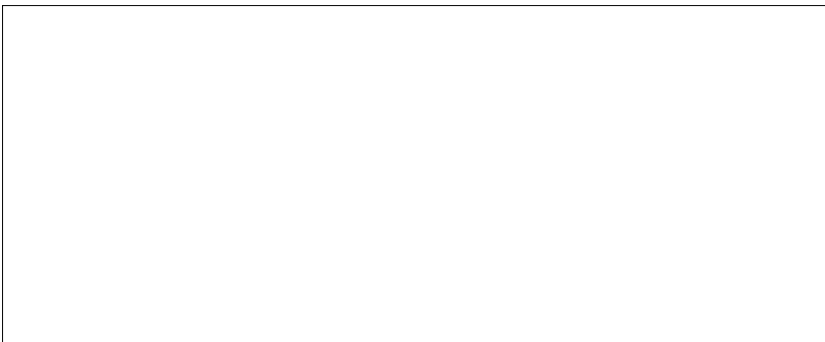
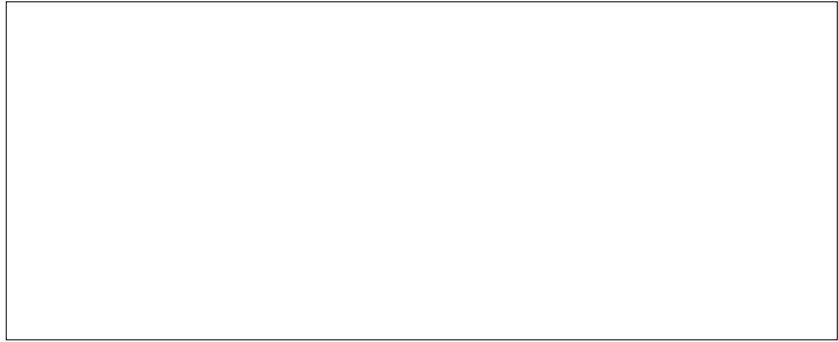


Figure 5. Visiting group (n=374).

### 5.1.4 Visitor group

Consistent with other recreation and tourism/leisure studies, the majority of visitors to the Glaciers were accompanied by others. Most commonly, respondents were visiting with a partner (42.0%), but family (17.9%) and friends (18.4%) were also frequently mentioned. Fewer than 10% of respondents were visiting the Glaciers alone, and only one visitor in twenty (5.3%) was visiting as part of an organised tour group (see Figure 5). Visitor group variations between the two sites were only small.

Figure 6. Frequency of visits to natural areas (n=372).



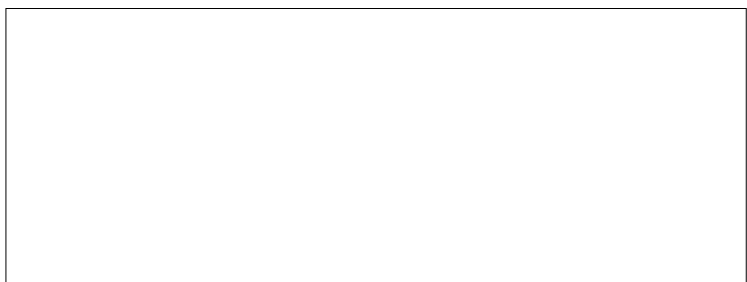
### 5.1.5 Level of experience

In order to get an understanding of visitors' familiarity with relatively natural environments, respondents were asked to approximate the frequency with which they visited *largely unmodified natural areas* when resident in their home countries. This question produced an interesting result (see Figure 6), in that while 36.5% of respondents reported visits to such areas two or fewer times per year, as many as 31.2% claimed to visit *more than ten times per year*, thus placing themselves in the most experienced visitor bracket. Taken at face value, this result implies that an important proportion of visitors to both glaciers were quite familiar with natural and unmodified environments. It could be inferred that these visitors had a reasonable awareness of hazards and were prepared to accept greater responsibility for their own safety in such areas. However, this result should be interpreted cautiously. It is possible that the nature of the question was misunderstood by some respondents, particularly the interpretation of what constitutes *largely unmodified*. The researcher's own observations of visitors and discussions with them suggested that people were far less familiar with largely unmodified environments than is indicated in the result above.

### 5.1.6 Time spent at the sites

Visitors were asked to approximate the time spent on the glacier access tracks. Overall, more than three quarters (76.1%) of the sample spent between one and two hours at the site. The most commonly reported visit time was 1.5 hours. When the glacier sites are compared (Figure 7), it is clear that visitors spent longer at Franz Josef (mode = 90 minutes) than at Fox (mode = 60 minutes). Over one quarter (26.9%) of visitors to Franz Josef stayed in the valley for two hours, compared with 16.4% at Fox.

Figure 7. Approximate length of visit.



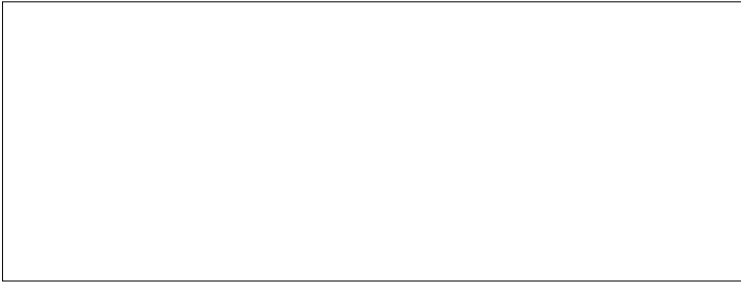
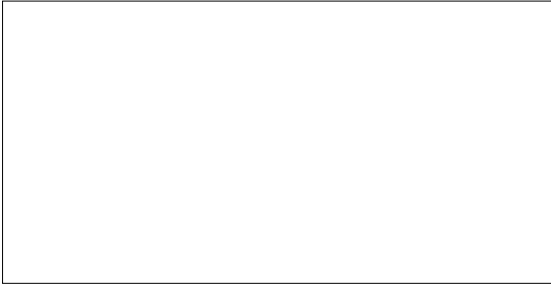


Figure 8. Visits to one or both glaciers.

**5.1.7 Visits to one or both glaciers and the information centre**

Most (71.8%) respondents visited both Glacier attractions. The remaining 28.2% stated that they would only visit one glacier. When the sites are compared (Figure 8), it is clear that a higher proportion of respondents at Fox Glacier intended to also visit Franz Josef (79.4%)<sup>1</sup>, than was the case for those visitors to Franz Josef who intended to visit Fox Glacier (65%). Conversely, only 20.6% of those visiting Fox Glacier claimed that Fox would be the only glacier they visit, compared to Franz Josef visitors, of whom 35% claimed that Franz would be the only glacier they visit. This may be explained by the directional flow of tourist traffic, or the fact that Franz Josef is the more well-known of the two sites, and as such has a higher profile in the minds of visitors to region, and the tour operators who influence which attractions are visited. That most visitors intended to visit *both* glaciers is contrary to the claim made by TRC (1995: 5) that the ‘...visitor to South Westland is principally interested in visiting one glacier...’.

Figure 9. DOC Information Centre visited prior to arrival at glacier.



Visitors were also asked if they had visited the Department of Conservation Information Centre *before* their trip to the glacier access track. In the combined sample, the majority of respondents (63.7%) had *not* visited the Centre prior to arriving at the glacier (see Figure 9). While the proportions differ slightly between the two sites, the overall trend remains clear. This finding has important implications for the situation of information about the area, and in particular the dissemination of information relating to hazards at the two sites.

**5.1.8 Discussion of visitor characteristics**

Visitors to the Glaciers of Westland National Park are broadly typical of Short Stop Travellers (SST) in other national parks and natural attractions in New Zealand. For instance, the results show that visitor age distribution was bimodal, reflecting the life stages of the majority of long-haul travellers, and a broad cross-section of visitor nationality was evident. Other New Zealand studies have also revealed high proportions of overseas visitors, although few as high as 80% (see Espiner, 1995; NZTB, 1993). Compared with visitors to national parks in general, however, it is likely that Glacier visitors are slightly atypical. The most obvious difference is the greater proportion of domestic visitors recorded in most studies of national park visitation. These visitors stay for longer periods of time overall, and have higher levels of experience in unmodified environments. Furthermore, male and female visitor representations are more disparate than reported in the current study, although visitor group ratios appear similar.

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<sup>1</sup> This is despite the fact that at the time of sampling at Fox, the access track to the Franz Josef glacier was closed to visitors.

The Glacier visitor characteristics reported here, present management with a number of challenges and concerns, some of which are unique to the region. For instance, while short walks are extremely popular SST attractions throughout New Zealand, many access tracks are not of the duration found at Fox and Franz Josef. Site visits here average about 90 minutes—sufficient time for visitors to be exposed to a range of natural hazards. Furthermore, with the majority of visitors to the Glaciers originating from overseas, it is clear that the management focus cannot afford to be on New Zealanders alone. With significant proportions of visitors likely to be from countries where English is not the first language, consideration will need to be given to the most appropriate strategies for conveying hazard warnings. In this regard it is salient to note that visitors generally did not visit the Department of Conservation information centres prior to their arrival at the glacier access tracks. Attempts to increase the hazard awareness of visitors should be cognisant of this fact. In addition, the results show that most people intend to visit *both* glaciers while in South Westland. This finding stresses the value of continuous and consistent hazard management strategies between the two sites. Management at one site has the potential to affect awareness and behaviour at the other site.

The next section of the results examines visitor awareness of hazards, and the effects of hazard signs on visitors' perceptions and behaviours.

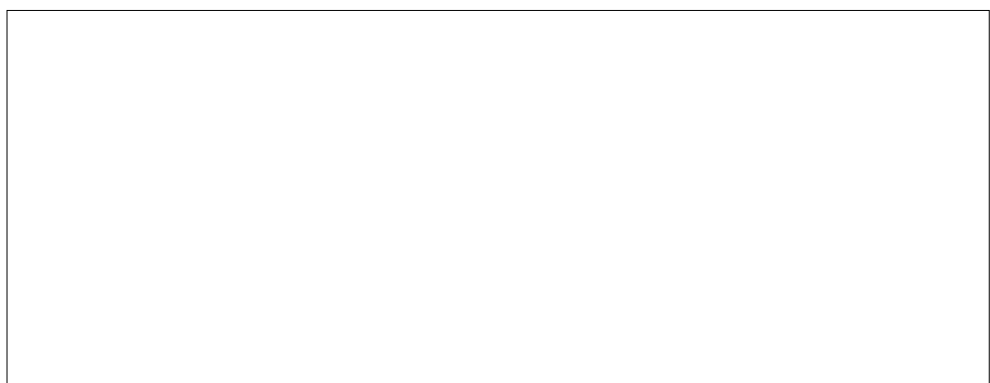
## 5.2 HAZARD AWARENESS

Visitors' awareness of hazards in the Fox and Franz Josef Valleys was determined in several ways. These included the development of a hazard awareness scale, recording the specific hazards identified by respondents, and calculating the total number of hazards identified. This section of the results reviews the central findings of this component of the study, and is followed by an analysis of the awareness and effects of introduced hazard signs.

### 5.2.1 Hazard identification

Visitors were asked to recall any hazards noticed during their visit to the glacier. Overall, one in five (19.3%) respondents claimed that there were no hazards at the sites. Some hazards are more easily identified than others. In Figure 10, rock fall (58%), tripping or slipping on loose stones (33.2%), icefall (31.6%), and falling in the river (26.5%) were the most frequently reported<sup>2</sup> among total visitors.

Figure 10. Hazards reported by visitors to glaciers.



<sup>2</sup> Visitors were not prompted with any information about hazards (or possible hazards) at the sites. Responses reflect the range of visitor beliefs and understandings.

When the sites are examined independently (also Fig. 10), there are some clear differences between them. For instance, visitors to Fox Glacier appeared to be more aware of rock fall (67.8%) and falling in the river (24.9%), than their Franz Josef counterparts of whom 49.2% and 8.6% identified the respective hazards. Of the other hazards (6.4%) reported by visitors the most common included: other tourists; strong winds; bees; and eight visitors who, believing that the track marker posts were, in fact, *hazard* markers, went to great lengths to avoid them!

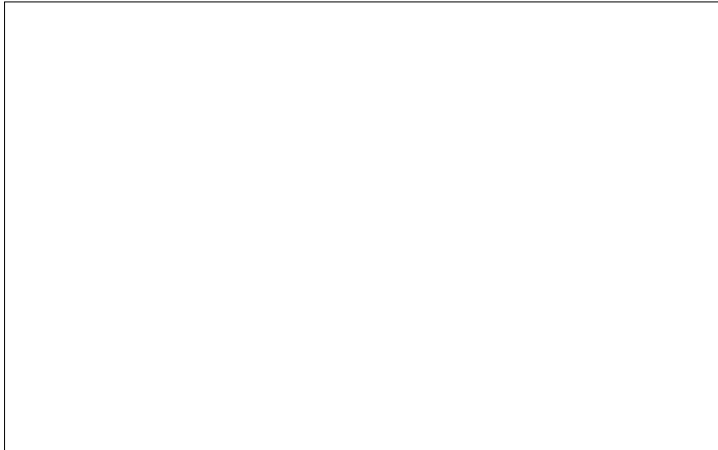


Figure 11. Mean hazard scores.

### 5.2.2 Hazard awareness scores

Following a reliability analysis, a final hazard awareness scale comprised nine items. On this scale, the minimum score possible was nine, and the maximum score possible was 63. A high score represents a high level of hazard awareness.

Figure 11 represents a summary of the key comparative findings relating to hazard awareness scores. Those with higher hazard awareness include: visitors to Fox Glacier; visitors from New Zealand; women; and visitors aged under 40 years. Statistically significant differences were found for age ( $t = 2.48$ ,  $df = 348$ , 2-tailed  $p < 0.01$ ), and for visitor origin ( $t = 3.03$ ,  $df = 119.5$ , 2-tailed  $p < 0.01$ ).

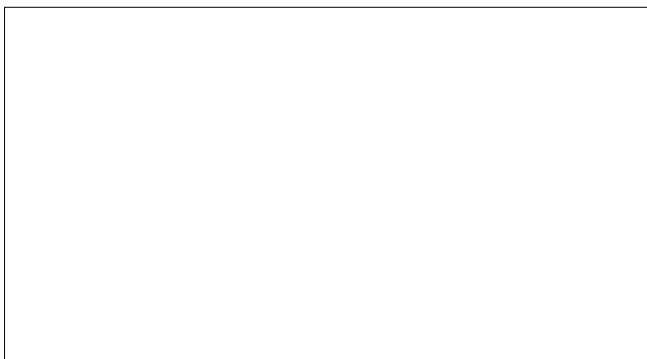


Figure 12. Mean hazard score by region.

Further analysis (one-way ANOVA) of visitor origin also showed statistically significant differences ( $F_{5,22} = 7.51$ ,  $p = 0.000$ ). For instance, visitors from the UK and Ireland had a higher hazard awareness (43.6) than European (32.7) or Asian (35.1) visitors. Figure 12 illustrates the mean hazard awareness scores for visitors from Australasia, Europe, Asia, the USA and Canada, the UK and Ireland, and Other. A *post-hoc* comparison (Scheffe, 1953) reveals that, in terms of

hazard awareness, Europeans differ significantly from visitors from Australasia, the USA and Canada, and the UK and Ireland.

### 5.2.3 Total hazards identified

A final measure of hazard awareness used was the total number of hazards identified by respondents (Figure 13). While one in five (19.3%) visitors could not identify a single hazard, slightly over a quarter (27%) identified three or more hazards. The results at the two sites differ dramatically when examined. For instance, at Fox, 14.1%

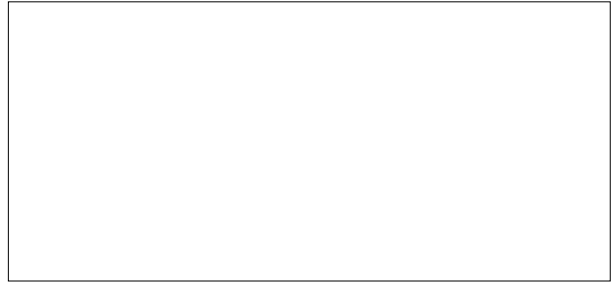
Figure 13. Total number of hazards reported.



of visitors were unable to identify any hazards in the valley. At Franz Josef, nearly one in four (23.9%) reported zero hazards. Further, 38.5% of visitors to Fox identified three or more hazards, while only 16.8% of those at Franz reported this number.



Figure 14. Comparison of total reported hazards.



As illustrated in Figure 14, the mean number of hazards reported for the sample is 1.75. There are, however, statistically significant differences between sites ( $t=4.78$ ,  $df=372$ , 2-tailed  $p<0.001$ ), and origin ( $t=3.7$ ,  $df=372$ , 2-tailed  $p<0.001$ ). For instance, visitors to Fox Glacier had a higher mean number of reported hazards (2.1) than their Franz Josef counterparts (1.4). Visitors from New Zealand also identified a greater number of hazards than those visitors from overseas, with means of 2.24 and 1.62 respectively. Interestingly, those visitors who had visited the Department of Conservation information centre prior to their arrival at the glacier also reported a higher number of hazards than those who had not visited the information centre. This result was also found to be statistically significant ( $t=2.97$ ,  $df=247.5$ , 2-tailed  $p<0.01$ ).

### 5.3 AWARENESS AND EFFECT OF HAZARD SIGNS

One aspect of this study endeavoured to ascertain the effectiveness of hazard warning signs in alerting visitors to the presence of danger. This section of the results documents the findings pertaining to this. The limitations section in this report also provides some important notes about this part of the study design.

In addition to reporting actual hazards identified, visitors were asked if they were aware of any hazard signs on the access track. The vast majority (91.4%) reported that they *were* aware of hazard signage at the site. The signs reported were recorded and are presented here (Figure 15). It is interesting to note that, in general, greater proportions of visitors reported seeing the signs than identified the hazards themselves. The awareness of hazard signs followed a similar pattern to the awareness of hazards (Fig. 10), with rock fall signs (64.1%) and icefall (39.9%) most commonly reported. Signs or structures restricting access (38.3%) and the 'no stopping' sign (13.9%) were also noted by visitors, especially those visiting Fox Glacier. Despite this, the fact still remains that, with the exception of rock fall, more

Figure 15. Reported hazard signs.



Figure 16. Comparison of hazard sign awareness.



than 6 in 10 visitors were unaware of important hazard messages, such as those warning of icefall, restricted access, and falling in the river.

In order to gain some impression of the effectiveness of the hazard signage, it is important to compare visitor responses both at times when the introduced signs were present and when they were absent. Figure 16 reviews the effectiveness of five signs used at both glacier sites. In all cases, the differences in visitor awareness of the signs are statistically significant<sup>3</sup>. For instance, signage relating to rock fall was reported by 33.9% of visitors when only the existing signage was present. With the introduced signage also in place, the proportion of visitors reporting rock fall increased to 66.1%. Although less dramatic, the effect is similar for the icefall hazard warning. The other three hazard signs examined all returned results as expected. For instance, the strong winds sign was not reported prior to its introduction simply because there is no existing sign (or anything similar to it). What these signs do show is that at least some visitors were aware of the signage on site; they were not simply using their own intuition or experience to determine what hazards were present. Figure 17 shows existing and introduced warning signs<sup>4</sup>.

#### 5.4 PERCEPTIONS OF SAFETY

One of the aims of this study was to determine the extent to which visitors to the Glaciers felt safe in their surroundings. The focus of interest is primarily any differences between visitor groups; these will be highlighted here.

Visitors' perceptions of safety were tested using a semantic differential scale, the items of which contributed to an overall safety score. The maximum score on the safety scale was 56, and the minimum was 7. On the scale, a high score represents a high perception of safety.

Overall, visitors appeared to have a moderately high perception of safety at both glacier sites, with the mean safety score of 44.0. This pattern appeared to be consistent across virtually all visitor groups, with only small variations across site, gender, and origin. The only statistically significant difference appeared when visitors were compared on the basis of age ( $t= 4.26$ ,  $df=349.2$ , 2-tailed  $p= 0.000$ ). Those aged 40 years and over perceived themselves to be considerably safer at the glacier (mean = 46.6) than those under the age of 40 years (mean = 41.7). This is a surprising finding considering that younger people are often portrayed as fearless and carefree. This is, however, consistent with the earlier finding that this same younger age group

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<sup>3</sup> Bees ( $c^2= 89.7$ ,  $df=1$ ,  $p<.001$ ); Rockfall ( $c^2= 4.32$ ,  $df=1$ ,  $p<.05$ ); Icefall ( $c^2= 7.67$ ,  $df=1$ ,  $p<.01$ ); Fall in river ( $c^2=55.8$ ,  $df=1$ ,  $p<.001$ ); Strong winds ( $c^2=32.01$ ,  $df=1$ ,  $p<.001$ );

<sup>4</sup> Introduced signs were black figures on neon yellow background. The triangular signs were secured to DOC green posts. When erected the signs were 1500 mm in height.

A. Existing DOC sign alerting visitors to rockfall.

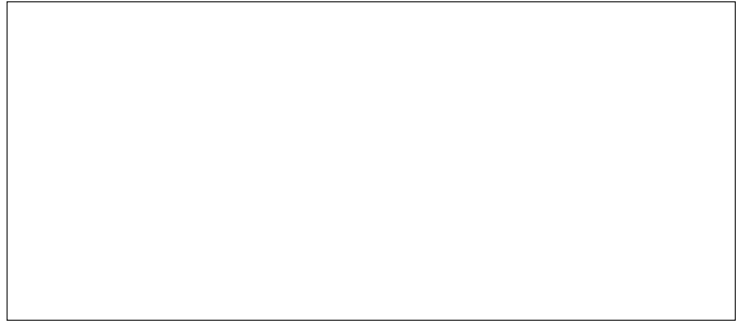
B. Existing DOC sign alerting visitors to instability.

C. Introduced sign alerting visitors to rockfall. Height 1500 mm.

D. Introduced sign alerting visitors to strong winds. Height 1500 mm.

Figure 17. Comparison of existing and introduced hazard warning signs.

Figure 18. Safety ratings for tourist destinations by origin.



had a greater awareness of hazards in the area. The result also concurs with the findings of Pinhey and Iverson, (1994) who found that older visitors to Guam reported feeling safer than did the younger visitors.

In another part of the interview, respondents were asked to score three places on a safety scale (see Figure 18). Visitors rated New Zealand, their own country (if other than NZ), and the glacier site. The results<sup>5</sup> of this question are presented in Figure 18. Consistent with other measures of visitor safety perception, the results show that respondents generally rated all three places high in terms of safety. The only statistical difference between groups was found in visitor origin ( $t=4.91$ ,  $df=93.16$ , 2-tailed  $p<.001$ ). Overseas visitors scored New Zealand as a tourist destination considerably higher in safety terms than did New Zealanders. Similarly, visitors from overseas rated their own countries as less safe than either New Zealand, or the specific glacier site. Finally, compared to New Zealanders, overseas visitors scored the glacier site as slightly safer.

## 5.5 ATTITUDE TO INDIVIDUAL RESPONSIBILITY

Visitors to the Glaciers were also assessed on the extent to which they held attitudes linked to feelings of individual responsibility for safety. Having some understanding of this is important in terms of understanding the expectations of visitors, and will influence the style and extent of signage and other hazard communication tools employed.

Respondents' attitudes were assessed using a semantic differential scale. The individual responsibility for safety scale (IRS) used eleven items. The maximum score on this scale was 77, and the minimum was 11. A high score on the scale represents a strong feeling of individual responsibility for safety. The mean score on the IRS scale was 50.7 representing a moderately high feeling of individual responsibility.

When visitor groups were compared on the basis of IRS, there was generally a high level of consistency between them. The exception to this general trend was visitor origin. As predicted, visitors from different parts of the world had varying attitudes to the extent of responsibility they would accept for their own safety. Figure 19 illustrates the mean scores by geographical region, between which there are statistically significant differences ( $F_{5,327} = 4.8$ ,  $p=0.0003$ ). A Scheffe (1953) Test revealed that the greatest difference was between visitors from Asia, and those from

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<sup>5</sup> The results of this scale have been recoded so that a high score represents a high level of perceived safety.

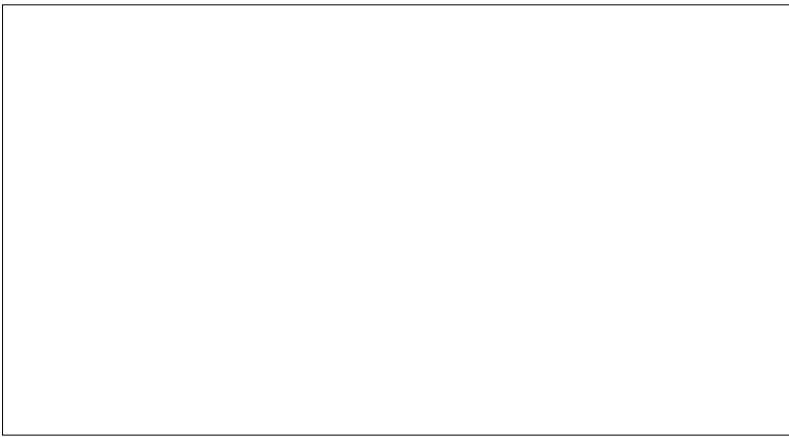


Figure 19. Mean scores for individual responsibility by region.

Europe, USA and Canada. It is interesting to note that, despite the reported 'liability crisis' in the USA (Hanna, 1991), visitors from this region scored highest on the IRS scale (mean = 54.1). Insignificant differences were identified for age, gender, and site. A higher degree of difference was also found when comparing the scores of those visitors who had visited the Department of Conservation Information Centre prior to their glacier visit (49.5) with those who had not (51.5). Somewhat

surprisingly, visitors who had not been to the Information Centre had higher scores on the IRS scale ( $t=1.7$ ,  $df=327$ , one-tailed  $p<0.05$ ).

## 5.6 VISITOR BEHAVIOUR

This final section of the results examines the behavioural dimension of the Glacier Visitor Survey. This component was used in addition to the questionnaire because there are potential differences between what respondents say, and what they do. While it is not possible to validate one method against another (and determine precisely any differences), it is useful to present the additional data to complement the other findings. The behavioural data have been divided into that which is *reported* (i.e. obtained via the questionnaire), and *observed* (i.e. obtained via a series of scheduled observations made by the researcher).

### 5.6.1 Reported behaviour

Visitors were asked about their actions while at the glacier site. For instance, one question sought to determine what proportion of visitors had walked as far as the track terminus. Of the total sample, 69.5% reported walking at least to the present closure immediately before the terminal face<sup>6</sup>. Of these visitors, nearly one in four (23.8%)<sup>7</sup> claimed to get *close enough to touch* the ice face. To touch the ice at the time of the study visitors needed to go beyond the roped closure.

It is clear that touching or getting close to the glacier is very important to many visitors. The vast majority (69.6%) of all visitors expressed a desire to *get closer* (than they had) to the glacier. This was especially true for visitors to Fox Glacier, where nearly three in every four visitors wanted to get closer.

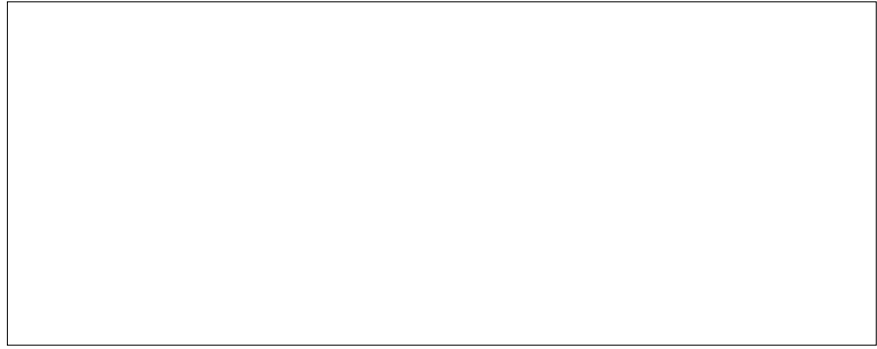
It is possible that the above figures under-represented the real extent of transgressions. It is likely, for example, that respondents avoided admitting to something that they perceived as rule breaking or socially undesirable. It is for this reason that an observation component was included the study design.

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<sup>6</sup> It needs to be emphasised that this figure refers to visitors who ventured beyond the carparks and immediate surrounds. No visitors were interviewed in the carpark or its close proximity. Refer to the section on Methods for a description of the interviewing locations.

<sup>7</sup> This represents 16.6% of the total visitor sample.

Figure 20. Compliance of visitors at terminal face by signage condition.



### 5.6.2 Observed behaviour

Attempts were made to observe visitor behaviour at the terminal face on each day of the study. These observations were undertaken in a covert fashion, and notes carefully made detailing the number of visitors arriving at the track terminus, and the number and actions of those who elected to proceed beyond the ropes and signs which were designed to restrict access. In order to approximate the effect of introduced hazard signs, this procedure was carried out in both existing and introduced signage conditions.

Figure 20 provides a comparative illustration of the visitor actions at the terminal faces of Fox and Franz Josef Glaciers. For the total sample, it appears that approximately 60% of the visitors who walked as far as the track terminus complied with the existing hazard signage. Conversely, four in every ten visitors chose to ignore the access restrictions, and ventured beyond the rope closure. The compliance rate was lowest at Fox Glacier (50.8%). Interestingly, compliance appeared to rise dramatically when the introduced signage was employed<sup>8</sup>. Total compliance increased from 59.1% to 78.9%, while at Fox Glacier the leap was from 50.8% to 81.8%.

These dramatic results suggest that the introduced hazard signs were influential on visitor behaviour at the terminal face. It is possible that the existing signage is of insufficient impact and/or ambiguous meaning, resulting in a high level of non-compliance. The introduced signs may convey a clearer message regarding appropriate visitor behaviours, providing an explanation for restricted access via the pictorial nature of the messages. Unfortunately, it is not possible to state categorically that the reduction in non-compliance was directly attributable to the effect of the introduced signage. It is conceivable that the reduction was caused by the cumulative effect of increased signage itself. The sensitive nature of hazard and safety management on public lands does not allow for extensive manipulation of signage, and therefore remains one of the significant limiting features of the study.

It is important to emphasise that the results presented in Figure 20 represent the average compliance rates, determined from six observation sessions covering a period of eight days (for each site). Predictably, there is considerable variation between observations, demonstrating the situational effects related to the weather, general conditions, and the presence of other visitors. For instance, during some observation periods, very few visitors were recorded as non-compliers. At other times, virtually all visitors who arrived at the track terminus continued beyond the rope closure. This phenomenon is described in the social psychology literature as *social facilitation*, and is a valuable concept in understanding visitor behaviour at the Glaciers.

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<sup>8</sup> A maximum of two introduced signs were used at any one time. Introduced signs at the terminal face included those warning of icefall, rockfall, and river hazard (near the ice cave).

In essence, social facilitation is a type of social modelling behaviour, and occurs when the behaviour of one (or more) person(s) facilitates a second person's doing the same thing (Baldwin and Baldwin, 1986). Popular examples of social facilitation include joining a crowd of on-lookers, and mass donations to publicised causes. People are drawn to things that they observe other people doing. This aspect of human nature has obvious implications for visitor behaviour at the Glaciers.

The effect of social facilitation, in some ways, plays down the role of hazard signage in the battle against modifying visitor behaviour, and shifts the emphasis to the effects of visitors on other visitors. Clearly, the high rate of non-compliance is a complex phenomenon, and is unlikely to be the result of a single variable such as insufficient visitor signage. Contributing factors appear to include: the importance to visitors of getting close to the glaciers; unrealistic expectations of proximity (linked to tourism promotion materials); ambiguous hazard warning messages (and some mixed messages); and the phenomenon of social facilitation. While the Department of Conservation may have limited control over several of these variables, some suggestions are put forward in recommendations section of this report.

## **5.7 SUMMARY OF VISITOR PERCEPTIONS AND BEHAVIOUR**

### **5.7.1 Hazard perceptions**

Visitors' perceptions of hazards can at best be described as modest, and among some visitors it is poor. In particular, visitors to Franz Josef, and overseas visitors to both sites, appeared to have the weakest hazard perceptions. With the exception of rock fall, fewer than one third of all visitors identified any other hazard at either site. Furthermore, while over ninety per cent reported an awareness of hazard signs, six visitors in every ten were unaware of any specific hazard sign, other than rock fall. Visitor awareness did, however, increase significantly when the introduced signs were erected. This latter finding suggests that either the introduced signs were less ambiguous than the existing Department of Conservation signs, and/or that the increased hazard awareness was a function of the cumulative effect of the two sign forms.

### **5.7.2 Safety perceptions**

Visitor perception of safety was reasonably high at both Glacier sites. Visitors did not perceive either glacier to be an especially dangerous place to visit, relative to New Zealand in general, or their home localities as tourist destinations or attractions. While it is gratifying for management that the sites were not seen as unsafe, the concern remains that feelings of safety and security among visitors can lead to over-confidence and inappropriate actions.

### **5.7.3 Individual responsibility for safety**

Managing natural attractions for visitors means pitching the level of manager intervention at an appropriate level. Part of determining this appropriateness is understanding the extent to which visitors are prepared to assume responsibility for their own experiences (including safety). At Fox and Franz Josef Glaciers, there appeared to be a moderately high level of individual responsibility for safety among visitors. The exception to this finding were certain overseas visitors, who clearly assumed lower

levels of responsibility for individual safety compared with New Zealand visitors. In general, visitors seem prepared to assume responsibility for their own safety within certain limits. Visitors expressed a reliance on managers to inform them of potential dangers, and to provide modest facilities to allow their access to the attractions. Beyond this, there was strong reaction against over-management of the areas. The prevailing attitude was: 'if you ignore the warnings and advice of managers, then you have only yourself to blame'. Given that individual responsibility for safety was lowest among particular visitor groups, a targeted promotion about responsibility may be beneficial.

#### **5.7.4 Visitor behaviour**

The majority of those interviewed reported walking at least as far as the existing closures. Of these, nearly one quarter reported getting close enough to touch the ice. Proximity to the ice was very important to visitors. In terms of visitor compliance with the hazard signage, observations suggested that six in every ten visitors complied with the current recommendations. When the introduced signs were employed, the rate of compliance increased to eight in every ten visitors, although there were differences between sites. This finding suggests that the current Department of Conservation signage is inadequate in expressing the message to visitors. It is important to acknowledge, however, that hazard signs are not the sole influence on rates of non-compliant visitor behaviour. On the contrary, other factors are likely to be involved, including the effects of social facilitation and the goals and expectations of visitors.

## **6. Recommendations**

This section includes site-specific and generic recommendations for the management of visitors to highly accessible natural attractions on lands managed by the Department of Conservation.

### **6.1 THE FOX AND FRANZ JOSEF GLACIERS**

On the evidence of the survey results, observations and personal discussion with visitors, the following recommendations are made for visitor management in the Glacier region.

#### **6.1.1 Site management**

- Increase the presence of Department of Conservation personnel in both glacial valleys, especially at the terminal faces. There is good evidence both from this study and others conducted overseas to suggest that behaviour can be modified by the mere presence of park staff. For this to be effective, additional information about the hazards at the glacier face would need to be available to visitors. If it is not feasible to station staff at all sites where non-compliance is an issue, roving employees, frequently visible to the visiting public may be sufficient to prompt more compliant behavior. Volunteers may be considered for this role.



- Increase the on-site availability of graphic information relating to the dynamic nature of the environment. Visitors seem to have a poor understanding of the rate of change in the valleys, and assume, for instance, that the glacier face is a permanent and stable geological form. One visitor's remark helps illustrate this view: 'why [would the ice collapse] today, when it's been like that for hundreds of years?'. The location of such information is crucial, and is naturally governed by the constraints of the environment. However, consideration should be given to the possibility of locating information about the glacier at points closer to the terminal faces. It is apparent that many people do not stop to read the information panels in the carparks, presumably because they are very focused on getting to the glacier. Onsite information is further justified by the survey results which indicate that as few as one visitor in three visits the information centre prior to arriving at the glacier access track.
- Reconsider the possibility of allowing controlled access to the terminal face of the glaciers. As discussed, getting close to (and preferably touching) the ice face appears to be very important to many visitors. Can visitors be directed (via rope closures) to the least hazardous parts of the face? Clearly this would involve increased monitoring of conditions, and additional staff resources.
- Guided groups should not be exempt from closed areas. Owing in part to the effects of social facilitation (see p. 32), guided groups clearly influence the behaviour of other non-guided visitors to the Glaciers. Discussions with visitors at the terminal face revealed a confusion best illustrated by the remarks such as: 'if it's safe for those guys to stand around under the ice, then surely it's okay for me too?'. The guides' use of the roped-off areas to store gear and brief clients makes a mockery of the Department of Conservation's closure and is a management issue in need of review.

### **6.1.2 The use of hazard warning signs**

- Increase impact and reduce ambiguity of hazard signs at both glacier sites. The current hazard signs are unspecific and appeal largely to the English literate visitor. Furthermore, the style of the signs is such that too often their content appears to be information rather than warning of danger. In order to appeal to the wide cross section of visitors to Fox and Franz Josef Glacier, a differentiation between hazard signage and general information signage is needed. Moreover, people are far more likely to comply with signage if they understand the consequences of non-compliance. To this extent, the pictorial sign has a major advantage over the text only signs. Colour and shape of hazard sign is another important feature. In this study, a bright yellow triangular shape was used. This was intended to relate to people's existing awareness of international road signs—helping them differentiate between hazard signs and other information signs.

### **6.1.3 Visitors' centre**

- Reconsider the use of 'classic' images of people standing in the ice cave as part of the Visitor Centre display. These photographs send contradictory messages to visitors about appropriate behaviour, and what to expect at the sites. Getting close to the ice cave and terminal face is clearly important to visitors. This value has many contributing factors, including images in tourist brochures, other people's photographs and anecdotes, and the information obtained in visitor centres. The

Department of Conservation can realistically control the last of these factors, and should consider doing all it can to make visitor expectations accurate. Many visitors expressed surprise and disappointment that access to the ice face was restricted—something they had been unaware of prior to reaching that point. Photographic displays of the rope closures need to be evident in the Visitors' Centre.

- The Department of Conservation visitor centres need to be more clearly identified. For instance, those visitors approaching from the South will arrive at both Fox and Franz Josef Glaciers before encountering their respective visitors' centres. Road signs could be erected at the turn-off to each glacier access road stating the location of and distance to the visitors' centre (e.g. Information about this glacier, conditions, and access—500 m).

#### **6.1.4 Community relations**

- Increase alternative sources of information about (and awareness of) rough terrain and access conditions. Visitors noted the lack of information about appropriate footwear and clothing prior to their arrival at the sites. Alternative visitor education strategies, such as supplying accommodation providers with a clear and simple, current information sheet about the nature of each access track could contribute to visitors being more prepared and help prevent minor injuries and general dissatisfaction. While perhaps not currently viewed as part of the Department of Conservation's role, this should be interpreted as simply another means of communicating information. In light of the fact that many visitors do not visit the information centre before going to the glacier, alternative methods of information dissemination need to be considered.
- Increased awareness and dissemination of the Department of Conservation philosophy on safety and its legal position is required. This information should be more widely appreciated by staff and visitors alike. The incorporation of the Department of Conservation's safety philosophy and its understanding that visitors need to accept some level of responsibility for their own safety into information sheets and signage may help alert visitors to hazards in the region. The Department of Conservation cannot possibly sustain what is sometimes seen as a paternalistic position on visitor safety.

### **6.2 VISITOR MANAGEMENT IN GENERAL**

Both the results from this study and those reviewed in other works, allow some more general recommendations to be made regarding the communication of information to visitors, and the indirect management styles which may help modify their behaviour.

#### **6.2.4 Site management**

- Where visitor behaviour is felt to be inappropriate (e.g. vandalism, track-widening, visitor safety), consider the employment of seasonal or volunteer staff to increase the presence of DOC personnel at the site. The simple presence of a

staff member has been shown to reduce undesirable behaviour in national parks in other parts of the world.

- Whenever possible, locate important visitor information (e.g. safety) as close to the visitor attraction as practicable. SST in particular may have little desire to spend time looking for information in visitor centres, preferring instead to get to the focus of their visit as quickly as possible. It is more likely that visitor centre use will occur in time remaining after the attraction has been visited. Prioritise visitor information on this basis.

### **6.2.3 The use of hazard warning signs**

- Hazard warning signs will be most effective when they are differentiated from other information signs (e.g. track times and interpretation).
- Messages will be clearer to the widest possible audience if good illustrations are used. Communication will be more effective than text-based signs, which appeal largely to the English-literate visitor. Illustrations should include a clear consequence, should the visitor choose to ignore the warning.
- Ideally, sign style and colour will differ from those used in other information signs. The author recommends the use of triangular or diamond shape signs, using black (or dark green) figures on a bright yellow background.
- Source credibility (the credibility of the person or agency giving the message) will be enhanced through well-maintained signs and closures, and on-site consistency.
- Avoid using signs where they are not needed. Too many warning signs (or closures) may desensitise visitors, resulting in greater ignorance of warnings or non-compliance with requests.

### **6.2.4 Visitors' centres**

- In the interests of promoting appropriate visitor behaviour, ensure that displays are consistent with other messages you are attempting to communicate. This will help reduce undesirable behaviours and increase the accuracy of visitor expectations—ultimately leading to safer, more environmentally appropriate and satisfying visitor experiences.

### **6.2.5 Community relations**

- Increased awareness and dissemination of the Department of Conservation's philosophy on safety and its legal position is required. This information should be more widely appreciated by staff and visitors alike. The incorporation of the Department of Conservation's safety philosophy and its understanding that visitors need to accept some level of responsibility for their own safety into information sheets and signage may help alert visitors to the saliency of hazards in the region. The Department of Conservation cannot possibly sustain what is sometimes seen as a paternalistic position on visitor safety.

## 7. Conclusions

Despite considerable efforts by the Department of Conservation to provide appropriate hazard signage, and two informative, up-to-date visitors' centres, people visiting Fox and Franz Josef Glaciers appear to have only a rudimentary appreciation of the hazards to which they may be exposed in these valleys. Moreover, significant proportions of visitors ignore access restrictions, placing themselves and others at risk.

Results from this study suggest that this modest level of hazard awareness, and the associated risk-taking behaviour, is a consequence of a variety of factors. These include: ambiguous hazard signage; unrealistic visitor goals and expectations; moderately high visitor perceptions of safety; a low level of visitor centre use *prior* to glacier access; and the phenomenon of social facilitation. Perception of hazards, and behaviour compliant with management restrictions, was observed to increase in the presence of pictorial (introduced) signs. While not necessarily comprehensive evidence, this finding does imply that management can play a further role in advancing visitor awareness and perception of hazards in the Glacier valleys.

Visitor management in South Westland is caught in an unenviable position. Compelled by both statutory requirement, and the social and economic dependency of many local residents, the Glaciers must remain as accessible to visitors as possible. Access, however, must also involve the minimum risk to visitors, in an area in which natural hazards are inherent. The challenge of creating an appropriate balance between the legal, social, economic and visitor safety considerations should be assisted by the information contained in this report.

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