

A Review of the New Zealand Avalanche Hazard Advisory and Information Service



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Cover photo: Wet snow slab avalanche on the Waikato Glacier of Mt. Raupehu: Ski tracks on the left and centre.

Executive Summary

New Zealand has a very high avalanche hazard and an increasing avalanche safety risk in the back country as a result of growing numbers of users.

All first-world countries with an avalanche hazard provide public advice about current avalanche conditions.

New Zealand provided intermittent advice about avalanche conditions beginning in the 1980s. Since the early 2000s, public advice about avalanche conditions has been systematised. It is now provided on a daily basis for areas outside of managed ski fields, covers twelve alpine regions, and operates between the end of May and October.

The Avalanche Advisory costs approximately \$150,000 per annum to operate, using part time contractors located in the twelve alpine regions, two part time coordinators, and in-kind contributions of data and observations from snow safety professionals from most New Zealand commercial ski operations.

Advice on avalanche conditions is provided on a website and via signage located at over 90 locations at access points to avalanche hazard areas in the twelve alpine regions. Use of the website appears to be significant and since its inception four years ago, use is growing.

Avalanche incidents and fatalities have declined in New Zealand over the past ten years. While evidence about cause and effect is not certain, it seems plausible to attribute this decline, at least in part, to avalanche skills education and greater accuracy and availability of expert public advice about avalanche conditions. Both these initiatives are coordinated by the Mountain Safety Council.

The Mountain Safety Council (MSC) is an incorporated society of government and non-government national organisations with roles related to safety in the outdoors. The MSC is funded through grants and sponsorship. The current level of grant funding for the public Avalanche Advisory will not continue beyond 2014.

This report finds that the Avalanche Advisory operates efficiently for the level of service it provides and is valued by stakeholders and users. It meets international good practice. The report canvasses a suite of options for the future, from ceasing the service if no future funding is found, to expanding the service.

It would be extremely inadvisable to cease the service both because of safety risks and reputation, given New Zealand's high avalanche hazard and growing domestic and international users.

It is recommended that the Avalanche Advisory is maintained at its present level of reporting.

It is recommended that funding is put on a more secure long-term footing by a club funding formula involving agreed contributions from the main government agencies with a stake in public information on avalanche conditions and safety.

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A Review of the New Zealand Avalanche Hazard Advisory and Information Service

Purpose of this review and structure of the report

The purpose of this review is to provide advice to the New Zealand Search and Rescue Council on options for future organisation and funding of the New Zealand Avalanche Advisory and Information Service.

This report addresses a set of questions contained in terms of reference attached at the end of the report.

What is the Avalanche Advisory?

The New Zealand Avalanche Hazard Advisory and Information Service (the Avalanche Advisory) provides coordinated daily assessments of avalanche hazard and provides avalanche risk and danger ratings for twelve alpine regions (excluding ski fields, where responsibility rests with the ski area management). The Avalanche Advisory operates between the end of May and October.

Daily avalanche assessments are provided online via www.avalanche.net.nz (see figures 1, 2 & 3). Further information is communicated through regular e-mails, social media outlets, and media advisories. In addition, approximately 90 backcountry Avalanche Danger assessment signs (similar to rural fire risk signs) are maintained and updated at key mountain lands access points, such as ski fields and Department of Conservation (DoC) visitor centres.

Figure 1: Avalanche Advisory warning sign

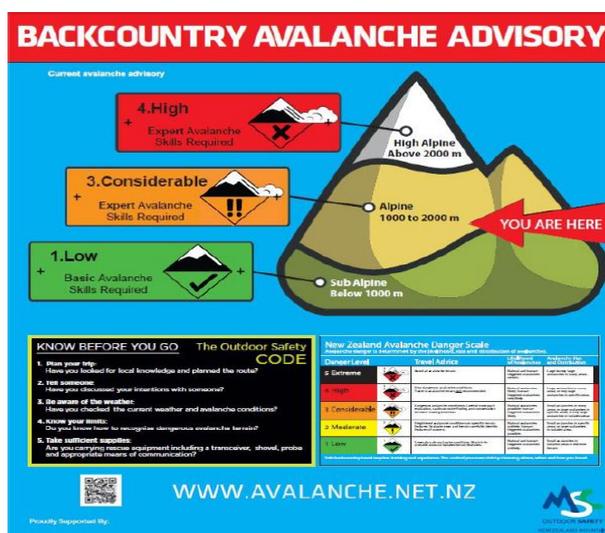


Figure 2: Front page of the Avalanche Advisory



Figure 3: The New Zealand avalanche danger scale

Avalanche Danger Scale				
New Zealand Avalanche Danger Scale				
Avalanche danger is determined by the likelihood, size and distribution of avalanches.				
Danger Level		Travel Advice	Likelihood of Avalanches	Avalanche Size and Distribution
5 Extreme		Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Large to very large avalanches in many areas.
4 High		Very dangerous avalanche conditions. Travel in avalanche terrain not recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific areas.
3 Considerable		Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas.
2 Moderate		Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 Low		Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.
Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.				
No Rating		Insufficient information to establish avalanche danger rating.	OUTDOOR SAFETY NEW ZEALAND MOUNTAIN SAFETY COUNCIL	For more information visit www.avalanche.net.nz

The Avalanche Advisory is coordinated by the Mountain Safety Council (MSC). Two staff are employed part time by the MSC to coordinate and run the Avalanche Advisory. Up to thirteen people or organisations with considerable avalanche management experience and who work in the snow industry, located in the twelve alpine regions reported on by the Advisory, are contracted part time to supply data, observations and analysis. Further data and observations are supplied largely from ski area snow safety and ski patrol staff. Data and observations are entered into a central web-based data repository known as **Info-ex**¹.

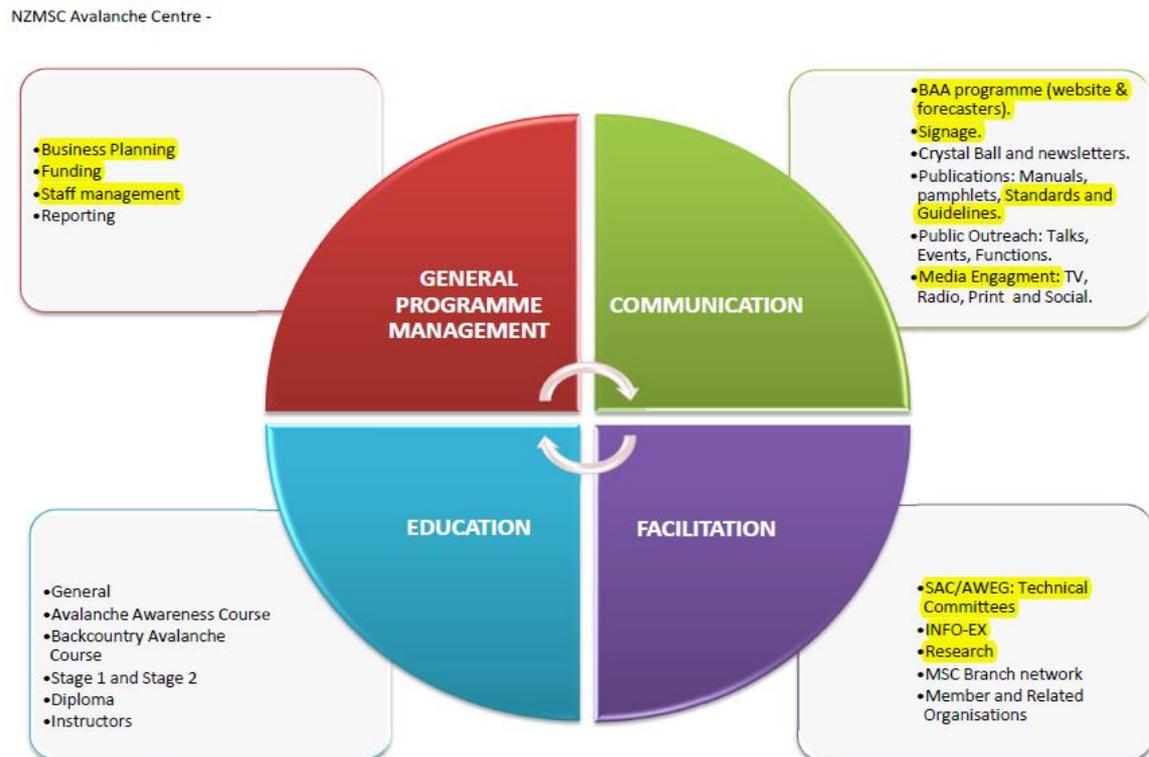
¹ See link <http://infox.avalanche.net.nz/infox/view-reports/daily-summary/>

The Avalanche Advisory is not a standalone system but works within, and relies on, a wider network involving:

- Coordination and standards,
- Research,
- Communications,
- Education.

The MSC provides overall coordination of this national network, described in Figure 4. Those parts of the New Zealand avalanche network that are essential for the operation of the Avalanche Advisory are highlighted in yellow.

Figure 4: Elements of the New Zealand avalanche safety system



In addition MSC's Snow and Avalanche Committee (SAC) has played, and continues to play, an important role in supporting the development of the Avalanche Advisory, as well as providing advice, guidance, stakeholder communication and research linkage for the overall New Zealand avalanche network.

Why have an avalanche advisory?

The purpose of an avalanche advisory is to provide information on avalanche hazard in order to avoid avalanche incidents and fatalities, assist avalanche management and control, and protect users of infrastructure. An avalanche advisory is analogous with a weather forecast.

An avalanche advisory is part of a wider programme of avalanche safety and management. There are two key parts to this programme in terms of public and backcountry user safety; skills development through education and training (see figure 4 and, for details, <http://www.avalanche.net.nz/>), and communication of hazard and risk (the public Avalanche Advisory).

Avalanche forecasting and warning systems exist throughout Europe and North America, in Japan, in India, and in South America (specifically Chile and Argentina). New Zealand was late to recognise the nature of its avalanche hazard and risk. Only since the 1970s has a system of avalanche management, research, prevention, forecasting, and rescue evolved, and until the establishment of the current version of the Avalanche Advisory in 2010, New Zealand's approach to public advice about avalanche conditions was unsophisticated compared to northern hemisphere regions.

New Zealand experiences a very large number of snow avalanches due to its mountainous terrain (especially in the South Island), heavy snow precipitation and fast moving cold moist weather systems. In international terms New Zealand's avalanche terrain and hazard is considerable. The impact of the avalanche hazard in terms of human lives and infrastructure (known as avalanche risk) is lower, at least in international terms. This is because comparatively few people live permanently in avalanche hazard regions and infrastructure there is light. This is changing however, and the risk is growing as backcountry use increases, particularly from the trend to ski and recreate in areas accessible from ski fields.

Current structure and operation of the Avalanche Advisory

The New Zealand Avalanche Advisory relies on a distributed and decentralised system of observers, data collection, analysis and reports.

The Avalanche Advisory provides daily public avalanche hazard assessments for twelve alpine regions, chosen on the basis of highest backcountry use (and hence risk). The alpine regions, and current contracted reporters, are:

Ruapehu: Ruapehu Alpine Lifts (RAL)

Taranaki: Individual from Stratford Mountain Club (the Mt. Taranaki ski field operator)

Nelson Lakes: Individual based in Nelson & at St. Arnaud

Arthurs Pass: Temple Basin Ski Field snow safety officer, & individual observer in Arthurs Pass Village

Craigieburn Range: Senior patroller/snow safety officer at Porters Heights Ski Field

Mt. Hutt: Snow safety officer Mt. Hutt Ski Field

McKenzie Basin (incorporating Two Thumbs region, Aoraki/Mt. Cook region & Ohau region): Alpine Guides Ltd

Wanaka: Snow safety officer at Treble Cone ski area

Queenstown: Individual working for Harris Mountain Heliski

Fiordland: Individual working for DoC Te Anau

The Avalanche Advisory is run by Andrew Hobman (MSC avalanche programme manager based in Christchurch) and Gordie Smith (MSC employee based in Wanaka, working full time 6 months, ½ time for 2 months and ¼ time 2 months. Work

involves reading, critiquing and supporting the network of observers, as well as supporting the Wanaka field observations).

Cost and funding of the Avalanche Advisory

The current **cost** of the Avalanche Advisory is reported as \$150,000 p.a., involving contractor payment, coordination by Gordie Smith, part of Andrew Hobman's salary, and website maintenance and development²

The past and current **funding** for the Avalanche Advisory is complex. The Avalanche Advisory "emerged" in 1999 from two decades of growing avalanche research, education and development of standards. The original core funding for an Avalanche Advisory came from an annual grant from the Lottery Grants Board (LGB) Outdoor Safety Committee. This has been a traditional source of funding for outdoor safety programmes. The LGB grant was supplemented by one-off funding from time to time from government agencies, occasional ski industry sponsorship, and some limited sponsorship and donations from firms and individuals. The MSC has actively sought and continues to receive some sponsorship, with varying success. Details of sponsorship and donations are available on the Avalanche Centre web page³.

By the mid-2000s the LGB funding had become uncertain and insufficient for what MSC and the snow industry deemed useful in safety terms. First, grants had to be applied for annually, causing uncertainty for staff and the operation of the service. Second, reportedly, the LGB were uncomfortable funding an on-going service, preferring instead programmatic applications for outdoor recreation safety. Third, the MSC wished, and had always planned, to improve public access to the Advisory with a web portal and better reporting coverage. In 2011, DoC provided funding for four years to support the continuation of the Advisory and make it a web-accessed service. In 2013 DoC said that further funding from DoC would cease.⁴ However, in 2013/14 DoC provided a one-off lump-sum of \$200,000 for four years, reportedly on an understanding that any additional funding to run the Advisory would come from other sources. The upshot of this is that there is insufficient funding to maintain the New Zealand Avalanche Hazard Advisory at its present level of service.

Other New Zealand avalanche advisories and the role of the snow sports industry

The MSC Avalanche Advisory is the only publicly available general avalanche forecasting and advisory service in New Zealand.

² A breakdown of cost has been provided in considerable detail by MSC in two funding applications to DoC, in 2011 and 2013. The figure of \$150,000 p.a. is based on these costings, assuming the Avalanche Advisory continues in its present form using part time contracted observers/forecasters. MSC estimated a figure of \$267,000 if full time forecasters were used.

³ See <http://www.avalanche.net.nz/donate/Check-out-who-is-donating.asp> and <http://infox.avalanche.net.nz/infox/data-entry/weather-obs/>

⁴ DoC advised MSC initially that due to resource limitations and the need to prioritise, it had decided to fund the Met Office for backcountry weather forecasts but cease funding \$150,000 per annum for backcountry avalanche advisories. Following a Budget decision to provide new funding to support DoC reorganisation, an additional allocation was made of \$200,000 over four years.

Each ski field is responsible for snow safety in designated areas within their ski field license areas (some licensed areas are larger than the terrain managed for skiing). Ski fields operate under voluntary ski field safety guidelines (the Ski Area Safety Management guidelines - SASM) produced in the 1980s by MSC, or else to higher standards developed themselves. Commercial guiding or instruction operations must have their own snow safety standards as a requirement under Health and Safety in Employment (Adventure Activities) Regulations 2011.

Downers Ltd run a form of avalanche advisory (and control and research) for the Milford Highway under contract to the Land Transport New Zealand. Their advisory consists, publicly, of media warnings as part of their highway management. The Downers programme is separate from the MSC national programme. It does not contribute to **Info-ex**.

Although ski fields have individual independent avalanche assessment for areas they manage, and could operate separately from the Avalanche Advisory, in practise the two work hand-in-glove. Most ski field snow safety officers and patrollers are very supportive of the Avalanche Advisory and actively contribute to **Info-ex**. New Zealand is also fortunate to have a comparatively large cadre of field staff expert in avalanche control and forecasting.

International comparisons

New Zealand's overall avalanche programme follows ICAR (International Commission for Avalanche rescue) recommendations of best practise for a national avalanche effort. ICAR recommends a combination of 1: Avalanche forecasting and advisories for the public, 2: Education, and, 3: Avalanche search and rescue capability.

For avalanche forecasting and public advisories, ICAR has identified the following characteristics as representing best practise.⁵

- There is a structured program providing avalanche forecasts and other warning services in avalanche prone areas of the country
- Avalanche forecasts are produced by either government agencies, or NGOs with government funding. Ski resorts can provide useful local information
- National and/or regional avalanche forecast centres are most common. Ski resorts can supplement national and/or regional programs
- Daily avalanche forecasts are most common. Frequent avalanche forecasts are preferable to bi-weekly or weekly forecasts
- In the countries surveyed most avalanche forecast regions are <5000 sq. kms
- Advisories use "push" (fax, email, radio, TV, newspapers, trailhead postings, MMS) and "pull" (phone, website) methods to distribute avalanche information
- The avalanche forecast season should run from late autumn into late spring.

In almost all cases internationally, avalanche forecasts and advisories involve a major national government agency either providing or closely supporting avalanche

⁵ <http://www.ikar-cisa.org/ikar-cisa/documents/2008/ikar20081208000270.pdf>

awareness. These agencies are sometimes associated with weather forecasting services. For a wide range of international examples of avalanche advisories, see the NZ Avalanche Centre link <http://www.avalanche.net.nz/resources/Related-Organisations/International-Avalanche-Centres.asp> .

The look and feel of the New Zealand web-based avalanche advisory, the standards used, and the warning levels align with ICAR best practise recommendations, and mirror avalanche advisories available in Canada, USA and Europe.

New Zealand avalanche incidents and accidents

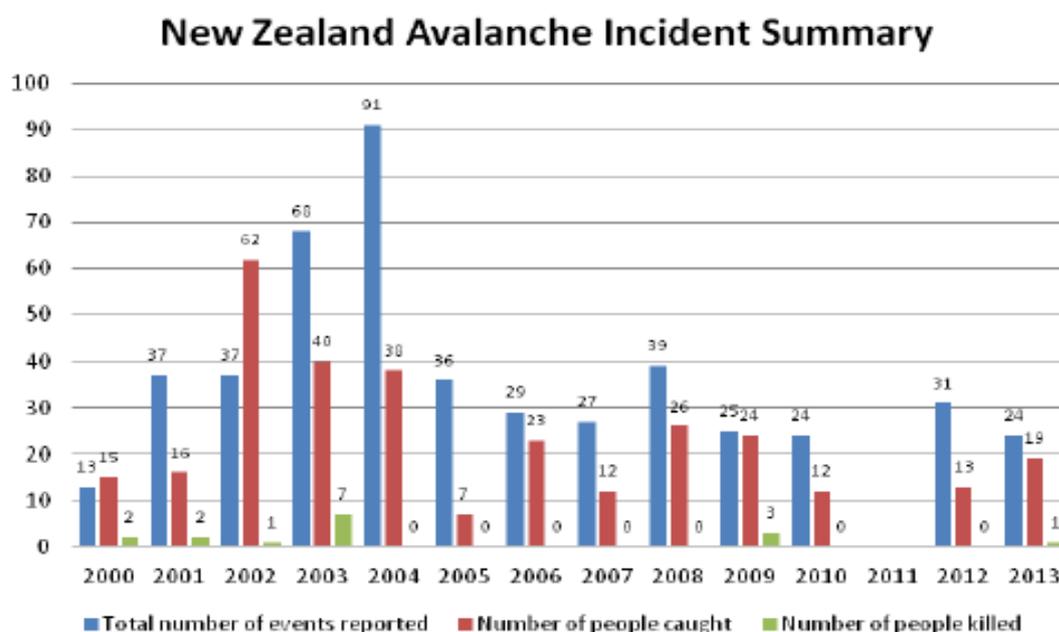
Avalanche incidents accidents and incidents have been reported since the mid-19th century. A major avalanche event involving up to 41 fatalities is believed to have occurred on the Otago Goldfields in 1863. Number of avalanche fatalities were small until about the early 1970s, after which they began to grow. By the end of the 20th century New Zealand was experiencing a long term average of 2 fatalities a year.

During the last decade, statistics gathered from data collected by the New Zealand Mountain Safety Council show that during an average year in New Zealand there will be 37 reported avalanche involvements, resulting in 23.6 people being caught in avalanches, 1.25 of whom will die.⁶ This represents a drop in decadal average fatalities from 2 per year to 1.25 per year. Figure 5 provides an analysis of avalanche incidents between 2000 and 2013.

Analysis of avalanche statistics suggest avalanche incidents and accidents have declined in New Zealand since 2004. It might be extrapolated from this that avalanche education and advisories are serving to improve avalanche safety. A challenge with statistical analysis of avalanche incidents and deaths however is that trends are rarely linear or probabilistic. Avalanche hazard varies enormously spatially and in time, especially month to month and year to year. One winter season can have a light snow pack and generally low hazard whereas the next can have a heavy, unstable snow pack. A single incident involving a large party can have major consequences. The number of injuries and deaths from avalanches in New Zealand is low in total numbers compared with international experience (although reporting systems are fragmentary outside of Europe, North America and Japan). But even on an average of 1.25 deaths per year, on a population size basis (including overseas tourists) it is on a par or larger than comparable snow sport countries such as Canada, USA, France, and Switzerland.

⁶ Based on anecdotes to the author of this report, there seems to be very significant under-reporting of avalanche incidents.

Figure 5: New Zealand avalanche incident summary 2000 -2013 *Crystal Ball*, Vol. 23, p.3.



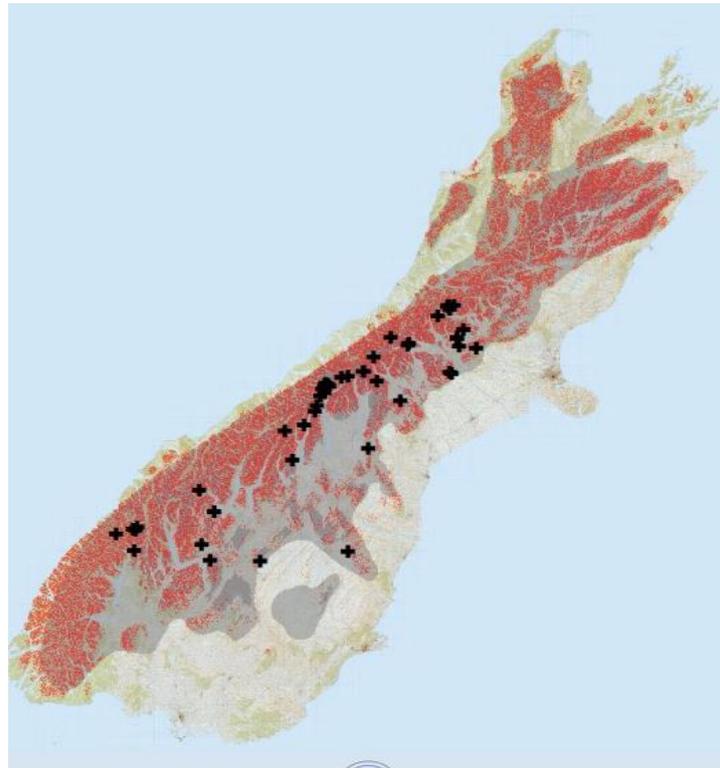
Costs of avalanche incidents and accidents in New Zealand have not been collected on a comprehensive basis. Consequently, estimating the cost of avalanche incidents is difficult. Most incidents in the backcountry involve self-rescue by the affected party. Injuries in these cases are usually minor and may not appear in ACC data. Furthermore, avalanche incidents involve either rapid recovery (in terms of minutes) or else fatality. Where rescue teams become involved however, avalanche rescue costs can mount considerably due to the manpower needed to successfully undertake search for buried individuals, helicopter access, followed by debriefs, sometimes hospitalisation, and enquiries and recommendations (a Coroners enquiry will follow every avalanche fatality – recent Coroner enquiries into avalanche related fatalities have emphasised the value and importance of use of up-to-date and accurate avalanche advisories⁷).

The greatest avalanche risk in New Zealand exists on ski fields and on the Milford Highway. New Zealand has been very fortunate (perhaps lucky) that it has not experienced a major loss of life from an avalanche event at these places. The New Zealand avalanche network, coordinated by the MSC is a factor in helping mitigate the avalanche risk. The price of avoiding any future tragedy is continued vigilance and a nationally coordinated network. Perhaps reflecting the relative success of ski area management, however, is the evidence that the majority of fatalities in recent years are occurring in the backcountry. The issue with avalanche hazard and risk is the high potential for harm. While many accidents and incidents to date in the backcountry tended to have involved small groups, there is the possibility of larger groups being caught, especially education groups⁸.

⁷ Since 2006 see Campbell [2010] NZCorC 118 (12 August 2010), Morgan [2011] NZCorC 162 (8 August 2011), Vinton-Boot [2014] NZCorC (15 August 2014).

⁸ One of New Zealand’s most notable avalanche events, involving the deaths of four Air Force personnel, occurred on just one such ‘education’ event on Ball Pass in 1975. This accident triggered a re-examination of avalanche safety in New Zealand.

Figure 6: *South Island avalanche terrain and recorded fatalities*

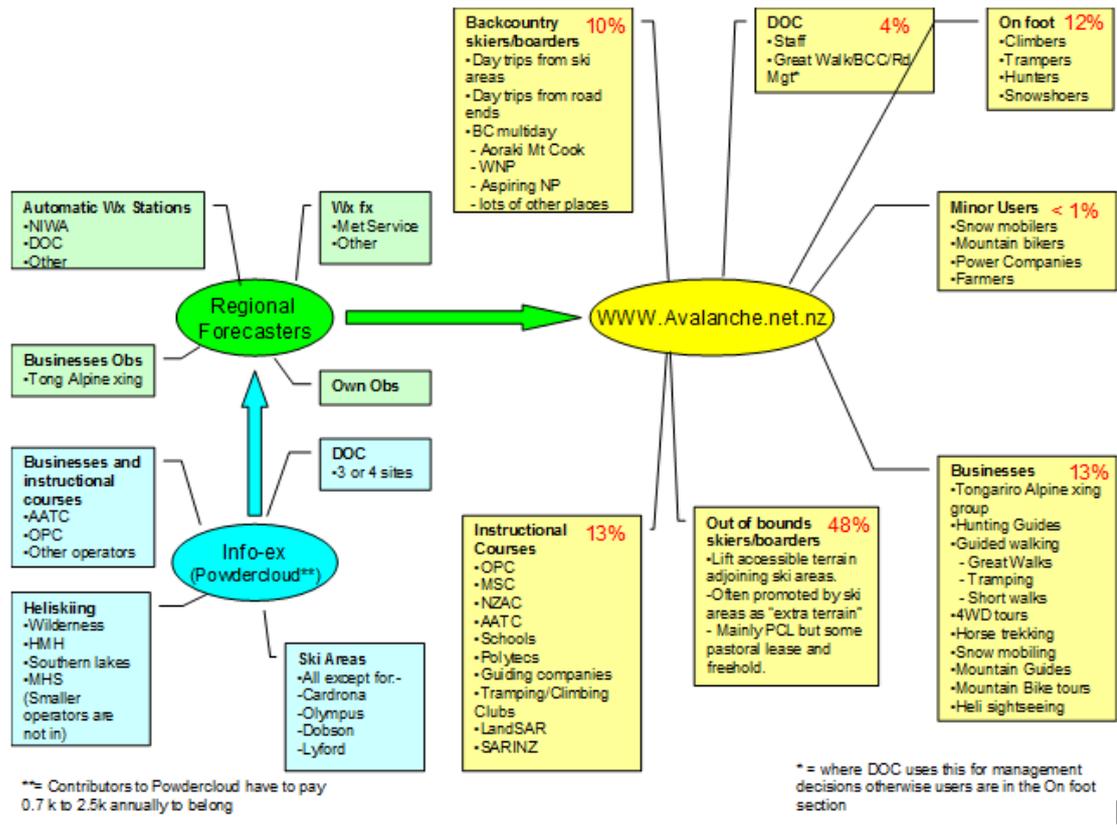


The Avalanche Advisory participants, users, and beneficiaries

Participants

The Avalanche Advisory is not a stand-alone system. It draws heavily on (and could not operate without) data provided from the weather forecasts and snow industry staff and their avalanche forecasting and management expertise developed in New Zealand and overseas. The linking mechanism is the **Info-ex** data base. Andrew Hobman, the avalanche programme manager from MSC, has provided in Figure 7 a representation of the relationship between participants (**Info-ex**, and forecasting), and users (the Avalanche Advisory, and user groups, roughly estimating the percentage of use of the Avalanche Advisory per group). In Figure 7 the ‘participants’ are shaded in blue or green. They include government agencies, crown owned entities, educational institutes, commercial organisations, and private individuals.

Figure 7: Data Providers, Forecasting & Users



Users

In 2008 ACC estimated of 687,000 people engaged in tramping, mountaineering, snow sports and hunting, 5% could be described as backcountry users. Snow industry sources report increased sales of ski alpine touring bindings and gear over the past 5 years. The trend in people recreating near or above the snowline in “side” or backcountry is increasing quite dramatically, especially day visit ski touring off ski areas. These users are described as “side country” users but in effect can be regarded as backcountry. Organised group use of the backcountry, especially for education and developing snow craft and survival skills similarly have increased since the 1990s. It appears those venturing beyond ski area boundaries, or using the backcountry during the winter are using the Avalanche Advisory.

Evidence for use of the Avalanche Advisory are the number of unique visitors to the advisory web site. According to data supplied by the MSC, these have been as follows;

- 2010-11: 18,997
- 2011-12: 22,990
- 2012-13: 30,530
- 2013-14: 43,116

Beneficiaries

There are a multitude of beneficiaries. The primary audience is backcountry users seeking up-to-date information on snow safety. Ski field operators benefit by shifting responsibility for advice about conditions beyond their boundaries by referring skitourers to the Advisory and to uniform, consistent and up-to-date warning signage. Search and rescue benefit from reduced risk because of the information provided by the Advisory. Clubs, education institutions, commercial guiding and instruction firms and government agencies benefit from better knowledge of avalanche conditions and presumably better decision-making (see figure 7).

A number of government departments, Crown Owned Entities, and government funded organisations have an interest in, a need for, and use of all or part of the Avalanche Advisory. These include the search and rescue sector, land managers, those responsible for health and safety in the work place, land transport systems, accident prevention, tourism, and building research capability and knowledge to address future avalanche hazards. For example, the land-oriented constituents of the New Zealand Search and Rescue Council benefit from reduced incidents, better outdoor user decision-making, and rescuer safety planning and operations. The Department of Conservation benefits from greater visitor awareness, staff safety, and infrastructure planning and safety. ACC benefits from lower accidents. The New Zealand research community (MBIE, NIWA, and universities) benefit from access to better data and observations for the amount of avalanche related research⁹. New Zealand tourism (MBIE and TIA) benefits reputationally from having an internationally compatible avalanche advisory available for overseas visitors, especially in the case of any accidents or fatalities. The NZ Defence Force benefits as a regular user of mountain lands and in safety planning operations for defence personnel. Many government agencies had direct HSE responsibilities for staff or operations involving avalanche terrain, or else have regulatory or policy responsibilities that arise from avalanche risk, such as the adventure tourism or safety of road and rail transport routes.

The ICAR describe national-level public avalanche advisories as a public or common good. In New Zealand, it is difficult to separate the Avalanche Advisory from ski field/ commercial ski guiding snow safety operations. Indeed, the Advisory could not operate in its present form without their support. However, the ski fields and commercial guiding operations receive minor direct benefit, but nevertheless contribute significantly through data and observations to a wider public good (from which they derive residual benefit through cooperation, and knowledge of other operators' conditions).

No one has stepped up to provide a stand-alone commercially-based general avalanche advisory in New Zealand. The costs would be considerable in that such a business would drive off the present voluntary and potentially-competing operator contributions. It might be said that the present system, operated in effect by a quasi-government organisation (MSC), is a “club good” but it is almost entirely funded

⁹ This is a topic beyond the scope of this review, but warrants scrutiny. The amount of current avalanche research in New Zealand is limited compared to overseas – and there are some New Zealand particularities that need further research, especially about our fast changing, wind affected, moist snow conditions combined with our generally steep terrain.

from the taxpayer base (or a version of it – the Lottery Grants Board). The assessment of this review is that the Avalanche Advisory, as a general public advisory of hazard and risk predominantly on public conservation land, is a public good in that the benefits in terms of public safety are manifest, but general in nature and beneficiaries are diffuse.

General observations on the current Avalanche Advisory

1. The wider New Zealand avalanche system is a mix of central government support, industry involvement, non-government participation, and volunteerism. The avalanche scene is characterised by a small group of skilled and enthusiastic participants, drawing on local and international skills and experience, and driven by a common interest in the outdoors and the avalanche phenomenon.
2. New Zealand's understanding and response to avalanche hazard has been evolutionary, drawing on international (especially Canadian) experience and more recently adaptation to New Zealand's circumstances. Compared with overseas, New Zealand was slow to understand the nature of the avalanche hazard and hence was exposed to considerable risk – especially at ski fields- but in the past 15 years has begun to catch up with international best practise. Considerable progress was made in the avalanche forecasting and public advisories the 2000s under the management of MSC employees Steve Schreiber and now Andrew Hobman.
3. The Avalanche Advisory appears to be adequate for New Zealand's circumstances as they stand at present. The website and forecasts are easy to use. Avalanche warning signage is generally well placed at ski fields and at major hazard entry point on public conservation land. The design of information as represented on the website and signs is at international best practice.
4. The ski industry provides considerable support for the Avalanche Advisory, mostly at the snow safety officer/patroller level, reflecting the enthusiasm and volunteerism of highly skilled experienced field operators. Management support was reported to be, at times, wary because of the potentially negative publicity associated with acknowledging avalanche risk. It is noticeable that some operators do not contribute to **Info-ex**, or else adopt a stand-off approach to the overall avalanche forecasting system, either because of a protective approach to their operations, or extremely small size/sporadic nature of their operations. It is surprising that the Milford Road research, data and forecasting is not better integrated into the wider New Zealand avalanche network and advisory, given that it funded by a government Statutory Entity contract.
5. Side and backcountry users and backcountry infrastructure is not large by international comparison, but growing. The number of fatalities is small. The Avalanche Advisory appears to have contributed to reducing avalanche incidents and fatalities in the backcountry. Nevertheless, despite best endeavours, there will always be avalanche risk in New Zealand, especially as backcountry/side country activity grows. If the Avalanche Advisory alone can

be said to have caused annually at least one fatality to be avoided, then it will have paid for the \$150,000 p.a. it takes to run the Advisory (using cost of death calculations applied by ACC or NZTA, or direct costs of search and rescue and Coroner Court costs).

6. The funding system for the Avalanche Advisory is unsettled. If it is accepted that that the Advisory is a long-term public good, then an agreed sustainable funding arrangement should be found. Drawing a relevant but larger analogy, a developed country like New Zealand would not run a weather advisory in the ad hoc manner that is currently used with the Avalanche Advisory.
7. Alternative funding mechanisms have been discussed with stakeholders as part of this review. One option suggested was a levy of, say, 8 cents per ticket sold at all ski areas. Apart from opposition of ski areas to such a levy and the impossibility of getting them to all agree voluntarily¹⁰, the compliance and collection costs would seem to outweigh the return. Ski fields and commercial operators note the considerable input they provide already in data, observations and staff time. Another option is to resurrect the Lottery Grants Board funding scheme, but this would return the Advisory to a system of annual funding applications and a reduced service (and the LGB have signalled they don't want to fund the Advisory). Options such as levying ski equipment sales seem too fraught with attribution and compliance issues. Another option is to have the main land manager pay i.e. DoC, as happens in some States in the U.S.A., but this would place the full financial burden on a single agency in a time of public funding stringency. A variation would be a form of club funding from agencies that stand to benefit from avoiding incidents to public users, reputational risk, and public good research. This would require collegial understanding of levels of benefits and acceptance of the public good orientation of the Advisory. Yet another option, a subscription service, would be fraught with issues of free riders, willingness to pay, and compliance costs. Using an insurance scheme would be beyond New Zealand's present policy settings.
8. Another way to view the issue is whether the resources currently applied to a public Avalanche Advisory would produce greater safety outcomes if applied to either different activities or in a different way. Such exercises are a useful discipline but, first, comparing avalanche safety awareness with, say, river crossing awareness or forms of urban recreation safety is like comparing apples with oranges. Furthermore, safety awareness and education should endeavour to address all significant safety risks. Avalanches are one such risk. The key questions seems rather whether costs have commensurate benefits in terms of risk reduction. Relatively small sums of money are involved producing the public Avalanche Advisory. The Advisory is complemented by an active avalanche education programme, one that is largely self-funding with a group of private providers. Adopting an approach of education (largely self-funded) and public advisory (public funded) seems a sensible strategy to avalanche risk reduction. As will be commented on later in this report, it is

¹⁰ Advice from Miles Davidson, executive director of the NZ Ski Industries Association, citing his difficulties over many years in getting levies for joint industry marketing, ski racing promotion etc.

inconceivable given the avalanche hazard and risk that some sort of public avalanche advisory would not be provided in New Zealand.

The Future: What does an Advisory need to operate?

An avalanche advisory requires;

- Up-to-date weather reports and forecasts,
- Records of snow accumulation,
- Field observations of deposition and snow pack stability,
- A way of collating and analysing observations and data, and,
- A means of communicating up-to-date information, preferably as widely as possible.

If an avalanche advisory is to be truly effective, it is best made openly available and widely broadcast. In this way people and organisations can then use their own judgement about the level of risk they wish to take on. This same principle applies to national weather forecasting.

The Future: Assessment of reporting regions and reporting times

New Zealand's diverse and distributed alpine regions combined with fast moving moist weather systems mean that reporting regions need to be slightly smaller in area than the ICAR norm, in order to recognise the spatial variability of New Zealand's avalanche hazard.

The current twelve reporting regions are logical in terms of hazard and numbers of backcountry users. MSC keeps these regions under regular review¹¹. The avalanche assessments for these regions, particularly those in the South Island, can in some cases apply to the immediate surrounding mountain areas, although this requires interpretation and judgement on the part of users.

If adjustments and additions are to be made in near future, consideration could be given to reporting on the following regions, **in priority order**;

- A more sophisticated approach to reporting in Fiordland, incorporating the Milford Road- Milford Track complex and the high use Fiordland/South Western Aspiring National Parks regions
- Arrowsmith Range (Central Canterbury)
- The Otago Block Mountains (Rock and Pillar through to the Pisa Range), although accurate reporting on such a large region may be challenging.

¹¹ The Arrowsmith Mountains were recently removed from the Mt. Hutt reporting region. The avalanche hazard in the Arrowsmiths is regularly high to extreme. This was distorting the overall assessment for the mountains in the same region further east. Numbers of backcountry users in the Arrowsmiths are generally low, other than commercially guided heliskiing. The heliski operation makes its own assessments, because the hazard in the Arrowsmiths is so high. By way of anecdote, the closest the author of this report has come to being an avalanche fatality was in the Arrowsmiths in a Class 5 avalanche.

- The Lewis Pass region
- Mt. Arthur Region of Kahurangi National Park (NW Nelson)

Detailed reporting and advisories begin in late May/June and wind up in early October. This coincides with the availability of contracted observers and the opening and closing of ski field areas and a number (but not all) ski guiding operations. **There is, however, a risk.** There is a potential gap in the system between mid-October and the end of November when winter type avalanche conditions can prevail, or briefly appear. This is a time when backcountry users and ski tourers are active, and when the reporting is limited or non-existent. There is no easy fix to this gap. However, it would be wise for MSC to create a permanent solution for this gap, perhaps with a less detailed and more general advisory.

The Future: Organisations that might produce an Avalanche Advisory

The present arrangement, where the MSC oversee and coordinate the Avalanche Advisory, works. The MSC is the preventative side of New Zealand's approach to outdoor safety (as opposed to the response side). Consequently there is a sound logic in locating responsibility for a public Avalanche Advisory with the MSC. The challenge is not the functioning or management of the Advisory, but how it should be funded. **If** there is to be a change for MSC, a question for the future is what institutional base is needed in order to maintain an on-going public Avalanche Advisory?

The organisational design of the Avalanche Advisory is such that it could be transferred to another entity, but if it was to operate in its present form it should be kept as part of the overall avalanche network, crucially with **Info-ex**, and especially linked with the snow sport and adventure industry.

Alternative providers might conceivably include;

- Metservice (national weather organisations provide avalanche advisories in some other countries),
- NIWA (creating a better linkage between data, observations, analysis, reporting and research),
- DoC (as manager of most of the areas of avalanche hazard in New Zealand, paralleling some avalanche forecasting arrangements in parts of the USA and Canada),
- Establishing a stand-alone national avalanche forecasting centre, probably based in the South Island (avalanche forecasting centres exist in Canada, and parts of the USA and Europe),
- A new outdoors accident prevention and accident response organisation combining MSC and LandSAR with a statutory base (such organisations are exist overseas).

Each of these options has strengths and weaknesses. It is difficult to see that any of them would be less costly than present arrangements. However, if there were to be any change for the MSC that would make it unviable to run an avalanche advisory

from there, then these other options could provide a suitable institutional base for the long term.

The Future: Options for future avalanche forecasting and information

While the present arrangement for avalanche forecasting does not remove risk of avalanche incidents and fatalities, it does provide a general level of hazard warning and sufficient information on which users can use their judgement about the level of risk they are prepared to accept.

There are obviously a number of options for the level of service that might be provided in the future.

1. If funding is not available, then the Avalanche Advisory could **cease operation**. There are considerable public safety and very considerable reputational risks involved if this occurs. The onus for safety would be put on individuals and their (voluntary) use of education and avalanche training. Some burden would be transferred to ski field operators who inevitably will be asked by the growing number of side country users about assessment of avalanche risk. While \$150,000 p.a. could nominally be saved by ending the service, costs would be transferred elsewhere (search and rescue, enquiry costs, ACC, insurance, land owner or land occupier costs, costs to user organisations, and reputation costs). However, it is inconceivable that New Zealand, a country with a high avalanche hazard and growing backcountry domestic and international users, would not provide at least some form of public advisory about current avalanche conditions.
2. A **more general advisory** could be issued for wider areas of the North Island and South Island and or reports issued on a weekly or two weekly period. It would mean that there is a form of avalanche warning to the public and users. An ad hoc version of this occurred from the 1980s until the late 1990s. A general advisory about avalanche hazard was sometimes issued by the Department of Lands and Survey and the New Zealand Forest Service and more recently by DoC, based in part on fragmentary observations and in part on judgment based on snowfall events.

Today's better knowledge is likely to improve the accuracy of a public avalanche advisory of whatever form. Nevertheless, any advisory needs some data, observations and reports, and access to weather station data. Staff need to be employed and oversight, data checking and critique is still required. The costs of the current level of contracted observers could be reduced, but the core costs are likely to remain. Provided observers were willing to operate within such a system, it is estimated the costs could be between \$80-90,000 p.a. Less frequent reporting is not recommended by ICAR. Larger reporting areas will increase risk. Less accuracy of reporting will reduce user confidence in the system and lead to questioning of its value.

3. Maintain the **current system**. The advantages of this approach is that New Zealand retains a system of public avalanche advisory that is respected

internationally. It utilises of New Zealand's avalanche expertise in a sensible manner without creating any significant overhead costs. The information is valued and is communicated efficiently.

The disadvantages of the present system is there is no agreed form of funding for the \$150,000 p.a. required to maintain this level of service. The system does not remove risk. The risk "hole" in reporting in October and November would continue. In addition, there are some operational issues that should be resolved to make the system work better (see recommendations).

4. **Expand** the current reporting areas and expand the reporting period. In addition, consider creating one or possibly two stand-alone avalanche forecasting and reporting centres (one South Island and one North Island).

Expanding the reporting regions and reporting period would increase the quality and extent of information available to backcountry users. Creating a stand-alone avalanche forecasting and reporting centres will provide greater critical mass to the expertise applied to data, observations and analysis, **provided such a centre was well managed.**

The disadvantage of expansion is the cost. It is likely that the cost would rise from \$150,000 p.a. for the present system to at least \$250,000 to \$3000,000 p.a. in order to support more field observer contracts and some extra costs for a stand-alone reporting centre (if there was no stand-alone centre, the increased costs would be at the lower end) ¹².

Recommendations

The present New Zealand Avalanche Hazard Advisory and Information Service is a sound, well-regarded system. It makes good use of avalanche expertise available in New Zealand. Furthermore, the system has been designed to address the particularities of New Zealand's avalanche hazard and risk. The most immediate issue is how to fund the continuation of the service.

I have received positive comments from stakeholders about the way the Advisory (and the wider avalanche network) is run. Similarly, stakeholders and users say the Advisory information and signage is valued and, since 2010, is easily accessible.

The present Advisory system represents a trade-off between detailed site-specific information with consequently lower risk, and sufficient general information to encourage users to apply judgement to manage risk based on some level of avalanche education, awareness, and avalanche management skills.

Funding the Avalanche Advisory on an ad hoc or year-by year basis is unsatisfactory, given the ongoing nature of avalanche forecasting, changing risk circumstances, and a need for some medium term certainty for management and staffing of the Advisory.

¹² These estimates for an expanded service are based on MSC costings for full-time forecasters set out in bids to DoC in 2011 and 2013.

I recommend that;

1. The present level of public advisory, based on twelve higher-use alpine regions, is the minimum level of reporting for effective public safety given the geographical spread and the way different level of hazard occur region-to-region.
2. MSC remain as the manager of the public Avalanche Advisory, provided there are no changes with the MSC that would jeopardise producing an Avalanche Advisory in whatever form is decided.
3. The Advisory for the Fiordland alpine region is reviewed to create synergies with the information available currently. This will require discussions between MSC staff, DoC, NZTA and Downers. The information and expertise developed by Downers under contract to NZTA should be made freely available to the New Zealand avalanche system.
4. DOC ensures that ski fields on public conservation land are required to contribute the snow safety data they collect to **Info-ex** as part of their license concession conditions.
5. The public agencies that benefit from both **Info-ex** and the Advisory enter a long term club-funding arrangement to support the public good delivered by the Avalanche Advisory. The \$150,000 p.a. cost of the Avalanche Advisory, when contrasted with overall departmental budgets is very small. For example, a mix of 40:20:20:20 funding split between the land manager (The Department of Conservation - DoC), the two government departments with land-based search and rescue oversight and responsibilities, and the tourism/research-responsible agency (The Ministry of Business, Innovation and Employment-MBIE) seems very achievable, based on the reviewer's prior experience as a public service CEO.
6. Improving coverage of the reporting period of the Avalanche Advisory for October/November should be an immediate goal.
7. Expanding the alpine regions covered by the Avalanche Advisory should be an intermediate term goal.
8. Consideration could be given in the longer term to establishing a stand-alone avalanche forecasting and reporting centre, but only if that did not jeopardise the efficiencies of the present distributed system.
9. One-off upgrades or top-ups, for example upgrades of the web-site, could be funded by applications to the Lotteries Grants Board Outdoor Safety Committee and/or from sponsorship, or one-off grants from government agencies if deemed necessary.

AVALANCHE ADVISORY REVIEW TERMS OF REFERENCE

5 August 2014

Past and Current.

Provide a brief picture of the avalanche advisory as it is currently constructed including its recent history/evolution, target locations, audiences, costs and all funding sources.

Summarise all other avalanche advisory products existing in New Zealand (i.e. what does ski fields have, heliski operators provide, NZ Transport Authority, Department of Conservation etc.). Outline how they work (or don't work) together.

Summarise international comparative avalanche advisory services, products & arrangements.

Outline the occurrence of avalanche incidents. Where possible, include numbers, locations, consequences and costs

Describe who and how many use and/or benefit from the avalanche advisory.

Ascertain and explain if the avalanche advisory is best described as a public good, common good, club good, private good or some combination of these.

Describe what information the avalanche advisory requires in order for it to be produced (sources).

Future.

Describe the interest in, need for and access to the advisory for the search and rescue sector, Mountain Safety Council and Department of Conservation.

Provide advice on where the avalanche advisory locations should be in the future.

Identify which organisations could produce an advisory and provide advice on which one(s) are best placed to provide the advisory.

Outline at least three future avalanche advisory options (i.e. optimal, mid-range, minimum):

Provide brief comment on services for each and consequences for each option.

For each option - describe how many forecasters are needed and where and who should they be.

Outline a projected cost for each option and suggest how each might be funded.

Recommend your preferred option.

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THE AUTHOR

Hugh Logan has headed the New Zealand Antarctic Programme between 1988 and 1991, served as Chief Executive of the Department of Conservation for 9 years, and the Ministry for the Environment for 2 years. He has a PhD in environmental public policy. He is an active user of the backcountry, served on the Executive of the Federated Mountain Clubs, and as President of the New Zealand Alpine Club and the Canterbury Mountaineering Club.