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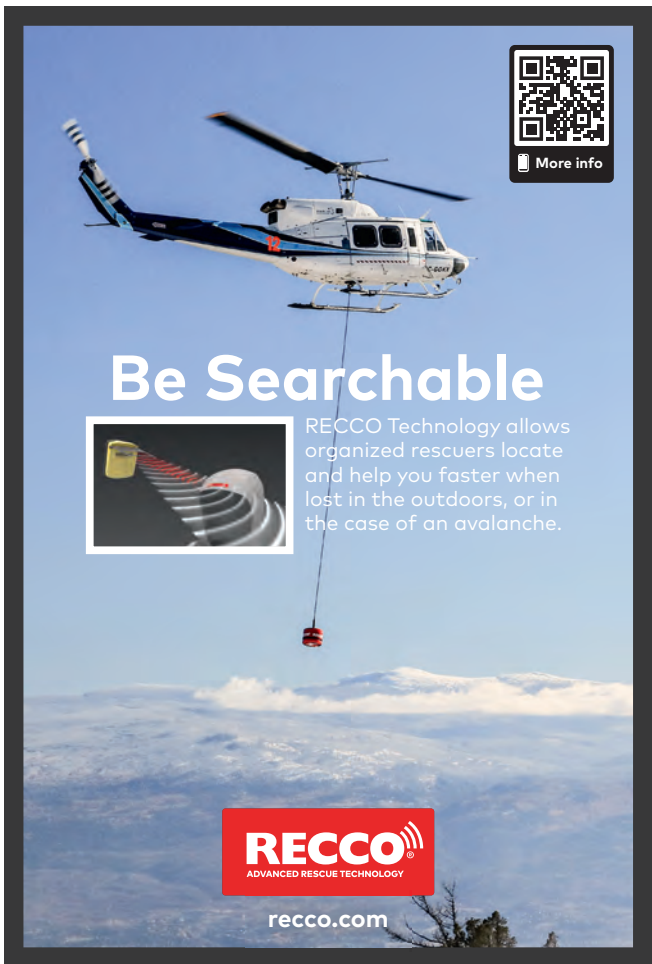
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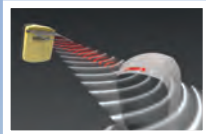


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Contact *The Avalanche Journal* editor: editor@avalancheassociation.ca

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BCA's Andy Wernberg points out in the northern Saq'uans. Photo: @erfranco



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Regulatory amendment: The right to refuse unsafe work

On August 22, 2022, amendments to part 3 of the Occupational Health and Safety Regulation took effect. Employers are now required to inform workers about a previous work refusal before reassigning the refused work.



To learn more about these changes, visit worksafebc.com/refusing-unsafe-work

WORK SAFE BC

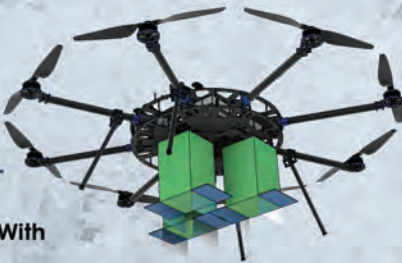
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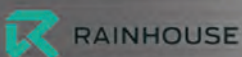
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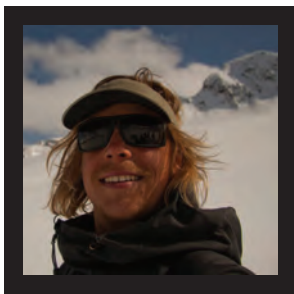


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Eirik Sharp
CAA President

CAA President's Message

MEMBERSHIP AND PROFESSIONALISM MANY STEPS TAKEN, MORE TO COME

and ITP courses has improved this. I was recently discussing how best to navigate an avalanche career and CAA membership with a recent Level 1 graduate when I realized many of our new members might be unfamiliar with the history of the CAA's path to self-regulation.

In the last issue of *The Avalanche Journal*, I discussed the new names for competency-based membership categories of the CAA. This marked a significant and symbolic milestone in the transition of the CAA from an association of avalanche professionals into a self-regulating professional association. After several decades of operating with little oversight, it became apparent in the first decade of the millennium that avalanche risk management work was attracting the scrutiny of regulators. (Some of these challenges are explored in this issue in the retrospective on the avalanches of 2003.) Having seen the effects of regulators' previous intrusion into the upper levels of practice (WorkSafeBC's development of the short-lived Qualified Avalanche Planner concept for instance), the CAA took it upon itself to define membership in terms of competencies rather than be subjected to highly prescriptive external oversight.

The competency-based membership profiles and associated membership application process were introduced in 2020 and were the outcome of six years of hard work in developing the guiding policies and procedures. While

ALTHOUGH I'M LUCKY ENOUGH to have year-round avalanche work, geographically, I live on the periphery of the avalanche patch. I initially moved to the Yukon for a job with Avalanche Canada running one of its nascent field programs. My plan for a temporary stay was quickly derailed hours after arriving in the territory when my now-wife introduced herself and offered to take me out ski touring the next day. I've now been here for 12 years.

The avalanche community in the Yukon is comprised of a small but vibrant collection of avalanche professionals working in all different industry sectors, at different stages of their careers. One of the challenges is access to mentorship and professional development, although the online delivery of CPD events

initial feedback was largely positive, a post-rollout review is a vital phase of any policy lifecycle. Now, after two years of members and stakeholders stress testing the new membership model, we have a good idea of what is working well and where there is room for improvement. Two common themes have become apparent in the feedback we have received: concerns the membership categories are out of sync with members whose focus is mainly on instruction; and that the application processes are overly onerous compared to other professional organizations.

While there is little desire to change the competency profiles, there is a gap within the current membership framework that excludes avalanche workers with a very limited scope of practice and limited opportunities for professional mentorships in more traditional avalanche operations. Specifically, I'm thinking of the increasingly in-demand, introductory-level avalanche educators. Although the membership category name change was an important milestone along our path to self-regulation, the ongoing refinement of a model of professional avalanche practice that protects the public interest while meeting the needs of members, regulators, and industry remains a high priority in the association's latest strategic plan.

Membership applications have also proven to be an arduous process not only for new applicants, who are now required to record and provide evidence they meet the defined competencies, but also for the Membership Committee, which is responsible for vetting and reviewing these applications. While it is a critical facet of self-regulation to ensure our existing and new members meet competencies, we are actively looking for ways to streamline these processes.

An example of this are the equivalency tables developed by Kerry Macdonald, chair of the Membership Committee, that simplify the application process for members of the ACMG and CSGA. These tables recognize the competencies gained through established guiding certifications within the applications for CAA membership. While this development has been well received, we recognize there is more work to do to ensure the application process is efficient for applicants, staff, and the Membership Committee.

Lastly, I want to close by wishing a fond farewell from the board and the entire membership to our long-serving Operations Manager, Kristin Anthony-Malone, who stepped down from her role in September. Kristin, it has been a pleasure to work with you. I wish you the best of luck in all your future endeavours.

Eirik Sharp, CAA President



Joe Obad
CAA Executive Director

Executive Director's Report

LOOKING BACK AND MOVING FORWARD

changes to policy and priorities, particularly when they attract significant public attention. Governments, regulators, mountain organizations, individuals, and operations are pushed by fatalities to consider where advanced avalanche risk management practice has succeeded and failed.

This is both tragic and hopeful. It is tragic in that some of the lessons may look obvious with the benefit of time and perspective, and we are left to wonder about the lives lost for learning too late. There is also hope in that avalanche risk management is improved for both the public and professionals based on the lessons from fatalities.

When editor Alex Cooper and I first discussed this issue, I encouraged him to be unflinching and open in considering contributors for this issue. I think that shows in the diversity of voices available in these pages. There may be an impulse for some to ask: "Haven't we looked back enough?" I'm inclined to resist this impulse. Around us, we are seeing the nature of knowledge and memory change as we move from books to websites, from economies of goods bought and sold to the attention economy where whole industries of social media and algorithms are devoted to shaping our thoughts before we even complete them for ourselves.

In this context, revisiting keystone experiences is necessary. Consider for a moment B.C.'s Granduc Mine avalanche that took 26 lives in 1965, and the coroner's report on the death of Paddy Desmarais, a surveyor who was killed in an early-season avalanche in 2012. The inquest that followed the Granduc incident led to changes in the BC's

MANY OF YOU ARE LIKELY OPENING this issue of *The Avalanche Journal* within weeks of the 20th anniversaries of two of the most challenging avalanche tragedies in Canadian history: the La Traviata incident in the Selkirk mountains on Jan. 20, 2003, and the Strathcona Tweedsmuir in Glacier National Park 12 days later, which each took seven lives. Both incidents profoundly changed the lives of families who lost loved ones, and the professional and recreational landscape of avalanche travel in Canada.

It should be noted that CAA members and the industries the association serves seek continuous safety improvement at all times, not only when tragedy strikes. That said, deaths in the mountains often spur

Mines Act that included the requirement that, "Exploration activities shall be designed and implemented by a qualified person to minimize the risk of those activities causing... snow avalanche." The Desmarais report noted this history and contrasted it with the weak initial investigation by the Chief Inspector of Mines, which all but ignored the key obligations of the Mines Act related to avalanche hazard. Thankfully, the coroner revisited the Granduc history and made recommendations that led to revisions in the Mining Code in 2021. The old saying that not learning from history means being doomed to repeat it remains powerfully true.

In that light, I join Alex and the many authors in this issue to invite you to reconsider the tragedies of 2003 and their lessons once more.

AVALANCHE FATALITY DATABASE

The CAA, Avalanche Canada, and Simon Fraser University are working together to bring lessons from the past to light in a different way. We have not compiled a record of *Avalanche Accidents in Canada* since Volume 5, which covered fatalities from 1996 to 2007. Together we applied under Avalanche Canada's banner for funding from the Search and Rescue New Initiatives Fund. This application has been successful. This multi-year project will establish an online national avalanche fatalities database covering the period from 2008 to present, and pull in the data from the previous five volumes. Expect to hear more about this project over the coming years.

CHANGING OF THE GUARD

We have restructured the org chart a bit at the CAA. Rosie Denton was elevated to Membership Services Manager. Her close work with the Membership Committee to date allows her to seamlessly move into this role.

This change was needed with Kristin Anthony-Malone stepping down after 13 years as Operations Manager. I hope all members are lucky enough to have someone like "KAM" in their workplace. We were blessed to have Kristin over this time. She set a high bar for delivering for members, board, and staff. She consistently had member interests at the forefront of her thoughts whether organizing the Spring Conference, putting together fall CPDs, or rolling out a new service. In all these things she put members first and promoted a joyful atmosphere around the office. If we're ever shy for ideas going forward, we'll do well to ask, "How would Kristin do this?"

I wish all members the best with your work as you face your mid-season challenges. Please reach out if there is anything your association can do for you.

Joe Obad, CAA Executive Director



Alex Cooper
Managing Editor

From the Editor

WHERE WERE YOU IN 2003?

avalanche professional. If you're reading this, it's doubtless you know about those two avalanches and the impact they had on our world.

I was a long way from this world in 2003, working towards a degree in international relations at the University of Toronto. My grandfather was in a Montreal hospital after experiencing a stroke and would pass away a few weeks after the Connaught Creek avalanche. I struggled to keep my mind on my schooling and I have no recollection of hearing about these avalanches on the news.

It wasn't until a decade later, after becoming a 30-something ski bum reporting for the *Revelstoke Times Review*, that they would enter my consciousness. After moving out west, I started backcountry skiing and grew interested in avalanches. I pitched a story about the 10-year anniversary of 2003 and how they impacted the avalanche industry. I spoke to many of the figures who were in some way involved. It turned into a four-part series and I'm pretty

AS SYLVIA FOREST

writes later in this issue, most avalanche industry veterans can tell you exactly where they were when the La Traviata and Connaught Creek avalanches took place in 2003. Many were directly impacted by the tragedies. Some lost loved ones, others took part in the rescues, and more were involved in the aftermaths.

At the same time, an entire generation has entered the industry since then. You may have just been starting the training program, or even just learning how to ride as a youth. Depending on where you were, La Traviata and Connaught Creek may have been burned into your consciousness when they hit the news. Perhaps they inspired you to become an

sure I included those articles in my application for this position years later.

This summer, Joe Obad suggested we do a retrospective on those avalanches and the events that followed. Rather than watch the mainstream media write anniversary stories that simplify many of the dynamics of the time, Joe suggested reaching out to the individuals and organizations who were impacted and allow them to tell their stories, unfiltered. Our goal was to not simply re-examine what happened on those two fateful days, but instead to allow key figures to look back and tell their stories with the benefit of 20 years of reflection. Not everyone replied, but we are grateful to those who did.

This is by no means the complete story of what happened 20 years ago and the years that followed. It would take a book to properly tell the stories of the victims, their friends and families, the guides and teachers, the first responders, the investigators, and the many people who moved the industry forward with varying degrees of success.

Due to the constraints of the print format, I made the hard decision to focus on the experiences of people and organizations connected to the avalanche industry (with the exception of an interview with the head of Strathcona-Tweedsmuir School). As a result, this issue does not tell all the stories of the victims, survivors, and their friends and families. I struggled with that decision but ultimately made the hard choice to restrict this focus to individuals involved in professional and public avalanche safety. On this point I welcome your thoughts, as I do with all the editorial decisions I make with *The Avalanche Journal*. I can be reached at acooper@avalancheassociation.ca

Alex Cooper

MAInEx Project: Delivering InfoEx 4.0

Stuart Smith

INFOEX IS ONE OF THE MOST IMPORTANT services offered by the CAA. Over time, it has required various investments for both maintenance and advancement. InfoEx 3.0, which was funded by Tecterra, was launched in 2013. It introduced the concept of workflows, augmented InfoEx's data sharing, and introduced operational record keeping. At project completion, maintenance and development were handed over to our sole CAA developer at the time. A second developer was added in 2018 when the CAA started offering the international service to augment revenue.

Over the time InfoEx 3.0 was in service, there were many positives, such as iterative development and stabilization, but some essential servicing was missed. Additionally, the technologies chosen in 2013 reached their end of life and a completely new desktop application using up-to-date technologies was needed. Users also rightly requested mobile functionality to keep up with how they were operating.

MAINEX PROJECT

(MOBILE AVALANCHE INFORMATION EXCHANGE)

In 2019, the CAA launched the three-year MAInEx project, which emphasized the shift to mobile devices. The CAA successfully applied for funding from the federal government's Search and Rescue New Initiatives Fund, which was contingent on CAA and subscribers' pledges of significant in-kind contributions for software development, design and functional feedback, and testing.

The MAInEx objectives were to develop a robust online data exchange system that is optimized for mobile and desktop devices; and to implement a design that supports system upgrades and ongoing feature enhancements in a rapidly changing technological landscape.

The three-year funding began Apr. 1, 2020, and runs until March 31, 2023. A single project team consisting of contractors and the CAA InfoEx team has worked together in all project functions (design, software development,

and testing). A user group comprised of subscribers has tested functionality as it has come online and provided key feedback to the team. Dual English-French support has been plumbed in and will allow for other languages too; translations will be implemented when the app is stabilized. The project has resulted in the launches of a new desktop app for 2022-2023 and a new mobile app. There are a number of new features, including:

- Decoupling of snowpack summary, freeform, and control planning from workflows.
- The freeform was enhanced with a rich text editor and attachments, and now appears in reports, with the option to share or keep private.
- Revised the configuration of freeform templates to allow use in data entry and/or workflow steps.
- Enhanced reports: new report templates can be customized to provide additional options to standard daily reports.
- Observation input form templates work in both the mobile and desktop apps, and are set at the operation level. Weather site specific templates are now available.
- Changes were made to avalanche occurrence time.
- New run list and control extension configurations. These are significant enhancements in themselves, and they will also permit further development of extension functionality.
- Control planning now appears in reports.

The project faced numerous challenges. The transition from a stable, but end-of-life, old app to a new one has come with growing pains for users and CAA staff.

- On the server side, InfoEx's back-end database required a large amount of work to allow the project to proceed. More behind-the-scenes server-side work remains.
- Offline usage for mobile devices in and out of connectivity is highly complex. Initial testing with the mobile app has been positive, but we anticipate challenges as the full user community comes online.
- The custom design process continues. A key aim is to make InfoEx usage more intuitive and support ongoing enhancements, but the downside is there is significant complexity involved in building custom web app user interfaces.
- The main focus has been on having the new desktop app ready for this season. Other feature development has been deferred until the new apps are stable.

NEXT STEPS

Many improvements and new features will be worked on in the last few months of the project. They will not all get completed, but the second project objective of facilitating ongoing feature enhancements means that given adequate resourcing, feature development will continue after April 1. Many long-requested enhancements are in mind to be actioned when possible. Check out the image to see some of what we're working on.

Looking forward, action is being taken to identify and implement a funding model for InfoEx that will provide long-term service sustainability in a fast-moving technical world where the required technical expertise comes at significant cost. 📌

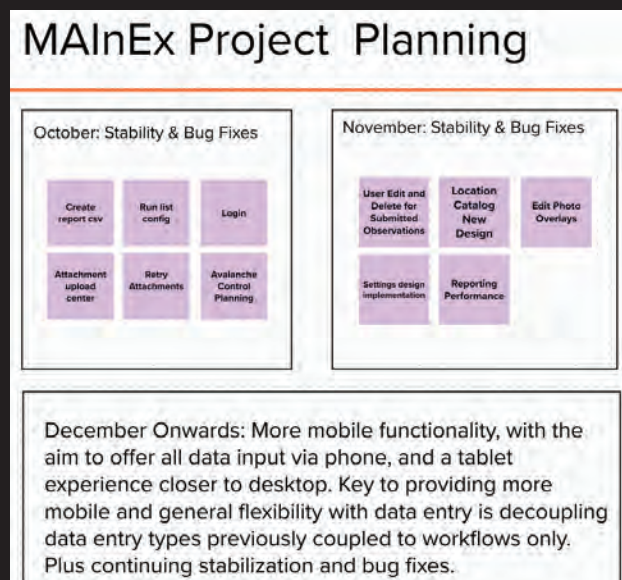


FIG. 1: MAINEX PROJECT PLANNING. FEATURE ENHANCEMENTS ARE GROUPED BY RELATIVE SIZE OF TASK FROM SMALLER (5) TO LARGER (34) WITH A SEPARATE COLUMN FOR THE MOST COMPLICATED.

Transceiver Interference Workshop

Considering new practices to address our gadget-filled times

Jayne Thompson Nolan, Executive Director, American Avalanche Association

MOST OF US DON'T go anywhere without our phone, so it's worth knowing how it, and the many other electronic devices we take into the backcountry, might impact the digital transceivers we rely on in event of an avalanche, and how we can mitigate those impacts.

In the context of avalanche transceivers, electromagnetic interference, (EMI) is, "the disruption of reliable signal acquisition by the receiving unit caused by other electromagnetic noises in the area," according to Bruce Edgerly, the founder of Backcountry Access. "EMI can result in reduced receive range and 'false triggers,' or misleading distance and directional readings that can distract from an efficient transceiver rescue."

Nearly all transceiver manufacturers have developed basic minimum distances they recommend their transceivers be kept from other objects, particularly electronics, to function properly and limit EMI. These minimums are based on extensive testing by the manufacturers and are included in user manuals. In general, these minimum distances can be distilled down to the 20/50 rule: keep items capable of producing interference 20 cm from your transceiver in transmit mode, and 50 cm away while in search mode.

These rules have generally served users well; however, as the electronics we choose to carry into the backcountry increase in number and function (heated gloves, heated jackets, touch screens, cameras, GoPros, radios, and electronic avalanche airbags), conversations are taking place about whether these technical rules alone are enough to address the tidal wave of electronics entering the backcountry.

To discuss the challenges presented by EMI, the CAA and Avalanche Canada invited a group of industry professionals to a meeting. In September, representatives from transceiver manufacturers Backcountry Access, Black Diamond/PIEPS, Ortovox, Mammut, Alpride, and Arva; and multiple sectors of the avalanche industry including the American Avalanche Association, American Avalanche Institute, American Institute for Avalanche Research and Education,

Association of Canadian Mountain Guides, American Mountain Guides Association, the Colorado Avalanche Information Center, the National Avalanche Center, the Northwest Avalanche Center, and the Utah Avalanche Center, met for a multi-day conversation around at Black Diamond headquarters in Salt Lake City.


The working group sought to explore:

- best practices around items brought into avalanche terrain that have the potential to cause interference;
- how to carry electronic devices in a manner that will not cause interference in both transmit and search modes; and
- technical considerations around additional research to assess the parameters of interference and to establish guidelines for mitigation and response.

The group reviewed and discussed transceiver technology, interference issues, knowledge gaps, desired user behavior in various settings, and ways to develop those user behaviors. The parties seemed to agree there is room for manufacturers, educators, and avalanche centres to work together in guiding how the public understands and manages potential EMI. We also seemed to agree the issue of EMI needs to be addressed appropriately, but not to the point of overshadowing the basic need to carry a transceiver, shovel, and probe.

The main outcome from the meeting was to begin development of a universal document for both the public and avalanche professionals that will include:

- consistent messaging and information about transceiver interference;
- a list of common signs of transceiver interference;
- emphasis on the importance of registering transceivers with the manufacturers and keeping firmware updated; and
- best practices for key settings: learning, pre-trip steps, trailhead check, and rescue settings.

This is an emerging collaboration. The process to date has been inclusive, ensuring that a wide array of perspectives is heard so that the group can offer effective practices to mitigate the potential effects of EMI to undermine rescues. Stay tuned for additional updates from this working group. 

Fuse News

Steve Brushey and Chris Argue

THE START OF EVERY avalanche season typically begins with preparation, certification renewals, skills refreshers, and/or annual training. This winter, there are several updates to explosives regulations and certification processes that are summarized below.

WorkSafeBC (WSBC) updated its blasting exam package, which now includes its new documentation requirements. Highlights include:

- New blasters require eight hours of training (OHS Reg. 21.8).
- Recertification now requires demonstration of six hours of continuing professional development (CPD) (OHS Reg. 21.8.1). WSBC provides a CPD log and training declaration at www.worksafebc.com/en/resources/health-safety/forms/continuing-professional-development-log-training-declaration-blasters

Other WSBC OHS regulation changes, which came into effect in December 2021, include:

- OHS Regulation 21.29 Safe Operation: “a person operating a vehicle that is transporting explosives must operate the vehicle in a safe manner consistent with prevailing road and weather conditions.”
 - The reference to 90 km/h maximum speed limit has been removed.
- OHS Regulation 21.4 Vehicle Load Limit has been repealed.
 - Load limit of 80% of vehicle GVW has been removed.

The Explosives Advisory Committee (EAC) recommends those who currently hold a WSBC blasting ticket or supervise employees who handle explosives review the current WSBC OHS Regulation Part 21: Blasting Operations so they are aware of all changes.

BC Mines (Ministry of Energy, Mines, and Low Carbon Innovation) is no longer granting direct equivalent for avalanche control blasting tickets. The process now involves writing the exam for the Surface Blaster 3rd Class (\$100 fee), and you must maintain your WSBC ticket as well. More information can be found at:

- www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/mineral-exploration-mining/documents/health-and-safety/certifications/faq_ext_blaster_certs_20211208_final_updated_20220317.pdf; and
- openschool.bc.ca/bcminescert

The EAC recommends anyone who currently holds a BC Mines blasting ticket or plans to work at a mine review the current changes at the ministry website.

All annual training in explosive handling and preparation, and explosive deployment counts toward CPD. In discussion with the instructors who taught Avalanche Control Blasting in Revelstoke this fall, all new changes were discussed with the students that attended.

Navigating regulations from our various regulators can be challenging as it certainly is not one-stop shopping. The EAC relies on its members' diverse sector experience and relationships with manufacturers and regulators to stay

abreast of current topics and changes. If you find yourself unsure or confused, either contact the regulating body or feel free to reach out to one of us on the Explosive Advisory Committee.

Currently on the EAC radar are federal regulations for hillside magazine storage at ski areas. To date, the EAC has acted as subject matter expert and has two representatives engaged in the situation. The Canada West Ski Areas Association provided funding to secure explosives expert Johanna “Joey” Viljoen. Working with our SMEs, Joey has developed a template that is available to affected ski resorts struggling to meet quantity-distance (QD) requirements set out by the Explosives Regulatory Division (ERD). The template allows ski resorts to provide a qualitative risk assessment to ERD in instances where resorts cannot meet QD requirements. Members in need of the template should reach out to Christopher Nicolson at the CWSAA or Joe Obad at the CAA.

As a reminder, the EAC asks that all programs that handle and use explosives use the InfoEx General Messages for blasting-related reports. We all benefit from the sharing of information. As the tendrils of the EAC grow, we are tied in with several of our neighbours south of the border, which benefits everyone.

Finally, the Transportation Safety Board released its investigation report of a helicopter crash during an avalanche control mission last winter. The report was published on November 2, 2022, just before press time. We encourage everyone to read the report at www.tsb.gc.ca/eng/rapports-reports/aviation/2022/A22P0019/A22P0019.html, with attention to the safety actions and messages at the end of the report.

EAC MEMBERSHIP UPDATE

The Explosive Advisory Committee does not currently have a representative from the heli-ski sector. We are always a bit uncomfortable not having a fully rounded committee. If anyone who is employed in the heli-ski sector and is involved in an explosive control program wants to contribute to our committee, we can use you!

We'd like to thank Rupert Wedgwood for his work on the EAC. Rupert has been a staple to the CAA for many years and certainly needs no introduction. He is one of the most engaged CAA members we have known, and has sat on several committees, volunteering his experience and logical rationale for many years. Rupert recently retired from an illustrious 30-year career as a Visitor Safety Specialist at Parks Canada, and last season was his last with the EAC. Thank you for everything you have done, Rupert!

Alex Lawson from Parks Canada Visitor Safety is replacing Rupert on our committee. Although Alex is currently in Europe, the EAC looks forward to working with him this season. 🇨🇦

Update on Guidelines for Instruction in Avalanche Terrain

Iain Stewart-Patterson, GIAT Implementation Coordinator

THE GUIDELINES FOR INSTRUCTION IN AVALANCHE TERRAIN (GIAT) are in effect for the 2022-2023 winter season.

What does this mean?

There are two key components of avalanche course delivery: planning and implementation. On the planning side, this means having an Avalanche Safety Plan, Emergency Response Plan, Terrain Catalogue, AM Trip Form, insurance, and land use permits. On the implementation side, this means that the use of terrain for avalanche instruction is based on the instructor's certifications and CAA membership.

FREQUENTLY ASKED QUESTIONS

WHY IS THIS HAPPENING?

GIAT establishes the best practices and provides a tighter platform for the delivery of professional avalanche instruction. The underlying goal is to improve public safety.

WHAT IF I AM ALREADY DOING ALL THIS? DO I NEED TO MAKE ANY CHANGES?

No changes are needed. You have established yourself as an industry leader.


WHAT IF I CANNOT FOLLOW ALL OF THE GIAT PROCEDURES YET?

You have had a year to prepare for this, however there are potential extenuating circumstances. Document your circumstances and demonstrate how you are meeting the intent of TASARM. If you are a CAA Avalanche Practitioner delivering AST 1 courses, you need to have a Professional Member help you with your documentation to ensure you meet CAA membership expectations and the Code of Ethics.

WHAT IS THE ENFORCEMENT PROCESS?

At this point, there is no GIAT compliance officer. The expectation is you fulfill your CAA membership requirements, particularly the Code of Ethics, and Continued Professional Development policy. However, as GIAT establishes the best practices for instruction in avalanche terrain, anyone not meeting these guidelines puts themselves, their clients, and their company at risk in the event of an accident.

The documents, such as the Avalanche Safety Plan, do not need to be submitted for approval. The GIAT Implementation Coordinator is available for support in the development of the documents. Review and feedback is available, but the documents do not get vetted or approved.

If you have any more questions, please email giat@avalancheassociation.ca. 

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Being a Good Reference

Kerry Macdonald, Membership Committee Chair

AN APPLICANT ASKS and you agree to be a reference. Perfect! Thank you for taking on that responsibility—you are more important in this process than you may know. But what does it mean to be a reference? Why are references so important in the membership process? As an Avalanche Professional, when I provide a reference, what are my responsibilities? These are questions we should ask ourselves every time we agree to provide a reference for a potential member.

To be a good reference you must have a good understanding of the competencies the applicant needs to fulfill for the level of membership they are applying for. You should also understand the level the applicant should be performing these skills at. If you have not reviewed *Competency Profiles and Proficiency Scale for CAA Members and Examples of Portfolio Competencies and Evidence*, as well as the membership application page, then I encourage you to do so. You should review these documents every time you write a reference. This will aid you in your endeavour to support the applicant.

The reference you provide is a key part of the application process, both for the applicant and for the people reviewing the application. Without your reference, the process fails. Your words as an Avalanche Professional carry weight. If you provide a well thought out and well composed reference for the applicant, you aid them by demonstrating how they meet the competencies, even ones beyond those you are required to validate. If your reference lacks detail or effort, this reflects poorly on the applicant. The worst sentence you can write is, "Sally/Johnny meets all requirements to be a member of the CAA." Unless it is supported by details about how they meet the competencies.

Within this process, you are providing a professional reference and you are speaking to the applicant's work experience. You have been involved in the development of the applicant and you must be intimately familiar with

their work and work history. If you are not, then you are not the reference this person needs. It is OK to say that you are not the right reference for this person.

As a reference, you are expected to review the application and mentor the applicant while they build their application. This is a common practice for many professional associations. If the applicant provides an incomplete application, this reflects poorly on you and on your reference. If you do not have time to review their application and mentor the applicant, then you should not be their reference. If you are not the right reference, that is OK. It is our duty to tell them this, even though it is hard. Along with effort, honesty is vital in a reference. When I have been asked to be a reference (for anything), I often tell the applicant, "Ask yourself what have you shown me and what I have observed about you? What can and will I say about you?" With this, I encourage introspection. These are also key questions to ask yourself before providing a reference, which I hope will inspire introspection before you provide a reference.

We all want to be a mentor, to be kind, to be appreciative, to be understanding, to be positive, and to be a supportive person. This is necessary in our industry to ensure we develop the next generation of avalanche workers. This is admirable beyond words. To achieve this, we also need to search deep within ourselves to ensure our reference is unabashedly honest, means what we say in every word, is clinical, and is forthright.

So, please be a reference, but be a great reference. Be the reference this applicant deserves. If you cannot be the reference they need, then explain that to them and respectfully decline so they can find someone who is. Thank you for what you do for the CAA and for those applying for membership in the CAA. 📌

The Avalanche Canada Foundation's ISSW Fund

Grant Statham

THE AVALANCHE CANADA FOUNDATION'S ISSW Fund supports projects and people who are professionally engaged in avalanche safety, forecasting and research in Canada. The fund promotes the ISSW motto of "A Merging of Theory and Practice", and aims to develop crossover between the practice of avalanche forecasting and the science of avalanche research. The fund was started after the 2002 International Snow Science Workshop in Penticton, and subsequent Canadian ISSW conferences in Whistler (2008) and Banff (2014) have contributed their surpluses.

Applicants must clearly describe how their proposal combines practical avalanche forecasting with the theoretical or scientific aspects of avalanches. Funding may vary each year depending on applications, but generally will range from small grants for travel to conferences, up to \$15,000/year for more complex research proposals. Awards may go to a single recipient or to multiple recipients and the annual maximum distribution is \$15,000. Projects that extend over multiple years will also be considered. For 2023, applications must be received at the ACF by May 31 for decision by June 30, and by September 30 for decision by October 31.

For more information visit www.avalanche.ca/foundation/funds/issw. 📌

Contributors



KARL KLASSEN has made innumerable contributions to public avalanche safety and Canada over his lengthy career. He is an internationally certified mountain guide and has held various roles in the North American avalanche community, most recently serving as Avalanche Canada's Warning Services Manager, where he played a crucial role in developing the forecasting program and creating new and innovative forecasting software. Additionally, he served as both the executive director and the president of the Association of Canadian Mountain Guides.

18 RESPONSIVE FORECAST REGIONS



TYLER CARSON, an Avalanche Professional with the CAA, has been patrolling for 21 seasons and is the current Snow Safety Supervisor at Fernie Alpine Resort. He is the secretary/treasurer of the Elk Valley Snow and Avalanche Workshop Society. In the off-season, he is a retired fishing guide and almost full-time first aid instructor who is just starting to learn that denial isn't just a river in Africa.

25 MINDING OUR MENTAL BATTERIES



DR. CHRISTOPHER B. MARSH is a postdoctoral fellow at the University of Saskatchewan, working with Dr. John Pomeroy, and is the principal developer of the Canadian Hydrological Model (CHM) and Snowcast. His research interests are in cold regions numerical modelling and the improved prediction of mountain snow covers. He has created novel ways of simulating key winter processes over large mountainous areas.

28 CANADIAN HYDROLOGICAL MODEL



BRAD ROACH lives in Golden, B.C., where he plays in the mountains with his wife and dogs while working as an avalanche technician and paramedic. He has published a book of poetry titled *Ski Bum*. Brad enjoys big days and sandbagging his friends with the statement, "only 20 more minutes."

23 WICKED LEARNING



DR. VINCENT VIONNET is a research scientist at Environment and Climate Change Canada. He has a strong expertise in modelling snow cover in mountainous terrain and its interactions with the atmosphere in support of avalanche hazard, and hydrological and numerical weather forecasting. He has proposed innovative modeling strategies to improve our current understanding of blowing and drifting snow in alpine terrain.

28 CANADIAN HYDROLOGICAL MODEL



DR. JOHN W. POMEROY is the is Director of the Global Water Futures Program, Canada Research Chair in Water Resources and Climate Change at the University of Saskatchewan, and the Director of the Coldwater Laboratory in Canmore, AB. His primary research interests are in cold regions hydrology and water quality, with an emphasis on snow redistribution and ablation processes. He developed much of the current theory on blowing snow and snow interception processes from 40 years of field work and modelling studies.

28 CANADIAN HYDROLOGICAL MODEL



front lines

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Responsive Forecast Regions

A New Approach to Defining Boundaries for Avalanche Canada's Public Avalanche Forecasts

Karl Klassen

IF YOU'VE BEEN USING Avalanche Canada's public avalanche forecasts or following our social media channels this season, you already know we've made some changes to how we display information to our users. Most notably, our old forecast regions have been replaced with flexible regions that change based on conditions. In this article I review how our forecast regions evolved over the decades, discuss the challenges presented by the traditional approach to regions, provide an overview and some background on where we're at now, and share a few thoughts on where we might go next.

HOW DID WE GET HERE?

When Avalanche Canada was formed in 2004, we inherited a set of forecast regions from the Canadian Avalanche Association, which had previously established a public forecasting program. The historical rationale for where to set region boundaries was largely based on geography, snowpack, and weather patterns. In some cases, such as in the northwest and South Coast Mountains, main ranges were split on a north-south axis, where western areas were the "wet side" and eastern areas were considered "dry." Some areas encompassed an entire range (e.g., the Cariboo). In other cases, regions cut through mountain ranges east-west, such as the North and South Columbia, which, somewhat arbitrarily, used Highway 1 as the dividing line between portions of the Selkirk and Monashee Mountains.

We did make some changes over the years and as of the 2021-22 season we had 16 regions in British Columbia, Alberta, Yukon, and Newfoundland & Labrador (Image 1). However, the constraints of the systems used for forecasting limited our capacity to make significant alterations. A lack of funding and resources also played a part, limiting our changes to relatively minor and incremental revisions.

Over the years, there have been two constants. First, our regions have always been relatively large. At the end of 2021-22, region sizes ranged from about 4,000 km² to just under 52,000 km², and our total jurisdiction was nearly 366,000 km².

Second, forecast region boundaries have been fixed. That is, they were immutable during the forecasting season and, other than an occasional tweak or two between seasons, they remained the same from one year to the next.

CHALLENGES WITH LARGE,

FIXED-BOUNDARY REGIONS

There are many challenges associated with large forecast regions. They present considerable difficulties with data density, terrain familiarity, and spatial and temporal variability. As public forecasters, communicating that variability to our users is a significant challenge.

Forecasters can publish only one set of danger ratings, avalanche problems, and discussions per region. Regional variability adds complexity to the messaging, not to mention it all must fit into the limited space of the public forecast template. When your average region size is over 22,000 km², regional variability occurs fairly regularly. When it does, users who base their decisions primarily on danger ratings may form an inaccurate impression of hazard depending on which part of the region they are travelling in. It also means users looking for more detail are forced to carefully parse information to gain an understanding of conditions in their specific area of interest.

A secondary challenge in public forecasting arises when there are large areas of uniform conditions and the weather is relatively static. In this case, forecasters are required to create essentially identical forecasts for multiple regions—a waste of resources and capacity that could be better used on other responsibilities.

WHERE ARE WE NOW—AND WHY?

We recognized that giving forecasters the ability to adjust forecast region boundaries to reflect conditions alleviates these issues. To enable responsive forecast regions, senior



IMAGE 1. AVALANCHE CANADA'S FIXED FORECAST REGIONS OF WESTERN CANADA AND NEWFOUNDLAND FROM THE 2021-22 SEASON.

forecasters were tasked with developing a set of criteria that could be used to divide our forecast area into smaller subregions. To improve our ability to communicate distinct avalanche conditions, the criteria included traditional factors such as snow climate and weather patterns, but we also incorporated more nuanced factors like backcountry user patterns and common access routes. For example, to effectively communicate risk, we agreed subregion boundaries should not bisect a high-use area or separate an access route from a destination even though geoclimatic factors might indicate otherwise.

When developing the new subregions in the summer of 2022, the forecasting team used its experience and knowledge along with data from sources like the Mountain Information Network (which helped us determine where use is concentrated) and our snowpack modelling application (which helped us visualize snowpack patterns). This exercise resulted in 92 subregions across B.C., Alberta, Yukon, and Newfoundland & Labrador (Image 2).

These new subregions were incorporated into an updated version of our forecasting software, AvIDfx 1.2, which was developed in collaboration with the Colorado Avalanche Information Center (CAIC) and launched in the fall of 2022. The new forecasting app has been adopted by the CAIC, Parks Canada, Kananaskis Country, and Avalanche Quebec. While there are many improvements, the most notable change is a feature that allows forecasters to build dynamic, responsive forecast regions.

Like always, the forecasting team develops its picture of current conditions and incoming weather using various data and tools such as InfoEx, the Mountain Information Network, our snowpack modelling app, our weather station and avalanche observation visualisation tools (Image 3), and the Mountain Weather Forecast.

And, for the first time this season, forecasters are also using a new geospatial weak layer visualisation system to support their understanding of snowpack conditions (Image 4).

As in the past, this process results in an analysis of what conditions



IMAGE 2. AVALANCHE CANADA'S NEW SUBREGIONS OVERLAID ON THE HISTORICAL FIXED REGIONS.

exist where and how conditions are expected to evolve during the forecast period. This analysis is now overlaid on the 92 new subregions instead of the traditional 16 regions. Most importantly, the new software allows forecasters to aggregate subregions into “clusters” that have similar conditions. These aggregated clusters form the forecast regions shown to the public on our map at avalanche.ca (Image 5).

As a result, when large areas are experiencing similar conditions, forecasters can aggregate large numbers of subregions and create fewer, larger forecast regions than

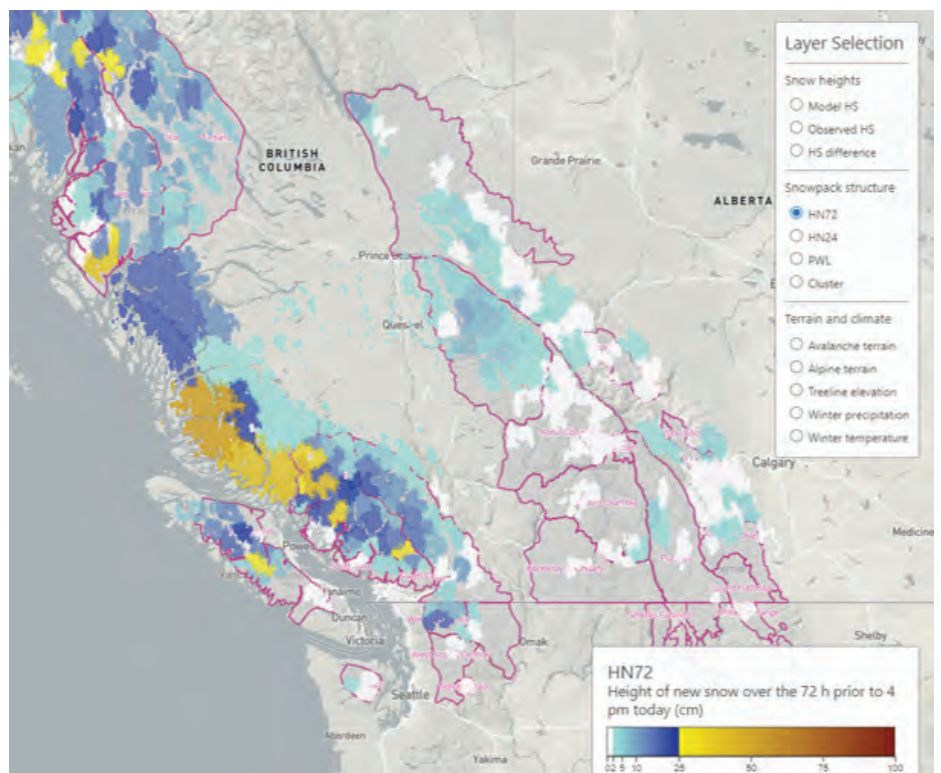


IMAGE 3. AVALANCHE CANADA WEBCAM, AVALANCHE OBSERVATIONS, AND SNOWPACK MODELLING TOOLS.



have typically been produced at AvCan. When variability is high, forecasters can aggregate fewer subregions per forecast and you might see more, smaller forecast regions than in the past. And, at times, you may see “spot” forecasts where the data indicates an anomaly within a relatively small area, perhaps encompassed by only one or two of the subregions. In short, public avalanche forecast regions are now dynamic and responsive to evolving avalanche conditions.

Because we expect to revise subregions over time as

our knowledge increases, and the internal names used by forecasters are subjective and meaningless to most users, we do not show subregion boundaries or names to users. Only forecast region boundaries are shown. Because the regions change based on conditions, they are also not named. We've removed the traditional icon with elevation band danger ratings from the map and moved to coloured regions that reflect the highest local danger rating. This, along with the ability to 'hover' over a region and see a truncated

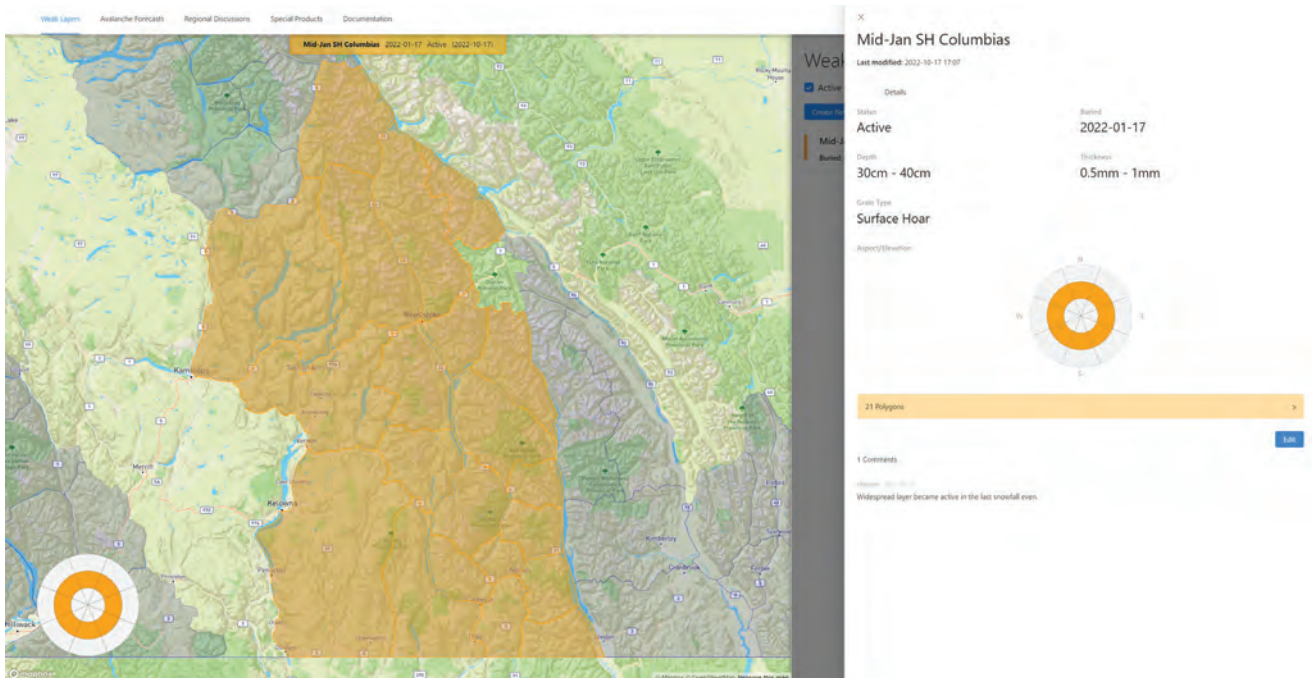


IMAGE 4. AVALANCHE CANADA'S NEW GEOSPATIAL WEAK LAYER VISUALISATION DASHBOARD.

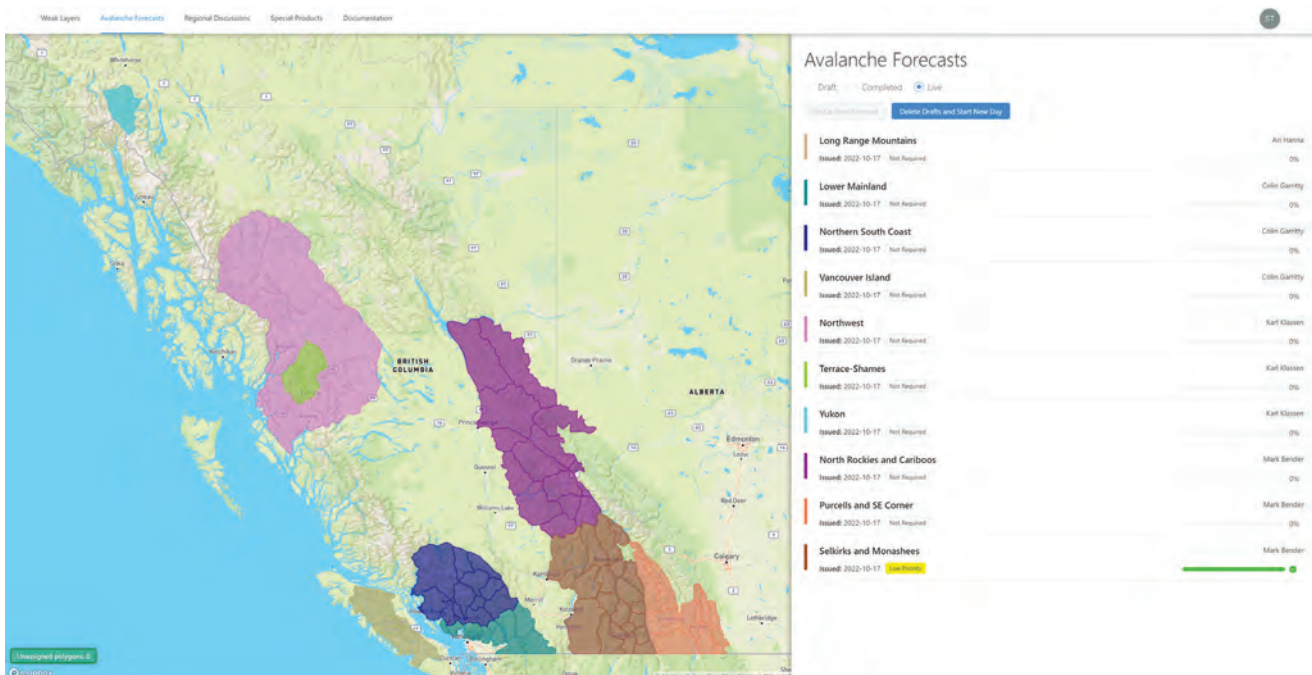


IMAGE 5. AVALANCHE CANADA SUBREGIONS CLUSTERED INTO AVALANCHE FORECAST REGIONS.

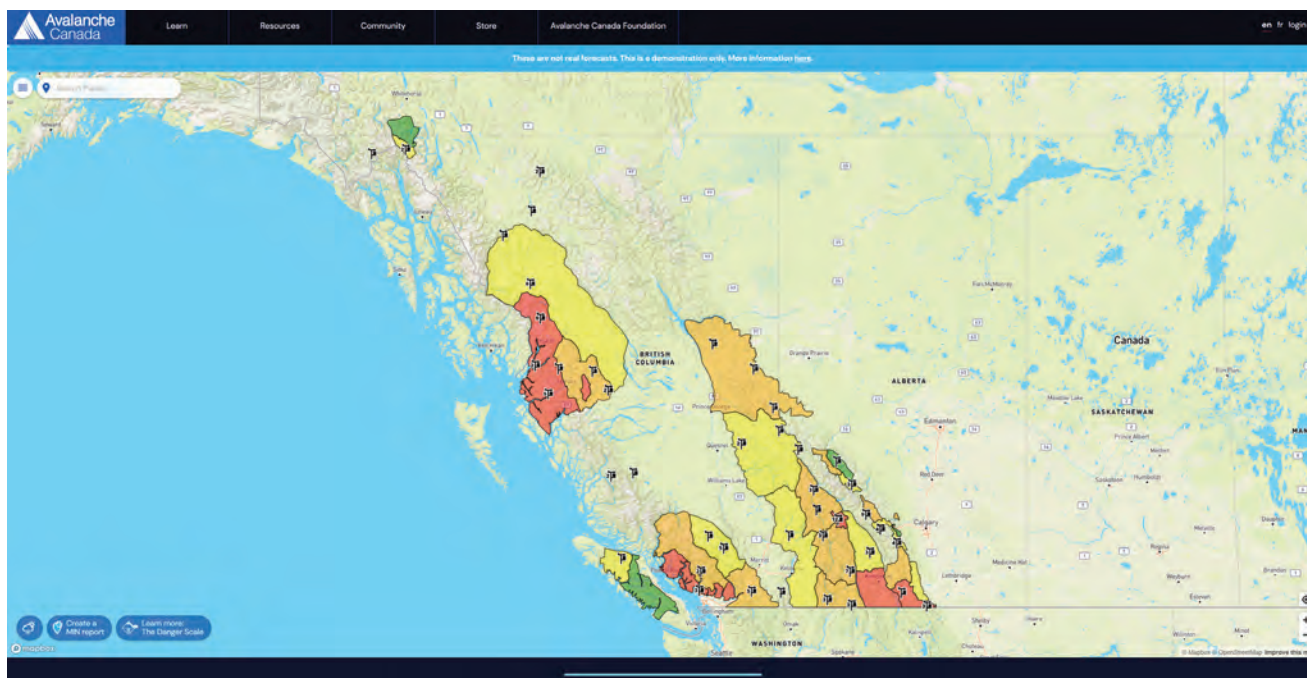


IMAGE 5. AVALANCHE CANADA'S NEW FLEXIBLE FORECASTING SYSTEM.

description of the danger rating, allows users to better visualise the danger where they plan to travel.

To make it easier for users to determine which forecast region is applicable to them, they can use the new search bar. The user enters a place name—for example, a backcountry skiing, snowmobiling, snowshoeing, or climbing destination—and selects their location from a list. The map then centres on that location and the user can open the applicable forecast with a single click.

Various other information can be added, adjusted, or removed from the map using the filter menu; notably, a colour-blind safe version is available. As in the past, popular features like the Mountain Weather Forecast and Mountain Information Network remain directly accessible by using the links shown on the map.

The changes to how our public avalanche forecasts are displayed reflect common practices in various risk communication contexts and align us with the approach used by most other major public forecasting agencies worldwide. The location tools, features, and techniques included on our map are ubiquitous in the electronic age and bring us to modern standards. Entry-level users will see features like the ones they use when navigating the non-avalanche world (e.g., searching for and finding a location on apps like Google Maps). More experienced users who use advanced mapping tools like Gaia, CalTopo, or FatMaps will feel comfortable with the new features and functions available on the new forecast map.

This new approach has solved one of our biggest challenges, which was variability in conditions across large regions. Now, our forecasters are no longer required to issue forecasts with complex and potentially mixed messages to account for variability, which results in more

effective communication of information to our users. The new system provides a forecast that is more responsive to changing backcountry conditions. It also enables more efficient forecast production and more effective forecasts, making it simpler and easier for users to plan safe trips into the backcountry.


WHERE DO WE GO FROM HERE?

We see the changes implemented this season as the starting point for an improved suite of products and services. Moving forward, we will be looking into things like:

- customising the search functionality to include even more features, such as common local names;
- a more detailed default base map;
- offering more base map options, such as satellite imagery, shaded topography, or perhaps even 3D maps; and
- updating the forecast structure, format, and iconography, including adding images and video to forecasts.

The new forecasting software and improved public display of forecasts opens the door to an array of longer-term future possibilities, such as:

- new types of avalanche information that address the needs of specific locations and/or users: for example, avalanche safety information products designed for ice climbers in the Rockies or snowshoers in the North Shore Mountains;
- computer-generated forecasts;
- integration of terrain into forecast information; and
- vastly improved decision-making support tools.

The AvCan forecasting and software development team has been working for years to create the systems we use. Those systems have allowed us to make the changes you see today. It's been a long, hard road, and we're excited about moving into a new era for public avalanche safety. 



Updates to the Public Avalanche Danger Scale

James Floyer






THIS SUMMER, A WORKING GROUP agreed to make some minor, but important, updates to the North American Public Avalanche Danger Scale that have been implemented for the 2022-23 winter season. In Canada, the public avalanche safety agencies were represented by Avalanche Canada and Parks Canada. In the U.S., they were represented by the Forest Service and the Colorado Avalanche Information Center. The updates improve accessibility and increase clarity.

The extreme category now has its own unique icon that is coloured black to match its category colour. Previously, the same icon was used for both extreme and high danger levels and was coloured red. Each danger level category now has its own distinguishing icon and colour; this is more logical than the previous version and removes any ambiguity regarding which category is being referenced.

Also, in extreme, the statement, “Extraordinarily dangerous avalanche conditions,” was added to the Travel Advice. This summary statement conveys the exceptional avalanche danger present when this category is in use. Adding this brings consistency, since all the other categories have a summary statement.

The additional design changes are intended to increase legibility and accessibility. Colour contrast has been significantly improved, which is a key component of accessibility for people with visual disabilities, including colour blindness. The font size has been increased, making the text easier to read, and the table has been arranged with good spacing and subtle shading to provide a clean and clear reading experience.

The updated danger scale is more intuitive and easier to interpret. You can download the new scale at github.com/NationalAvalancheCenter/north-american-public-avalanche-danger-scale.

North American Public Avalanche Danger Scale			
<i>Avalanche danger is determined by the likelihood, size, and distribution of avalanches. Safe backcountry travel requires training and experience. You control your risk by choosing when, where, and how you travel.</i>			
Danger Level	Travel Advice	Likelihood	Size and Distribution
5 - Extreme	 Extraordinarily dangerous avalanche conditions. Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	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.

Wicked Learning

Brad Roach



THE AUTHOR'S DOG, ACHILLES. // BRAD ROACH

ON MARCH 22, 2014, I triggered a size three avalanche while ascending a slope I deemed safe.

The energy I felt under my feet was something I will never forget. I recall looking around for fracture lines, seeing an unbroken slope, then looking up to my ski partner Dev and seeing him already 50 m above me. In an instant, I was hit with the hard blocks of a large slab and I went down into the chaotic nightmare that I would revisit in my dreams for years to come. As I was ripped violently down the slope, the tenuous hold on my mortality became clear. In that moment, it appeared I had lost my grip. I hit a tree and wrapped myself around it, clinging to this piece of hope as the debris smashed into my body.

Then, silence.

Adrenaline coursing through my body, I let out a primal scream of both terror and joy. Dev returned the call, remaining safe near the flank of slide. It was only after this moment that I realized that my dog was not there. Getting my probe out, I began searching the debris, but it had piled up deep into the wetland below. The debris was over five metres deep and my probe was 280 cm long. As night fell, Dev headed back to the cabin. I searched for hours before accepting my decision-making had killed my companion.

In the darkness, I wept.

THE AFTERMATH

I would find Achilles in the summer with my lost gear, the visage of advanced decomposition with its carrion smell burned into my mind. Imprinted there was both a sense of loss and a savage reminder of how close I had come to a similar end.

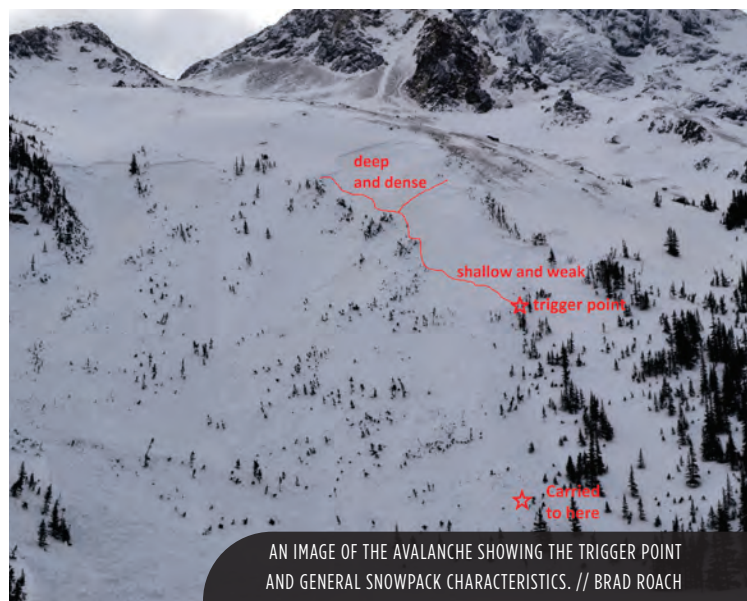
When I left the accident and sent out my avalanche report, it hit social media with a flurry of activity. As an aggressive skier logging over 100 days of touring a year, with many days of poor decisions, there was a backlash from a small percentage of the community. Most messages were supportive, but I gravitated toward the minority expressing the sentiment: "You had this coming."

The pain was real because they were right, but it had an alienating effect. I headed for another round of post-secondary education in an attempt to give up the ski life. This failed miserably. Instead, I joined ski patrol and the professional side of the snow fence.

As I gained education and experience, I also met many mentors, friends, and acquaintances who had similar experiences that resulted in deep mental wounds. Many of these people had wounds so deep, they would never heal. There are so many in this industry who have mental injuries from near-death experiences, coupled with loss and survivor's guilt. For some, the healing process is nearly impossible.

An avalanche educator who was familiar with my personal accident introduced me to the concept of the wicked learning environment (Hogarth et al., 2015). This concept is that in avalanche terrain, we often lack the correct feedback to make effective decisions. Furthermore, our poor decision-making is often rewarded with fantastic skiing. Due to the elements of spatial variability and heuristic traps, we may come so very close to a fatal decision and receive positive feedback for our transgression (Johnson et al., 2020).

Part of the anger I felt towards my critics was that many of the most hurtful comments came from those with the least amount of experience with backcountry travel. Many of these individuals may have made similar decisions without triggering an avalanche, strengthening their confirmation bias. Some had simply not been out in avalanche terrain long enough to realize their vulnerability. It does take time to get sucked into the Bayesian vortex of avalanche accident probability, which gets increasingly complex and unpredictable with increased exposure, even with considerable safety margins (Ebert, 2019).



AN IMAGE OF THE AVALANCHE SHOWING THE TRIGGER POINT AND GENERAL SNOWPACK CHARACTERISTICS. // BRAD ROACH



EIGHT YEARS LATER

The memory of my avalanche remains fresh, but the mental injury has largely been healed. Occasionally, there is a trigger that reopens the experience for a short while, but it is no longer a consuming and negative energy as it was for the first several years. My empathy for anyone in an avalanche with lasting impacts is far more real than it was before the event. I also feel like mountain communities are starting to abandon a blame culture and become more supportive of avalanche victims. Empathy and support are needed after critical incidents. We, as backcountry travelers, have all had moments where the wicked learning environment rewarded us for a transgression that caused unimaginable pain and trauma to another.

The nature of this environment still gives me pause. Touring recreationally with my wife, the concept of losing her through my own poor decisions is deeply troubling. With all the education and experience from the past eight years, I am still unconvinced I will not get caught again in a very similar low-probability, high-consequence situation. While I would like to think I am safer now than I was in my twenties, I also realize it is this exact thinking that may cause a similar situation.

As a skier, I seek out new experiences, big journeys, and deep snow. This pursuit means I am inherently vulnerable to the undeniable risks in the mountains. I will continue to be rewarded for poor decisions. While I respect the power of large avalanches and the value of terrain selection more now than before, the biggest realization I've had is how vulnerable we are to the power of the mountains and the holes of our cognitive bias.

The wicked learning environment is not often a place of gentle lessons. It can have harsh repercussions for the most minor of infractions, yet it is also a place where we can gain great meaning, wisdom, and resilience.

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Minding Our Mental Batteries

Fernie Ski Patrol's Mental Health Journey

Tyler Carson

SOMETIMES THE ROAD AHEAD can look short and smooth—just follow Siri's directions turn-by-turn until you reach your destination. Not everything in life is like this though. When you start off not knowing where you are or where you are going, it's hard to tell where to start.

For Fernie Alpine Resort's ski patrol, our journey began several years ago after a few incidents where being reactionary to high-stress events could have gone better. It took us time and reflection to see a way forward. Many of the patrollers were finding ways to cope, but those methods were actually detrimental to their mental health. We came from a culture of just going out drinking off the day's worries, working so hard you didn't have time to reflect, and finding other Band-Aid solutions. When the time came that we knew a change was needed, we started out by planning a systematic approach to dealing with critical incident stress occurrences. We basically came up with a playbook: when a critical incident happens, we go through these steps and solve the problem.

Things started slowly. We implemented debriefs that had meagre turnouts and few patrollers benefitted from them. This system only dealt with one incident at a time and didn't take into consideration the ongoing effects of multiple events, seasons, and lifetimes of exposure not just to work stresses, but to events that happen when we are not at work and just living the human experience.

In the fall of 2018, with support from all levels in our company, we brought in a trainer for the Road to Mental Readiness™, now known as the Working Mind First Responders, through the Mental Health Commission of Canada. All patrollers, as well as some upper management, participated in this workshop. It brought us some tools and training to help identify our current personal mental health state and gave us some tools to cope. Problem solved, case closed, boxes ticked.

Then, on Nov. 6, 2019, a very short time before staff training started, a key member of our patrol team died by suicide. We felt like we had driven off the road.

How could this have happened? We were taking the right steps, we were on the road, and we had a map of where we thought we were going. For a short while we stumbled around lost, doing the best we could on our own. Members of our team recognized the need for external help and connected with an excellent mental health resource within our community, the Elk Valley Suicide Task Force. Reaching out to them and bringing in trained professionals was key to our collective healing and getting to a place where we could see a way forward.

At the start of the 2020-21 season, we knew the winter would look different, with separated shifts and limited gatherings due to the pandemic. We included basic mental health training and gathered a diverse group of willing speakers from within the team, who shared their own journeys with mental health in order to reduce stigma. The more we shared, the more we saw empathy spread and the more willing everyone was to share their own struggles and successes. We also started to put into place an informal strategy to optimize our communication when one of the few opportunities presented itself.

A great analogy that we discussed in training likened our transceiver batteries to our personal batteries. As patrollers, we check our transceiver batteries daily, but what about our personal ones? Nik Dunn, a patroller early in his career, gave me a good description of how this self-assessment worked for him. He talked about how everyone has an internal battery that can be affected by sleep, stress, experiences, and more, and related it to the battery in our transceiver. He suggested that every morning when I check my transceiver battery, I should also check my internal battery.

"Initially, I thought relating your transceiver battery to your internal battery sounded kind of silly, but it's safe to say I'm glad I gave it an honest shot. The season proved to be a challenging one and having that self check-in and team check-in with my partner was extremely valuable for setting a foundation for the day," explained Nik. "I find it very easy to be hard on myself, and just having a quick check-in and saying, 'OK, my internal battery is at 75% today' allows me to be a little bit more kind and understanding to myself. I think this goes a long way toward my patience and empathy as a



FERNIE SKI PATROLLERS DURING A TRAINING EXERCISE. // K. JOHNSON



professional. It is also a valuable tool to bring up and form an understanding of where my partner is on any given day before we head out on a route. This process, which I thought to be kind of cheesy at first, has really proven to be a useful tool I now use daily.”

When Nik provided his explanation to me, it hit me that we were making progress slowly and uncomfortably, but it was happening. In the fall of 2021, we added a peer support group to our team that was made up of volunteers within our department who had attended peer support training. They supported both individuals and the group by organizing activities, providing an ear for individuals, and helping to give direction and information for ongoing and greater support. Naturally, there are members within the team that carry the larger load just by virtue of their role in the department, their personality, or their schedule. This, unfortunately, increases mental health challenges for the peer-support team.

In the later part of the season, we noticed an even bigger shift. After multiple critical incidents, we initiated group debriefs that weren't tied to our working hours and open to anyone to attend. We made sure to connect with external mental health professionals and offer a warm, inviting atmosphere for people to feel comfortable sharing where they were at. We had done these kinds of debriefs in the past, but something shifted last winter and the turnout was beyond anything we had previously seen. This was a launching point for moving beyond a small team of peer-

support members carrying the biggest load and really becoming a workplace that put a priority on caring for each other every day, especially when a critical incident happened.

After any of our high-stress situations, of which there can be many on a ski hill, we have built a system of support that relies on all the previous training and experiences. We utilize the Road to Mental Readiness and we check in on our internal batteries. We have gone beyond a small group of peer support members and are working our way to a more holistic approach to mental health. Our entire team is learning there are co-workers that are safe to talk to and have many shared experiences. We are becoming comfortable holding space for the vulnerability of each individual's well-being.

Using this formal and informal method is hopefully leading us down the road to a more sustainable level of mental health. We have discovered the value of speaking about mental health and how making it a more common part of our vocabulary helps to make seeking help more acceptable and reduces stigma. Our journey may not work for everyone, but you have to start somewhere. The one thing we have learned is your approach needs to be diverse and multi-faceted to meet people where they are. We see that not every two steps forward can come without a step backwards, and that's OK. Like Nik says, we all need to identify when we need to show ourselves a bit more empathy and understanding. 📌





in the loupe

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CANADIAN
HYDROLOGICAL MODEL



The Canadian Hydrological Model A New Way to Estimate Snowpacks in the Canadian Rockies

Christopher B. Marsh¹, Vincent Vionnet^{2,1}, John W. Pomeroy¹

¹Centre for Hydrology, University of Saskatchewan, Canmore and Saskatoon, Canada

²Meteorological Research Division, Environment and Climate Change Canada

INTRODUCTION

In the Canadian Western Cordillera, spring snow melt supplies the majority of water that generates streamflow, recharges lakes, wetlands, and groundwater, and results in the largest river discharge events of the year. Globally, billions of people depend on mountain headwaters for fresh water (Viviroli et al., 2007). In Canada, over 60% of the flow of the Saskatchewan River is provided by melting snow and almost all of this comes from the Canadian Rockies headwaters (Pomeroy et al., 2005). There is significant motivation to improve predictions of this critical water storage to aid in water supply forecasts for downstream floods, hydroelectricity generation, irrigated agriculture withdrawals, ecosystem management, reservoir management, ecotourism, and drinking water withdrawals. These snow covers are also a critical component of ski and snowboard tourism, safe backcountry travel, and infrastructure protection. The alpinist, avalanche professional, and snow hydrology research communities share a common interest in quantifying the variability of these snow covers, and how they are changing due to climate and land-use change.

Mountain snow covers are highly variable in space and time due to many interacting factors. Snow cover heterogeneity is principally influenced by the transport of blowing snow (Pomeroy et al., 1993; MacDonald et al., 2019; Mott et al., 2010; Marsh, et al., 2020; Vionnet, et al., 2021) leading to the loss of up to 30-40% of total winter precipitation in alpine regions (MacDonald et al., 2010; Mott et al., 2018). Wind scours snow from ridgetops, forms deep snow drifts in the lee of ridges and at treeline, and forms avalanches (Bernhardt and Schulz, 2010) that often start in deep snow drifts formed on the leeward side of ridges.

Avalanches transport snow from high-elevation, lower-melt-rate locations to higher-melt-rate, lower elevations located down slope and in valley bottoms (Bernhardt and Schulz, 2010). They create areas of significant snow depth at the base of steep slopes (Bernhardt and Schulz, 2010), which may be shaded locations that allow the deposit to persist late into the summer. These can also supply extra snow to glaciers. These deep and cold snow accumulation locations can be found at lower elevations, which impacts the rate and timing of snow cover ablation (DeBeer and Pomeroy, 2017). Figure 1 shows an example of the spatial variability of snow cover resulting from blowing snow and avalanches.

The forest canopy is also very important to the development

of mountain snow covers (Pomeroy and Gray, 1995). Snow is intercepted in canopies for periods from hours to weeks in winter. It is subject to sublimation to water vapour, unloading from the canopy, or melt in situ on the canopy, from where it drips to the ground (Pomeroy et al., 1998; Ellis et al., 2010). This results in “tree wells” of shallow snow under isolated evergreens and much lower snow accumulation under dense forests than in nearby clearings.

It is exceptionally difficult to observe snow depth and snow water equivalent (SWE) over large areas. Direct observation via snow courses and automatic stations are spatially sparse (DeBeer et al., 2021) and tend to be confined to low-to-mid elevations, sheltered sites, and forest clearings. Snow pit observations can provide detailed information of the snowpack, but only at one site, and so do not represent the heterogeneity of mountain snowpacks. This results in biased sampling and under-measurement of high-elevation mountain snow covers.

Remote-sensed observations of snow cover from aircrafts, Unmanned Aerial Vehicles (UAV), and satellites have increased in availability and fidelity over the past 20 years (Hopkinson et al., 2012; Deems et al., 2013; Tedesco et al., 2014; Painter et al., 2016); however, none are by themselves a complete solution. Airborne laser altimetry (lidar) and structure-from-motion photogrammetry provide high-resolution observations of the elevation of the snow surface in open areas, but it is unable to reliably sample snow depth under dense forest canopies (Hopkinson et al., 2012; Schirmer and Pomeroy, 2019; Harder et al., 2016, 2020). Satellite lidar and microwave are at a coarse spatial resolution, have limited repeats, and are highly uncertain in forested and steep terrain (Treichler and Kaab, 2017). Thus, the accurate prediction of snow cover via numerical models is therefore an avenue of interest for estimating SWE. This is only possible when incorporating the full set of snow processes such as blowing snow and avalanching.

THE CANADIAN HYDROLOGICAL MODEL

The Canadian Hydrological Model (CHM) (Marsh et al., 2020b) is a numerical modelling framework that enables the accurate and timely estimates of snowpacks by including key mountain snow processes that have so far been ignored in water supply models. This includes blowing snow, avalanching, snow interception and sublimation, and the impact of terrain shading, slope and aspect on snow melt rates.

A key innovation of CHM is how topography is represented. Most hydrological and atmospheric models consider the ground to be flat and either ignore or lump landscapes together using a fixed grid. CHM uses variably sized triangles to represent the topography. Each triangle is a computational element with a unique and individually simulated SWE and blowing snow transport flux. In areas with complex and varying topography, where increased fidelity is required, smaller triangles are used to better represent the landscape. For example, they may be used to capture the details of an alpine ridge or the transition from forest to alpine. Where the topography and land cover are more homogenous, such as open prairies, larger triangles can be used. By using larger triangles, fewer total triangles are required, reducing the computational requirements.

Judicious use of variably sized triangles allows the landscape to be represented with often only 1% of the total number of computational units that was previously needed to be used in fixed-resolution models. This reduces the computational burden and allows for simulating larger regions and incorporating snow redistribution and melt processes that are critical for snow cover heterogeneity. These triangles are shown in Figure 2 where, from left, the triangles are made increasingly coarser and thus represent the landscape less and less well. Figure 3 shows a set of variably sized triangles that were generated to capture the transition from treeline to alpine. The triangles are shaded green corresponding to vegetation density (unitless), with the darker green denoting higher density. Smaller triangles are found along river valleys and at treeline in order to capture these important areas.

In CHM, snow accumulation and ablation are simulated by solving the energy balance equation to determine the energy from solar and thermal radiation, turbulent transfer from the atmosphere, condensation of water vapour, energy advected

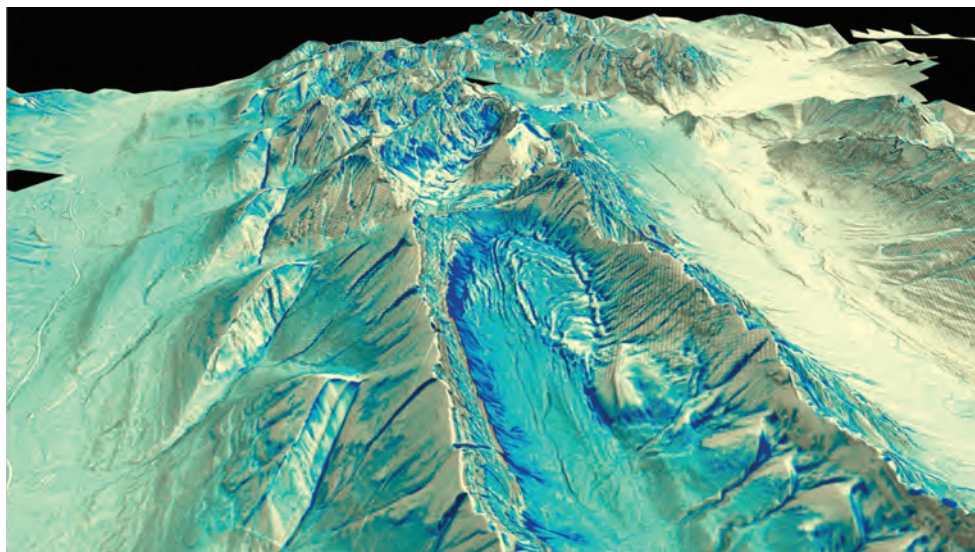


FIGURE 1. A 5 M RESOLUTION 3D MAP OF SNOW DEPTH DERIVED FROM AIRBORNE LIDAR OVER THE KANANASKIS REGION ON APRIL 27, 2018. DARK BLUE CORRESPONDS TO DEEPER SNOW COVERS.

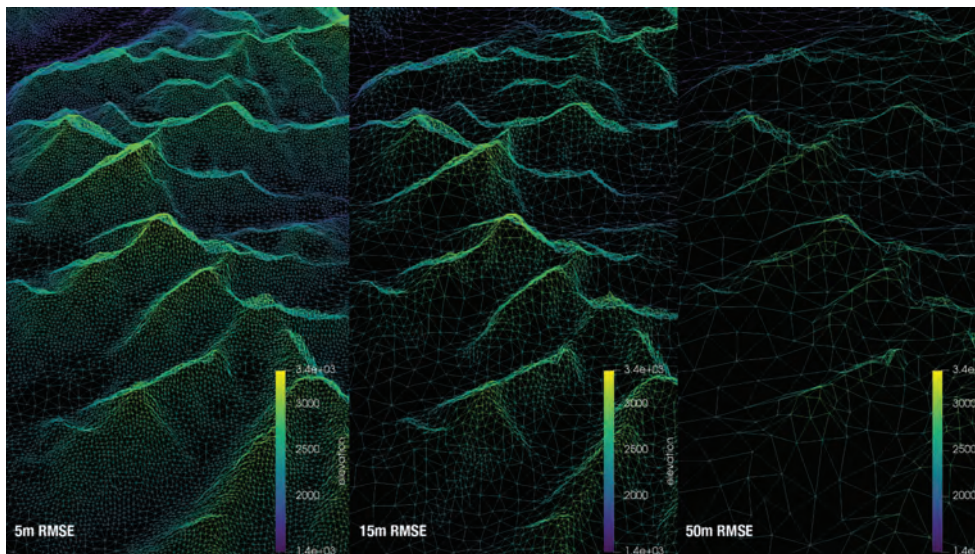


FIGURE 2: VARIABLY SIZED TRIANGLES REPRESENTING A MOUNTAIN WITH INCREASINGLY COARSE APPROXIMATION TO THE SURFACE. ELEVATIONS ARE GIVEN IN METRES, AND A) 5M ROOT MEAN SQUARE ERROR (RMSE), B) 15M RMSE, AND C) 50M RMSE. A LARGER RMSE MEANS A COARSER REPRESENTATION OF THE LANDSCAPE.

from rainfall, and energy conducted from soil or rocks available to sublimate and melt the mountain snowpack. This approach, versus simpler approximations that are based only on air temperature, ensures much higher fidelity in calculating melt rates in complex mountain terrain, forested and open environments; and for both current and future climates, as it is not calibrated to sparse historical observations. Energy balance snow models are the only type that can accurately predict snowmelt due to mid-winter melts and rain-on-snow events; and to snowpacks on shaded or very sunlit slopes. The redistribution of alpine snow by wind, its in-transit sublimation, and the associated loading of snow drifts on leeward slopes are explicitly simulated in CHM.



This simulation is the result of almost 40 years of blowing snow studies in various environments, including Scotland, Canada, and the U.S. (Pomeroy, 1989). Wind speed and turbulence estimates are necessary to calculate blowing snow fluxes. In CHM, they are provided by using an approximation to a numerical wind flow model that ensures fast runtimes (Wagenbrenner et al., 2016).

The avalanching scheme used in CHM is a method to redistribute snow to lower slopes by gravity (Bernhardt and Schulz, 2010). It is not a 3D avalanche model that simulates the timing of avalanche release and subsequent flow dynamics. In its current configuration, it cannot be used to assess avalanche hazards, paths, extents, or provide hazard forecasting. Accounting for this type of snow redistribution for hydrological purposes is different from classical avalanche hazard forecasting, although both require understanding of high-alpine snow covers. Rather, the snow gravity redistribution calculation in CHM is just an information tool to permit more accurate mapping of SWE by moving high-elevation snow to lower elevations based on observed relationships between slope steepness and snow depths after avalanching.

The model also deals with the effects of treeline and sub-alpine forests on snow accumulation, interception, sublimation, and sub-canopy snowmelt. In summary, CHM provides unique information for the distribution of snow over large mountain areas because it is capable of fine scale calculations (e.g., 50 m length scale on ridges) and scalable to continental areas.

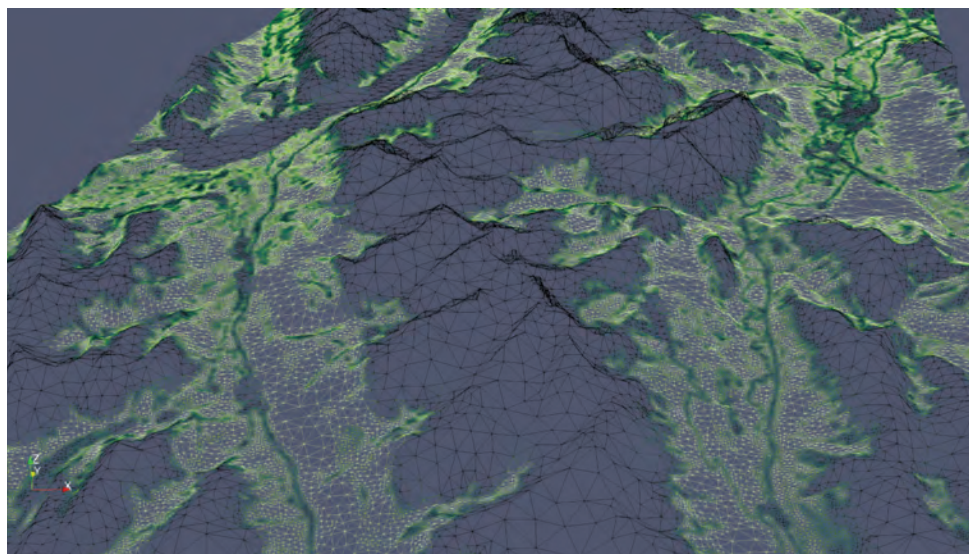
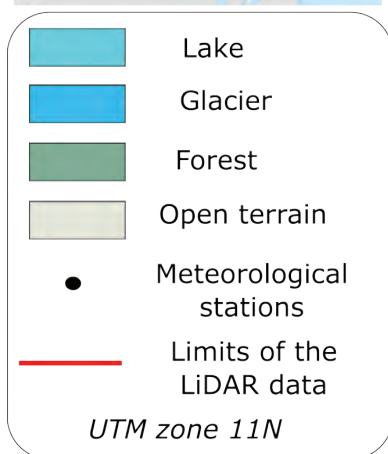


FIGURE 3: MESH GENERATED TO OPTIMIZE FOR REPRESENTING THE VEGETATION DENSITY. DARKER GREEN CORRESPONDS TO MORE DENSE VEGETATION (UNITLESS). THE SMALLEST TRIANGLES ARE FOUND ALONG THE RIVER VALLEYS (THE RIPARIAN VEGETATION) AND THE TREELINE TRANSITION.



Land Cover

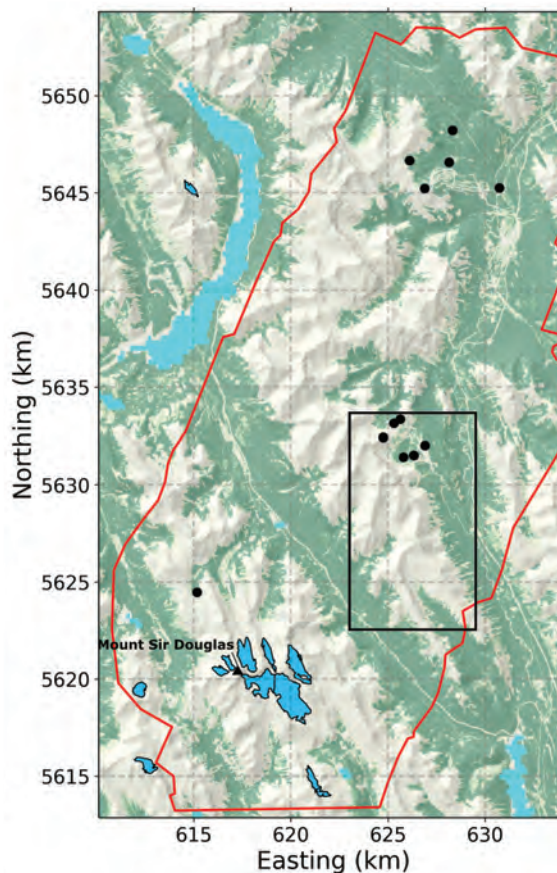


FIGURE 4. LAND COVER MAP OF THE KANANASKIS VALLEY, ALBERTA, STUDY DOMAIN. THE BLACK CONTOURS CORRESPOND TO THE LIMITS OF THE AREA SHOWN IN FIGURE 5. THE SUBSET REGION IS THAT SHOWN IN DETAIL IN FIGURE 5.

SIMULATION OF MOUNTAIN SNOW COVERS

In Vionnet, et al (2021), CHM was used to simulate the mountain snow covers around the Kananaskis valley on the eastern slopes of the Canadian Rockies. This study combined:

- the atmospheric forcing from the Environment and Climate Change Canada numerical weather prediction system at a 2.5-km grid spacing (Milbrandt et al, 2016); and
- a wind-downscaling strategy relying on a diagnostic wind model capable of generating realistic estimates of wind speed and direction at 50-m resolution in alpine terrain.

Covering an area of 958 km², the study area is characterized by a complex and rugged topography with elevations ranging from 1,400 m at valley bottom up to 3,406 m at the summit of Mount Sir Douglas (Figure 4). The region is an active snow hydrology research area and includes several research basins, snow surveys, and high-elevation weather stations that are part of the University of Saskatchewan's Canadian Rockies Hydrological Observatory.

Vegetation cover (Figure 4) follows elevational gradients, with variation due to surficial geology, slope, and aspect. Evergreen forests predominantly cover the lower slopes and valley bottoms; short shrubs and low vegetation are present just above treeline; and exposed rocks, glaciers, talus, and grasses are found in the highest alpine elevations and on steep slopes at lower elevations.

Model evaluation was done against airborne lidar surveys. The measurements were taken from two flights: one on Oct. 5, 2017, (late-summer) and a second on Apr. 27, 2018, (winter scan) by Professor Brian Menounos and his team at the University of Northern British Columbia. These observations had a horizontal and vertical positional uncertainty of ± 15 cm (one standard deviation).

The configuration of CHM used in Vionnet, et al (2021) included the critical winter processes identified as important in this region: energy balance calculations for snowpack melt and sublimation; terrain shadowing, slope, and aspect for incoming solar radiation; precipitation type (rainfall vs. snowfall) estimation; forest canopy snow interception, melt, and sublimation; blowing snow redistribution; and avalanching. To quantify the impact of not including key processes, a falsified simulation was performed where avalanching and blowing snow were not enabled. These results are shown in Figure 5.

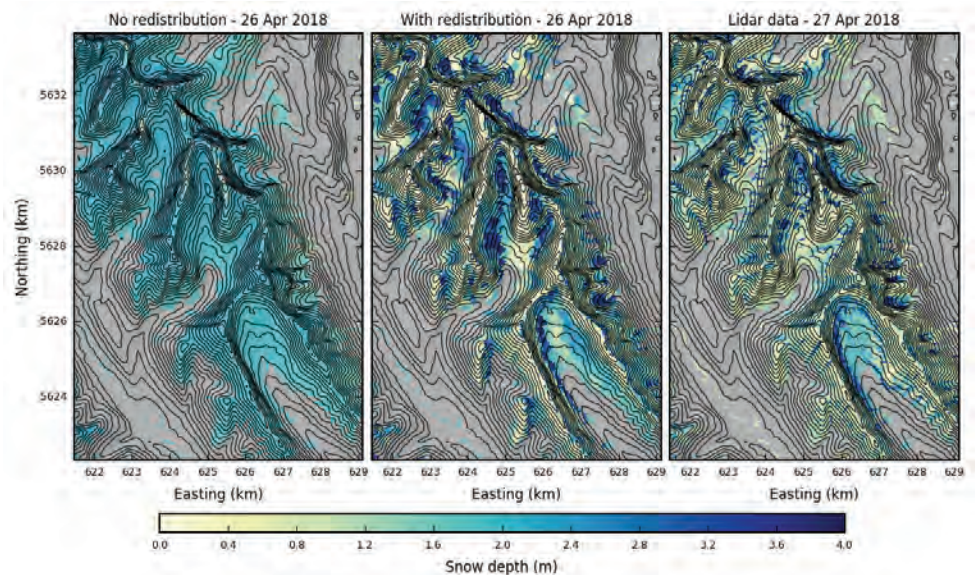


FIGURE 5 SNOW DEPTH ON APRIL 26/27, 2018, AS SIMULATED BY CHM FOR (FROM LEFT): NO BLOWING SNOW OR AVALANCHES; WITH BLOWING SNOW AND AVALANCHING; AND SNOW DEPTH ESTIMATED FROM AIRBORNE LIDAR OBSERVATIONS. BLACK ISOLINES CORRESPOND TO 50 M ELEVATION BANDS.

Snowpack simulations without blowing snow and gravitational snow redistribution were not able to simulate the spatial variability of snow cover in alpine terrain. Without these processes, there was a significant overestimation of snow depth and snow cover duration at high elevations. Including these processes improved the model results dramatically and reduced the snow depth over-estimation at high elevations. Including these processes provided the best estimates of the shape of the elevation-snow depth relation across the region and reproduced the decrease in mean snow depth found at high elevation, something intrinsic to mountain snowpacks around the world (Pomeroy and Gray, 1995).

DISCUSSION

High mountain headwaters are a critical supply of freshwater for downstream ecosystems and communities. Blowing snow and avalanche redistribution are key processes that move snow from high to low elevations, or to shaded, north aspects, where snow melts more slowly. The deep snow drifts and avalanche deposits have an inordinately important role in summer streamflow; sustaining glaciers and perennial snowfields; and supplying water for treeline forests and valley bottom wetlands (DeBeer and Pomeroy, 2010; Pradhananga and Pomeroy, 2022; Pomeroy et al., 2012).

Observed changes in air temperature and precipitation due to climate variability and climate change will continue to have profound global impacts on high-mountain snow. DeBeer et al., (2021) summarized the majority of observed snowpack changes in western Canada where warmer air temperatures are a dominant cause of change (Brown et al., 2011). These changes led to reduced snow cover extent, snow depth, and snow-covered periods due to an earlier spring and more frequent mid-winter melts (Brown et al., 2020; Musselman



et al., 2021; DeBeer et al., 2021; Mudryk et al., 2018). The increased occurrence of mid-winter melts at mid and high elevations that are snow covered late in the season (McCabe et al., 2007; Corripio et al., 2017); and rain-on-snow events have profound implications for the structure of the snowpack, such as the creation of ice lenses.

The exact impact of warming snow covers on avalanche formation remains unknown (Strapazzon et al., 2021), however, there is evidence there may be a decrease in mid-winter low-elevation avalanches and an increase in the occurrence of wet-snow avalanches (Strapazzon et al., 2021). Pomeroy et al., (2015) predicted a 50% reduction in blowing snow transport and decrease in sublimation of 30% with climate warming of 5 C in the front ranges of the Canadian Rockies. There are therefore reasons to expect a substantial reduction in the ability of blowing snow to supply snow to cornices that supply avalanches in the future, and profound implications for the distribution of snow cover and the existence of melting snow patches and glaciers in the summer.

There is a timely need to forecast potential changes to mountain snow covers due to climate and landscape change, and increased water supply prediction needs downstream. To do so requires advanced next-generation numerical models like CHM that are coupled with expert in situ knowledge and observations. A strength of CHM is its ability to calculate wind loading on slopes in complex terrain, which is critical for mountain blowing snow and avalanche calculations. It is anticipated model improvements will lead to a new form of fine-scale snow prediction that can be made available over large areas and coupled with Environment and Climate Change Canada's weather forecast system, but available at resolutions down to tens of metres. The quasi-operational tool SnowCast (www.snowcast.ca), where CHM is run in a forecast mode, is an example of such a tool that could potentially pair well with citizen science snow observations and help alleviate the gaps in point observations of snow covers. Although it cannot be used to inform about avalanche hazard risks, it shows the spatial development of the mountain snow cover. It is hoped that tools such as Snowcast can support broader conversations in the mountain community about snow in the mountains.

The alpinist, snow avalanche professional, and snow hydrology research communities are all facing the impacts of rapidly changing mountain climates and snow regimes. This has led to the inability to predict future snow based on the past. These communities need to continue to strive to better understand this changing environment, its changing snow and the repercussions for all those who depend on these areas for recreation, livelihoods, homes, water supply, climate regulation and the appreciation of natural environments.

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2003 retrospective

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2003 RETROSPECTIVE

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ON JAN. 20, 13 PEOPLE WERE BURIED when an avalanche was triggered while they were climbing a slope known as La Traviata while ski touring out of the Durrand Glacier Chalet. Seven people died: David Finnerty, Naomi Heffler, Craig Kelly, Kathleen Kessler, Ralph Lunsford, Jean-Luc Schwendener and Dennis Yates.

Twelve days later, on Feb. 1, 14 students from Strathcona-Tweedsmuir School, their two instructors, and one other adult were struck by a natural avalanche that roared down from Mount Cheops while they were traveling up the Connaught Creek drainage in Rogers Pass. Seven students died: Ben Albert, Daniel Arato, Scott Broshko, Alex Patillo, Michael Shaw, Jeff Trickett and Marissa Staddon.

Fifteen more people died in avalanches that winter.

Over the next 19 pages, *The Avalanche Journal* looks back at those accidents and that winter through the words of people who experienced them first-hand or dealt with the fallout. The goal is to not revisit what happened those days, but to reflect on their impacts on the avalanche industry. The opinions and views presented are those of the authors and do not necessarily reflect the official policy or position of the Canadian Avalanche Association. // CAA ARCHIVES

2003: A Winter That Called Us to Evolve

Ken Wylie

ETCHED IN MY MEMORY is the image of 15-year-old Daniel Arato's lifeless body laying atop jumbled heaps of snow and shattered timber. His unnatural pose revealed the violent forces he experienced. Witnessing this young man, along with the six classmates from Strathcona-Tweedsmuir School who shared his fate, left us deeply shaken. We stood as mountain professionals and rescuers in the Connaught Creek valley beneath Mount Cheops in Glacier National Park. Dismay was written across all our faces as responders, as if to ask: "What will we do with this?"

I had reason to ask this same question 12 days earlier, having survived being fully buried under the snow for 45 minutes, and learning that seven of our professionally guided clients had not. I sat shivering in the back of a helicopter lifting away from the tumultuous response to the La Traviata avalanche in the Selkirk Mountains of British Columbia wondering: "What will I do with this?"

A lifetime of engaging with the mountains has taught me their power is subtle, until it is not. Critical information for effective decision-making, I now know, requires the greatest sensitivities of my humanity to capture. The key to calculating exposure to peril, or in managing the crushing devastation after having failed to do so, is courage, humility, and compassion expressed as listening.

The first dire report landed on Jan. 20, 2003, and forever altered the lives of parents, wives, a husband, a fiancée, sisters, brothers, daughters, and friends of those who died at La Traviata. On February 1, it was the adolescents' turn, as dispatches reached parents, teachers, siblings, families, janitors, and friends. When the powder cloud of these avalanches settled and news about these catastrophes encircled the globe, the heartbreak was bigger than any of us could have imagined. Our fairy tale ideals about mountain adventure burst with a searing dose of reality, and our illusions about our individual and collective competence crumbled. We were suddenly dropped into profound uncertainty, without effective tools to navigate such a unique, emotional environment. This scared the hell out of us.

Fear either helps us usher in a wise response, or we allow it to run the show. 2003's tragedies challenged two communities—Strathcona Tweedsmuir School and the mountain professionals—to choose a series of responses that would lead to evolution. Only one group succeeded.

In the case of the Connaught Creek disaster, the change agents were resilient individuals who understood that a tragedy of this magnitude required transformation to foster growth and development. Judith and Peter Arato were grieving parents with strong hearts and a courageous

tenacity. After several months advocating for change in youth outdoor programming, and initially encountering complacency from the school and Parks Canada, they were fortunate to find Alan Latourelle, then CEO of Parks Canada. Not only did Latourelle have the humility to listen, but he also had the courage to create the right environment for change. In support of the Aratos, resources were put in place and the long, hard work of listening, engaging, and uncovering the truth began. The results were potent, including the creation of the Avalanche Terrain Exposure Scale and Custodial Group Policy, which both addressed risk tolerance for youth.

The Aratos' and others' efforts spawned additional changes, including an evolution of the entire risk management culture at both Strathcona-Tweedsmuir School and the Calgary Board of Education; improved avalanche forecasting; and several other initiatives. The school also built a memorial to Ben, Daniel, Scott, Alex, Michael, Marissa, and Jeff, and they host a commemorative event each anniversary. In a recent discussion with their current Head of School, Carol Grant-Watt, she articulated it is their "sacred responsibility" to continually learn and embody ongoing lessons from the 2003 event.

However, youth losing their lives in the Strathcona-Tweedsmuir School tragedy served as a formidable distraction from the fact that much more egregious leadership errors were made at the separate La Traviata event. As one astute individual senior guide put it: "The school teachers exposed their group of 17 to an avalanche runout zone in a valley bottom when there was a deep snowpack instability. The guides at La Traviata exposed their group of 21 to a start, track, and runout zone when there was a deep snowpack instability." It is also worth noting the STS avalanche was naturally triggered, while the guided group brought the snow down on themselves.

It was profoundly ironic the mountain professional community was looked to for oversight and advice on the STS culture considering the facts. When one reads Ross Cloutier's report on the STS avalanche, one finds a claim of objectivity in the fifth paragraph, which means the author is "not influenced by personal feelings or opinions in considering or representing facts." Yet, on page 48, he wrote, "Local professional guides have a higher level of awareness to trends, conditions, snow pack structure, and danger potential than visiting recreational skiers or school group leaders." The facts from La Traviata clearly make this statement untrue. It is important to note that Ross' work at the time was to train mountain professionals.




To date, there have been no inquiries, studies, or publications championed by Canadian mountain professional organizations that specifically or directly reference La Traviata with the intention of connecting lessons from the tragedy with pervasive cultural, safety, and risk management issues. The mountain professional community has failed to host a dedicated process where all those involved gather to respect each others' perspectives and experiences and be openly accountable with the aim of harvesting lessons and, through the process, heal. There is also no memorial or annual event of remembrance. Kathy, Vern, Dennis, Craig, Dave, Jean Luc, and Naomi are at risk of being collectively referred to only as "The 7".

In the slipstream of all the changes Strathcona-Tweedsmuir School's tragedy produced, there are fervent claims by key members of the mountain professional community that all that could be done is being done. However, the level of reconciliation, transparency, accountability, introspection, humility, and ownership that was initiated by and demanded of the Strathcona-Tweedsmuir School community, as well as that necessary for any authentic change, was never practiced by the mountain professional community in response to La Traviata. It is true that individual private efforts have been made, but these have not been supported publicly or championed in any meaningful way by the mountain professional community. In a deep twist of irony, mountain professionals were awarded the responsibility to guide youth in our mountain parks in winter.

The call to action to address this vulnerability is to gather a group of individuals who are willing to review and listen to the all facts from all parties about the human decisions that led to La Traviata (and other key tragedies in the mountain professionals' 50-year history) and publish them so they can

be shared with mountain professionals everywhere. What is at stake is the wellbeing of our Canadian youth, the integrity of mountain professionals, and a fundamental purpose for mountain travel.

There is great value in traveling in the mountains chiefly because they are real. They present us with the ardent gift of authentic exhilaration and consequence, which urges us to claim the responsibility for ourselves to learn from what happens when the adventure ends. Yet to gain knowledge from the mountains, we must have the heart to listen, speak, and experience the truth about the inner workings of ourselves, others, and the conditions we travel in, especially when it hurts. When it counts, we need to be able to say: We (I) screwed up, and we (I) need everyone's' help and perspective to make this better. This act reduces future impact because we learn, grow, and change. Strathcona-Tweedsmuir School was fortunate to have the leadership of the Aratos and Alan Latourelle, and we all respect their legacy. Our mountain professional journey is still waiting for us.

I have discovered that the secret to learning from tragedy is to gaze directly into the most painful parts, until there is healing. 

**BIO**

Ken Wylie is an IFMGA Guide, the author of *Buried*, and creator of *Archetypal*, a process for understanding human decision-making in high potential-consequence situations and environments. In 2003, he was an apprentice guide at the La Traviata avalanche and he responded to the Connaught Creek tragedy with Strathcona-Tweedsmuir School 12 days later.

A Winter Wonderland Shattered

Florina Beglinger

THERE ARE DAYS IN ALL OUR LIVES that tell of a moment so difficult that they become a marker; all other days fall into the category of 'before' or 'after' this one day. For the families of the seven people killed in the La Traviata avalanche, Jan. 20, 2003, was such a day. For my family, this day also irreversibly changed our lives.

I was eight years old that morning, living with my parents and my sister at the Durrand Glacier Chalet and drawing a map of PEI for my class in Revelstoke. Until that day, my world was one of happy ski guests, passion-driven parents, and a remote, idyllic winter wonderland. Afterwards were years of anxiety. I suddenly feared my dad wouldn't come

home from work. I would run out of the lodge each morning to kiss him goodbye, just in case. I wondered often why we ventured into the mountains, deliberated risk versus reward, and decided I could never work in the avalanche industry.

What I didn't realize at the time was that this event shook not only my life and the lives of all those involved, but the avalanche industry as a whole. In combination with the Strathcona-Tweedsmuir School accident 12 days later, the Canadian avalanche industry set out to make major changes in public avalanche forecasting and would become a world leader. It's gratifying to see terrible events transform into positive change. The avalanche education system that resulted

would become very helpful for me to overcome my fear of uncertainty in the mountains. It gave me the structure and the tools to move forward with my eventual career.

After high school, I moved to Vancouver for university. In 2016, I was finishing my degree and signed up for CAA Operations Level 1. It was the first step into this world I had been avoiding. I completed my ACMG Ski Guide certification last spring. The process of becoming a guide has run parallel with my journey of coming to terms with the fatal 2003 winter season.

The alluring and terrifying thing about snowpacks is that nobody knows with 100 percent certainty that a slope is safe. I used to think that becoming an avalanche professional would give me the tools to be certain. It was shocking to reach the point where I expected absolute certainty of the snowpack, only to realize that even with ample knowledge and training on our side, we still take a chance every time we step into the snow. The hardest hurdle to jump was accepting that in

a guiding career of thousands of slopes skied, that one day there may be an oversight or a bad card drawn that results in an accident. It's haunting. I'd grown up in the aftermath of La Traviata; the overwhelming sadness for the families of those we lost, the media circus, and the continuation of my family's business was difficult. It was nothing compared to the trauma endured by those who lost family members that day, but it painted a dark picture of the guiding world that is etched into my mind forever.

As guides, we experience so many perfect days with deep snow, bluebird skies, big smiles, photos, memories, and happy guests. We are fulfilled. But inside, there lurks the question: is it worth it? Will those 1,000 perfect days justify the one day that divides our lives forever into before and after?

The snow industry and guiding is a calling. Near the end of my time in the city I realized that a life outside the mountains would never feel like a life worth living. I think it's this allure of the snowy mountains that unites us all, whether we're guides, forecasters, recreationists, or clients. This common understanding of the joys and meaning we find in the mountains allows us to justify why we spend our lives out there, despite the risks. As Helen Keller said, "Security does not exist in nature, nor do the children of men as a whole experience it. Avoiding danger is no safer in the long run than exposure."

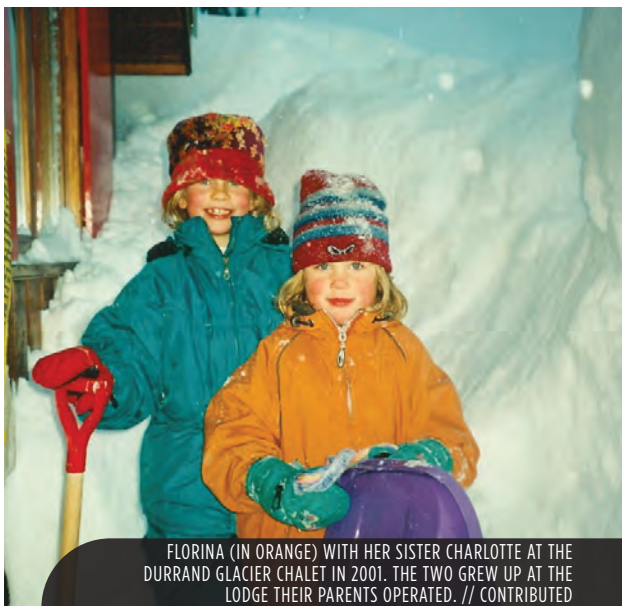
It has been remarkable to watch the avalanche industry change since 2003. The operations work together through the InfoEx to keep each other informed in a way that is unique to Canada. Taking AST courses has become standard practice for recreationists. The forecasting system developed by Parks Canada and Avalanche Canada for making avalanche risk, hazard, and terrain easily understood for the general public has become a gold standard across the world. Perhaps we

will never achieve security in nature, but the industry has united as a community to do our best to keep everyone as safe as possible.

An equally important milestone has emerged in recent years. As all of society is recognizing the importance of mental health, so too is our avalanche community becoming better at supporting guides and others who make the decisions that results in accidents. As a child, watching the avalanche shaming that occurred after La Traviata was traumatizing. It seemed as though a large portion of our community forgot that we are

all simply flawed humans doing our best, and the outpouring of harsh criticism that resulted is ultimately what made me initially decide to never become a ski guide.

Twenty years later, we are now openly admitting to our incidents on social media groups, MIN reports, and other publications, which fosters so much important learning. Near-miss and accident reports, and the vulnerability needed to share them, are crucial if we want to better understand the mountains. We need to continue supporting those brave enough to speak openly about their accidents and foster a community that is willing to grow. Because ultimately, not one of us knows with absolute certainty that nothing will go wrong on a day out in the ever-alluring mountains. 🏔️



FLORINA (IN ORANGE) WITH HER SISTER CHARLOTTE AT THE DURRAND GLACIER CHALET IN 2001. THE TWO GREW UP AT THE LODGE THEIR PARENTS OPERATED. // CONTRIBUTED



BIO

Florina has been an active member of the CAA since 2017 and is an ACMG Ski Guide. In 2003, she was eight years old, and the child of lodge owners and a mountain guide, living at the Durrand Glacier Chalet during the La Traviata avalanche accident.



Working Through Trauma

Abby Watkins

THE LIFE-DEATH INTERFACE is a powerful place. I had never experienced it before digging down to a real person in Connaught Creek on February 1, 2003. Minutes before, he was a living, breathing teenager. We had only just passed them all. I had noted their youth and felt their potential as I passed. I could not have predicted what would happen next.

I do my best to try to see if he has any sign of life. I look down at him. I struggle to make sense of what I'm looking at. I don't know what to do. Is he alive or dead? I don't know. I can't find a sign of life and yet, I know that the cold can make it harder to detect. All those avalanche search trainings and practice with the transceiver, the probe, the shovel, it all comes automatically. But this? I had only ever dug down to a backpack. What do I do now? Do I stay here and try to revive him? Or do I go and try to find other people? There are more people under the snow. Shock hits every cell in my body. I am not prepared for this impromptu triage. I have only heard triage talked about in a first aid course. I am no expert.

He is perfect in every way. And unresponsive. Is he dead?

After what feels like forever, but is probably only a minute or so, I drag myself away from him to search for others still buried. It is one of the hardest decisions of my life. I struggle with it for years, that decision. Would the CPR I never provided have kept him alive until help came? I will never know.

Rich and I sit stunned in the truck as we drive back to Golden. We do not speak. We are wrung out. We spend a lot of time crying in the next month, trying to make sense of what happened in Connaught Creek, while journalists circle and experts and punters alike give their opinion on the tragedy. We cling to each other. We try to carry on with our lives. And then, about a month after the avalanche, the door between Rich and I slams shut. I remember the day I lost him. But I was too traumatised myself to have any idea what to do. I was just trying to survive.

We struggled through the next three years, traumatised. Although life seems mostly normal, it isn't quite. I complete my Level 2 Avalanche Ops and pass my full ACMG Alpine Exam. I climb a Himalayan peak and have other amazing adventures and times with friends and family. Rich and I share many an amazing climbing, riding, and surfing road trip. And yet, I am not quite me. I'm a bit jagged, hard-edged. Less resilient. Snappy. I'm coping, indeed at a high level in some ways, but I am making my decisions with my brain and not my heart.

Then, in 2006, Rich leaves me. I'm devastated. My life falls apart.

My counsellor pulls the chair in closer and says, "Tell me about that avalanche..."

"Oh," I answer, "...that..."

It was probably my second or third session with Simone, who turned out to be a godsend, just when I needed her, with the insight and sensitivity to realise that this avalanche, that I had mentioned in passing amongst all the other events in my life, was significant. I thought I was there to talk about the end of my marriage, and I was, but Simone had the experience and training to know that this avalanche was what I also really needed to talk about.

Once I broke that dam down, though, the tears began to flow. They flowed for the lost teenagers at Rogers Pass, they flowed for their families, they flowed for me and for Rich, and the others who just happened to be there, who had also tried in vain to find and save those children. My tears flowed for my parents' break-up when I was a teenager, for all the things I had tried my heart out for but lost anyway, for every heartbreak... All my losses just tumbled out in a river of my tears. I think I cried every day for six months. It wasn't easy, but it was the beginning of healing. It was cleansing and such a relief that I had finally begun to grieve.

I fought with the "Why me? Why was I there? I didn't want to be there. Someone else would have done it better." But I was there. No reason. No rhyme. I was just there. And I experienced that day with the tools I had at the time. It was only years later, upon watching an interview with the parents of one of the children that Rich and I had dug up, that I learned a little of the impact I might have had that day. They thanked Rich and I for being there. That someone was there trying to save their child, even though he had not survived. Although I so wished I had been able to save him, it gave me a little bit of comfort that I had somehow comforted them by being there.

Through a year of Simone's skilled sessions, I worked through the acute symptoms of carrying the weight of my experience with no outlet. I came to understand the massive physical, psychological, emotional, and life-changing impact of being a first responder that tragic avalanche had on me. I also learned how trauma affects people and began to connect with other people who had experienced similar things. I began to forgive myself for the decisions I had made that might have changed the outcome.

Now, 20 years have passed. Life has moved so far from there. I almost never think about that day, unless something related reminds me, like the date. Every February 1, I take pause and remember. I feel into my heart and my being. How does it sit with me now? I think about everyone else involved in that avalanche and how they are now. Where have their journeys taken them since that day, which was life-changing

for us all? I think about that beautiful valley, Connaught Creek, in Rogers Pass. Wild, snowy, timeless. I also remember incredible ski days up there. I can't even really believe I did that. The girl from Geelong, Australia, skiing the unmatched wild powder snow in that powerful mountain wilderness.

As I write this on the other side of the world from Connaught Creek, in a farmhouse next to Mt. Arapiles in Australia, I feel it all again. I weep a little for the massive day it was for me, for Rich, and everyone else involved. I know it wasn't the only tragedy to ever happen and that it precipitated good changes to how avalanche risk is communicated to the public and a clearer understanding of expectations of acceptable risk for custodial groups.

Our stories go on. We live life with its ups and downs, its sublime joy and beauty juxtaposed on the deep valleys of loss and grief. That day left an indelible mark on me. It left

an indelible mark on all who experienced it, and, for better or worse, we carry this with us through our lives.

I don't know how to finish this story, my story, of that day. Perhaps I never will. ❧



BIO

At the time of the Connaught Creek avalanche in 2003, Abby Watkins worked as an ACMG Assistant Alpine Guide and lived in Golden, B.C. She continued guiding (ACMG Alpine and Assistant Ski Guide) in Canada and New Zealand until 2017. Now living in Australia, she

works as an ecologist and lives next to Mt. Arapiles, where she still climbs regularly.

“We’re Going to do What?” The Story of Parks Canada’s Backcountry Avalanche Risk Review

Grant Statham

ON FEBRUARY 1, 2003, A HUGE AVALANCHE in Rogers Pass buried 17 students and teachers on an outdoor education ski touring trip up Connaught Creek. Seven grade 10 students were killed. Twelve days earlier and 30 km to the west, a similarly huge avalanche on the run La Traviata killed seven adults on a guided ski touring trip. That winter, 29 people died in avalanches in Canada, the worst year on record. We all knew this would have implications.

I was 34 and had spent the previous 17 seasons working as a ski patroller, avalanche forecaster, mountain guide, and avalanche consultant. Following the Rogers Pass avalanche, Parks Canada commissioned a review of its whole public avalanche safety program. The *Parks Canada Backcountry Avalanche Risk Review* returned 36 recommendations. The Province of BC did its own review, as did Strathcona-Tweedsmuir School. All told, there was 81 different recommendations made by three different independent reviews.

I was hired by Parks Canada on a two-year term to implement the recommendations of the *Risk Review*. I started on Nov. 3, 2003, and walked into the most intense professional experience of my life. I think of it as the day I went inside.

I began with a blank slate—an office in the “Kremlin,” an empty desk, computer, telephone, 9-5 schedule, and plenty of

offers to help. Ian Syme helped me find my way and Bill Fisher, the Executive Director of the Mountain Parks, was my boss. I began to make contacts, develop my ideas, and put together a tangible plan for what Parks Canada was going to do.

Those first three months were a blur of false starts, intense media pressure, and an overwhelming new reality for me. I reached out to meet the parents of the Connaught Creek students and share with them my ideas, which marked a turning point in the project. Unknown to me, our CEO Alan Latourelle had done the same thing. Those parents became our allies and, together with my colleagues and closest friends, we developed plans to change the way public avalanche safety was delivered.

On Feb. 19, 2004, the Honourable David Anderson, Minister of the Environment, announced Parks Canada’s plan. He was flanked by Parks Canada’s CEO, the presidents of the CAA and CAF, and Justin Trudeau, who gave a moving speech about his brother. Media was everywhere and I was at the table to answer technical questions. Sitting in the front row were several of the parents who’d lost their children in Connaught Creek. Their presence was powerful; our journey together to reach this place had been difficult, and they were there to show their support. It was a very moving experience.

The Minister announced the following five initiatives:



1. It would become the law that custodial groups would be led by guides in avalanche terrain.
2. Icon-based avalanche warning systems would better communicate the risk to lay-people.
3. Avalanche terrain ratings will differentiate between high-risk and low-risk terrain.
4. Trailhead signage will provide graphic information about the avalanche risk.
5. Environment Canada will contribute \$175,000 annually towards a national avalanche centre.

I returned to work to face my colleagues. There were many funny looks and skeptics who said: “We’re going to do what?” Here is how it went down:

1. ICON-BASED AVALANCHE WARNINGS

I proposed a single map with icons illustrating the avalanche conditions across all of western Canada. I modelled my ideas after weather forecasters on television, standing in front of a map overlain with sun and cloud icons, waving their hands and pointing—very 1990s. I imagined maps like these in the newspaper too, or icons scrolling across the bottom of a ski resort TV feed. Some people thought my proposal was nuts. “You can’t communicate the complexities of avalanche hazard with a graphic,” was a common refrain, sometimes followed with an angry accusation of “dumbing down” the system.

We did it anyway. Alan Jones from the CAA and I drew out the first versions (Figure 1) of what would become the Backcountry Avalanche Advisory. We proposed making these icons available using the portal where the mainstream media collected its weather information. The CAA joined the Meteorological Service of Canada’s media portal and by winter 2004-05, icon-based avalanche warnings were in *The*

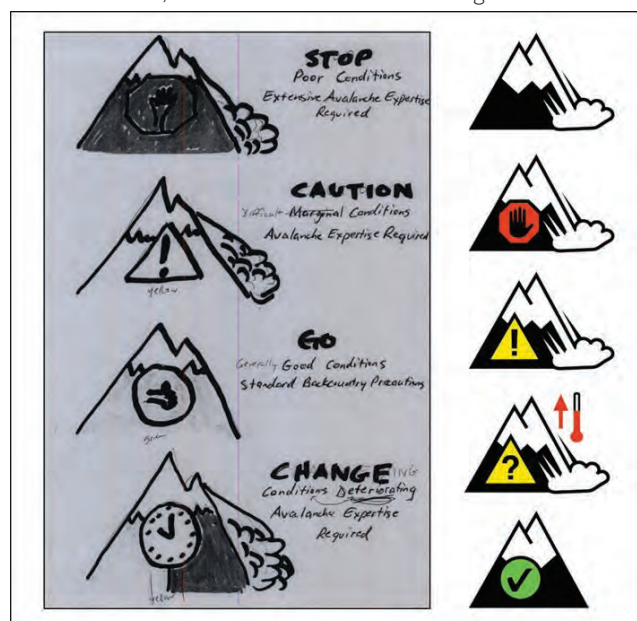


FIGURE 1. FIRST SKETCHED DRAFT OF THE CAA ICONS (LEFT) AND THEIR FINAL 2004 VERSION.

ICON	DEFINITION
	Extensive exposure to frequent natural avalanches and/or human triggering possible in multiple locations.
	Recurrent exposure to periodic natural avalanches and/or human triggering possible in some locations.
	Limited exposure to infrequent natural avalanches and/or human triggering unlikely.
	No history of avalanche activity.

FIGURE 2. FIRST DRAFT OF WHAT WOULD BECOME THE AVALANCHE TERRAIN EXPOSURE SCALE, FROM MARCH 2004.

Province newspaper every day, alongside temperatures, air quality, and tides.

In 2007, the icons were picked up by the Swiss, who adapted them to fit the European Avalanche Danger Scale. In 2010, when revising the North American Avalanche Danger Scale, we introduced these same icons to make the international standard danger scale icons used today.

2. AVALANCHE TERRAIN RATING SYSTEM

It was pretty obvious to me by reading through the *Risk Review* and then meeting with a lot of people who didn’t know much about avalanches that we needed a terrain classification method. In fact, I’d pitched this idea to Parks Canada in my job interview. We needed to easily show the difference between a serious backcountry trip and a mellow one. While this might seem like a simple idea today, it was not perceived that way at the time. It seemed like a pipe dream. As forecasters, we had been struggling for years how to better communicate terrain because we knew how important it was, but we were focused on doing that using the avalanche bulletin. Now we were thinking outside of that box.

I just started, not really knowing where it would go but looking for momentum and help. I made my first draft of the “Avalanche Exposure Scale” (Figure 2) and sent it to my colleagues. They replied with good suggestions and the system improved draft by draft. We modelled it after rating systems like rock climbing or white water and were making progress until the team in Rogers Pass decided it was too simple. They were not prepared to classify avalanche terrain based on my two-sentence descriptors. One day, I opened an email from Bruce McMahon and there was the first version of the ATES technical model. It proposed thresholds for different components of avalanche terrain and provided a reasonable technical basis for rating terrain. I immediately liked it.

But I realized, again, that it was too technical for public warnings. Of course, the forecasters liked it as it met their needs, but we needed something simple for public consumption. That's when I realized the Avalanche Terrain Exposure Scale (ATES) needed to speak two languages: a technical model that met the needs of forecasters and a public communication model that communicated those ratings in a way the public could understand.

By the start of winter 2004-05, the ATES system was finalized and applied to over 275 different backcountry trips in the national parks. We published brochures and a website, and the system was immediately popular. It wasn't perfect, but it was obvious we had filled a gap. Two years later, we added another 75 waterfall ice climbs. In 2005, working with Pascal Haegeli, ATES became one of the fundamental inputs to the risk assessment method of the Avaluator. These days, who can imagine a risk assessment without the terrain part?

That first version of ATES has stood the test of time. The system has been adopted for many different purposes in many different countries. People use it to zone terrain on maps, apps, risk assessment products, workplace safety protocols, regulations, avalanche education, and more. As the old adage goes: terrain, terrain, terrain.

3. NATIONAL AVALANCHE CENTRE

One recommendation made to both Parks Canada and the Province of B.C. was to support the creation of a national avalanche centre (NAC). This was the birth of Avalanche Canada.

I was Parks Canada's point-person for this work and we started with a large meeting in Calgary that was attended by all the important stakeholders. Clair Israelson and Bill Mark spoke for the CAA and Chris Stethem for the Canadian

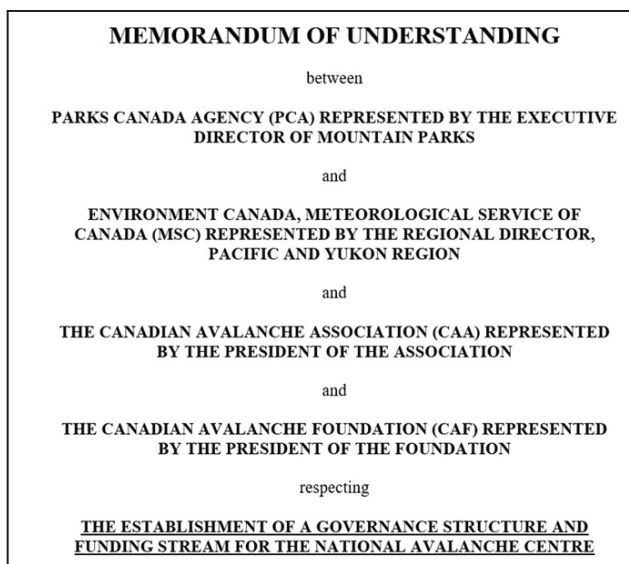


FIGURE 3. THE MARCH 2004 MOU THAT FORMALLY STARTED COLLABORATION TOWARDS A NATIONAL AVALANCHE CENTRE, TODAY'S AVALANCHE CANADA.

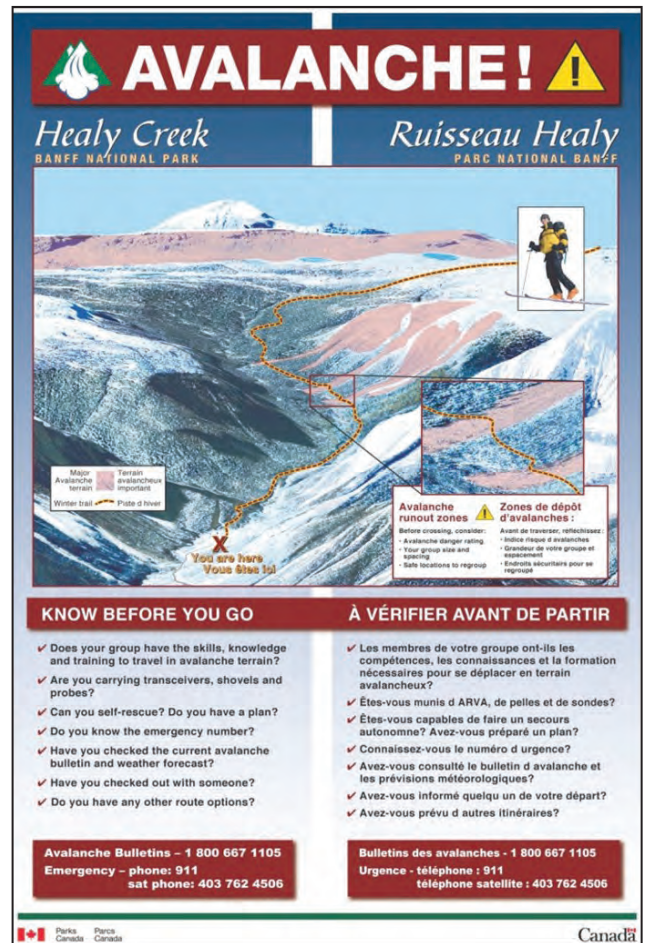


FIGURE 4. AVALANCHE TERRAIN SIGNS STARTED APPEARING AT PARKS CANADA TRAILHEADS IN NOVEMBER 2004.

Avalanche Foundation. It was obvious the CAA and CAF had the background and knowledge to take on this role, but how?

We signed an MOU (Figure 3) and agreed to build a structure. We hired a governance consulting firm with experience setting up national NGOs. We held meetings, we penned agreements, the CAA proposed a structure, we secured funding, and on Nov. 20, 2004, the Canadian Avalanche Centre officially opened its doors with a mandate, "To serve as Canada's national public avalanche safety organization." A modest budget of \$400,000 annually in government funding supplied by Parks Canada, MSC, Alberta and BC would be combined with funding from the CAF.

I could never have imagined the road AvCan would travel to get to where it is today, thanks to its many staff, CAA members, public volunteers, avalanche survivors, government officials, and politicians who have contributed to its evolution. I'm very proud of how it has grown from a grassroots start-up to a robust national organization. Since 2005, the running average of avalanche fatalities in Canada has decreased by over 30%, despite the continuous growth of winter backcountry recreation.



4. AVALANCHE TRAILHEAD MAPPING

For years, CAA professionals had produced avalanche terrain maps for professional use—there was even an avalanche mapping course. I had made avalanche maps for ski areas, highways, forestry, and heli-ski operations. This was essential in order to provide a common reference point to discuss the risk. Who doesn't like crowding around a run photo to pick the lines, or carefully studying the boundaries of an avalanche path?

We made maps for the public too and developed a list of the most popular winter trailheads in the seven mountain parks. GIS was rudimentary at the time and when I look back at our first grainy images (Figure 4), I cringe, but the idea was to provide a graphic display of the terrain, show it online, and at the trailhead, and accompany these maps with safety messages. The idea has grown, in particular with Avalanche Canada and the Province of B.C. investing in ATES mapping and trailhead signs for many popular snowmobile areas in B.C.

5. CUSTODIAL GROUP REGULATIONS AND POLICY

The Risk Review described the legal implications of organized youth groups, or what they called “custodial groups,” travelling in the national park backcountry. They recommended custodial groups be led by a professional guide, “where not-for-profit custodial groups propose to use difficult terrain or use areas presenting high-risk conditions.” In response, Parks Canada’s CEO announced this would become the law.

This was another perfect use-case for terrain ratings, but first we had to define custodial groups (Figure 5). I spent many hours with Glen Marko from the Department of Justice working out a definition that would capture the right groups, without casting too wide a net. Meanwhile, the outdoor education sector was gripped. I was contacted by teachers and educators telling me what a mistake it would be to implement such regulations. They predicted doom for outdoor education and this weighed heavily on me. As a strong believer in getting youth outdoors, I felt an enormous responsibility to get this part right.

We defined custodial groups, built the ATES, and then used both to make it the law that custodial groups be led by a professional guide in ATES Class 2 terrain, and prohibiting travel in Class 3 terrain. Sober stuff, but the coup was that custodial group travel in Class 1 terrain remained unrestricted. Interestingly, once you get beyond the hubris and start looking at the facts, the majority of custodial groups only ever go to Class 1 terrain. It worked—not for everyone, but for the majority. Teachers could continue taking classes into easy, low-risk terrain, and now they even had a list of about 100 different Class 1 trips to choose from. The regulations kicked in when the avalanche terrain became more serious.

2004 and 2005 were the most intense years of my professional life. I left the comfort of a well-established guiding and consulting practice to step into the centre of a tragic mountain disaster. I had no background in government relations or media, little experience with grieving families, and I'd never implemented a regulation or prepared a contribution agreement. I even had to rent a suit the first time I briefed the Minister of the Environment. I was as green as could be in the public sector.

But I had passion, a lot of experience in the mountains, empathy, and a willingness to ask questions and listen to the answers. I discovered my own skill at communication and came to realize the immense importance of respecting and listening to other people who knew nothing about avalanches, but knew about a lot of other things. Any mountain elitism I had was stripped away.

In 2005, Parks Canada made my job permanent and I remained in that position for 10 years. I continued to develop the ideas we started with the Risk Review, which led to changes to the danger scale, the Conceptual Model of Avalanche Hazard, bilingual avalanche bulletins, and a universal avalanche bulletin format for Canada, among other things. I honed my skills in policy, writing, and collaboration. By 2013, I felt like my work was done. I had completed what I'd set out to achieve and it was time to go back outside. I resigned from my position after the 10-year anniversary of the Connaught Creek avalanche.

Reflecting back now, I'm very proud of this work and think of the many people who helped me in whatever way they could, most of whom are retired now. That avalanche and the deaths of those children galvanized our community like never before. The relationships I built with their parents, at first fraught with anger and anxiety, evolved to a special place of compassion, respect, and understanding.

I will never forget their courage to push so hard for change in the face of such immense grief, and I've always wished to dedicate our work to the memory of their children.

They really did make a difference. 



BIO

In 2003, Grant was teaching avalanche courses and writing avalanche bulletins for the CAA, guiding heli-skiing at Crescent Spur, guiding waterfall ice climbing in the Rockies, and working for Chris Stethem & Associates doing avalanche control for CN Rail and Crestbrook Forest Products. In 2022, he is working for Parks Canada doing avalanche forecasting and control, and search & rescue in Banff, Yoho, and Kootenay National Parks, guiding snowcat skiing at Mustang Powder and ski touring trips, and consulting internationally on avalanche and risk-related topics.

Recollections Of Winter 2002-03 and the **Creation of the Canadian Avalanche Centre**

Clair Israelson

IN THE FALL OF 2002, I was recently hired as Executive Director of the CAA. The CAA had been in operation for more than 20 years and was becoming a mature organization, based in Revelstoke. It had a well-functioning Board of Directors led by President Bill Mark and numerous committees drawn from its membership. In our small, modest office on 1st Street, I was supported by a staff of five, led by Operations Manager Evan Manners. Both Audrey Defant and Brent Strand were employees then, as they are to this day.

Prior to my arrival at the CAA, I had spent 26 years with Parks Canada, where I was instrumental in establishing a daily backcountry avalanche bulletin for backcountry recreationists in the national parks. In the U.S., forecasts were being provided through the US Forest Service. In Europe, each jurisdiction had well-supported avalanche forecasting programs for mountainous regions, usually run as government agencies. The CAA was being increasingly pressured to generate backcountry avalanche forecasts for provincial lands based on daily InfoEx reports from professional avalanche operators across western Canada. In the previous couple of winters, Alan and Evan had done their best to accommodate this growing demand, putting out a rudimentary weekend forecast for the most popular regions of the province. They paid for these efforts through very modest support from commercial sponsors and an annual \$20,000 grant from the B.C. government's lottery fund, as the CAA Board of Directors had set clear policy membership dues and fees for services should not subsidize public warning services.

In the fall of 2002, the province elected a new Liberal government and Solicitor General Rich Coleman became responsible for grants from the lottery fund. Shortly after, the CAA received a letter from Mr. Coleman stating our grant would not be renewed. Numerous phone calls, letters, and a face-to-face meeting with Mr. Coleman in Revelstoke could not get this decision revisited.

In a stroke of good fortune, a prominent Kelowna-based CBC reporter named Mohini Singh was married to CAA member Finbar O'Sullivan, and he kept her up-to-date on the public bulletin funding issues. Mohini turned out to be a formidable ally. In my opinion, she is the unsung hero of this campaign, keeping establishment of public avalanche safety programs part of the political discourse of the province throughout that winter. Other media also took up the cause and the cancelled grant became a symbol of widespread

public dissatisfaction with the new provincial government's austerity measures.

The 2002-03 avalanche season began with good early-season snowfalls across mountain ranges in B.C. In November, a warm rain fell to the mountain tops, followed by a prolonged period of clear cold weather that resulted in a crust/facet layer near the base of the snowpack that would remain a problem throughout the season.

The first major incident occurred at Durrand Glacier in mid-January when seven guided ski tourers were killed in a large avalanche that failed on the November crust/facet layer. By coincidence, a Spokane-based television network happened to be filming heli-ski operations in Revelstoke that day. They broke the story of the avalanche live across the U.S. that night. Canadian media picked up the story and by the time the RCMP hosted a press conference the next day, Revelstoke was awash with reporters from TV, radio, and print media. As Executive Director of the CAA, I was invited to participate in the press conference, where I explained the nature and hazard posed by the persistent November weak layer. Following the press conference, Evan and I spent days responding to interview requests from the press. Avalanche hazard and the lack of backcountry avalanche forecasts in the B.C. mountains became front page news across the country.

Less than two weeks later, a group of students from the prestigious Strathcona-Tweedsmuir School in Calgary were ski touring up Connaught Creek in Glacier National Park when they were hit by a large avalanche off Mt. Cheops that engulfed the entire party. By chance, Rich Marshall, a mountain guide from Golden, and his partner Abigail Watkins were in the forest just above them when the avalanche hit. They responded immediately and managed to recover 10 people alive. Seven of the students did not survive. A major rescue effort led by Parks Canada ensued, supported by heli-ski companies operating in terrain adjacent to Glacier National Park.

When news of this event became public, all hell broke out in the media. Two major avalanches, killing 14 people, in less than two weeks. The RCMP scheduled a press conference the next day and more than 50 reporters were in attendance. When my turn came to speak, I didn't talk to the snowpack conditions in the mountains. Instead, I called for British Columbia, Alberta, and Canada to come together to fund a centre capable of providing comprehensive backcountry



avalanche safety programs commensurate with those that existed in the U.S. and Europe.

Fatal avalanches involving skiers and sledders continued throughout the winter, and so did the media coverage. Until then, on average there had been 10 avalanche fatalities per season in western Canada. In 2002-03, there were 29 deaths. Backcountry avalanche safety programming became a political issue, with broad media and public support from across western Canada.

Following the Connaught Creek avalanche, Parks Canada announced the formation of an expert review panel to evaluate all of its public avalanche programs. The panel came back with more than 20 recommendations for improvements. To its credit, Parks Canada committed to fully implementing all of the recommendations and hired Grant Statham to lead its efforts. This work by Parks Canada was a direct benefit for the yet-to-be-established Canadian Avalanche Centre, and set standards and benchmarks for backcountry avalanche forecasts and educational programs.

By the end of the winter, the political pressure on the B.C. government to provide funding for backcountry avalanche programs had become an issue they could no longer ignore. The Solicitor General created a team to study the issue. The study team engaged in extensive consultations with the CAA, outdoors clubs, land managers, and others. By the end of the summer, they came back with a report stating the CAA should establish a centre to provide public avalanche programs for British Columbia and pledged to provide approximately \$450,000 annually in provincial funding for this work.

The fatalities of 2002-03 resulted in the establishment of the Canadian Avalanche Centre (CAC) in 2004. The early years of the CAC were heady times. John Kelly was hired as Operations Manager and he hired staff, oversaw development of the CAC's safety programs, and provided advice on policy issues. Ian Tomm played a similar role for CAA operations. My role primarily focussed on financial sustainability, policy development, and engagement with external stakeholders. I look back with fondness to working with staff and the Board of Directors to set goals and directions for the CAC. Supported by this group of capable and motivated people, we laid the foundations for the organization we now know as Avalanche Canada. Under the leadership of Gilles Valade, Avalanche Canada is now acknowledged as a world leader in public avalanche safety programming.

Over the past 20 years Avalanche Canada, in collaboration with Parks Canada and numerous researchers and developers, has created a comprehensive set of daily bulletins, awareness and training programs, and other avalanche safety services for the winter mountain recreation community across Canada, all accessible through its website.

The scope and professionalism of the public avalanche safety programs created over the past 20 years has exceeded my wildest expectations. Congratulations and a sincere thank you to everyone who contributed their expertise to these efforts.

I'd like to note a few features of the current Avalanche Canada programs that I suggest are truly outstanding:

- Incorporation of social sciences research and best practices to enhance communications.
- During periods of elevated hazard, avalanche forecasts are featured on radio and TV across western Canada and are seen by the public to be highly credible.
- Signs along B.C. highways advertise avalanche.ca as the source for avalanche safety information.
- In 2019, the Canadian Avalanche Foundation received a \$25 million endowment from the federal government that is being used to support Avalanche Canada's operations.
- Avalanche Canada is on a sound financial footing, with assured funding from the B.C. government.
- Avalanche Canada continues to secure private sector sponsorships that generate funds to offset program operating costs.
- Avalanche Canada programming has developed an avalanche safety culture among winter recreationists. Now, it's cool to be avy savvy!

Professional avalanche operators have also benefited from new technologies and methodologies developed by Avalanche Canada. One example is a program that generates snow profiles from weather model data, developed for data-sparse bulletin regions in northern BC and now available for use by the broader professional community.

2002-03 was Canada's most deadly avalanche winter since 1910. It profoundly changed the Canadian avalanche community in ways still being felt. From its humble beginnings, Avalanche Canada continues to develop and deliver world-class backcountry avalanche safety programs that are emulated around the world.

Looking back at the impacts of those events, I realize what a privilege it was to collaborate with a great team of people and do meaningful work. 🇨🇦



BIO

Clair started avalanche work in 1971. During his career, he worked as a Park Warden for Parks Canada, Executive Director for the CAA and CAC, and Operations Manager for a heli-ski company in northwest B.C. He has been a CAA member and IFMGA mountain guide since 1981. He is now retired and lives in Revelstoke.

Professionalism at a Crossroads: How 2003 Impacted the CAA

Alex Cooper

This article is based on research from *The Avalanche News* and a conversation with Clair Israelson, the CAA's Executive Director in 2003, and Ian Tomm, the CAA's training program coordinator in 2003. They both reviewed the article prior to publication.

TUESDAY, JANUARY 21, 2003, was a day unlike any other at the Canadian Avalanche Association's head office in downtown Revelstoke. The news that seven people were killed in an avalanche the previous day at Selkirk Mountain Experience had spread and media from around Canada and the United States had flocked to the CAA's front door, waiting for someone, anyone, to answer their questions. Inside, the phone was ringing off the hook and the answering machine was flashing relentlessly.

When seven students died in Rogers Pass 12 days later, the calls renewed and wouldn't stop all winter. Public avalanche safety was front page news. The two tragedies, along with 15 other avalanche deaths that season, created huge pressure for the provincial and federal governments to start a national avalanche centre.

For the CAA, the accidents brought to a head pressures on the industry that had been bubbling to the surface over the past decade after numerous avalanche fatalities involving avalanche workers and at guiding operations.

"There had been enough fatalities in the professional sector over the years that there was a public perception of, 'Are you guys good at what you're doing or are you just out there winging it?'" explained Israelson.

Government regulators such as WorkSafeBC were eyeing new rules around avalanche work; they believed accidents at professional operations were unacceptable and steps must be taken to increase safety. On top of that, the BC Coroners Service was losing confidence in the ability of CAA members to investigate avalanche accidents. The coroner was concerned about the variability of the reports they were getting from members, and felt commercial accidents were not being investigated with the same rigor as recreational ones.

As Israelson wrote in *Avalanche News* before the start of the 2003-04 season: "Society expects a higher standard of protection than we have been delivering in the past... The bar has gone up."

Professionalism was a dominant theme within the CAA in the years after the winter of 2003. While a great deal of

energy was expended establishing the Canadian Avalanche Centre, the CAA also looked at raising standards of professionalism across the industry. Professionalism was the theme of the association's 2004 strategic plan and became central to its new mission. It was commonly brought up in *Avalanche News*, the predecessor to *The Avalanche Journal*. "As a community, we need to continue to work as professionals and to further develop our levels of professionalism as avalanche specialists," wrote Bill Mark, the CAA President, in his summer 2004 column.

In the spring of 2005, a continuing professional development session called "Professionalism at a Crossroads" was held at the Spring Conference. It featured talks on risk

management in other professions, heuristics, rule-based decision-making frameworks, and more. The series of talks sparked a great deal of discussion both in the conference hall and afterwards. "Quantifying its impact will be impossible but, by all accounts, what went on in that room is going to effect change," wrote Mary Clayton, Communications Director, in *Avalanche News*, following

"Society expects a higher standard of protection than we have been delivering in the past... The bar has gone up."

the landmark session.

The events of 2003 accelerated many industry reforms that were already underway or being discussed. The Level 2 program had already been revamped in 2001 and significant efforts were made to strengthen the scientific foundation of the curriculum and incorporate social sciences, particularly research into human factors. "I remember the training curriculum being challenged," recalled Ian Tomm, who was then the coordinator of the CAA Technical Schools (now the Industry Training Program).

"We had all this public pressure to change. We had the confluence of expertise and academics that really enabled us to nurture and flourish that development of knowledge and skill.

"I just took good ideas and brought them to curriculum as fast as I could."

A direct consequence was the evolution of the avalanche search & rescue program. The major rescue operations of



2003 highlighted the need for a course on multi-agency avalanche rescue response. A major grant was applied for and received to create an online course. While it never launched, the work put into it filtered into the AvSAR program and helped spread awareness of the incident command system used by other agencies.

InfoEx was also transformed in years following 2003. Work began that spring to transform it into a proper online program that met modern standards and was far more user-friendly. Like many of the changes, this work had already been discussed, but the events of 2003 added fuel to the fire, said Israelson.

Significantly, there was a shift in risk tolerance at professional operations, said Israelson. "Prior to 2003, and certainly back through the 90s, the accepted risk was higher. 'Shit is going to happen, so let's go skiing,'" he said. "That certainly changed with the new Level 2 course and all the scrutiny around 2002-03."

Two other major developments that emerged were improvements to the avalanche danger scale and the Conceptual Model of Avalanche Hazard. The former was recommended by Parks Canada's Backcountry Avalanche

Risk Review, which was produced following the Connaught Creek avalanche. CMAH emerged from work on the danger scale. "Up until that time, the best we could say about avalanche forecasting was that it was some intuitive process that involves chicken bones and dice," Israelson related. "Grant (Statham, the primary author of CMAH) was able to condense it down into something that was technically and conceptually logical, that gave a process for forecasting avalanches that we never had before."

Throughout the years that followed 2003, the CAA sought to maintain its role as an honest broker between various groups such as employers, workers, and government, and working to establish consensus, said Israelson.

"We muddled through," he said.

"We stopped the loss of confidence and started to rebuild the competence," added Tomm, who later became Operations Manager and the Executive Director of the CAA.

"It's an ongoing job," continued Israelson. "The specific issues change from year-to-year but it's still an ongoing job to maintain credibility and stay ahead of what the issues are going to be." ❏

Reflections From an Investigator

Dick Penniman

IT IS ALWAYS TRAGIC when people die in avalanches, but when numerous clients led by experienced and well-respected guides die in a single avalanche event, questions and attempts to answer them are inevitable. In the paper that I coauthored with the late Frank Bauman¹ and delivered at the 2004 ISSW in Jackson Hole, we tried to collect meaningful data and answer the important questions. We studied the available weather, snowpack, terrain, and human factors leading up to the avalanche and spent two days at the La Traviata site taking first-hand ground and satellite measurements to verify what was known and to add whatever data we could.

My purpose in writing this article is not to rehash our data. Rather, I offer a bit of background on my experience after the avalanche that led to the decision to write the paper; and to offer some insights from my personal experience as a Selkirk Mountain Experience client that were, in my view, aspects of the operation I observed that may have contributed to the tragedy.

Many of the skiers at SME that day were friends and former students of mine. One, Kathy Polucha, was both. The news of her death came as a shock to me and the Truckee community, where we both put down roots. For years, I had heard about SME, and out of concern and curiosity, I had made a reservation to go there with some friends that year. By coincidence, our trip was two weeks after the avalanche. Upon hearing the news, I seriously considered cancelling. On second thought, however, I contacted SME and told them I would still like to attend provided we did not ski on slopes over 30°. I was assured all avalanche terrain would be avoided. I decided to go see the operation for myself, to observe it first-hand as a client.

I had heard SME was tough. Climbing and descending a minimum of 1,500–2,000 m a day was expected. Clients were divided into two groups: the stronger A group and the slower B group. I was in the A group, led by none other than the legendary owner of SME, Ruedi Beglinger. My experience was as described. Tours departed promptly at 8 a.m. If you

¹Proceedings of the 2004 International Snow Science Workshop, Jackson Hole, WY, 2004, *The SME Avalanche Tragedy of January 20, 2003: A Summary of the Data*, Dick Penniman and Frank Bauman

weren't ready, you were left behind. The pace was grueling. As promised, we were never on terrain over 30°, though most of the days were so foggy none of us had any idea where we were or what steeper terrain lay above or below. Finding our way back to the chalet without our guide was out of the question. Even Ruedi had to use his GPS at times. All things considered, my trip was a success. All ended well, but from my point of view, some of SME's policies left a bit to be desired.

On the first evening, I asked to see the most current snowpack data from SME's study plot and the guide map; whether I am leading or following, I like to have some idea what conditions are like and where I am going ahead of time. My request was denied. I was told that information was never shared with clients. As a guide and instructor, I've found going over my planned route for the day to be helpful for the more experienced individuals.

On the third day, I rented a pair of skins from SME after my own began to fail the day before. I did not feel the need to inspect them (my mistake) and the next day, after a morning descent from the chalet, I could not pull them apart. After several minutes of desperate struggle, I discovered I was alone. The group had skinned up and disappeared into the fog. Eventually, one of my friends returned to find me and helped get the skins apart. We raced to catch up. When we did, the group already had its break and were in downhill mode. We were chided by Ruedi for being slow. We switched as fast as we could but there was no waiting. We followed the disappearing tracks into the fog and eventually caught up. Keeping track of all of one's clients was a practice not strictly followed in my experience at SME. A rule I always follow, that the group travels only as fast as the slowest person, was also not strictly followed.

I've found that while on route, asking members of the group to pass along any concerning observations they may make is also wise. The last person may see or feel something the leader does not. On one ascent, when I informed our guide I had just felt a whumpf, there was no discussion. I was simply told not to worry about it. This did not build my confidence in the leader; in fact, it did quite the opposite.

There was also obvious strife between the guides on my trip. The head guide openly criticized the other guides for their ascent routes and other things. Doing this in front of clients cast doubt in their competence. Such open criticism also seemed to make it more difficult for the guides to make their own decisions.

The proverbial bottom line was that blind following of the guide was demanded. Keep up or get left behind. No

discussion or argument about the guide's decision was tolerated. From this standpoint, a tragedy like La Traviata was understandable, if not inevitable.

The data and events that led to the avalanche have offered many important lessons that have helped others understand how to avoid such a tragic decision from ever happening again. To its credit, the avalanche changed some of SME's policies for the better. The following year, it is my understanding it reduced the client/guide ratio from 10:1 to 8:1. It also provided avalanche airbags to all clients. The year I was there, SME insisted we only use its beacons to make sure they all worked properly. Doubtless it made other improvements I am unaware of.

In 2004, I wrote in my ISSW paper: "Lessons from the SME avalanche tragedy need to be studied, understood, learned, and passed on to the professional guiding community and to students through avalanche safety courses. Those who participate as clients in guided backcountry activities must understand the risks they are choosing to take not only involve avalanche terrain, weather, and snowpack, but most importantly include placing absolute and complete faith and trust for their safety in those who may or may not be competent or knowledgeable enough on any given day to be worthy of that trust."

Following my oral presentation, I received a number of positive comments from young guides, but some in the audience felt we were making blanket accusations against the entire guiding industry, which, of course, we were not. While I have not kept close track of guiding safety practices over the past 20 years, I am interested learning how the guiding industry reacted to this tragedy and our recommendations. I reached out to the ACMG, CAA, and AMGA to learn what changes, if any, were made for this article, but did not receive any responses as of writing.

I hope the industry took the lessons from La Traviata to heart and that they continue to be taught. ■

BIO

Dick Penniman has been a skiing and avalanche safety consultant for over 40 years. He has worked at or consulted for ski resorts, heli-ski operations, and mines, and has taught avalanche safety courses to over 5,000 students. When the La Traviata avalanche happened, he was teaching full semester Level I backcountry avalanche safety courses at Sierra College. He scheduled his trip to SME with a former student out of concern for his current students, many of whom were prospective clients there. The La Traviata avalanche happened two weeks before his trip.



The Guiding Community's Response

Sylvia Forest

THE WINTER OF 2003 IS REMEMBERED by many people in the avalanche industry as a year of tragedy. It was also a winter of learning. In addition to many smaller events, two significant avalanche accidents occurred within two weeks of each other. Most guides who were working in the industry in 2003 could probably say exactly where they were when the La Traviata and Connaught Creek avalanches occurred, killing seven people each. Many guides were present during the rescues—most notably on the Connaught Creek avalanche.

These incidents have been well documented. What is less clear is the long-term consequences of these avalanches. From today's perspective, it might be surprising how little was understood and implemented less than 20 years ago about risk communication and mental injury. This article speaks to the effects these tragedies had on the guiding community, the learnings that contributed to change within the Association of Canadian Mountain Guides, and the stronger, healthier evolution of the ACMG.

The winter of 2003 was unique. In late-fall, heavy rain fell to mountain top, creating a thick, smooth ice crust on which subsequent snowfalls rested. This formed a persistent weak layer that by early-winter was deeply buried. This layer was monitored closely over the winter by guides in the ski industry. Guides had to be vigilant, choose terrain carefully, and never forget the presence of this deep persistent weak layer.

PART I: RISK COMMUNICATION

Mountain Guide Larry Stanier, summarized the initial lessons learned:

"From my perspective, there were two main lessons from the accidents of 2003. One was to really show the value of avalanche observations on the InfoEx when dealing with geographically widespread deep persistent weak layers. The second lesson was to recognize the discipline required of ski guides that winter to just stick to conservative terrain well into the spring once the evidence was strong that this layer wasn't going away. The Connaught Creek accident starkly brought home that guiding children and young adults is fundamentally different from guiding adults."

In 2003, the concept of communicating risk and uncertainty to clients and the general public within the ACMG was still in its infancy. Although the ACMG had been part of the International Federation of Mountain Guides Associations since 1963, it functioned primarily as a member

services organization. The ACMG at the time was not well prepared to manage critical incidents. It was criticized for having poor communications with the families and public. The guiding industry was accused of being unregulated and irresponsible, and the association's integrity was questioned. We were viewed as protectionist.

According to Mountain Guide Scott Davis, who was on the Board of Directors at the time, the avalanches of 2003 triggered several positive steps in the evolution of the ACMG. In the spring of 2004, the board held a two-day facilitated session that culminated in the first ever Strategic Plan. The board also investigated the path to becoming a legislated profession and took steps to emulate as closely as possible the attributes of a regulated profession. From 2005–2009, the ACMG governance documents were re-written, which most notably resulted in the inclusion of members of the public on the Board of Directors. In 2005, the board also approved changing the ACMG mandate to include, "Protecting the Public Interest." This was a massive change to the entire complexion of the ACMG and was the catalyst for many fundamental and positive changes in policy, procedures, and accountability.

Marc Piche, past Technical Director for the ACMG, points out:

"The shift toward protecting the public interest started from these incidents. These accidents were pivotal in terms of how the public views our organization and how we respond to these accidents. They changed the philosophy of guide training and how we embrace the concept of uncertainty. It all started with these avalanches."

Since this time, the ACMG has recognized that guides must do a much better job of risk communication. Risk communication is now a formal part of the guide training program and is the subject of continuing professional development. It constitutes both internal and external communications. External risk communication is the message the guide provides the client. The intent is to always be as clear as possible regarding what the hazards are, what steps the guide will take to mitigate them, and to update this risk assessment constantly throughout the trip. It is essential the client understands the risk and either they accept it or the trip is changed to reflect the guest's risk tolerance.

Internally, the big learnings from the 2003 avalanches revolved around how guides and avalanche professionals relayed critical information to each other, such as the reactivity of the weak layer that haunted the snowpack that winter.

As part of the shift to protecting the public interest, the ACMG has since adopted a number of best practises, including the creation of professional practice audits, and forming a conduct review process and an incident reporting and learning system in which lessons learned are communicated to members.

“In guide training, all guide candidates and instructors are trained to question their decisions; we have moved away from autocracy; everyone has a say; humility in decision making is encouraged.”

~ Marc Piche

As a result of insights from the rescue response to the Connaught Creek avalanche, the Training and Assessment Program (TAP) has also made training in avalanche search and rescue mandatory. Additionally, TAP has created supplemental content specific to ice and summer alpine climbing.

Since the events of 2003, ACMG guides have experienced other critical incidents. Because of the avalanches of 2003, the ACMG was better positioned to react to these. But we could still have done much better in every case. As a result of this realization, the ACMG contracted Mountain Guide and risk management specialist Grant Statham and lawyer Jon Heshka to write a Post-Critical Incident Management Plan. This plan helps direct and inform ACMG leadership in providing the best response for members, their clients, and the public. It is noteworthy that one of the triggers for what constitutes a critical incident now includes mental injury or stress reaction.

PART II: MENTAL INJURY

The emotional cost of being involved in an avalanche is massive and often results in life-long mental injury. The mental cost to a guide of simply operating, trying to keep clients safe, and to be vigilant and disciplined is also high. It was particularly high in 2003. It was a winter of walking on egg shells. In 2003, the ACMG had a limited understanding of the long-term effects of Post-Traumatic Stress Disorder (PTSD) and, even today, the effects of mental injury continue to be underestimated. In 2003, the mountain community, including the ACMG, was ill-equipped to address issues of mental health or to offer help to those who needed it. Incident debriefs were done, but follow up, with or without mental health professionals, was not. As a result, many guides and avalanche workers likely still carry scars, not just

from the events from 2003, but from any and all events and routine stresses that accumulate to cause mental injury.

In recent years, the ACMG has made significant strides toward moving the dial on mental health by increasing awareness, normalizing it as a type of injury that is common in our industry, and standardizing the steps to manage it.

Today, any member can request mental health counselling, for which the ACMG provides financial support. Other mental health resources are provided, such as continuing professional development in mental resilience, where members learn how to anticipate stress and crises whenever possible, and equip themselves with the skill set to practice self-care. The ACMG has hired a Mental Health Services Manager whose role includes administrating all of this, as well as supporting members who ask for assistance in dealing with mental injury.

The ACMG also partnered with our sister organizations, the Canadian Avalanche Association, Heli Cat Canada, and the Canadian Ski Guide Association, to assist mountain professionals in managing post-incident stress. The Canadian Mountain Community Critical Incident Stress Management Program (CISMP) was developed for members and workers in Canada's professional mountain community associations to prevent, reduce, and control stress symptoms following a critical incident. As one of the organizations supporting the CISMP, the ACMG is involved in the oversight and management of the CISMP.

Many individual members of the ACMG have also contributed to increased awareness of mental health in the guiding profession, such as the guides who created the Mountain Muskox Mentorship.

While not directly related to the avalanches of 2003, but in direct relation to mental health, the ACMG has recently created several human rights policies to assist all members, including an anti-harassment and bullying policy; a section in our code of conduct that addresses discrimination complaints; and a big push to promote diversity, equality, and inclusiveness.

FINAL THOUGHTS

While the avalanches of 2003 obviously occurred in a winter environment, lessons from these incidents extend to all guiding and instruction activities. We are still learning from these incidents 20 years later. We have a long way to go, but the path forward is clearer now than it ever has been.

I would like to thank Scott Davis, Marc Piche, and Larry Stanier, for their thoughts and contributions to this article. 📌



The Impact on Strathcona-Tweedsmuir School

Alex Cooper

The Connaught Creek avalanche on Feb. 1, 2003, took the lives of seven Strathcona-Tweedsmuir School (STS) students. I spoke to Carol Grant Watt, STS' Head of School, about the impact of the tragedy on the school and its community. This transcript was condensed from the original.

Alex Cooper: It's been 20 years since the seven students died in this avalanche at Connaught Creek in Rogers Pass. How does the school remember what happened and honour those seven students?

Carol Grant-Watt: It's the most heartbreaking time in our school's history. Not only do we honour formally, we take opportunities informally almost on a daily basis to reflect. I just met with new teachers and finished with the story of the avalanche. The sanctity of life is something you can never forget, and we always must reflect on our responsibility when we are entrusted with other people's children, so we honour very much our commitment to safety at the school in so many ways.

We formally do that every year. On February 1, we have a ceremony called Honour Day. We host a speaker who inspires our community to live their best lives. We invite back family, classmates, and colleagues, and we come back in remembrance and honouring for that event and for the individuals impacted. Not only those students who passed away, but those students and faculty who were there, those students who were classmates, and the impact on the greater community.

The other formal way and really meaningful way we honour is the Forever Woods. The school built a physical memorial called the Forever Woods as a tribute to each of the students—it's a beautiful place on campus. There's also a scholarship program that was set up to honour those students called the Forever Woods Scholarships.

AC: You joined STS in 2018, but you've been involved in education in Alberta since the early 2000s. What did you know about this event and its impact on education in Alberta?

CGW: I remember the day that the avalanche happened. The emotional response was to contact STS and offer support. I watched the community deal with it in such a very public and open and transparent way. I have watched through the years how we've learned lessons and all of us have improved our health and safety protocols, not only in schools, but in organizations and certainly in the mountain programs. I've been able to experience first-hand the lessons learned and how they've impacted so many people worldwide.

AC: After this avalanche happened, the school was very open in how it responded. It commissioned a review of its outdoor programs. What are the lasting impacts of those reforms and how are they still being implemented?

CGW: I credit all of those involved at the time to open the doors and say, "What can we learn? Let's find out what happened, and let's ensure some learning comes out of this." That's one of the biggest lessons of the avalanche. I really credit the parents and families of the students lost for their advocacy and support of that. In hindsight, it's really an amazing example of how tragedy and crisis should be approached. I think seeing the legacy piece of that, and a spirit of constant improvement at our school, and in organizations overall, is a meaningful legacy.

AC: What does the outdoor education program look like today, particularly the backcountry skiing component, which I see is still being offered?

CGW: It's done in accordance with the standards and protocols that came out. Every student at STS participates in some form of outdoor education and learning to complement other learning experiences at our school. It's fundamental to our core and achieving our mission of students pursuing lives of purpose and flourishing emotionally, physically, and intellectually.

What goes into the ability to do that and say yes is great training, developing respect for the outdoors, proper equipment, responding to individual concerns, engaging people, and acknowledging risk. Not taking undue risk, and following well-established principles and guidelines, some of which didn't exist in 2003, but came out of it. When you know better, you do better.

AC: One of the big recommendations of the review was involving parents more and making them more aware of the risks. How does the school involve the parents now?

CGW: You involve them as partners by having really good processes and procedures, and providing real clarity in the acknowledgment of risk. There are debriefings before, during and after all trips. We're very proactive going out. We don't just say, "This is the trip," and then we go out. We continually analyze weather conditions and what's changed since the last time we were there, etcetera, and parents have an opportunity to participate in that feedback.

It's beyond parents. It happens with the staff, the administration, the students too. It's a partnership with all those parties. We're also a member of the Association of Experiential Education, so we undergo a rigorous accreditation process. They go through our program with a

fine-tooth comb, make recommendations, and we're required to maintain that accreditation, respond, and report any actions where there's improvement. It's really an important component as well.

AC: The outdoor education program webpage shows a picture of the students on a backcountry ski trip in the Rockies.

Why do you think it's important to continue offering that opportunity to students? Given what happened, given the dangers, it could be easy to say it's not worth it.

CGW: We believe there's a connection between well-being, leadership, and resilience that comes from outdoor learning. It creates a living curriculum where students can benefit from deep learning, authentic personal connections with classmates and teachers, and engagement in their natural surroundings, which builds resiliency, curiosity, humility, respect, excellence, and joy. These are all part of our key values at STS. These become lifelong activities students can participate in, and, if we can ground them in the knowledge, skills, and attributes that serve them well, they can engage in these experiences safely with a healthy respect for nature well beyond while they are attending STS.

I think there's a component too for sustainability. When you're out in nature, that concept of sustainability is real, not just philosophical or theoretical.

AC: This interview will be published in *The Avalanche Journal*.

In our world, the legacy of this tragedy is it sparked wholesale changes in public avalanche safety in Canada that have probably helped save lives. Can the STS community take solace in the fact that those deaths have had this legacy?

CGW: I'm not sure if solace is the right word. I think it is important to have learnings to save lives. Solace might be the right word, I don't know. I don't know why I'm struggling with that. But there was some good that came out of a horrible situation, and for that I'm grateful as a nature user myself, as somebody who participates in these activities. For students and in education, I think it allows us to honour the immense sacrifice of these students, their families and their classmates.

AC: Is there anything else you'd like to say?

CGW: We have a community of more than 10,000 alumni and current families, students, and employees who believe in our school and play active roles ensuring we continue to honour the students who were lost, while collectively upholding our belief in the importance of safe outdoor education. We feel a real sense of responsibility to those families, to those students, and to this school community. And that's something I'd like people to know. 📌

The 2003 Review of the Strathcona-Tweedsmuir School Outdoor Education Program

Ross Cloutier

IN FEBRUARY 2003, I was asked by the board of Strathcona-Tweedsmuir School (STS) to review the school's outdoor education program and the Connaught Creek avalanche that occurred during the school's ski trip to Rogers Pass. I had previously analyzed fatalities related to outdoor programming for other schools and have done many more reviews since then. The scale of this event, where 14 skiers were buried and seven students died, combined with earlier avalanche incidents that winter, indicated the review would, and did, garner strong public and media interest, both nationally and internationally. This event remains one of the most serious school-based outdoor education accidents in Canada, a tragic event that will affect families and the STS community forever.

From the outset, the openness of the STS Board, school administration, outdoor education staff, parents, school alumni, and the broader school community was impressive. There was widespread willingness to provide input for the review, and widespread support for outdoor education as

an important and valued element of the STS's culture and identity.

A programming review related to fatalities can ultimately affect a wide range of related areas beyond the initial scope. Among other things, this review addressed risk tolerance within school programming; the field trip decision-making process; impacts of organizational culture and "grade effect" on field-trip decision-making; field trip leader qualifications; acceptable terrain and activities; differences in acceptable standards of care between schools and commercial guiding enterprises; and how Parks Canada managed custodial groups compared to professionally guided clients.

A few comments expressed within the review were as follows:

- Connaught Creek was well known as a ski touring route with significant avalanche exposure. To a large extent this was, and still is, considered a location with acceptable risk for commercially guided guests and recreational skiers. However, the area was widely used by schools and other




custodial groups—the 2003 trip was STS's 30th trip in the Rogers Pass area (between one and three times per year)—and my position was, and remains, that this type of terrain was not acceptable for school (custodial group) programming.

- The ski group comprised 17 skiers travelling together in one large group. Fourteen were buried in the avalanche and seven died. It is only by good fortune and the quick response of two professional guides who were skiing in the area that there were not more fatalities.
- At the time, Parks Canada's management position was to not restrict access to park terrain. Professional guides needed commercial use permits but custodial groups did not. The recent custodial group management regime is Parks Canada's response to an evolved position.
- The students on the trip had a high level of theoretical knowledge about avalanches. The trip was intended, at least in part, to provide practical exposure to avalanche terrain. However, this could have been done in a much safer location.
- Low-likelihood events can still have catastrophic consequences. The STS incident was a low-likelihood event, and the avalanche was not started by the group—it started far above on Cheops Mountain and swept the valley floor where the group was travelling. However, schools should have not been programming field trips where even low-likelihood, catastrophic events could occur.
- During the planning and delivery stages of an outdoor education program, it is easy to philosophize about outdoor education theory and the potential benefits to students of challenge and risk programming. The philosophy and benefit of outdoor and experiential education are well documented; students thrive on the learning style, adventurous activities, and challenging atmosphere. Although the potential risks in outdoor education activities are acknowledged, many instructors and the organizations they work within accept the risks because of the ensuing benefits. However, a benefit-focused approach may not give opportunity to consider the full potential cost of risk programming.
- Schools should not be making risk tolerance decisions for students, parents should. The level of due diligence required on the part of a school to fully inform and educate parents about the activities their child will undertake with the school was not totally clear. However, it was reasonable to expect the more risk a trip entails, the more onus there was on the school to fully inform parents.
- The standard of care required by school-based outdoor education programs was not well defined and had long been debated. Schools often expressed that they did not have the resources to meet a "commercial" standard of care and therefore the standard expected should be

lower. What is behind the commercial standard of care? Commercial guiding businesses operate under a very different legal environment than schools do. Their clientele is primarily adult, the relationship is a contract which the parties negotiate, businesses willingly advertise the risks and hazards, adult clients voluntarily sign legal releases that would have no enforcement status if signed by minors (or their parents), and fatalities occur with some frequency and are an accepted potential element of the activity. The position of society, however, was that the risk of catastrophic events is unacceptable within school-based programming. Therefore, a school needed to operate to a higher standard of care by having a lower tolerance for risk than a commercial operator. This means that schools may not have been able to operate in some of the same terrain or participate in some of the same activities to the same level as commercial operators. The difference in standard of care was defined by a school's lower tolerance for risk.

One of the byproducts of accident reviews is the legacy they may generate. What "societal good," what "greater purpose," what "elemental change," what "long-term memory" result from critiquing the event? While I remain saddened by loss of lives in the Connaught Creek avalanche, I am encouraged by the changes made and embraced by the outdoor education sector, Parks Canada, and Strathcona-Tweedsmuir School. Although this event is far enough in the past that a large segment of contemporary outdoor education teachers may not be aware of its implications and the review's findings. Many schools reconsidered their risk thresholds; the insurer for over 800 schools in Alberta developed extensive activity standards for dozens of school outdoor education and travel activities; school insurers in provinces across Canada reviewed their own operating standards; Parks Canada developed its custodial group policy which limits the terrain custodial and guided groups may enter with youth; and the Avalanche Terrain Exposure Scale (ATES) had origins from this event. These are among some of the lasting legacies of this event.

The report on the 2003 Strathcona-Tweedsmuir School Outdoor Education Program can be found at: drive.google.com/file/d/1ESGEfp0xhzNyRA9nKMZdTl_HkclqKSUY/. 



BIO

Ross Cloutier has more than 45 years of experience in the adventure tourism industry. He is the Executive Director of HeliCat Canada and the owner of Bhudak Consultants Ltd. Ross has completed dozens of adventure tourism consultant reports, strategic plans, accident investigations, and court opinions. He reviewed the 2003 Strathcona-Tweedsmuir School (STS) avalanche for the STS Board.

2003 and the Formation of the BLBCA

Tannis Dakin

THE PEOPLE WHO OWN AND RUN B.C.'s backcountry lodges are, by necessity, tinkers. Far from town, operating at the whims of Mother Nature, and with infinite variables at play, they get good at coming up with creative solutions. But even after nearly 20 years of operations, many of us weren't ready for the doozy that landed on our plate in 2003. The Durrand Glacier and Connaught Creek avalanches were hard blows to a young industry and had lasting consequences, but they were just a piece of a perfect storm started by 9/11.

When the insurance world was rocked by the fallout of 9/11, it had to adjust its cash on hand to balance the liability of potential claims. Companies dealing with higher perceived risk found themselves on the chopping block. In 2002, as owner/operator of Sorcerer Lodge, I was told we would no longer be provided with liability insurance. I hunted unsuccessfully for a replacement policy and then wrote to the B.C. government to explain the situation and ask for help. Although I was one of the first to lose my insurance, I could see it was coming down the pipes to all of us. Our government's response was essentially: please provide proof of insurance or your licence will be revoked. This wasn't very helpful.

I eventually found a U.S. company willing to insure us for four months—for \$18,000! It was a roughly 600% increase, and for only one-third of the year. This allowed me to operate in 2003 and bought some time to find a solution.

Bill Dunlop of JLT Canada gave our little industry a huge lift. He convinced underwriters to provide liability insurance for lodge operators that formed an association that would create standard operating procedures, a code of ethics, bylaws, auditing procedures, and more. We were working on that when the 2003 avalanches happened and launched us into a terrible and tragic spotlight. We feared this would blow any chance we had of finding industry-wide affordable insurance and continue operating at all. Fortunately, Bill kept the underwriters on track and it became our job to create the framework of guidance documents that would eventually become the backbone of the Backcountry Lodges of BC Association (BLBCA).

Following the avalanches, I had to respond to our clients and their friends and family. Sorcerer Lodge is located between the two avalanche sites. Many folks who had friends or family skiing in a backcountry lodge didn't know which one they were at or where they were located. They were just terrified by the horrible news. The weeks that followed were challenging as we fielded calls from worried people and media from all over the world, at all times of the day and night. It was exhausting and heart wrenching.

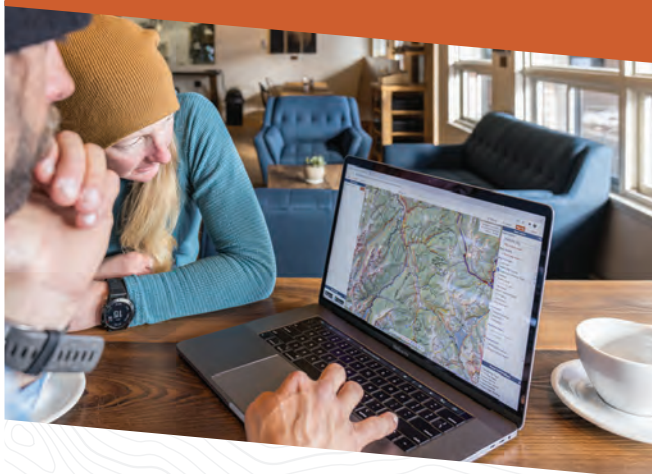
One thing that stands out was the realization I (and likely many of the other owners) came to regarding our clients' true understanding, and acceptance, of risk. Prior to the accidents, I believed most backcountry skiers knew things could go wrong, not everything was controllable, we were not infallible, and they could in fact die on a trip despite the care taken. I believed our clients accepted this. I quickly discovered my thinking was wrong, which came as a bit of a shock. I learned many of the people who skied with us every day did not truly understand or accept the risk. Despite the clarity of the waiver and the willingness on their behalf to sign it, they did not really believe they could die on a trip with us. That changed how I communicated with my clients.

The accidents spurred backcountry lodges to start sharing information. The coroner's report on La Traviata recommended all backcountry lodges subscribe to InfoEx. At the time, InfoEx was expensive and the technical demands made it difficult for smaller operations to take part. There was little appetite on the behalf of the CAA to create a separate category for smaller companies. To address the coroner's demands, Sorcerer Lodge supported the creation of Wisegoat.ca, an information-sharing website that was also available to the public. As InfoEx matured and became more inclusive, backcountry lodges joined up and the need for Wisegoat ended.

The BLBCA gradually matured, and members saw value in working together. The accidents cemented the realization we needed to talk to each other, share problems and solutions, and that if the worst happened, we were not alone. We became a family that had its differences, but could rely on each other. At annual meetings, we shared experiences and learned from each other on subjects like effective solar panels, composting toilet, and water treatment systems. Members realized that by helping each other, everybody gained. Documents outlining the expected behaviour of BLBCA members were developed, approved and frequently updated. Bylaws, Standard Operating Procedures, Code of Ethics, Code of Conduct, Guiding Procedures and Terrain Classifications, Self-Guided Recommendations, Information Sharing Recommendations, and board roles and responsibilities were painstakingly developed. In essence, the BLBCA grew up.

This organization was seeded by a need for insurance but motivated by a desire to come together to do whatever we could to prevent another winter like 2003.

With contributions from Brad Harrison, Executive Director of the BLBCA. 📌



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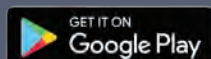
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