the avalanche journal

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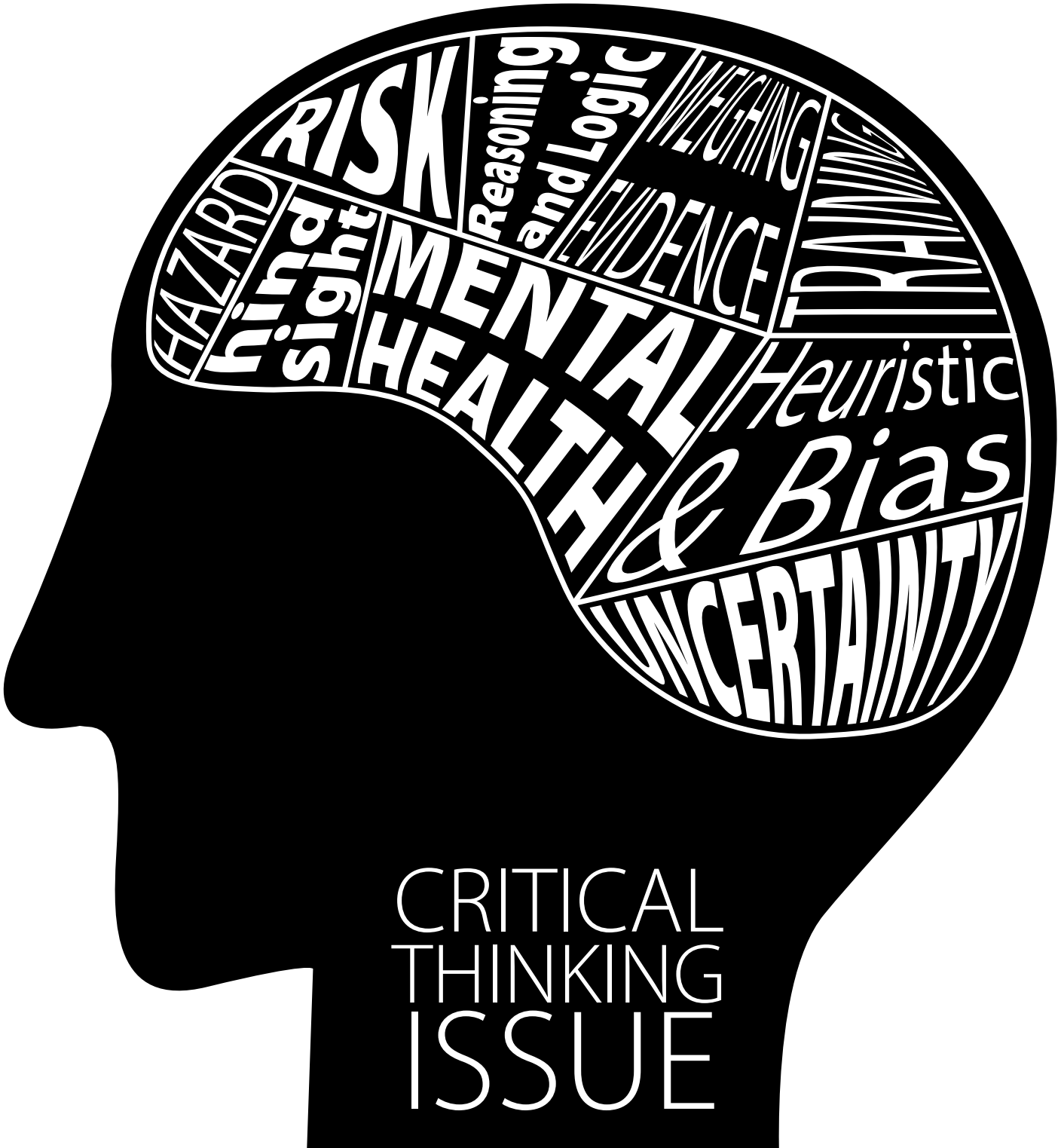

CRITICAL THINKING ISSUE

the avalanche journal

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Contributors

DANYELLE MAGNAN
Danyelle Magnan is an avalanche technician and has been a part of the Visitor Safety team in Glacier National Park for the past 10 years. She is also an ACMG ski guide.
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GRANT STATHAM
Grant Statham is visitor safety specialist for Parks Canada in Banff, Yoho and Kootenay National Parks, and has been a professional member of the CAA since 1991, and the ACMG since 1989. He moonlights as a mountain guide and avalanche consultant, working internationally several times per year. Grant is a frequent public speaker, has been an Arcteryx sponsored athlete since 1998 and is an adjunct professor with Simon Fraser University's Avalanche Risk Management program. Grant lives in Canmore with his partner Leigh Ann, and their sons Ryan and Asher.
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DREW HARDESTY
Drew Hardesty has been an avalanche forecaster at the Utah Avalanche Center since 1999/2000. He spends his summer as a warden/climbing ranger in Grand Teton National Park. Drew is often described as a storyteller at the forecast center, infusing his forecasts with haiku, metaphor, allegory, even references to the Book of Job. He cites Cormac McCarthy, whale hunter Herman Melville, dry fly fisherman Norman Maclean, French aviator Antoine de St. Exúpery, and the Japanese poet Bashō as literary inspiration.
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MARK STAPLES
Before becoming Director of the Utah Avalanche Center, Mark was a forecaster at the Gallatin NF Avalanche Center in Montana, a professional ski patroller at Big Sky Ski Area, and has an MS in Engineering and Snow Science from Montana State University. He splits his time equally between skis and snowmobiles and is a father of 3 boys.
24 20/40 HINDSIGHT

DAVID JONES
David developed an interest in weather on the snowy slopes of Grouse Mountain and the rainy, wind-blown sports fields of the North Shore. With his degree in meteorology, he was first posted to Halifax, then returned home to become a familiar, but not quite famous face and voice in local broadcasting. Prior to retirement, his final project was leading the Environment Canada side of the Avalanche Canada weather page.
40 THE COLD DRY BITTER TRUTH ABOUT SEASONAL FORECASTS

RACHEL REIMER
Rachel worked with women affected by violence, inner city youth and refugees before taking up her studies in Leadership. Following years in the wildfire industry, she recently joined the avalanche community as a tailguide. She is also an ACMG hiking guide and initiated the Open Mountains Project to bring youth at risk into the mountains.
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Letters to the Editor
Correction

Article title: Operational Avalanche Risk Management
Volume: 114//W 2016-17
The caption was incorrect for Figure 1.
Correct caption and figure are to the right.

From Cam Campbell

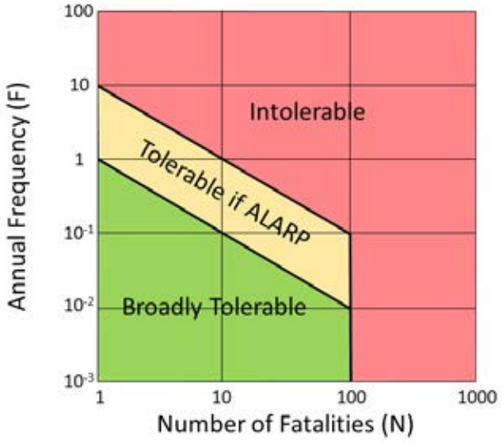


Figure 1 – Example of what societal tolerance for avalanche risk in Canada might look like on a F-N plot (CAA, in prep). The plot is divided into three zones: broadly tolerable; tolerable if as low as reasonably practical (ALARP); and intolerable. The boundaries are provided for illustrative purposes only. They are based on expert opinion of voluntary and involuntary avalanche risk, but no formal analysis has been conducted.

New Staff

Katherine Dalman
ITP Coordinator

KATHERINE started working with the Canadian Avalanche Association at the start of September as the new Industry Training Program Coordinator. She has been working in the outdoor industry for more than 10 years and also works as a tailguide at K3 Catski in the winter months. She lives in Revelstoke with her partner John and dog Indy.

Andrea Lustenberger
Administrative Assistant

ANDREA hails from Invermere, BC, where she grew up in the mountains, skiing and exploring with her family. Nine years ago, she moved to Revelstoke. Here she enjoys discovering the local terrain on skis and running trails. For the past three years, she's been working with HeliCat Canada and looks forward to being part of the CAA team.

Critical Thinking

Jill Macdonald
Managing Editor

ONE OF THE MOST REVEALING THINGS we can do is examine our own work. Take a good honest look while scrubbing the toilet and see if our methods are effective. It can be nasty and that's why we avoid doing it. On the downside, the longer we prolong rolling up our sleeves and getting in there, the worse things get.

The genesis for this issue came from Grant Statham's presentation at our annual Spring Conference. He had the audience at attention with his honest self-examination, a process that came about from making a decision and then later reflecting on the why and how behind it. (see: Below Treeline Hazard Rating).

Whether it's our methods of recording information, assessing risk or our mental health, taking the time to be objective is never a bad idea. When we poke holes in our rationale, we shed light on the murk. Why do we think the way we do? If it makes us uncomfortable or defensive, there is probably a festering reason. While the process of self-examination can be irritating, frustrating or upsetting, the worst that can happen is a revelation.

Once we have touched on the source, things can only improve.

Several of the articles in this issue point to the essential need to communicate. To say what we think, observe and feel. From weather forecasts to patient care in mountain environments, to gender and leadership, we have the tools to share observations and ask questions of each other.

Start with yourself. Be honest. We're all in this— together we share the good times and we weather the bumps. It is up to each one of us to create a community where there is no consequence in sharing personal issues or constructive feedback in professional practice.

In the words of the inimitable David Jones, "Don't be a turkey."

Talk to each other. Share the bounty — and pass the stuffing.

Jill Macdonald

The Avalanche Canada Foundation's **ISSW Fund**

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 proposals. Awards may go to a single recipient, or to multiple recipients. Projects that extend over multiple years will also be considered. Decisions on the awards are made twice annually by June 30 and October 31.

For more information visit: avalanche.ca/foundation/funds/issw

President's Message

Walter Bruns
CAA President

THERE'S NOTHING quite like a crystal-clear sunset, a hard frost overnight, and a blue sky day dawning to direct one's thoughts to the coming winter. Many of you in the avalanche community are already ramping up with hiring, scheduling, logistics and infrastructure preparations for the season soon to be upon us.

Your president must confess to a bout of delinquency these past several months. What started as a (simple) kitchen renovation has suffered extensive mission creep. New cabinets required removal of walls, then a new side entrance, new stairs, with a new concrete slab, etc etc. The only building element between me and that hard frost right now is some 6 mil poly and duct tape.

Thankfully, the good staff at the CAA have been busy and on task working with the board, committees and project teams on budgeting, planning and executing. As this is our first full year with our new fiscal cycle running from December 1 to November 30th, we're all adjusting to the new pressures and opportunities that come with it.

In May, we began the process of developing an annual operating plan (AOP) so the board could have a better overview of the full extent of work in committees, operations, and projects. This process led to a meeting in Revelstoke in June before final approval in August. (Thanks to the good folks at RMR for complementary mountain coaster tickets.)

The scope of what the CAA does with relatively modest resources is impressive. Equally important is that we reach these goals in a sustainable way relative to our collective human and financial resources.

On the budget side, Operations Manager Kristin Anthony-Malone and Treasurer Mark Bender presented an operations budget targeting a 7 to 10 percent surplus to support sustainable development in our major areas: Association, ITP and InfoEx. Kristin coordinates tightly with Executive Director Joe Obad and Comptroller Janis Borden to make sure expenses stay within these lines.

Within our capital budget we reaffirmed commitments to existing projects and emerging needs. We authorized our annual $10,000 to the Simon Fraser University Chair in Avalanche Risk Management. Like so many of you, the board is pleased with Dr. Pascal Haegeli's appointment as chair in this program and the initial work of Pascal and his students. To help advance the project to develop terrain guidelines for avalanche education, we allocated $5,000 to hire subject matter experts, with the aim to bring completed draft guidelines to the spring 2018 AGM.

Similarly, we allocated $15,000 towards expertise supporting development of a revised assessment strategy for entrance to active and professional membership. $5,000 went toward a new printer in Revelstoke – critical for all staff, especially the ITP program. Lastly, we allocated $20,000 for much-needed new flooring in our building. Despite all these expenses we remain in a strong position with cash reserves and the CAA building as equity.

Within operations, achieving our goals requires additional resources. The Industry Training Program (ITP) has added an ITP coordinator. Katherine Dalman joins the CAA in this role. This frees up ITP manager Emily Grady to look at more strategic ITP issues ranging from instructor training to supporting the NSS-funded project to revise the ITP program.

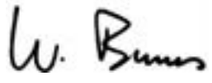
Scott Garvin and professional member Danyelle Magnan worked with your survey feedback to give the staff input for this year's CPD. Joe and Kristin have taken that feedback and have been diligently working with our friends at the ACMG on a late fall CPD in Revelstoke from November 24 to 28.

On the InfoEx front, at the spring meeting we heard concern from the InfoEx Advisory Group (IAG) about the increasing seriousness of the issues dealt with by the IAG. The IAG and the board both felt these extremely valuable good faith efforts should be protected by our directors' and officers' insurance. Over the summer, Stuart and Joe worked on a draft terms of reference to move the IAG to committee status. The board and IAG revised this document to a final version which we have both approved. This is a good move that brings these great volunteers under the protection of our insurance without much impact on the freedom they have to provide the best advice they can offer in the interest of the subscribers.

In all these efforts, the board has tried to support the staff and committees. In turn, Joe and the staff have structured our conference calls and in-person meetings in a way that has been very efficient and cost effective as they put forward matters requiring governance decisions.

As we head towards May, we will lose several board members timing out. I encourage those of you who have been thinking of serving to join us, to keep advancing the CAA in its service to the public, industry and membership.

Best wishes for a productive fall season,



Walter Bruns, CAA President

Executive Director's Report

PERSPECTIVES

Joe Obad
CAA Executive Director

AS THIS ISSUE OF *The Avalanche Journal* shows up in the mailboxes, you are likely busy getting ready for the season ahead in a hundred ways. From communications with bosses or employees, to conversations with clients or prospective students, to preparing to be away from family, and so on. All that urgency does not always lend itself to reflection. I'll offer a few thoughts here that I hope are worth peeling you away from the early season rush.

In June, many of us attended the memorial service for professional member Dean Flick. Beyond the sadness of the service, a question permeated the air. How could Dean have taken his own life, yet have so many people here to celebrate their connection to him? Mental health, suicide, and the grieving that follows evoke complex questions the CAA and our partner organizations are not well suited to address. Yet, Dean's death is the fourth member suicide in the last five years. By my modest calculations, this is several times more than the national average for any other profession.

Like many you, over the summer we have had conversations about the stresses faced by our members and those in similar mountain work: modest wages; high pressure work with consequential decision making affecting safety, transportation and profit; long hours; time away from family in many cases; frequently uncertain prospects for employment; and more. For all the joys winter snow and avalanche work offers, these are serious and often cumulative pressures. To what degree these pressures played a role in member suicides is unknown, but it is not rocket science to assume many of our fellow co-workers in the snow industries are quietly struggling with many of these pressures.

So, where do we go from here? First, we can ask about our own self-care. Long gone should be the notion that we can tough everything out. Sure, there are days when we need to press on to get back to the trailhead or out of an immediately critical situation, but before the next wave of pressure hits, try to give yourself time to reflect. Process and speak openly to peers you trust to hear you without judgement. If you're doing well, make sure you contribute to a supportive work environment. Are you doing what you can to encourage colleagues who may be struggling, to come forward to you or to seek other resources? We have come a long way from when mental health was regularly stigmatized, but those gains are held or lost daily by the support we offer each other and the example we set. By being open about our own experiences, we can support others who have yet to call to a counsellor or similar resource. In the wake of Dean's death, many friends and colleagues have spoken more openly about stresses and mental health challenges. For Dean and for the others we have lost, let's learn from their lives and their deaths, and offer each other support moving ahead.

Circling back to the spring conference, Rachel Reimer presented her findings on gender and leadership in the forestry sector. Her work looks into the space where leadership and human factors meet sociology and gender studies. She surveyed and studied the BC Wildfire Service (BCWS), and brought some illuminating considerations for the avalanche patch. BCWS has a similar profile to many environments in which CAA members work: potential for serious injury while working in close proximity to hazards that are not easily defined or constrained; continual need to balance operational objectives with risk tolerance; and, lastly, a predominantly male workforce, especially as leadership and responsibility increases.

Reimer's findings, which she discusses in this issue, should offer all of us pause. In the challenging environments our members face, are we doing everything we can to make sure all voices are heard? Particularly in leadership positions? As risk management questions the industry faces become increasingly more complex, can we afford to lose the perspective of many women and men who do not readily conform to the culture of the industry but who are equally skilled and professional? I encourage organization and industry leaders to read Reimer's work and to reflect on the work culture you're promoting. Hopefully it is an affirmation of your practices. If it raises uncomfortable questions, maybe some of you will find the time to sit down with your teams to ensure, irrespective of gender, that your staff feel empowered to contribute effectively to your workplace.

While the challenging topics above give us pause, I'll end on a matter of positive perspective where we can all easily contribute. At the AGM, the membership embraced and passed a motion to explore a historic summary of the CAA to celebrate at the upcoming 40-year anniversary. Each CAA member likely identifies more strongly with a particular era in our history. As we try to wrestle this proposed project into shape, all of your perspectives are greatly appreciated. Please contribute your images or stories by email: info@avalancheassociation.ca with the subject line: "CAA History". This project will gain more structure but for now we welcome any initial thoughts to get the ball rolling.

From all the staff, we wish you the best in the 2017-18 season and look forward to seeing you out in the snowy hills!

Joe Obad, CAA Executive Director

front lines

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HIT FROM ABOVE

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THE BARE BONES

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After a long and detailed project with Martin & Shaft LLC Division of Orion Safety Products Inc, C-I-L Explosives has been able to convince them of the depth of training and safety knowledge within the avalanche control clientele. With that established, Martin & Shaft have agreed to remove the use restrictions that they had in place vis `a vis avalanche control use.

The result of that has been a new Instructions For Use of Pull Wire Igniters (PWL), P/N 2020 flyer developed by Martin & Shaft and vetted by NSAA, AAA, C-I-L Explosives and Maple Leaf Powder. It is a well written, comprehensive and educational flyer that every practitioner in the industry should study carefully. These instructions are limited to the Martin & Shaft PWL 2020.

We offer a preview of that flyer here as it goes into production to be inserted in each case. Any questions or clarification requests can be directed to C-I-L Explosives:

Attn: Dave Sly at 250.744.8765; or davidsly@mapleleafpowder.com

Please see the following two pages on the Martin & Shaft Pull Wire Igniters (PWL), P/N 2020 procedures.

MARTIN & SHAFT, LLC
Pull Wire Ignition Devices

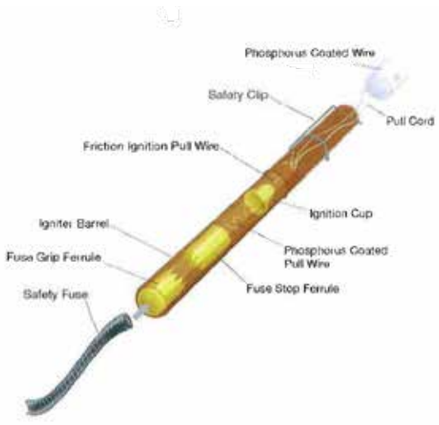
P.O. Box 1034
Easton, Maryland 21601
Phone 303-567-4801
Fax 303-567-4802

INSTRUCTIONS FOR USE OF
PU LL WIRE FUSE LIGHTERS (PW L), PIN 2020

WARNING:
Working with explosives is inherently dangerous. Carefully follo w these Instructions for Use an d your department's safety protocols.

This PWL device is intended to ignite a length of Safety Fuse for the detonation of explosives.

Exploded View of PWL



Note: Diagram is representative only and is not to scale - intended only to familiarize user with internal components of PWL. Safety Clip (which pins Safety Cap in place on end of PWL) is shown in diagram in locked/safe position despite fact that diagram shows Safety Cap off PWL body. In reality, once the Safety Clip is removed, the Safety Cap (which is attached to Pull Cord and Friction Ignition Pull Wire) will drop down away from PWL body and when pulled will activate the PWL (by pulling the Friction Ignition Pull Wire through the Ignition Cup). Component names identified in diagram are underlined in these Instructions for Use.

ALWAYS

1. **ALWAYS** be sure the Safety Fuse is dry and cut squarely with a sharp, clean cutter designed for that purpose. A slant cut is more likely to cause failures to ignite the Safety Fuse.

2. **ALWAYS** insert the Safety Fuse into the open end of the PWL tube, pushing it in slowly and carefully with a twisting motion but never more than 2 1/2 inches (which is depth of Fuse Stop Ferrule from open end of PWL). Be aware it is always possible that the Safety Fuse will light when the PWL is placed on the Safety Fuse.

3. **ALWAYS** remove the Safety Clip only immediately prior to use. After removing the Safety Clip, hold the PWL tightly in one hand and with the other hand give a firm pull on the Safety Cap. Do not hold the Safety Fuse alone or the act of pulling the Safety Cap could separate the PWL from the Safety Fuse and cause a no light. Once you have pulled on the Safety Cap, and assuming you have followed the other Instructions for Use contained herein, the Safety Fuse will be lit. Quickly retreat to a safe place. The safety protocols adopted by different departments may direct the user to "confirm ignition" after pulling the Safety Cap before retreating. This is an acceptable practice as long as the confirmation process takes only a few seconds. If there is concern that the Safety Fuse is not lit after pulling the Safety Cap, follow your department's safety protocols for this situation - DO NOT ATTEMPT TO RE-LIGHT!!!

4. **ALWAYS** confirm weather conditions (snow, wind, etc.) are acceptable for use of the PWL in accordance with your department's safety protocols. If your department requires that the user "confirm ignition" after pulling the Safety Cap before retreating to a safe place, verify that the weather conditions do not inhibit your ability to confirm ignition. When in doubt, delay use of explosives until conditions are conducive to safe use. If that is not feasible, assume the Safety Fuse is lit once the Safety Cap is pulled.

5. **ALWAYS** wear safety glasses and gloves when handling the PWL. The PWL becomes hot to the touch soon after the Safety Fuse is lit.

NEVER

1. **NEVER** re-cut the Safety Fuse and attempt to re-light.

2. **NEVER** insert the Safety Fuse into the PWL until immediately prior to the intended ignition of the Safety Fuse. Again, always assume it is possible that the Safety Fuse will light when the PWL is placed on the Safety Fuse.

3. **NEVER** insert Safety Fuse into the PWL carelessly or rapidly and **NEVER** insert the Safety Fuse more than 2 ½ inches into the PWL (do not push Safety Fuse into or beyond the Fuse Stop Ferrule). Forcing the Safety Fuse beyond the Fuse Stop Ferrule can force the Friction Ignition Pull Wire into contact with the Ignition Cup (the two act together like a match and scratch surface), thereby causing ignition of the PWL and lighting the Safety Fuse. **PAY CAREFUL ATTENTION!**

4. **NEVER** use less than the legal minimum length of Safety Fuse according to manufacturer's recommendations, your department's safety protocols or governmental regulations, whichever is greater.

5. **NEVER** use Safety Fuse less than 0.18 inches (4.57mm) in diameter.

GENERAL CONDITIONS

1. Safety Fuse must be long enough so that the user has enough time to retreat to a safe place before detonation.

2. Excessive static electricity, which can be generated by wind and blowing snow among other things, might be a factor in effecting a premature detonation of explosives unless using a detonator with a static bleeding shunt. Carefully follow your department's safety protocols relative to use of the PWL in varied weather conditions.

3. While the PWL is not designed to be removed off the end of the Safety Fuse after ignition (i.e., after pulling the Safety Cap), some departments recommend this practice to assist users in confirming ignition of the Safety Fuse. While this practice is not prohibited under these use instructions, it is not recommended as it is contrary to design.

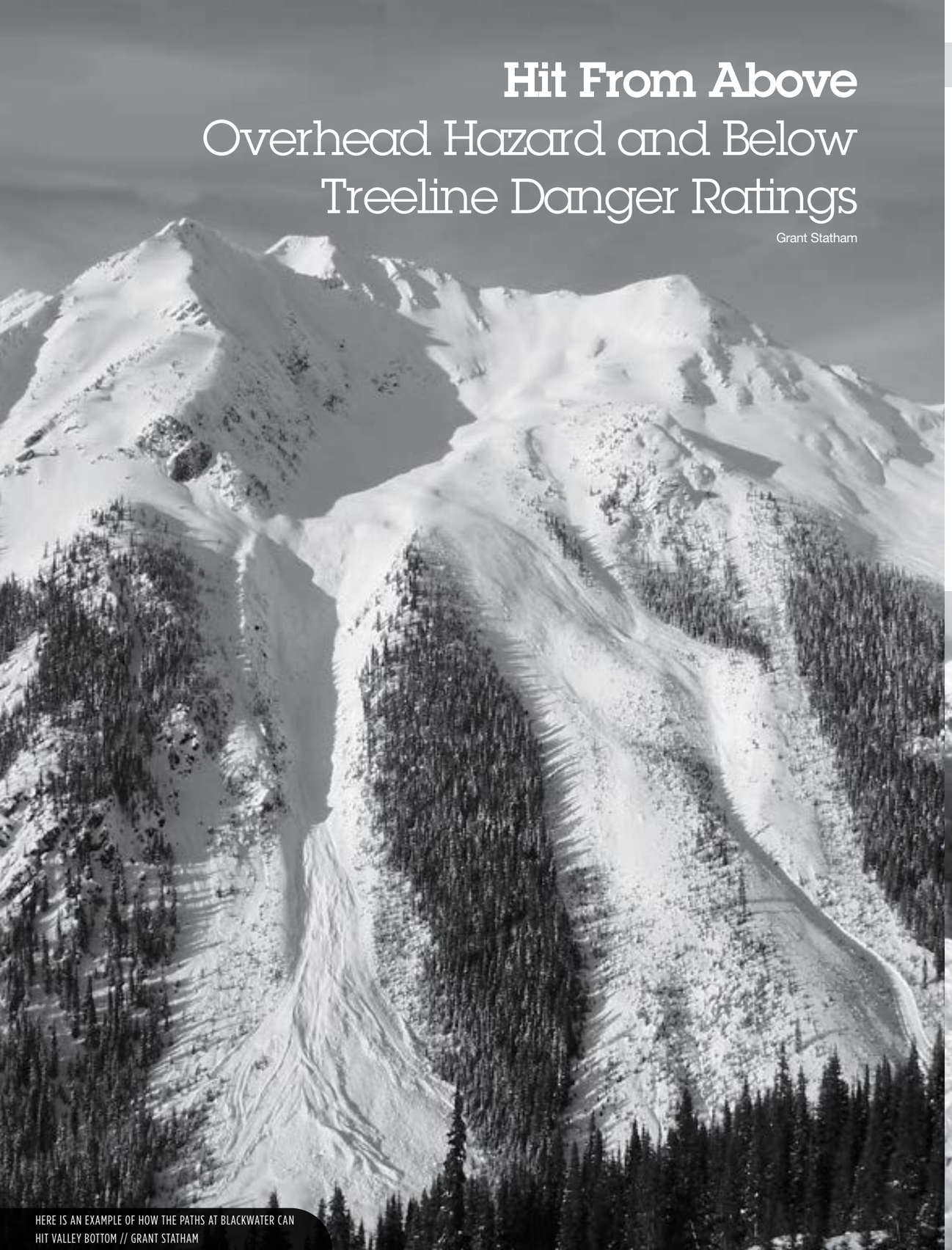
4. The PWL is intended to generate a flame to ignite the Safety Fuse. The PWL must be stored properly and handled with great care and in accordance with these Instructions for Use at all times. The manufacturer will not be responsible for any loss due to improper storage or use of PWLs.

5. DISCLAIMER OF WARRANTY AND REPRESENTATION: The manufacturer cannot anticipate every possible procedure or circumstance in the use of PWLs. PWLs are sold without any express or implied wananty or representation of any kind, including fitness for a particular purpose, and on the condition that users satisfy themselves as to the suitability for their intended use.

Hit From Above

Overhead Hazard and Below Treeline Danger Ratings

Grant Statham



HERE IS AN EXAMPLE OF HOW THE PATHS AT BLACKWATER CAN HIT VALLEY BOTTOM // GRANT STATHAM

IT WAS A TYPICAL LATE THURSDAY afternoon on the 29th of December 2016. Everyone had already left the office for the day, and I was alone trying to finish off the avalanche forecast. Steve Holeczi and I had toured into the Yoho Valley that day to a study plot near Takkakaw Falls, which is a great trip for making subalpine snowpack observations. We'd put in the uptrack, done a snow profile, skied a lap into the moraines above, and then returned back to the office where I was now trying to crank out the forecast and get home for dinner.

So far that winter it had been a great start to the high elevation snowpack, and we'd had only one minor avalanche cycle from December 20-23. Below treeline the snowpack was shallow; mostly below threshold with no place where you'd worry about triggering an avalanche. We'd been rating the danger Low below treeline every day since our forecasts started in November. Steve and I had agreed after our trip that there was no way we could trigger a slab below treeline, but as I sat alone contemplating the danger rating, I started thinking about all the ice climbers in Field. Earlier that morning one had called, and I'd advised him to stay away from the higher frequency gullies on Mt. Dennis because we'd seen recent avalanches running over the climbs and into the trees. But if this was the case, how could I rate the danger *Low* below treeline? That just seemed totally misleading for any ice climber reading our forecast, so I bumped it to *Moderate* and went home for dinner.

That moment of solitary contemplation – simple as it was – revealed to me a serious inconsistency in the way we understand and communicate avalanche danger ratings below treeline and I decided to dig deeper into it.

A few days later I went back and reviewed our avalanche forecasts for the Little Yoho region during an eight day period before Christmas when we had a minor avalanche cycle. During that time, our alpine and treeline danger ratings varied from *Moderate* to *Considerable*, but our below treeline rating remained Low the whole time. This, despite statements warning of avalanche control, avalanches running far and avalanches running over climbs into the forest below. The text was correct, but what about the

AVALANCHE BELOW CASCADE WATERFALL // GRANT STATHAM

AVLANCHE OVER PILSNER PILLAR // BRIAN WEBSTER

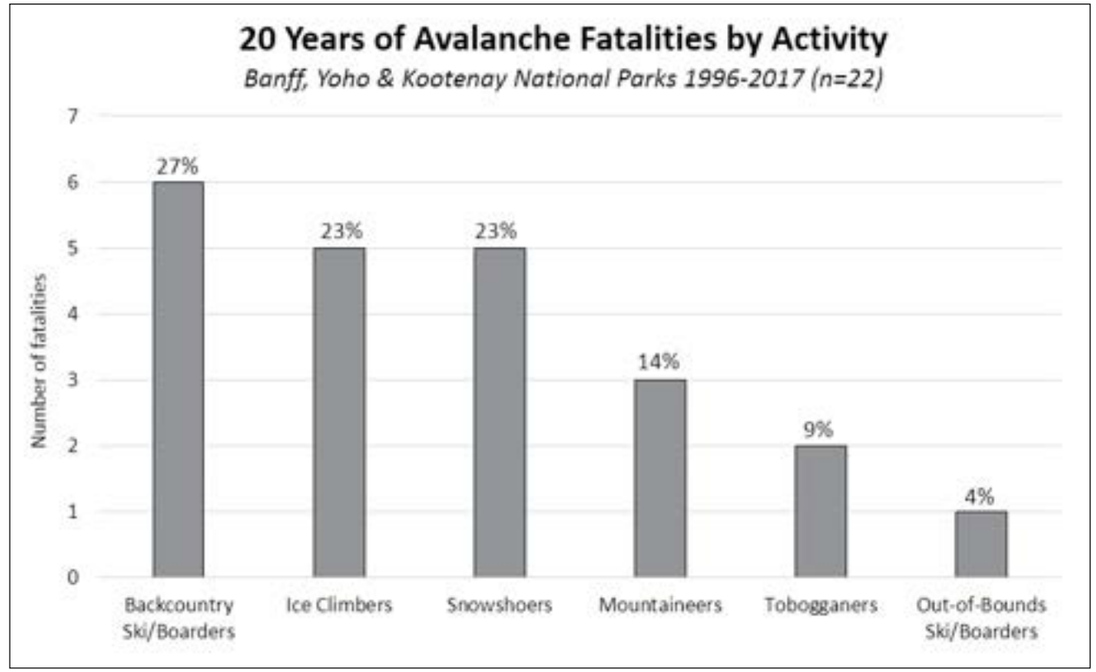


FIG. 1: AVALANCHE FATALITIES ACCORDING TO THE DIFFERENT TYPES OF RECREATIONAL ACTIVITIES UNDERTAKEN IN BANFF, YOHO AND KOOTENAY NATIONAL PARKS.

rating? Something about that rating and what was actually happening just didn't add up.

I started wondering about our bias towards avalanche initiation in public forecasting, and asked myself if we too easily disregard the runout of avalanches when rating the danger? Do other forecasters consider the likelihood and impact of getting hit from above when applying a danger rating? They certainly consider this in their analysis, and this shows up in the text, but what about when applying a danger rating? Where I work, we double as highway forecasters too, and in that case it's all about runout distance and impacts from overhead. As far as I can tell, everyone is forecasting for runout distance but these impacts are not necessarily being reflected in the public danger ratings.

So I asked around and soon learned that many forecasters believed that danger ratings are about initiating avalanches and not about the impacts from an avalanche runout. Others thought that when there was a slim chance of an avalanche runout, the rating should be kept at Low and the problem described in the text, "Don't dumb it down, the danger ratings are for experienced tourers who know when to avoid runouts". Still others thought the recreating public should know the elevation and danger rating for any starting zones they travel under. Mostly though, people hummed and hawed and said they didn't really know but assumed danger ratings were for avalanche initiation.

How did that happen? I spent a decade working on the avalanche danger scale, and I don't ever recall it being for initiation only. How could I have gone this long without realizing this issue before? I recall the question being posed after the Connaught Creek avalanche in 2003, but I'm not sure anyone ever answered it.

As part of the Visitor Safety team in Banff, Yoho and Kootenay National Parks, I work alongside eight other mountain guides to forecast for the highways and the backcountry. More than half of our team cut our teeth as heli-ski guides in British Columbia – places where the avalanche hazard below treeline usually revolves around surface hoar in giant forest glades. Has that experience formed our view of danger ratings below treeline? Are we rating the subalpine for avalanche initiation only, the same way we did when we rated the Snow Stability for heli-skiing? We all remember countless times when the stability was Good below treeline because you couldn't initiate a slab, yet large avalanches were running in the adjacent

paths. These are the classic conditions on those legendary powder days when you stay in the trees and avoid all the avalanche paths. But avalanche danger and hazard are different because they incorporate the size of the avalanche, which snow stability does not. While snow stability ratings do not include the impacts of an avalanche, avalanche danger ratings do.

This led me to consider the recreational activities that occur below treeline in Banff, Yoho and Kootenay National Parks. This is the heart of the Canadian Rockies, not the Monashees. Here we don't have many big, steep gladed forest runs and our snowpack is comparatively shallow. In this part of the Rockies, below treeline is mostly a place for cross-country skiing, snowshoeing, ice climbing or a transitory zone that ski tourers pass through on their way to higher elevations. This is not a place where people routinely ski tour in big, steep, triggerable glades in the forest, yet our below treeline danger ratings appear to be dominated by that scenario.

Later in the winter when I found some more time, I dug into the avalanche fatality records. Over the past twenty years, there have been 22 avalanche fatalities in Banff, Yoho and Kootenay National Parks. Figure 1 shows the distribution of activity types where these people have been killed, and provides a modern snapshot of who is exposed to avalanche danger in our parks. It's interesting to see that ice climbing and snowshoeing are almost on-par with backcountry skiing, and also that 36% of these incidents involved people not traditionally reached with avalanche forecasts (snowshoers, tobogganers and out-of-bounds skiers). I was also interested to learn who was hit from above, so I took a close look at each one of these incidents and found that 41% of these victims were hit by natural avalanches from above (Figure 2). Low and behold, every one of those incidents occurred below or just at treeline.

On March 14, our team began a search for two missing people who had not returned to their hotel room for 36-hours. By mid-afternoon we'd found them; two

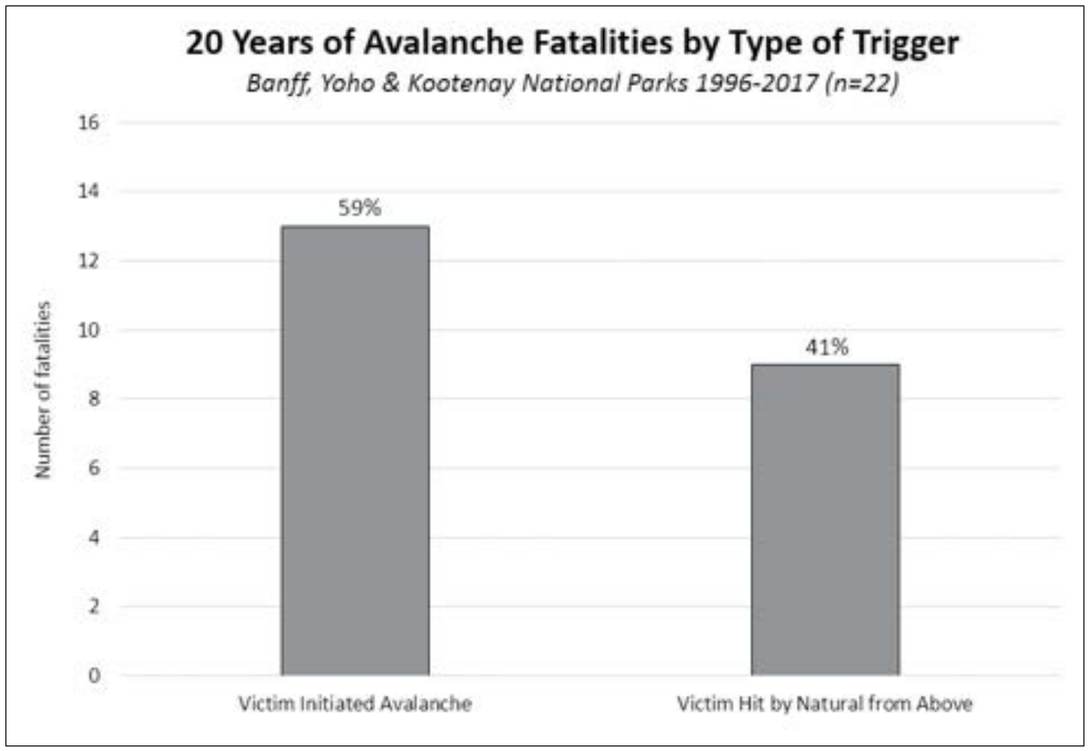


FIG. 2: THOSE WHO WERE KILLED BY AN AVALANCHE THEY STARTED THEMSELVES VERSUS WITH THOSE WHO WERE HIT BY A NATURAL AVALANCHE FROM ABOVE. FOR THE INCIDENTS WHERE PEOPLE WERE HIT FROM ABOVE, ALL OF THEM OCCURRED BELOW, OR JUST AT TREELINE.

VIEW FROM BOTTOM OF AVALANCHE DEBRIS IN THE YOHO VALLEY // GRANT STATHAM

snowshoers buried in a large avalanche from the slopes of Mt. Andromache north of Lake Louise. Three days later, in the midst of the biggest avalanche cycle in 25 years, we got them out. They had just reached treeline, not far above the dense forest and underneath 900 meters of avalanche terrain. On the Sunday before, the day we think they were buried, the danger rating had been *Considerable* at treeline and we'd warned of Deep Persistent Slabs.

Just over a week later, the peak of that huge cycle was over and the snowpack was on the mend - but we were gun-shy. None of us wanted to tour anywhere except the flats, as we were continuing to see at least one size 4 run full path every day. While the likelihood was coming down, the size of the avalanches were not. Our alpine and treeline ratings were pinned at Considerable, but on March 24 the rating below treeline was dropped to Low with a headline that read *"natural avalanches reaching valley bottom trails are still considered possible"*. If this was indeed the case (which it was), then by definition you cannot have Low danger.

Something is clearly astray with the way we understand and utilize the avalanche danger scale when it comes to overhead hazard. Avalanche danger in its purest form is simply a combination of Likelihood and Size. It doesn't matter whether you start an avalanche or get hit by one, because people's exposure is not part of the equation – a size 3 avalanche that starts is still a size 3 where it stops, including below treeline areas. In purely deductive terms, it's impossible to have *Low* danger when avalanches of size 2 or larger are possible. This is a fact of the danger scale one can glean by reading the definitions.

People have expressed concern that considering the impact of avalanches from above will bias our danger ratings to be overly conservative. "It will always be *Considerable* below treeline" seems a common worry. While this approach may result in higher danger ratings below treeline during and immediately after an avalanche cycle, once it becomes unlikely that natural avalanches will reach the low elevation runout zones anymore, then the danger rating below treeline will return to *Low*. This is the natural rhythm of an avalanche cycle and to me this approach seems like a more accurate reflection of the conditions.

The Conceptual Model of Avalanche Hazard may have contributed to this problem by making common use of the term *Likelihood of Triggering*. While this was always intended to include both human triggered and naturally released avalanches, the term is flawed because the word "triggering" inherently implies initiation under foot. A more representative term is *Likelihood of Avalanches,* which implies the chance of an avalanche occurrence. As a result, the Conceptual Model has been changed to reflect this improved terminology.

1. Avalanche hazard assessment considers both initiation and runout

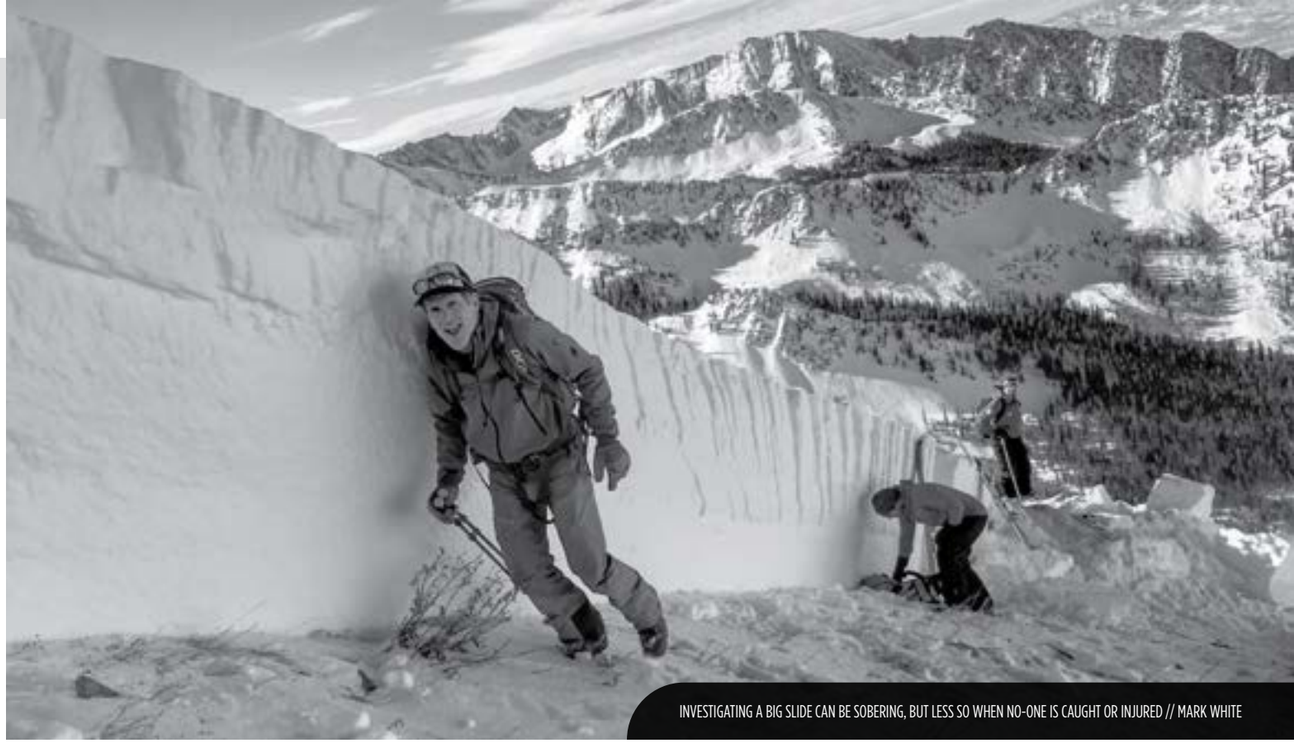
2. When considering the runout, refer to the *Likelihood* and *Size* definitions

3. Text explanations are of critical importance to explain the situation

Since starting down this path last December, I don't look at danger ratings the same way anymore. I can't even remember what I used to do, because for me the argument to consider overhead hazard and the impact of runouts in the rating is so compelling that I can no longer do anything else - especially for public warnings. In fact I am astonished that we've come this far without clarity or consensus on such a fundamental question. I think I drove my colleagues a little nuts last winter as I came to terms with this. We risked divergent philosophies within our team, and so for this winter we'll seek consensus on this issue at the start of the season.

I learned a lot during the winter of 2016/17, but probably the biggest lesson was not to make assumptions about the kind of people who use our products and what they ought to know. The forest of the Canadian Rockies is mostly a place for travelling on trails; for cross-country skiing and snowshoeing, or ice climbing in gullies, and when we rate the avalanche danger in these areas we have to consider the likelihood and impact of natural avalanches running out below treeline. Those who know enough to distinguish the difference between that condition and triggering one themselves will still find their own low-risk, steep lines in the forest. Those who don't will have at least been cautioned to avoid runout zones during times when natural avalanches are active.

Thanks to Steve Holeczi for reviewing this article and continually keeping me honest with challenging feedback, and to the rest of my fellow forecasters in Banff, Canmore and Lake Louise for the many thought provoking discussions about this topic.



INVESTIGATING A BIG SLIDE CAN BE SOBERING, BUT LESS SO WHEN NO-ONE IS CAUGHT OR INJURED // MARK WHITE

#NothingBadHappened

Drew Hardesty, Saturday, December 24, 2016
This article first appeared in Volume 35.4 of *The Avalanche Review*, April 2017. Reprinted with full permission.

I CRIBBED THE NAME FROM AN ESSAY BY IAIN STEWART-PATTERSON, a mountain guide and faculty staff member of Thompson Rivers University in British Columbia. His dissertation: *The Role of Intuition in the Decision Process of Canadian Ski Guides*. You can find his essay in issue 34.4 of *The Avalanche Review*, the publication of the American Avalanche Association.

I imagine most of you reading this are familiar with the very close call in the Birthday Chutes from last Monday. I've added Mark White's photo below and the full accident investigation report by Mark Staples, Greg Gagne, Mark White, and Snowbird ski patrol can be found adjacent to these companion essays. Long story short, a party of two triggered a very large avalanche to the ground in mid-White Pine canyon of Little Cottonwood. One of the two was caught and carried for over 500' and was uninjured.

That night, we received an email from a backcountry skier who that same day had skied the northwest face of Red Baldy - the steep open face lording over upper White Pine canyon in LCC and sitting just up-canyon from the Birthday Chutes. As I respect and value his self-reflection, I thought it might be of interest to share his email and my thoughts back to him.

Hello UAC,
I'm wondering if someone would help me analyze my decision to ski Red Baldy on the day that the Birthday Chutes slid.
In hindsight, I still feel it was a reasonable decision. But if someone is inclined, I'd like to know if you see any mistakes in my process, so I could avoid repeating them.

BEFORE I HIT THE SNOW:

- I'm a regular bc skier
- Carrying beacon, shovel, probe and 10 essentials
- Familiar with the terrain
- Familiar with the weather and this season's snow in the central wasatch, but not upper white pine
- Had a goal -- NW Red Baldy -- but not set in stone
- Strategy for making good decisions under stress: go w/ the most conservative judgment

- Read weather and avy reports from UAC and other sources that morning and each day since the most recent storm
- Was on a similar aspect and elevation the day prior, Argenta.

ON THE APPROACH:
- Looking around a lot/keeping awareness focused on physical environment
- Specifically looking for signs of recent avalanches, sun and wind effects, effects of prior skiers travel
- Observed no signs of recent avalanches, only infrequent sightings of point releases below cliffs, trees; no cracking or collapsing on skin up
- Looked at the BDays from the summer road skin track: suspected it would be loaded in parts and scoured in others -- could see westerly winds transporting snow up high -- sensitive and have the potential to slide leaving no easy escape.
- No noticeable effect from sun on snow

ON RED BALDY:
- Wind was stiff and swirling with a slightly west prevailing direction above the forest at the base of RB.
- NW face had up to half a dozen faint, wind buffed ski tracks, some starting just under the ridge line rocks, others going only half way up the face, and running down the center of the face. No sluffing seen near any of the old ski tracks.
- NW face showed only small, isolated areas of wind loading. Mostly, swirling wind transporting snow in all directions. The only drifts encountered were avoided by changing the path of the skinner.
- just below the top of the NE ridge, I traversed west below the ridge line rocks. Rocks above were scoured and not holding much snow. Transitioned in a rock outcropping mid-way across the NW face
- First turn was a fast, left cut to the bottom of the summit rocks. Looked over the shoulder for trailing snow. 2nd turn was the same, traveling over to the rocks that form the skier's left boundary of the face.
- Skied the far skier's left (west) side of the face reasoning it would've been sheltered from prevailing westerly winds and sun by the rocks.
- Looking back up at my tracks from the flat, nothing slid or even sluffed. One and done.
- Lastly, while the Red Baldy face and the BDays are a similar aspect and elevation and location, while planning my tour I felt RB would be in different and safer condition than the BDays b/c of the contour of the terrain -- a flat, open face versus funneling gully chutes -- and that the line I planned to ski, the far west side abutted by the rocks, would be sheltered from wind effect whereas the BDays were hammered.

Thanks for helping me cover my blind spots, if you can!

THANKS FOR WRITING IN. We've all had our close calls out there and we've all had times when we got back to the car and realized that maybe we got away with something. I appreciate your self-reflection and awareness of how you "go about the work" in order to make good decisions and avoid the avalanche problem. Seems you're as diligent as they come in regards to your approach to the mountains. Sometimes, however, we feel like we do everything right and then still something bad happens. (It's driven me to read more of the Old Testament over the past couple of years, but I digress.) After a well-publicized avalanche fatality in the Tetons a few years ago, I wrote at length about it for Backcountry magazine; here's the link: http://backcountrymagazine.com/stories/mountain-skills-understanding-the-avalanche-problem/.

The avalanche in the Birthday Chutes may have been one of the most surprising avalanches that I've seen in almost 20 years of avalanche forecasting. I know that I'm not alone in that sentiment. As far as I know, only a few avalanches ripped to the ground during the storm with only one or two that stepped to the ground (on Saturday) with explosive control work. These were of similar aspect and elevation, but there are times when we feel that while storms, explosives, very large cornice fall, etc may trigger deep slabs, a single skier on the slope will not. Or it's very unlikely that they will. I made a slight mention of this on that Monday mostly in the fine print of Storm Slab in the advisory. Still, certainty is the enemy of wisdom, and this is what makes this profession or pursuit so compelling. Risk and uncertainty are always a part of mountain travel.

At some point, one must decide (or not) that the poor structure is now dormant. Recent human triggered slides? Cracking? Collapsing? Tests? These are all part of the calculus. It's my personal view that none of this type of information was evident.

It was conveyed to me that the Birthday Chutes avalanche took out previous tracks on the slope, but I can't confirm this. What I do know is that depth hoar has bedeviled avalanche practitioners since before it was even called depth hoar...and it will continue to do so. You simply cannot trust it. When you enter this terrain with this type of snowpack, you're playing the game...and it's just a matter of odds - or risk - and then it's a matter of understanding your own level of acceptable risk. 1:10? 1:1,000? 1:10,000? Most of us are prematurely grey because we are tasked with helping the public reduce their odds or exposure.

But before I get back to your original question I want to say that I particularly appreciated your use of the term hindsight... because in my view, the hindsight bias is nearly always damning because the outcome is already known - How could this person miss all of the obvious clues leading up to the incident? My opinion is that if you could go back and re-live that Monday 100 times and ski Red Baldy, you would come back to the truck at the end of the each of those days.

Drew Hardesty

VIEW UP FROM THE HUGE DEBRIS FIELD // MARK WHITE

20/40 Hindsight

All too often, we find ourselves unable to predict what will happen; yet after the fact we explain what did happen with a great deal of confidence. This "ability" to explain that which we cannot predict, even in the absence of additional information, represents an important, though subtle, flaw in our reasoning. It leads us to believe that there is a less uncertain world than there actually is, and that we are less bright than we actually might be. For if we can explain tomorrow what we cannot predict today, without any added information except the knowledge of the actual outcome, then this outcome must have been determined in advance and we should have been able to predict it. ***The fact that we couldn't is taken as an indication of our limited intelligence rather than of the uncertainty that is in the world.*** *–Daniel Kahneman/Amos Tversky*

THE EVENT

On December 19, 2016, two young backcountry riders exited the Snowbird access gates to enter the backcountry. They skied one steep line and then paused above the Birthday Chutes of White Pine Canyon. The Birthday Chutes sit at just over 11,000' and face north-northwest. They had seen one other avalanche from two days prior on their tour. They had observed no cracking or collapsing of the snowpack. Many, many steep lines in similar, representative terrain had been ridden with impunity. The small depth hoar crystals at the base of the snowpack – long suffering holdouts from the late fall storms – had been dormant or asleep to human triggering for weeks. Snow tests had indicated that the snowpack was stable or that the snow was too deep to allow for triggering a full-depth release. The avalanche danger for the day was rated as Moderate, thought the fine print relayed that, "*Basal instabilities seem to have gained a great deal of strength over the recent days and are unlikely to be human-triggered now but in very steep thinner snowpack areas on slopes in the high shady terrain.*"

You can imagine what happened next. Person A drops in, makes 10 turns and sees the snowpack come alive around him. Person B, still near the top, imagines an earthquake has occurred as the earth itself cracks open 6-10' deep right at his feet. He later recalled diving back to grab a tree to avoid being engulfed and swept down the mountainside. Person A rockets 500' down the slope, getting bashed and hammered by hard slab blocks almost twice his size. When the enormous pile of debris finally comes to a rest, Person A stands up, dusts himself off, and walks away.

Using the United States avalanche classification system, this avalanche is described as an HS-ASu-3.5-O or a hard slab unintentionally triggered by a skier that broke to the ground. Its destructive force could have taken out a something between a large vehicle and a house. (It was 4-10' deep and 700' wide.) The subscript 'u' denotes unintentional. It should really denote unpredictable or unmanageable. In the aftermath, everyone looked back at the events leading up to the avalanche to try to understand what went wrong. "*Facets were on the ground,*' some said; others said "*There was way too much wind 48 hours before. Of course the Birthday Chutes are suspect with this set-up: How could you not have seen this coming?*"

Expert Intuition

In their powerful, collaborative essay *A Failure to Disagree*, the world renowned behavioral psychologists Gary Klein and Daniel Kahneman describe the circumstances that may enable one to develop something called *expert intuition*. They argue that two fundamental criteria must exist:

1. The environment must be one of high validity.
2. The individual has an adequate opportunity to learn the environment (they recommend roughly 10,000 hours).

High validity refers to a stable relationship between cause and effect. Children learn early on. In fact, they become experts at not putting their hand on a hot stove-top. The stove coils are red, they are hot, you put your hand on them, you get burned. There is a direct correlation between the hot coils and the immediate pain of your hand on the stovetop. Klein calls this "recognition-primed decision making" (RPDM). We see a situation, our cerebral hard drive searches for a similar situation from past experience, and we follow the course of action that produced a favorable outcome or avoided a terrible outcome from the previous times.

A WICKED ENVIRONMENT: THE SUBCONSCIOUS MIND DOES NOT KNOW DEATH

But what if we are in an environment that is not highly valid, or one that promotes the *illusion of validity?* An environment where we are actually getting feedback, but learning the wrong lessons? Imagine the rooster looking over his shoulder, the sunrise behind him on the horizon, and – in a cocky way – saying, "You're welcome." What about inconsistent feedback? And finally, what if the lesson is both surprising and tragic? The business and statistics researcher Robin Hogarth has a name for this: A Wicked Environment. A wicked environment is one where feedback may be X until it's Y, and Y may be death. For most of us, this can be viewed with a great deal of skepticism, because the subconscious mind does not know death. To wit: who among us has died and returned with great enlightenment?

THIS WAS A LOW LIKELIHOOD EVENT THAT HAD HIGH POTENTIAL CONSEQUENCES BUT LOW ACTUAL CONSEQUENCES. IS THAT THE DEFINITION OF LUCK? // MARK WHITE

The Role of Expert Intuition in Low Probability, High Consequence Events

The risk management consultant Gordon Graham parcels out four different situations:

- Low Probability, Low Consequence
- High Probability, Low Consequence
- High Probability, High Consequence
- Low Probability, High Consequence

In avalanche terms, the first situation might be a LOW avalanche danger day. The second situation is arguably a MODERATE to CONSIDERABLE avalanche danger day, but with avalanche types where avalanche professionals may develop expert intuition: storm slab, wind slab, loose wet and dry snow avalanches. The third situation may best describe a HIGH or EXTREME avalanche danger. The fourth situation, however, is, as Graham writes, when "the bells of Saint Mary ought to be going off in your head".
The Low Probability, High Consequence environment. An environment where ski cuts in one place produce an avalanche in another. Or the 5th or 25th person on the slope brings the whole face down. Or walking in the drainage, one collapses the slope and pulls the whole mountain of snow on top of them. The argument here is that with these types of avalanches – deep slab, persistent slab, wet slab, glide avalanches – and particularly the first and the last – these types of avalanches fall neither into a high validity environment nor the one where we can gain the figurative 10,000 hours. This helps to explain why — in Utah anyway — an estimated 95 percent of the avalanches are of the type where we can hypothetically develop expert intuition...but the second kind account for more than 70 percent of our avalanche fatalities, well illuminating the stark contrast between the high probability low consequence events…and their opposite.

"The question is not whether these experts are well trained… the question is whether their world is predictable." – Daniel Kahneman/Amos Tversky

But back to the Birthday Chutes. In the end, we may try to reverse-engineer a problem to try to make sense of the world because an uncertain world – one that we don't fully understand – can be a frightening and humiliating place. So that "*after the fact we (may) explain what did happen with a great deal of confidence*". The confidence that comes with hindsight. The problem, however, is that we may be taking home lessons to understand the world, but sometimes they may be the wrong ones.

The **Weight** of **Water**

Karl Klassen

// PARKS CANADA

IN MY EARLY YEARS as an avalanche forecaster, measuring and recording snow water equivalent (SWE) was a routine part of the job. But when I changed to guiding as my primary winter employment, I was surprised to see that SWE was often seen as "science stuff" and not considered important or useful information. More recently, as manager of a guiding program, I see new hires, many coming directly from a CAA ITP L1 course, who often seem confused about how to observe, record, and calculate SWE and why the data is relevant.

It appears that observing, recording and sharing SWE is increasingly falling out of fashion. I think that's a shame. Looking at InfoEx in recent years, the number of operations reporting SWE in daily obs is woefully small and when load on a weak layer is described as "x" cm of snow, it's clear that a fundamental understanding of load has been lost.

SWE is the only way to calculate load, which aids in assessing the potential failure of a weak layer, which in turn helps determine how close the snowpack is to the tipping point between stability and instability. This is critical information in determining what kind of mitigation measures might be prudent and when to apply them.

If there's 30cm of snow on a layer of surface hoar and you're wondering if you should be worrying about pending failure, you need to know how much water that 30cm contains to calculate the load on the surface hoar. For example, 30cm of 100kg/m3 snow equals an SWE of 30mm but 30cm of 200kg/m3 snow contains double that: 60mm. Even though the depth of snow on the layer is the same, there's a significant difference in load, as indicated by the SWE.

Clearly, there's more to it than just SWE when assessing if the surface hoar in the above example might be reactive or not. In addition to SWE, the characteristics of the weak layer, slab property and terrain configuration are just a few of the many elements at play. But in my experience, SWE is a significant factor; ignoring it eliminates critical data, especially at 5:00 in the morning when it's still dark and all you've got to go on is weather readings for your hazard analysis.

Like anything else, for SWE to be helpful, you need to learn how to use it. To gain that knowledge you start with the data, then pay attention and critically assess what happens. Do this every time it snows and eventually you'll get an idea of the kind of problem that occurs when certain combinations of SWE and weak layers are observed.

For example, after nearly 30 seasons working at least part of every winter in the interior ranges of BC, one of my general rules is that a "typical" Columbia Mountain surface hoar layer tends to become interesting when load hits 40mm or so. By tracking load, I get a feel for when it might be time to pull back and perhaps do some testing to see if my rule applies. I pull back sooner if the surface hoar looks like it's a touchier variety, or if there's a wind slab involved. I might not be as worried if the weak layer doesn't seem too bad or if the overlying snow is cold and unsettled. But at least I've got something in the way of firm data I can use to help me gauge when to start paying attention.

By watching what's going on around me, I can start to make an educated guess about when I'm approaching critical load. For instance, if my neighbor and I seem to have a similar weak layer — the last storm dropped 30mm SWE on them but I only got 20mm, and they are seeing reactivity while I am not—I'll want to be pretty careful even if the next storm only produces a relatively light snowfall. For this to work though, my neighbor needs to calculate and share SWE.

These days, I'm managing perhaps the largest public avalanche forecasting program in the world and the lack of SWE in InfoEx makes it far more difficult for my team to analyze and forecast conditions. For our operation, where forecasters aren't in the field every day and we base our forecasts on third-party data, tracking and comparing load is a great way to get a better understanding of what's happening. We know that 30cm of snow is generally not the same on the coast as it is in the Selkirks—but 30mm of water is.

I suppose you can guess where I'm going here. I wish everyone in the avalanche biz would observe, record, and share SWE as a regular part of daily weather observations. It's not particularly hard and it doesn't take much time.

Here are a few ways to do it:

- A good precipitation gauge is probably more expensive than other methods but it's more or less automatic—minimal action and calculation required.
- Use your density gauge to measure density, then calculate SWE. This is less accurate than other methods and can be time consuming as you need to carry out a measurement in each layer and add all the layers together. But it's an inexpensive option using equipment most practitioners already have and use.
- Purchase scientific scales from a science supply house. Use it with a standard sampling tube as taught on CAA courses. This is a more expensive option but offers better accuracy. A mechanical triple-beam balance can be left outside all winter in a shack or instrument box. However, these tools are not particularly robust, so don't stand up too much abuse. Electronic scales are faster and easier to use, but generally have to be kept somewhere warm so batteries don't freeze up, then taken outside when needed, which adds hassle.
- At my guiding operation, we use a good quality electronic kitchen scale and a standard sampling tube. This offers a reasonable compromise between cost, ease of use and accuracy. The only downside is we need to keep the scale inside and remember to take it along when going out to make observations.

Kudos to all of you who observe and share SWE. Those of you who used to do it and stopped, I'd encourage you to reconsider. And for anyone who learned this on your Level 1 course then never bothered again, it's worth refreshing your knowledge and adding SWE to your toolkit.

The Fatal Avalanche at the North Route Café
Subsequent Changes to Avalanche Risk Management for Highways and Occupied Structures in BC

Chris Stethem

IN 1964 THE NORTH ROUTE CAFÉ (elevation ~30m) was constructed on the north side of Highway 16 about 45 km west of Terrace, BC. The café was about 60m west of an obvious avalanche path that reached the highway in 1971 and 1972 (Fig 1). In addition to the café, there was a service station and a motel at the site.

During a major snow storm that started on 15 January 1974, the temperature reached 0°C at the Terrace airport (elevation 219m) on 21 January. After the fatal avalanche, the air temperature reached 0°C on 22 January at the McLean Mountain microwave station (elevation 1130m.) The wind was moderate, which is favourable for transporting snow into lee start zones.

On the night of 21 January and early hours of 22 January, the heavy snowfall made travel on the highway difficult. At about 05:30, four people in three vehicles, including a snow plow, stopped at the café to wait for conditions to improve. They joined a short-order cook in the café.

At about 08:00, the owner, his daughter and a machine operator were in the back of the building when the avalanche struck.

The smashed buildings were spotted by a helicopter crew checking for broken telephone lines at about 09:30. A small rescue party, including a search dog, was dispatched from Terrace at 10:30. The number of searchers grew to 65 that afternoon. Seven bodies and one survivor were found between 14:45 that afternoon and 03:30 the following morning. The bodies were located under 1.5 to 5m of avalanche deposit. Snow accumulation on and around the building also contributed to the depth of the deposit.

The large dry avalanche likely started between 1100 and 1200m on the west side of a large complex start zone. As it approached the highway, it did not follow the more obvious course for avalanches — especially wet avalanches — which reach the highway through a 25m wide gap. Subsequent investigation revealed that the fatal avalanche followed a 10m wide gap in the forest — 60m west of the obvious gap in the forest — where the return interval was approximately 15 years (Figures 3 and 4).

THE AVALANCHE TASK FORCE

Following the North Route avalanche, an avalanche take force was formed, consisting of a five-member group of engineers and avalanche technicians. The task force was charged by the Minister of Highways to report on "measures to be taken to identify and control avalanche hazards from snow and mud as they may endanger highways and facilities adjacent to highways in British Columbia."

The recommendations of the avalanche task force have influenced avalanche programs in B.C. and elsewhere over the past 40 years. A hazard index (later known as the avalanche hazard index) was developed to assess the relative seriousness of the problem in various avalanche areas. Using this method, avalanche-prone areas on B.C. highways were grouped as high, moderate, low and very low hazard with commensurate recommendations for management of the risk (the term *hazard* as used in the 1970's is interchangeable with today's use of the term *risk*).

CHANGES TO AVALANCHE HAZARD ASSESSMENT AND MITIGATION FOR BC HIGHWAYS

The task force recommended:

- A program of preventative closures during periods of high avalanche hazard
- An avalanche control program using artillery for a section of Highway 16, including the area of the North Route Café
- Relocation of sections of highways at Terrace-Tyee (review of existing proposals), Bear Pass, Pine Pass. Further study of relocation was also recommended for Three Valley Gap and Allison Pass
- Reforestation in Alison Pass, Kootenay Pass, Revelstoke-Glacier
- Hiring avalanche coordinators for the three areas identified as high hazard routes including: Terrace, Hope, and Kootenay Pass between Salmo and Creston, as well as hiring a senior avalanche coordinator in Victoria
- Avalanche training programs for Department of Highways staff in the maintenance, management and planning groups

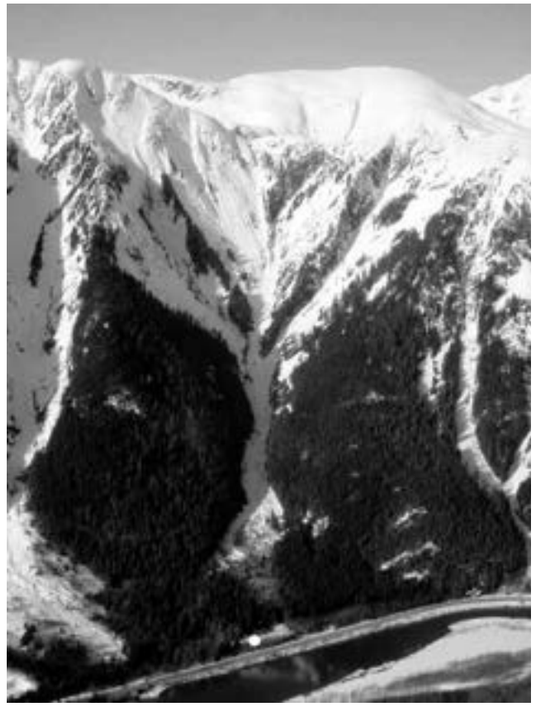


FIG. 1: SITE OF NORTH ROUTE CAFÉ (WHITE DOT) AND THE AVALANCHE PATH ABOVE IT. THE CAFÉ WAS LOCATED IN LINE WITH AN INFREQUENT AVALANCHE COURSE AND 60M TO THE WEST (LEFT) OF THE OBVIOUS GAP THROUGH THE FOREST CREATED BY MORE FREQUENT AVALANCHES. PHOTO COURTESY BC MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE.

- Safety measures for highways maintenance crews
- Avalanche warning signs for all avalanche areas
- Installation of weather stations and exchange of weather data through cooperation with Environment Canada
- A public information program
- Investigation of the effect of structures including barriers, dams and other earthworks, as well as snowsheds at various locations
- An assessment of the adequacy of snow removal equipment.

The task force also recommended further study to assess:

- Artillery for controlling avalanches at Kootenay Pass and Bear Pass
- Use of explosives at Pine Pass, helicopter bombing at Golden East and case charging at Silver Creek in Revelstoke-Glacier
- Cost-benefit analysis of earthworks and other mitigation structures
- Review and refinement of avalanche control procedures
- Establishing an Avalanche Information Centre to group expertise, compile avalanche information, undertake research, provide technical support and assist in training programs
- Specific training in avalanche terrain evaluation for foresters

Prior to the recommended avalanche forecasting and control program being fully implemented, three of five people in a convertible were killed by an avalanche at Kootenay Pass in 1976 (Stethem and Schaerer, 1979, 107-111). Between 1977 and the time this document was written, vehicles have been hit by avalanches on BC highways but there have been no further fatalities.

CHANGES TO PERMISSIONS FOR OCCUPIED STRUCTURES

After the accident at the North Route Café in 1974, the BC Ministry of Highways introduced a policy that no buildings with access to a provincial highway were permitted in avalanche hazard zones (BC Dept. of Highways, 1974). Where developed property was identified in avalanche hazard zones, the BC Government re-purchased the land from the owners and destroyed or abandoned the buildings. This included developed property near Sparwood and along the Hope-Princeton Highway. The Ministry of Highways, however, had no jurisdiction for buildings that were not accessible from a provincial highway. Concerns about avalanche hazards in other areas were left to the municipalities, regional districts and parks. Regardless of the jurisdiction, an approval officer reviews the application and can submit the application for review by other agencies (Freer and Schaerer, 1980). This review can be for a variety of concerns including natural hazards such as avalanches.

Around 2001 the BC Municipal Act was replaced by the Local Government Act, which applied to municipalities and

FIG. 2: AVALANCHE DEPOSIT INCLUDING DEBRIS FROM THE NORTH ROUTE CAFÉ AND ADJACENT BUILDINGS AFTER BEING PUSHED UP BY SNOW MOVING EQUIPMENT. PHOTO BC MINISTRY OF TRANSPORTATION AND INFRASTRUCTURE.

FIG. 3: PHOTO TAKEN 43 YEARS AFTER THE FATAL AVALANCHE SHOWING THE APPROXIMATE LOCATIONS OF THE CAFÉ, MOTEL AND GAS PUMPS, WHICH WERE DESTROYED (S. BRUSHEY, PERS. COMM., 2017). THE RIGHT ARROW MARKS THE USUAL COURSE OF AVALANCHES. THE LEFT ARROW SHOWS THE COURSE OF THE FATAL AVALANCHE. B. JAMIESON PHOTO.

regional districts. Currently, Chapter 323 Part 26 Section 920 (7.1) of the Local Government Act states that "a development permit may … specify areas of land that may be subject to … avalanche … as areas that must remain free of development." This policy did not apply to existing developed areas.

There have been subsequent "buy-backs" due to avalanche hazard being recognized after residential developments were allowed. For example, during initial construction of a few houses on a new subdivision north of Highway 16 and 3.5 km north-northwest of Tete Jaune Cache, a large avalanche in L'Heureux Creek ran close to the subdivision in January 1989. Following a study by an avalanche consultant, which showed that an extreme avalanche could affect the lots in the northeast corner of the subdivision, the BC Government bought back all the lots.

FIG. 4: PHOTO OF VEGETATION IN THE INFREQUENT AVALANCHE COURSE ABOVE THE CAFÉ. BC HIGHWAYS AVALANCHE TECHNICIAN, MIKE ZYLICZ, IN FOREGROUND. C. STETHEM PHOTO.

GROWTH OF AVALANCHE PROGRAMS FOR BC HIGHWAYS

As of 2015, the Snow Avalanche and Weather programs for the BC Ministry of Transportation and Infrastructure has grown to 17 full-time-equivalent positions managing the avalanche risk from 63 avalanche areas and a total of 1365 avalanche paths. The network of weather stations has grown to 199 stations, including 58 remote weather stations that are at elevations similar to avalanche start zones. The expertise of this program is recognized internationally and has a record of protecting those who travel on BC highways.

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Paying **Attention**

Danyelle Magnan

Mental health is one of the elephants in the room. Gender and leadership is another. When people are defensive or reluctant to broach a topic, it's a sure sign that the issue touches on vulnerability, doubt, anger or grief. In other words: personal truth. The intent of this issue is to raise questions and begin conversations amongst ourselves that will make us all safer and stronger. Kudos and thanks to the author for having the courage to demonstrate faith in this community.

WHEN I WAS APPROACHED TO WRITE a piece about mental health for the Avalanche Journal, my initial response was: No. I had excuses. I didn't have enough time; I'm not a subject expert; I wasn't ready to talk about it. This past summer, I lost a friend and colleague to suicide. I know the loss of Dean Flick affected many people. For me, it raised a lot of emotions and among them was guilt. I had failed my friend. How had I missed that he was struggling? Why hadn't I asked him how he was, and why didn't he talk to me? What I realized as I looked for reasons not to write this article was that all my excuses were really my way of avoiding the conversation. Because talking about mental health is hard.

In the avalanche industry, many workers have the potential to be involved in a traumatic incident. Whether it's physically being involved in an avalanche, responding to an accident involving our team, clients, or the public; having a close call with a helicopter; or any countless other possibilities, the potential for exposure is there. Research published in the *Canadian Journal of Psychiatry* in 2017 found that while 10% of the general population screened positively for mental disorders, the result for first responders was 44.5% (www.cbc.ca/news/politics/police-fire-fighters-ptsd-paramedis-1.4266720).

Until recently, the subject of Post-Traumatic Stress Disorder (PTSD) was rarely discussed, but fortunately that is changing. New research, fresh resources and in some provinces, even legislation is being developed to support workers suffering from PTSD. This is all good news, but as individuals there are actions we can take. A simple, but challenging, first step is to not avoid the conversation. We need to change the stigma associated with mental health and PTSD; we need to talk about it openly and without judgement.

As a friend, I won't hesitate to ask someone who's recently had knee surgery how their recovery is going. But I'm uncomfortable asking someone who's been through something traumatic how they are doing. Why is that? I might tell myself if they want to talk about it they'll come to me, or that I don't want to make them uncomfortable, but maybe they want to talk. And even if they don't, at least by asking, I am showing that I care. I am there for them.

As friends and co-workers, we need to support and look out for each other. Noticing a change in behaviour, social withdrawal, increased alcohol or drug use, or a coworker who is suddenly avoiding specific tasks are a few examples of signs and symptoms of PTSD. We need to be genuine when we ask: "How are you doing?" And be ready to listen.

As an individual, and one who regularly responds to traumatic incidents, I need to ask myself the same question. I need to regularly and honestly check-in with myself to assess how I am coping, processing and healing. Returning to my earlier example, if I injure my knee, I don't hesitate to go to physio, but after responding to serious incidents, I have never sought help nor gone for counselling. Why is it that we are reluctant to consider, let alone look after, our mental health?

In the future, if I notice any signs or symptoms of PTSD - perhaps experiencing recurring and distressing memories, or my heartrate skyrockets every time my phone rings - I plan on seeking help. Whether it's talking to a friend or peer, or a professional counsellor, talking about it is the first step in hopefully preventing PTSD. And if a friend asks how I'm doing, I won't give the automatic response: "Good." I will try to give an honest and likely uncomfortable response, not only because it might make me feel a bit better, but also because we need to have these uncomfortable conversations until we're comfortable with them.

Leadership, Excellence and Gender in Professional Culture: Dialogue-Based Research From Wildland Fire–With Implications for the Avalanche Industry?

Rachel Reimer, MA Leadership Studies

WHY GENDER *AND* LEADERSHIP? Is this a connection that makes sense? My very first glimpse into how leadership, gender, and culture interact was during a six–month research internship with the United Nations in Lebanon, when I was tasked with studying female leadership within Palestinian refugee camps on behalf of the Women's Program. When the project finished, I returned to Canada. Several years later, I changed careers from humanitarian aid to the wildfire profession. My experiences in the Middle East caused me to be aware in ways that seemed uncommon among my wildfire peers. After a few years on the fireline, I was curious. One key conversation sparked change for me.

IN TRUTH, MY STUDY OF LEADERSHIP AND GENDER IN WILDFIRE BEGAN ON A SKI TRIP.

It was at the Asulkan Hut on a trip with two other female fire friends, when into the night with perhaps some liquid courage, we started sharing our stories. The winter mountain environment provided a safe space for honest conversations that were, in my experience, rare on the fireline. No one wanted to be seen as complaining, or as an ungrateful member of the team. Above all, our competency as firefighters needed to remain intact, and speaking openly about any struggles we'd had could have implicated us as the weak link. When you are the only female on a crew, or at a base, it is easy to give in to self-doubt and to begin to mistrust even your own experiences. The stories shared openly among firefighters at work reinforce the belief that fire is fun, the culture is amazing, and that we're all lucky to have the best job in the world. Any pain or discomfort as a result of the profession was something to be overcome, persevered through, or even ignored out of loyalty to the team. Bringing up painful moments as a way of questioning the bigger culture was simply not done.

One year after that ski trip, I had enrolled at the School of Leadership Studies at Royal Roads University with the intent to study my own profession, and dig deeper into the connections between gender and leadership within the context of a professional culture.

WHY GENDER AND LEADERSHIP: HOW THIS CONNECTION MAKES SENSE

What is gender, anyway?

Gender research can sometimes be equated with studying women and this is because for many people, gender equals women. To be clear, *gender* is the learned behaviours that we adapt over time, otherwise known as masculinity and femininity. They are fluid, malleable behaviours. Sex is about biology, the wiggly bits.

Social science research is about collecting stories, perspectives, and feelings. It provides a snapshot in time of a community's sense of something. The exchanges in the Asulkan hut lead me to see that stories have power, and became the basis for data gathering. In fact, as my study progressed I quickly realized that female firefighters were not the only ones struggling with norms in the professional culture. Ultimately–*femininity*, whether demonstrated by a male or female person, was seen as weakness.

LEADERSHIP

When firefighters in my study described excellent leadership, the qualities listed included typically feminine characteristics such as: being supportive; willing to admit to mistakes; and being tolerant of mistakes in others. However, when firefighters described how anyone who showed femininity at work was treated on a day-to-day basis, it was clear that femininity was equated with weakness.

This presented a crux for leaders. Excellence (by their peers' definition) included developing feminine leadership qualities, yet in the culture these same qualities are associated with weakness. How was a leader to foster their own personal development and excel at leadership when the professional culture evaluated these feminine qualities as weakness?

WHAT DOES THIS MEAN FOR THE AVALANCHE INDUSTRY?

This article is intended to pose questions rather than answer them. My research focus was on creating space for open dialogue about gender and leadership among wildland firefighters as a means of sparking change in the culture. What I found was that both male and female firefighters were affected negatively by cultural norms that evaluate masculinity as strength and femininity as weakness.

Risk-taking and gender

This manifested in many different ways for firefighters in my study, and some described how a masculine approach to risk-taking was part of being seen as competent within the culture.

I suspect this insight will be of particular use to the avalanche industry. The interaction between gender and risk-taking is incredibly challenging to study, in part because risk-taking is so challenging to simulate in a controlled research experiment. In real life, there are unknown unknowns. To try and illuminate causal factors, researchers are now differentiating between *risk* and *uncertainty*. They are also integrating gender to see if mixed-gender groups make decisions differently than same-gender groups when facing profound uncertainty. There are some indications that gender is a factor, and that in all-male groups risk tolerance can escalate when faced with uncertain outcomes (like avalanche risk) while in mixed-gender groups this tendency is moderated.

Professional culture and gender norms

Another aspect worth consideration is how the professional culture differs from regular society. Are there cultural norms about gender roles in broader society that are being unconsciously transported into the avalanche industry, and if so, how does that affect males and females in the professional culture? Do we form perceptions of competence, trustworthiness, and performance partly based on genders norms? Reflect on your own experiences, and ask yourself: Are things in the avalanche industry getting better, worse, or staying the same? The importance of having numbers to back up these gut feelings cannot be underestimated, because perceptions of where the culture is at can often be based on an individual standpoint–it's like digging one snowpit and then extrapolating that knowledge to the entire aspect.

Spatial variability in snowpack analysis is not so different to the social science approach taken by researchers–each point on the slope, and every personal set of experiences of the culture, reveals something new. You never know what you're missing until you look.

CONCLUSION

Taking a professional approach to cultural norms at work means going beyond assumptions and opening up a dialogue about gender, leadership, and how the culture affects us all.

If you are interested in these conversations and want to learn more, reach out to the Canadian Avalanche Association or read the full draft of the thesis, *The wildfire within: Firefighter perspectives on gender and leadership in wildland fire*, at www.racheldreimer.com.

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The **Bare Bones:** Mountainside Orthopaedics

Mike Innis

TRAINING MOULAGE OF AN OPEN FRACTURE LOWER LEG // MIKE INNIS

PATIENT TRANSPORT PACKAGING FOR HELI EVACUATION // DOUGLAS NOBLET

AS PROFESSIONALS WORKING in the mountains we are well acquainted with the unfortunate results that occur when human body parts under the force of gravity meet stationary objects, such as rocks and trees, rich in inertia. Fractures and dislocations are common occurrences and their proper management an important skill to acquire as backcountry first responders. Ideally, we need to be able to accurately identify specific injuries and treat them accordingly, but before we jump in and impress those around us with our expert diagnosis and reduction of that dislocated shoulder, we need to incorporate some core principles of the approach to mountainside orthopaedic care.

GET THE BIG PICTURE

Never is it more critical than in the mountains to remember you are caring for a whole person in a hostile and potentially dangerous environment. It is easy to become distracted by the agonizing screams of a skier with a broken femur or the nauseating deformity of an unstable open boot top tib/fib fracture. There is good reason scene safety is taught as the first priority in any backcountry rescue response; environmental factors can quickly make a bad day worse - for you, your team and your injured subject.

Care for an injured subject in the mountains requires aggressive measures to expediently address hypothermia. Interventions to treat and prevent progressive hypothermia should be occurring in conjunction with the primary survey. Remember that the musculoskeletal assessment is part of the secondary survey and as responders we need to remain disciplined in our approach so as not to overlook care priorities. Injured subjects in cool or cold environs are “hemorrhaging heat”.

Massive hemorrhage from an open fracture (addressed immediately with a tourniquet) and pelvic fractures (addressed emergently if patient shows signs of shock with a pelvic binder), are two orthopedic injuries addressed in the ABC's of the primary survey.

LIFE THREATENING ORTHOPAEDIC INJURIES

Pelvic fractures (internal hemorrhage) and open limb fractures (external hemorrhage) are the two life threatening orthopaedic extremity injuries encountered in the

mountains. All backcountry first responders should be able to identify these injuries and intervene appropriately with pelvic binders (improvised or commercial) and tourniquets *in the case of* significant external hemorrhage (improvised or commercial), respectively. Closed femur fractures alone do not typically bleed enough internally into the enclosed compartment of the thigh to cause life threatening hemorrhagic shock, but can contribute significantly to the overall blood loss if other bleeding is present.

LIMB THREATENING ORTHOPAEDIC INJURIES

Any bony injury (dislocation or fracture) that compromises vascular supply can threaten the loss of a limb. The assessment of bony injuries is not complete without the neurovascular (pulses and sensation/movement) assessment of the limb. This assessment should occur during the initial assessment of the injury, at any time the limb has been manipulated (eg after splinting or reduction) and at regular intervals during any prolonged extrication. Dislocated elbow and knee joints, where the distracted bone ends pinch off nearby large arteries, can often cause vascular compromise. Field reduction attempts are indicated with injuries that compromise blood supply.

In addition, an awareness of the potential for limb threatening compartment syndrome is important. Compartment syndrome can occur when marked bleeding or edema (burns) fills the impermeable muscular compartments of the injured limb leading to marked pressure build up and subsequent vascular and neurologic compromise. This condition is heralded by marked and ever-increasing pain and loss of function of the affected limb, often hours after the injury. This occasional complication of limb injuries is a medical emergency and surgery is required to release the build- up of pressure and restore function of the limb.

Open fractures (also known as compound fractures) are also limb threatening due to the high risk of infection. Any open fracture in the field should be triaged as emergent and transported urgently to medical care. A careful removal of contaminated debris manually or with sterile water irrigation (if available) may be indicated based on circumstances, or alternately a quick non-constricting wrap (eg plastic food wrap) to keep the open wound enclosed may be most expedient.

SPLINTING

Timely,effective and robust splinting is a critical skill to become proficient at in the care of orthopaedic injuries in the field. This can't be over emphasized. Principles here include splinting the long bone above and below any injured joint and the joints above and below any injured long bone. Strategic padding to prevent pressure sores on bony prominences and allowing for access to assess neurovascular status once the splint is placed is prudent. Effective splinting is the best field analgesic for any orthopaedic injury. Buddy splinting body parts (eg one leg to the other) can be an effective adjunct. In general, deformed injuries do better when they are able to be reduced to anatomical position by applying gentle steady traction followed by realignment prior to splinting. It is realistic that comfort levels for attempts at reduction will vary amongst responders based on experience and training. Assessment and maintenance of vascular status and patient tolerance are necessary components of reduction attempts.

DISPOSITION

The experienced responder is aware of the consequences of unnecessarily immobilizing an injury to the point that makes the injured subject incapable of egress under their own steam and thus committing the rescue team to full care and the resources and any risk that might entail. For example, becoming proficient at field anterior shoulder reductions (now generally accepted as standard of care in the field for organized responders) can make the difference between an assisted, relatively pain free walk out and a protracted, painful and potentially hazardous litter extrication with all the resources and risks that entails.

By incorporating the concepts reviewed in this article into our approach to mountainside orthopaedic injuries we will enhance the overall care provided—leading to improved subject comfort and injury outcomes, while reducing risk to the rescue team. The ability to identify common patterns of orthopaedic injuries and the training to appropriately care for such specific injuries (acquired by taking wilderness and occupational first aid courses) rounds out the skill set required to effectively and safely assist injured mountain folk when gravity conspires against them.

PATIENT TRANSPORT // MIKE INNIS

Schedule of Upcoming **Events**

WORLD EXTREME MEDICINE CONFERENCE AND EXPO
November 25-27, 2017
Edinburgh, United Kingdom
Taking medicine to the extremes.
For more information:
extrememedicineexpo.com

CAA FALL 2017 CPD SERIES
November 24-27, 2017
Revelstoke, BC
Start This Season Fresh.
For more information:
avalancheassociation.ca/?page=Fall2017CPD

WESTERN SNOW CONFERENCE
April 16-19, 2018
Albuquerque, NM
A forum for individuals and organizations to share scientific, management, and socio-political information on snow and runoff from any viewpoint and advances snow and hydrologic sciences.
For more information:
westernsnowconference.org/

CAA SPRING CONFERENCE AND ANNUAL GENERAL MEETING
April 30-May 4, 2018
Penticton, BC
Join us for the AGM, meetings, case study and research presentations and discussions about the Canadian avalanche industry.
For more information:
www.avalancheassociation.ca/page/SpringMeeting2018

ISSW 2018
October 7-12, 2018
Innsbruck, Austria
A Merging of Theory and Practice.
For more information:
issw2018.com/en/

CAA Fall 2017 CPD Series
Start This Season Fresh

Do you want to head into the winter season with sharp skills and a fresh mind? The CAA and the ACMG have partnered this year to bring you four days of clinics, activities and refresher courses in Revelstoke, November 24-27.

Join your colleagues for engaging workshops and activities. Topics including decision making, navigation, AvSAR skills, injury prevention, mental health, mountain weather and much more.

Both organizations have worked hard to deliver affordable high-quality sessions, a complete listing of sessions along with descriptions can be found on the CAA website.

For more information visit: avalancheassociation.ca/?page=Fall2017CPD

avalanche **community**

40

THE COLD DRY BITTER TRUTH ABOUT SEASONAL FORECASTS

in this **section**

42 SCHEDULE OF EVENTS

// JOEY VOSBURGH

// CHRIS CHRISTIE

The Cold, Dry and Bitter Truth About Seasonal Forecasts

David Jones, Meteorologist

"Some suffer from an acute expert problem, producing cosmetic but fake knowledge, particularly in narrative disciplines…" Nassim Taleb, The Black Swan.

RECENT HEADLINES SCREAM *Environment Canada Blows Winter Forecast*. The next day: *Environment Canada Forecasts Warm Spring Ahead*. The following day it's: Groundhog Prophecies Mixed on Spring's Arrival. The media are stuck in a loop, rushing headlong to create the seasonal weather story every three months, overselling it as *Weather You Should Fear Today!* In the rapid-fire nothing-is-too-inconsequential-to-be-made-consequential twitter-verse, the next weather horror is never far away.

Once established, the hair-brained scare is impossible to unseat. In 2010, it was *The Worst Winter in 50 Years*. In 2011, it was *The Coldest Winter in 20 Years*. The oversell nicely sets up the inevitable end-of-season follow-up story about the 'blowing' of it. It's really much ado about nothing and enough to make a meteorologist moan.

In my 30+ year career, I've been asked for the seasonal 'outlook' more than any other forecast. The question wrongly presumes: a) an answer is possible; b) such a forecast exists; and c) a meteorologist can provide it. The cold, dry and bitter truth is: a) a useful answer is impossible; b) no such forecast exists; and c) you're asking the wrong expert anyway.

A useful answer is impossible because a highly variable element cannot be described by its average. For example: the mean temperature of a fall day that starts frosty at 0° and peaks at 20° in glorious sunshine is identical to that of a rainy day where the temperature never budges from 10°.

$$\text{Tmn frosty sunshine day} = \frac{0° + 20°}{2} = 10°$$

$$\text{Tmn rainy day} = \frac{10° + 10°}{2} = 10°$$

This averaging is a 'first order of smoothing" that severely constrains our ability to describe the day's weather from the temperature alone. Now, consider that the seasonal temperature forecast is the average of 90 days of mean temperatures! Or, working in reverse: ask yourself what might be said about today's weather in any city when given the average of today's mean temperatures from 90 cities? Answer: absolutely nothing and likewise for the average of 90 days' worth of forecast temperatures for a single city. The 'average of averages' is a second order of smoothing that yields a result devoid of useful information.

Believe it or not, there is no such thing as a 'seasonal weather forecast'. Weather – meteorology - is simply not predictable beyond a week at best. Predictions of ninety-day average temperature and total precipitation – climatology - are made by the climatology divisions of various national and international agencies. Short of a grocery-stand almanac – whose forecasts come from 'a secret formula that was devised in 1792 and that remains locked in a black box in a New Hampshire office', no credible agency even attempts to produce a 90-day weather forecast. Furthermore, candid climatologists concur; verification demonstrates very little skill in 90-day temperature outlooks and practically zero skill in the precipitation outlooks.

The sole exception to death-by-smoothing is the case of an extreme season where the mean temperature or the total precipitation may hint at the weather experienced. This however, only applies looking backward at what has happened rather than looking forward to what may happen - because of a third order of smoothing essential to the forecast strategy. Seasonal outlooks are merely predictions of the broad ranges into which the 90-day mean temperature or the total precipitation is expected to fall: below normal, near normal or above normal. With only three possible outcomes, these predictions – by design - simply cannot identify extreme seasons. The ranges are broad for good reason. To quote Nils Bohr: "Prediction is very difficult, especially about the future." A consequence of this scheme is that even a perfect forecast won't discern anything about the weather. Predictions of 90-day averages and totals may be valuable to climatologists or to utilities that need to hang their hats on something to guess at seasonal energy consumption, but they have zero value to the public trying to extract weather forecasts.

"You're asking the wrong expert anyway." This is where I have a serious bone to pick with some of my colleagues. Meteorologists have no training, experience or skill at forecasting beyond five days. **It is simply unethical to stand in front of a microphone and pretend to be an expert when you are not**. The 2011 *Coldest Winter in 20 Years* story was hatched by a Canadian so-called weather expert at a private company in the United States. To find out how this forecast was created, I emailed the expert a few times. After four weeks without a response, I left a voicemail posing as a reporter. Within an hour, I had a call-back.

Posing Reporter: Are you a climatologist? **Expert**: No
PR: Do you have any training in climatology? **Expert**: No
PR: Are there any climatologists working for your company? **Expert**: No
PR: Are these forecasts based upon climate models? **Expert**: No
PR: Do you know the accuracy of your previous forecasts? **Expert:** No
PR: How did you arrive at the 'third coldest winter' prediction?'
Expert: "Well, I just sorta looked at about the last twenty winters in Vancouver and it wouldn't take much more than a degree or two colder conditions to put this into the top three coldest." The 2011 winter narrative that spread like wildfire across all major media was based on mere speculation, by a person with no climatological credibility.

To quote Nassim Taleb again: "At the core of the expert problem is that people are suckers for charlatans, particularly when the charlatan is invested with some institutional authority… they serve as experts while offering the scientific reliability of astrologers. Anyone relying on them is a turkey."

Don't be a turkey.

// CRAIG ELLIS

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ROB BUCHANAN

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