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LATE WINTER 2023

the AVALANCHE REVIEW

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AMERICAN AVALANCHE ASSOCIATION

A3 STATEMENT OF PURPOSE

The American Avalanche Association promotes and supports professionalism and excellence in avalanche safety, education, and research in the United States.

the AVALANCHE REVIEW

The Avalanche Review is published each fall through spring by the American Avalanche Association, Inc., a nonprofit corporation. For a digital version, visit theavalanchereview.org. *The Avalanche Review* welcomes the submission of articles, photographs, and illustrations.

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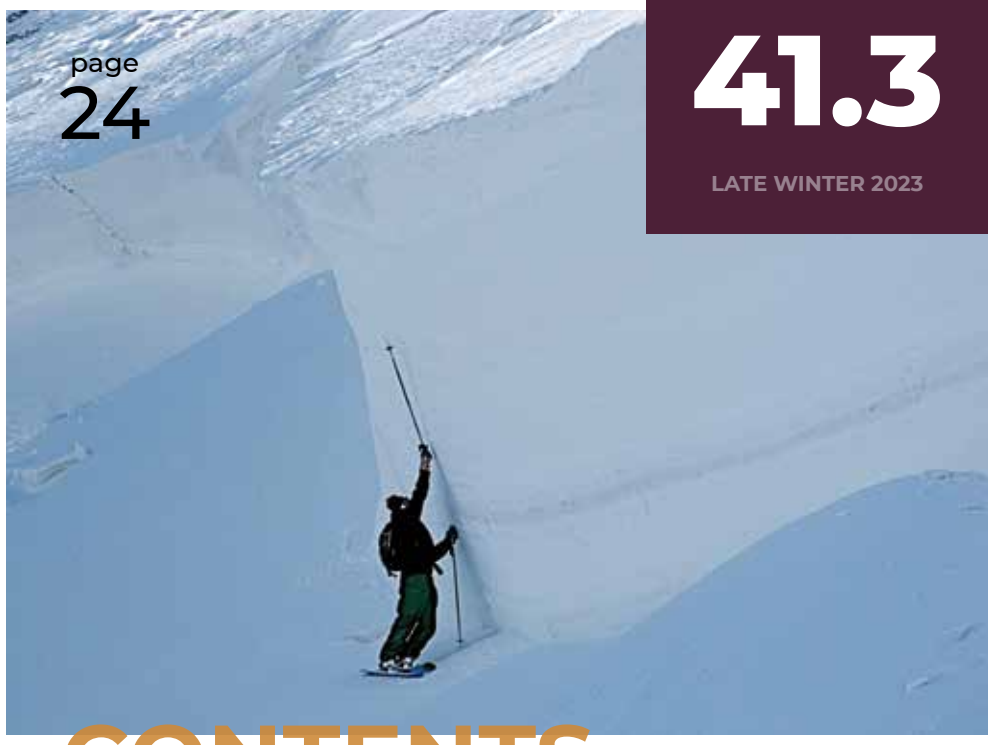
Subscription: $35 per year (4 issues). Subscription is included with membership dues to A3. For subscription and membership information, see www.AmericanAvalancheAssociation.org.



41.3
LATE WINTER 2023

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Big mountains make big avalanches. Simon Thomson in the Gulmarg Backcountry, Kashmir, India.
DAVE WATSON

ON THE COVER

A last minute invitation to ski in Antarctica with the Ice Axe Expedition group this past November had me prepping for a ton of travel with what I thought was going to be marginal skiing conditions, but I still couldn't pass up the opportunity. We were greeted with great corn snow and even a day of boot-top pow. This moody image was taken towards the end of the trip while approaching the anchor point for the day.
ALEX PASHLEY

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In December 2022, Zach Guy took a helicopter flight to document avalanche activity on Baldy Mountain, Colorado. Nirvana Bowl is pictured.
ZACH GUY, CRESTED BUTTE AVALANCHE CENTER

FROM THE EDITOR

Sense and Sense-making: the theme of this late winter issue of *The Avalanche Review* evolved over time. It first emerged as I edited Jayson Simons-Jones' story about managing uncertainty, where he reminds us of the crucial synthesis skills of anomalizing and bigger picture sense-making. Sense-making has also figured centrally in my recent work teaching Pro courses and helping friends who are new to forecasting figure out the stories of the snowpack—both where has it been and hypothesizing where it is going.

I was reminded this fall, thanks to Laura Maguire, while I was putting together a presentation about Reliable Organizations, that making time in your forecasting group to figure out those stories is critical in translating science into insight—and then communicating it to the public or to your partners. With that in mind, here's a variety of stories, mindsets, and locations to dive into.

First up in the Forecasting category is an essay about subtleties of Moderate from Eric Trenbeath of the UAC in Moab. Gotta say here how much I admire you forecasters: turning a science problem into clear communication is such a challenging proposition! Here's another excellent take on the topic. Good stories and apt metaphors make for powerful messages.

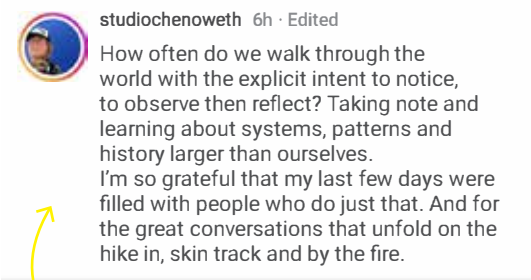
Next, in Rescue, Brooke Edwards equates our nervous system to a layered snowpack; incremental loading requires ongoing attention and choosing appropriate terrain. Thanks, Shiny one for having the courage to research and share tools that help us when we lose our buddies in the mountains.

Under the Decision-Making header, Kelly McNeil presents part 3 in her public health series. Bringing in professional-level material from other fields can only make the avalanche community stronger and smarter. (I'm looking forward to her part 4 with Pascal Haegeli.) Also in Decision-Making you will find the aforementioned essay by Jayson Simons-Jones. It's dense; read it twice and ponder on how you categorize anomalies and turn data into mindset in your practice.

In this issue, our Crown Profiles section digs into three mindsets: three focused images of terrain and how humans move through it, manage it, and manage themselves. First, Maddie Crowell and her buddies went to Alaska in the spring, where they found growth and adventure both inwards and outwards. Then I piqued my curiosity about skiing in the Himalaya by persuading Luke Smithwick, who spent a few seasons at Gulmarg in northern India, to share impressive images and information. Furthering TAR's ongoing interest in the Urban Avalanche Problem, Eeva Latosuo and Brad Meiklejohn tag team with their essays on last year's Hiland Road (Anchorage) avalanche. Welcome back to the avalanche world, Brad, if only for a cameo.

In the Education category, Gray Grandy leads off with a helpful and entertaining essay on training new ski patrollers; anyone involved in education (or even communicating with partners) will find some useful tips in his piece. Max Ritter of TGR then gives us a closer look at training pro athletes for situations they might encounter out at the sharp end of risk tolerance. I taught a couple of those athletes in a Pro 1 just after the IPRW; it was noticeable how comfortable they were with vocabulary, concepts, and execution of the Conceptual Model of Avalanche Hazard. Then you'll find summaries of this autumn's snow and avalanche workshop (SAW) circuit. I am continually impressed by the caliber of each regional SAW; there's so much talent and insight wrapped in the culture of each forecast zone. I've tried to present some of the highlights, but encourage you to dig into the videos, which are posted or linked on each forecast center's website. A good use of A3 funds, don't you agree?


PETER THURSTON



Finally, I ran across some wonderful words from my friend Darcy Chenoweth of Missoula, whose graciousness and ongoing curiosity are worth sharing:

Hope you can use these stories to help you make sense of a complex world. Get some sleep!

—LYNNE WOLFE

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FROM THE NEW PRESIDENT

Greetings snow and avalanche aficionados,

Last week's A3 Board Member orientation meeting was eye opening; your organization has come a long way since my previous stint serving on the board. The organization is on solid financial footing and is making impressive strides implementing a well-thought-out strategic plan. I'm excited to join an already highly-functioning team. While my ultimate goal as President is to increase A3's organizational capacity by learning from the past, living in the present, and planning for the future, it's going to take a few months for returning leadership to bring new board members—myself included—up to speed on current projects and priorities. Fortunately, your Executive Director Jayne Nolan is a force of nature who will make the board member transition as seamless as possible. Here is Jayne's brief rundown on current A3 priorities:

- **Education Oversight**—A3 is hiring a full-time education staff position in January or February 2023. This position will provide oversight to the Pro Training Program—including expanding A3's capability to review new Pro Providers—and assist the A3 Education Chair in administering, evaluating, and improving the Recreational Educational Program.

Late-Breaking News: welcome Jen Reddy to the team in new role of Education Manager for A3. Full announcement in TAR 41.4.

- **Publications**—Continue producing high-quality publications like *The Snowy Torrents*, SWAG, and *The Avalanche Review* and evaluate digital options to promote or facilitate wider distribution.
- **Outreach**—Continue partnering with the Forest Service National Avalanche Center to maintain and develop avalanche.org to meet the needs of the public and regional avalanche centers.
- **Professional Development**—A3 is committed to supporting and providing professional educational opportunities for members via SAWs, winter webinars, and scholarships for professional education. The scholarship program grew by 600% in the last year.
- **Inclusivity + DEI**— Guided by our strategic plan, A3 will develop education and inclusion opportunities for our internal teams and our membership in order to push forward diversity, equity, and inclusion efforts within our industry. This winter A3 will host a DEI-centered webinar for members and expand our scholarship offerings for underrepresented individuals.
- **Resilience**—We recently launched our resilience program. We aim to grow the program to ensure our members have access to the mental health support they need.

I'm truly honored to serve as A3 President. After a single meeting with the staff and board, I can confidently say you have a talented team working diligently on your behalf to advance your professional organization.

Respectfully,
Scott Savage

THANK YOU JONATHAN SHEFFTZ

BY RICK GRUBIN & HALSTED MORRIS

After ten years of service on the A3 board as Member Affiliate Representative (AMR), Jonathan Shefftz is departing in January. Jonathan has served on the board from 2012–2022. Bruce Edgerly was elected in the last A3 election as his replacement.

Rick Grubin was the previous AMR before Jonathan. Back in those days board members had to find their own replacements. The two of them met on the original Telemarktips.com forums and hit it off.

Over the course of his decade-long tenure on the A3 board, Jonathan was often the only board member from the eastern US, providing an important regional voice for the A3. He was an invited three-time presenter at the Eastern Snow and Avalanche Workshop (ESAW), and always positively represented A3 and its value proposition to ESAW participants. Jonathan is also a regular contributor to *The Avalanche Review*, writing on topics from ESAW summaries to transceiver reviews to avalanche airbag effectiveness.

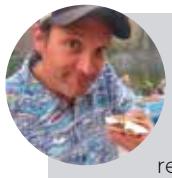
Jonathan was the consummate Member Affiliate—though he earned professional-level avalanche-related qualifications, taught courses for AIARE and NSP, and reviewed avalanche beacons for the *WildSnow* blog and subsequently the *Beacon Reviews* website, his vocation was not on snow. His desire to 'give back' to the avalanche safety community during his time on the A3 board represents Jonathan's enduring commitment to the US avalanche community.

Most A3 board members don't realize the high-level academic credentials Jonathan holds, and what his day job entails. After studying economics at Amherst College (when not skiing with the then-varsity alpine team) and then finishing graduate school at Harvard (also coaching the ski team there), he started working (when not continuing the coaching habit at the then-varsity ski team of MIT) at an environmental economics and public policy consulting firm. His work can be summarized as: "Estimating the economic impacts of environmental regulations, and the environmental impact of economic regulations." Jonathan brought a real business insight to the A3 meetings.

But Jonathan is more than a consultant behind a desk. When we recently called, he was packing to come to Colorado for some ski-mountaineering races at Arapahoe Basin. Skimo races are not new to him as he has been the organizer of several in the New England area. He also spends some of his ski time as a NSP patroller in New England.

Jonathan has expressed how "grateful he is for the many true career professionals from whom he acquired his avalanche-related training." The A3 board will certainly miss Jonathan's contributions, though his wife and daughter will appreciate the upcoming curtailment (however slight) of his snow-related volunteer activities.

Jonathan, we thank you for, and very much appreciate, all your years of service to the A3. ⬢



RICK GRUBIN builds and deploys atmospheric coupled model environments to help reduce operational risks and make informed decisions. Time on snow is enjoyed for fun (skiing with family) and non-profit (teaching AIARE courses).

HALSTED MORRIS was the Board President for the American Avalanche Association for two terms. He built and maintains the website www.heliskihistory.com and remains the A3 Awards chair.

A3 SCHOLARSHIP RECIPIENTS

WYSSEN AVALANCHE CONTROL SCHOLARSHIP AWARDS

Wyssen USA, Inc. (a subsidiary of Swiss-based Wyssen Avalanche Control AG) is pleased to award their 2022–2023 Pro Training Scholarships to A3 Affiliate Members Eliza Allen and Jackson George. These scholarships represent Wyssen's dedication to furthering expertise and innovation in the avalanche community. Wyssen is proud to partner with A3 to offer these scholarships to the next generation of avalanche professionals—including those who are underrepresented within the industry.

Originally from the Southern Rockies, Jackson George earned his chops skiing in the rugged San Juan Mountains while pursuing a Geology degree at Fort Lewis College. He found his passion for snow science quickly and by necessity, as he learned firsthand about the lingering instabilities for which his home range is notorious. Jackson now lives in Columbia Falls, Montana, where he is a board member of the Flathead Nordic Backcountry Patrol, a cat skiing guide, and a volunteer for the Flathead Avalanche Center. His happy place is the leeward side of a snow pit, digging deep into the mysteries of avalanche country. Jackson is grateful to Wyssen Avalanche Control for the opportunity to migrate back to the San Juans for a Pro 2 with the Silverton Avalanche School this winter.

Eliza Allen grew up in Southwestern Colorado, where her first downhill turns were at Ski Hesperus and Purgatory. She later worked as a ski instructor at Crystal Mountain, and got into alpine mountaineering and ski patrolling at Mt. Bachelor in Oregon. Eliza moved to Utah to work as a pro ski patroller at Snowbird in 2013, and has been in the Wasatch ever since, with one season on a ski patrol exchange at a resort in the Chamonix Valley.

Eliza has been an instructor for AIARE courses for four years, and a cat skiing guide with Snowbird Mountain Guides for seven years, most recently guiding with Chugach Powder Guides. This season, Eliza is stepping into a new role as the Director of Snowbird Mountain Guides. In this capacity, Eliza will manage the AIARE courses, cat skiing tours, and backcountry tours that the program offers. She is honored and grateful for the support of the Wyssen Scholarship Program so that she can continue her professional training this winter.

The Wyssen and A3 Pro Training Scholarship program began last winter and the first recipients of the award were Kakiko Ramos-Leon and Taylor Guetschow. Wyssen Avalanche Scholarship Applications are announced each fall. To learn more about the program, visit www.americanavalancheassociation.org/scholarships. ⬢

BCA AND A3 NAME RECIPIENTS OF THE 2022–2023 WOMEN'S SPECIFIC PRO TRAINING SCHOLARSHIP

BY LOUISE LINTILHAC

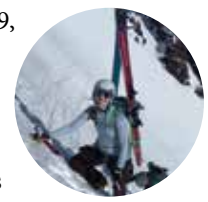
In an effort to create more opportunities for women-identifying people in the fields of snow science and avalanche safety, the American Avalanche Association and Backcountry Access have partnered to fund an avalanche education scholarship of up to $1500 per recipient in tuition support for three women in the 2022–2023 season. On December 15th, the two organizations named Megan Guinn, Katy Lanfri, and Caroline Carlson as the beneficiaries of the scholarship.

Each of the women will now have the opportunity to pursue their own areas of interest in the betterment of their careers, with Guinn focusing on snow science and avalanche forecasting, Lanfri focusing on avalanche education and guiding, and Carlson focusing on expanding her ski patrol career.

"We were extremely impressed by the quality of applications submitted to our scholarship review committee. Seeing so many female-identifying individuals continuing their professional avalanche education this year is remarkable and encouraging," said Jayne Thompson Nolan, Executive Director of the American Avalanche Association and a member of the scholarship selection committee.

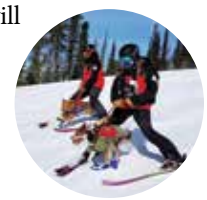
For Megan Guinn, born in Golden, Colorado, scientific research has been her longtime calling. In December, 2022 she received a degree at Portland State University where her studies focused on forest fires in the Pacific Northwest and their effect on snow hydrology and water resources. She'll be putting her scholarship towards a PRO 1 course with the American Avalanche Institute this winter in Jackson, and plans to utilize the knowledge and in-the-field experience gained for her ongoing internship with the Chugach Avalanche Center in Alaska.

"Taking my PRO 1 is a necessary step in my professional career in the avalanche and snow industry," says Guinn. "I'm excited to combine the operational knowledge gained in my PRO 1 with my scientific background so as to progress my skills. I hope that knowing this common language will help me communicate ideas and foster the sharing of information among practitioners as well as my community."



Katy Lanfri, a ski patroller in Bend, Oregon, since 2019, will be using the awarded money to become an avalanche education instructor and a ski guide. She'll be taking her PRO 1 course this winter with AIARE in Crested Butte, Colorado in order to gain experience with a different snowpack. The scholarship will free up financial resources for her in order to make that possible.

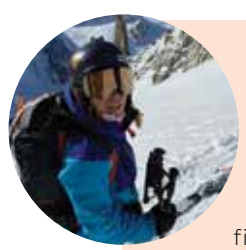
"I am excited to receive this funding not only for practical reasons, but to also feel supported by A3 and BCA in my career development as an avalanche worker. Taking my Avalanche PRO Level 1 will be invaluable experience as a pro patroller and aspiring AIARE instructor & ski guide. I am extremely grateful for A3/BCA in their support of female-identifying professionals in the industry."



For Caroline Carlson, the next chapter in her career will be taking her PRO 1 course with Silverton Avalanche School in Silverton, Colorado. "I applied for the BCA women's scholarship in order to ensure I could access quality training for the good of my team as a new leader in our patrol," she explains. "This scholarship also allowed space in our training budget making the PRO Level 1 course accessible to more patrollers and elevating us collectively."

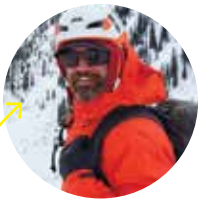
This step is a natural progression for Carlson. She currently works as Hill Captain at Brundage Mountain Patrol in McCall, Idaho, but began her journey in the winter sports industry as a teen, tallying jobs that included ski area operations, ski instructing, lift operations, and freeski coaching. During the warmer months she works as a wildland firefighter and EMT rescuer.

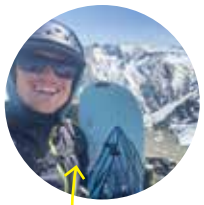
For Nolan and the American Avalanche Association, the opportunity to support career development for these women is exciting. "Caroline, Katy, and Megan bring a different focus and skill set to the industry and they each will be utilizing their scholarship to further their career and benefit not only themselves but their teams and the general public," said Nolan. "We are thrilled to support these three women as they continue their careers in the avalanche industry and we are extremely grateful to Backcountry Access for their continued partnership." ⬢



LOUISE LINTILHAC is a Senior Account Manager at Vermont-based Press Forward PR. She found PR after spending four-and-a-half years as an editor at *Backcountry Magazine*. A former Freeski World Tour participant, Louise filmed for four seasons with Meathead Films and strives to spend 80 days a year split between lift-served and backcountry skiing.

METAMORPHISM




EASTERN SIERRA AVALANCHE CENTER STAFFING UPDATES

Eastern Sierra Avalanche Center is excited to announce some staff updates at the Center. We have two new faces joining the ESAC forecasting team this season, Clancy Nelson and Everett Phillips. Additionally, former ESAC Lead Forecaster, Steve Mace has stepped into the role of Center Director at ESAC.

Clancy Nelson grew up in Mammoth Lakes with skis on his feet. His experience with snow safety started in 2007 as a professional ski patroller for Mammoth Mountain Ski Area. He spent nine years as an observer for ESAC before starting his forecasting career in 2016. In 2018, Clancy moved to Montana where he spend four seasons forecasting for the Flathead Avalanche Center. We are delighted to welcome Clancy back to the ESAC team.

Everett Phillips has worked in the avalanche safety field for over a decade. He was lucky to get his start as a ski patroller at Crystal Mountain in Washington where he discovered backcountry skiing and avalanche science. He has continued to develop those interests professionally as a ski patroller, park ranger, backcountry ski guide, and avalanche educator in California, Washington, and Colorado. We are very excited to have Everett on staff.

Steve Mace has been forecasting for ESAC since 2018 and started working as ESAC's Lead Forecaster in early 2022. Steve stepped into the role of Center Director starting November 2022. ⬢

Andrew Kiefer and Dallas Glass.

NEWS FROM NORTHWEST AVALANCHE CENTER

Joe Dellaporta joined the team at the Northwest Avalanche Center this fall as an avalanche forecaster for the Mt. Hood and East South zones. He comes to us after a season working with the Bridgeport Avalanche Center. Joe Dellaporta is no stranger to NWAC. He spent several seasons working as a professional ski patroller at Mission Ridge Ski Area and the Summit at Snoqualmie Pass. He also served as a frequent field partner for NWAC staff and was a regular contributor to our public observation platform. He's excited to combine his snowmobile skills from the Sierra and his mountaineering talents as a climbing ranger on Mt. Shasta to serve these two very different forecasting areas.

Joe will replace Andrew Kiefer who worked with NWAC since 2018. This winter Andrew moved on to a career in water resource management for the State of Oregon. While we at NWAC will miss his cheerful spirit and insightful forecasts, we're also excited for him in his new endeavors. We hope each of you will join us in thanking Andrew for all of his hard work in helping to grow NWAC over the last four seasons. ⬢

NEWS FROM THE NATIONAL AVALANCHE CENTER

The Forest Service National Avalanche Center is excited to announce that Chris Lundy is joining our staff as a National Avalanche Specialist. His is the first new position at the NAC since its inception over 20 years ago, and it reflects our rapidly growing workload. Chris brings over 20 years of diverse professional experience with snow and avalanches to his position, including time as a researcher, ski patroller, highway avalanche forecaster, backcountry ski guide, backcountry avalanche forecaster, Director of the Sawtooth Avalanche Center, and web developer. His snow career began when he conducted the first rigorous field verification of the Swiss SNOWPACK model, earning an M.S. in Civil Engineering from Montana State University-Bozeman. That and his subsequent work have resulted in three presentations to the International Snow Science Workshop, multiple presentations to regional snow and avalanche workshops, and several publications in *The Avalanche Review*. Though his varied professional experience ensures he can fill just about any role at the NAC, his primary duty will be managing the Avalanche Forecasting Platform. Chris lives in Stanley, Idaho, with his wife Sara, where they enjoy mountain travel in all its various forms. ⬢

PAC

Payette Avalanche Center

2021–2022 AVALANCHE CENTER SEASON SUMMARY

Sincere apologies to the Payette Avalanche Center for mis-filing their season summary.

—The Editor

PAC: An early January avalanche cycle up Lick Creek canyon, photo taken from near the top of the crown looking down at the deposition zone. This wind slab avalanche failed within new storm snow from a storm that dropped over four inches of water. KEVIN STUDLEY

The winter of 2021–2022 will be remembered for atmospheric river events in December, a prolonged and challenging mid-winter drought, and a triumphant return to winter in mid-April. Staff at the PAC spent most of the season tracking an abnormally high number of crust and facet combinations.

The PAC operated with three avalanche specialists: George Halcom (full-time), Dave Bingaman (part-time) and Kevin Studley (part-time). Kevin was a welcomed addition to the PAC staff and provided a new perspective with six seasons of avalanche hazard mitigation and snow safety experience within the ski patrol world.

Our first seasonal snowfall began in late October when an atmospheric river event dropped more than 3" of water as snow above 7000'. The first half of November stayed cool and wet with another 3" of water. 6000-7000 feet was the rain/snow level for this part of the month.

The first week of December was warm and dry. McCall airport (5000') set a record high temperature of 53 F on 12/01/21. During the second week of December, an atmospheric river event delivered over two feet of snow (4" SWE and with eighteen days of accumulating snowfall and monthly totals just under 100" (11.5" SWE). We monitored the ensuing crust/facet weak layers through January but they were benign.

A multi-day storm hit our area on January 3rd–7th dropping 20–30" (4.5" SWE, bringing rain up to 6000'. We observed our first widespread avalanche cycle right at the tail end of this storm. Most avalanches ran on the new/old interface.

Our second avalanche cycle of the season began on 02/28 and came at the end of a storm that dropped 11" (1.7" SWE) and rained up to 7,700 feet. Several days before this storm, two separate storms totaled 12" (0.9" SWE). Most avalanches during this cycle ran on facets above a crust formed on 02/14. These avalanches started right above the rain level and began as dry, wind slab avalanches, but then grabbed wet snow, and acted as wet loose avalanches further down the slope. Late February was the first time we had received full block propagation in an ECT. The 02/14 crust and the 03/01 rain crust continued to give us results in compression and propagation tests leading up to the March warm up.

The big story in March was the heatwave from the 23–27. Before the heatwave, we issued a persistent slab problem for the first time all season. We were leery of conditions heading into the warmup, as the 02/14 and 03/01 weak layers had been giving us results prior to then. A high temperature at or above 50 F was recorded at 6500' for five consecutive days. During this period we saw five nights above freezing at 7800', with the last night only getting down to 41 F! Meltwater percolated down in the snowpack three to four feet in some locations. Despite adding it to our forecasts we escaped unscathed with no wet slab avalanche cycle.

For the 2021–2022 season, the PAC issued Advisories at Low for 23 days, Moderate for 40 days, Considerable for 18 days, High Danger for only one day, and 38 General Avalanche Information products. The Friends of the Payette Avalanche Center (FPAC) hosted two Know Before You Go Avalanche safety video presentations, one Level 1 Avalanche Course, two transceiver training clinics, an Intro to Avalanche Safety, and hosted two separate screenings of the movie Buried: The 1982 Alpine Meadows Avalanche Film, at their annual fundraiser.

The Payette Avalanche Center saw 10-plus year veteran forecaster Dave Bingaman's final season- he will be greatly missed. Dave plans to remain active in the PAC volunteer squad and with the Friends of the Payette Avalanche Center. New forecaster Kevin Studley came into our team with great spirit and skills.

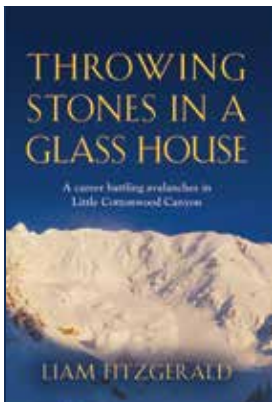
—Kevin Studley and George Halcom

PAC: One of our few reported human triggered avalanches occurred during the last week of issuing advisories under Considerable avalanche danger which resulted in a close call for a local snowmobiler. GEORGE HALCOM

BOOKS OF INTEREST

Throwing Stones in a Glass House

BOOK BY LIAM FITZGERALD



Ron Perla once told me, "*Little Cottonwood Canyon is the best place on earth to study avalanches.*" After thinking about his statement for a moment, he corrected himself and said, "*No, not just on earth; the entire solar system; and maybe the entire universe, as I understand it to be.*" After spending forty-three years of my life there, I agree with him.

This book is the story of those forty-three years, from the early 1970s, when as a young, enthusiastic, and very green avalanche aficionado, I suddenly found myself at the center of an environment known for its abundant snowfall, steep terrain, and often tricky snowpack (and all within a 30-minute drive of a metropolitan area with over one-million inhabitants), to 2014 when, at the age of 68, I finally decided it was time to go.

> To Liam, many thanks, but you forgot to add "and in alternate universes."
>
> — Ron

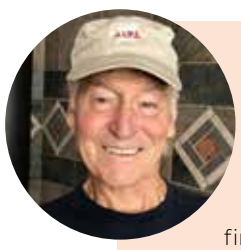
Little Cottonwood Canyon is home to two major ski resorts renowned for their extensive avalanche problems, a world-class heli-ski operation, an abundance of very desirable and to a large degree, very accessible backcountry skiing, and a steep, dead-end, avalanche-prone highway that transports thousands of powder-hungry individuals to the upper reaches of the canyon every day during the winter. It's a unique place with a long colorful history, a portion of which is recounted in this book.

The generation of avalanche workers to which I belong began its career during an exciting period in history. There was a lot going on in the world: socially, culturally, and politically, and it was also a time during which the ski industry in the U.S. was really starting to take off. People were moving to the mountains, and the population of ski-resort towns was expanding at a considerable rate. The number of vehicles traveling on mountain highways in the winter months increased significantly, and it seemed that EVERYONE was being drawn to the allure of powder snow and steep terrain. This rapid and widespread growth had a profound affect on the avalanche world as lots of new triggers and targets found their way into the mountains. More people were being exposed to avalanches more often than ever before, and eventually all that increased exposure would catch up to them; they needed protection! It was a good time to become an "avalanche-guy."

This is a story about battling the elements and taking risks that will be familiar to many of you who are regular readers of TAR, and who like me chose a career that is often challenging, sometimes brutally difficult, and on occasion tragic. But it's also a career you will be able to look back on once you call it quits, and be grateful that it happened to you.

—LF ⬢

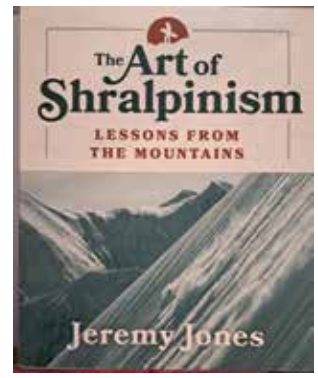
Starting mid-February, copies of this book can be purchased from the publisher, BookLocker.com*, or they can be ordered from your favorite online or brick-and-mortar bookstore.*



LIAM FITZGERALD is a retired avalanche worker who had a remarkable career in Little Cottonwood Canyon. He will be REALLY happy when this book finally makes it to the printer.

The Art of Shralpinism

REVIEW BY AARON DIAMOND



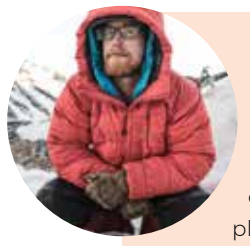
The Art of Shralpinism is, as author Jeremy Jones describes it, a "handoff" of knowledge from one generation of shralpinist to the next. For those unfamiliar, a shralpinist is a lover of shredding and alpinism, and Jeremy is one of its most skilled practitioners. The knowledge Jeremy passes along in this book is wide reaching and ranges from progressing your snowboarding, to climate activism and inclusivity in the outdoor environment. This is a book that a younger me would have read cover to cover many times; a mix of storytelling from my heros and a "how to" of sorts for approaching big mountains on a snowboard (or skis).

The book is divided into three sections, Wisdom, Science, and Art. **Wisdom** speaks to foundational things such as snowboarding progression, finding partners and mentors, and the most unanswerable question of all, how much risk is just enough without being too much. **Science** dives into more complex subjects such as specific mountain hazards, terrain progressions, stability evaluation and the health and wellness aspects of being in the big mountains. Finally, **Art** is a dive into stories from Jeremy's past and a look at the future of the sport including raising the next generation of shredders and making sure they have snow to shred.

The advice offered throughout the book on managing risks in the backcountry is simple 101 class on adding margin; start small after every weather event, avoid snowpacks and ranges with persistent weak layers, do your homework, and don't rush. This is great advice and coming from Jeremy it might actually stick with its audience. In this book Jones omits the more in-depth and science-heavy aspects of snow science and instead chooses to focus on terrain evaluation and informal testing.

Throughout the book there are sidebars and stories from a wide cast of outdoor athletes including climbers, skiers, and ultrarunners. While reading I found the these excerpts a little bit distracting from the general flow of the book but when I did remember to go back and read them they provided great insight and usually a little different perspective from the one offered by Jeremy. Standouts for me were interviews with the late Hilaree Nelson and waterman Laird Hamilton.

If you're an aspiring shralpinist, this is a must-read and if you have an aspiring shralpinist in your life the book would make an excellent gift. For this 30-something splitboard guide *The Art of Shralpinism* was a great preseason read to put myself in the winter state of mind. ⬢



AARON DIAMOND lives in Moran, Wyoming. He works as a splitboard guide and avalanche educator in the Tetons and Alaska. When he is not working you can find him wandering in the Tetons or planning ski trips he can't quite afford.

ICAR 2022 AVALANCHE COMMISSION REPORT

BY MICHAEL FINGER & RYAN CLERICO

The International Commission on Avalanche Rescue kicked off on October 12 in Montreux, Switzerland. It had been three years since the last in-person conference, and it was nice to see new faces and old friends.

The first day was a practical field day, hosted by the Avalanche Commission (AVACOM) and held in the mountains of Jaman above Montreux. The Col de Jaman sits at an elevation of 4961 feet above sea level, while the nearby Dent de Jaman peak is 6152 feet above sea level. Since it was early in the season and low elevation in the Swiss Alps, temperatures were cool, but snow was absent. This limited the "avalanche-specific" field demonstration opportunities.

Air Zermatt conducted a Recco long-range receiver demonstration, consisting of three "victims" hidden in the trees in the valley below the field area, with their locations unknown to the helicopter search crew. Radio communications, mostly in French, were broadcast for the audience. Of particular note were the obvious transect/signal acquisition search patterns, followed by the directional location of each victim. Upon location, the victims stepped out of hiding and popped smoke to confirm their location, which was a valuable visual aid for the audience. Recco now has eleven helicopter-based long-range receivers in North America. Mountain Rescue Association (MRA) teams near Alaska (Alaska Department of Public Safety), California (California Highway Patrol), Colorado (Colorado Highland Helicopter), Montana (Two Bear Air), Utah (Utah Department of Public Safety), Washington (Snohomish County Helicopter), and Wyoming (Teton County Search and Rescue). Who? Other SAR teams? should consider contacting those agencies/entities for training and establishing avalanche mission deployment protocols and procedures. Representatives should also consider contacting those agencies/entities for potential terrestrial search missions, as Recco reflectors are now becoming more common in four-season apparel and equipment.

Ryan Clerico author's note: MRA places a premium—and rightfully so—on education and prevention; the rescue we never have to do is the best one for the patient. There may be an opportunity for MRA to be a leader in this initiative, particularly given Stephanie's role with Backcountry Zero and as AVACOM President, should AVACOM endeavor to coordinate more with avalanche forecasting centers.

Swiss Alpine Rescue also provided a search dog demonstration. While not avalanche-specific, the "Swiss four-phase" method is well-known throughout the avalanche search dog community in the United States.

The next three days were spent at the Montreux Music and Convention Center with our respective commissions. Stephanie Thomas of Teton County SAR was elected as president of the AVACOM last year and was serving in her new role at the conference. It was a welcome change to have organization and leadership after the last few conferences, with a renewed energy and interest in getting things back on track.

The first item on the agenda was accident reports from the attending countries. It was found that accidents were down last season, with the theme being warm and dry winters leading to less snow/participants. This led into a discussion about how to expand the accident reporting and make them useful, rather than simply a hashing of grim statistics. Stephanie distributed a "standardized" accident report format prior to the conference, although only about half the reporting countries followed the format. This was likely due to the late distribution and without context as to the reasoning for the format. Accidents and fatalities across reporting countries continue to be most common at the "Considerable" hazard rating (or the corresponding country equivalent), consistent with what we tend to see in the U.S. One of the goals of the standardized report format should allow for more empirical analysis of this data within the Avalanche Commission going forward. Anecdotally, other countries seem to struggle with the same "Considerable is the New Moderate" mindset as the U.S. There will be more on this below.

The accident reports and ensuing discussion also brought up the topic of where the AVACOM sits regarding forecasting and avalanche centers. Avalanche forecasting and accident investigation have a different role and scope vs. mountain rescue. However, "prevention" should ideally be a common theme across both organizations, as evidenced by the Considerable observation above. One use of the more empirical statistics in the country reports may be to inform and improve the messaging used in avalanche forecasting. How best to engage forecast centers in the U.S. may be a future (current?) topic for the MRA to consider, and the ICAR AVACOM should be an important venue for MRA to observe how other countries are doing it, (effectively or otherwise).

When AVACOM last met in Poland, we decided on four areas we wanted to focus on as individual working groups: Prevention, Partnerships, Recommendations, and Common Language and Statistics Workgroup. We were able to continue work this year and spend time in breakout sessions. The first area, Prevention, focuses on public outreach and prevention. Partnerships looks at working with companies and other organizations to help with avalanche rescue issues (see Joe Obad's talk below). Recommendations looks at rescue techniques and equipment that the AVACOM commission will recommend as best practices. Lastly, Common Languages and Statistics looks at how to bridge the language and culture barriers in reporting accidents. These four groups will meet throughout the year and work in their respective areas.

Ryan facilitated the AVACOM Recommendations breakout working group. Many of the previous recommendations are dated, with the most recent update from 2015; hence, a single breakout session was not going to be sufficient to review all, or even most, of the commission's recommendations. The breakout group agreed that the best path forward would be to convene an AVACOM subcommittee over the next year to review each of the recommendations, prepare updates where appropriate, present to AVACOM for preliminary approval prior to the ICAR 2023 conference, and then present to the full assembly of delegates. In general, it was agreed that recommendations should be simple, clear, and easily translatable in multiple languages, using graphics/illustrations wherever possible. This follows with the MountainSafetyInfo (MSI) initiative approach (addressed separately below).

There was also a discussion within the breakout group about whom the audience of AVACOM's recommendations should be – mountain users, mountain rescue teams, or both. It was generally agreed that there will be some overlap and recommendations that apply to both; but that there should be some clear recommendations of best practices for mountain rescue teams and a separate set for mountain users. This again came back to MSI, which is likely the better venue for the mountain user audience, so they do not get lost or mixed up with rescue-specific recommendations. AVACOM will consider a "recommendation" to adopt and endorse the MSI material. For the mountain rescue team audience, these recommendations will be particularly important for new teams/entities joining ICAR, where they have a resource to review what ICAR considers as best practices.

Finally, the group agreed that AVACOM should make a new recommendation regarding the implementation of an incident command structure (ICS) for organized avalanche rescue response. Although most country teams already follow some sort of ICS, the AVACOM recommendations are presently silent on the topic.

Michael attended the breakout group on Common Languages and Statistics. The idea of an international avalanche accident and incident database has been the dream of many people over the years, but it has been elusive, due to the lack of standards and language around the idea of what constitutes an 'accident.' While the loss of life or a serious injury is agreed upon, what constitutes a near miss? Another question was regarding keeping statistics: avalanche rescue is usually a low occurrence event for most teams, but if data can be gathered and aggregated globally, we might be able to infer things much quicker. This can help answer the questions of what techniques, equipment, and outcomes are teams using for avalanche rescue.

One of the more notable talks was by Joe Obad of the Canadian Avalanche Association about the recent convening of equipment manufacturers and avalanche professionals to discuss transceiver electrical interference. A small workgroup got together September 20–21, 2022 in Salt Lake City, Utah with the initial stated goal to hone in on desired behaviors and outcomes; which the working group identified and Joe summarized briefly but indicated required some more work before formalizing. The working group invitation list was originally kept small to encourage more dialogue, but the group will be expanding. Contact him directly about joining (jobad@avalancheassociation.ca).

The current recommendation from manufacturers is that avalanche beacons should be 20 centimeters from other electrical devices when in send mode and 50 centimeters when in search mode—both of which AVACOM attendees noted is becoming increasingly difficult for rescuers. Between cell phones, radios, GPSs, airbags, etc., interference is a significant concern. It was noted that there have been several recent airbag design updates specifically to address the beacon interference issue. (*Editor's note: see TAR 41.2 for a report on this meeting.*)

For a potential AVACOM research opportunity (which could be conducted jointly with MEDCOM and DOGCOM), AVACOM has recommendations regarding training, but there seems to be little data about the effects of "simulated burial" on training patients—meaning, those individuals that are voluntarily buried as part of avalanche search drills—and what an acceptable amount of time for a training burial might be. One approach could be to monitor burial volunteer heart rate, oxygen saturation, and core temperature to recommend a time limit/threshold within which an individual should be subjected to burial. At least one manufacturer has conducted similar medical monitoring during product development. Product vendor Cosinuss has a Bluetooth in-ear monitor for these physiological data points, so there is potential for real-time data collection correlated against burial time.

Felix Meier presented on a software tool he has written to help determine avalanche beacon reception distance. He stated, "SearchPath is a tool for visualizing the shape of magnetic field that emanates from a buried avalanche transceiver. Various parameters such as snow properties, dipole inclination, burial depth, number of receiving antennas and view plane can be chosen. The optimum search path can be determined." More information can be found on Felix's website: https://felmeier.com/en/software/SearchPath.shtml.

After six years of work with Version 1 of their platform, MountainSafety.Info is implementing a major update of their online content management, collaboration, review, and translation tools. The workgroup collaboration tools exist in almost 20 languages, allowing subject matter experts from all over the world to share their know-how and to contribute to translations without the barrier of having to manage a user interface in a foreign language.

Swiss Alpine Rescue gave a presentation on an avalanche accident that happened near the location where the practical day was held. Four local young adult skiers were caught and carried ; two were able to self-rescue and help dig out one of their partially buried companions but they were unable to locate their missing friend.

None of the skiers were wearing beacons, and the avalanche danger rating was Considerable, moving to High. The roads were closed, but the initial rescuers were able to arrive by train. A helicopter arrived in one hour. Due to the hazards of the day and communication issues, the response was kept as small as possible. The missing skier was ultimately located under several meters of snow three hours later by a rescue dog. He was transported to the hospital by helicopter, where he later died.

Finally, U.S.-based speaker Laura McGladrey of Responder Alliance and the University of Colorado presented multiple times to different commissions, including a plenary presentation on the stress continuum and stress injuries amongst rescuers. This seems to be further along in the U.S. than it is in Europe, but ICAR attendees certainly took note. It will be interesting to follow how these principles are applied internationally over the next several years.

Aerosize, a Polish company, showed off an airbag vest that looks very similar to an inflatable life vest. Their goal was to make a unit that could be worn with or without a backpack. This could prove useful to mechanized users, such as helicopter crews or road maintenance employees, who traditionally don't wear a pack but still could benefit from an airbag.

Black Diamond Equipment as part of their Avalung development, but possibly others.

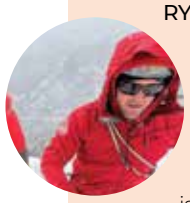
Also of note was MEDCOM's work on management of avalanche victims. The following is from Dr. Alison Sheets' and Dr. Christopher Van Tilburg's report from MEDCOM. I think it is relevant and important enough to repeat here:

This year much of the MEDCOM work at the conference was in "development sessions" to bring recommendations and work in progress before the committee for discussion and critique. A great deal of time was spent on Medical Management of Avalanche Victims and an update on the avalanche resuscitation algorithm. Much of the discussion was related to hypothermia care and differentiating the asphyxiated avalanche patient from the hypothermic one. The survival of critically buried avalanche victims in cardiac arrest is, and has always been, grim. Once the recommendations are published, they will be available to the MRA as ICAR members. The basic decision point remains at 60 minutes. Any avalanche victim with signs of life is treated according to well established trauma and emergency care protocols. The ***cardiac arrest*** *victim is assessed as follows:*

- *Critical burial less than 60 minutes, initiate resuscitation with emphasis on rescue breaths unless OBVIOUS signs of death from trauma.*
- *Burial greater than 60 minutes and open airway, assume hypothermia and resuscitate per hypothermia protocols.*
- *If burial greater than 60 minutes and airway is obstructed (nose and mouth packed with snow or debris), assume asphyxia, and do not resuscitate.*

There are many details about measuring temperature in the field, use of monitors and ultrasound, witnessed vs unwitnessed arrest. The reality is that avalanche victims with unwitnessed cardiac arrest have an extremely low chance of survival. The working group admittedly states they are looking for the unicorns, those hypothermic patients that look dead but can survive with good neurological outcome. Wisely, there is a strong recommendation for medical directors to establish protocols for the SAR teams that address their specific environment, resources, EMS, and hospital systems as there is significant variability worldwide. ⬢

MICHAEL FINGER is an Assistant Commander for Salt Lake County Sheriff's Search and Rescue team. He has been an active MRA member for over 15 years and serves as alternative US ICAR delegate on the avalanche committee. Michael is an active ultra-trail runner, climber, and backcountry skier.



RYAN CLERICO is a 10-year veteran of the Salt Lake County Sheriff's Office Search and Rescue Team, currently serving as the team's Vice Commander, as well as a part-time ski patroller at Brighton Ski Resort. One of two U.S. delegates to the ICAR Avalanche Commission, Ryan is also a Level I Avalanche instructor.

AVALANCHE PRESENTATIONS AT AMERICAN GEOPHYSICAL UNION 2022

BY HP MARSHALL & ERICH PEITZSCH

The American Geophysical Union (AGU) Fall Meeting occurred from December 12–16, 2022, in Chicago, Illinois, where over 25,000 attendees convened to share research and network on Earth and space science. This year, Jeff Deems, HP Marshall, Erich Peitzsch, and Jesus Revuelto convened oral and poster sessions around the theme of "Quantifying Spatial and Temporal Variability of Snow and Snow Processes" where, of 39 oral and poster presentations, nine presentations focused specifically on avalanche topics. Here we summarize these presentations to make this work more accessible to a broader audience and to initiate interest for ISSW 2023 in Bend, Oregon. Many of the topics in the session can be viewed in the context of avalanches, but here we focus on those presentations with explicit avalanche implications in the presentations.

Several presentations focused on the use of various models and simulations to improve our understanding of avalanches and avalanche forecasting across various spatial scales. Cameron Wagner and others used Uncrewed Aerial Systems (UAS, or drones) and SnowModel, a spatially distributed snow-evolution modeling system, to model wind slab depth maps using Mount Washington Observatory weather station data on a 1-meter grid scale. Katreen Wikstrom Jones and others, in collaboration with the Alaska Railroad, used Rapid Mass Movement Simulations (RAMMS) and LiDAR data to assess the proposed placement of remote avalanche control systems (RACS) towers in a prominent avalanche path affecting the railway. Similarly, Gabe Wolken and others illustrated how they are using RAMMS and downscaled climate data to evaluate avalanche hazard locations throughout the state of Alaska.

Three presentations focused on improving forecasting efforts by 1) modeling efforts using the model SNOWPACK to investigate how well specific layers of concern identified by public avalanche forecasters are represented in simulations (Florian Herla and others) assessing the feasibility of SNOWPACK to aggregate small public forecast zones into larger regions by applying clustering methods to simulated snow profiles (Simon Horton and others) validating and localizing automated Avalanche Terrain Exposure Scale (autoATES) in two different snow climates in British Columbia and Alberta, Canada, and comparing digital elevation model input types for accuracy assessment for these regions (John Sykes and others).

The remaining presentations focused on the use of specific tools to improve understanding of avalanche processes. Jeff Johnson and others illustrated their work using a network of infrasound arrays in Little Cottonwood Canyon, Utah, to distinguish avalanches from other types of incident infrasound, including traffic, earthquakes, urban Salt Lake City cultural noise, and artillery by using event optimization and machine learning techniques to record nearly 100 avalanches during a storm sequence in 2021. HP Marshall and others demonstrated a new technique using synthetic aperture radar (SAR) on aerial and car-based platforms to automatically detect location and timing of avalanche events. Finally, Zach Miller and others presented their use of UAS and high-resolution photogrammetry to quantify snow depth spatial variability in complex mountain terrain.

This breadth of robust work highlights the strong presence of avalanche research in the greater geoscience arena, and we thank the presenters for sharing their work in this session. We are very excited to see so much more snow and avalanche research at ISSW 2023 in Bend, Oregon, from October 8–13, 2023. The abstract submission portal opened January 16, 2023. Abstracts are due no later than April 17. See you in Bend!

Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

The ISSW23 Scientific Program Committee (Erich Peitzsch, HP Marshall, Scott Savage, and Simon Trautman) looks forward to a great week of snow and avalanche science in October. The abstract submission portal is now open. Visit **issw2023.com** for more information.

REFERENCES:

Using SnowModel to Simulate Spatial Distribution of Wind Deposited Snow in Mount Washington, NH Avalanche Terrain (confex.com)

Assessing the Placement of Proposed Remote Avalanche Control Systems Using LiDAR-derived Snow Maps and Dynamical Avalanche Modeling (confex.com)

Snow Avalanche Hazard Mapping for the State of Alaska (confex.com)

An Informative Large-scale Validation of Snowpack Simulations in Support of Avalanche Forecasting in Canada (confex.com)

Dynamically Aggregating Avalanche Forecast Regions Based on Simulated Snow Profiles (confex.com)

Validation and Localization of an Automated Method for Large Scale Avalanche Terrain Exposure Scale (ATES) Mapping (confex.com)

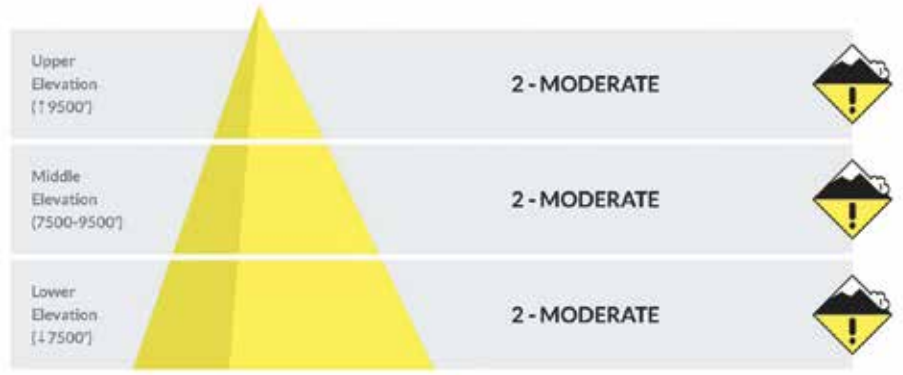
Tracking Snow Avalanches Using a Network of Infrasound Arrays in Little Cottonwood Canyon (Utah, USA) (confex.com)

Avalanches in L-band InSAR imagery during the 2020-21 NASA SnowEx Mission (confex.com)

Understanding Snow Deposition Patterns Leading to Natural Avalanche Formation in Heterogenous Mountain Terrain (confex.com)

ERICH PEITZSCH is a Research Physical Scientist at the U.S. Geological Survey in West Glacier, MT, and is chairing the scientific program committee for ISSW 2023.

H.P. MARSHALL is an Associate Professor of Geophysics at Boise State University and co-directs the Cryosphere Geophysics And Remote Sensing (CryoGARS) group in Boise, Idaho.



The danger was "only" moderate that day. My friends and I had climbed up through south facing terrain looking to ski powder in an upper alpine north facing bowl. It was a beautiful day. The danger had recently dropped, and we didn't see or experience any outward signs of instability such as cracking, collapsing, or recent avalanches. When we reached the top of the ridge and peered into the bowl on the other side, we saw numerous sets of tracks. We quickly transitioned, dropped in one at time, and shredded the fresh powder without incident.

which slopes are going to slide and which aren't. This is legitimate. When choosing a slope is a lot like rolling the dice with your life, moderate danger doesn't seem to cover it.

MODERATE DANGER WITH A PWL

STORY BY ERIC TRENBEATH
PHOTOS BY MARK WHITE

"I'll trust that PWL when it's floating down the river."
—Jamie Weeks

Wanting more and feeling good about things, we contoured around to a secondary shot. I dropped in and made about five turns when suddenly everything collapsed into a pile of sliding blocks. Glancing quickly over my shoulder I could see all my turns coming apart with a fracture 2'–3' deep well above me. The avalanche had broken much deeper than just the most recent snow. The next thing I knew I was cartwheeling, choking on snow, and thinking I was going to die.

This is the danger of a persistent weak layer (PWL). Though they become less reactive and harder to trigger over time they *persist*, and when they do cause an avalanche, they are no less devastating then when the danger is considerable or high.

This is what keeps forecasters up at night. When the likelihood is trending down but the consequences remain the same. When it's been several days since the last storm or avalanche. When there aren't any outward signs of instability. When people are pushing it into more consequential terrain without incident. But the weak layer of faceted snow underneath *persists*.

Any avalanche professional will cite the old adage "never trust a faceted weak layer." Some forecasters even advocate for never dropping the danger to moderate as long as a faceted PWL poses the threat of a dangerous avalanche, especially when it is nearly impossible to predict

Most forecasters will eventually drop the danger from considerable to moderate as the overall likelihood or probability decreases, but does this mean that we now trust the weak layer? Are we ready to push the boundaries and jump into terrain steeper than 30 degrees when a PWL of faceted snow under a slab is likely to exist? We are not. The consequences of a failure are simply too high. Much higher than a moderate danger from avalanches involving wind drifted snow, or the most recent storm snow. These are deep and dangerous, potentially un-survivable avalanches.

Miraculously, I came out on top of the snow that day over 30 years ago. I knew I was lucky to be alive, and I never wanted to experience that again. In spite of it, I still have a passion for big lines and steep terrain. Moving from the Wasatch down to the La Sal Mountains near Moab, where weak, faceted layers are the rule rather than the exception, I've had to learn a lot of patience. Some years, the lines never even come in at all. But at the end of the day, it's far more worth it to wait and come home at night than the alternative. And when the avalanche problem type is a persistent weak layer, I'll never say the danger is "only" moderate.

A UAC forecaster for the La Sal Mountains near Moab, **ERIC TRENBEATH** is a desert loving mountain guy. After a 10-year career as a ski patroller at Alta, he moved to Moab full time in 1999. He continues to wait patiently for the lines to come in.

LEARNING TO DIG SNOWPITS IN OUR NERVOUS SYSTEM SNOWPACK

BY BROOKE EDWARDS

"Trauma is not what happens to us but what we hold inside in the absence of an empathetic witness."
—Peter Levine

If we read this quote; indeed, if we actually absorb this quote and then apply it to our own lives, then we will recognize that we are all diverse and layered snowpacks. From early childhood, experiences that lacked an empathetic witness, even ourselves, are laid down like the first snows of winter on bare ground. As the season progresses and life evolves, each event adds a layer, some with more inches of snow, some with clear sparkling dry spells…but a snowpack is formed nonetheless. We can go through years of incremental loading, allowing time for our internal snowpack to recalibrate and constantly adjust to our own stress/strength balance. We all know what happens if there's a big weather event, rapidly loading our layers with a massive slab; an incident that upsets the balance. Did we understand the layers in ourselves below this slab? Did we have the language of snow science, or take the time to dig pits and observe the weather to know what we were working with?

When these rapid loading events occur, we experience a physiological response in our nervous system that can manifest in any number of ways: **fight, flight, freeze** or **fawn**.

The fight response is your body's way of facing any perceived threat with an active or sympathetic system response of action and motion.

Flight is where your body instinctively moves away from the danger physically or psychologically.

Freeze is a powerful protective mechanism when other, more active, responses are not possible.

Researcher Steven Porges describes Fawn is a "neurobiological strategy for survival" of resilience to avoid physical or psychological injury.

The goal of each of these is to evade danger and return to physiological baseline, or responsive state. But what if it's all happening incrementally and the body never gets a break to return to that zone of safety? Our nervous systems are not designed to be in a perpetual state of alert and responsiveness, and there is a price to pay. The body has to sustain the extended duty of high alert. We simply cannot sustain at such a high level of alert, and the danger can result in what the U.S. Military first defined as "allostatic" loading similar to the incremental loading of a snowpack.

Research defines allostatic loading as: "*The cumulative burden of chronic stress and life events. It involves the interaction of different physiological systems at varying degrees of activity. When environmental challenges exceed the individual ability to cope, then allostatic overload ensues. Allostatic load is identified by the use of biomarkers and clinical criteria.*" Guidi J, Lucente M, Sonino N, Fava GA. Allostatic Load and Its Impact on Health: A Systematic Review. Psychother Psychosom. 2021;90(1):11-27. doi: 10.1159/000510696. Epub 2020 Aug 14. PMID: 32799204.

But do we really "Know Before We Go?" as it applies to our own nervous systems? We still need to get the forecast, get the gear and most importantly: Get the training! Responder Alliance and many other organizations such as A3, The Redside Foundation, The American Alpine Club's Grief Fund are developing tools, education, conversation, and community to recognize and support each other with chronic stress.

The foundational course for Avalanche Education is the Avalanche Awareness level, where the student is introduced to the four elements of snowpack, weather, terrain and our own human factors. Similarly, most outdoor professionals, I would argue, are currently at the "Awareness" level of introduction into the complex dynamic of resilience work and impacts of stress on us as individuals and a team. Ski patrols, search and rescue workers, avalanche professionals, and guides are becoming aware of the psychological impacts of our work.

Responder Alliance has modified a deployment tool from the US Marine Corps to be used as an awareness tool for stress accumulation. If we apply the lens of the stress continuum at our avalanche assessment questions, (Jayson Simmons-Jones, IFMGA Guide and avalanche educator has been introducing the stress continuum at his morning guide meetings as a continuation of risk assessment) perhaps it would look something like this:

What's our weather? What's going on in your life? Is it bluebird? Or is a storm brewing?

What's our snowpack? Do we have incremental loading? Is it right side up? Or upside down?

What's our terrain? Are we entering triggering terrain? Are we actively engaging with our job?

What's our human factor? Who has eyes on us? How many people on our team? Have we trained together? Do we have prior knowledge of stressors? Is anyone acting avoidant? Experiencing stigma? Open dialogue, trust and good partners are essential.

What's our mitigation/travel plan? If all of the above are orange/red, how can we adjust our terrain/angles? Having the knowledge doesn't make it any more or less dangerous, it just informs how we proceed.

When first entering a level one avalanche class, participants are essentially given the keys to a decoder ring and welcomed into a whole new world of definitions, skills, tests, observations and a language that can be used to communicate information to others the world over. After learning these skills, one is taught how to practice them. Back in 2017, TAR 36.2, After The Fire. gave us all our "Awareness Intro/Know Before You Go" course on the stress continuum, grief, and trauma.

Now it's time for the greater snow professional industry to sign up for the next step, the equivalent to an Avalanche Level One. We need to build a skillset for early awareness and early mitigation of stress injury. When we, as avalanche professionals, first head out into teaching a snowpack field observations day with level one students, we don't expect them to whip out their shovels, dig a hole in the snow and understand what's going on. Instead, we teach them skill sets in a prescribed method that is practiced by all snow professionals. For example, doesn't everyone demonstrate pushing nose cartilage with gloved fist (two lbs of pressure, remember…) in order to calibrate their personal hand hardness scale with everyone who feels for structural differences in the snowpack? Forecasting may be a mystery to those outside of our profession, but is a transferable skill once trained and practiced. So, too, can be stress injury prevention and mitigation.

Building resilience strategies at an individual level and then as a team is also a varied and complex skillset. There's a language to learn, methods to employ, and implementation skills to practice. It is time we bring the impacts of our occupational stress up to the same standard that we hold physical health. We train for the season and our employers are invested in us showing up physically strong and ready to do our jobs as avalanche forecasters, ski patrollers, and guides. So why wouldn't we build up our stress resilience as well?

Psychologist Dr. Guy Winch makes the case that as a society we are biased heavily towards physical health over mental health. He uses the example that by the time we are five years old, we already know how to brush our teeth and that if we scrape our knee, we understand that we will need a band-aid. But what do we know about mental health? Nothing, he argues. When someone confesses that they are suffering from depression or anxiety, we give them platitudes that range from the "suck it up and deal" variety to the "it's just in your head" responses. Yet, if someone breaks their leg, you don't just tell them to "go walk it off." In the multiple waves of the pandemic, thousands struggled with depression, loneliness, and anxiety as we wrestled with an uncertain world challenging us daily. It's time we recognize that in order to be healthy, happy, resilient snow and avalanche professionals, that we need to apply our educational attention to learning this new skillset that is just as much an occupational hazard as a torn ACL. For those of you who work professionally in snow science, consider your many years of education in reading the snowpack, forecasting, and mitigating risk. How many hours do you recall spending learning to do the same for yourself?

available for download at
theavalanchereview.org/tar-36-2/

In the past decade in particular, tools and skills for stress mitigation for the providers who work in austere environment (the ski patrollers, avalanche professionals, guides and search and rescue workers) have developed through feedback, beta testing and implementation. It is clear that resilience and vitality across the career lifespan are not dependent on one skill alone, but a series of skills that make up personal and organizational care for occupational stress exposure with a goal of resilience and thriving.

It can be overwhelming to a rescuer, organization, or system to attempt to learn all the skills at once. Choosing one focus area at a time on the way helps establish a comprehensive approach.

Unlike the Avalanche Education Rec/Pro progression that is linear in nature, there are actually multiple entry points into learning these skills- each team and each individual is at a different point in their stress injury awareness and mitigation journey.

Beginning with the **individual**:

What **training and practices** do you have for your own awareness and how do you re-calibrate when stressors occur?

With regard to your **team**:

What is the **culture** you've created? Is your team's mission for caring for each other explicit and known?

How do you handle **incidents**?

Do you have training in Psychological First Response, how to provide care for workers while on scene or in the field?

How do we care for the general public and help give them tools?

What happens **post-incident**?

What tools do you have in place to support yourself and the team after a large event; including preparing for resilience, Emergency Response Plans (ERP), post-incident evaluation tools for more precise mitigation and team care strategies?

A Colorado-based organization, Responder Alliance, was created to increase awareness and tools for stress injury prevention and mitigation in austere responders such as snow workers. We do this work through education courses, which incorporate awareness skills into team training, rituals, best practices, and functional operation plans. The training also includes infrastructure guidance to follow up with community leaders who focus on implementing the tools and connection among teams by using or innovating the skills into their unique team culture. These courses are available at: https://www.responder-alliance.com/. I joined the Responder Alliance earlier this year, after 28 years of guiding, because I was compelled by the lack of training to prevent and mitigate the injury I think most likely to occur in guides over the course of their careers. **The mission of Responder Alliance is to offer support and innovation in the national conversation on stress injury formation and mitigation, and responder and organizational vitality.**

Just like in the backcountry, no matter how much training you get or how often you are out there, the evaluation process is never complete; every day is a different creative problem to solve, offering ongoing mental challenges and problems. A crucial question that surfaces amid the mental challenges is **Where's our agency in risk mitigation?** Just like we build in margins for error into our travel plans for the day, how can we build in margins for managing our nervous systems in a high-risk workplace? We are creatures of risk in order to gain reward, whether that's at work or play, so the time has come to apply our same level of devotion to resiliency training as we do to learning the technical aspects of our jobs.

Remember, decision-making in the backcountry is easy when it's Low or High. The difference when it comes to the stress continuum is that we hold the power to maintain ourselves in the green or seek professional help when we find ourselves in the red. There is also a mountain of tools to move us more closely to the green end of the spectrum through a work season, instead of just coping at an orange level via unexamined reactions to stress.

The Responder Alliance has created a network of communities, including SAR, NPS, Outdoor Educators, Ski Patrol, Avalanche Professionals and Guides. Each community is comprised of the whole spectrum of practitioners working towards incorporating resilience into their workplace. Through meetings and networking, community members can get support and information on new tools and trainings on offer. It's a space to share stories, answer questions and work together towards implementation.

If you would like to join these communities, please email our communities coordinator, Griffin Lawrence at: community@responderalliance.com Please include your name, current position(s), what team(s) you're on, and your goals in joining the Community. ⬢

BROOKE EDWARDS has called Girdwood, Alaska her home for the last 24 years. Brooke loves sharing her passion for skiing as an avalanche educator, a ski guide, and a PSIA Level III ski instructor. After almost 30 years of guiding, Brooke is excited to join the Responder Alliance Team as the new Communities Lead for avalanche professionals and guides.

HEALTH COMMUNICATION: PART 3

What Can We Use in Avalanche Messaging?

This article is part of a season-long series intended to introduce avalanche practitioners to concepts of health education and communication and posit a process for a public health-oriented approach to the avalanche industry.

BY KELLY MCNEIL

In the December issue, we covered some potential applications for contemporary behavioral science research on the way we plan and deliver avalanche education. Many of those concepts apply more broadly than in the traditional 24-hour avalanche course; in fact, public-facing avalanche messaging—for example, a forecast—is, in the literal sense, "education." In this issue, we'll take a deeper dive into the field of health communication and how it may be useful in our messaging to the public around managing our avalanche risk.

WHAT IS HEALTH COMMUNICATION?

What exactly is health communication, and how is it related? **Health communication** uses strategies to *inform and influence individual and community decisions that enhance health* ("Guide to Community Preventive Services," Health Communication and Health Information Technology, 2022).

These health communication campaigns include verbal and written strategies to influence individuals, populations, and communities to make healthier choices, and utilize various components from existing behavior change theories (like the ones I mentioned in TAR 41.2) in order to guide and help promote behavior and attitude changes.

Social marketing strategies, on the other hand, are "marketing designed to create social change through raising awareness for a cause or problem and also convince the audience of the importance of special behavioral change" (Njogu, 2021).

In order to make sure our target audience understands our message, health communication and social marketing strategies need to take into account factors like **health literacy**—"the degree to which individuals have the ability to find, understand, and use information and services to inform health-related decisions and actions for themselves and others" (Office of Disease Prevention and Health Promotion [ODPHP], n.d.)—and access, including access to the Internet and media exposure.

Health communication and social marketing are similar and are deeply interconnected through the development of activities and interventions designed around the influence of positive decisions and changes in behavior. Effectively, they include research-based strategies we can use to develop materials and products, as well as research on how to deliver the information to the specific target audience we want to reach. Understanding conventional wisdom, concepts, language, and the priorities of the culture or setting one is trying to reach is crucial.

To reach a mass audience, public health officials might use any number of outlets: print and digital articles, videos, TV broadcasts, radio commercials, billboards, pamphlets, case studies, group discussions, and so forth. Because health communication strategies also aim to change an individual person's knowledge, attitudes, and/or behaviors, the messaging might also trickle down to more personalized messaging for niche groups.

This type of messaging utilizes behavior change theories I mentioned in the last issue to reinforce positive behaviors, increase risk perception, influence **social norms** (i.e. participating in a certain behavior because one

Figure 1: Modified Stage of Health Communication Process from Making Health Communication Program work.

believes others like them practice that behavior), and increase awareness of support and services.

Like the health program planning discussed in the December issue, social marketing, and health communication follow a process, which begins by asking the population what they need and then developing messaging and programs based on that needs assessment. Health communication and social marketing are very similar. The proposed messaging is pre-tested with a subset of the audience, adjusted as needed, and put forth to the population that we are trying to educate and inform. After a period of time, we evaluate the effectiveness of that message (See Figure 1).

HOW CAN WE APPLY THIS IN AVALANCHE MESSAGING?

We can learn from examining existing evidence-based health communication and social media campaigns aimed at influencing attitudes, behavior, and knowledge. Recall Smokey Bear? Smokey is part of a social marketing campaign aimed to prevent wildfires. Tips and tricks on how to put out controlled fires (and why it's important) are posted at campsites, on brochures and billboards, and even broadcast in TV commercials. Smokey provided awareness and education. What if the avalanche industry had its own "Smokey Bear"? Picture a familiar face posted at trailheads and seen in the media, explicitly telling the public they're entering avalanche terrain, and to get the forecast and education before they travel.

Smokey Bear is just one example. There have also been numerous social marketing campaigns to promote safe driving, anti-smoking, and healthy eating campaigns. Some are so effective we remember their taglines decades later—remember D.A.R.E.?

As an industry, we need to use as many communication and media strategies to reach as many people as possible—even if it's with the same message. We also need to ensure that all those who need to see and hear the forecast and messaging have access to it. By way of example, I believe we're doing a good job messaging avalanche forecasts by adding videos posted on various social media platforms. But not everyone is on those platforms—what else can we do to ensure that messaging is received by ALL the folks who need to see it?

As an industry, we need to use as many communication and media strategies to reach as many people as possible

Compared to decades past, we have more and better tools than ever: interactive awareness presentations with films, sophisticated graphics, and other outreach products. To reach even more backcountry users, a cross-disciplinary approach like the examples mentioned above could be incredibly effective.

Dr. Pascal Haegeli and his research team out of Simon Fraser University are doing great work to gain a better understanding of user groups. Once we have an idea of what each of these groups needs, we can develop specific strategies and targeting messaging that match the needs. We can then disseminate those messages out to the different user groups.

Lastly, but extremely importantly, we must evaluate the effectiveness of our messaging. Does our audience understand the messaging? Are we writing our forecast to a degree that users can comprehend and use the information? Who are we reaching? What do we need to do to improve our products? Are our awareness presentations meeting the needs of the user groups? We should be evaluating all the different communication/forecasting/education strategies we are disseminating. We will not know if we are effective if we do not evaluate our products. Once we evaluate our messaging, we can adapt and start the process over again.

We've come a long way, and a lot of this work has already started—but we still have room for improvement. For the last part of this series Dr. Pascal Haegeli and I will work together to bring this discussion full circle. We will discuss what is currently being done, some of the latest developments in this realm, and posit a few potential next steps. ⬢

REFERENCES

Guide to Community Preventive Services. Health Communication and Health Information Technology. https://www.thecommunityguide.org/topics/health-communication-and-health-information-technology.html. Page last updated: October 4, 2022

Health Communications Publications. (n.d.). National Cancer Institute. https://www.cancer.gov/publications/health-communication

Njogu, T. (2021, July 30). Difference Between Social Marketing and Health Communication. Difference Between Similar Terms and Objects. http://www.differencebetween.net/business/difference-between-social-marketing-and-health-communication/

Office of Disease Prevention and Health Promotion. (n.d.). Diabetes. Healthy People 2030. U.S. Department of Health and Human Services. https://health.gov/healthypeople/objectives-and-data/browse-objectives/diabetes

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Left: Mali Noyes, Lani Bruntz, and Maddie Crowell step out onto bigger terrain mid-way through their trip to the Alaska Range.

STEPPING OUT

BY MADDIE CROWELL
PHOTOS BY BY FRED MARMSATER

I watch as Lani struggles to put her foot in her frozen boot. My own liners are warming up inside my mega-puffy and I know I'm not far behind her in the routine morning wrestle with my ski boots. It's cold this morning and the blonde wispies around my face are frosted. Three days ago we flew onto the Pika glacier and were greeted with blue skies and deep snow. We are finally starting to settle in and find our groove as a team.

Above: The team skins away from basecamp with ambitions to assess the snow and explore new terrain on glacier.

When I was seven I watched my first Warren Miller movie. Since then, I've had a secret dream to be in a ski film of my own. So, when Mali Noyes and Lani Bruntz asked me to be a part of a film project I jumped at the opportunity. After six months of phone calls, endless lists and countless emails, we finally flew into the Alaska Range this past April. It was a self-supported endeavor, which meant the three of us spent six months planning logistics, reaching out to sponsors for support, and recruiting a cinematographer and photographer. Behind the scenes it was a lot of work. We wanted the style of our trip to represent how we wanted to move in the mountains—no guides, no basecamp manager or third parties telling us where and what to ski. As a team we were motivated to take on the expedition prep work (food packing, gear organizing), cook all our own food, handle the setup, and conduct the onsite planning of everything while we were on the glacier.

We flew onto the glacier in early April with goals to push ourselves, ski huge Alaskan lines and ultimately making a really rad ski flick. However, we were quickly humbled by the glaciated terrain, the remoteness, and our ability to work as a team to manage a completely new zone. We had big dreams of stepping ou—and in some ways we did, but ultimately, we had to take a step back, slow down and redefine how we wanted to manage risk.

For me a huge part of this trip was reassessing my own personal relationship with risk. Post-trip reflection allowed me to see that there were a number of factors influencing my risk management strategies.

Initially, the pressure to film was something I had not encountered on any previous ski expeditions. The need to "get the shot" and fill our deliverables for our sponsors felt heavy to me. It changed how I was looking at the mountains and where I wanted to go. In some ways, I felt like I should be pushing myself to do more. At the same time, I felt like I was brand new to this zone and I just wanted to figure out the snowpack and terrain on my own pace. It was a conflicting dynamic that I hadn't experienced

TO STEP BACK

How a Recent Ski Trip Redefined My Risk Management

Left: Maddie Crowell drops into a steep line with a bergschrund that shut the team down days before. Timing can be everything when it comes to risk management.

before. I didn't have the right tools to try and manage risk in a new role of being an athlete versus skiing for myself or guiding a client.

Not only was the pressure to film affecting my decision-making and risk tolerance, I started to experience what I've deemed the Domino Effect. The Domino Effect demonstrates just how complex our relationship with risk can become. It's not just one thing that can trigger a change in risk tolerance or risk management. Previous experiences, past trauma, expectations, and a number of other factors can compound and make it more challenging to manage risk.

For me it was a culmination of elements, starting with the fact that I worked 26 out of 31 days in March before flying directly to Alaska. Poor planning and lack of sleep gave me three days to do the meal plan, food shop, and gear pack for five people for two weeks. Humming below these stresses was grief I had submerged from a friend dying in an avalanche two weeks before our trip. The remoteness of our location triggered the recollection of close calls from previous seasons, causing us to constantly question how we would rescue ourselves if something similar happened. All these mixed with our desire to film things that I had seen in the classic Alaska films and increased the pressure, both internally and externally.

As a team we had really high standards for ourselves, so we were disappointed when our expectations weren't meeting the reality of what we were skiing or our perceived gains we were making. As everything compounded, I felt my role in our team dynamics shift. Prior to the trip, Mali, Lani and I had only skied once together. We didn't have a foundation, so when things got challenging, we were navigating our team dynamic for the first time. Essentially, all of these factors played a role into my mindset and how I was managing risk. The Domino Effect made it hard to make decisions and step out because everything was piling on top of each other, clouding my ability to be present and figure out the snowpack, enhance our team dynamics and ultimately problem solve. Instead, weighted under a pile of toppled dominoes, I resorted to a survival mindset.

As skiers, our relationship with risk is dynamic and complex. No single factor defines how we will manage risk, and our strategies change with time. As we get older and spend more time in the mountains, we can develop a more intricate relationship with risk. The more we know, the more education we have, the close calls we encounter, the people we lose, all culminate and accrue, deleting our initial ignorance. The day-to-day can also have an effect on our risk management. There are days when we are simply "just not feeling it," our instincts tell us to back off, or our ski partners might not show up the way we need. For me this was a challenging realization because a twenty-year-old version of myself wouldn't have experienced off-putting instincts or spent any time getting bogged down by the pressure to film or the results of the Domino Effect. Her experience was much simpler and she would have just been riding the high of making a life-long dream come true.

While operating in an ignorance is bliss type of mentality would certainly be easier, fostering a relationship with risk helps us grow into better skiers and riders. Learning how we respond to risk and what can cultivate a healthy relationship with risk management teaches us how to mitigate it. This trip has better prepared me to push myself next time as I have great experience in what works for me on remote trips, and what kind of things will trigger me. Through all these factors I can better understand my own personal risk tolerance. While this trip was different from my childhood ski movie fantasies, I now have so much more knowledge of how to venture into complex terrain and how to progress my relationship with risk.

No trip is perfect. There are always ups and downs. This trip challenged me in so many ways, and for months I was fixated on how I was limited by the effects on my risk tolerance. We tend to focus on the setbacks, but no matter what there are always moments of glory. Together we flew into a completely new zone, assessed the snow pack and terrain, made all the decisions and ended up on top of some really amazing Alaska lines. There were days where Mali, Lani and I came together as a team and as a member I felt empowered and supported. Most nights we recapped the day, lying in our -40F sleeping bags, and laughing until our stomachs hurt. We managed the basecamp, melted snow, cooked meals, winter camped, all while skiing long days, filming and trying to make it all happen. In the end, we came out with a really powerful film that showed a story behind the scenes.

On this trip we stepped out, only to step back, learning that often when we push ourselves, we can be met with challenges that help us learn and grow. Overall, experiences like these provide a stepping stone for future trips and impetus for continued progression of our mountain skillsets.

Maddie, Lani, and Mali's 15-minute film Stepping Out toured for two months with the Salomon QST Film Tour this fall. The film was also shown at the 4-Corners Snow and Avalanche Workshop, Sawtooth Film Fest, Alta Film Fest, Irwin's Women's Backcountry Fest, and the annual Telluride Avalanche Education Fundraiser through the PI Foundation. It can be found online SalomonTV.com.

MADDIE CROWELL was raised outside Telluride, Colorado. She graduated from the University of British Columbia and spent three summers working as a field biologist. She now splits her time working as a mountain guide on Denali and as a heli-ski/backcountry ski guide in the San Juans. Maddie also teaches avalanche courses and is a member of the Salomon Ambassador Ski Team.

A Snow Safety Officer's Perspective on Developing Professionalism

BY LUKE SMITHWICK

From 2014 to 2017 I was stationed as the Snow Safety Officer at Gulmarg gondola in the former state of Jammu and Kashmir, India. Gulmarg gondola is a two-stage gondola that runs from Gulmarg meadow at 2600 meters to the mid-mountain station of Kongdoori at 3000 meters and further to 3980 meters on a shoulder of Mount Apharwat. The second section of the gondola was completed in 2005. Gulmarg is mostly a summer destination, with more than a thousand guests a day riding the gondola to its top for views of the Karakoram to the north and Himalaya to the east, the two highest mountain ranges on Earth. In the winter months Gulmarg sees several hundred skiing guests a day, with that number rapidly growing as more and more domestic tourists come to experience skiing at the former British hill station of Gulmarg.

gulmarg, kashmir

February 12, 2015. MATT HAGE

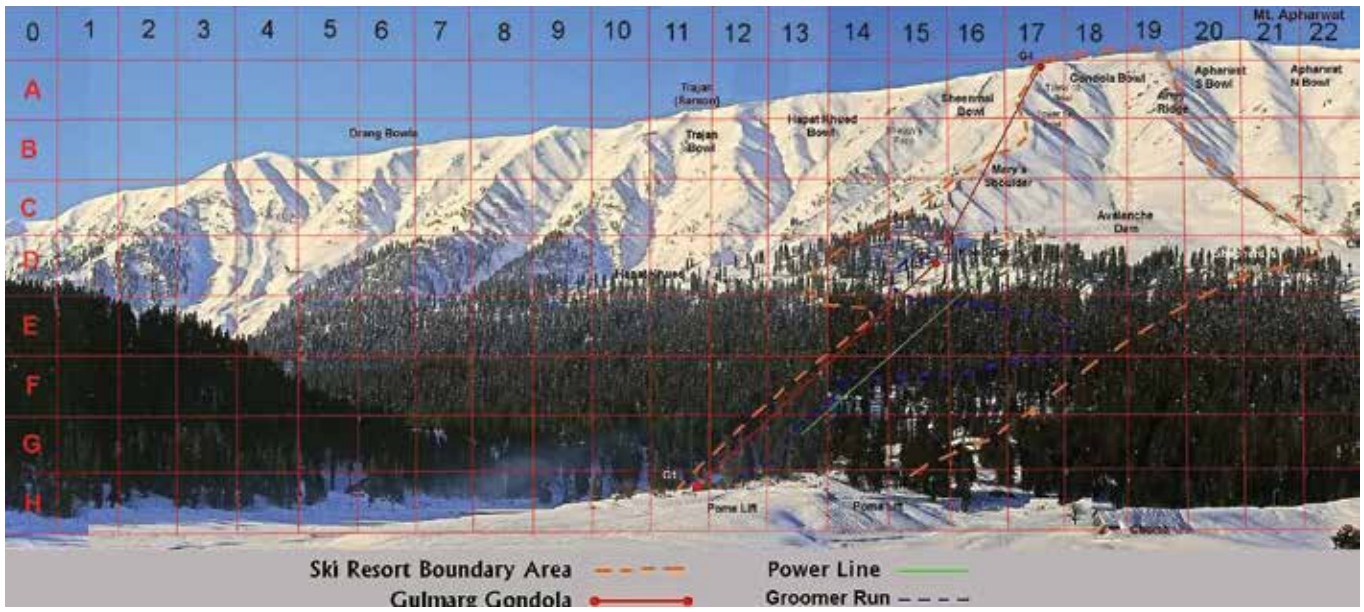
Much like La Grave in France, Gulmarg gondola provides access to massive alpine terrain. A small portion of Mount Apharwat is patrolled and mitigated; the remainder of the mountain is a wild snowpack. Outside of the rope lines and signs that demarcate Gulmarg Ski Area (the green zone, see following page) can be found very attractive ski terrain that people from all over the world fly there to experience.

The role of Snow Safety Officer is multi-fold as the job description from the Jammu and Kashmir government explains:

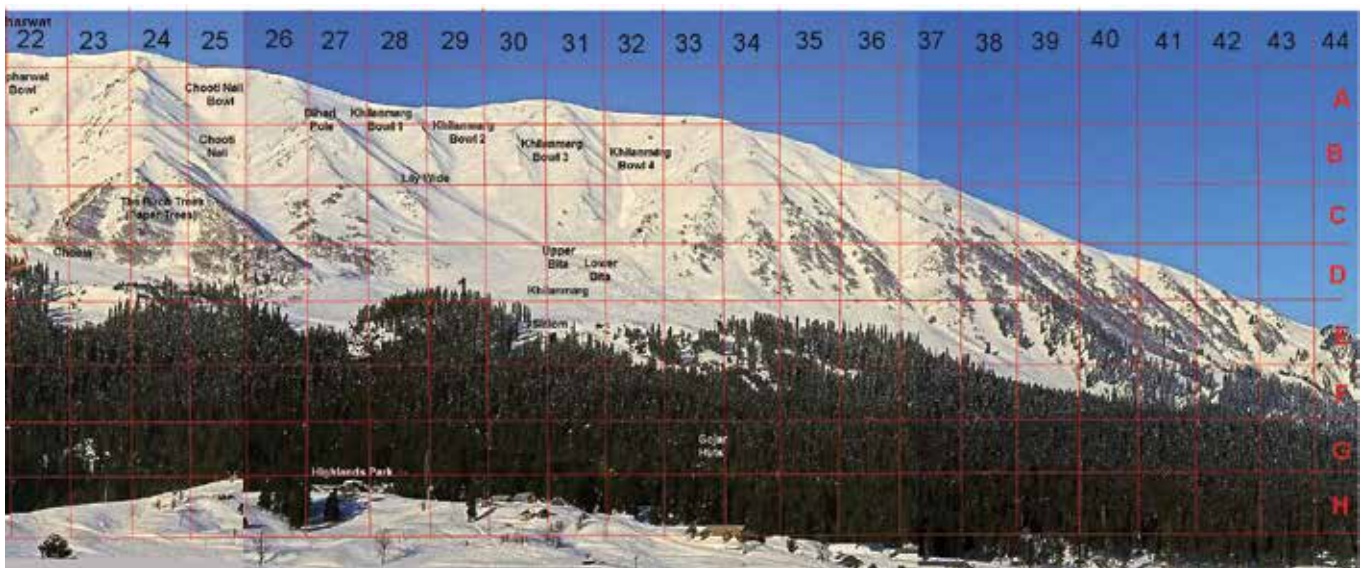
1. To lead the Ski Patrol in a proactive manner and endeavor so that no mishap takes place.
2. To segregate the mountains area into marked and unmarked zones.
3. Avalanche mitigation and controlled use of explosives for avalanche triggering.
4. To take a weather call to close the upper mountains reaches for skiing due to storms or perceived threats of avalanche and issue advisories/ notices accordingly.
5. Evacuation of injured skiers and administration of first aid.
6. Training of the local Ski Patrol Team.
7. To develop strategies pertinent to local conditions.
8. General advice to J&K State Cable Car Corporation and Tourism Department regarding operation of ski lift/skiing.
9. To keep the resort open for the skiing for maximum number of days.
10. The Snow Safety Officer should submit the annual report of the resort after the completion of the contract.

The "green zone" demarcates Gulmarg Ski Area. The remainder of the mountain is a wild snowpack.

The south end of Mount Apharwat. Gulmarg, Kashmir



The north end of Mount Apharwat. Gulmarg, Kashmir



The Snow Safety Officer is thus the backcountry avalanche forecaster, the ski patrol director, the snow safety director, and also teaches avalanche awareness classes twice weekly in the evenings to the public. It is a 90-day contract and requires about a 12-hour workday. No days off, although just like anywhere you find some rest during high pressure between storm cycles. During these periods you focus on ski patrol training, supply chain of mountain equipment, and professional development in greater Kashmir.

The Gulmarg Ski Patrol is a 17-member pro patrol. Each member is trained in high angle rescue, pre-hospital emergency care, search and rescue, large scale avalanche rescue, companion rescue, avalanche mitigation and interagency emergency response. Pro patrollers spend four nights at mid-mountain while on shift; they are housed in a mountain lodge with a cook and are on call 24 hours a day for rescue and ski patrol operations. All members of the Gulmarg Ski Patrol are Kashmiri and most of patrol operations are done in the Kashmiri language.

During my tenure at Gulmarg gondola I trained four new ski patrollers to earn a pro patroller status; done through a nine-tiered system over two winter seasons and overseen by senior patrollers along with myself. Additionally, we brought AIARE instructors to Gulmarg and many local ski guides along with the ski patrol received Pro Level 2 training certifications. Kashmir doesn't necessarily need an American avalanche certification, yet it does need a foundation for developing its own curriculum and protocols. Additionally, a CAA certified instructor is now coming to teach annually in the region. The opportunities are there for those who seek professional development.

The director posts an avalanche forecast each morning online and at the base of the gondola and at its apex. Two pro ski patrollers are stationed at G4 (the top station), where they check each user's transceiver function, explain to them the avalanche conditions for the day, and ask what their trip plan is. We do not close the backcountry; however, on certain days of the 90-day ski season, we strongly recommend that skiers and riders remain in the ski area. Gulmarg is unique in this way, it would be challenging to approach leading Gulmarg with American avalanche professional eyeballs. Perspective from the Alps and the Alpine mindset meshes with mindset as an American and offers many tools and mindsets that all come together at a gondola in the Himalaya on the border with India and Pakistan.

Remoteness and scale make you quite conservative and strategic in your decision-making. Yes of course you must, as your job description aptly explains, "…keep the resort open for skiing for the maximum number of days," just like any mountain. However, when the infamous Western Disturbance storms cycle through the region and deposit upwards of two meters of snow, then a true understanding of the power of the big

Luke Smithwick walking up to do a crown profile. 12 February 2015. MATT HAGE

mountains requires you to keep things buttoned up until the cycle has passed. We then encourage the user public to watch their slope angles and ski in the old growth cedar forests well below Alpine.

Every decade Gulmarg sees an avalanche fatality, sometimes more than one.

You can find the avalanche advisory for February 11, 2015 here: http://gulmarg-avalanche-advisory.com/2015/02/11/232/.

Mid-day that day, we were putting away rescue equipment after cycling through a rescue scenario in bounds. Two patrollers were stationed at the top of the gondola, checking transceivers and informing the public not to go into the backcountry. Three local skiers arrived at the top station. The patrol asked them to not go into the backcountry. They ignored the patrollers request, entered Hapat Khued bowl from the rocks on the right, and almost immediately triggered a deep slab avalanche that traveled up and released beneath the cornice.

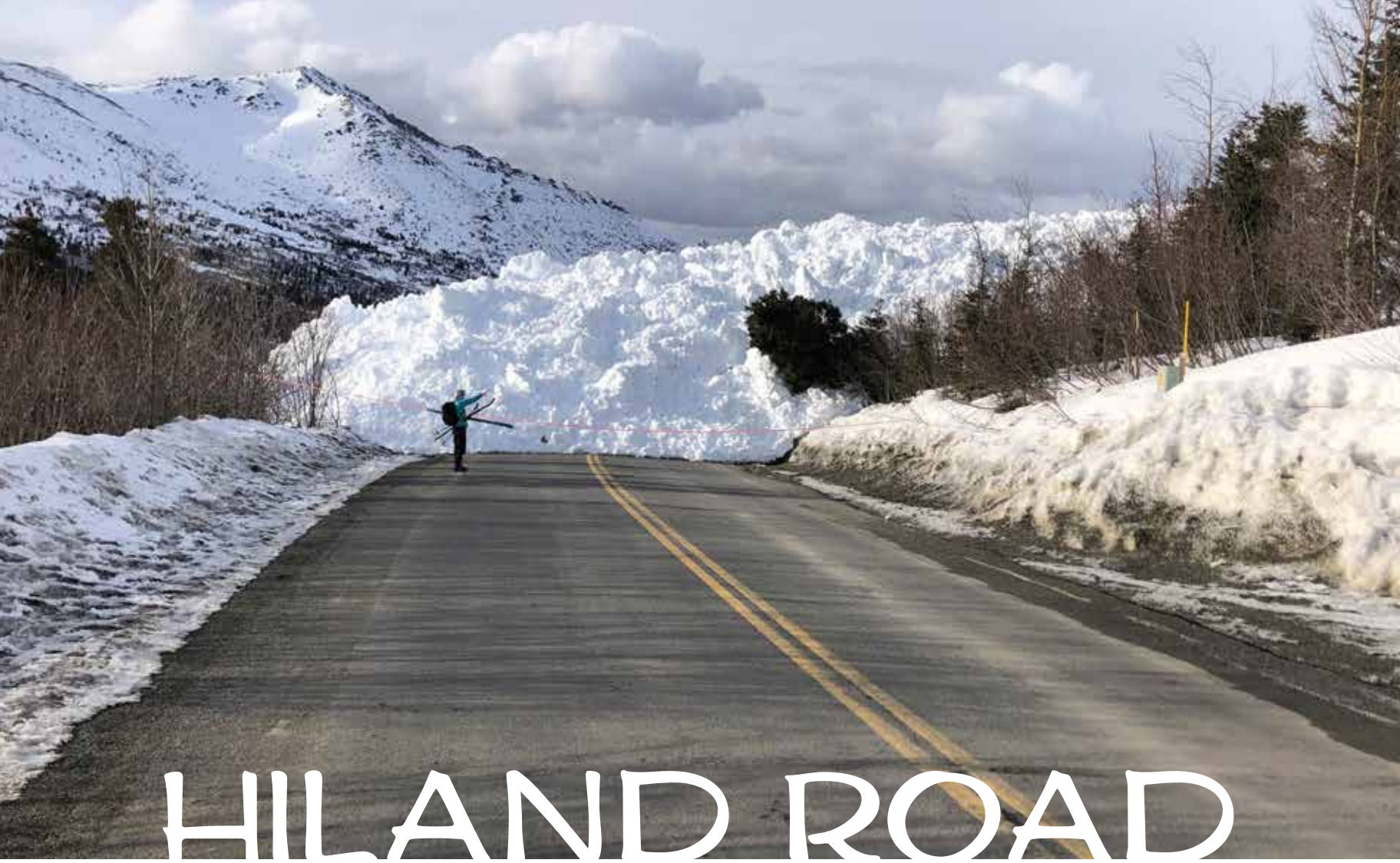
We responded immediately, using the protocol that we'd practiced so many times that winter. The resort closed and two ski patrollers remained stationed at the top station to monitor skiers clearing the mountain and then sweep the mountain. The rest of us responded to the top of the avalanche. I went through the phone chain calling Kashmir Heli Ski, the Gulmarg hospital, and the High Altitude Warfare School (HAWS). Just that winter we had started interagency response, where we were on call for Kashmir Heliski and HAWS, and they for us. If there was an incident in the Gulmarg backcountry their helicopter would respond.

I remained at the top of the avalanche while my team searched the path with the Recco and transceivers. We received a call that two of the skiers were safe at mid mountain, so we knew one was still missing, yet still had to clear the entire path for other skiers and riders. In the debris at the bottom one patroller called on the radio "Signal!" as he continued his search. He pinpointed, probed with a strike and they began shoveling. The helicopter arrived and landed at a safe distance nearby with oxygen on board. The victim was buried 2.2 meters deep and was deceased due to internal injuries.

The following day I wrote a full report of the incident (available at Gulmarg Ski Patrol headquarters), and logged it into Gulmarg Ski Patrol records. I am proud of my team and how they responded. This was the first fatality of a Gulmarg local and was the impetus for the start of the Kashmir Avalanche Association, with a goal of teaching avalanche awareness and safe backcountry travel in the Kashmiri language. These courses proved to be "aha" moments for many local skiers and riders. Concepts and best practices taught in English for years at the avalanche awareness nights finally hit home when participants could hear those same thoughts in their first language of Kashmiri.

The following day we reopened the resort and continued operations. I am writing this article as I'd like to see more avalanche professionals getting involved in Gulmarg. At the Wyoming Snow and Avalanche Workshop (WYSAW) in October 2022 it was great to see researchers focusing on deep slab avalanches. As a forecaster I do my best to "never cry wolf" with deep slab problems, people simply stop listening when you do so. You have to pick your days. 11 February 2015 was one of those days. Sadly, the forecast wasn't enough, yet it was an eye opener for locals and became the start of the Kashmir Avalanche Association. ⬢

LUKE SMITHWICK resides in Victor, Idaho at the base of the Tetons with his dog Wolfie. He is the owner & founder of Himalaya Alpine Guides (Himalaya-Alpine.com), the founder of Outreach Himalaya (to fund avalanche awareness and mountain sports development in the rural Himalaya), and an avid backcountry skier and ski mountaineer. He can be reached at lsmithwick25@gmail.com.



HILAND ROAD AVALANCHE

BRAD MEIKLEJOHN

BY EEVA LATOSUO

At 11:30pm on March 24th, 2022 a very large natural avalanche released in the Three Bowls slide path located in the South Fork of Eagle River drainage (above the town of Eagle River, northeast section of Anchorage Borough, Alaska). The avalanche produced a significant amount of debris that covered approximately 600 linear feet of the Hiland Road up to 80 feet deep. The debris extended into residential land, damaging smaller structures and other property, and stopping within feet of occupied homes. One home was damaged, none were destroyed, and no persons were buried.

After avalanche mitigation was completed on March 27, it took 14 days for workers to clear the debris from Hiland Road.

The event was an eye opener for the residents of the sleepy homesteading valley that has grown in population steadily since the 1980s. Chugach State Park provides the mountainous backdrop without avalanche warning services. The community is part of the Municipality of Anchorage, which does not have any staff that can provide avalanche information to its residence or operations. Several of the houses in the valley have been hit by debris or powder cloud on occasion, but large-scale events have been rare in living memory.

HS-N-R3-D4-O(G)
Crown: 110-150cm
Width: 0.75 miles
Run length: 2100 vertical feet over 3200' distance
Width of road covered: 600' (debris spilled 100' beyond the road).
Height of debris at midline of the road: 40-80'
Return period: 50yrs according to Doug Fesler. One of the trees transported in the debris was 96 years old.

In 1982, Art Mears completed avalanche hazard mapping for Anchorage. The accuracy of Mears' work is remarkable to this date. These maps continue to be the main resource for avalanche hazard knowledge for administrators, planners, real estate agents, and residents and are posted as a GIS datalayer on the municipal website. Another relevant technical report from 2005 is by avalanche expert Doug Fesler when he evaluated one of the Hiland parcels at the base of the Three Bowl path for a real estate transaction. Fesler's message was that "it is not a question of if but when" the lot would get hit by a slide and suggested the best tactic would be to construct the structures to withstand avalanche impacts. Despite the well-identified avalanche hazards in various regions within the Municipality of Anchorage, the city does not have avalanche zoning that restricts building in blue or red zones nor is there a plan on how to deal with structures in place in these zones.

Three Bowls path is one of the numerous slide paths along Hiland Road that has the potential to spill onto infrastructure. Typical to Southcentral Alaska, its mosaic of tundra vegetation and rocky terrain is almost exclusively above treeline. As the name suggests, Three Bowls has three large interconnected starting zones spanning almost a mile wide. All the bowls funnel into an hourglass shaped constriction halfway down the track. Full run of the path is 2600 vertical feet over 1.4-mile distance. It released almost to the road in a wet

slab event on May 5, 1984 and has taken the lives of two skiers in the last twenty years. Each of these events left behind significant overhead hazard when the start zones did not release completely.

Three Bowls harbors continental snow climate and the shallow snowpack habitually grows large basal facets while the rest of the snow gets whipped into varied wind layers with the Chugach Range winds. In 2021–22, seasonal snow started accumulating in September and the early snow had plenty of time to facet into impressive depth hoar. By March there were several midpack crust/facet combos and the valley had seen several avalanche events, including releases on unusual paths due to deeper than average snowpack. One of the surprising things in the set up was that there was no significant precipitation leading to this event. The best working theory is that unusual easterly winds transported snow across the ridgeline to load starting zones for this large natural avalanche.

Close to midnight on March 24th the debris ran down the full path, pouring over the road and stopping shy of six occupied structures. One garage door was caved in and one separate mother-in-law structure was ripped off its foundation and transported 400' along the edge of debris flow almost intact. Several parked vehicles were buried deep under the snow. Neighbors checked on each other and everyone was accounted for. It is remarkable that nobody was caught.

Even without lost lives, this was clearly an emergency. Safety of the homes was in question and many people left voluntarily. Red Cross provided shelter and food for the displaced. The neighborhood was cut off from the road network. Alternative transportation was arranged with snow machines and shuttles since kids needed to get to school and folks to work. Busted power lines shut down electricity, but the grid was fixed quite quickly with temporary lines. The main problem was the safety of the road clearing operation.

Initial emergency response was from the Police and Fire Department; Alaska Mountain Rescue Group became part of the operations as designated backcountry avalanche SAR group for the region and was the key connection with avalanche experts. Incident Command consisted of a large team of city staff led by the Fire Department with representation from the State Emergency Operations Center and the State Risk Management Office. Both the City of Anchorage and the State of Alaska declared Hiland Road an emergency in order to be manage and fund the large operation.

Let's be honest, no plans or protocols were in place, and everyone was winging it with the best knowledge available. Large overhead hazard of unreleased starting zones made it unpalatable to start clearing the road for 100 residents cut off. This was an avalanche job without clearly mandated avalanche professionals to do it, which created tricky questions about the scope of practice, and the liability of execution. Without paid avalanche professionals on staff, how did Muni get this task done? A team of avalanche practitioners from SAR, Alaska Department of Transportation, Alaska Railroad, and the Chugach Electric came up with the plan and saw through its execution.

The avalanche advisory team helped to decide which households were directly impacted by the unreleased start zones, and while some residents left their homes voluntarily, many residents were not interested in evacuating. In Alaska, police cannot force anyone to leave their home. Officers and SAR volunteers visited every household to advise them to evacuate, but a handful refused, staying true to the Alaskan homesteading spirit. Another example of self-reliance is that two residents punched through an alternative access road with their own heavy equipment within 12 hours. When mitigation was imminent, the City Manager used a legal contract with each resident in the hazard zone stating that if the mitigation caused property damage, the city would pay for it.

There was no precedent to use explosives mitigation in Anchorage above the residential area so it took many conversations over two days to find a way to do the task. Once all the legal tees had been crossed, explosives specialist from Advanced Blasting and Alaska Railroad avalanche forecaster Matt McKee used R66 from the Alpine Air helicopter service to conduct the mitigation. The results from the ten shots of 30 pound ANFO bags on two separate flights were minimal, a bit of a disappointment to the residents watching from the sidelines expecting something more spectacular after the two-day wait.

Snow removal on the road was a big operation. The contractor had no previous experience on this type of project, and Alaska DOT shared some of the best practices so that the work could be done safely. A local resident with experience as avalanche forecaster, Brad Meiklejohn, stepped in to make safety calls for road crew. It took 14 days, 3200 truck loads and 39,000 cubic yards of moved snow to re-open the road.

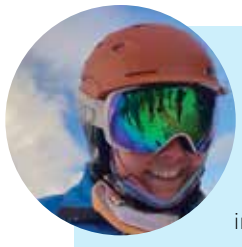
The lessons from the March event are used to improve the Anchorage Comprehensive Emergency Plan, a key pre-planning and preparedness guidance document. While urban area avalanche conditions tracking is not available, Friends of the Chugach Avalanche Center is working towards providing backcountry avalanche information for this specific recreational zone which could also keep residents in the know.

There has not been political will or citizen pressure to execute avalanche zoning rules for these lots. It is possible that a large avalanche event like the March 24th incident creates momentum to rethink the ways residents and municipalities can be more adept in preventing structural or human damages from avalanches. It is more likely that with the limited loss of property and no loss of life, the Hiland avalanche of 2022 becomes only a wild story to share and to forget before many permanent improvements in zoning, avalanche risk communication, or structural adaptations are completed.

Brad Meiklejohn, Jill Fredston, and Doug Fesler walking on the debris at the road line discussing the size of the event. Art Mears' hazard mapping from 1982 was almost spot on for the boundaries of this slide. 📷 TRIP KINNEY

Three Bowls path consists of three separate bowls. Significant hangfire at starting zones created an overhead hazard to deal with before the road could be cleared from massive amounts of debris. 📷 TRIP KINNEY

This content was created in collaboration with the avalanche experts that participated in the response: Tim Glassett from Alaska Mountain Rescue Group/Alaska DOT, Paul Wunnicke from Chugach Electric, Trip Kinney from Arctic Valley Ski Patrol, and Brad Meiklejohn. ⬢



EEVA LATOSUO is an avalanche advisor with Alaska Mountain Rescue Group, that sometimes responds to "urban" incidents, like Hiland Road avalanche in Eagle River. Currently Eeva is a PhD student at Simon Fraser University wrapping her head around avalanche risk communication.

OFF THE BENCH

BY BRAD MEIKLEJOHN

I retired from the avalanche game back in 1992. An accident in Utah's La Sal Mountains did that to me. After digging up four dead friends I no longer had anything to say about avalanches.

I left Utah, went off to grad school, and spent the past 28 years working in conservation in Alaska. I still ski and I still think about avalanches, but only as a hobbyist. I am no longer an avalanche professional.

On March 25th, 2022 I was dragged off the bench. I woke that morning to see, from my living room window, avalanche debris that filled the Hiland Road valley, just three doors down from my house. I was suited and booted within minutes, shovel and beacon in hand and a sick feeling in my whole body. It seemed likely that today, I was once again going to be digging up dead friends.

Hiland Road in Eagle River, Alaska is twenty minutes from downtown Anchorage. It is a gorgeous alpine valley with numerous homes along the creek bottom and steep slopes rising 3,000' above them. South winds funnel through the valley, stripping the snow down to a pack that rarely exceeds four feet in depth. In March I skin up daily from my front door, tiptoeing around a faceted mess that resembles a chronically-thin Colorado snowpack more than the surrounding Chugach Mountains might suggest.

The 2021–22 winter season on Hiland started early, with two feet of snow on the ground by mid-September. Come March, the facet process had hollowed out the snowpack to a porous and touchy "crazy aunt" prone to dramatic collapses. Many slide paths in the valley ran larger than I had seen before, some reloading and repeating to clean out the entire snowpack.

In the 1980s, the Municipality of Anchorage hired Art Mears of Colorado to compile an avalanche hazard map. Mears collaborated with Doug Fesler of Alaska to produce a top-notch map that has stood the test of time. Mears and Fesler categorized hundreds of slide paths according to return interval of ten years (red zone) and 100 years (blue zone). The city never formally adopted or enforced the Mears/Fesler zoning and now, forty years later, there are forty homes along Hiland Road with some avalanche exposure.

In the time that I have lived on Hiland Road, homes have been hit by avalanches on multiple occasions. Doug Fesler once advised a terrified girl stuck home alone to barricade herself into the downslope basement bedroom. Good advice, it turned out, as she woke to find the uphill bedroom full of avalanche debris. On other storm occasions when I felt the conditions were verging on disaster, I have alerted the Anchorage police and fire departments, who responded by asking if I had taken my meds.

They were right: I was just a washed-up avalanche has-been. It wasn't my job to tell anybody anything about avalanches, so mostly I just kept my mouth shut. The Mears/Fesler map haunted me because of the disaster it predicted, but somehow the worst never happened. The Hiland Road winds would load the slide paths right to the tipping point, then strip the snow away to bare tundra.

The night of March 24th the winds were hammering my house so badly that I retreated to the basement to sleep. I heard nothing until my phone rang early the morning of March 25th.

When I first saw the avalanche from my living room, I thought the worst had finally happened. Looking at a debris pile that towered above the trees and filled the valley, it didn't seem possible that homes were not destroyed and people not killed. Someone was walking around on the debris pile with a headlamp, looking for something. Family members?

As I hurried down my driveway the slide loomed even larger. My first guess was debris 100' deep and ¼ mile wide, dwarfing the roof lines I could see, the road and power lines swallowed. What an awful day this was going to be.

It took me 20 minutes to cross the debris. There were sheer sidewalls 30' tall and a polished bed surface, grooved as if by a glacier and too icy hard to walk on. My mental inventory picked out a garage 200 yards from where it belonged, with a truck smashed next to it. I couldn't see three houses on the downhill side of the slide; had they been demolished?

To my great relief I found my good friends and neighbors dressed and ready for school. We walked and carried their kids through this enormous jungle gym. I silently hurried them on as I wondered how much of the slide path had or had not run.

The day unfolded in a jaggy, bad-dream fashion. Police, firemen, volunteer rescue crew, news crew, bewildered residents and politicians all bumping into each other's jurisdictions. Skies cleared enough to show that only half of the Three Bowls path had slid, half still sitting up there menacing all. All the residents seemed to be accounted for, but someone asked how we would know if there had been any cars on the road when the slide ran in the middle of the night?

The damage report began to emerge: one garage destroyed, another damaged, a Jeep, a truck, and a motorhome missing. Avalanche pressing up against two houses, within feet of four others. Power poles sheared off, the only road to 100 homes blocked seemingly until summer. A major miracle no one killed.

The remaining hangfire of unslid snow locked everyone into legal paralysis for two days. The road clearing crews wouldn't touch the debris with

Another view of the entirety of the Three Bowls. 📷 BRAD MEIKLEJOHN

Toe of the debris fanned out shy of hitting six houses. Along the right edge of the flow, a smaller building was transported 400 feet down to stop barely above the road. 📷 TRIP KINNEY

that overhead problem. But no one wanted the liability for a bombing mission that might destroy houses. Into the breech came Matt McKee, the only heroic figure to emerge from the jurisdictional squabbling. Matt, an avalanche technician for the Alaska Railroad, commandeered a helicopter and ten 30-lb bags of ANFO to hit the remainder of the slide path. The assembled community, watching from the relative safety of the opposite side of the valley, had a betting pool on which houses would be rendered into matchsticks. There was audible disappointment when Matt's work produced only minor sluffing.

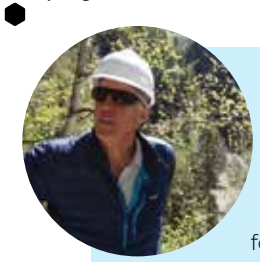
Things had changed since I worked at the Utah Avalanche Center. Then, whatever needed doing got done. Now, the first call is to the lawyers. One by one, all the avalanche experts in Alaska pushed away from the table because their lawyers told them it was not their jurisdiction. Not the Forest Service's problem, not the DOT's problem, not the railroad's problem, not the local SAR's problem. So who was going to babysit this situation in the weeks ahead while crews worked to clear the road?

That would be me.

On one hand that made sense. I live three doors down from this avalanche. I had once been an avalanche forecaster. Of course I wouldn't just hide and let my neighbors down.

But on the other hand, I hadn't been an avalanche forecaster in 30 years. Lots had changed, not with avalanches but with the liability of being an avalanche forecaster. Good friends advised me to wash my hands of the situation, but instead I boned up on the "reasonable man" test and consulted my lawyer.

Nothing happened on my watch. It took two weeks to haul the snow away and re-open Hiland Road. That was 3200 dump truck loads. The last of the debris melted in early August and no missing motorists were found. And the Mears/Fesler map was exactly right about the red zone, but we'll have to wait for the blue zone event. ⬢



BRAD MEIKLEJOHN worked at the Utah Avalanche Center from 1984–1992. He has been the Alaska State Director for The Conservation Fund since 1994, and is past president of the Patagonia Land Trust and the American Packrafting Association.

ON MANAGING UNCERTAINTY

BY JAYSON SIMONS-JONES

Managing uncertainty has become a much discussed, talked about, theorized about, and researched topic these days in the post-pandemic world we now inhabit. Although having to confront or manage uncertainty is in fact an inherent certainty to being human, the last three years offered a novel situation in which the entire human-race was thrust into massive uncertainty due to Covid. Personal well-being, economies, global trade, careers, societies, politics, relationships—all facets of the human experience were impacted by mass uncertainty on a global scale.

This increased global uncertainty has forced me to reflect on how much experience and familiarity we in the snow safety and avalanche science world have to offer regarding skills and experience, at managing uncertainty… after all, it's basically what we do at work every day: manage an uncertain product (the snowpack) in an uncertain environment (mother nature), for an uncertain customer (human beings and their risk profiles and decision-making skills). While there is much that we as an industry can offer to the rest of the world on managing uncertainty, it also made me wonder and begin to research what the rest of the world's tactics could offer us in the snow safety and avalanche worker world, and could there be some tools or processes that could help us work to manage uncertainty on a daily basis even better?

After a long season of decision-making and uncertainty management on skis, a few mistakes and one wrong turn in Alaska at the end of the heli-guiding season resulted in an exploded right knee and my own personal uncertainty management journey. Suddenly I was faced with an uncertain immediate future regarding all these: my future physical ability, my career as a guide, my immediate financial situation, and ultimately my personal identity of who I am when I can't do what I do to define myself. Uncertainty across many levels of depth avalanched down on me at once, triggering some deep dives into how to manage it all in micro and macro contexts.

A mentor of mine in the snow safety world once wisely said to me "data and evidence are the counterpoints to uncertainty." This has stuck with me throughout my career; when trying to counteract and account for uncertainty management in the snowpack and in a snow safety organizational management context. While I don't disagree with this simple saying and how helpful it can be in guiding decisions that make complex situations simpler to understand, I have also come to understand that it may have limitations as well. Gathering data and evidence can take time. Regarding managing snowpack instability, patience is usually the best process, but sometimes we are not afforded patience in our roles and jobs. Sometimes we must open terrain, a highway, or provide a product without the luxury of patience to help us gather more data and evidence. Early stages of Covid showed us how challenging and difficult it can be to employ patience as a strategy while unlocking data and evidence to make decisions to move forward on… especially when faced with a novel problem. Many times, we simply strive to reduce the uncertainty to what we deem is a manageable and acceptable level for us.

So, what do we do in the snow and avalanche safety world when time and patience are not available to us? The broader organizational world has tools to add to our uncertainty management toolbox in the avalanche industry.

In breaking down the processes and tools for managing uncertainty in our environment, it is also important to make a distinction between risk and uncertainty, and that although they generally are complementary processes, they are also fundamentally different in nature. In the snow safety and avalanche worker industry, personal and operational risk tolerances tend to be discussed and focused on for obvious safety and legal reasons; however, the specifics of uncertainty arguably much less so. Generally, risk as defined by Merriam-Webster (2022) is "the degree of probability or possibility of loss or injury." This definition would suggest therefore that risk can be calculated based on probabilities and past data patterns. For example: "for every 1000 miles you drive, your chances of getting into a car accident are 1 in 366." (Levine, 2022). However, uncertainty is less easy to quantify, as suggested by Sharma, et al. (2020), "uncertainty is defined as the lack of knowledge about the probabilities of the future." And as suggested by Alpers (2019), a key difference between risk and uncertainty is that most risks can be anticipated and measured with varying degrees of probability, whereas uncertainty is a subjective, multi-dimensional concept that varies based on its source and the degree to which it is experienced—hence difficult to measure.

Risk in our industry can generally be clearly defined with parameters specific to our personal tolerances and our organizational tolerances for what is acceptable based on mathematical probabilities and possible consequences from that risk . Uncertainty, however, is more vague and slippery, with harder to define parameters, because it is not something that has boundaries

Crown of a D4 deep persistent slab remote-triggered avalanche. Noticing the pattern differences not similarities due to the process of 'anomalizing' led forecasters to introduce that problem's likelihood into that morning's bulletin. 📷 JAYSON SIMONS-JONES

Taking a tactical pause to look for anomalies in how the current snowpack overlies terrain 📷 JAYSON SIMONS-JONES

that are easily understood. We must first find the parameters that define the uncertainty before we can assess its impact on our risk tolerance.

Diving deeper into this topic of uncertainty management this past summer became not just a personal research endeavor based on seeking to build more tools for mental management of my rehab situation, but also one that lead to graduate degree level research papers. As this process unfolded, I came across tools and behavior studies that informed my curiosity. When studying the processes employed by High Reliability Organizations and other organizations that must operate in highly dynamic and consequential environments, I found several parallels to common situations in the snow safety and avalanche worker industry.

An interesting study by Barton et al. (2015) explores ways to identify and categorize specific human behaviors within an organizational context and then contribute to success with highly uncertain situations. Two specific behavior patterns on managing uncertainty: **anomalizing** and **sense-making**, have context in the avalanche worker industry as well. In order for an organization to effect these individual behaviors, it must have a structure and a culture designed to promote collaboration and communication. Organizations that operate effectively under uncertainty balance adjustments of information from different parts of the system (front-line workers, managers, directors) through interactive processes that enable ways of thinking and acting to make sense of ambiguity, and in response can coordinate actions (Barton, et al. 2015).

'Anomalizing' in the context of uncertainty management refers to the process of front-line workers (ski guides, ski patrol route leaders, etc.) being vigilant to anomalies in their operational environment and treating these anomalies as critical indicators of potential and emergent problems rather than attempting to normalize them. Generally, we are good at this when the anomalies are obvious to us…ie: large and widespread surface hoar events; exceptional SWE storm amounts; strange wind events; unusual avalanche cycles. The more subtle and barely obvious anomalies that seem familiar tend to catch us by surprise through our tendency to simplify and normalize them into familiar categories: the first unusual avalanche before a widespread cycle or the first notice of a surface hoar layer before it reveals its more widespread and stubborn distribution. "The more people hold onto differences, nuances, discrepancies, and outliers, the more slowly they normalize the details and the more nuanced and fine-grained an understanding they can create" (Barton, et al. 2015). Thus, pay attention to noting the differences between patterns, not the similarities.

'Sense-making' is the second and complementary part of this process that needs to have the organizational structure of collaboration and communication culture in place to make it all work. Organizational leadership plays an important role in creating the proper conditions for 'anomalizing' behavior to take place. Therefore, leadership is burdened with the responsibility to communicate the specifics regarding uncertainty in the operational environment and appropriate processes for managing it. Specifically, through such routine operations as morning meetings, daily operational staffing, forecasting, and field observation data-gathering missions, organizational leaders frame a situation on a continuum of high to mid to low uncertainty and dynamism. Where are we on that continuum today? What is unknown information? When managers and leaders work proactively to inquire and seek to make sense of potential problems through embracing and encouraging sharing perspectives they send a message to staff that there is no right answer or right perspective on the situation. In addition, by encouraging divergent thinking and differing viewpoints garnered from 'anomalizing' data gathering, management pushed the organization towards more effectively managing uncertainty.

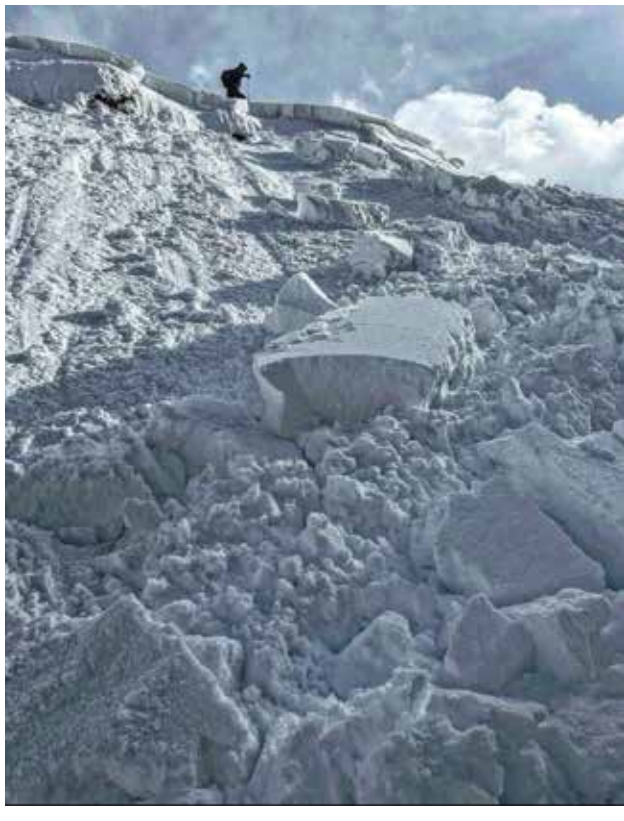
While there is much that we as an industry can offer to the rest of the world on managing uncertainty, it also made me wonder and begin to research what the rest of the world's tactics could offer us in the snow safety and avalanche worker world, and could there be some tools or processes that could help us work to manage uncertainty on a daily basis even better?

We in the snow safety profession are pretty good at these things already. How many times at our morning meetings is the conversation derailed and hard to keep succinct and on point due to the many voices and viewpoints of divergent thinking, perspectives, and opinions on what should be operationally prioritized for the day? Sometimes (at least in my experience) this process has been maddening. However, it is the foundation for front-line workers to openly communicate environmental discrepancies or anomalies… the first action against managing uncertainty in our environment. Kudos to organizational management and leaders who attempt to build and foster a culture in which this is seen more as collaboration (instead of just 'herding cats'). Within this context, 'anomalizing' becomes a pathway to 'sense-making.'

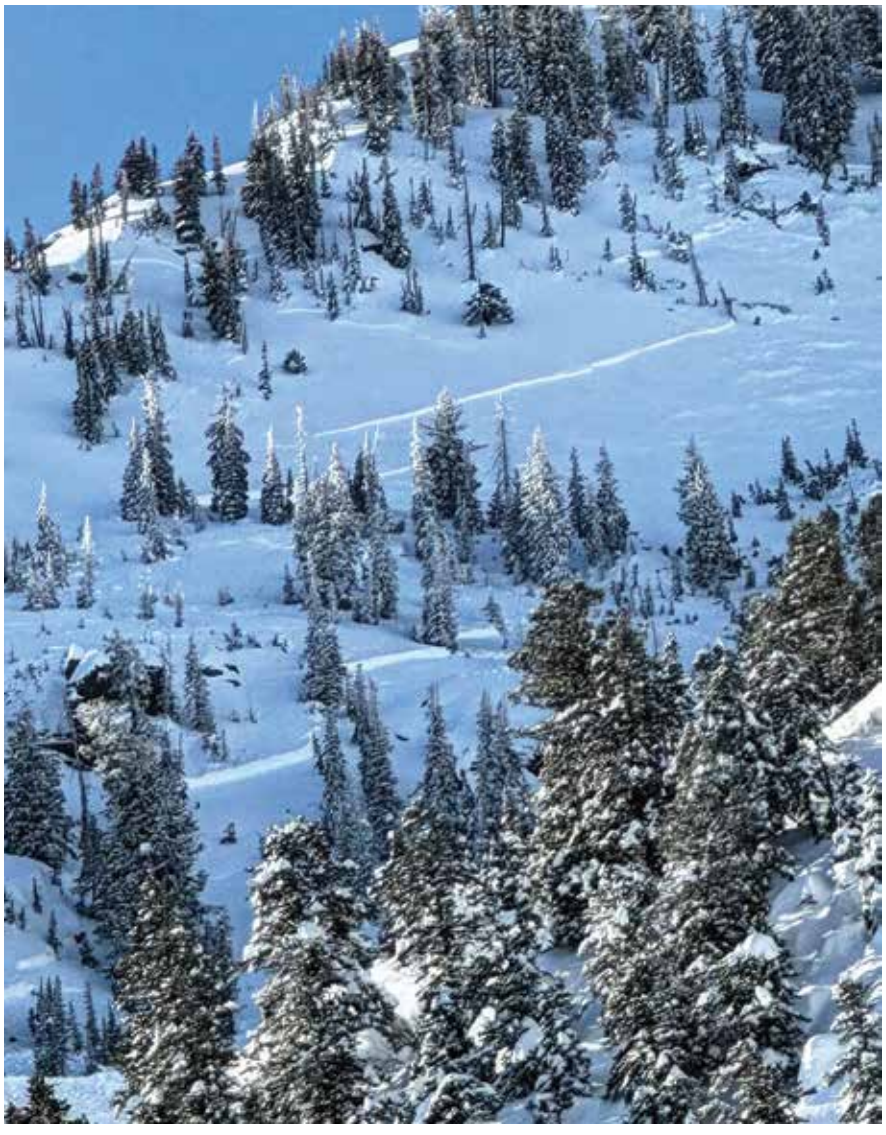
The effectiveness of these collective actions depends on the a few key managers' ability to coordinate and leverage the collective knowledge and expertise towards clear and simple goals. Goal clarity is critical to coordinating in times of uncertainty as it directs a clear focus of attention and action from the team's daily behaviors (Barton, et al. 2015).

The very act of looking for environmental anomalies may be critical to uncertainty management because it disrupts the momentum of ongoing events and motivates a renewed effort to make sense of all the data. As operational environmental conditions rapidly change, these subtleties can be missed, so outcomes can include: sense-making is not renewed, the interpretations of the dynamic situation are not updated in the working mental model, and actions become ineffective at best and inappropriate at worst. Therefore the tactical pause is particularly useful in fast-moving and dynamic situations.

Finally, one would be remiss to not include the idea of human resiliency in the equation when looking to better manage uncertainty. According to Sutcliffe & Vogus (2003), resilience refers to the 'ability to absorb strain and preserve (or even



Inspecting fresh debris from an early December 2022 avalanche cycle in the Wasatch. 📷 MARK WHITE



Broads Fork, Utah, January 2023. Two views of a natural avalanche that stepped down to the November PWL, took out mature pines and alders, and ran 3500ft vertical. MARK WHITE

improve) functioning despite the presence of adversity, and to recover and bounce back from untoward events.' At the risk of improperly anthropomorphizing the snowpack as a metaphor …. the uncertain and dynamic environment of the snowpack that we choose to study and operate in can stand to teach us a thing or two about resiliency and the ability to absorb strain, recover, and bounce back from untoward events. It is arguably the human perception of adversity that challenges us in our reality. The work of Laura McGladrey adopting the Stress Continuum into the outdoor industry has been an effective first step at operational teams gaining insight into the importance of team resiliency. Overall, this tool aims to create a more effective workplace and foster healthier personal interaction within daily stresses of the industry.

It is of critical importance to note that operations that face a highly consequential uncertain and dynamic environment cannot rely just on tools for managing uncertainty. The daily nature of uncertainty in our environment also requires us to use these tools to perform consistently and reliably throughout the season despite the uncertainty, hence the importance of team resiliency as part of the matrix for uncertainty management in our industry. McGladrey's 'Stress Continuum' is one good tool to help become aware of how resiliency is playing out in our lives, but the onus is then on us, our team, or our organization to help develop specific emotional, social, technical, and financial tools to then make sure we can perform through and despite uncertainty.

As an industry we have learned much about the concept of risk management through the study of past data patterns and probabilities, helping us define our acceptable personal and operational boundaries. Uncertainty management is crucial for both the outside environment (the snowpack and its instability) and the inside environment (our fellow snow safety workers, patrollers, guides, forecasters, and various team members). I see this two-pronged approach, coupling uncertainty management tactics with resiliency awareness, as an evolution of the risk management process in our industry, designed to help us as an industry continually learn and grow in order to increase our operational and contextual team safety amid what will always be an uncertain and risk-laden work and play environment. ⬢

REFERENCES

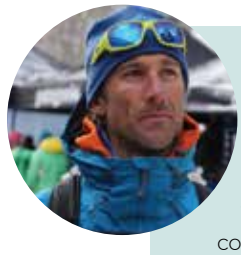
Barton, M., Sutcliffe, K., Vogus, T., & DeWitt, T., (June 2015). Performing under uncertainty: Contextualized engagement in wildland firefighting. Journal of Contingencies and Crisis Management. Vol 23, Number 2, June 2015. John Wiley & Sons, Ltd.

Levine, P. (Feb 11, 2022). What is My Probability of Getting into a Car Accident? Accidents, Auto-Accidents. Pacin-Levine Attorneys at Law, Ltd.

McGladrey, L. (2022). The Stress Continuum: Responder Alliance. Retrieved from: https://www.responderalliance.com/stress-continuum

Merriam-Webster, (2022). Risk: noun. Risk: verb. Merriam-Webster Dictionary, Retrieved on Dec 19, 2022 from: https://www.merriam-webster.com/dictionary/risk

Sharma, P., Leung, T.Y., Kingshott, R., Davcik, N., & Cardinali, S. (May 25, 2020). Managing uncertainty during a global pandemic: An international business perspective. Journal of Business Research, Volume 116, 2020, Pages 188-192. Elsevier Inc.



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TRAINING AVALANCHE PROFESSIONALS

BY GRAY GRANDY

Avalanche industry professionals have an opportunity to further their industry by being better teachers. It is obvious that professionals with the title Instructor or Educator need to be good teachers, but the rest of us patrollers, forecasters, mitigators, and guides need to be good teachers too. Why? Because on the job training and mentorship is where avalanche professionals progress the most. Latosuo et al (2016) revealed that avalanche workers value mentorship, professional community, and experience near or above their value of formal continued education. This is not to slight the avalanche education system or its members, but it is a realistic recognition of its limitations due to limited time with students and the nature of our environment and industry.

If we recognize that most professional learning takes place (intentionally or unintentionally) in the workplace and in the professional community, it becomes clear that this learning and development can be optimized by everyone in those circles becoming more effective teachers. Simply by working with a co-worker, one is engaging in some sort of teaching, learning, and training, whether you like it or not. Both parties are observing norms and forming habits that will shape their career in a large or small way. If we are blind to our effects on others, we are missing learning opportunities for all of our co-workers, and may even be actively slowing their progress by teaching them that effective idea sharing is not important to our job.

Kirkwood Patrol takes advantage of a recent avalanche to train on avalanche response. Using sites with real crowns and debris piles helps work out the kinks better than made-up scenarios. REID NOLAN

BECOMING A MORE EFFECTIVE TEACHER

Small tweaks in your daily interactions can make a significant impact on the learning opportunities of those around you. For those in leadership, instruction or mentorship roles, any dive into teaching theory and practice will be rewarded proportionally to their efforts.

The following sections are meant to include some simple tactics that anyone can integrate into their day, or serve as a jumping off point for someone keen on improving their training or mentoring potential. Most of us work in an environment that is often rushed, so making these concepts habitual will still fit your schedule and help enhance learning opportunities for all.

ADULT LEARNING THEORY

Teaching adults has similarities to teaching children but also has significant differences. Adults come with a full slate of experiences and filters, so we must cater to the life experiences and aspirations of those around us (Knowles, 1984). So first get to know your co-workers: what are their strengths, weaknesses, and motivators? How have their past experiences with education determined their current learning preferences? Adults need to know why the content is relevant and how it will help them toward their goals. Adult learners have the capability to be much more self-directed and self-motivated than children, but having clear relevance is necessary in order for them to engage.

INSTRUCTION PROCESS

It may seem cumbersome to plan out each training session or mentorship opportunity but having some structure will help the right plan fall into place. Also, the planning process will become instinctual after some concerted practice. As with the rest of our work, ability to adapt and make changes on the fly are vital to success.

After you have gotten to know your co-worker/s, it is time to decide what your learning objective is/ what are you trying to accomplish in this teaching session? This **learning objective** will help you make clear decisions for the rest of your planning and execution. In your planning, consider the answers to Who? Will do? How much or how well? Of what? By when?

In some environments, you will have the luxury of saying "today in our training session I want to work on X." However, our unpredictable workplace will often prompt you to say, "the weather and tasks that need done put me in the unique situation to show somebody Y". The latter will just cause you to flip your order of planning operations, but is also a great way to start a learning opportunity.

Next, identify what type of **learning environment and activities** work best for that objective. Does the person need to sit down and be told the basics of a topic, or is it more appropriate to head out and challenge them with a complex scenario? Do you have the resources and equipment to make your plan happen? Do you have some extra time to chat as you shoot across the ridge? Do you have a SWAG manual to reference as you train on InfoEx? Can you access the terrain that will illustrate the point you want to make?

Choosing the learning environment and activities are where the creativity of teaching really shines. Try thinking about where the student is on the continuum of—"they don't know what they don't know" to "they know what they don't know." Students who are less self-aware will need more direct instruction, while a more advanced student who knows their weaknesses will respond better to a challenging scenario or to you facilitating exploration of a topic. A learning opportunity can be one block of time, or a process over a whole season. You may just be facilitating resources like books or simple skills practice for someone to work through on their own time.

While all our workplaces offer different constraints, adopting some teaching theory and skills will help build the team around you. The quality of the next generation of avalanche professionals will be equivalent to the quality of our training abilities.

For educators that don't have the luxury of large training time blocks, cognitive science is on your side. It turns out that people retain information longer if they train on a topic in multiple short sessions vs. one longer session (Keppel, 1964). This highlights the value of quick, repeated learning sessions. This distributed learning, or micro-training, should be able to fit into any learning scheme, from organized training to mentorship.

A good learning objective will have some corresponding **assessment criteria**. How will you know if your lesson was effective, or if you will need to follow up and revisit the topic? What measure best highlights your student's learning, and how well did you do teaching to that test? Assessment doesn't need to mean a formal test, it may be as simple as observing the student apply the skill in real life. Clear learning objectives will help you create clear assessment criteria. In a tidy classroom setting, teachers can often build assessment into their daily lesson plans. In our often-disjointed world, you may have to wait for the right opportunity to assess the effectiveness of training you did months ago. This feedback is vital, because it updates the picture of where your student currently stands, and informs your next lesson plan. It also gives you a reality check of how well your instruction went.

For more feedback on your performance as an instructor, leave time for a **training debrief** or AAR (After Action Review). Debriefing a scenario can be a learning activity that fits above, but here I am referencing a discussion on training tactics and structure. Often I pull aside a few students after a larger exercise and ask for feedback. A discussion among an instructor team can also be useful. It is easy to have your training activities run over your allotted time, and rush away without getting this feedback. Make time into your training schedule for feedback, or catch relevant parties in your next downtime to hear their thoughts. Make the conversation comfortable, as excessive formality can lead to less honest feedback. Your students will learn the valuable skill of giving good feedback up and down the leadership structure as well as preparing you to give better instruction in the future.

These steps—Objective, Environment and Activities, Assessment, and Debrief—can be applied on a macro and micro scale. The macro scale version is what we can do when we have dedicated training blocks of time. The micro scale can be applied to even the simplest of questions.

For example, a new patroller comes up and asks the difference between a butterfly knot and an inline figure eight. I can quickly register who my audience is, and silently consider what can be realistically covered in the next five minutes we have to spare. Then I consider my learning environment (one on one in a patrol station) and think of a good way to illustrate my point. I dig out a piece of rope so we can tie and compare the knots as we discuss. I then ask her to tie the two knots, and explain back to me the difference. I finish with a simple question like "was that useful?" Each step may have only been a thought in my mind, but they helped me teach more effectively.

The steps and concepts presented provide structure to work from, but are not intended to be constraining rules. You will find that adaptation and flexibility will be the trend, rather than the outlier, especially if your workplace does not have structured training time set aside.

While instructing and mentoring have differences, grey areas and overlaps between formal training and mentorship abound. For example, a mentor may find themselves thinking through a lesson plan to specifically target their mentees specific goals. Or, a good trainer in your organization can become a mentor to many people they train.

Being a good instructor or mentor advances your co-workers, but it also improves your job skills with "improved understanding of other areas of the company's operations, opportunities for extended networking, a better understanding of their own practices, and the development of personal skills and satisfaction" (Dymock 1999: 316).

Successful avalanche professionals have many years of learning before achieving anything resembling mastery of their craft. We have an opportunity to optimize the interactions during those years of learning by helping others learn more effectively (which then deepens our understanding of the skill or concept). While all our workplaces offer different constraints, adopting some teaching theory and skills will help build the team around you. The quality of the next generation of avalanche professionals will be equivalent to the quality of our training abilities.

Story Time: I ask Crusty John to teach me about an avalanche control route. We silently click in and head out on the ridge. I nod as Crusty John points and whistles at terrain features, speaking in riddles, half sentences, and references to patrollers who retired before I had outgrown my Edgie Wedgie tip tether. We spend a good hour out there in the sun, with him sharing everything he has learned in his 35 years on this mountain, from feast to famine and back again. Then he skis off "gotta go check the fluids in the cat," so I hop on the slow triple and reflect on my learning experience.

Did Crusty John know his student? I certainly did not know half of his references, so it seems he was better suited for a more tenured audience. What learning objectives was he shooting for? If he wanted me to assemble a list of people, words, and riddles to research—he certainly provided that. If his goal was to get me to be a more competent route leader anytime soon, we missed that mark by a long shot. He picked a pretty good environment, we at least went out in the terrain and looked at it. As far as activities, he just spouted on, with hardly an opportunity for me to say a thing. So he chose lecture format over more interactive. He skied away feeling great about all the historical knowledge he imparted on me. Simple questions having me summarize what he was saying would have revealed that I was no closer to understanding than if I had studied the route using Tik Tok. Crusty John is doing his best, and teaching the same way he was taught. He really does want to help me out, and he put a lot of time into it. A little organization and consideration of how he is teaching could help make this time a little more useful for everyone involved. I, as the student, also have a responsibility to ask good questions and clarify when I am unclear, to help him on his way. ⬢

While someone is practicing a skill, metering your input takes tact. These sliding scales give you some ideas to consider while you decide to hold your tongue or not. Sometimes, one scale will take precedence over all others, like when you only have two more minutes and someone is still confused and hanging on a rope. In that case, you may just need to talk them through step by step, rather than letting them figure things out by themselves.

REFERENCES

Cross, K. Patricia. (1981). Adults as learners (pp133-134). San Francisco : Jossey-Bass

Dymock, D. (1999). Blind date: a case study of mentoring as workplace learning. Journal of Workplace Learning: Employee Counselling Today, Vol. 11 No. 8, pp. 312-17.

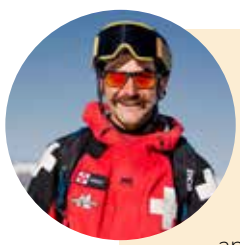
Knowles, M. and Associates (1984). Andragogy in action: Applying modern principles of adult learning. San Francisco: Jossey-Bass.

Latosuo, E., Johnston-Bloom, A., & Wolfe, L. (2016). Tinder for mentors: Examining the prevalence and value of mentorship relationships amongst avalanche professionals in the United States. International Snow Science Workshops (ISSW) Proceedings of Professional Papers and Poster Talks. Retrieved October 8, 2022, from https://arc.lib.montana.edu/snow-science/objects/ISSW16_P2.25.pdf

McManus, S., and Russell, J. (2007). Peer mentoring Relationships. In Belle Rose Ragins and Kathy Kram, The Handbook of Mentoring at Work (pp 273-298). California: Sage.

MENTORSHIP QUICK GUIDE

- Get to know the strengths, weaknesses, background, desires of your mentee—this will guide all of your instruction.
- Making thinking out loud habitual, they learn from your actions but will learn exponentially more from your thought process.
- Ask probing questions.
- Share your resources. What reference books do you keep by your desk? Who do you call to bounce ideas off of?
- Let them fail (when the consequences of failure are acceptable).
- Give timely and relevant feedback, both in the moment (Figure 1) and later as a debrief.
- Have them forecast or problem solve independently, then ground truth their expectations.
- Know your weaknesses, and suggest other resources to help your mentee fill in the gaps of what you can offer
- Mentoring doesn't need to be in the traditional one-on-one format, anyone can mentor anyone else, for a brief or long time. Multiple mentors for one mentee can have an additive effect. (McManus and Russell, 2007:294)



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15 YEARS OF INTERNATIONAL PRO RIDERS WORKSHOP

With Teton Gravity Research

STORY & PHOTOS BY MAX RITTER

Nearly thirty years ago, a handful of young skiers from Jackson Hole ventured north to Alaska in search of white gold. With money saved up from working on summer fishing boats, the crew bought 16mm cameras and bummed rides on helicopters to fulfill their dreams of documenting skiers and riders pushing their limits in extreme terrain. In 1996, the now world-renowned documentary production company Teton Gravity Research was born from that dream, but founders Dirk Collins and Todd and Steve Jones were soon faced with a reality check—how can pushing those limits be done with a reasonable margin for safety? Guides and recreationists might make their own choices when it comes to snow safety in small groups but bring in a professional multi-person camera crew and a team of hungry athletes and the stakes get exponentially higher.

In 2008, TGR's founders hosted the first International Pro Riders Workshop at their home hill Grand Targhee. The IPRW combined expertise from the best guides and instructors in the snow safety and wilderness emergency medical into a curriculum that continually evolves by accessing deep resources in both fields. IPRW isn't a course as much as it is a meeting of the minds—an opportunity for high-level operators to exchange ideas and learn from each other's successes…and mistakes. Since 2008, IPRW founder and instructor Jim "Sarge" Conway estimates that over 1000 rescuer training days have been shared among the group. Instructors have included everyone from veteran mountain guides like Zahan Billimoria, Doug Workman, and Jamie Weeks to professional athletes like Ian McIntosh and Griffin Post, to Paramedic Denali Rescue Ranger Dave Weber, former Army Captain and mental health professional Stacy Bare, and many more experts in their respective fields.

This year marked the 15th anniversary of the annual workshop, held again at Grand Targhee, which brought together 40 members of both the athlete and production team to hone their skills with a curriculum that included advanced new avalanche forecasting techniques, wilderness medical care, a mental health seminar, winter survival shelters, and large-group rescue drills. Conway introduced Dave Richards' new methodology, originally presented in *The Avalanche Review*, around snowpit scoring—a skill the group practiced in the forecasting and snowpack analysis portion of the workshop. Addressing mental health and normalizing how we approach and deal with stressors was the focus of both a presentation from Jamie Weeks and a seminar by Stacy Bare, and in review, was something the group unanimously agreed should be included in more professional mountain safety education.

Veteran athlete Sage Cattabriga-Alosa mentors 16-year-old Kai Jones on the intricacies of identifying persistent weak layers in a snowpit.

JIM "SARGE" CONWAY

JAMIE WEEKS

15 years in, instructors and IPRW masterminds Conway and Weeks dove into and shared what sets IPRW apart from the rest.

"Why do we run IPRW? To avoid mishaps and to take personal responsibility if the shit hits the fan. It's simply not fair to do what we do and expect someone else to pick up the pieces if something goes wrong," says Conway.

In the real world, training with the crew you would be working with will lead to better outcomes. Knowing what specific skills each team member brings to the table is crucial. TGR athletes and production crew are scattered all over the globe and this event brings most of them together and they undergo the training together in one place. "This not only bonds them as friends and coworkers but it gives people a chance to identify their strengths and weaknesses. Building a rescue sled and placing your buddy in it and then skiing it down the mountain and lowering them over a cliff is slightly more effective than the 'trust fall' at a corporate team building event," Weeks says.

Athlete Jim Ryan practices the art of improvised wilderness patient care by placing a leg splint on filmer Drew Herder.

Over the years, TGR athlete and production teams have fallen back on their IPRW training when responding to serious incidents, including a helicopter rescue in Haines, a 2013 snowmobile accident in Cooke City, saving athlete Nick McNutt's life via probe line after an avalanche sent him into a tree and buried him without a transmitting beacon, and many others. The Cooke City response, where a recreational rider approached the TGR team for help after his partner became unresponsive after a tree collision, earned an award from the local SAR team that ultimately completed the evac.

Each year, the workshop includes time for team members to ask questions and learn not just from the instructors, but from each other in the "Defend My Line" portion, where a close call or accident is analyzed for learning potential by the whole group. Conway adds, "The mentorship aspect of IPRW was a natural development from the culture of *watch out for each other.*"

New this year was an entire afternoon discussing mental health. Stacy Bare and Weeks spent a good chunk of their summers figuring out what and how they were going to talk to TGR about mental health. The discussion was split into two parts: mental health/trauma response and stress management. Weeks says: "Our common goals were creating an environment where it is OK to talk about mental health, recognizing common stressors and manifestations, presenting tools to make communication easier, and starting a discussion about what we can do as a team to reduce stress."

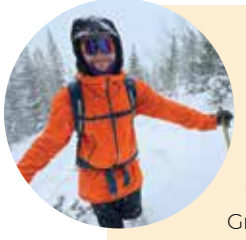
While traditional AAI, AIARE, NOLS, WMI, or other organized training provides the groundwork for any guide, athlete, or production member's education, IPRW offers a greatly expanded curriculum that is meant to be taken every year to maintain skills and stay current on the latest developments. Conway says, "This method allows us to rotate the focus each season based on specific needs or training objectives. The program was always designed to evolve as the team's skills grow and industry best practices evolve. IPRW teaches to the more advanced students. People with less experience get perspective on what they will need to learn while they take in what they can. Advanced participants maintain their current skills and stay current on the latest changes."

Weeks adds, "On a personal level, the absolute most valuable part of the IPRW for me as an IPRW instructor and a TGR guide is the relationships I have built with everyone in attendance and then trusting each other in the field. As a heli guide I'm not given the opportunity to run through a full three-day training before heading out with my clients, let alone the multiple years of IPRW training like what I go through with the TGR crew. Typical heli clients get a two-hour rescue briefing and for some of them this is the first time they ever use a transceiver. I know what the TGR athletes are capable of and have built trust over the years"

New to the course this year was an evening spent in the woods constructing fires and various group snow shelters. Canadian athlete Nick McNutt won the IPRW "Fire Master" Award for this beauty of a self-feeding fire that kept his group warm all night.

Looking back at a moment that stood out while working as safety coordinator and guide for the film team this past season, Weeks says, "This spring while working with Kai Jones we did some highly technical helicopter maneuvering to get him to a heli landing and he then had to get himself into position to be able to ski the line, all in very high consequence terrain. This was communicated inside the heli with the doors off where every second counts. Having known and worked with Kai for the past five years at the IPRW I know him well enough to be able to communicate efficiently and I have the trust to put him into position. I knew he had the skills to be able to get to where he needed to be. When the pilot and I flew away after dropping Kai off, the pilot asked me how I felt about leaving a 15-year-old on that spot. I replied, 'I feel great leaving THAT 15-year-old there.'"

With 15 years on the books and looking into the future, Conway, Weeks and TGR are excited to continue progressing the curriculum, with the goal of eventually making it available to other professional groups. Conway says, "The program will continue to evolve into one of the most challenging professional-level courses available to hard core backcountry users. We also see it going public with one-day Advanced Rec Rescue and three-day Pro Rider Workshops at various serious backcountry hubs in the US like Jackson, the Wasatch, Bozeman, Tahoe and Colorado." ⬢



MAX RITTER is a professional photographer and writer who's been using his "job" as an excuse to go skiing for nearly 10 years. He works as Managing Editor at Teton Gravity Research and is lucky to call the Tetons his backyard.

SNOW & AVALANCHE WORKSHOPS

Editor's Note: Thanks to Colin Johnson of Salt Lake City who attended every SAW, virtually or in person, and helped TAR sort through the bounty of presentations.

Perfect weather for post-CSAW beers at the Riverwalk Amphitheater. CSAW

4SAW

Under majestic snow dusted summits, amidst the burning glow of autumn aspens, the 2022 **Four Corners Snow and Avalanche Workshop** (4SAW) convened in Silverton, CO. The 4th annual 4SAW included a full line-up of speakers, workshops, clinics, exhibitors & activities. Three days of pre-conference workshops afforded attendees the chance to participate in digital mapping sessions facilitated by CalTopo, Jim Woodmency's legendary Mountain Weather seminar, an International InfoEx User's Summit and a multi-day avalanche dog camp hosted by C-RAD and SASDOG

Saturday's marquee event began with seasonal snapshots from the region's avalanche centers- Colorado Avalanche Information Center, Taos Avalanche Center, Kachina Peaks Avalanche Center, Crested Butte Avalanche Center and the Utah Avalanche Center- all in attendance. The centers' respective representatives and their talks were as varied as their mountain ranges and snowpack summaries.

The morning was bookended by scientific presentations offered by the National Weather Service, unpacking this winter's triple dip La Nina and Mikael Schlumpf's graduate work at the University of New Mexico that focuses on identifying and monitoring the strength of snow interfaces that accumulate water.

4SAW crescendoed that afternoon as a thematically chosen line-up of dynamic speakers centered on "Our Relationship with Risk." Jimmy Tart presented ARE WE COMMUNICATING RISK CORRECTLY? and challenged the crowd to think about their use of language in the backcountry. Steve Conger targeted the conference's theme and highlighted the importance of RELATIONSHIPS as a central component to managing risk. Maddie Crowell, a mountain guide and backcountry athlete from Telluride, CO. premiered her new ski movie and spoke about the role risk played in that adventure in a talk entitled STEPPING BACK to STEP OUT. Finally, cognitive scientist and engineer Dr. Laura Maguire sealed the deal with her keynote address; YOU, ME, WE: RELATIONSHIPS TO RISK IN THE BACKCOUNTRY. This heavy hitting line-up of deep thinkers and industry luminaries impressed the packed house.

4SAW 2022 coincided with the 60th Anniversary of Silverton Avalanche School. In addition to the exhibitors, vendors, sponsors, and nonprofits packed inside the Silverton School gymnasium, 300 participants from across the west came out to learn, laugh and celebrate the oldest, continuously operating avalanche school's birthday: 4SAW 2022 was quite the party!

—Michael Ackerman
Silverton Avalanche School

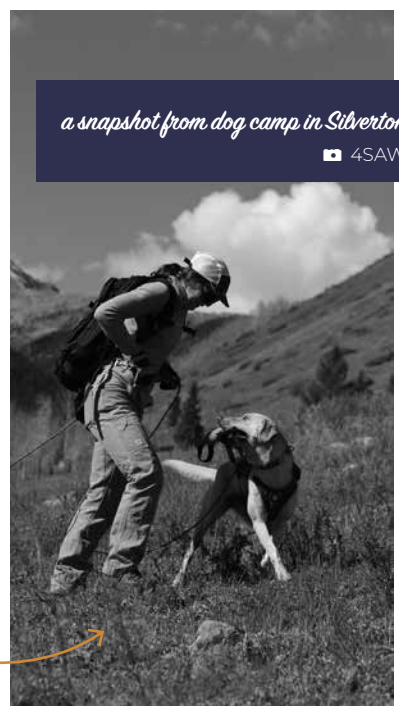
Bend SAW

November proved to be a great start to both our ski season and our operations at the Central Oregon Avalanche Center. We held our fifth annual **Bend Snow and Avalanche Workshop** on November 12, and that morning I was driving to the event through fresh snow!

The event continues to be located at the Central Oregon Community College and this year we had 129 in person attendees and sold 49 virtual tickets. Nearly all of our ten speakers were able to attend the event and present in person. As I look back over our list of speakers, I'd say that the trend this year was that we had bit less focus on pure snow science and more attention given to our human experience in the snow or with avalanches.

Two memorable speakers were Wyn Wiley and later, our keynote speaker Bruce Tremper. Wyn (aka Pattie Gonia) advocates for inclusivity in the outdoors through various streams of media. They treated us to a somewhat raucous video of Pattie Gonia (Wyn in full drag) skiing at Mt Bachelor, and then continued with the story of their experiences in nature and their efforts to ensure that everyone can safely access outdoor and spaces. Bruce's presentation "Three Generations of Avalanche Knowledge" provided an awesome history of some of the early practitioners of avalanche science, and how that understanding and experience of avalanches has been spread throughout the country and to following generations.

Both Victor McNeil and his wife Kelly McNeil gave presentations focusing on avalanche education. Victor spoke about the outreach that the Wallowa Avalanche Center has been doing with the large motorized contingent in Northeast Oregon, including offering motorized specific AIARE courses. Kelly meanwhile has been looking at avalanche education in this country from the standpoint of public health, and presented her ongoing research focusing on the needs assessment she has



a snapshot from dog camp in Silverton 4SAW

conducted and follow-up surveys with backcountry users.

Chris Lundy gave a presentation on what role luck has played in the experiences of seasoned backcountry travelers. By honestly examining what role luck has played in our experiences, we might make better decisions in the future (ie exactly how much and how often are we each relying on a little bit of luck?).

Lastly, we had several presentations with a more local focus. COAC forecasters updated us on the center's move to daily forecasting and the associated new staff. I was excited to see a presentation by Betsy Norsen, former Mt Bachelor patroller and mountain manager. Betsy has been a great liaison between Mt Bachelor and the avalanche center so it was cool to see her presentation focusing on the dangers of tree wells/deep snow immersion fatalities. Personally, my favorite presentation came from local (Pendleton, OR) meteorologist Matthew Callihan. I was disappointed that he couldn't attend in person, but as an avalanche forecaster without a meteorology degree I am always psyched to learn more about winter weather prediction.

Thank you very much to A3 for their generous support of this event. These events are such a great opportunity for education and making connections in both our local and national snow and avalanche communities. We are looking forward to ISSW 2023 here in Bend!

—Gabriel Coler
Central Oregon Avalanche Center

I wanted to say thank you for providing the grant money to help us fund our event. We are extremely grateful for the support.

We started 7 day a week forecasting on December 1st, this season, which we are really excited about, but it also makes fundraising even more important. We wouldn't be where we are without the generous support of A3.

—Adam Stroup
Central Oregon Avalanche Center

CSAW

In-Person Attendees: *592*
Virtual Attendees: *432*
Expert Speakers: *17*
Presentations: *19*
Other unique things of note:
The 22nd Annual CSAW marked the first time for a hybrid online/in person format which allowed international presenters to be involved and for virtual attendees to join around the world, while still welcoming in person attendees back to Breckenridge for the first time since 2019. It was great to see everyone!

The 22nd annual **Colorado Snow and Avalanche Workshop** (CSAW) was the first hybrid (virtual and live) event in CSAW history. After two years of virtual CSAWs we were excited to have a live event, but one great thing about the virtual events was that we could include speakers and participants from outside of Colorado. We didn't want to miss out on including our international colleagues who attended CSAW since the start of the pandemic. This year's CSAW seemed like the best of both worlds; a return to a semblance of normalcy and a chance to see all of our colleagues with a traditional in-person event, and a virtual event that continued idea exchanges and interaction with high-level researchers and practitioners from around the world.

The moderators of the virtual sessions did an amazing job running the sessions and facilitating discussion between the audience and the speakers. Karl Birkeland, Ron Simenhois, Erich Peitzsch, and Jeff Deems put a huge amount of time and effort into preparing for the virtual event. With nineteen talks over two days, we couldn't even attempt to summarize all of the talks in this article. Fortunately, you can now view all of these presentations online. You can find them on the education menu on our website, colorado.gov/avalanche.

There are a few organizations we would like to highlight that helped make this event a success. The WSL Institute for Snow and Avalanche Research SLF out of Davos, Switzerland had four researchers present on our virtual workshop day. Researchers from the Simon Fraser University Avalanche Risk Management program led by Pascal Haegeli and the Snow and Avalanche Simulation Laboratory EPFL out of Lausanne, Switzerland and led by Johan Gaume also presented. These organizations shared the latest research on avalanche release, emerging technologies in avalanche mapping and modeling the snowpack, and the interplay between climate change and snowpack stability. It's incredible to see what these organizations have accomplished and the potential for future development that could change the way avalanche professionals do their jobs in the years ahead. For a backcountry avalanche forecaster, it is exciting to see us getting closer to operationally mapping avalanches with satellites. These key data would not only help us with today's and tomorrow's forecast but also in assessing a season's worth of avalanche forecasts, helping to identify areas to improve for the future. 432 people from nine countries watched the seven presentations on October 13 with many attendees participating in discussions.

Meghan Twohig of CalTopo shows the audience just how big. 4SAW

On October 14 we were back at the Riverwalk Center in Breckenridge for the first time since 2019 with 592 of our friends. The twelve presentations covered numerous topics from avalanche education surveys, backcountry avalanche forecasting, avalanche accidents, and avalanche release, to new technologies for snow profiles. Seven of our ten presenters traveled from outside of Colorado. John Sykes, Emma Walker, and Eeva Latosuo made the trek from Alaska. Kevin Hammonds, Karl Birkeland, and Alex Marienthal traveled from Montana, while Kelly McNeil visited us from Oregon. Bruce Jamieson made the trip down from Canada and left us with discussions about avalanche size in every patrol room or professional conversation since.

Overall the two-day workshop was attended by 1024 people from 9 countries and 29 US states. CSAW is organized through a partnership of the Friends of CAIC, the Colorado Avalanche Information Center, and the National Avalanche Center. We hope to see you all next year, maybe again both virtually AND in person.

—Jason Konigsberg
Friends of CAIC

MSU SAW

The 8th annual **Montana State University Snow and Avalanche Workshop** was held on October 26 with 250 in-person attendees and a live-stream audience of over 300 viewers from across Montana and beyond. A recording of the event can be found at https://www.montana.edu/outdoorrecreation/saw/. Dr. Jerry Johnson was our MC for the evening, and Backcountry Access, Black Diamond, and many local vendors and avalanche course providers donated a variety of raffle prizes.

The MSU SAW is completely free and serves as both a professional development opportunity to our region's avalanche professionals as well as an introduction to key regional avalanche issues and tools for both student and non-student recreationalists.

Dr.Matt Caires, Montana State University's Dean of Students, started off the evening with a welcome and a sober reminder of why his office supports the SAW event annually: there's a long history of student avalanche-related injuries and fatalities both before and during his time on campus. Dr. Caires explained how MSU has advanced snow safety initiatives because of these incidents and how attendees and other parents can donate to continue to support these efforts.

Shannon Regan, Education Coordinator for the Friends of the Gallatin National Forest Avalanche Center (GNFAC), took the mic next to give an overview over the mission of the Friends and the many avalanche education opportunities available to the Southwest Montana community.

Dave Zinn, GNFAC forecaster, was up next to present on the GNFAC's website, forecast products, and 2022–2023 season updates, and then finished by reviewing a personal non-avalanche case study, with relevance for all winter backcountry users.

Ian Hoyer, GNFAC forecaster, tagged in to discuss the specific phenomena of avalanches occurring during low danger forecast ratings and highlighting the concept that "Low Danger does not mean no danger." He encouraged backcountry users to be mindful if they choose to increase their exposure during low danger rating days.

We shifted gears a bit to focus on research being done locally at Montana State University. Maddie Beck (Master of Science Student in the Earth Science Department) started off by sharing a bit about her research using remote sensing and meteorological modeling to quantify the amount of water stored in our mountain snowpacks. Evan Schehrer (PhD student in Materials Science) was up next, sharing how he uses scanning electron microscopy, LiDAR, and Hyperspectral Imaging to analyze faceted snow crystal growth and shape, along with studying impurities in snow and how they may play a role in strength and bonding. Our final research talk was by Nata de Leeuw (Master of Science Student in the Earth Science Department), sharing her research on wind slab formation, with a focus on the relationship between meteorological variables and wind slab properties.

At CSAW, Eeva Latosuo gives a presentation on last year's Hiland Road avalanche. See page 28 of this TAR for this presentation. CSAW

Jim Donovan, Executive Director of the Silverton Avalanche School, was our keynote speaker for the evening. Jim shared a personal account of responding to an accident involving Olivia Buchanan. Olivia had started at Montana State University to pursue snow science in 2011, and in January 2015, she was caught in a deadly avalanche in Silverton. Jim shared how Olivia's rescue helped to shape the evolution of the professional rescue community in Silverton, one important way that the community has found meaning from loss.

Thanks to A3 and the MSU College of Letters and Sciences for their continued support of this important event. Stay safe out there!

—Dan Sandberg
MSU Outdoor Recreation Program

PRO NIGHT

New this year, pro night created a special opportunity for local snow and avalanche workers to mingle and discuss more technical and operational topics. The White Raven Winery in Columbia Falls provided a fantastic atmosphere for a full crowd of 65 people. Based on the enthusiastic feedback we received, we absolutely plan to continue and evolve this aspect of NRSAW. Thank you to our speakers for their excellent presentations: Zach Miller (Snow Depth Variability and Implications for Avalanche Forecasting), Jake Hutchinson (30 Years of Balancing Exposure, Risk, and Operational Goals in a Wicked and Ruthless Learning Environment), Gabrielle Antonioli (A3 Resiliency Program), Simon Horton (Importance of Snow Depth Data for Snowpack Modeling for Forecasting), and Matt Hansen (How to Get the Story Right, and Other Near Misses of a Media Pro).

THE MAIN EVENT

Excitement for the season was palpable during our public workshop session. We hosted nearly 300 stoked attendees at the O'Shaugnessy Center in Whitefish. Highlights: the bustling sponsor booth fair, a full-audience cheer for mental health, and the best raffle in the valley. We took a new approach to the event this year with a condensed afternoon session, rather than a full day of workshops. We'll continue with this efficient, engaging format in the future, but build in a little more buffer time. Our brilliant speakers made this event the success it was! Thank you: to Joel Shehan (Physical Therapy for a Strong, Healthy Season—and Lifetime), LeeAnn Allegretto (NW MT Winter 2021–22 in review and 2022–2023 preview), Jake Hutchinson (When Things Do Go Wrong: how a little critical thought, a few shortcuts

NRSAW

The Flathead Avalanche Center proudly presented the 11th annual **Northern Rockies Snow & Avalanche Workshop**.

and better practice will make you a more effective and efficient companion rescuer), Simon Horton (Comparing Avalanche Seasons: do more dangerous conditions result in more fatalities?), Matt Hansen (Burying the Lede: lessons learned from a career of writing about people and avalanches, and our panel on regional avalanche programs: Adam Clark (BNSF), Lloyd Morsett (WMR), Blase Reardon (FAC), Erich Peitzsch (USGS), and moderator Keagan Koellner (WMR).

—Flathead Avalanche Center

NSAW

The **Northwest Snow and Avalanche Workshop** (NSAW) took place on October 16, 2022 at Seattle Town Hall. This was our first event run in a hybrid format and we were excited to welcome back 213 in-person attendees and 113 virtual attendees.

The morning began with a coffee and social hour highlighting local vendors, sponsors, and non-profit organizations for attendees to engage with. The first session of presentations was themed around Supporting Access to Our Winter Mountains and featured presentations from Scott Schell and Dennis D'Amico, Amy Jenkins, and Charlotte Guard.

Welcome and What's New at NWAC—Scott Schell and Dennis D'Amico

Overcoming Adversity, Navigating & Improving Mental Health by Recreating in the Backcountry by an Adaptive Athlete —Amy Jenkins

Meet You at the Trailhead: Connecting with Our Community – Charlotte Guard

After a short break we began session two on Making and Communicating Pertinent Observations with presentations from Wes Thelen, Larry Goldie, and Liz Riggs Meder.

If An Avalanche Happens on a Volcano, Does it Make a Sound? Seismic Detection of Avalanches on Cascade Volcanoes—Wes Thelen

Communicating Observations: My Team, Other Parties, The Community—Larry Goldie

Work With Your Brain to Pay Better Attention in the Backcountry—Liz Riggs Meder

During the lunch break, attendees were invited to join for a working lunch with NWAC where non-profit and US Forest Service staff answered questions from the crowd. Lunch was followed by session three, Our Changing Mountain Snowpack, with presentations from Alia Khan, Nina Aragon, and Nick Bond.

Light Absorbing Particles, Snow Algae, and their role in our Changing Snowpacks—Alia Khan

CommunitySnow.org: Snowpack Modeling and Monitoring Changes—Nina Aragon

Winter 2022–2023 Outlook for the Pacific Northwest—Nick Bond

Overall, the workshop featured 10 expert speakers and a total of 12 presentations. We're incredibly thankful to the 21 volunteers that helped the event run smoothly, the sponsors that made this workshop a reality, all the presenters for sharing their knowledge and experiences, and the community that came together for a day of learning.

—Northwest Avalanche Center

SAAW

In November, we were excited to host the first in-person **Southcentral Alaska Avalanche Workshop** (SAAW) since 2019. As in many past years, the event was hosted on the Alaska Pacific University campus, the perfect venue to gather over 100 avalanche professionals and public users from Anchorage, Girdwood, the Mat-Su Valley, and beyond (plus 65 participants who joined virtually, thanks to this year's hybrid format).

Working lunch panel with NWAC staff.

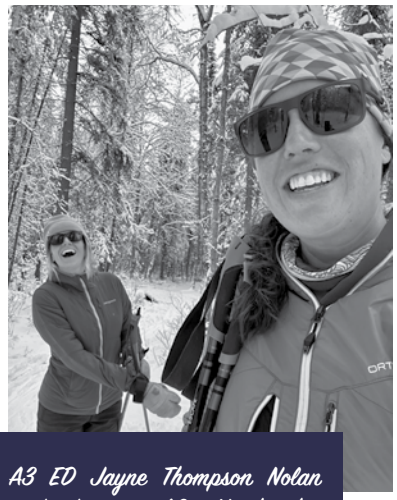
This year's workshop featured speakers on a variety of topics, ranging from the super-technical to insightful recaps of past incidents. A3 Executive Director Jayne Nolan joined us in person and opened the day with some remarks on the latest from our professional organization. (She also sold out of copies of *The Snowy Torrents*!) Next, we had a fascinating update from Canadians Doug Latimer and Ivars Finvers, who presented their latest findings on transceiver interference.

Later in the morning, we switched gears with a talk from Coloradan Amy Pertuz on adjusting one's perspective as an avalanche professional to cultivate intellectual humility in the face of ongoing human factor-adjacent incidents. Amy's talk was juxtaposed with a presentation allowing us to apply that lens to the pattern of deep persistent slabs (and decision-making strategies to help manage them) by the Northwest Avalanche Center's Matt Primomo.

We rounded out the morning session with two talks by Alaskan researchers: Matt McKee of the Alaska Railroad Avalanche Program and Katreen Wickstrom-Jones of the Alaska Division of Geological & Geophysical Surveys gave a talk on avalanche modeling to optimize RACS locations in a series of start zones that threatens infrastructure as part of an effort to plan for phasing out artillery programs in the state. John Sykes, a forecaster with the Chugach Avalanche Center and PhD student at Simon Fraser University, brought us up to the lunch hour with his latest automated ATES mapping research.

After lunch, Allie Barker of the Hatcher Pass Avalanche Center and Kyle Van Peursem of the NWS Alaska-Pacific River Forecast Center drilled down on the 2022 Valentine's storm cycle at Hatcher Pass. During the afternoon, we stuck with the theme of Alaskan case studies from last season: Trip Kinney of the Arctic Valley Ski Patrol gave a talk on the historic Hiland Road avalanche and cleanup. After Trip's presentation, Mike Welch and George Creighton, both of Chugach Powder Guides, were kind (and vulnerable) enough to let the audience in on their analysis of a close call they had on Eddie's Ridge last season.

We finished up the day by looking ahead to the coming season. Carson Jones of the National Weather Service gave us a season outlook and overview of avalanche forecast products, and Gabe Wolken, also of the Alaska Division of Geological & Geophysical Surveys and the UAF Climate Adaptation Science Center,



A3 ED Jayne Thompson Nolan and former A3 Membership Coordinator and Snowy Torrents editor Emma Walker manage an in-person visit on skis before this year's SAAW. EMMA WALKER

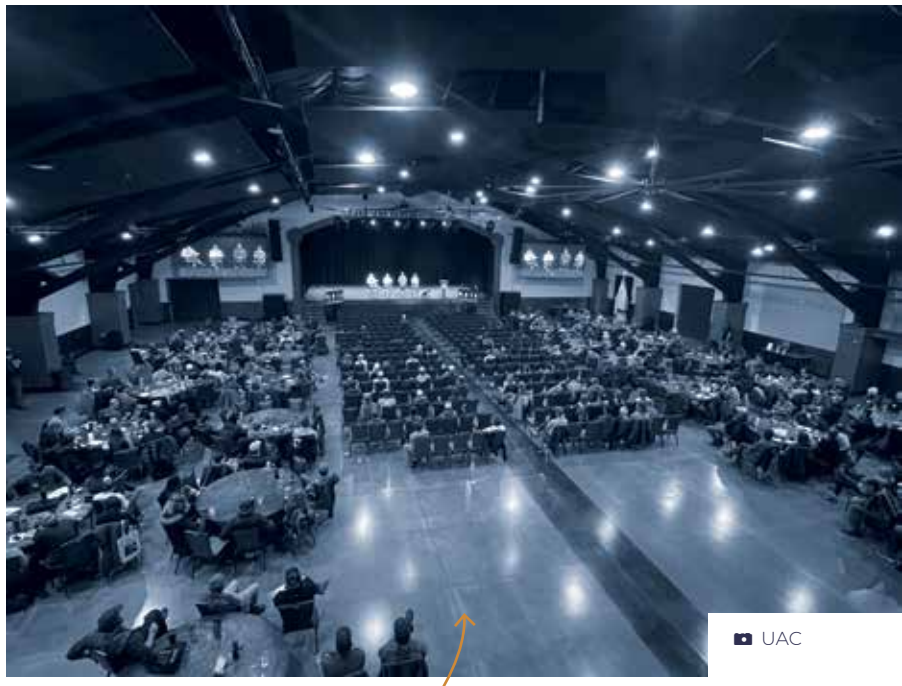
gave a talk about the application of Community Snow Observations, encouraging the audience to incorporate this collaboration into their work and teaching over the coming season. Finally, we got a combination of virtual and in-person updates from avalanche centers across Alaska: Hatcher Pass, Valdez, Haines, Coastal Alaska, Cordova, the Eastern Alaska Range, and the Chugach National Forest.

The Chugach NF Avalanche Center and Alaska Avalanche School are thrilled to have hosted another productive, collaborative convening of snow professionals in our region. Thanks to the sponsors and volunteers who made the day possible. We wish everyone, from the folks who attended to those getting ready for winter in the lower 48, a safe and happy season!

Thanks to the members of the 2022 SAAW Organizing Committee: Jeff Bristow, Melis Coady, Monica Keim, Rich Peterson, Andrew Schauer, Wendy Wagner, Emma Walker, and Katreen Wikstrom-Jones.

— SAAW Organizing Committee

USAW & PROSAW



UAC

15th Annual **Utah Snow and Avalanche Workshops** (PROSAW and USAW).

Back in person! It was great to be able to hold PROSAW 2022 in-person. After two years of being remote, local ski patrols and snow professionals were eager to attend PROSAW in person this year to take advantage of the networking opportunities. In order to accommodate snow professionals across the west, we also delivered PROSAW as a live stream. As part of our move back to in-person, we hosted the workshop in a new venue, the lovely Dejoria Center in Kamas, Utah. Tucked at the foot of the Uinta Mountains at the High Star Ranch, the Dejoria Center was the perfect setting to provide a cost-effective professional development workshop for snow professionals across the west.

During PROSAW, attendees were able to learn from avalanche professionals and researchers from California, Colorado, and Montana on topics including avalanche mitigation, and operational challenges. We ended the session with a mental health and wellness roundtable discussion.

We offered the USAW General Session only as a live stream, delivered over two evenings instead of the three evenings of prior years. Feedback from prior years indicated that three evenings was too much of a commitment and we would see a large drop-off of attendance for the third night. Using the live stream format for the General Sessions provides a broader reach to users across Utah and beyond. The General Session revolved around two themes:

1. Applying Your Backcountry Toolbox to Changing Conditions
2. When Does a Weak Layer Turn the Corner?

As in prior years, storytelling was the key to delivering presentations. Stories seem to be what we can remember best and carry with us into the backcountry every day this winter. Presentations around decision-making, personal stories from avalanche accidents, and tips and tricks from the pros were the preferred presentations by attendees.

PROSAW By the Numbers

- 14 Presentations
- 18 Presenters
- In-person Attendees: 321
- Livestream Attendees:
  - 704 unique viewers
  - Viewers watched from 6 countries and 42 states
  - 41% watched from a phone; 59% watched from a computer
  - 371 views of the recording in the 4 weeks after the workshop

USAW By the Numbers:

- 10 Presentations
- 11 Presenters
- Day 1: 792 Viewers
- Day 2: 490 Viewers
- 589 views of the recording in the 4 weeks after the workshop

Over the years we look at various trends of attendees to try to get a more diverse group. Some interesting stats from this year.

PROSAW:

- With 73% of attendees being male, we need to do a better job of attracting female avalanche professionals.
- 21% of attendees had never been to USAW or PROSAW before. It is great to see that we are attracting new snow professionals each year.
- 76% of attendees had a Pro 1 avalanche education or higher.
- The highest rated presentation was Dave Richard's presentation on the ECT scoring system.
- The most impactful presentation was the A3 Resiliency Project Round Table discussion.

USAW:

- Only 12% of attendees were under the age of 40. With the

huge number of new users, we need to ensure we continue to attract this important audience
- With 35% of attendees being female, we still have room for improvement on getting more female attendees.
- 38% of attendees had 1-5 years of backcountry experience, equally 38% of attendees had 20+ years of backcountry experience. This indicates that while we are not attracting young users, we are attracting new users.
- 19% of attendees had less than a Level 1 avalanche education.
- This year was 43% of attendees first USAW.
- Over 70% of attendees noted they would use the USAW recordings to reference back to in the future.

All of the presentations were recorded and available to watch.

PROSAW:
https://bit.ly/2022PROSAW

USAW General Session Day 1:
https://bit.ly/2022USAWDay1

USAW General Session Day 2:
https://bit.ly/2022USAWDay2

Thank you to all of our amazing sponsors for making USAW/PROSAW successful:

American Avalanche Association, American Alpine Club, Accurate Energetic Systems, Alta, Arva, Backcountry Access, Brighton, Byrne Family Foundation, CIL Avalanche Control Product/WESCO, Deer Valley, DPS, Gazex MND/TAS, Mammut, Mapleleaf Powder, Monument Snowcat Skiing, Mountain Guard, Nordic Valley, onX Maps, Ortovox, Park City Powder Cats, Pit Viper, Powder Mountain, Powderbird, Scott Sports, Ski Utah, Snowbasin, Snowbird, Solitude, Sundance, Terrell Smith, Utah Department of Transportation, Park City Mountain Resort, Uinta Brewing, Utah Office of Outdoor Recreation, Wasatch Peaks Ranch, Wyssen

— Chad Brackelsberg
Friends of UAC

WYSAW

We returned to The Center for the Arts in Jackson, Wyoming, this past October for the eighth annual **Wyoming Snow & Avalanche Workshop**. Going back to its pre-pandemic format, WYSAW consisted of a half-day Pro Workshop on Friday, October 21, followed by a General Session that spanned a full day on Saturday. As has become standard for WYSAW, the presentations and panel discussions covered a variety of topics relevant to risk management in the winter; we learned about trees, books, new ways to think about terrain assessment, cultural humility, and (of course) avalanche mechanics.

The Friday workshop kicked off with Grant Statham who shared how the Conceptual Model of Avalanche Hazard, or CMAH—the workflow that forecasters move through to determine things such as hazard rating—is used in a number of different ways in Canada. A take home from current research is that "humans are inconsistent." Data has shown how subjectivity can mar a process that is designed to yield consistent outputs. The future is looking towards models; "less human judgment, more algorithm" is likely an important part of the future of avalanche forecasting. Following Statham, Jesse Quillian presented on how avalanche professionals can incorporate cultural humility into their group management practices, ultimately reducing risk and dismantling power structures. One WYSAW attendee noted, "Jesse made me acutely uncomfortable, so I think I needed her talk." Ron Simenhois delivered the final presentation of the Pro day, discussing our current understanding of avalanche release and how recent research is highlighting the difference between the crack propagation we see in ECTs and what actually happens on a slope-wide scale. The videos and visuals Simenhois shared gave the audience excellent food for thought. Deep research into whumph sites informed the findings presented in this talk.

Two panels rounded out the Pro session. Don Sharaf moderated a discussion on "Not Following the Rules," a deep dive from Erich Peitzsch, Quillian, Jake Hutchinson, Statham, and Simenhois on surprises they have encountered in their careers. The concept of "that's not supposed to happen" was fleshed out in condensed presentations from the panelists. Turns out, some of the "truths" we learn in avalanche courses can get dismantled by the complex material that is snow. Changing up WYSAW norms, a second panel was hosted by the American Avalanche Association out in the lobby with a "gather-round" vibe. Jayne Nolan, A3's Executive Director, brought us a conversation on the new edition of *The Snowy Torrents*, published in August 2022, that analyzed accidents from 1986-1996. Authors Spencer Logan and Blase Reardon chatted with the audience about their process writing this edition as well as how "this book could save your life." A3 quickly sold out all copies available for purchase at the event.

We continued to connect with a variety of topics throughout Saturday's General Session. Repeat presenters Simenhois and Statham took to the stage to share presentations on other aspects of their work. These talks were more accessible to all users. Specifically, Statham reviewed the changes that the Avalanche Terrain Exposure Scale, or ATES, is undergoing to yield a better product that can now acknowledge winter users who never encounter avalanche terrain. Peitzsch talked about how cool trees are, and how tree-ring mapping can allow us to reach back in time to understand and chart the history of avalanche cycles and climate in a variety of mountain regions in the U.S. Lessons from the field of public health were unpacked by Kelly McNeil, who tied what we know about changing behaviors, learned from campaigns such as the child obesity fight, to how we can improve our avalanche education and forecasting messaging. Reardon and Logan, authors of *The Snowy Torrents*, took to the stage to share "their book report," a formal presentation on accident reporting. Continuing the thread of looking at incidents, Frank Carus, the new director of the Bridger-Teton Avalanche Center, shared an analysis of the 2021–2022 winter and reviewed a fatality that occurred in the Game Creek region of the southwest Tetons. Carus also gave us a preview of what the BTAC will be working on and who will be behind the scenes.

The final presentation came from Aidan Goldie-Ahumada. He gave a talk that was based on his article "Intersectional Heuristics in Backcountry Decision-Making," published in the 40.3 TAR. He introduced the idea that our industry is vulnerable to intersectional heuristics, "a shortcut to decision-making driven by unbalanced power structures." He received an impromptu round of applause by putting forth the idea that being an avalanche professional is most accessible to those with some level of privilege. Goldie-Ahumada shared tools we can use in our operational and classroom settings. WYSAW was capped with one last panel discussion, "When Reality and Expectations Collide," moderated by Jake Hutchinson that looked at avalanche rescue and how the way we train can fall apart in real time. Thanks to John Reller, Nick Armitage, Jen Reddy, and Doug Workman for engaging in this conversation, even (especially) when it sounded more like ranting. I took home that it is essential to expect chaos and that I need to intentionally improve my habits and training year after year.

No discussion of WYSAW would be complete without a nod to our MC, Lynne Wolfe. A big thanks to Lynne for being the cornerstone of yet another WYSAW stage. This event is put on by the Teton County Search & Rescue Foundation in partnership with the Bridger Teton Avalanche Center and Central Wyoming College. All WYSAW 2022 talks are available to view, for free, at TetonCountySar.org/wysaw. We'd love to see everyone in Jackson for WYSAW 2023 or connect with us virtually if a Wyoming trip isn't in your fall plans.

— Liz King
Associate Director, TCSARF

Audience involvement at WYSAW was spirited. Flathead Avalanche Center Director and former TAR editor Blase Reardon expands on a point as Gabrielle Antonioli, newly of the Bridger-Teton Avalanche Center, looks on. Orijin Media.

Your editor as WYSAW MC takes questions. Orijin Media

IN IT FOR THE NACHOS

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One of the hardest things about human behavior in avalanche terrain (/life) is communication. At the heart of good communication is self-awareness. This old fashioned mad libs exercise—a fan favorite at many of my lectures—is designed to make it easier to get clear on your personal style, goals, and motivations while having fun communicating these things with your partners. .

SARA BOILEN is a clinical psychologist in Whitefish, MT. She is fascinated by how humans make decisions. Stay tuned for more from Sara on addressing human factors in our avalanche education curriculum

DEAR EDITOR,

After attending my local (and always excellent) SAW this fall, I was struck by a few things: the high level of knowledge and experience the presenters bring to the table, how good it is for the local community to come together and collectively get our heads working again after a summer of idle snow-thoughts, AND how much needless waste is generated at each and every workshop across the country. I mean really, how many red lanyards do I need, all with the logo of a company whose products have no competitor? And each one with a thick plastic nametag holder? Add it to the collection hanging from my closet door from years past. Hundreds of attendees, times the dozen or so SAWs that take place annually, equals a lot of lanyards hanging from a lot of closets.

Printed programs on thick glossy paper? Unnecessary, except to appease the sponsors. Stickers we won't ever stick to anything? Superfluous. Knit hats that may be worn by only a quarter of the attendees? Excessive, add it to the hat pile in the closet across from all those lanyards. And all those vendor tables covered in all that swag? Come on, this event is supposed to be about knowledge sharing, not Christmas shopping.

A huge thank you is in order to all the folks that work so hard putting these events together, they are an invaluable asset to the snow community. But really, it's time to change the culture around generating waste. As a group that strives to be environmentally-conscious and supportive of climate science (along with other so-called "progressive" ideals), lets add minimal-waste to our lists of goals. I've now got enough lanyards to last a lifetime, what I need is more knowledge and experience. And more powder turns.

Cheers to a deep and safe winter, and thanks for the great work with TAR!

Bobby Griffith
Victor, ID

THE AVALANCHE REVIEW
PO Box 11443
Denver, CO 80211

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A Publication of the
American Avalanche Association

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