

THE AVALANCHE REVIEW



ISSW

What We Learned:

Perspectives, Presentations, Panels, & People
Page 16

Chasing the master Liam Fitzgerald along The Wave of Monte Cristo. Another cream filled start zone high above the southerlies of SR210, north side of Little Cottonwood Canyon, Utah. Photo Adam Naisbitt

THE AVALANCHE REVIEW

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

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CONTRIBUTORS



By the time **Steve Conger** was three years old, he had spent his winters in the avalanche towns of Ft. Collins and Bozeman. Eventually he persisted in playing in perilous snow and working with avalanches throughout the transitional snow climate as a ski patroller and forecaster. This emeritus editor of *The Avalanche Review* can be found in Golden, British Columbia, where current efforts include new technologies for snow science, avalanche risk assessments and planning projects, independent research, and instructing professional courses.



Aleph Johnston-Bloom is an avalanche specialist for the Chugach National Forest Avalanche Information Center in Girdwood Alaska. Over the past 16 years she has garnered experience as a highway avalanche forecaster, a backcountry avalanche forecaster, a patroller and a ski guide. She is an American Avalanche Association Certified Instructor, Professional Member and Co-Chair of the Ethics Chair on the Governing Board.



Eeva Latosuo is Associate Professor in Outdoor Studies at Alaska Pacific University and part time avalanche educator with Alaska Avalanche School. Born and raised in Finland, she has called Alaska home for the last 12 years after sampling other mountain regions in North America. With all her spare time, she trains her operational avalanche dog, Sisu, and drinks strong coffee.



Brian Lazar is the Deputy Director of Colorado Avalanche Information Center. He has worn many avalanche hats over the years, having given up visors to protect his increasingly exposed scalp. He knows that Lynne “manages” his TAR time planning with loving deception, and acknowledges that he needs it. He resides in Carbondale, CO, with his wife and two kids. He is realizing that his goal of keeping up with his kids until they turn 16 is a fantasy.



Jonathan Shefftz lives with his wife and mondopoint-size 19 daughter in Western Massachusetts, where he patrols at Northfield Mountain and Mount Greylock. He is an AIARE-qualified instructor, NSP avalanche instructor, and AAA governing board member. When he is not searching out elusive freshies in Southern New England, he works as a financial economics consultant and has been qualified as an expert witness in state and federal courts.



Heather Thamm has been a forecaster since 2015 for the Chugach National Forest Avalanche Information Center based in Girdwood, Alaska. Previously she was the Assistant Ski Patrol Director for Alyeska Ski Resort where she continues to patrol part-time. In the summers she splits her time as freelance photographer and hiking guide in Southcentral Alaska.

FROM THE EDITOR

BY LYNNE WOLFE

Post-ISSW, my brain is always full. Everything presented there seemed important, so it's hard to come away with discrete conclusions. With time, discussion, and reflection, I acquire perspective and organize my thoughts into coherent messages. My friends and colleagues help with that process, as they have done for you in these pages. In this issue, you'll find a variety of ISSW reports from a range of contributors, to whom I owe a very sincere thank you.

The perspectives come from educators, practitioners, guides, and scientists, who answered a common question "What from ISSW will you incorporate into your practice?" Many of their points are expanded upon in the text; for others, you may need to track down the paper. Look first on MSU's ISSW paper site, <http://arc.lib.montana.edu/snow-science/> By the time this issue arrives in your mailbox, the papers should be posted.

Next, you'll find a selection of presentations and posters that stood out, are referenced in the perspectives, or whose authors provided new versions at short notice. At the top of this list are Jerry Isaak's take on teaching to younger students from the teacher's desk and Emery Rheam's thoughts from the student's eyes (pages 24 and 27). A couple of important posters were selected out of many: Steve Conger's look at accidents during avalanche classes (page 32). Check out his table with illustrative quotes from survey respondents - could you hear yourself saying any of those sentences? Brian Lazar's paper and oral presentation on forecasters translating several scenarios into varying forecasts (page 28) is fascinating to me (and I hope to you), and in my mind it ties in closely with one of the panel topics, Integrating Public Safety Messages, (page 42). Lastly, I included a poster on mentorship, one of my favorite topics, from Eeva Latosuo, Aleph Johnston-Bloom, and myself (page 36).

I enjoyed the conversations among the panelists and with the audience on the panels (beginning page 40); the topics fit my curiosity and made me think. Perhaps some of the quotes will challenge your thinking as well. Other events around ISSW made me proud to be part of this community. The AAA awards were scattered throughout the week, honoring the mentors in our midst (page 10), and a report from the Avalanche Divas (page 44) showcases all women, not just the honorees, in our industry.

Finally, the unquantifiable value of ISSW is the personal contacts with colleagues - hallway conversations that provide the all-important idea exchange that is hurried or electronic during high season. These are impossible to reproduce in these pages. I hope you've been able to achieve a similar level of discourse at one of your local SAW events this autumn, and I hope also that something in this ISSW issue of TAR will engender thought, conversation, or a fresh examination of your own practice for the upcoming season. ▲



LW and AAA President John Stimberis address the crowd at the AAA membership meeting in Breckenridge. Thanks again to Upslope Brewing Company for providing beer. Photo Karl Birkeland

FROM THE PREZ

BY JOHN STIMBERIS

Welcome back to another winter! There's so much going on as we transition from summer to fall. I love seeing the trees change color and the nights get cooler. The Cascades are beginning to get some snow (and rain). My mindset is definitely moving towards snow and avalanches. There's nothing better to help that process than the ISSW. I had a great time in CO and hope you did as well. The AAA Board held a very productive meeting prior to the ISSW, and I think we are continuing to move forward with some really positive momentum. That feeling seems to be shared by many of you as well. I can't begin to thank you for all the positive things I heard from our members and non-members, about the AAA. I am really impressed with the look of the new SWAG, and I can't wait to see the *Snowy Torrents* too!

It isn't just the work that goes on behind the scenes or the look and content of *The Avalanche Review* that makes the AAA what it is. It's you the members who make this association what it is. Over 250 members RSVPd to the general membership meeting, and I find that incredible. I have to think it was more than the offer of free beer from Upslope Brewing that brought you there. Thank you again for being engaged and coming out to meet your fellow members.

If you weren't able to make the ISSW I hope you attended one of the many regional Snow and Avalanche workshops. Not only do these events highlight the scientific and practical approaches to avalanches, but they are great venues to meet your peers, AAA representatives, and fellow members. I get as much from the presentations as I do from meeting each of you.

As we head towards winter I look back on these meetings and workshops and ask myself what new information will I integrate into my program, was there something I came across that will change how I approach avalanches and risk, and finally who will I call upon in the future to help me sort through all this information?

The answers to these questions will undoubtedly add to my experience and help me to be a better professional. I hope you will ask these questions as well.

As always feel free to reach out, and have an awesome winter! ▲



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The AAA Seeks to Grow Philanthropy During Winter 2016/17

BY JAIME MUSNICKI, AAA EXECUTIVE DIRECTOR

With expanded projects and initiatives at the American Avalanche Association in recent years, we greatly appreciate and are asking for your continued support now more than ever. Membership dues only cover a portion of the annual budget of the AAA, so we are reliant on philanthropic donations to help us continue to accomplish our mission of supporting and promoting professionalism and excellence in avalanche safety, education, and research in the United States. The AAA is a registered 501c3 non-profit organization, so your contributions are tax-deductible.

In the last year, your contributions have helped us:

- Maintain the high quality content and production of *The Avalanche Review*, a premier publication that shares information across the avalanche industry in the U.S. and around the world.
- Revive *The Snowy Torrents*, a publication of avalanche accident reports last published over twenty years ago; new volume due to be published early this winter.
- Keep both americanavalancheassociation.org, our professional-focused website, and avalanche.org, the public portal for avalanche information in the U.S., up-to-date with quality, relevant information.
- Provide support to snow and avalanche research through annual research grants for both graduate students and practitioners.
- Support regional Professional Development Workshops across the U.S. with grants (e.g. USAW, CSAW, ESAW, etc).
- Spearhead an effort to create a new framework for avalanche education in the U.S. that includes a professional stream of instruction to improve consistency and professionalism of training across all segments of the avalanche industry. In winter 2016/17, the AAA Pro Training Program will focus on providing Pro Trainer Workshops to help course providers prepare to offer the first public Pro courses in winter 2017/18.
- Organize and run an annual upper-level avalanche course focused on training professionals the AVPRO course- and provide scholarship funds to help pros access this learning opportunity.

Please consider donating to the AAA again or for the first time before the end of 2016! We need your support to continue making a difference for avalanche professionals and the entire avalanche industry. Anyone who contributes \$25 or more before the end of 2016 will be entered into one of our monthly raffles for great prizes from our generous Industry Supporting Partners. Every \$25 increment donated will get you one entry in the raffle - so consider a larger donation for a greater chance at winning!

You can donate to the AAA online by clicking on the "Donate" button on either the AAA website or avalanche.org. You can also send the AAA a check at: PO Box 248, Victor, ID 83455.

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METAMORPHISM

NWAC update from Dennis D'Amico



I'm excited to say the final paperwork has gone through for my position and I have officially been re-hired as a permanent avalanche meteorologist for the Northwest Avalanche Center. Previously I was a temporary employee (Term) whose position expired after four years. NWAC has changed so much in the short amount of time I have worked here, but we realize our work in modernizing and diversifying the center is not done. If there's one thing these last four years has taught me, it's that government works slowly, so be both patient and persistent to foster the change you want.

During the time of my selection (the third forecaster), a selection was not made for a fourth avalanche meteorologist. We are hoping to re-open the fourth avalanche meteorologist position later this Fall. When long time forecaster Garth Ferber retires at the end of 2017, we plan to hire one or more avalanche specialists and drop back down to three avalanche meteorologists. The devil is of course in the details, but we are starting to see the outline of the future NWAC take shape.

CSAS Welcomes Jeff Derry



Center for Snow and Avalanche Studies (CSAS) is pleased to welcome Jeff Derry as the new Executive Director. Jeff's passion for polar regions led him to work as a migrant polar worker, holding positions from Field Camp Manager to Science Technician in Antarctica, Greenland, and North Slope Alaska for 15 years and acquiring specializations including hydrology, meteorology, project management, and field operations logistics. Jeff also spent time as a consultant where he managed ambient air quality monitoring stations in the North Caspian Sea. Jeff returned to academia in 2002 and earned a M.S. in Watershed Science from Colorado State University with an emphasis in snow hydrology. Thesis and post graduate research focused on regional patterns of snow water equivalent, and physiographic influences on snowpack variability, in the Colorado River Basin.

CSAS, established in 2003 by founder Chris Landry, includes the high alpine Senator Beck Study Basin intended to foster new research on mountain snowpack processes and to monitor for climate-driven and other changes in regional mountain snow systems. CSAS is also home to the Colorado Dust-on-Snow program (CODOS), an applied science program serving stakeholders in the Colorado River Basin, which monitors dust in the Colorado snowpack and reports on its implications.

The arc of Jeff's life and career now brings him to CSAS where he draws upon his range of skills and experience to contribute to the future development of CSAS. Please contact Jeff (jderry@snowstudies.org) with any questions you might have, and be sure to visit our website (snowstudies.org) to see the latest happenings at the Senator Beck Study Basin and in the world of dust-on-snow at the Colorado Dust-on-Snow (CODOS) website (codos.org).

Kevin Hammonds Joins MSU



After just recently finishing his Ph.D. in Materials Science and Engineering at Dartmouth College, Kevin Hammonds is moving to Bozeman, Montana, where he will be joining the faculty of the Civil Engineering Department at Montana State University as an Assistant Professor. His plans are to continue to follow his research interests through the study of snow and ice mechanics, ice particle formation in clouds, and ice sheet dynamics. He is very excited to be joining such a stellar (no pun intended) crew of scientists and engineers at MSU and to be afforded the opportunity to work in one of the best snow and ice research laboratories in the world, the Subzero Science and Engineering Research Facility, directed by Ed Adams. After spending a total of six grueling years in graduate school (between the University of Utah and Dartmouth College) Kevin is looking forward to being back out west amongst "his people" and the mountains that he loves. He aims to continue to foster the many fruitful scientific research relationships that have already been established between MSU and the surrounding ski areas, the Gallatin

National Forest Avalanche Center, and Yellowstone National Park.

Previously, Kevin was an avalanche forecaster at Sylvan Pass in Yellowstone, a climbing ranger at Mount Rainier, a member of the Ski Patrol at Park City Mountain Resort, and a member of the Baker River Hotshot Crew. He claims that these were the experiences that not only sparked his academic interests in weather forecasting and snow mechanics, but also provided him the mental fortitude to persevere through graduate school. Collectively, Kevin now holds degrees in Materials Science and Engineering, Atmospheric Science, and Natural Resources Recreation and Tourism. He has published various articles in *Cold Regions Science and Technology*, the *Journal of Applied Meteorology and Climatology*, the *Journal of Glaciology*, *Meteorological Technology International*, and *The Avalanche Review*. When asked if he has plans for any more schooling, he said quite succinctly that he doesn't, but that he does plan to always be a student.

GNFAC Welcomes Alex Marienthal

The Gallatin National Forest Avalanche Center (GNFAC) is pleased to welcome Alex Marienthal as a permanent, seasonal Avalanche Specialist. He will work alongside Doug Chabot and Eric Knoff at the Bozeman, MT center. Alex's position was newly created in the USFS system and he is the country's first GS -9 avalanche specialist that is not an avalanche center director.

Last year Alex worked as an avalanche specialist for the GNFAC through a Cost Share agreement with the Friends of the Avalanche Center. Before this, he worked six seasons on ski patrol at Bridger Bowl, plus five years as the primary avalanche education instructor and then education coordinator for the Friends of the Avalanche Center. In addition to his experience ski patrolling, doing avalanche control and teaching avalanche classes, Alex also received his MS degree in 2014 from Montana State University's Department of Earth Sciences with a thesis on forecasting deep slab avalanches on persistent weak layers. Alex has presented academic work at three snow science conferences and was lead author on four papers as well as written avalanche articles for local and national publications.

Alex grew up skiing and navigating the mountains of Colorado and has skied off mountaintops throughout the intermountain west, Sierra Nevada, Chugach, and Canadian Rockies. Alex can be reached at amarienthal@fs.fed.us.



New Forecasters at the CAIC

Boulder office: Nick Barlow grew up along Colorado's Front Range, chasing his older brothers on skis. His professional career began in 2009 with a helicopter skiing operator in southeast Alaska. He eventually followed his heart back to Colorado, and accepted a position as Snow Safety Director for a small cat skiing operation along the Continental Divide. Nick holds degrees in both English and Meteorology. He describes the latter as his true passion, but still enjoys reading and writing (mostly about the weather). In the summer, Nick works as a private-sector meteorologist, monitoring thunderstorms and urban drainage.



AIARE Welcomes Richard Bothwell as New Executive Director

The American Institute for Avalanche Research and Education (AIARE), a nonprofit organization dedicated to saving lives through avalanche education, has announced that Richard Bothwell has been selected to be its new executive director, effective immediately.

Richard has over 20 years of experience in the guiding and outdoor industry. He lives in Truckee, California, has a passion for snow, and was a co-founder of the Outdoor Adventure Club, a San Francisco based multi-sport guide service. He is an AIARE avalanche course leader, and his company has been an AIARE course provider for several years. In addition, he is an AMGA SPI climbing instructor and PSIA 1 ski instructor. He also volunteers as an adaptive ski instructor at Achieve Tahoe.

For more information, contact Richard at richard@avtraining.org or (530)536-0404.



New AIARE ED Richard Bothwell and AIARE Program Director Ben Pritchett look to be thoroughly entertained at the ISSW banquet on Thursday night. Photo Joe Vandal

CAIC-Eisenhower Tunnel: Ron Simenhois

has worked as a ski patroller and avalanche forecaster in Colorado, New Zealand and Alaska. In addition to his forecasting jobs, he has also collaborated with scientists from the US and Europe on applied research projects. Ron's work includes the development of the Extended Column Test with Dr. Karl Birkeland as well as other avalanche forecasting tools. Ron enjoys spending time outside with his wife and two kids.





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MOUNTAIN WEATHER MASTERS

Joe Ramey, National Weather Service meteorologist and climatologist will soon join the staff of Mountain Weather Masters (Jerry Roberts, Mike Friedman, Denny Hogan, Peter Lev) upon his retirement from NWS on Oct. 1st. MWM surely looks forward to Joe signing his bonus contract and joining the crew.

Roberts said: "even if there isn't work and we're all in the unemployment line we'll have a fine holiday office party at Desperado Estates."



'AVALANCHE AWARENESS' AND 'SNOWMOBILE' GUIDELINES

A Conversation with the AAA Education Committee

INTRODUCED BY JAKE URBAN AND KIRK BACHMAN

As we move toward the home stretch in completing updates and revisions to Guidelines for Recreational Avalanche Training in the US, the tasks of better defining more consistency in 'Avalanche Awareness Level Training' and 'Snowmobile Education' remain. Each of these areas of avalanche education presents particular challenges, given the broad scope of instruction providers serving a variety of distinct audiences across a varied regional landscape.

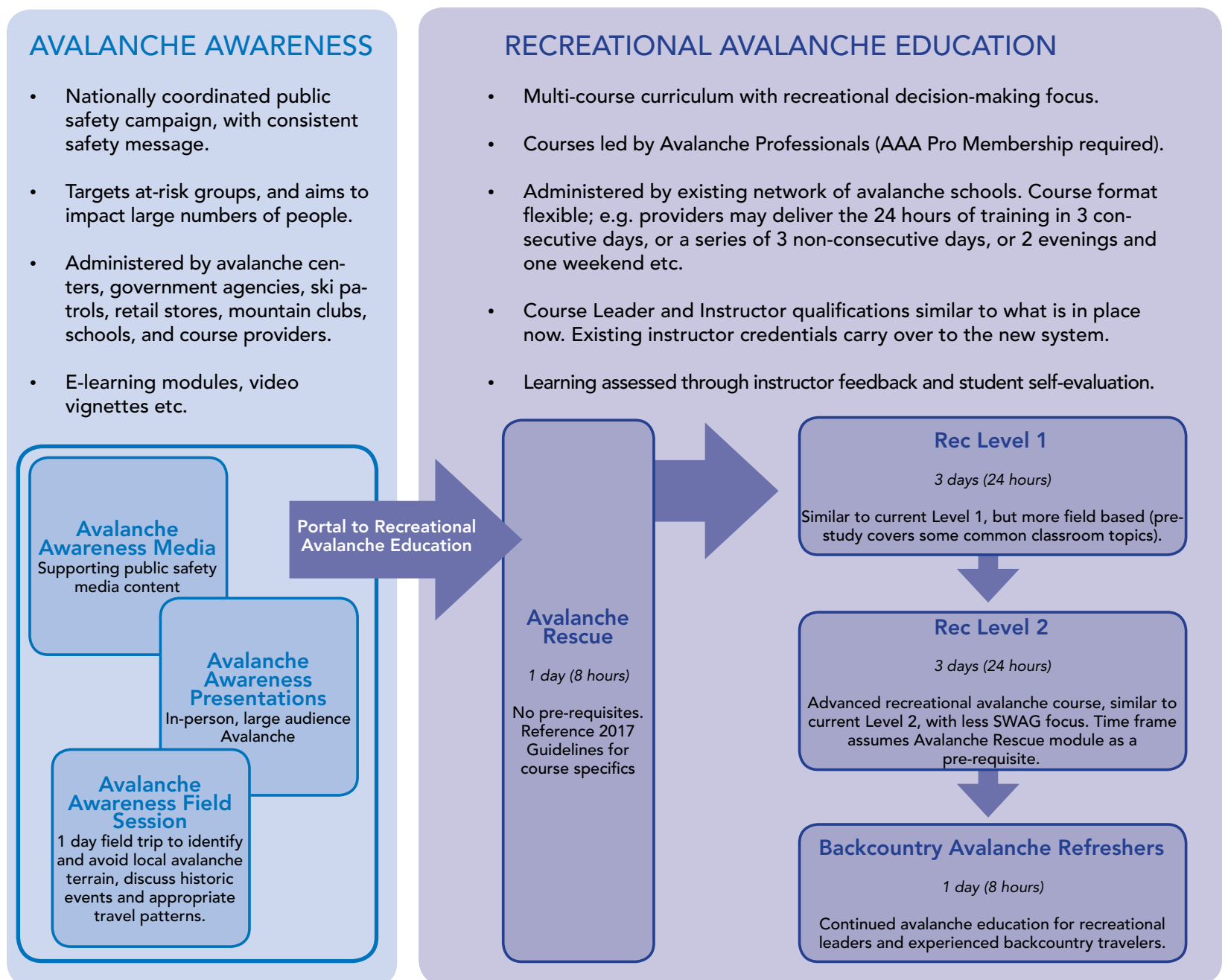
The "snow elephant" in the room is Avalanche Awareness as it currently has no clear identity or message and no consistency in learning outcomes among varied course providers. There are many differing opinions on what an Avalanche Awareness course should look like and what should be limitations of this level of training.

As a starting point, it is worth referencing the existing 'old' guidelines: <http://www.avalanche.org/guidelines.php>

A number of crucial questions arise:

- Do the existing guidelines represent the needs of the entry-level recreational community moving forward?
- Do we need to change the guidelines and outcomes for avalanche awareness education to better suit the modern student? How about distinct Snowmobile Guidelines?
- If there is no need for change, how do we address the inconsistency in the Awareness product so as to not confuse the modern student?

As the Education Committee reconvenes to complete the work of new education flow, we encourage you to contribute feedback and opinions about the future of Avalanche Awareness guidelines and Snowmobile guidelines. Our collaborative approach has served us well on the Pro/Rec Avalanche Education Project. Let's complete the work as an avalanche community. ▲



Linking Avalanche Awareness Programs to the Recreational Avalanche Training Course Stream

Avalanche Awareness course providers play a critical role in communicating to their entry level students the limitations of awareness education and the opportunities for additional recreational avalanche training that provide clear next steps for their students.

CHANGES IN SWAG

BY DOUG KRAUSE

The Snow, Weather, and Avalanches: Observation Guidelines for Avalanche Programs in the United States (aka SWAG) version 3.0 is out and available for purchase on the AAA website. The estate of Pablo Diego José Francisco de Paula Juan Nepomuceno María de los Remedios Cipriano de la Santísima Trinidad Ruiz y Picasso called to congratulate us on the title.

The biggest immediate change you will notice is the new format. Content changes were modest but when coupled with a new format the process was akin to taking a sand castle apart, making a few tweaks, then putting it back together again. Karl Birkeland and Ethan Greene respectively wrote a new Foreword and Acknowledgments. The fantastic graphic design is the product of McKenzie Long's hard work. Blase Reardon made invaluable contributions to the final proofing and, of course, the Observational Standards Committee (Ethan Greene, Karl Birkeland, Don Sharaf, Ian McCammon, Kelly Elder, and Mark Staples) put in long hours hammering out the gory details of what should be changed and how.

We already have a healthy list of items to consider for SWAG 4.0. Updating the photos is a priority. It's remarkably hard to find high quality photos that support the text. I was personally shocked at my own photo collection's dearth of images documenting graduated snow boards. Seriously though, if you have high quality engaging photos of things like weather stations, snow-pack tests, and snow crystals, please send them to myself or the AAA.

SWAG v3 Changes

The following changes were implemented in the Fall of 2016 for the Third Edition.

- The language was improved for accuracy and consistency in the use of "fracture" versus "crack."
- The use of Fracture Character and Shear Quality ratings for the ECT and PST tests is discouraged as redundant information.
- The "+1" caveat in the ECT procedure was eliminated.
- Advice was added to the ECT and CT test procedures regarding removing a failed portion of the column.
- Advice was added to the ECT and CT test procedures regarding removing a wedge of snow from the top of the column.
- Wording indicating that cut length may vary with slope angle was removed from the PST test description.
- The data code VAR was added for describing estimated wind direction as variable.
- The pencil hardness standard was changed to represent penetration of the blunt end of a pencil, not the sharp end.
- Section 2.7 Column and Block Tests sub-headings were reorganized for consistency. "Interpretation" sub-headings were removed.
- There are numerous photo updates.
- The Glossary was revised.
- The Sample Avalanche Hazard Scale for Transportation Corridors was updated.
- The CAIC contact information was updated on the Avalanche Incident Report forms.
- The Stuffblock Test was deprecated. Information on the test is available through the AAA.
- The sample code for Campbell Scientific data loggers was deprecated. It is available through the AAA.
- The riming modifier is now allowed when coding the DF class of surface snow (DFr).
- Many of the Notes were incorporated into the main text
- Numerous figure references were added to the text
- Table and Figure indices were added to the front material. ▲



Doug Krause works as a patroller, guide, educator, and forecaster in Colorado, Alaska, Japan, Argentina, and Chile. Home base is currently Lima, Peru. The commutes are a bitch.

AVALANCHE TECHNICIAN PROGRAM AT CMC LEADVILLE

BY ROGER COIT

LEADVILLE – The highest-altitude college campus in the country is about to have another distinction: a program aimed to better train workers in avalanche country.

Starting in fall 2017, Colorado Mountain College Leadville plans to introduce an immersive program on snow and avalanche safety. Called SWAT – for snow, weather and avalanche field technician – the program, based at the 10,200-foot Leadville campus and taught by respected experts, is a long-term preparatory program for those aspiring to or currently working in and around avalanche terrain.

The Colorado Avalanche Information Center and Colorado Mountain College established a cooperative relationship in 2014 to develop the program's extensive snow science and avalanche curriculum.

"The Colorado Mountain College program fills a niche in North American avalanche education," said Dr. Kelly Elder, a supervisory research hydrologist with the U.S. Forest Service, who worked on SWAT's development team. "The proposed curriculum and program format is a significant departure from any other model and will serve professionals at many levels."

Concurrently, SWAT's training is appropriate for aspiring and working ski patrollers, ski area snow safety employees, transportation workers, rescue technicians, environmental scientists, avalanche forecasters, government researchers and educators. For working professionals, SWAT will provide additional and advanced education and hands-on training. These workers interested in professional development may enroll in individual courses and waive the application process by demonstrating their current knowledge and experience.

For the aspiring avalanche technician, SWAT will offer a certificate of occupational proficiency establishing the graduate's superior level of competence in preparation for a future in snow-related industries. This full certificate program is meant to be completed over two years, involving 21 credits and 500 hours, with both class and field work required. Student applicants must have basic avalanche safety and rescue training, be physically fit, and have appropriate equipment and skill to travel safely in the winter-time backcountry environment.

"This high-elevation facility provides ample opportunity to learn about mountain weather, mountain snowpacks, and avalanche formation," said CAIC Director Dr. Ethan Greene. "It is located near a variety of active avalanche safety programs. The program leverages these resources to help students develop snow science and avalanche safety skills."

For more information about the SWAT program, which is currently pending state approval, contact CMC's Roger Coit at 719-486-4259 or rcoit@coloradomtn.edu, or visit coloradomtn.edu/swat. ▲



SWAT avalanche fracture line: A proposed new program, scheduled to begin in fall 2017 at Colorado Mountain College Leadville, will offer students in-depth training for working safely in and around avalanche terrain, such as here near Monarch Pass, where CMC outdoor studies instructor John MacKinnon holds class. Photo Roger Coit

2016 AAA AWARDS

BY HALSTED MORRIS

My favorite part of being the Awards/Memorial List chairman is getting to present the AAA awards during ISSW. This year at ISSW and the Colorado Snow Avalanche Workshop (CSAW) the AAA was pleased to present six awards. Three were **Bernie Kingery Awards**, two were **Honorary Memberships**, and one was an **Honorary Fellowship Award**.

BERNIE KINGERY AWARD

The American Avalanche Association's Bernie Kingery Award is awarded for sustained career contributions by dedicated avalanche field professionals engaged in avalanche forecasting, mitigation, research, education or safety.

KELLY ELDER

Read by Ethan Greene. Co-nominators: Karl Birkeland, Rod Newcomb, Don Sharaf, Roger Coit.

As a researcher, educator, and mentor to many in the avalanche industry over the past 30+ years, Kelly Elder is clearly a deserving recipient of this award.

Kelly grew up in Wilson, Wyoming, on the doorstep of the Tetons. The Jackson Hole that Kelly grew up in had little resemblance to the upper-crust living found there today. It was more remote, rough, there were cowboys, and no one had yet coined the term "bro-brah". Kelly started skiing shortly after learning to walk. By the age of four he was skiing Snow King without adult supervision. His formative years were filled with mountain activities including skiing, climbing, kayaking, and snowmobiling. His family was featured in a mid 1970s ad for Polaris, with photographs of the Elders traveling a high speeds, in 70s garb, with no helmets and riding sleds off building



Kelly Elder with his Kingery award and his proud family. Photo Halsted Morris

roofs. One notable accomplishment from those years was a ski descent of the Grand Teton in 1976.

In 1977, Kelly moved to Boulder to attend the University of Colorado. Once enrolled at the university, he inquired about the ski racing program. He attended a practice and was offered a full scholarship, essentially walking on to the ski team. Kelly was recently honored as a member of the CU ski team that earned an unprecedented eight consecutive NCAA national championships. Kelly also studied geography during his time in Boulder. He worked as a field assistant for Lee Dexter who was investigating basin scale snowpack variations for his dissertation. He worked with Art Judson and Betsy Armstrong at Colorado Avalanche Warning Center. During these years, time with Nel Caine fed Kelly's love of mountain environments, his natural curiosity, and eventually led him to pursue a graduate education at the University of California at Santa Barbara. He joined Jeff Dozier's team and contributed to their pioneering work on the remote sensing of snow in complex terrain. Kelly gravitated to the field component of this work, and completed comprehensive basin-scale studies of snow water equivalence while earning his MS and PhD degrees. California was nice, but he longed for the mountains of Wyoming and he completed the work on his dissertation in a cabin at "UC Wilson". After some postdoctoral research, Kelly landed a position at Colorado State University. At CSU Kelly continued his research and teaching. He founded a course on snow mountain environments. Kelly's enthusiasm for and knowledge of the subject made it a popular course for graduate and undergraduate students in the Engineering, Natural Sciences, and Natural Resources colleges.

Finding some aspects of university life not to his liking, Kelly left CSU and took a position at the Forest Service's Rocky Mountain Research Station. Since joining the Forest Service he has continued coordinating vast field campaigns to examine the spatial distribution of snow in complex terrain and working with scientists from NOAA, NASA, and JPL on remote sensing applications. Recently he has been working with indigenous people in the Alaskan Yukon and Baffin Island, recruiting local expertise to monitor climate change and provide local communities with tools to examine weather and climate.

Though much of his work has focused on snow hydrology, Kelly has made the time to be a leader in the avalanche arena as well. As early as the mid-1980s he wrote a paper for a conference in Davos, and since then he has contributed to nearly every International Snow Science Workshop. He served as the Paper's Chair for the 2004 ISSW in Jackson Hole, and has served on the ISSW Steering Committee since that meeting. Rod Newcomb recognized his unique teaching skills early on, and tapped him to help with a wide array of American Avalanche Association courses throughout

the years, but especially for all the upper level avalanche classes. Kelly founded Snowmetrics in 1985 and has been building equipment to measure snow ever since. These high-quality instruments are used by nearly every avalanche operation in North America and by scientists around the world.

The list of Kelly's achievements is long, but what truly separates him from the crowd is his humble personality, self-deprecating humor, quick wit, and willingness to call BS on anything and anyone (including his friends) who are not giving their best. Kelly has been a valued mentor to many of those in our community, but especially to those of us who are nominating him for this award. His high scientific standards, his no-nonsense evaluations of our papers and proposals, and his discerning eye always brought out our best work. Kelly's sharp scientific mind as well as the raw joy he exudes on a snowy day in the mountains has inspired us all.

ETHAN GREENE

Read by Scott Savage. Co-nominators: Ed Adams, Karl Birkeland, Kelly Elder, Simon Trautman, Knox Williams.

I met Ethan Greene while ski patrolling at Big Sky, Montana in the early 1990s. Young Ethan yelled expletives when hard slabs cracked beneath him, wasn't afraid to question the status quo regarding policies and procedures, and didn't hold back when "educating" his peers about what they could have and/or should have done differently... who



Ethan Greene shows off his well-deserved Kingery award. Photo Halsted Morris

would have thought this rather colorful 21-year-old would become an outstanding mentor and a driving force in the North American avalanche community?

Before patrolling at Big Sky, Ethan began his avalanche career as an intern at the Gallatin NF Avalanche Center during its first year of operation. Following his time in Montana, Ethan pursued several degrees and worked as an avalanche forecaster at the Utah Avalanche Center. He earned a B.S. in Meteorology from the University of Utah, an M.S. focusing on snow drift formation from Colorado State University, and a Ph.D. from Colorado State University for his work on snow microstructure and metamorphism near crusts. He is coauthor of The International Classification for Seasonal Snow on the Ground and heads the Snow and Avalanche division of the International Association of Cryospheric Sciences. While finishing his Ph.D. in 2005, Ethan took the reins as Director of the Colorado Avalanche Information Center, the largest forecasting operation in the United States.

Ethan's impact on avalanche practitioners is profound. He is the lead author of Snow, Weather, and Avalanches: Observation Guidelines for Avalanche Programs in the United States (SWAG), a document that has increased our collective professionalism immeasurably. Ethan advanced professional avalanche education in Colorado through expanded Colorado Snow and Avalanche



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Josh Rhea and Joe Quinlan at Bunchgrass Yurt, Logan Canyon UT. Photo: Grant Gunderson

Workshops (CSAW) and innovative professional development seminars. Ethan continues to stress and promote operational safety at the CAIC; his work improves the CAIC program and trickles down to countless other forecasting and ski area programs throughout the country. He has written extensively on myriad topics, including avalanche worker safety, deep slab instability, avalanche problems, and avalanche accidents. Currently, Ethan is a Conference co-Chair and the Papers Chair for ISSW 2016 in Breckenridge.

Ethan's staff, colleagues, and many others will attest that although he may give difficult answers to difficult questions, it is usually a sensible, unfiltered, and equitable response. Ethan has obviously grown in the quarter century since his Big Sky days, but he has not lost that drive to question the status quo and move forward. As a community, we can only hope that Ethan continues to question both what we're doing and how we're doing it and offer practical, well-thought-out solutions to the problems and challenges we all face.

DOUG RICHMOND

Read by Bill Williamson. Co-nominators: Randy Elliot, Liam Fitzgerald, Scott Savage and Karl Birkeland.

I met Doug in December of 1974 in the Sierra, he was a self-proclaimed "Avalanche Hunter" and had the t-shirt to prove it. He was one of the elder patrollers on the small crew at Sugarbowl at 21 years old and three years of professional winter experience. He was a second generation patroller; his parents Liz and Howard both being members of the NSP. That's how they were able to get their kids



Bill Williamson reads Doug Richmond's Kingery award citation. These two have been friends since they were young ski patrollers together at Sugar Bowl in the 70s. Some stories can be printed, some can't.
Photo Karl Birkeland

on the slopes in the early days back in Montana. Doug spent some time competing and even today it doesn't take much for him to jump into a "racer pose" that he maybe once did 50+ years ago.

Even at the early age of 21, Doug was a teacher, leader, and mentor. He immersed himself in the natural sciences and would immediately pass on what he learned with an excited energy. While working at Sugarbowl in the winter he was attending Dartmouth the remainder of the year, graduating in '75. In the winter 75-76

he had moved to Colorado where he patrolled for a couple seasons, and then returned to Montana. There for almost the past 40 years he has received his Masters at MSU and been an integral part of the Bridger Bowl Ski Patrol and Avalanche Control Programs.

Through those years he has inspired hundreds of his peers and now the young and newer generations of patrollers and avalanche workers. Currently as the Patrol Director at Bridger, an educator, and frequent participant in workshops he shares his observations and knowledge. Industry wide he has left his impression with thought provoking presentations, representing the "peanut butter and jelly" members of the American Avalanche Association as the organization's vice president, and his frequent contributions to *The Avalanche Review*.

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Doug's continuing influences to our industry span over the past 45 years identifying him as the consummate recipient of the AAA's Bernie Kingery Award. And as an industry we can only hope that Doug will continue to inspire, educate, and mentor even more up and coming "Avalanche Hunters."

Honorary Membership Award

The American Avalanche Association's Honorary Membership award is the highest award bestowed by our organization. It is given to a person who has distinguished themselves by special achievements throughout their career in the field of snow avalanches.

DAVE HAMRE

Read by Jim Kennedy. Co-nominators: Karl Birkenland, Reid Bahnson, Dan Howlett, Mike Overcast and Matt Murphy.

As an avalanche forecaster, mentor, educator, consultant, and researcher for the past 45 years, Dave Hamre is clearly a deserving recipient of this award.

Dave's avalanche career began at Alta Ski Lifts in the early 1970s, where he became the Snow Safety Director for the small team of ski patrollers keeping the mountain safe for the public. After Alta he soon made his way to Alaska, landing the Snow Safety Director position at Alyeska. In 1981 he started with Alaska Railroad as their avalanche technician, a job he has held ever since. In that position he is responsible for all facets of the avalanche program, including forecasting, control, rescue, and logistics. In addition, he has worked

to install the latest avalanche detection technologies to assist his program.

Dave has contributed to the broader avalanche community in many ways over his long career. He has completed avalanche consulting projects across Alaska the western U.S. The number of projects he has worked on and the folks he has worked with is too long to list, but includes studies on highways, ski area, mines, pipelines, railroads, and more. Most recently he has been working with the Colorado Avalanche Information Center helping them to assess their highway avalanche mitigation program. He has served as a board member of the Avalanche Artillery Users of North America Committee, contributed to International Snow Science Workshops since before they were called ISSWs, and served as the Chair of the highly successful 2012 ISSW in Anchorage that featured a field trip on the Alaska Railroad.

Dave has also played an integral and influential role in the rise of the Alaska heli ski industry. Dave started a friends heli ski club in the 1980s that eventually evolved into Chugach Powder Guides,



AAA Honorary Membership awardee Dave Hamre embraces ISSW mascot "The Weiner." Keep your hands where we can see them, Hamre. Photo Scott Savage

which he owned and led for 12 years. Dave was also the first avalanche forecaster for the World Extreme Skiing Championship, a job that was a natural fit since it required onsite mitigation with helicopters and explosives. He approached avalanche problems with tact and firepower, yet always in appropriate balance to overcome the challenge. In times of low hazard, Dave could be found pioneering steep descents throughout the Chugach and Alaska Range and creating ski circuits for the helicopter operations. There are none better you'd want to be with in the mountains: even if he does like to say "You go first" when you're standing at the top of 4000 feet of never before skied Chugach vertical.

The respect that the Alaskan avalanche community can be summed up in a short story from Matt Murphy, who has worked at Alyeska, the Chugach National Forest Avalanche Information Center, and Alaska Department of Transportation:

"There are lots of pieces to the avalanche puzzle that a forecaster needs to pay attention to...Hamre adds another element to the environment around Girdwood that everybody should add to their list for making avalanche forecasts. I learned that you can tell a lot about avalanche conditions just by listening to train horns. It might be calm and sunny today, but if you hear a rapid rush of coal trains heading to Seward or freight trains heading to Whittier the day before a storm, then you know that Hamre is thinking that he is probably going to bury the tracks with at least a class 3 avalanche tomorrow. If you don't hear any train horns throughout the day, then that's a good time stay the hell away from avalanche terrain. Lastly, if you are hiking up on a ridge at Turnagain Pass on that first clear day after a storm and you hear those muffled



Don Sharaf (left) and Drew Hardesty (center) pulled a classic bait-and-switch on Ian McCammon (right), asking him to help present an award to Don when in fact it was Ian's Honorary Membership award.
Photo Krister Kristensen

sounds of artillery over near Spencer Glacier, then you better factor that into your decision making process because it means that Hamre is still a little uncomfortable about avalanche conditions. As a DOT forecaster, hearing normal train traffic was like music to my ears."

The list of Dave's accomplishments is a long one. However, what really separates Dave has been his mentorship to many in the avalanche community. This is especially true for the folks in Alaska, where he has mentored so many and has inspired the next batch of avalanche pros just by being a great guy to talk to and to share ideas with. Given all of the above, we hope that the AAA Governing Board agrees with us that Dave Hamre is a deserving recipient of the Honorary Membership Award.

IAN MCCAMMON

Read by Drew Hardesty. Co-nominators: Don Sharaf, Marco Johnson, Lynne Wolfe and Sarah Carpenter.

Ian earned a PhD in mechanical engineering at the University of Utah and worked in the robotics division at the University of Utah designing sensory systems for robotics and aerospace systems for organizations like NASA and the Department of Defense. On a lark, Ian enrolled on a NOLS Winter Outdoor Educator course in January 1994 where a significant part of the curriculum included avalanche safety. Ian became a NOLS field instructor that same year. The rest, as they say, is history. By applying an engineer's understanding of the physical world, a statistician's zeal for hard

data, a psychologist's understanding of the human element, and a skier's love of the mountains, Ian has influenced our understanding of these ideas through numerous peer-reviewed papers, keynote speeches, and the dynamic presentations he is known for. Of particular importance are his research projects in snow structure and human failure, for which his acronym checklists FACETS, ALPTRUTH, and LEMONS remain a foundation for decision-making, communication, and education across North America. But let's be clear in understanding Ian's motivations. His motivations have never been about making a name for himself, climbing the corporate ladder, or powder skiing. Ok, maybe that last part is true. Fundamental and central to his work was giving people the tools they need so they might enjoy the winter mountain environment, and do so safely. So that they might enjoy powder skiing and return home at the end of the day. It is impossible to quantify the number of people who have not perished in avalanches due to Ian's research and his impact on avalanche education and methodology; however, what we can say is that Ian has affected a sea-change in the way in which we talk not only about snow, but about ourselves.

For his long record of accomplishment in North American avalanche-related activity, the American Avalanche Association is hereby presenting Ian McCammon with an Honorary Membership, our highest award and distinction.

Honorary Fellowship Award

This award is presented to people who have made significant contributions to avalanche-related programs in countries other than the United States, and who have communicated their work to those of us in the U.S.

ALEC VAN HERWIJNEN

Read by Karl Birkeland. Co-nominators: Ned Bair, Ron Simenhois, Ed Adams, and Dan Miller.

We nominate Alec van Herwijnen for the American Avalanche Association's Honorary Fellowship Award. Not only has Alec made contributions in the field in other countries, but he has also collaborated directly with avalanche scientists and practitioners in the U.S. on many of his projects.

Alec has contributed a great deal to our avalanche knowledge even at this relatively early stage of his career. He did two Master's Degrees (in Experimental Physics and Meteorology) be-



Alec Van Herwijnen was a co-author on every paper in the first ISSW session on Avalanche Release, and co-author of three of the four papers in the second Avalanche Release session. Photo Karl Birkeland

fore moving to Canada to work on his PhD with Bruce Jamieson. Following his work with Bruce he landed postdoctoral research positions at SLF and Montana State University before securing a permanent position at SLF as a Research Scientist and the Team Leader for the Avalanche Formation group.

Alec has worked on a number of topics, including avalanche detection, snow metamorphism, and the snow micropenetrometer. Some of his early work formed the groundwork for the development of the Propagation Saw Test. Alec is best known for his pioneering work utilizing Particle Tracking Velocimetry (PTV) to analyze snow fracture. In the decade or so since he started this work with his dissertation, he has utilized PTV to expand our scientific knowledge and understanding of fracture mechanics, fracture speed, how stability tests work, and crack face friction after fracture, among other topics. The videos from his and his collaborators' work are widely used in both scientific talks and avalanche education courses worldwide.

In addition to his scientific work, Alec has also worked to develop tools for practitioners. As an example, he pioneered the use of time-lapse photography to track wet avalanches and glide crack expansion. These tools can now be used by avalanche forecaster to aid in their predictions.

Alec is easy going, open, and a good communicator. He has worked with a wide array of scientists and practitioners from the U.S. and around the world. His work has expanded our knowledge in many areas related to avalanches, and has helped inform and transform the way our community looks at avalanche release. We look forward to continuing to work with Alec – and to hearing more about his research – in the years to come.

On behalf of the American Avalanche Association it is pleasure to present these awards and congratulations to each of the recipients. ▲

The awards were made by Lisa Issenberg of Kiitella custom inspired awards.



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USING A MECHANICAL ADVANTAGE FOR COMPACTION

BY MIKE SCHNEIDER

Compaction of early season snow in a continental climate can be very helpful in creating a solid foundation for future snow to bond and build on. Compaction of this shallow faceted snowpack can be dicey at best, boot packing and ski packing can be a dangerous and time consuming proposition.

One answer to this question is to use a mechanical advantage, the "winch roller," which is basically a modified farm implement lowered via gravity and a winch cat onto avalanche terrain, to disturb and compact the shallow snowpack. The roller is raised or returned to the top of the slope or path using the power driven cable of the winch cat.

The winch roller has its origins at the Telluride Ski Area in southern Colorado. The current version we are using was built by a very creative builder, Mark Bosse of Norwood, Colorado. Mark has had a hand in modifying some of the early rollers built in and used at Telluride Ski Area, and continues to improve the design and functions of the roller.

The current model we are using at Winter Park Resort, CO is a three-wheel unit which is remotely steerable using a backpack-sized remote. Our roller also has a clutch drive system so we are able to propel it across lower angle terrain allowing the winch cat to remain above or well back of starting zones in relatively safe area.

The width of the roller is 9' and weighs approximately 1,000 pounds. Using the roller in a cirque, above treeline it is able to bust through moderate windslab and break up softer cornice as it rolls into a path and as it is pulled back up through the cornice on the return, something boot packing alone would not be able to accomplish.

One or two patrollers and one winch cat operator are able to compact one of our typical paths in a couple of hours while staying out of harm's way. This typically would take a couple of days using patrol manpower bootpacking, not to mention exposing patrollers to injury walking on rocks and uneven terrain lurking under the shallow snowpack or taking a ride in a slide. The safety factor alone makes the roller a good choice for compacting early season snowpack, but it also frees up manpower for other projects.

We will soon be starting our third season using the roller, we continue to find out where and when to use it and where we can't use it. The roller doesn't completely eliminate bootpacking as we are not able to get into all our starting zones, but it does give us a big advantage in a number of areas allowing the bootpacking crews to concentrate on other areas. Monarch Ski Area has been using a similar roller for a few years and recently A-Basin and Copper Mountain purchased winch rollers to use this season. We look forward to sharing our knowledge base with our neighbors and learn from them as we all become more versed with the winch roller's possibilities. ▲



Winch roller compacting avalanche terrain Winter Park Resort, Winter Park, CO.
Photo Mike Schneider



Components of a winch roller operation.
Photo Mike Schneider



Winch roller compacting avalanche terrain Winter Park Resort, Winter Park, CO.
Photo Mike Schneider



Mike Schneider is a 30-year patroller at Winter Park Resort where he is currently the Snow Safety Coordinator. He admits that working in a continental snow climate never gets boring. He was recently elected to the AAA Board as the Rockies Section Rep.

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Log	Comments	E-3	E-3	Dist	Dist bearing	Ang	Units	Time	
HRF11	Waynes Sub	400 1500	3160	0	~	~	~	~	
HRF1	Col du Noyettes	400 1500	3160	0	123	N	23	5	
HRF2		400 1500	3160	0	146	E	176	10	
HRF3	Base NE Ridge Point McCh...	400 1500	3160	0	2	146	30	2	
HRF4		400 1500	3160	0	19	174	NE	2.4	35
HRF5	Col d' l' Eveque	400 1500	3220	110	7	120	N	1.9	30
HRF6	Top break lower	400 1500	3220	90	16	78	E	2.4	15
HRF7	Base NE Ridge La Jange	400 1500	2930	250	14	66	NE	4.2	10
HRF8		400 1500	2930	110	17	98	NW	3.9	60
HRF9	Col du M. Brule	400 1500	3130	110	15	~	SW	1.23	20
HRF10	Base E Ridge Point de l'...	400 1500	3130	100	6	11	E	1.6	10
HRF11		400 1500	3130	130	~	~	~	~	25
HRF12		400 1500	3130	130	~	~	~	~	16.3
HRF13		400 1500	3130	130	~	~	~	~	4.1
HRF14		400 1500	3130	130	~	~	~	~	3
HRF15		400 1500	3130	130	~	~	~	~	1
HRF16		400 1500	3130	130	~	~	~	~	2.7
HRF17		400 1500	3130	130	~	~	~	~	.9
HRF18		400 1500	3130	130	~	~	~	~	8.3
HRF19		400 1500	3130	130	~	~	~	~	3.4
HRF20		400 1500	3130	130	~	~	~	~	4.9

Mount Washington, Tuckerman Ravine

A TRULY NATURAL AVALANCHE TRIGGER, MARCH 9, 2016

BY JONATHAN S. SHEFFTZ

As an avalanche safety course instructor, one of my longstanding pet peeves has been the classification of avalanche triggers as artificial versus natural. By contrast, the distinction we really intend to convey is whether the trigger was external versus internal. So when this past season I witnessed a “natural” avalanche, first of course I basked in my self-congratulatory satisfaction from a tour plan that had kept us clear of the runout. But then I immediately wondered what internal change within the snowpack had occurred up to that precise moment to upset the precarious balance that had previously kept the snow in place.

I posted the video and some pictures to my skimo race series Facebook Page (www.facebook.com/NERandoRaceSeries). Avalanches are quite common in the New Hampshire’s Presidential Range, and Mount Washington’s Tuckerman Ravine in particular is under almost constant scrutiny from our USFS avalanche center snow rangers for their micro-scale forecast. Yet video and pictures of avalanches in progress have remained relatively elusive there.

Fortunately my post also prompted some collective sleuthing with my 2004 Level 3 classmate David Lottmann, now an AIARE Level 2 Course Leader for Eastern Mountain Sports Schools. He compared my picture taken after the avalanche with one he had taken the prior weekend while teaching an avalanche course. Hmm....



Intrigued, I searched around and found the first picture shown here, taken by the USFS avalanche center only the prior morning, March 8. Note the ice configuration with three prominent fingers, identical to the picture that David had taken a few days earlier. Those same fingers are seen, somewhat off-center and partially out of the picture frame, in the close-up of a picture I took only several minutes before the avalanche I saw the morning of March 9.

The third picture here was taken several minutes after the avalanche. The crown line to the looker’s left is from an earlier avalanche. The March 9 avalanche clearly starts higher up, and directly below an ice formation that ... well, let’s take a closer look at the fourth picture, which is the same but zoomed in more.

Yes, directly above the highest point of the crown line, two of the ice fingers are broken off now yet were fully intact only several minutes before the avalanche. So the answer to my question as to what internal change occurred in the snowpack is ... nothing! Although the avalanche was “natural” in the sense of not being triggered by human actions, the trigger was external to the snowpack, the same as with a skier, explosive round, etc. (Now admittedly, I was looking away at the exact moment that the avalanche was triggered. However, given the very short time frame from when photographic evidence shows that the two big ice fingers were still intact to when the avalanche was triggered yet when the ice fingers have since broken off, an “external” trigger in the form of the ice fingers is the overwhelmingly likely candidate.)

And finally, the fifth picture is cropped more tightly and rotated 180 degrees so as to provide a succinct summary of our 2016 “winter” that wasn’t. Thanks Mother Nature (sarcastically so), and back at ya! ▲



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LEFT: The first session begins with the big guns as conference chair and session chair Ethan Greene introduces SLF Director Jurg Schweizer for his talk on Avalanche Release. Photo Joe Vandal
RIGHT: Thanks and congratulations for hard work and top-notch outcome to the ISSW 2016 Organizing Committee. Left to right: Will Barrett, Scott Toepfer, Becs Hodgetts, Hunter Mortensen, Susan Hairsine, Heather McGonegle, Duke Barlow, Brian Lazar, Spencer Logan, Aaron Carlson, and Ethan Greene. Photo Joe Vandal



ISSW



ABOVE: Usual suspects on the Group W bench outside the posters hall. (Arlo Guthrie and Alice's Restaurant- go look it up!) Photo Christine Pielmeier
BELOW: Beer is an ongoing theme at ISSW. The 2016 organizing team is to be commended for smooth logistics (meaning plenty of beer) for an unprecedented 1100 delegates. Photo Joe Vandal





LEFT: Jake Hutchinson, AAA Certified Instructor rep, AAI instructor, and ace photographer, mans the AAA table. *Photo Joe Vandal*
 BELOW: The Weiner gets around. Here he is flanked by Suz and Knox Williams on the left and Roland Emetaz, better known as Mr Em, on the right. *Photo Tom Murphy*



ABOVE: Janet Kellam of the National Avalanche School and Karl Birkeland of the National Avalanche Center share a moment at one of the socials. *Photo Christine Pielmeier*
 LEFT: At the ISSW banquet Chris Davenport talked about risk tolerance and decision-making in his quest to ski all the Colorado 14-ers. In this photo, conference delegates peruse Chris's coffee table book, *Fifty Classic Ski Descents in North America*. *Photo Joe Vandal*
 BELOW: A candid shot of long-time CAIC forecaster Scott Toepfer. *Photo Joe Vandal*



**perspectives,
 presentations,
 panels, and
 people.**

from a guide

by aaron diamond

With snow in the mountains and ISSW wrapping up a few days ago, I have been thinking a bit about how ISSW will affect my behavior in the mountains. During the winter I wear three different (but similar) hats, an educator, a splitboard guide, and a recreational splitboarder and climber. This was my first ISSW. Although there were a few head scratchers, there were also excellent reminders/reinforcements, a couple things that I'm excited to try to put to use immediately/as soon as possible, and a couple bits that I'm looking forward to experimenting with and see if they fit into my system or not. There also were numerous presentations I found extremely interesting (Schweitzer, Birkeland, Damian Jackson, Reuter, etc) but not particularly relevant to my current place in the avalanche industry. The following list is in no particular order.

- Jonathan Spitzer presented on "Applying and Communicating our Operations Working Memory." My take-away from that presentation was that when dealing with a difficult or uncommon snowpack, I should do more to seek out and record information from the old guard. Ideally this will also increase face to face conversations as well. (Spitzer)
- Numerous presentations (Carpenter, Deighton, Rheam) spoke towards educating a younger avalanche student. They highlighted some of the difficulties, benefits, and strategies for reaching a younger audience. I am going to work on making my classroom presentations more interactive and presenting the core info early (and also in a conclusion)
- Russ Costa presented on "The Interface of the Snow and Human Sciences." I hope to introduce more deductive reasoning with a focus on eliminating uncertainties in my snowpack observations (And hopefully make better, more timely decisions as a result). For example, if I have seen propagation on a specific layer at X location and I find the same layer at Y location it is reasonable to assume its possible to see propagation at Y as well and I can focus my time on other layers and interfaces. The Wason Selection Task will also make its way into my classroom presentations.

WASON SELECTION TEST

What card or cards do you need to turn over to test the rule: *If there is a K on one side there is a 2 on the other*



answer: the K and the 7

- Todd Guyn of CMH presented on "10 Common Missteps of Avalanche Practitioners." As a reminder, his list has been written in the back of my field book next to FACETS and a few other checklists. Unfortunately, it lacks a cool acronym. (See TAR 35.3 or 4 for thoughts from Todd Guyn.)
- Ron Simenhois presented a phone application that calculates the critical slope angle for release. I'm typically a little bit skeptical of anything that needs a selfie stick but I'm excited to experiment with Simenhois's app. (It isn't available yet) The idea of incorporating friction into our snowpack and terrain assessment seems like a natural progression. Hopefully (in the near future) with this tool, we can reduce some uncertainty in our assessment of instability.
- I'm going to start using Whiterisk.org as a reference tool, or take home refresher for Level 1 courses. (Harvey)
- Alec Van Herwijnen presented on "Particle Tracking Velocimetry: a practical method for measuring mechanical properties of snow relevant for dry-snow slab avalanche release." Although spending time to use PTV currently doesn't fit well in my profession I did manage a couple takeaways. The biggest one being that with PST results with critical crack lengths I'll start using a longer column to better represent the transition to crack propagation. ▲



Aaron Diamond lives in Jackson Wyoming. He works as an avalanche educator and splitboard guide in Alaska and Wyoming.

When he is not working you can find him wandering in the Tetons or planning ski trips he can't quite afford.

from an educator

a merging of theory and practice

by bruce engelhard

The Conference lived up to every expectation I had. With this being my fourth ISSW, as in the past the potential to be overwhelmed by all the information continued to be a real issue. Yet my incoming awareness for this possibility appeared to help me to be able to get the most out of the Conference as a whole. Attending this Conference is like going to a good mystery movie where you sit back and allow the story to be told, and as it progresses, it all appears to come together and make more sense. The subtitle, a merging of theory and practice, speaks directly to the varied content presented. Just attending this Conference allows you to broaden your understanding and knowledge base on subjects within your comfort zones, as well as opening new doors and perspectives on subjects I would have never been exposed to otherwise. In addition, the opportunity to network with other avalanche practitioners can help your professional performance along with offering an opportunity to connect with old friends.

As a full time avalanche educator and part-time guide, the presentations that directly addressed these particular needs always pique my attention. Jerry Isaak's presentation on Social Media and Decision Making offered new insights on connecting with the millennial generation. Though I have always utilized technology and social media in my curriculum, the idea of totally accepting this obsession and incorporating social media more fully into my Youth Specific Classes was a gem. The message & video presented by Mary Clayton on the Rescue at Cherry Bowl stands out as the premiere piece I look forward to incorporating into my classes. The community involvement and awareness portrayed in her video spoke of hope, success, and the importance of practice, training and action in a seemingly impossible companion rescue situation. I will definitely be using her video in my future classes. And finally, the house was brought down by Jackson, Wyoming, teenager Emery Rheam's presentation on Teenagers in the Backcountry. Once again, understanding your audience's needs is the emphasis that we as educators need to focus on, and adjust/customize our classes so we can truly connect. I regularly teach teenagers and young adults, and I walked away from this lecture with both affirmations on my teaching techniques as well as gaining ideas and insights for even deeper connections.

Other particular interesting presentations from the research side of things included Karl Birkeland's The Effects of Increasing Load on a Weak Layer. We all continue to be challenged attempting to identify the properties and realities of when the slab comes to a critical level. Birkeland's illustrations creating a cohesive/consolidated slab were a highlight on Day 1. Throughout the conference, innumerable presentations spoke of the importance of the Critical Length of Crack Propagation, both studied by PSTs as well as modeling. Of note, Johan Gaume and Jurg Schweitzer's presentations on Avalanche Release 101 and Critical Length the Onset of Crack Propagation stand out. Bruce Jamieson was of course one of the other "Big Hitters" in this ISSW as his presentation on Measuring Snow Surface Temperature provided invaluable insights on what appears to be an evolving methodology of practice to be utilized by all field practitioners. Kevin Hammond's Investigating the Thermophysical Properties of Ice and Snow Interfaces displayed more compelling evidence of an overall change in how practitioners will continue to look at this phenomenon.

More importantly, the way these two presentations worked together to build on each other speaks to the way the overall conference was constructed. Each section appeared to be extremely well thought-out, allowing for a progression of information to tie together concepts and theories. Conference co-chairs Will Barnett and Ethan Greene deserve immense praise for putting together the best ISSW I have ever attended.

In the end, the privilege of sharing five days with the world's most prominent snow and avalanche practitioners allowed us all to widen our horizons, develop our strengths, and minimize the gaps within our personal limitations and weaknesses. What a great way to spark our coming season!

Finally, I'd like to note that the conference ended with Doug Chabot giving the final presentation; his humanitarian efforts represent the ultimate power and potential of avalanche work, which can truly be international in scope. ▲

Understanding your audience's needs is the emphasis that we as educators need to focus on, and adjust/customize our classes so we can truly connect.



Bruce Engelhard has worked as a guide for Utah Mountain Adventures and White Pine Touring since 1996, teaching avalanche education and backcountry travel in winter months and rock climbing in the summer. He has taught individuals from 4 to 80 years young...though he admittedly loves the opportunity to connect with the younger ones who are just getting going on their quests for mountain adventures. Bruce has also worked as a ski patroller, avalanche technician, and forecaster for the Utah Department of Transportation, Brighton Resort, Alta Ski Resort, and the Solitude Mountain Resort. He has been living and skiing the in Wasatch Range for over 30

years, compiling over 3000 days of backcountry travel and skiing. In 2006 Bruce completed a Masters in Social Work from the University of Utah, and he is now also a Licensed Clinical Social Worker. His dream is to combine his passion for travel, play and educating in the mountains with his new found profession of counseling. He calls this idea: "Walk and Talk."

from a young practitioner

by sean zimmerman-wall

The late evening light reflects off of the quaking aspen leaves as I roll into Breckenridge, Colorado in early October. The air is crisp and the mountains are devoid of snow as I return to a place that set the tone for my future as a skier over 15 years ago. Back then I was here to enjoy spring break skiing with my dad, now I am here to join in a gathering of the tribe of professionals from around the globe to share ideas. Walking into the reception hall the first evening I see a swath of new faces, interspersed with many I know so well. My colleagues, friends, and mentors are all here for various reasons and representing various positions and operations. But the common thread that binds us together in this colorful tapestry is the desire to increase our awareness and knowledge in an effort to benefit the collective whole. We are a proud bunch, strong willed, and discerning; however, we realize that there is always room for improvement and lessons can be learned from all of those in attendance, young or old.

One look at the program for this year's ISSW reveals a wide array of subject matter and presenters from differing backgrounds. The schedule is packed with interesting topics and I feel overwhelmed at how to manage to find the time to take it all in. Bumping into Bruce Tremper of the Utah Avalanche Center, I share my predicament and his wise words of wisdom help me focus my energies on things that will benefit me personally and professionally. Moving forward I cull through the list and develop a game plan that will maximize my opportunity to attend presentations that resonate most with my positions as a patroller, guide, educator, and business owner.

Dropping in on the panel discussion on Avalanche Worker Safety Strategies, I listen to the captivating conversations between professionals from North America. Their perspectives strike a chord with me as I reflect on situations in my own career that changed how I approach situations where uncertainty or hubris has affected my judgment. Margaret Wheeler-Farmer from the AMGA provokes thoughtful questions about how individuals (guides) make decisions versus how operations (patrols/forecasters) plan and act. Bill Nalli of the Utah Department of Transportation echoes this sentiment as he relates the story of a solo-worker fatality within his own operation. The panel formulates ideas on improving the understanding of complex tasks and abstract ideas by promoting a cultural shift toward better information sharing amongst professionals, addressing over-confidence, and slowing down in our daily duties. Craig Sterbenz of Telluride Ski Patrol sums it up best as he describes the simple acts of accepting personal responsibility for every action and taking pride in the work we do.

The topic of worker safety certainly applies to all practitioners and is an underlying theme throughout the week. A multitude of the oral presentations and posters delve into maintaining operational memory and the transfer of knowledge from generation to generation. Clearly, a shift is occurring in the demographic of snow professionals and it is paramount that tools are developed for sharing info about past events and experiences so history doesn't repeat itself. Accidents are already widely documented, but it is the near misses/close calls that need to be brought into the spotlight and mulled over. It seems this type of database is in the works and will serve as a great way to explore what went into certain decisions and how the ever-present human factor played a role in the outcome. Again, a cultural shift toward de-stigmatizing missteps and learning from each other's mistake is the only true way towards progress. Fostering the engagement of young professionals in daily meetings is one

method guide operations and patrols use to ensure the collective conscious of the group is shared. Clear communication strategies and discussions on using the appropriate tools and techniques for mitigation or logistical movements is another tactic that can be employed to reduce exposure and overall risk.

As the momentum of the week builds, my internal compass draws me towards discussions on avalanche education. Being involved in the AAA's Pro/Rec Project allows me to understand various needs of different user groups and the importance of targeting a message based on the audience. In mountain communities like Jackson Hole, teachers from

the local high school are partnering with local guides and educators to build a program to address the growing population of youth using the backcountry. Adapting the current curriculum to engage the younger participants in unique ways is proving effective and speaking to them on their level is critical

to continued success. The mentors in the program take a personal interest in the exploits of their pupils and realize that many are getting out into big terrain and producing content worthy of a Teton Gravity Research film reel. Instructors have also realized that empowering the students with decision-making tools is better than promoting complete abstinence from the backcountry.

The evolution of avalanche education in a dynamic social landscape is essential to keeping the populous (pros and joes) safe while pursuing objectives in the backcountry. Several presenters throughout the week hit on key aspects of developing methods for reaching user groups in ways that relate to their respective worldviews. Emery Rheam, a 16-year-old student from Jackson Hole Community School addresses the crowd and follows up on the topic of teaching youth. Her research speaks to a variety of points, including the psychological processes a teenager uses in decision-making. Impulsiveness and susceptibility to peer pressure are major

factors in how young people act during certain situations. On a basic level, Rheam implies that there is a way that avalanche courses can be tuned to better fit the minds of adolescents. Further research by people outside our industry adds depth to the conversation. Studies highlighting how the omnipresence of social media affects how people behave in avalanche terrain, as well as links between snow and human sciences are intriguing. The perspective these folks bring to the table is refreshing and the incorporation of new and differing ideas raises questions of how we can benefit from each other's work as time moves on.

Merging theory and practice is the concept of ISSW and the creative collaboration of all those involved made this conference a pivotal piece of my professional development. I walk away with more questions than answers, but am inspired by the work that is being done. For the 2016/2017 season and beyond, I am excited to employ some of my new knowledge, follow-up on connections made at the workshop, develop closer relationships with my co-workers, and cultivate a culture of open discussion amongst professionals and recreationists as we continue the "ascending spiral." ▲

Sean Zimmerman-Wall continues to work with the AAA on a variety of projects for the Pro/Rec split and spends a majority of his time in the mountains of Utah with his young family. In the summer, he heads south to Argentina to guide for Patagonia Ski Tours and keep his snow skills sharp.

Clearly, a shift is occurring in the demographic of snow professionals and it is paramount that tools are developed for sharing info about past events and experiences so history doesn't repeat itself.



Setting up the blind in LCC. See top of page 47 for results.
Photo Adam Naisbitt



from a rescuer

by jake urban

I arrived at the main presentation hall of the 2016 ISSW in Breckenridge and sighed out of relief after I ran into TAR editor Lynne Wolfe. We chitchatted for a few minutes and I escaped without a TAR assignment. Five minutes into the first presentation, my phone vibrated in my back pocket notifying me of a text. Sure enough, the text read, “Can you write me an article on how ISSW affects your practice?”

“Yup,” I replied. I then thought to myself, I guess it’s time to do what I came for, merge theory into practice... a simple concept that often is not as seamless or easy as one might perceive.

The first session at ISSW was titled Avalanche Release and included four sequential presentations on the mechanics of avalanche release. Each implemented the Propagation Saw Test (PST) and touched on subjects such as critical cut length, changing properties of the slab, and dizzying physics. By the end of this session I found myself reflecting on the Breccia Peak area near the Continental Divide, northeast of Jackson Hole where our instructors teach avalanche education. We too have found the PST to be quite effective in this fickle snowpack, helping us identify propagation propensity in weak layers protected by overlying hard slabs after not being found by the Extended Column Test (ECT). Even before ISSW I had begun to draw my own correlations between seasonal trends and our PST results and translate that into ways to better teach slab development and weak layer failure.

After ten years of teaching on and around Breccia Peak our JHOLI instructors are beginning to understand that area’s snowpack trends. This perspective, both seasonal and historical, is often what our students are lacking, so we attempt to communicate these trends by presenting a to-date seasonal weather history correlated with pit profiles and avalanche events. During the ISSW session on Avalanche Release, I began to realize the greater potential and teaching power of tying snowpack test videos, weather, snow profiles, and avalanche events into the seasonal snowpack history summary for better student comprehension, simplifying the correlations between seasonal trends in the weak layer, changing properties of the overriding slab, and the effects loading has on the weak layer. While developing a more robust understanding of snowpack trends we make the field observations more relevant for the students while engaging visual and technology based learners. Joining data and video will help us showcase column test for what I feel they were intended, showing instability trends over time as opposed to a “go” or “no-go” decision-making tool, a powerful outcome of this multi-media approach.

While the sessions and presentations are too exhaustive to list individually, I was continually reminded that our practice truly is art. While desired outcomes are the same across avalanche education curriculums, our methodology and pedagogy often vary greatly. A host of presenters showed their varied approaches to educational design.

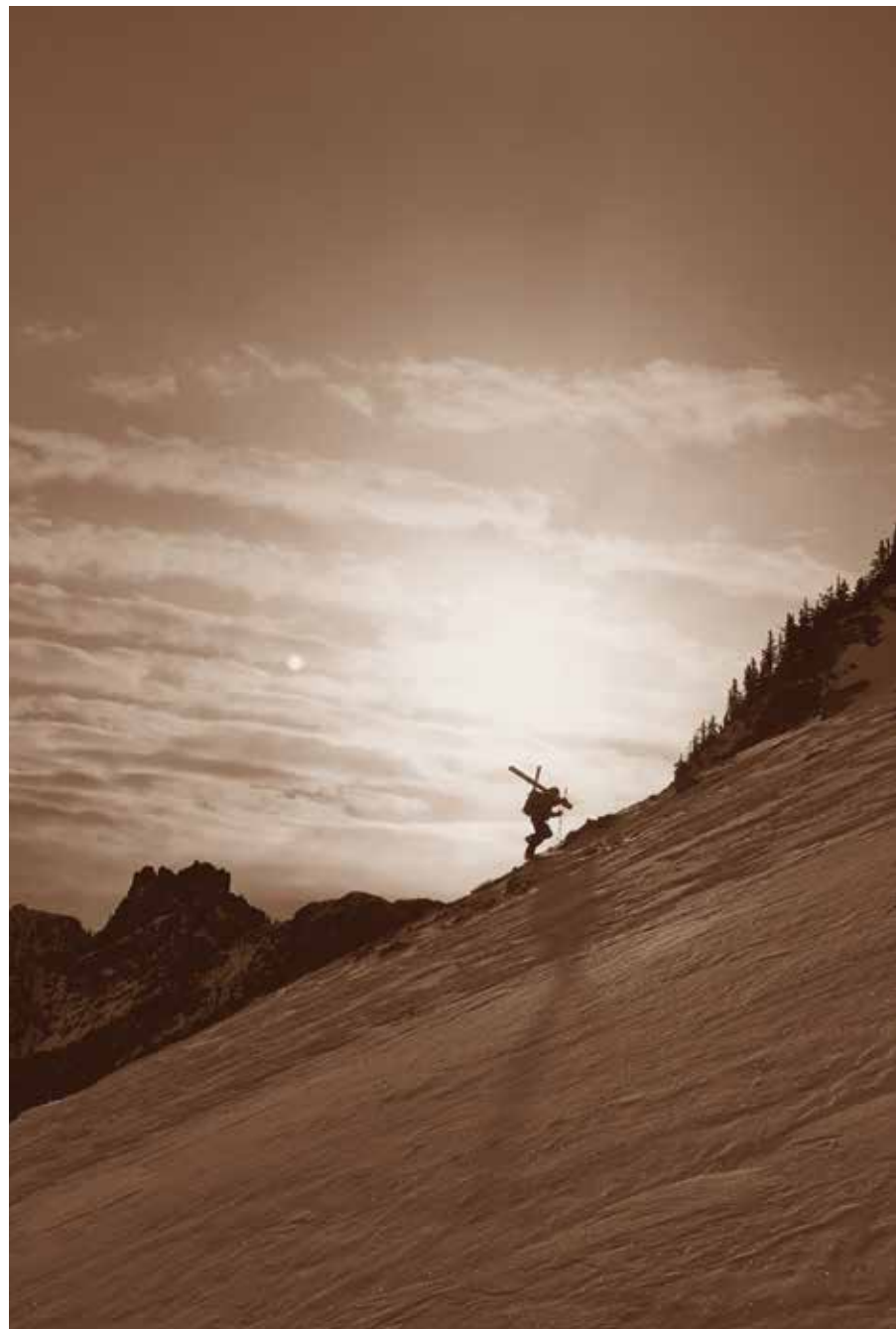
This last bullet was of particular interest to me in my role as a medical provider and rescuer. I have always been a proponent of Basic Life Support as a minimum training for backcountry enthusiasts. I was happy to see some formal recommendations being made for medical training. I feel this is a big step in the holistic training of companion rescue, filling a void in rescuer training for post burial treatments for avalanche victims. This simple presentation was one that encourages me to keep doing more medical training with my avalanche students.

So, how did ISSW 2016 Breckenridge affect my practice? Profoundly... I have plenty of work ahead of me because of it. As the snow is beginning to pile up in the Tetons, I am already in the process of developing a seasonal history that is multi-media based and identifying different places in the curriculums of Level 1 and 2 where it is appropriate to implement. I will be giving a talk on Post Burial Treatment Options for the Avalanche Victim on Nov. 16th at the Teton County Search and Rescue Hangar.

So while the mission of ISSW is explicit, a merging of theory into practice, I feel it is often a significant challenge to do so in a direct manner. While the way research affects my practice is not always direct, it gets the juices flowing in a way they never would without the outside influence of the greater industry. A challenge that our students, colleagues and touring partners depend on us to engage in- the engagement of lifelong learning. ▲

A few of my favorite educational posters were:

- Nerf Ball Avalanche Rescue Training by Halsted Morris a unique approach to summer time beacon training. You simply package a beacon inside of a Nerf football. Once packaged, chuck it and go search for it. I look forward to implementing this as an off-season training for keeping search and rescue personnel sharp during the summer months.
- How Beacon Parks Fail in Practice by A. Desjardins, S. Greenberg and J. Hamblen: This poster recognizes what beacon parks don’t address. In short, you need training to be able to have a good training in a beacon park.
- Post Avalanche Rescue and Injury Protocol at the Recreational Level by Karl R. Geisler



Dave Richards storms the Castle. Photo Adam Naisbitt



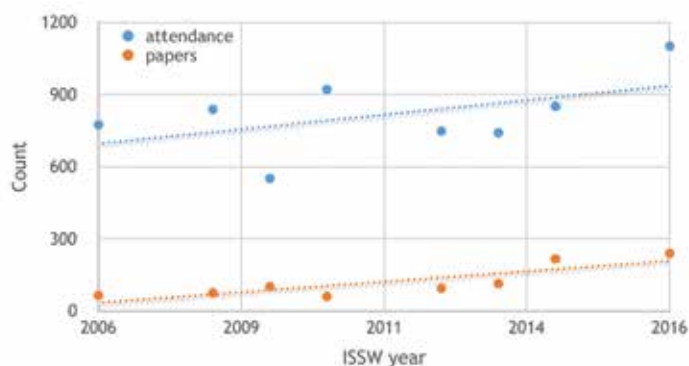
Wilson, WY resident Jake Urban is a husband, business owner, educator, rescuer, snow practitioner and board member & co-chair for several organizations. When he’s ignoring his responsibilities you can find him somewhere in the Tetons doing what the conditions suggest.

from the scientists

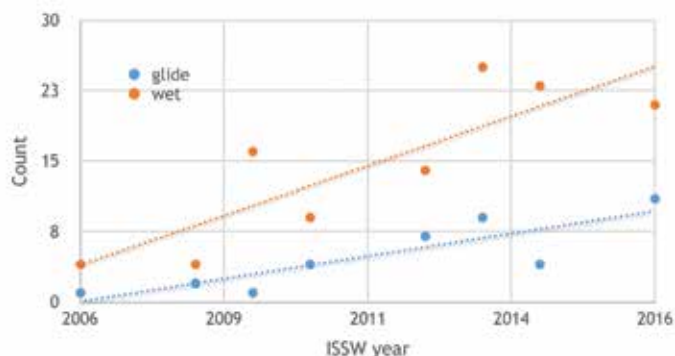
by ned bair

- ISSW set a record for attendance and number of papers, continuing a trend of increasing attendance and number of papers submitted over the past 10 years!
- The rate of increase in the number of papers with “glide” or “wet” in the title or abstract has increased more rapidly than the rate of number of papers submitted. It’s yet another sign of our rapidly warming climate. In south central Alaska, 62 days with glide activity were recorded last winter (2015/16), a record (Johnston-Bloom et al., 2016), prompting the apt keyword “message fatigue.”
 - Gaume et al. (2016) introduced a new model that combines the strengths of shear and collapse models and overcomes some of the previous snow fracture model limitations.
 - There was extensive research on the Mountain Hub’s SP2 penetrometer (Berbenni et al., 2016; Hagenmuller et al., 2016; Marshall, 2016; Pielmeier and van Herwijnen, 2016). From the validation studies (Hagenmuller et al., 2016; Pielmeier and van Herwijnen, 2016) using the Snow Micro Penetrometer (SMP), a research grade penetrometer, the SP2 was shown not to be a research grade instrument. Compared to the SMP, the SP2 had poorer repeatability, coarser resolution, a persistent failure to identify subtle hardness differences in soft layers, and biased layer depth measurements. Alternatively, the SP2 is something like 20X less expensive than the SMP, easy to use, and able to record coarse stratigraphy rapidly, making it a useful tool for users who are aware of its shortcomings.
- Novel snow and avalanche instrumentation and associated techniques were introduced including: a laser scanner on an unmanned aerial vehicle (Prokop and Singer, 2016); thermal infrared imaging for crowd and avalanche control in Little Cottonwood Canyon UT (Saurer et al., 2016); radar to measure glide rates (Skrede et al., 2016); and operational radar systems for avalanche detection (Long et al., 2016; Steinkogler et al., 2016), including integration with an automated road closure system in Zermatt, Switzerland (Meier et al., 2016).
 - Limitations of dial stem thermometers in snow pits were hammered, calling their utility into question. A study on the use of thermal infrared thermometers to measure snow skin temperature, which dial stem thermometers cannot do, was presented (Jamieson and Schirmer, 2016). Another study (Hammonds and Baker, 2016) highlighted dial stem thermometers’ coarse vertical resolution at crust/snow interfaces.
 - An innovative application of time-lapse photography was used to estimate the number of victims in an avalanche on Saddle Peak in MT (Saly et al., 2016).
- Doug Chabot (Chabot and Kaba, 2016) ended the workshop with a humanitarian theme by talking about his work setting up manual weather stations and avalanche warning services in central Asia. Christian Jaedicke remarked that these were real problems versus the “luxury problems” covered by the rest of the workshop. ▲

ATTENDANCE & ABSTRACTS



“GLIDE” OR “WET” IN THE TITLE OR ABSTRACT



Large glide avalanche on Heavens Peak in Glacier National Park (GS-N-R4-D3.5-G). The slope angle is approximately 22 degrees with the debris estimated to be 10-20' deep, running 4000+ vertical feet over a significant portion of dry ground. This was one of the last large natural avalanches we saw in the 2016 GTSR spring opening season, where historically high temps and lack of overnight freeze became the norm. Photo Jake Hutchinson

References

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Ned Bair, Ph.D. is a snow researcher at the University of California, Santa Barbara. He's also spent time as a ski patroller, guide, and avalanche consultant. When he's away from his beloved equations, he enjoys getting out in the mountains via skis, climbing, or running. By the time this is published, he hopes that his faith in the electorate will have been confirmed and he won't have to explain to his daughter how the worst nominee in history was elected President.

by jeff deems

- It's great to see that with years of effort and creative science we are inching closer to a unified fracture mechanics model
- Benjamin Reuter simulated the spatial variability of fracture initiation and propagation ... we can now start to explore how these two patterns relate and coincide (or not), and help make our concepts of stability patterns (and thus danger ratings) more robust
- from Alec Van Herwijnen's PST work: soft slabs need steeper slopes to overcome friction and slab erosion

by chris mccollister

Several presentations explored various remote sensing techniques to acquire information about the snowpack. These techniques are either passive or active. A passive method just collects ambient electro-magnetic radiation, which could be either pictures in the visible light range or infrared images. Active methods emit a laser beam, and the resulting reflections are captured and analyzed.

Jeffery Deems et. al. continued his work using terrestrial based LiDAR (Light Distancing And Ranging) to analyze pre and post avalanche reduction results. This is an active technique. LiDAR uses the same concept as range finders. A laser beam is emitted from a device, and the time from emission to the collection of the return is measured, which allows a distance to be calculated. When using a LiDAR scanner, this technique can be applied to a large area, and a topographic surface can be created. He used this technique to map out areas of loading before avalanche reduction work by creating a snow surface map prior to and after snowfall events. When the pre snow depth map is subtracted from the post snow depth map, the accumulation of the new snow can be mapped across the study area. The avalanche control crew were able to take this information to specifically target areas that had significant loading, and bypass areas that did not have loading. Similarly, a pre and post control map was generated to see avalanche reduction results. This information was not simply which slidepaths released, but also the depth and volume of the avalanche events. They also used this technique to map out snow depths in an area that has historically been closed. By obtaining snow depth patterns across the area, they were able to use this information to proposed new avalanche reduction methods for terrain scheduled to be opened in the future. Alexander Prokop and Florian Singer presented a similar laser based approach by mounting a scanner on UAV, and analogous information could be calculated.

Damian Jackson, along with coauthors Mark Saurer and Bill Nalli, used thermal imaging to obtain information for avalanche reduction in Little Cottonwood canyon outside of Salt Lake City, Utah. Control work often happens in the early morning hours when it is still dark. Using this passive technique, they were able to determine if Dawn Patrollers (very early morning backcountry travelers) had bypassed checkpoints and were in target or runout zones. Skiers and riders were easily seen in the dark, and if they were in areas where avalanche reduction efforts would cause harm, the mission could be altered. This technique also allowed the avalanche crews to see rounds as they traveled through the air and confirm detonation. They could even see resulting avalanche events by the heat signature of the warmed bed surface.

Another passive technique was employed by Michael Conlan and Dave Gauthier. Using a software package called Photoscan Pro, multiple photographs can be combined to produce a snow surface. This process is called photogrammetry. Similar to LiDAR, pre and post snow surfaces can be compared, and the resulting loading or avalanche events can be mapped and analyzed. This technique has pros and cons. The main limiting factor compared to other methods is that these pictures can only be taken in the daylight. Stormy conditions or flat light also inhibit this process. On the upside, this is a relatively inexpensive technique which uses standard cameras. This technique could even be used to gather information about past avalanche events if numerous pictures were taken.

The take home message for all of these techniques is that technology is rapidly enabling snow professionals to acquire data that was previously not possible. Using basic photographs and photogrammetry, backcountry and snow professionals alike can now gather information about avalanche events. Even if one does not have the software or expertise to analyze avalanche photos, very useful information can be extracted in the future if multiple photos are taken. And, these techniques will likely become cheaper and more refined. ▲

Chris McCollister has been forecasting for the Bridger-Teton National Forest for the past 10 seasons. During this time he also was a forecaster for the Jackson Hole Mountain Resort. His interest in snow science began in the mid 1990s when he was a ski bum between undergraduate and graduate school. He received his masters degree from Montana State University in 2004 where he developed software that incorporated GIS to analyze historic weather and avalanche data.



effective education crosses generational boundaries



by jerry isaak

One of the most engaging presentations at this year's ISSW in Breckenridge was given by a 16 year old high school student from Jackson Hole. The presentation, titled "Teenagers in the Backcountry: a Study of Use and Education from the Perspective of High School Students", was delivered by Emery Rheam with impressive poise and the fluency of a true subject expert. Her presentation, along with several related talks, generated significant discussion in media articles and among conference participants on questions of generational difference, particularly related to the use of technology and social media and the implications for avalanche education. In the articles and informal discussion there is general agreement that younger generations have profoundly different life experiences than previous generations. These differences appear to have a notable impact on avalanche education and the way in which people encounter avalanche terrain.

The question posed to me for this edition of TAR was: *Considering the generational differences, how might avalanche educators most effectively deliver courses for Millennials and future generations?*

The current generation of college students is certainly different from their parents' generation. They have been raised with technology which was part of the black and white science fiction movies their parents watched as children. They can Google virtually anything they want to know and receive hundreds of thousands of pieces of information in response in only seconds. Societal and technological change has been so rapid that the gulf in generational life experience is possibly greater than at any point in history.

The role of the instructor is primarily to design a challenging learning environment where participants feel a sense of control over their education, work collaboratively with others, and receive quality feedback separate of any judgment of their efforts.

However, despite enormous changes and difference between generations, research shows that effective education crosses generational boundaries. High quality teaching and learning environments appear to have the ability to transcend popular culture and connect with learners at an elemental, human level.

This has been true in my experience both as a teacher and learner. My best teachers, regardless of the generation they teach, have all seemed to apply common principles in pursuit of student success. I've attempted to apply these principles in my own practice as a college-based educator and I've distilled them here for the context of avalanche education:

1. Educators are critical to the learning process; now get out of the way!
2. People learn best from the process of addressing problems; so start with problems not answers.
3. Terrain, terrain, terrain.
4. If you meet the Buddha on the way slay him.

1 Educators are critical to the learning process; now get out of the way!

One of my professors in graduate school at the University of Edinburgh, Scotland told me how, before leaving his home every morning, he would ask himself, "Am I teaching today? – (if yes) have I left my ego at home?" He repeatedly reminded himself to take a conscious step back from the center of the learning environment and direct focus towards the creation of a learning community. It can be tempting for instructors to indulge the "sage on the stage" model, particularly in content-rich subjects like avalanche education. However, effective educators recognize that their role is not primarily as lecturer, but as designers of learning methods and environments. This is critical work, which requires skill and effort, but it also requires humility on the part of the instructor and a willingness to accept uncertainty in the learning process. Educational research indicates that learning is not simply "cumulative and linear" but is rather "a nesting and interaction of frameworks." Instructors within these nesting frameworks depend less on simplistic models of input, process and predictable outcome and depend more upon the complex



and sometimes messy process. The focus is on the learner in the process, not on the instructor or their abilities, accomplishments or ego.

2 People learn best from the process of addressing problems; so start with problems not answers.

One of my favorite quotes is this:

Questions are just as important as answers. Science is a way of asking more and more meaningful questions. So try to learn some answers, because they are useful and interesting, but don't forget that it isn't the answers that make a [snow] scientist, it's the questions. (Ames & Wyler, 1961).

Avalanche education is directed towards developing emerging snow scientists, at least in the sense that the goal is to develop an informed, but ultimately questioning, critical mindset among students. Not coincidentally, highly effective education happens when learners are engaged with questioning problems, not simply receiving answers.

According to the research of Professor Ken Bain, people tend to learn most effectively (in ways that make a sustained, substantial, and pos-

itive influence on the way they act, think, or feel) when:

- They are trying to solve problems that they find intriguing, beautiful, or important;
- They are able to do so in a challenging yet supportive environment in which they can feel a sense of control over their own education;
- They can work collaboratively with other learners to grapple with the problems;
- They believe that their work will be considered fairly and honestly;
- They can try, fail, and receive feedback from expert learners in advance of and separate from any judgment of their efforts. (*What the best college teachers do*, 2004, page 108-109).

The good news is that avalanche educators have a key head start: “solving” the avalanche problem is critically important to the future of the students in avalanche education courses. This means that the role of the instructor is primarily to design a challenging learning environment where participants feel a sense of control over their education, work collaboratively with

others, and receive quality feedback separate of any judgment of their efforts.

3 Terrain, terrain, terrain.

Learning environments in avalanche education begin and end with terrain. There is simply no substitute. When in doubt, bring students with you to encounter terrain and to question the overlying snowpack. Beginning with the “problem” of terrain/snowpack allows for generative learning but requires high levels of skill and effort from the instructor. Classroom-based content is important, but should be focused on allowing students to ask better informed questions of the terrain/snowpack.

It requires humility on the part of the instructor and a willingness to accept uncertainty in the learning process.

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Early morning problem solving in the Tien Shan Mountains, Kyrgyzstan. Photo Jerry Isaak

4 If you meet the Buddha on the way slay him.

Regardless of which generation one is teaching, there are no silver bullets for educators. Only continued pursuit of learning and growth will allow for sustained excellence in teaching. To paraphrase Gandhi, “The way is the goal, the goal is the way.” To help readers on their way I’ve included some of the texts which have been most influential in my own growth as an educator.

Adventurous Learning: A pedagogy for a changing world (2016). by Simon Beames and Mike Brown.

This elegantly written, accessible text advocates for four critical elements of highly effective learning environments: authenticity, uncertainty, agency, and mastery. The intersections of mountain guide/avalanche educator/outdoor instructor/educator aren’t usually well defined. What is always present however, is place, which is the literal and cultural terrain that we work in. I was, and am, challenged by the ideas in this book, especially because I enable and encourage my students to take expeditions far from their local “place”. I suspect the themes and approach of this book may resonate with you too.

Adventure Sports Coaching (2015). Edited by Matt Berry, Jane Lomax and Chris Hodgson.

Though primarily focused on motor-learning and skill acquisition, this is the first book to link contemporary sports coaching science with adventure sports practice.

Creating Significant Learning Experiences: An integrated approach to designing college courses (2013) by L. Dee Fink

This is the seminal text on course design in higher education, with extensive application to avalanche education courses for students of all ages.

Make It Stick: The science of successful learning (2014). by Peter Brown, Henry Roediger III and Mark McDaniel.

If you read one book on this list, make it this one. This book is written by a storyteller who was told what to write by two cognitive scientists; it is empirically-based and highly readable. I learned a great deal from this book and, more importantly, have been applying these lessons in my own practice. ▲

Jerry Isaak is an Associate Professor and Chair of the Department of Expeditionary Studies at the State University of New York in Plattsburgh. His research interests are in the areas of outdoor education, social influences on risk tolerance levels and decision-making, and educational expeditions. His favorite place to conduct research is on mountains while skiing. He can be contacted at jerry.isaak@plattsburgh.edu



teenage avalanche education: a view from the inside

by emery rheam

Growing up in a mountain town provides a childhood like no other. For many kids this upbringing means learning to ski at a very early age. By the time these kids are teenagers they are often better skiers than most of the adults they know and their passion for the sport is second to none. As teenagers they also tend to be willing to take pretty big risks as they venture beyond the resort boundaries and into the backcountry. Unmitigated avalanche terrain is easily accessible given their location and abilities. So what's the problem? Well, in most cases, an adolescent's skiing ability and access to terrain far outmatches their avalanche education. I am a teenager and have many friends who fit this description perfectly. A little over a year ago I became aware of this gap between education and skill. There was not one clear event that led me to this conclusion. I think it came from talking with my peers and watching the videos and pictures they posted on social media that featured themselves jumping off cliffs or skiing steep terrain in the backcountry. I decided that I wanted to do a project that looked at my peer group's use of the backcountry from our perspective.

I started by conducting Internet surveys of teenagers in mountain towns, particularly focused on high school-aged kids. I garnered a lot of responses from my hometown of Jackson and then looked at other communities. I got responses from all over the western United States – and even a few from Canada. The first part of my survey looked at how frequently teenagers are using the backcountry. I pretty much knew the answer to this question before I started – a lot. I gained responses from over 150 teens, of whom 75% used the backcountry. While their personal levels of usage range – roughly 30% recreate in the backcountry 1-5 days a winter while over 15% are using it over 20 days – it is clear that teens are getting out and about in avalanche terrain. It is also important to note that teens are participating in a wide range of activities from skiing to snowmobiling.

The survey also looked at what teenagers carry with them in the backcountry, who they travel with, their personal experiences with avalanches, and their education levels. However, the key component and the goal of the survey was to look at how avalanche education can be better improved to fit the teenage demographic – a demographic that is starting to make up a large percentage of backcountry users. Questions on the survey asked teens for ideas for improvement in the area of avalanche education. Their answers, combined with some other research, boiled down to a few things that can be done to better educate teens.

The areas for improvement are as follows: cost, logistics, age-specificity, information and preparation on decision-making, emphasis on experience, and potential use of phone application. Cost is a big deterrent for teens wanting to obtain a solid



Dan Verbeten of AAI gives an animated field-based avalanche lesson to a group of high school students. Photo courtesy AAI

75%
recreate in the backcountry

30%
use the backcountry 1-5 days a winter

15%
use the backcountry over 20 days a winter



"So how many taps will make this column fail, team? What's your prediction?" Photo Keely Kelleher

avalanche education. A potential solution to this problem is to create more scholarship opportunities for teens to take avalanche courses as well as have more schools realize the value of this education and provide it as part of their curriculum. Most teenagers are kept pretty busy with school and extracurricular activities, so courses are logistically difficult for them. Many survey respondents suggested that implementing avalanche education as part of a class at school would make participation much easier. Many teens reported that they feel awkward or out of place in courses with adults. They thought that they might learn better in a course designed specifically for teenagers. Courses like this could also be different than

adult courses, especially in the area of decision-making. Neuroscientists have shown that due to their levels of brain development, teenagers make decisions in different ways than do adults. Teens' decisions tend to be more impulsive and their processing of risk is not as in depth as in adults. Rules of thumb are sometimes frowned upon in the avalanche community because every backcountry situation is different. However,

due to teens' decision-making methods, easy-to-follow and clear-cut decision-making rules may be exactly what teens need. Emphasis should also be placed on the importance of exploring the backcountry with a well-trained adult or mentor and not just a group of friends with little to no education. Teens are also very good with electronic devices like smartphones. Some answers to the survey suggested implementing phone applications into courses. I recognize that there are some drawbacks to this because cell reception is not always available in the backcountry and phone batteries die. However, it is something to look into in today's technology obsessed world. I recognize that these suggestions are fairly basic but they could very easily be implemented into educating teens and would really benefit this current age group.

Many teens are and will continue to use the backcountry, regardless of whether or not they gain a good education, so the responsibility now lies in the hands of schools, avalanche professionals, athletic coaches, parents, and the high schoolers themselves to make sure this demographic gets educated. It's not just about educating teens; however, it's about changing education strategies to more effectively reach them and change their behavior. ▲



Emery Rheam is a junior at the Jackson Hole Community School. She was born and raised in Teton County, Wyoming. She is both a competitive ski racer and soccer player and absolutely loves spending time in the mountains. Her avalanche project includes these passions and comes from a desire to accurately represent her peers in the avalanche world.

north american avalanche danger scale: do backcountry forecasters apply it consistently?

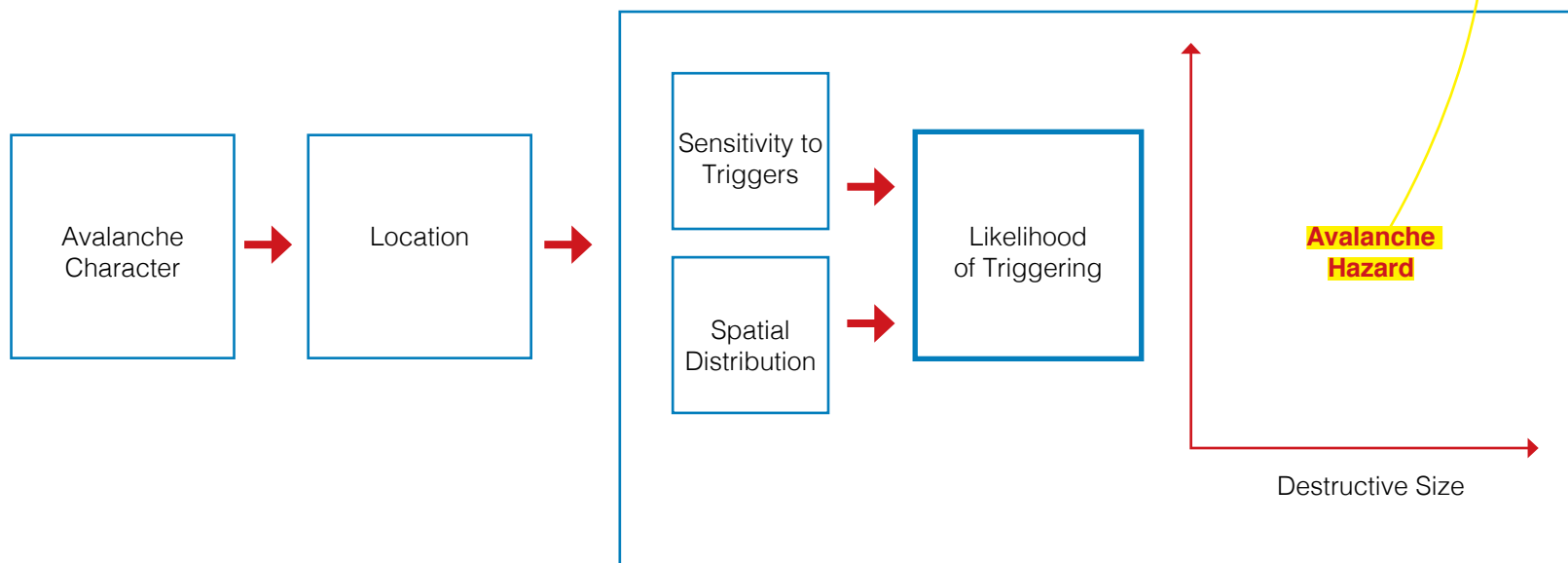
by brian lazar, simon trautman, mike cooperstein, ethan greene, and karl birkeland

The North American Avalanche Danger Scale is a tool used by backcountry avalanche forecasters to communicate the potential for avalanches to cause harm or injury to backcountry travelers. Danger ratings are the most basic component of the public forecast, providing the foundation for more nuanced descriptions of avalanche conditions. In 2010, the United States, Canada, and New Zealand adopted a consistent, five-tiered danger scale. Although widely used, we do not know how consistently the danger scale is applied both within and between avalanche forecasting operations. To address this question, we developed ten scenarios capturing a variety of avalanche conditions at the mountain range scale. We derived the scenarios from real avalanche forecasts issued by various avalanche centers throughout North America. Avalanche forecasters in the United States, Canada, and New Zealand reviewed each scenario and assigned a single danger rating for the forecast period. Results indicate that although most respondents choose ratings within one step of each other, individual forecasters can arrive at different conclusions when presented with identical information. Additionally, it appears that there are regional and/or cultural differences in how forecasters assign danger ratings.

North American Public Avalanche Danger Scale				
Avalanche danger is determined by the likelihood, size and distribution of avalanches.				
Danger Level		Travel Advice	Likelihood of Avalanches	Avalanche Size and Distribution
5 Extreme		Avoid all avalanche terrain.	Natural and human-triggered avalanches certain.	Large to very large avalanches in many areas.
4 High		Very dangerous avalanche conditions. Travel in avalanche terrain <u>not</u> recommended.	Natural avalanches likely; human-triggered avalanches very likely.	Large avalanches in many areas; or very large avalanches in specific areas.
3 Considerable		Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential.	Natural avalanches possible; human-triggered avalanches likely.	Small avalanches in many areas; or large avalanches in specific areas; or very large avalanches in isolated areas.
2 Moderate		Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify features of concern.	Natural avalanches unlikely; human-triggered avalanches possible.	Small avalanches in specific areas; or large avalanches in isolated areas.
1 Low		Generally safe avalanche conditions. Watch for unstable snow on isolated terrain features.	Natural and human-triggered avalanches unlikely.	Small avalanches in isolated areas or extreme terrain.

Safe backcountry travel requires training and experience. You control your own risk by choosing where, when and how you travel.

the current conceptual model for forecasters



the research method

A digital survey was sent to professional backcountry forecasters in the US, Canada, and New Zealand. A total of 68 backcountry forecasters, or more than two-thirds of the total population completed the survey.



the exercise

The following 10 scenarios depict a variety of avalanche conditions at the mountain range scale. They are based on real avalanche forecasts from around North America, but the place names are fictional. Although each is titled by date, the date does not imply pertinent information about the scenario.

In each scenario, you will be given:

- Recent weather (48-hours prior)
- Today's weather (24-hours following)
- Snowpack context and data
- Reported avalanches (over the previous 7 days)

Today is Monday, it is 6:00am, and you are forecasting for the next 24-hour period. Your job is to issue a single danger rating for each scenario. Use the highest danger rating you think will be reached in the next 24-hour period.

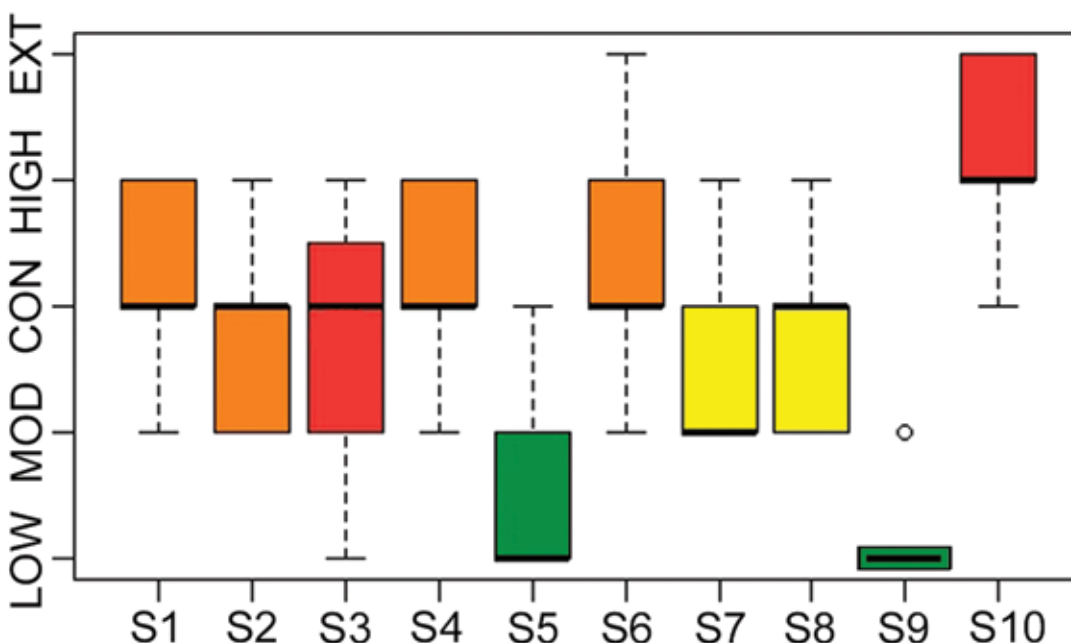
See two example scenarios on the following page.

You can find the entire survey here:
<https://goo.gl/forms/G95PhtBQNj11Cs4B3>

the results

- No scenario had a single danger rating.
- 90% had a spread of ≥ 3 danger ratings.
- 2 scenarios had a spread of 4 danger ratings
- the location on the danger scale spectrum had little influence on the spread of ratings.
- In all but S3, the most commonly selected danger rating matched the actual forecast danger for that day.
- Most forecasters assigned danger ratings similar to one another and to the original forecasted danger level.
- Most forecasters assigned one of two adjacent danger ratings (73 to 98% of total responses).
- Of the 13 operations with 3 or more respondents, 10 of them (77%) had at least one scenario with a spread of three danger ratings.
- All 7 of the operations with 4 or more respondents had at least one scenario with a spread of three danger ratings.

A Comparison Across All Scenarios



Summary of danger ratings for all respondents (n=68). The box represents the interquartile range, the dark horizontal line marks the median value, and the whiskers represent the range excluding outliers. The circle indicates an outlier (defined as more than 1.5 times greater than the upper quartile). The color corresponds to the actual danger rating assigned on the day from which the scenario was derived.

presentations & posters

the scenarios

scenario 3

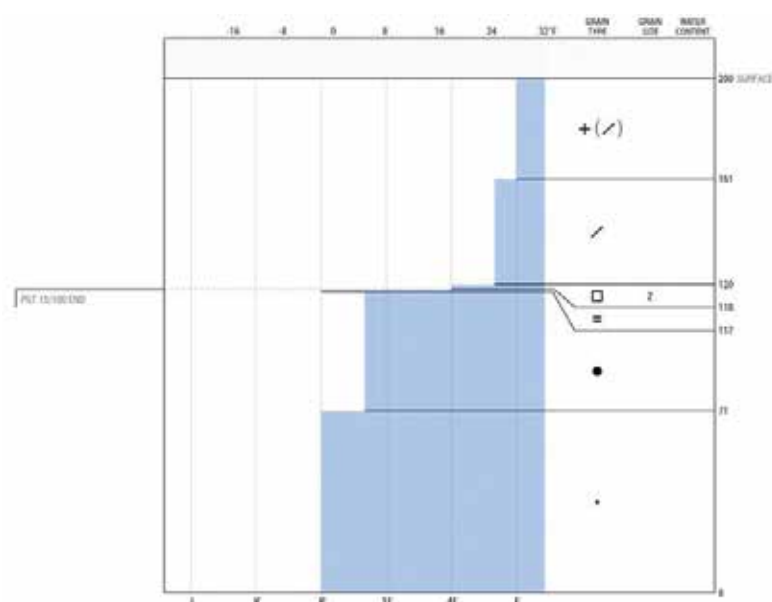
WEATHER: West flow will bring moisture and an associated warm front into the forecast area today. Rain or snow should become moderate to heavy this afternoon and continue tonight with rising snow levels. Weak surface flow and light cooler east winds may do little to delay a change to rain in the lower passes. There is some uncertainty in this forecast. If the heaviest rain occurs tonight then the greater avalanche danger may also occur tonight.

	2 days ago	Yesterday	Today
Max Temperature	36F (2C)	3F (-16C)	39F (4C)
Min Temperature	22 (-6C)	31F (-1C)	33F (1C)
Wind	light	moderate	strong
Precip (rain)	trace	trace	1-3in (2.5-7.5cm)
Cloud Cover	overcast	overcast	overcast

SNOWPACK: Professional observers were at Snowy Pass on 3 days ago and found a persistent weak layer of 2 mm facets on the crust that formed 8 days ago. While in this particular pit it gave a pretty remarkable score of PST 15/100 End, there was no reported activity on this layer since it was buried. The layer seems to have an inconsistent distribution.

In most areas, the middle and lower snowpack consists mostly of stable rounded grain or melt forms and crusts from warm periods this winter.

Baseline snow profile representative of mid-level elevations:



AVALANCHES: No significant avalanche activity was reported west of the main dividing ridge 4 to 5 days ago except at Snowy Pass. Both mornings 4 and 5 days ago the patrol there triggered 15-20 inch (~ 40- 50 cm) storm slabs on north through northeast aspects of Gnarly Ridge.

Recent Avalanches:							
Day	One week ago	-6	-5	-4	-3	-2	Yesterday
Natural	10	7	2	0	0	0	0
Triggered	2	1	2	2	0	0	0
Size	2	2	2	1.5	n/a	n/a	n/a



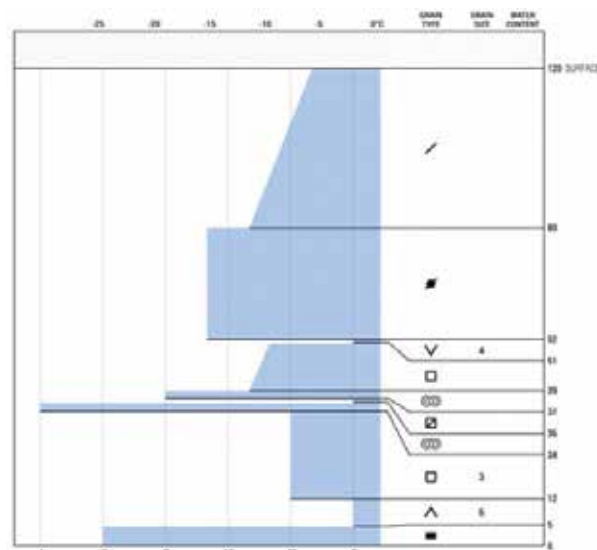
scenario 6

WEATHER: Last night, temperatures remained warm (high 20's and low 30's F / ~ -2.2 to 0C) and light winds blew from the northwest as a relatively small pulse of moisture moved through, bringing 2 to 4 inches (5 to 10 cm) of snowfall regionally. 24 hr storm totals are ~10 inches (25 cm), with 0.9 inches (2.3 cm) SWE. Today will be unseasonably warm and wet. Expect temperatures in the mid to high 30's F (~3.3 C), light to moderate south to west winds, and a mix of rain and snow, possibly accumulating 2-5in (5 to 13cm) of snowfall in the mountains by nightfall.

	2 days ago	Yesterday	Today
Max Temperature	25F (-4C)	32F (0C)	35F (2C)
Min Temperature	19F (-7C)	28F (-2C)	28F (-2C)
Wind	moderate	light	moderate
Precip	6in (15cm)	10in (25cm)	2-5in (5-13cm)
Cloud Cover	overcast	overcast	overcast

SNOWPACK: A variety of weak faceted layers formed during the dry period in 3 weeks ago; depth hoar at the bottom, facet-crust combinations in the lower half, and most recently thin surface hoar and small grain facet layers observed between storm snow deposited within the last two weeks. Our dry early season created a fundamentally unstable structure in the mid-pack (see picture) that is nearing its critical point.

Baseline snow profile representative of mid-level elevations:



AVALANCHES: A rider sustained multiple critical injuries yesterday in an avalanche on Stormy Peak. Multiple avalanches have run in the last few days on the persistent layers mentioned above. Last week we saw a fairly widespread cycle of small to medium sized natural avalanches on these layers. More recently, there have been several skier-triggered avalanches in areas with a thin, weak snowpack. One notable characteristic of this season's persistent problem is that slopes have been ripping out intermittently, in a patchwork fashion, and leaving a complex pattern of potentially unstable slopes.



Reported Avalanches:							
Day	One week ago	-6	-5	-4	-3	-2	Yesterday
Natural	75	2	0	0	0	0	2
Triggered	3	1	0	0	0	1	1
Size	2-3	2-3	n/a	n/a	n/a	2	2-3

the analysis

Danger Rating by Country Statistical Analysis

- We first used the non-parametric Kruskal-Wallis test ($\alpha = 0.05$) to test whether the countries originated from the same distribution (five scenarios had a $p < 0.05$).
- S3 did not meet the requirements of the Kruskal-Wallis test, however, visually appeared to have a differing distribution by country.
- We then applied the Fisher Exact test ($\alpha = 0.05$) to S1, S2, S3, S6, S7, and S10 to determine which countries were statistically different.
- Statistically significant differences in 6 scenarios (S1, S2, S3, S6, S7, S10).
- Statistically significant differences occur between all 3 countries in S2.
- Canada and New Zealand are statistically different in 2 scenarios (S2 and S3).
- United States and Canada are statistically different in 5 scenarios (S2, S3, S7, S8, and S9).
- United States and New Zealand are statistically different in 3 scenarios (S1, S2, and S6).
- More differences occur when the original rating is CON or above.

Take Home Points

- Forecasters from the United States generally rate the avalanche danger lower than forecasters in Canada and New Zealand.
- Forecasters from the United States are also less likely to use a danger rating of EXTREME than are forecasters from Canada and New Zealand.

Discussions within a highly functioning team not only improve the quality of the forecast, but also minimize inconsistencies within an operation.

conclusions

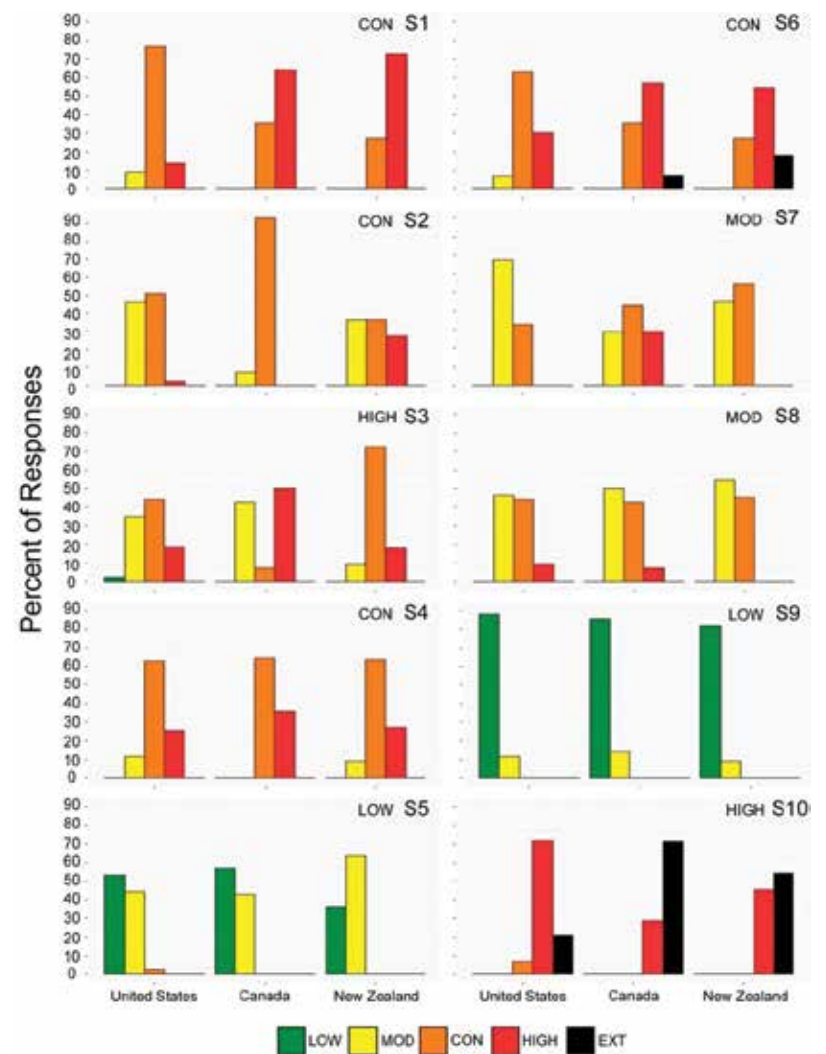
This exercise provides valuable insight into how forecasters from the U.S., Canada, and New Zealand use and apply the North American Avalanche Danger Scale. Encouragingly, most forecasters assign danger ratings within one step of one another. However, the fact that forecasters can arrive at different danger ratings when supplied with identical information highlights the need for discussion and calibration between team members. Discussions within a highly functioning team not only improve the quality of the forecast, but also minimize inconsistencies within an operation.

Based on our scenarios, there appear to be differences in the way the US, CA, and NZ apply danger ratings. Our data suggest that US forecasters are generally more likely to assign lower danger ratings and are less likely to use a rating of EXTREME than their commonwealth counterparts. Inconsistencies between operations would also likely be reduced from consistent inter-operational guidance and/or training.

There are clearly some inherent limitations to our study. When reading these scenarios, the forecast is obviously not integrated through time and therefore forecasters cannot minimize uncertainty through iteration; indeed, LaChapelle (1980) discusses in detail the necessity for continuously monitoring the snowpack throughout the season. Many forecasters find that leaving their forecast areas for even a few days in the middle of the season creates forecasting challenges. In our case we used snowpack descriptions and profiles as an imperfect and incomplete proxy for prior knowledge, but this really only provides a small sliver of the information that forecasters typically have available about the current season. In addition, our scenarios require forecasters to work alone rather than in a team where team members can bounce ideas and information off of each other to come up with a better assessment of the current conditions.

Due to the fact that many forecasters work through an iterative process with team members, we expect that the spread of assigned dangers is less in practice than in this study. That said, this study provides valuable insight into local and regional differences in the application of the avalanche danger scale. Our dataset contains much more information, such as the environmental factors that forecasters weighed most heavily in their decisions. Further analyses planned for these data are likely to provide additional insights into how avalanche forecasters arrive at specific danger ratings. ▲

Danger Rating By Country



Percentage of danger rating responses by country for each scenario. S1= scenario 1 through S10=scenario 10. The assigned danger rating for the actual scenario is noted in the upper right corner of each panel.

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close calls during avalanche courses, what can we learn?

by **steve conger**

This article describes a survey of avalanche close-calls that have occurred during field sessions in a formalized avalanche course setting. Historically, published accident histories have provided examples of events in the U.S., Canada, and New Zealand that occurred in 1964, 1967, 1976, 1987, 1991, 1999, and 2005 (Gallagher, 1967) (Irwin, MacQueen, & Owens, 2002) (Jamieson & Geldsetzer, 1996) (Williams, 1975) (Williams & Armstrong, 1984) (Jamieson, Haegeli, & Gauthier, 2010) (avalanche.org, 2016). However, these examples did not provide background or for use by course leaders and instructors. Given the scarcity of information, research was conducted in order to collect and analyze close calls with the belief that close calls might reveal clues that could suggest guidance in the future.

The information presented here was gathered via a survey that carefully guarded the anonymity of respondents. The 26 questions used in the survey can be found at the end of this article. Questions were organized in sets that asked: for some generic and contextual information; about the geography and exposure; about the instructional organization; about hazard and risk assessment, and for any shareable insights. From 152 responses, information was provided for 29 events.

To provide a baseline, let's consider three activities that one might participate in:

- Recreational ski touring or mountain sledding
- Taking an avalanche course
- Hiring a guide or commercial operation to take you touring, cat or heli-skiing.

Think about the objectives of the participants in each of those activities. The objectives are very, very different. If that is not obvious, please return to the opening quote.

A goal in what follows is to describe common threads and themes from the survey. Additionally, an effort was made to find where there might be room to improve both course delivery and close call information sharing.

Learning from Narratives

Klein (1998) suggests that the sources of power needed for decision-making in natural settings are intuition, mental simulation, metaphor, and storytelling. The power of metaphor helps to draw on experience by drawing parallels between current circumstances and other events. Storytelling makes both our and other's experiences available in the future.

The sharing of close call experience is precisely what Klein is suggesting to improve our decision-making abilities. Several questions asked respondents to reflect on the close call: how was the potential risk scenario communicated; and any narrative or insight that might be useful. It is here that the information collected in the survey helps us in the selection of instructional terrain that balances student learning with abilities and risk.

“I’m in an avy course to learn how to avoid being buried and the outcome is being buried? How screwed up is that!?”

—a succinct course participant

Theme	Illustrative Responses from Survey
Instructor humility is essential	Assessed and understood the conditions well, but still got very lucky; recognizing the potential for luck to have played a role in previous success when uncertain; admitting that successfully 'threading the needle' had more to do with luck than knowledge or skill.
Conservative margin of safety is critical when instructing	Acknowledged being ten meters from being right; that the safety margin was very small; we can make all observations necessary to predict nature, margin needs to be there to allow for error; and, that the large margins of safety built into the day ensured the outcome would be manageable. One respondent's words rang strong: "Despite very good stability, the clues that morning were obvious and clear. There was a significant weak layer, a new slab, steep slope, and a bunch of triggers. The situation was clearly dangerous, and I thought we could 'thread the needle' or 'walk the thin line' so to speak. The uncertainty that was kind of acknowledged, but really was more unforeseen, was the fracture line. It broke basically at our feet. That was way too close."
Group position warrants specific attention	"The identification of safe zones saved most of the group from being buried; students and other instructor were on the safe lower angle adjacent terrain; propagation cracks extended from the 35-degree slab area to the 20-degree adjacent slope where the group was; my group was in a safe location, but I took a ride for 150 vertical feet before grabbing a tree and escaping; the group underestimated the probability of remote triggering, it was assumed that fairly flat terrain well below an avalanche start zone would be reasonably safe; we remotely triggered the slope by digging our snowpits so close to the starting zone."
Maintaining situational awareness and avoiding biases remains a vital task	"We had been avoiding avalanche terrain all day, lots of walking and very little skiing. Upon arriving at the last skiable slope before returning to the lodge the group all expressed their desire to ski it - a small slope with sparse trees, barely steep enough to slide. To avoid a revolt I agreed, we would practice 'safety measures' and ski one at a time. After reviewing what we all should do the first skier launched onto the slope and it released 20 to 40 cm deep on his second turn. The mass was too small for burial, but he was knocked off his feet and hit a small tree as he tumbled downhill, breaking his hip."



Figure 1: Events since the 1986/87 season by geographic location and year.

The pattern visible in Figure 1 suggests a dramatic recent rise in the annual number of events, possibly the presence of the availability heuristic, possibly more educational opportunities, or some combination. More recent or notable events may have prompted responses to the survey. It may also indicate a recent shift in people's willingness for close-call sharing.

Avalanche Hazard

The conceptual model of avalanche hazard evaluation (Figure 2) was developed in an effort to provide a common framework for all North American avalanche bulletin writers (Statham, et al., 2010). It has been embedded in operational avalanche risk management through its inclusion at the heart of chapter 6 in Technical Aspects of Snow Avalanche Risk Management (TASARM) (Canadian Avalanche Association, 2015). The conceptual model may be used as a framework to add structure to backcountry decision making (Conger, 2016).

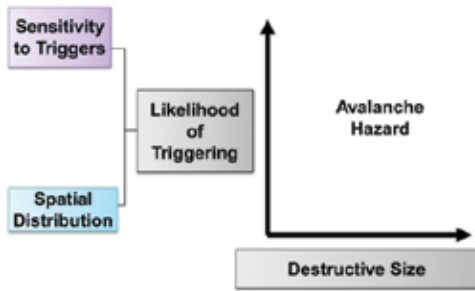


Figure 2: Graphic of the conceptual model of avalanche hazard evaluation.

Several of the elements that were ranked in question 24 were selected to directly match the conceptual model components. This question asked respondents to rank the role that hazard assessment or risk components played in the event. The box-plot in Figure 3 illustrates the relative importance that was associated with each of the components. Sensitivity to triggering (hazard element) and exposure location (risk element) are the two highest ranked components.

Figure 4 shows histograms of the rankings for each of the components related to likelihood of triggering and destructive size. Distribution of rankings shows sensitivity to triggers as the one considered most important. The distribution seen for propagation shows two distinct peaks (bimodal) and worthy of note. It highlights a group of events where propagation is ranked high; the balance is spread out as less important.

Additional comparison of response data was undertaken following presentation to AIARE instructors. This entailed comparison of the hazard factors to snow climates. At the broadest scale (Figure 5), continental (50%) represented the most common snow climate. The balance was comprised of transitional (20%), maritime (17%), maritime arctic (New England) and nordic (Scandinavia) (3%). Events in the continental snow climate seem to stand out as regularly occurring and most prevalent in the western US. The clustering seen in transitional climate events may reflect seasonal variations associated with the prevalence of persistent weak layers.

Graphics that present the comparison of factors to snow climates are shown in Figure 6 through

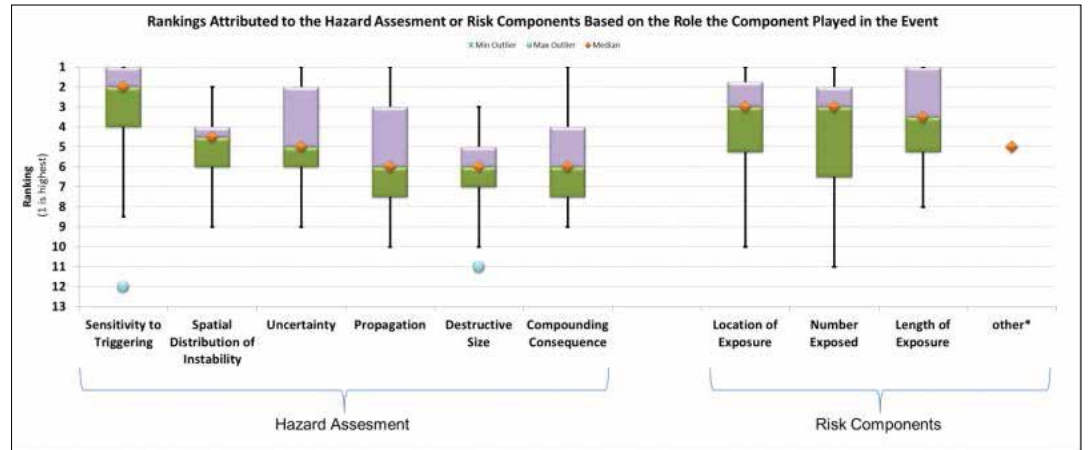


Figure 3: Box-plot of the ratings attributed to components of hazard and risk.

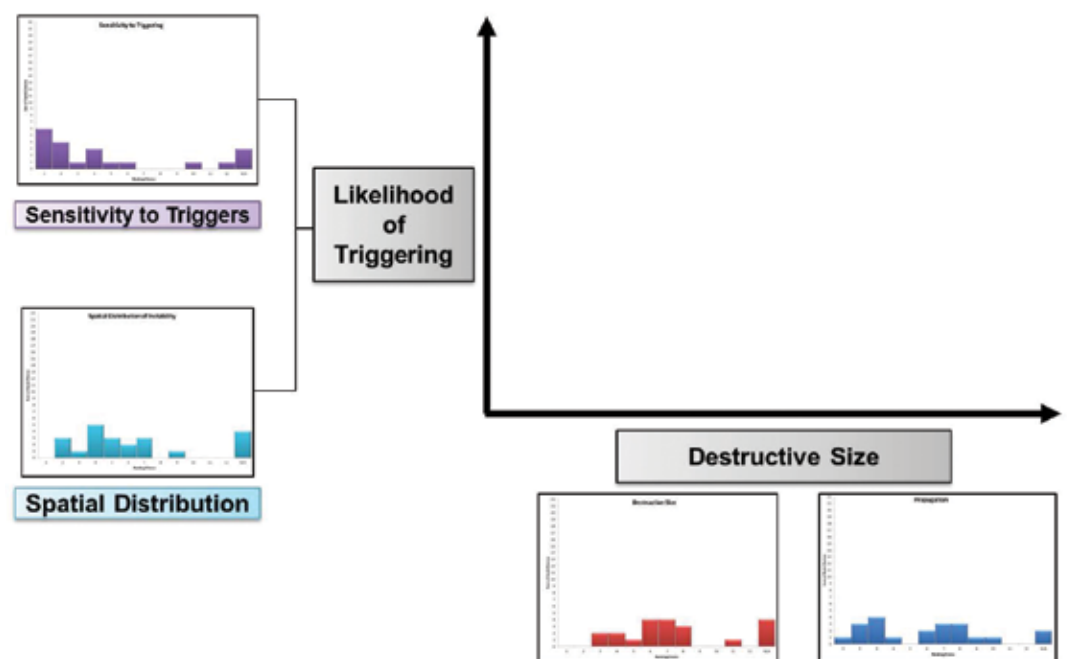


Figure 4: Graphic illustration showing histograms of rankings attributed to conceptual model components.

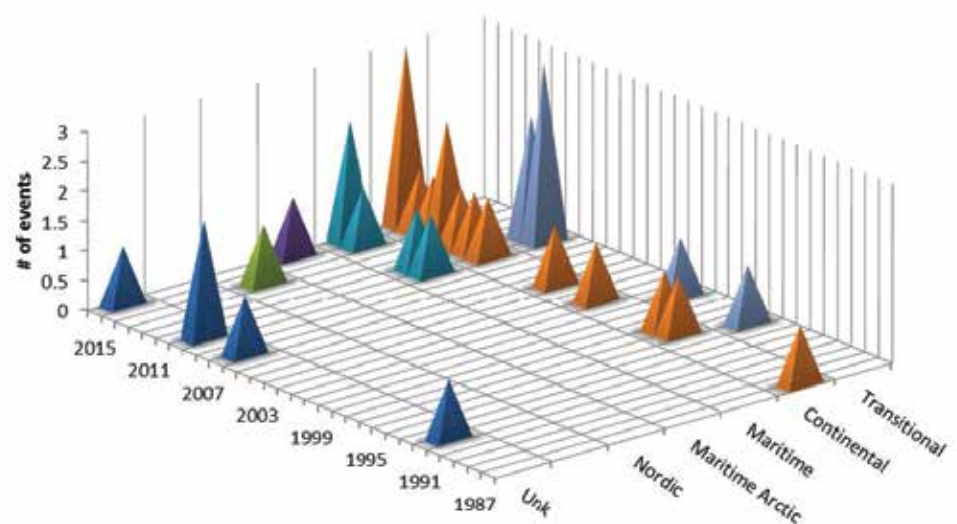


Figure 5: Illustration of events by season and snow climate.

Figure 11. Ranking of the factors is shown on the right axis.

Concluding Thoughts

In the Canadian Avalanche Association's shift towards a self-regulated profession, emphasis has been placed on ensuring members work in a way that improves the safety of people and resources in avalanche terrain. This has included the establishment of workplace competencies for

entry-to-practice. Recognized within these competencies are specific abilities related to avalanche course delivery and instruction. One expected ability is competency in the selection of instructional terrain that balances student learning with abilities and risk.

A type of scenario seems present that I believe is high risk and described in enough responses to warrant attention. In 24% of the events, motion was described as "one at a time" which I interpret

Survey Questions

1. Are you aware or knowledgeable of a close-call or avalanche involvement during an organized course? In other words, have you experienced one or have first-hand knowledge as an instructor or course provider?
2. What month/year did this occur?
3. What type of group was the focus of this course? (e.g. recreation, professional)
4. Do you wish to share additional information as part of a survey to understand any commonalities present in terrain use and hazard conditions?
5. What global location did this occur in? [U.S. lwr 48, Alaska, Canada, South America, New Zealand, European Alps, Pyrenes, Japan, other]
6. Was this in simple, challenging, or complex terrain?
7. What snow climate did this occur in? [maritime, transitional, continental, other]
8. What elevation band? [alpine, treeline, below treeline, arctic]
9. What position in avalanche terrain was the group or individual? [e.g. top sz, mid sz, top track, mid track, top runout, mid runout, toe of runout, not in distinct avalanche path, steep trees, etc].
10. Was the group moving or stationary (i.e. skis off)?
11. What form of instruction occurred on the previous day? [e.g it was first day of the course, classroom, previous day was a field day]
12. Were there and if so please describe the travel objectives for the field session?
13. Were there and if so please describe the learning objectives for the field session?
14. Were there and if so please describe the experience / skill practice objectives for the field session?
15. What was the situation (i.e. the group size, structure & control)? [e.g. 2 instructors leading 6 students each]

Spatial Distribution of Instability

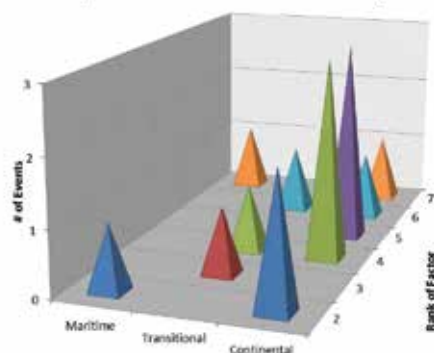


Figure 6

Propagation

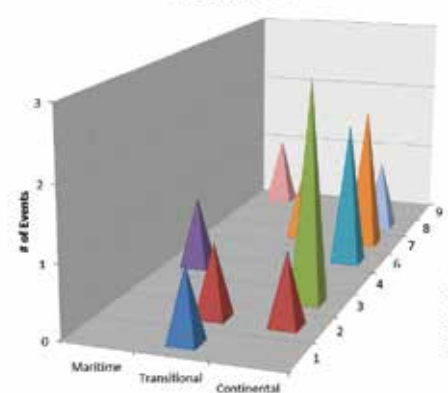


Figure 9

Sensitivity to Triggering

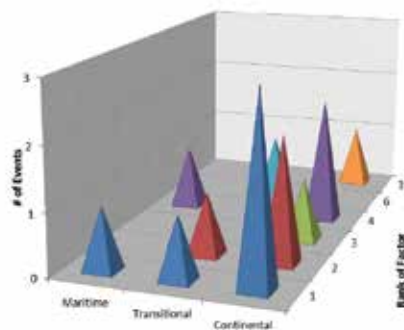


Figure 7

Exposure Position

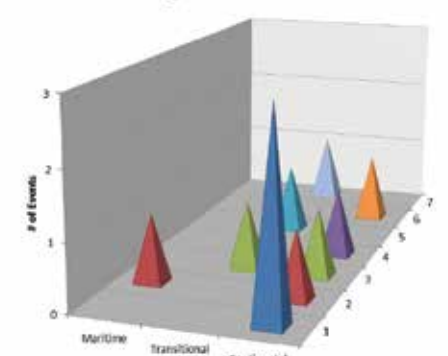


Figure 10

Avalanche Magnitude

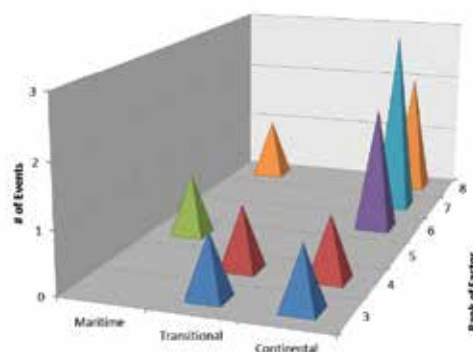


Figure 8

Number of People Exposed

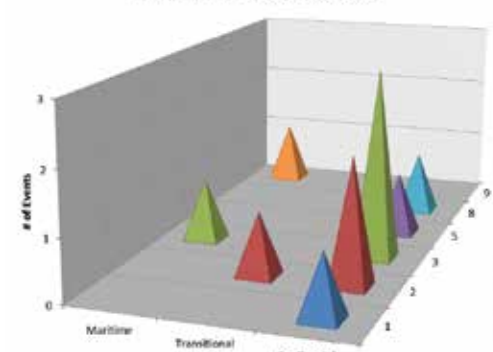


Figure 11

as using “standard traveling safety procedures.” The part that disquieted me the most and offers a good guideline is: when one feels that relying on exposing one at a time is the difference between go and no go (e.g. pushing it for the sake of demonstrating safe travel techniques), one is well outside the margin of safety that addresses the objectives of learning. This is mitigation that relies solely on a probability of changing vulnerability. The risk equation for an individual in avalanche terrain is already strongly affected by a vulnerability value that is closer to 0 than it is to 1. It’s about learning about snow, not learning how to guide as some related to their close call (e.g. defer to simpler terrain; courses should not target complex terrain; it is a class environment not leading near the edge of the abyss).

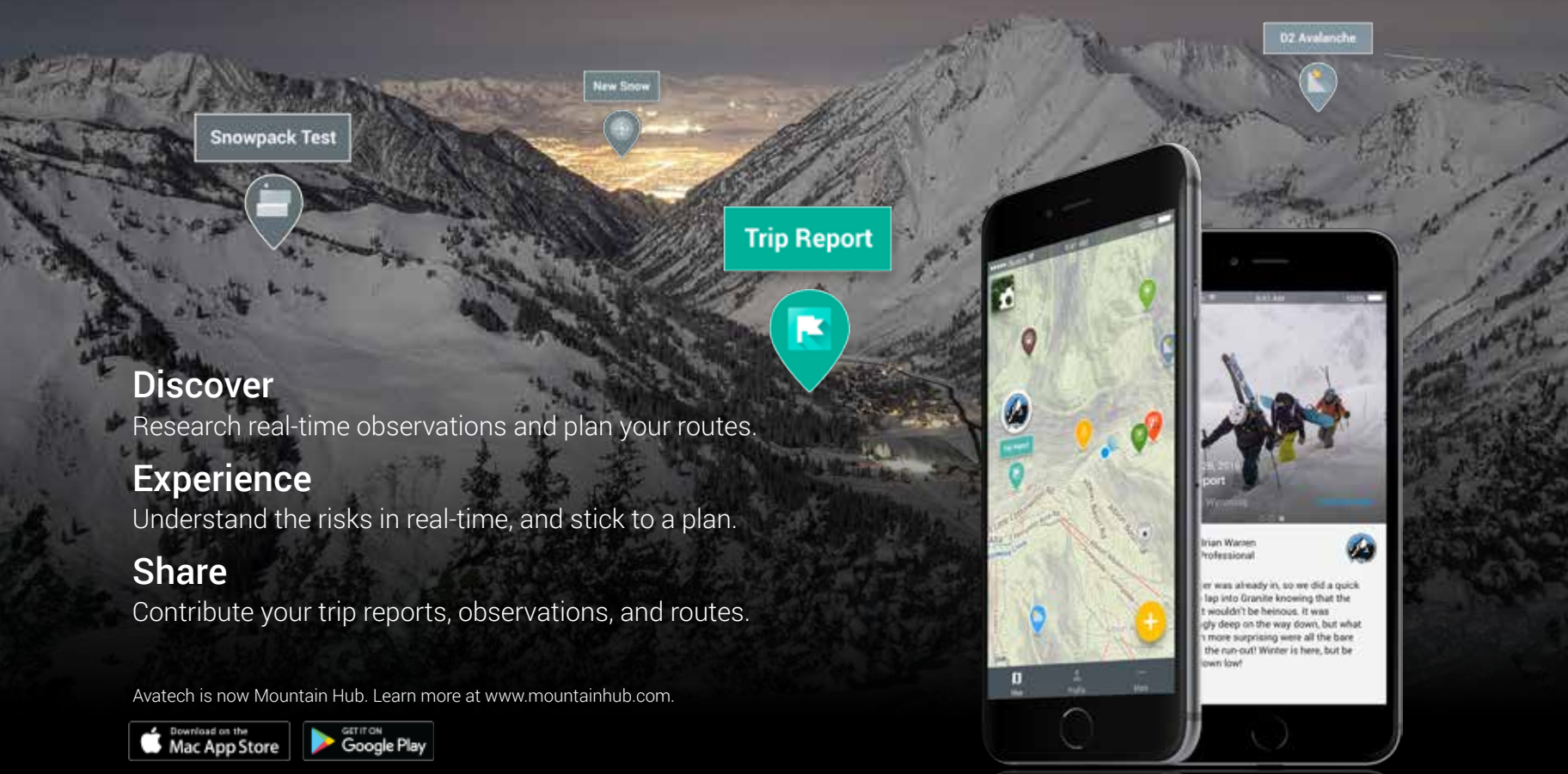
There are some suppositions that could be made from the data. The insights they present are important enough to consider regardless of whether they represent actual trends. The first is that maintaining a professional log book is important. 61% of the responses stated they were not

reconstructing from field book notes. Only 15% said yes, they were.

The second is how hazard was determined on the course. Use of the regional bulletin (31%), no defined process (4%), no answer (31%), and in-situ (10%) made up the lion’s share of response. It would seem that having instructors participate in an AM meeting prior to the student’s arrival would be a valuable model to follow. During this instructor’s meeting, a hazard/risk assessment for the day would be undertaken and operational plans outlined following an established format.

Lastly, there remains a reluctance to share information about close calls or “inconsequential” involvements, evidenced by responses to this survey. This is a part of the professional culture that presents an ongoing challenge and is a requisite for improvement.

Sharing information about close calls in a non-punitive model will improve the collective decision-making abilities of those responsible for selecting terrain while at the same time balancing learning, abilities and risk. The model should cap-



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ture key details in a manner that protects identity of a specific event. It should be anonymous and a freely open reporting system that uses narrative along with specific choices (e.g. ATES rating, position, modern assessment factors). Clues to new patterns or connections often lie in the narrative. In a field such as avalanche forecasting where uncertainty plays such a critical role, there will be unforeseen events that should not be treated as mistakes; i.e., there can be error without negligence. Reflection is very much a part of the professional identity of an avalanche worker, possibly because they will likely be first to an event or an event may threaten their lives too. ▲

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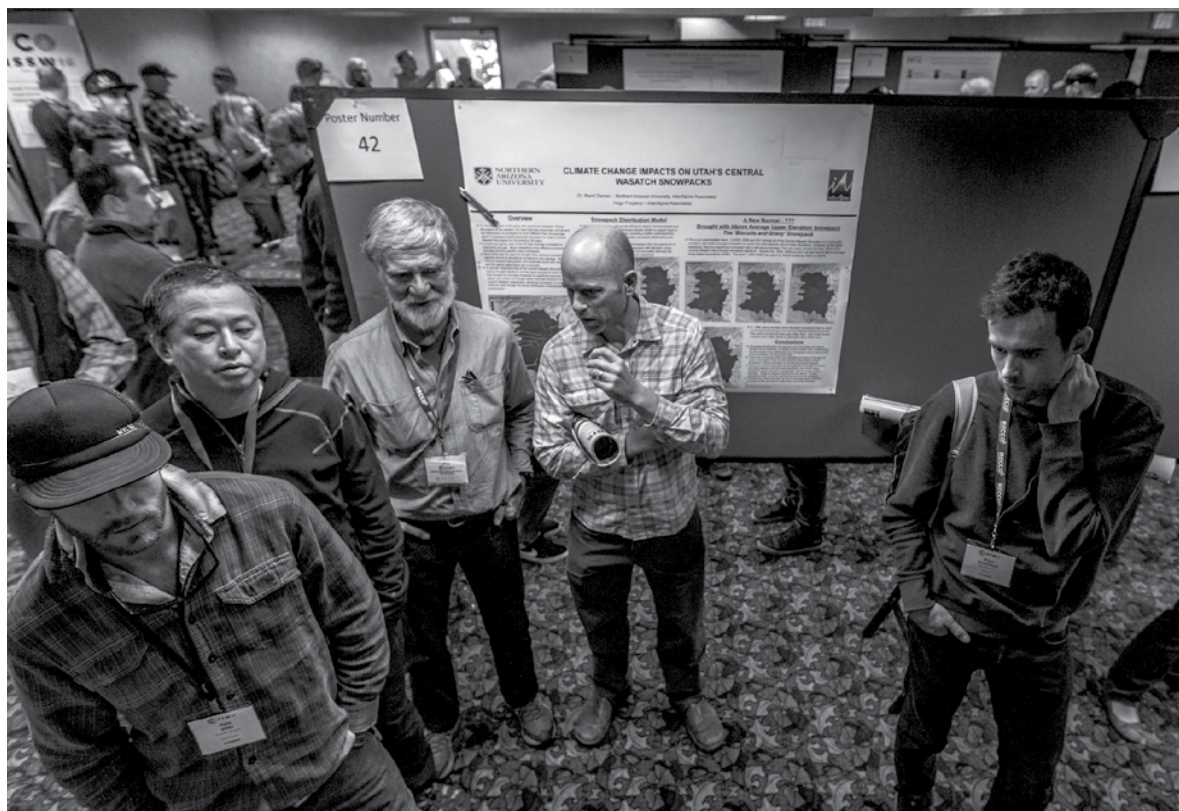
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A poster's-eye-view. Photo Joe Vandal

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tinder for mentors

by **eeva latosuo, aleph johnston-bloom, and lynne wolfe**

Mentorship can be defined as a developmental relationship between a more experienced mentor and a less experienced protégé or mentee (Kram 1985). It is used as a tool to foster good practices and to increase professional development through a collaboration where a more experienced person, the mentor, passes on the knowledge and expertise onto a newer or less experienced person, the mentee. The focus is on a long-term mutually beneficial relationship, different from teaching or coaching.

The Mentorship Project was started 10 years ago by the American Avalanche Association: “The project’s goals are to foster the transfer of information and inspiration from one generation to the next, and to help aspirants gain the appropriate skills, experience, and perspective needed to find a productive niche in the avalanche field.” (Williamson, 2006). In 2006, Lynne Wolfe, the editor of *The Avalanche Review* (TAR), asked the section representatives for the AAA to help gather career path suggestions from professionals in different aspects of avalanche work and set-up a loose network to connect potential mentors and mentees. TAR issue 25.4 shared those findings and suggestions on mentorship (Wolfe, 2007). A few aspiring professionals utilized the network. In 34.2, the December 2015 issue of TAR (Wolfe 2015), many respected professionals shared their stories about their mentors and the importance of mentorship to the field.

Mentorship is often referenced as a crucial part of knowledge exchange and professional development in the avalanche industry. Employers frequently ask, “Who is your mentor?” Young professionals are told at the start of their careers to “Go find a mentor.” This anecdotal evidence of mentorship suggests it has played a significant role in the avalanche industry in the US for years. Why has this never been explored in a quantitative way? In winter of 2016 the authors surveyed the membership of the American Avalanche Association (AAA) to dig deeper into this topic and see if mentorship is really as important and prevalent as suggested. Specifically we were interested in these questions:

- Who is mentoring and being mentored and how are these mentorship relationships formed?
- Who initiates these mentorship relationships, why they end, are they formal or informal?
- What value is placed on mentorship relationships in the individual process for developing professional competencies relating to workplace safety?

An online survey was sent to the members of American Avalanche Association. The final sample included 294 responses yielding a response rate of 34% of AAA Professional Mem-

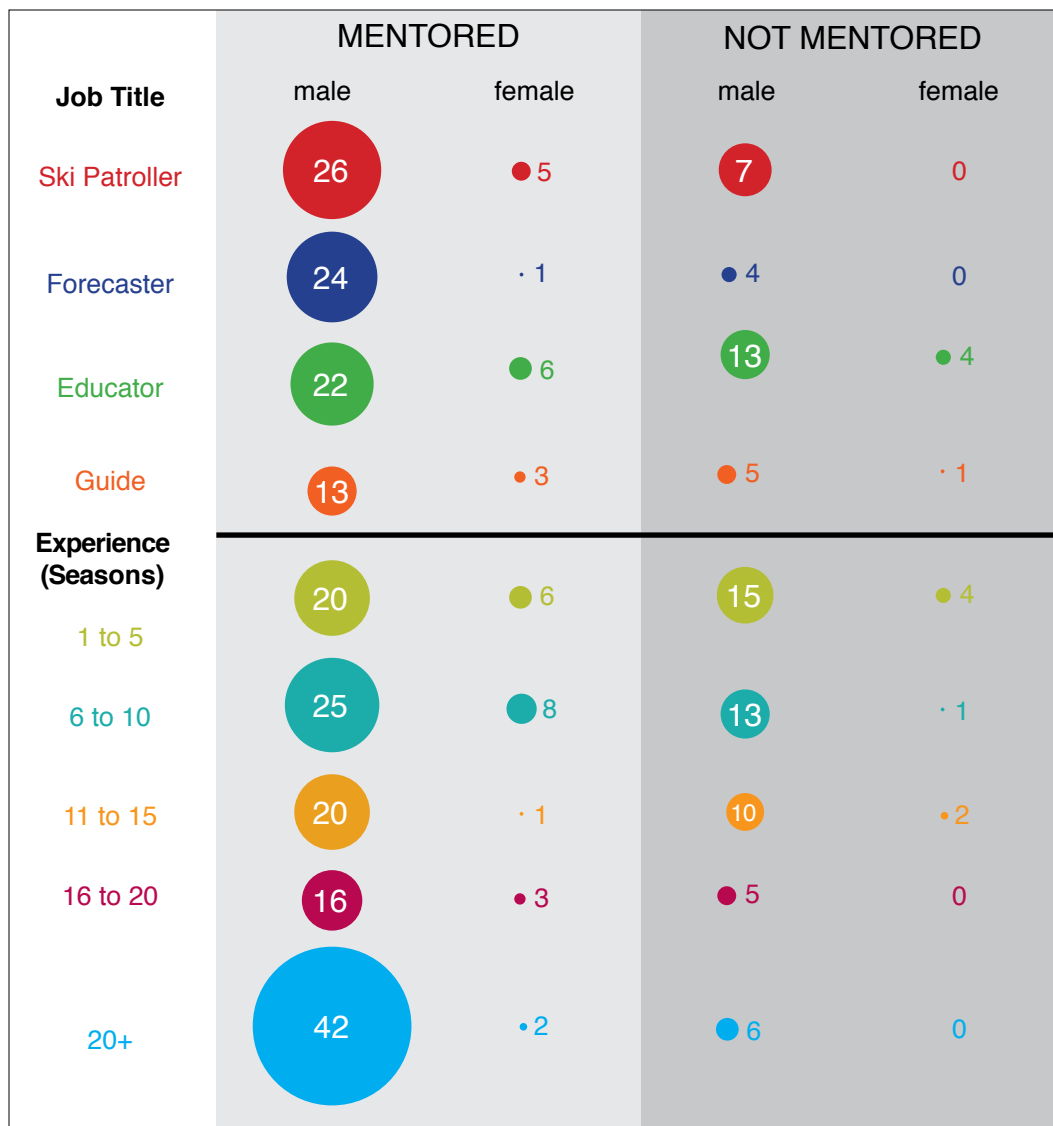


Figure 3: Job titles and experience of mentored & non-mentored avalanche professionals grouped by gender.

bers. Survey included 28 questions with a variety of question types. Data was collected in February–March 2016, and analyzed through August 2016 using descriptive statistics and qualitative analysis methods.

Who answered the survey:

Participating avalanche professionals represented the whole spectrum of ages, generations and work experience.

How prevalent is mentorship?

Mentoring is indeed prevalent in the avalanche industry. Almost 80% of respondents (n=222) have mentored others or have been mentored by other professionals. Even though mentoring takes time and effort, 165 respondents had mentored others professionally. 114 of the respondents are engaged in an ongoing mentoring relationship, while 51 mentoring relationships had ended.

Value Placed on Mentoring

We asked both the respondents who had been mentored (n= 222) and the group that had not been mentored (n=61) an open-ended question:

What are the best ways for an individual to gain workplace competency in the avalanche industry?

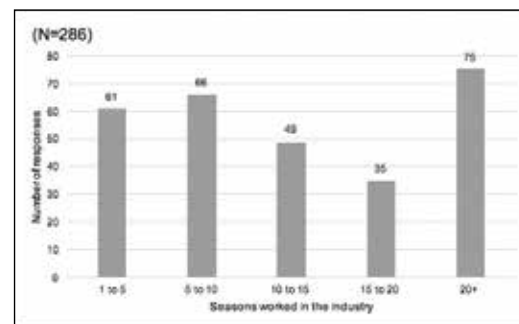


Figure 1: Respondents' cumulative work experience counted in seasons

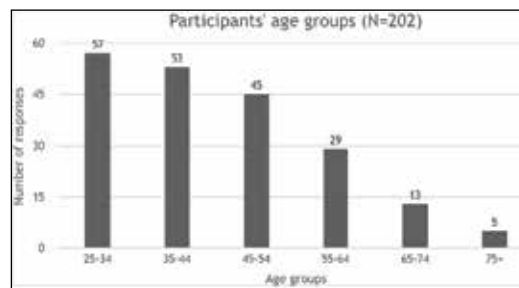


Figure 2: Age distribution of survey respondents.

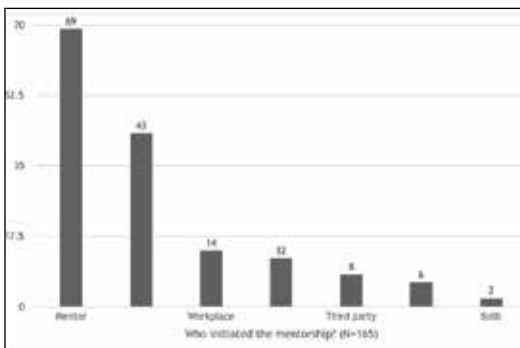


Figure 4: Most commonly mentor initiates the relationship. Workplace program was mentioned in only 14 responses.

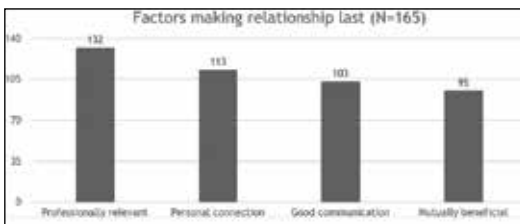


Figure 5: Most successful mentorship relationships are based on professional relevancy.

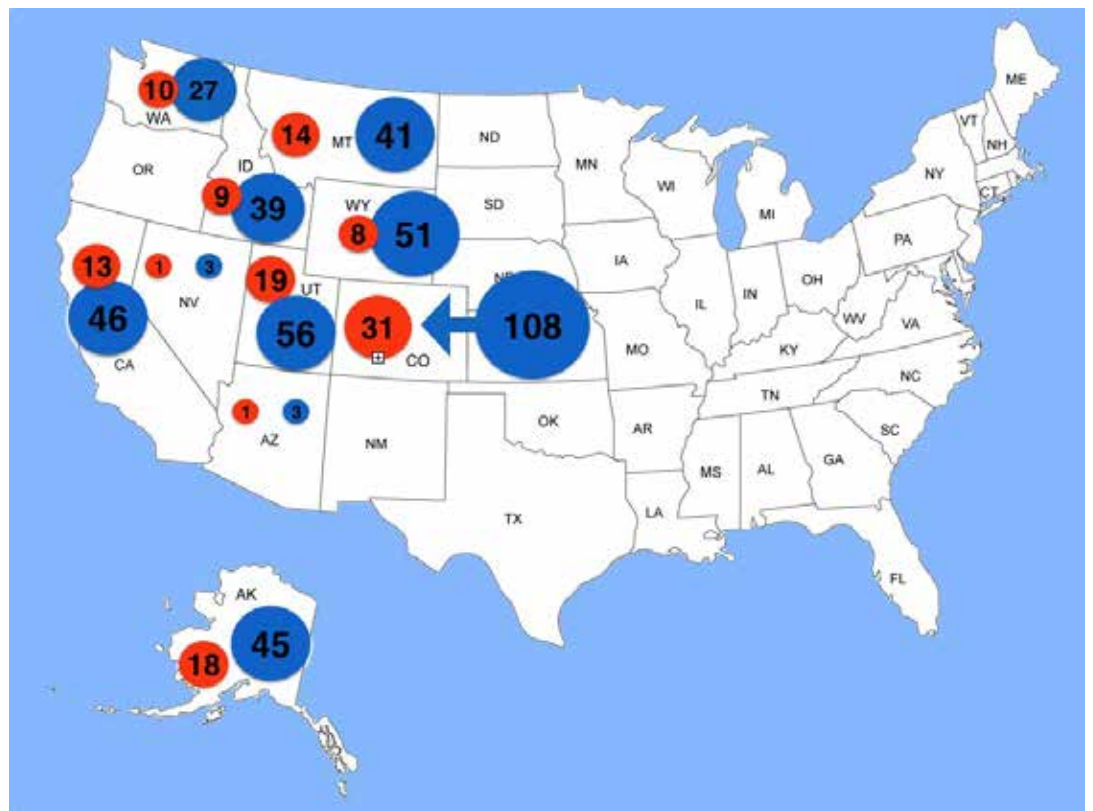


Figure 6: Geographical distribution of mentors (red circles) and mentees mentioned in our results. Colorado has most mentors and mentees.

When ranking the responses from the group that had been mentored, the majority answered that mentorship was the best way to gain professional competency. The next best method was being part of a professional community, followed by experience, then continuing education/training with an emphasis on intellectual curiosity, and finally communication and feedback. It is significant that individuals who had been mentored placed the highest value on mentorship as the best way to gain professional competency.

Example responses from those who had been mentored:

“Mentorship, direct experience and feedback, immersion in a good professional organization.”

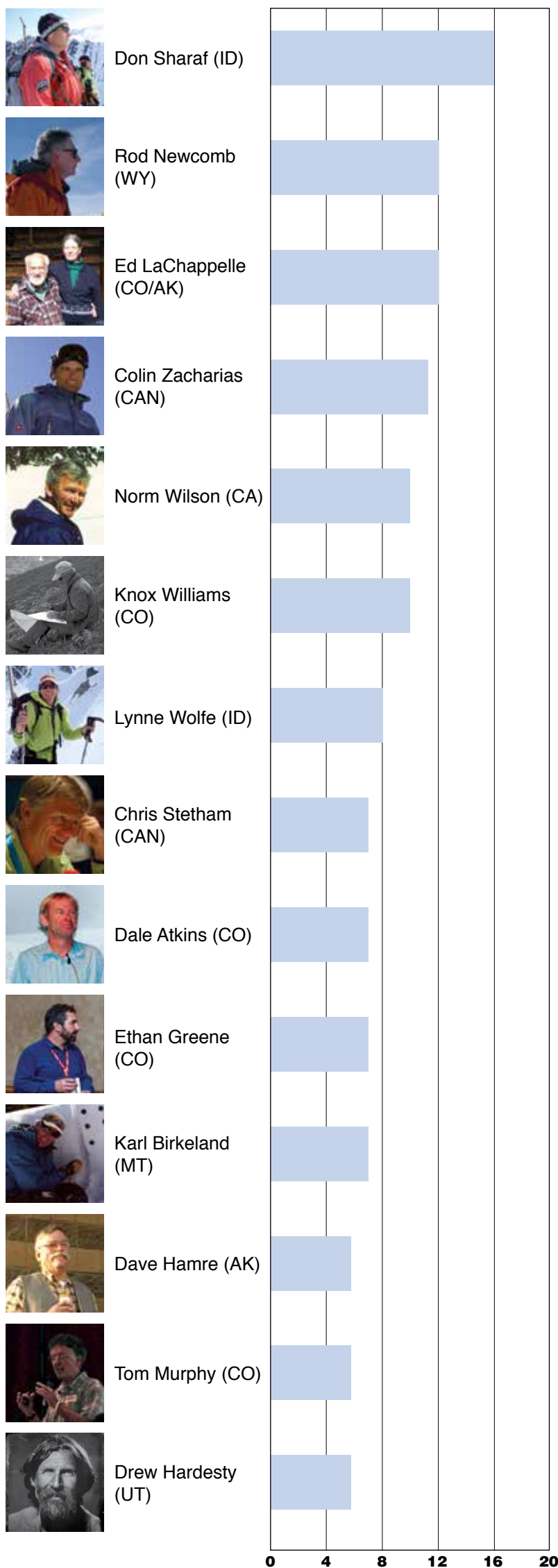
“Mentoring relationships, combined with continued professional development and pursuit of lifelong learning.”

The individuals who started the survey by saying they were not mentored were directed to the same question. Most replied that experience was the best way to gain professional competency, followed by continuing education with intellectual curiosity, then mentorship and then lastly supervision with feedback. For individuals who had not been mentored, mentorship still came up as one of the best ways to gain professional competency but did not hold the same weight as for the group that had been mentored. Many of these individuals checked that they would like to be mentored if the opportunity arose.



Early morning avalanche hazard reduction work at the Yellowstone Club. Photo Ethan Greaves

presentations & posters



Example responses from those who had NOT been mentored:

“Be part of a professional organization, seek out learning opportunities and continued professional development, pursue personal trips/experiences un-mentored, and seek feedback from peers and mentors”

“Formal training, experience and mentorship - all three are needed to contribute to solid knowledge, wide experience and sound decision-making.”

Respondents who had been mentored were asked to look more closely into the specifics of competency and workplace safety with the question:

How important has being mentored been in your individual process for developing the following professional competencies?

Competencies to rank included: Workplace safety, terrain capability, route finding decisions, mitigation practices, snowpack analysis, field risk management, personnel management in avalanche terrain, developing intuition, dealing with uncertainty, validating field experiences, understanding the limitations of what you know, guidance for anomalies, institutional knowledge and history, general workplace practices and work culture, networking with other professionals, career paths and professional growth, staying current with new technology/protocols/science.

For each of these competencies respondents ranked mentorship from most important to not important in their individual process of development. The responses to this overwhelmingly showed mentorship was valued in the development of all these professional competencies. Nothing stood out as “not important.”

The respondents unanimously ranked mentorship very important or important for everything related to Workplace Safety. The highest number of respondents marked mentorship as most important for --understanding the limitations of what you know.

Who initiates mentorship relationships?

Mentorship was most often initiated by mentor, while mentees were initiators in 26% of cases. This is an important result, since it makes us wonder about the efficacy of the often-used directive “Find a mentor”. Only fourteen mentoring relationships were started by workplace program. Interestingly, twelve respondents explained that the relationship started organically and it was difficult to choose or remember how it began. In two cases, both mentor and mentee were mentioned as mutually responsible for the initiation of the relationship.

The majority of workplaces in the avalanche industry do not have structured mentorship programs; only sixty-seven respondents participate in programs that are organized by the employer. This is most common for educators (n=18) and ski patrollers (n=16) followed by forecasters (n=12) and guides (n=10). Both American Institute for Avalanche Research and Education (AIARE) and National Ski Patrol (NSP) instructor training program offer structured mentoring for educators. The American Mountain Guide Association also promotes mentoring among its membership.

The effectiveness of structured workplace mentoring programs was ranked very high in creating workplace culture, bringing new employees up to speed and teaching risk management practices. Three responses rated programs ineffective in matching personalities well or teaching new employees.

We were also curious to learn how often employers incorporate information about mentorship when searching for new employees. Twenty-seven respondents ask job candidates about mentoring during hiring interviews. Mentoring history can gauge potential hire’s experience & knowledge base, commitment within the industry, and attitude towards learning and receiving feedback. Some survey comments included:

“Reveals commitment, depth and breadth of knowledge and skills, and biases.”

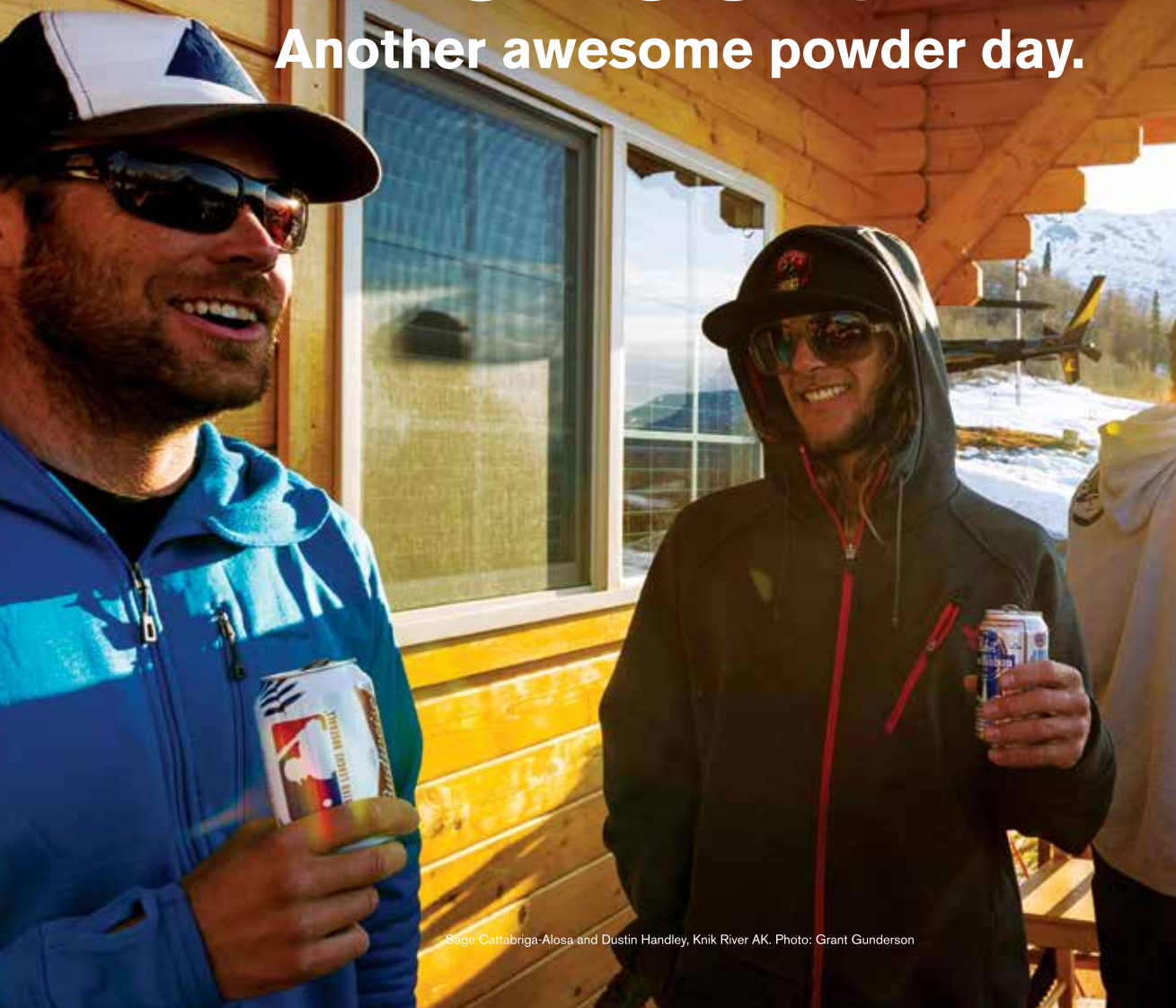
“Are they humble enough to know they don’t know everything, and humble enough to learn?”

“Mentorship implies a level of professionalism, seeking self-improvement, a willingness to accept constructive criticism in order to become better.”

Figure 7: Top 14 mentors with the number of times other avalanche professionals identified them as key mentors.

Cheers.

Another awesome powder day.



Sage Cattabriga-Alosa and Dustin Handley, Knik River AK. Photo: Grant Gunderson

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It is the responsibility of more experienced practitioners to take on the mentor role to have this legacy of mentorship continue.

On another interesting note, one could argue that asking about mentorship can bring up the conflict between exclusion and equal opportunity. Asking about mentoring could be viewed as promotion of “good old boys club.”

“Because if I have not drank beer with their mentor, or do not have a close friend who endorses their mentor, my thought would be the potential “candidate” has not been around the industry long enough.”

The most important contributing factor (Figure 5) to the continuation of mentoring relationship is professional relevancy (n=132). Personal connection and good communication are also ranked important by the majority of respondents. Most common reasons for the termination of mentoring were relocation to another region or change of job. Other natural reasons were retirement and death. Only four respondents had ended the relationship due to negative reasons, these included poor alignment of personalities and feelings of being used.

According to our results, most successful mentorship relationships are based on professional relevancy, personal connection, and are initiated by the mentor. This was one of most significant findings. It is the responsibility of more experienced practitioners to take on the mentor role to have this legacy of mentorship continue. Our results con-

firmed that mentorship is as prevalent in the US avalanche industry as anecdotally suggested and it is valued. **Professionals who have been mentored think that mentorship is the best way to gain professional competency specifically as it relates to workplace safety and understanding the limitations of what you know. This result stands out in an industry that operates with known risk and uncertainty.** Many of the individuals who were not mentored stated interest in being mentored if given the opportunity.

We have now a data set of mentor demographics including generations, gender, and geographical distribution. We also gathered specific names of mentors and mentees. Mentorship is prevalent through most of the mountain states (Figure 6). Colorado has the most mentors and mentees of all the states, which aligns with the high number of avalanche professionals in the region. However, not all states have similarly high numbers of both mentors and mentees. For example, Wyoming scores six mentees per every mentor whereas Utah has three mentees per every mentor. Wyoming mentors have individually larger impact than Utah mentors. Also worth mentioning is the high number of mentors from Alaska. The Last Frontier state has a high number of avalanche professionals but limited opportunities for wide range of educational offerings compared to contiguous United States. There

are some hard working and popular mentors who have helped numerous other professionals improve their skill sets & knowledge. We collated the list of the most frequently identified mentors, with Don Sharaf leading the charge with 16 nominations (Figure 7). Interestingly, there is only one woman, Lynne Wolfe, in the list of top mentors. This aligns with the number of women working in the field. Within our data set there are a few lines of three generations of mentorship with influential names in the avalanche industry at the top of the “family tree.” This prompts the question, if you were mentored are you more likely to become a mentor?

Our plan for a future study is to interview mentor/mentee pairs from different generations and ask more in depth questions about how these relationships were initiated and sustained. We will also collect the individuals’ perspectives on the value of mentorship in the industry. ▲

Acknowledgements:

We would like to thank the American Avalanche Association and its Executive Director Jaime Musnicki for supporting our research efforts.

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2016 panel discussions

by heather thamm

As a relatively new forecaster, I am often overwhelmed by the task of sorting through large amounts of data and transforming it into digestible advice for the public. At ISSW there's no shortage of equations, graphs, and complex abstracts to bog down the internal processor. For me the panel discussions have become a window into the industry's most pressing issues. I enjoy hearing what the experts have to say, what research I need to catch up on, and where the industry is headed in the future. In preparing this summary I tried to focus on key take-home points, but was limited by my understanding of some of the topics when they were presented. I attempted to research and provide additional context to support the panelist's input. I also did my best to credit each panelist, but unfortunately my notes didn't capture the full extent of the discussion.

This year's lineup of panelists tackled a variety of problems with several themes emerging throughout the week. The idea of individual responsibility was mentioned multiple times in terms of worker safety strategies and the role of the public within public safety. There was also a big push for avalanche programs to adopt a risk-based approach to create more data driven decisions. Information sharing and data collection of near misses seemed to be a necessary step forward in order to better understand and prevent more accidents. Thus Scott Savage's announcement of a nationwide database of near misses was exciting news to hear. (Editor's Note: look for more information about this in a future issue of TAR.)

The results of the CAIC study on fatality rates in the US over the last 22 years was another hot topic considering the rapid increase in users over this same period of time. One would assume if backcountry use has dramatically increased in the US within the last 22 years then we would also see a similar rise in fatalities. In Karl Birkeland's article in the September 2016 issue of TAR, he compares these results with an eight-time increase in user growth since 1994. This estimate, based on growth rates of advisory use, suggests the US should be seeing over 200 fatalities per winter. Dozens of factors (education, forecasts, technology) play into this "huge win" but we remain challenged to know the details of why this trend has occurred. This inspired much discussion on whether fatalities alone are a good indicator for success.



From Panel 1. Don Sharaf (in yellow shirt) tells TAR that he was enjoying being on the panel more than the photo implies. Sterbie is left of Don, Bill Nalli of UDOT has the mic, and Margaret Wheeler Farmer gets the easy chair. Photo Joe Vandal

panel 1

We're not as good as we think we are. —Colin Zacharias

Look at all the elements of an accident, not just the proximate ones. —Julie Rust

You can't take SKI out of SKI Patrol. Being human is the problem. —Craig Sterbenz

We can learn from the past and relate lessons to the future. —Bill Nalli on *The Snowy Torrents*

I could live with a skier buried and killed but not a coworker. —Craig Sterbenz

We need to develop a language for describing what we DON'T KNOW. —Margaret Wheeler

Just because it is a high risk job, does not mean we are expected to, or it is acceptable to get hurt. —Someone

Recorded by Lee Watson and Lynne Wolfe

Implementing Avalanche Worker Safety Strategies

Moderator: Scott Savage

Panelists: Colin Zacharias, Julie Rust, Craig Sterbenz, Don Sharaf, William Nalli, Margaret Wheeler Farmer

The first topic centered on implementing avalanche worker safety strategies. *In other words, how do we reduce workplace accidents?* Julie Rust, Vail Patrol Director, and now retired Telluride Snow Safety Director Craig Sterbenz initiated the discussion with the idea that protocols, standard operating procedures, and on-going training have become industry standards for reducing worker accidents. Implementing these best practices requires time and resources and for some organizations has happened as a result of accidents. "Big events are what make big changes," a comment from Bill Nalli, UDOT Forecaster, who described the institutional changes the Utah DOT underwent following the death of forecaster Craig Patterson in 2013. All panelists agreed that learning from mistakes and being transparent are important for the industry to continue to move forward. Julie Rust described how Vail Resorts has formed an internal best practices group with patroller participation from eight of the Vail Resorts. She used this as an example of how an organization can seek objective feedback from an outside perspective.

Clear and open communication, daily briefings and debriefings were all critical elements of a "safety culture." Margaret Wheeler Farmer, AMGA guide and instructor, emphasized that creating a culture of safety requires buy in from everyone and an elevated sense of individual responsibility. Don Sharaf shared his insight on inspections from OSHA. "They are really good at checking fire extinguishers and ear protection, but not good at safety in the mountains." He too expressed the need for more individual transparency when we push it too close.

Other challenges that came up were human factors such as pressure from the public and management to open ski areas on time. Personal pressure was addressed as a top mental health concern in an environment where overworking is the norm and self-care falls to the bottom of the priority list. There was also a request for more tools to help facilitate the process of documenting 'what we don't know', as a way to help us see our biases.

Books recommended by the panel: *The Black Swan*, *Black Box Thinking*, *The Avalanche Hunters x2*

Public Role in Avalanche Safety

Moderator: Drew Hardesty

Panelists: Jeff Goodrich, Lou Dawson, Jamie Yount, Jonathan Tukman, Harpa Grimsdottir, Doug Workman, Rich Mrazik

What's the role of the public in public safety? Drew Hardesty introduced the topic with respect to the significant increase in the number of backcountry users in North America and several accidents that have left everyone wondering who is responsible. *Is it time for the public to adopt a set of rules/ethics to help them avoid triggering avalanches on other public? Or will the next big accident cause land managers to restrict access or create permit systems?*

Jonathan Tukman, Telluride Patrol Director, described some of the issues with the Bear Creek Zone, Telluride sidecountry, where public can access uncontrolled avalanche terrain from gates within the ski area. Because this terrain is complex, parties are challenged to see run-out zones and several close calls have alarmed the community. Tukman expressed concern over the resort's responsibility versus the public's responsibility should a big accident occur in this area.

Several folks referenced the Teton Pass, Taylor Mountain, avalanche in 2012 where an experienced local skier triggered a very large avalanche that filled up Coal Creek with 20' of debris. Luckily this was a near miss and no one was traveling in the popular access area of Coal Creek at the time. This incident combined with frustrations over parking, increased crowds and people skiing avalanche paths that threaten the highway have ignited conversations around the Teton area.

Doug Workman, a Jackson Hole Mountain Guide and Marmot representative, addressed the Jumbo Mountain avalanche in Missoula that hit a house and killed one occupant in 2014. Doug posed the question of why the person who triggered the avalanche was not held responsible since he (a snowboarder) accessed this terrain in a 'closed area.' Doug was also curious about the city's responsibility to prevent people from building in avalanche terrain. Tom Mattice, a member of the audience familiar with the accident, said the area was closed for wildlife protection, not avalanche hazard. Tom also clarified that the avalanche occurred in an area previously not identified by the city as having avalanche hazard.

Rich Mrazik, an attorney from Utah who is on the Friends of the UAC board and also represents Alta, discussed some of the complexities of assigning blame. In the case of a backcountry skier triggering an avalanche that hits a driver on a road, Rich explains how a jury must understand the difference between each party's acknowledgment of risk. He explained how "The skier is buying a ticket to the show, the driver is not." Basically the skier is accepting that an avalanche hazard exists while the motorist doesn't necessarily include avalanches within their normal risks of driving. (editor's note: see Rich's article Liability in the Backcountry in TAR 31.3)

Jeff Goodrich, an avalanche specialist with Parks Canada, described the history of the winter permit system in Glacier National Park, CA and the need to involve the public in the conversation. In Rogers Pass several permanent closures and temporary closures were established, as well as a required permit system for all users. Parks Canada made a concerted effort to communicate with the public and in the end public suggestions were incorporated into their permit system. Jeff reiterated that public compliance was a direct result of their understanding of the problems.

Many panelists agreed that they don't want to see increased regulations, and a social contract would be a better solution if the public would buy into it. Social media and crowd sourcing were both mentioned as highly effective ways to include the public in the conversation. Harpa Grimsdottir, Coordinator for Landslides and Avalanches Monitoring in Iceland, was adamant that good communication between government agencies and the public was key for increased public awareness and support. She also attributed better zoning, improved structural mitigation, and an early avalanche warning system as causes for an overall reduction in avalanche exposure in Iceland. These public safety measures resulted from several very large avalanche accidents in populated areas, including an avalanche that killed 35 people in 1995. According to Harpa, most of the people who died were living in an area previously determined as a safe zone.

Our avalanche paths (that threaten the highway) are seen as terrain with skiing potential .. In 2008 we begin to see an increase in potentially negative interactions between skiers and trains...

Keeping people safe is not a simple endeavor, nor is there a simple solution...we ask people to understand our avalanche control program, seek to comply with the system, and be part of the solution.

You can't legislate behavior.

— Jeff Goodrich

panel 2

We as a society have placed an enormous value on keeping runs open. —Doug Workman

A big change happens when you go from doing control for a natural versus a skier triggered avalanche. —Jamie Yount

WHO is at fault is not the place to start the conversation. —Rich Mrazik

We don't have forests in Iceland, as such, we can't see the extent of existing slidepaths along the urban interface. —Harpa Grimsdottir

The older people knew about the avalanche paths but they didn't tell anyone or nobody asked them. —Harpa Grimsdottir

Everywhere I guide I have seen a tremendous increase in use ... I am very interested discussing how to be responsible in crowded terrain ... do we dare discuss regulating certain backcountry areas? —Doug Workman

We can have rules (handed down by gov't) or we can self regulate. —Doug Workman

Right now we have 90% of the community in 10% of the terrain. —Someone

There is room for small community based standards and those standards will not be the same in every community. —Rich Mrazik

we are not making the terrain safe for grandma and the kids, but we do have to account for skier triggered slides along the roadway —Jamie Yount

I will pretty much work for anyone who will pay me. —Doug Workman

I'm just here because it was a life goal ... —Lou Dawson

Recorded by Lee Watson and Simon Trautman

panels

panel 3 notes (from a panelist)

by don sharaf

Most things are safe, until we forget they are dangerous.

—Unknown

Appreciating accomplishments leads to complacency, appreciating mistakes leads to avoiding them.. —Liam Fitzgerald (TAR 34.2)

Regarding the topic of implementing worker safety strategies: these are complex situations with small and large solutions, better introduced from within than from OSHA.

My main talking points were that the issue is seldom a lack of awareness of the avalanche problem, but more our own reluctance to take the patient or cautious route. GPS tracking, good morning meetings, training(s), are all helpful and necessary, but we have met the enemy and the enemy is often us.

How do we train for patience and humility? —Doug Krause

panel 4 notes (from the moderator's chair)

by simon trautman

The panel was a good experience. I learned a lot and think it went rather well, in fact, it was kind of fun ☺ My read on the audience (based on questions, hallway talk, etc) is that the majority of individuals in the room would like to see a greater consistency in avalanche center operations There is also a smaller, but vocal, minority that is fine with the status quo. Lots to talk about here- the discussion is definitely continuing behind the scenes.

The app was great ... but almost too active. I think that the next time would be a bit easier after having been exposed to it once; in that regard, I think the pros (of using it) outweigh the cons.

Measuring Success in Avalanche Safety Programs

Moderator: John Stimberis

Panelists: Todd Guyn, Christine Pielmeier, Art Mears, Dave Hamre, Dave Gauthier

How can we measure success of avalanche safety programs? Panelists from a wide variety of avalanche disciplines all agreed that a risk-based approach to analyzing success is needed. In other words we need to figure out how to quantify risk based on its ingredients: magnitude, probability, exposure, and vulnerability. Basically more tools for documentation and data collection are needed to acquire a long-term base line.

According to Todd Guyn, manager of all CMH locations, the first step is to come up with “Key Performance Indicators” by identifying objectives to measure. Todd used an example of a heli-ski company collecting more data about near misses and avalanche size as ways to measure frequency and consequence, and compare those with meters skied as a way to measure exposure.

Dave Hamre, Alaska Railroad Avalanche Specialist, explains how understanding close calls would be a better way to measure success rather than fatalities alone. In his study Quantifying the Effectiveness of Active Mitigation on Transportation Corridors, Hamre looks at the ratio of total avalanches hitting the road compared to unmitigated (natural) avalanches hitting the road. His study offers insight on methodology that could be helpful for future studies of accidents and near misses.

One of the biggest challenges avalanche centers face is limited data about their users. Total number of backcountry users and their travel patterns would be helpful to have a better grasp of exposure. Panelists discussed strategies and biases associated with self-reporting surveys and wildlife tracking methodology. Christine Pielmeier, SLF Forecaster, referred to a survey conducted in Switzerland that looked at user risk factors and usage frequency compared to five years of accident data. Through a complex process using several social media groups they were able to survey enough people to gain a better understanding of travel patterns in Switzerland backcountry. One limitation, however, was not having a complete picture of the total number of users.

measuring the success of an avalanche mitigation program

by jonathan morgan

Measuring the success of a mitigation program is certainly a relevant topic as we all want to think of our programs as successful, but some may have differing opinions on how that is measured. Listening to this discussion from a ski area operations perspective I picked out several topics that I felt stood out among the rest.

First off, Todd Guyn brought up some great points that if you are going to use worker and customer safety as a measure of success, you need good data not only on the accidents that everybody remembers, but also of the near misses that sometimes get forgotten. These close calls don't always get the attention they deserve and become a missed opportunity to better your program. By keeping track of them you gain a way to measure progress towards a safer work environment. This made me think of building your program's “working memory” which fits in great with Jonathan Spitzer's paper at this year's conference; Applying and Communicating Our Operations Working Memory.

The topic of number of shots compared to number of avalanches was brought up from the audience by Bill Nalli of UDOT. He commented that sometimes the goal is to make more small avalanches to avoid larger more destructive ones. Karl Klassen responded that looking at the number of shots vs the number of avalanches was not a way to measure success. Karl used this example: if one person uses twenty shots to get one avalanche and nobody gets hurt and another person uses one shot to get 10 avalanches but five people are injured.

The topic of client/customer accidents surfaced on several occasions with the general consensus of the panel being that this was not a proper measure due to them being so infrequent. Karl Klassen stressed that we need to pay attention and learn from these anomalies. Art Mears added that we need to ask “Was it really an anomaly?”

In the final discussion, Dave Gauthier seemed to close in on the heart of the question by asking “What are the objectives? Is a slide crossing the road not acceptable?” A great point was then made by Dave Hamre who commented that you need to choose your objectives wisely. Management would like your objective to be open on time every day. Perhaps a better objective is to open on time without a patroller going for a ride. ▲

Jonathan Morgan is originally from the Green Mountains of Vermont and started his career with the Alta Ski Patrol in 2003. He's an avalanche dog handler for Wasatch Backcountry Rescue and an avalanche forecaster for Alta Ski Area.



Integrating public safety messages

Moderator: Simon Trautman

Panelists: Grant Statham, Doug Chabot, Mary Clayton, Rick Newberry, Sean Wetterberg, Stephen Harvey

Do the benefits of an integrated message system for the public outweigh the costs? If these messaging systems were more universal would it be easier for people to become informed? Are we doing a disservice to the public by not standardizing our information platforms?

First let's break down the difference between integration and standardization, since both terms were used. According to a quick Google search, integration is the process of uniting smaller components into a single system that function as one. Amongst the panelists the term 'standardization' was more widely debated. The Merriam-Webster dictionary definition is "to change (things) so that they are similar and consistent and agree with rules about what is proper and acceptable."

For avalanche centers in the United States there were differing opinions about the pros and cons of standardizing. Doug Chabot, emphasized the importance of each avalanche center catering its messaging to the local community it serves. His reasons focused on the diverse challenges US avalanche centers face in regards to funding sources, staff size, user groups, population size, and acreage size. For Chabot, maintaining flexibility was very important to adapt to the changing needs of the public. Sean Wetterberg, the National Winter Sports Program Director (USDA), urged for a more standardized platform between avalanche centers. He used the example of 'end of the season spring conditions' messaging being very different among all avalanche centers in the US. "Could there be one document that all avalanche centers use for spring time?" He felt a more consistent messaging approach would reduce confusion for users who visit multiple areas as well as save time and resources for avalanche centers.

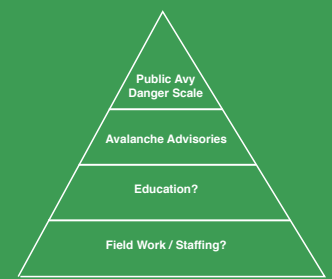
Grant Statham, Visitor Safety Specialist with Parks Canada, described the history of how Canada was able to integrate their messaging platform in 2011 with the help of Avalanche Canada (CAC at the time) and Alberta Parks Kananaskis County. He stressed the importance of everyone working together, but added it can be a tough process without adequate funding. For Canada, their integrated system was the result of Parks Canada paying for and developing a website platform (AvalX) that all forecasting agencies in Canada now share. This platform provides a standard layout, visual graphics, and concise wording. It also prioritizes the text to include avalanche problems, their location, likelihood of triggering, and size.

Mary Clayton, Communications Director with Avalanche Canada explained the importance of using standard wording in avalanche education and on social media to not confuse the public. She used the example of "The Gets" as effective messaging for snowmobilers and emphasized the idea of simple communication to educate to a universal understanding.

Standardizing avalanche hazard signs at ski areas were also addressed. A woman in the audience who lost her son to an avalanche at an Austrian ski area last year urged for more universal signage with flashing lights to help public recognize changing hazards when leaving the ski area boundary. She added that this is really important for visitors who may not be tuned in to current avalanche condition on local social media sources. Rich Newberry, Kirkwood Patrol Director, also added the importance of ski areas utilizing a variety of messaging tools to cast a bigger communication net.

Panelists all seemed to be on the same page with Lynne Wolfe's question: *Is there a need for consistency of messaging with avalanche accidents to the public?* Everyone agreed with the current practice of using the UAC template for collecting the facts and then turning it into a narrative. The most important things to keep in mind were maintaining an objective and fact-based approach to communicating with the community and remaining sensitive to the family. ▲

Figure 1: A preliminary conceptual process of integration/standardization as loosely presented by Sean Wetterberg of the U.S. Forest Service.



thoughts on panel 4 by erich peitzsch

The cast of characters as part of the panel titled *Integrating Public Safety Messages* tapped their decades of experience providing avalanche safety messaging to the public to provide a stimulating discussion and valuable insight. The panel moderator, Simon Trautman, sparked the lively conversation with thought provoking questions: Do the benefits of integration outweigh the costs? How much standardization is too much? Even though it occurred toward the end of the discussion, James Floyer of Avalanche Canada made a comment suggesting the importance of distinguishing between integration versus standardization. Understanding the difference can potentially aid in the process of achieving such goals. This was a poignant comment that may be a way to frame the overall discussion. Integration is defined the process of combining (two or more things) to form or create something, while standardization is to change things so that they are similar and consistent and agree with rules about what is proper and acceptable.

Another potential method to frame the overall process was proposed by Sean Wetterberg, the Winter Sports Program Manager for the U.S. Forest Service, responsible for coordinating the Agency's winter sports program nationwide, including the oversight of the National Avalanche Center who provides guidance and support for 13 regional agency-run avalanche centers. He proposed the order of standardization process as a **pyramid with the Danger Scale at the top**. This is an interesting notion where the specific levels, and number of levels, would likely change as integration or standardization processes progress, but the top level appears to be in place already.

Grant Statham of Parks Canada commented that standardization is relatively easy in a small community, but suggested to critically think about the goals and purpose before you begin the process. His experience with the North American Public Avalanche Danger Scale (NAPDS) modification process that resulted in the current NAPDS serves as a valuable perspective for future integration processes in the public avalanche messaging world. He also mentioned that a harmonized approach to this messaging works well, but that local flavor is also useful when working under a national framework or structure of commonalities.

Doug Chabot, Director of the Gallatin National Forest Avalanche Center in Bozeman, Montana, stressed that flexibility is key in public messaging as technology is moving fast. He suggested that standardization may not be necessary across U.S. avalanche centers as the structures differ in terms of budget, staffing, and the number of users. Though, he agreed that foundational concepts such as the danger scale and map are useful.

Mary Clayton, Communications Director at Avalanche Canada, discussed the value of standardization by stressing the importance of consistency to all users, but also to be aware of audience/user groups. During the discussion, she emphasized that expert knowledge of avalanche professionals should dictate the process of integration/standardization. She emphasized the advantages of standardization in Canada and finds that approach quite valuable and extremely effective.

Rick Newberry, Snow Safety Director at Kirkwood Mountain Resort in California, presented his experience of public messaging from the perspective of a snow safety team at a ski area. The transition from a small, independent resort to being operated by a larger corporation provided him with intimate knowledge of standardization. He also stressed the importance of understanding the user group and the ability to communicate via a myriad of platforms, such as signage and social media. Consistency and continuity were two concepts he emphasized in public messaging.

The final perspective on the panel came from Stephan Harvey, a forecaster with the Swiss Federal Institute for Snow and Avalanche Research (SLF). In terms of standardizing education, he states that the process/discussion was difficult to start, but the resultant product of White Risk (White Risk is the SLF avalanche app for all those who engage in winter activities in the mountains outside marked and open pistes: www.whiterisk.ch/en) is an excellent example of consistent messaging utilized by numerous organizations across Switzerland. He also stated that a useful strategy in Europe is the biannual meeting of forecast services to coordinate such public messaging.

The general sentiment appeared to be that standardized messaging is important, but the extent of such standardization appears to be one of the difficult questions. This may lead to more discussions about integration as well. As the panel members stated, this will likely require a thorough and potentially lengthy process. However, this may be necessary to fulfill the ultimate mission of helping to save lives. It was beyond the scope of this summary article to provide more perspective and opinion, but, based on the interest level of the audience and the thoughtful questions posed by the audience members, it appears to be a topic poignant topic worthy of more dialogue (perhaps in the pages of this relevant publication?). ▲

Editor's Note: TAR is open to pursuing this topic. Who's in? Erich?

When not chasing his two extremely energetic sons around, Erich Peitzsch is working on his PhD at Montana State University, as a scientist with the U.S. Geological Survey, and the lead forecaster for the Going-to-the-Sun Road Avalanche Program in Glacier National Park. He also serves/served as the Director of the Flathead Avalanche Center in northwest Montana.



avalanche divas night 2016

DIVA: A Woman of Outstanding Talent

Avalanche Divas Mission

- To honor women who have made significant contributions to the field of snow and avalanches
- To offer female attendees the opportunity to gather, share information, and network with other professional women in the industry
- Provide mentorship opportunities with experienced snow and avalanche professionals to newer members of the community
- To preserve the history of women's contributions to this field
- To create a support network and legacy of women in the industry
- Provide travel grants to women presenting at ISSW
(2016 Travel grant recipients Ingrid Reiveger and Jocelyn Cramer)

by aleph johnston-bloom

Divas night 2016 in Breckenridge celebrated 10 years of honoring women in the avalanche industry. It was a festive night including industry sector tables for women to network with others in their specific slice of the avalanche industry and an honoree presentation of each woman nominated by colleagues and selected by a panel of past Diva Honorees.

TOP: All the 2016 Divas Night attendees.
MIDDLE RIGHT: Divas organizer Aleph Johnston-Bloom MCing.
MIDDLE LEFT: Fanny Bourjaillat receiving her award.
BOTTOM RIGHT: Leslie Ross presenting Lel Tone.
BOTTOM LEFT: Attendees watching the honoree presentation. All Photos Heather Thamm



Ten Years of Avalanche Divas

2016 Breckenridge

Lel Tone, Eeva Mäkelä, Fanny Bourjaillat

2014 Banff

Mylen Bonnefoy, Sarah Carpenter, Kristie Simpson

2013 Grenoble

Margarita Eglit, Oceane Vibert

2012 Anchorage

Penny Goddard, Florence Naaim
Tribute to Cora Shea and Alaskan Spirit Award to Kirsten Kremer

2010 Squaw

Paola Dellavedova, Sylvia Forest, Jos Lang, Patty Morrison, Lori Zaccaruk,
Special Spouse Award to Doris Hendrickson

2009 Davos

Cécile Coléou, Nina Levy, Margherita Maggioni, Glòria Marti, Betty Sovilla

2008 Whistler

Lin Ballard, Mary Clayton, Margie Jamieson, Nancy Pfeiffer, Lynne Wolfe

2006 Telluride

Betsy Armstrong, Patti Burnette, Jill Fredston, Fay Johnson, Janet Kellam, Sandy Kobrock, Evelyn Lees, Chris Pielmeier

2016 Honorees

Lel Tone (United States):

Lel joined the Squaw Valley professional ski patrol in January of 1996 and never looked back. She has been conducting avalanche mitigation work and saving lives on the hill for almost two decades. Lel is a licensed blaster in the state of California and an avalanche control route leader at Squaw. In 2004 Lel became the Assistant Avalanche Forecaster for Squaw.

Her love of powder skiing and the miracle of snow science has shaped her life in many ways, taking her to far reaching places like Kashmir to film with Warren Miller, Bariloche, Argentina to teach avalanche courses, or Las Lenas to design ski gear for Eddie Bauer.

Lel has been working as a helicopter ski guide in the Chugach Mountains since 1999 and in 2000 became a guide at Chugach Powder Guides. Currently she guides for both CPG and Tordrillo Mountain Lodge in Alaska. She has her Level 1, 2, and 3 avalanche certifications and is an AIARE (American Institute for Avalanche Research and Education) Level 1 and 2 avalanche instructor. She also teaches courses for the National Ski Patrol. Since 2004 Lel has been teaching avalanche courses in the Lake Tahoe area and far beyond. Lel feels passionately about teaching people about avalanches and how to travel safely in the mountains.

Lel served the American Avalanche Association as the Ethics Chair for over eight years and was the Co-Chair and Sponsorship Chair for the ISSW 2010 in Lake Tahoe

She is incredibly grateful to have a job that allows her to share the joy and appreciation of time spent in the mountains with her clients, friends and co-workers. Lel works as an ambassador and athlete for Tahoe SUP, Volkl, Smith Optics, Teva, and Eddie Bauer.



From Leslie Ross presenting Lel

When Lel asked me to introduce her, I had four questions for her.

1. How she got hooked on snow?
2. What is one of your biggest accomplishments as professional Snow Diva?
3. What has been one of your biggest challenges?
4. What was really important for me to mention?

So first.....Where was the spark.....

1. How it began?

I think most of us in this room can relate to this. In high school, Lel was more interested in the outdoors and nature than academics and choose to do her senior project at Sunday River, in Maine. Must have had to do with something Snow?

2. Biggest Accomplishment:

Feedback from her clients on how she had positively affected their decision-making process in the backcountry.

3. Greatest Challenge and successes:

Keeping current and keeping learning. Her passion for the outdoors and learning since that senior project continues to inspire her to keep learning, keep exploring this medium so she can offer the most to those she works with- skiers at the resort, skiers on a heli trip and students at an avalanche course.

4. Lastly, Acknowledging all her amazing mentors

Like all of us, Lel feels incredibly fortunate to have had the pleasure to work with many talented teachers and mentors, especially all the snow men-over the years. This has been a critical component to her professional growth to be able to learn from others and collaborate on new techniques for teaching, see other examples of presenting materials as she constantly strives to get more honed and effective as educator and guide.

To name a few: Russ Johnson, Gary Murphy, Tom Murphy, Frank Coffey, Dave Hamre, Kirk Bachman, Tom Carter, Ben Pritchett, Brian Lazar, Howie Schwartz, Evan Salke, Andy Anderson, Larry Heywood & Joe Royer

Eeva Mäkelä (Finland):

Eeva Latosuo in her nomination letter: I have known Eeva Mäkelä since 1996 as a well-rounded outdoor professional. Despite her Nordic roots, Eeva has skied all over the world and spent extensive time on the mountains in BC and Utah. Eeva has CAA Level 2 and has completed Canadian ski guide training. She currently works as full time faculty at Finnish University of Applied Sciences.

The main reason for nominating her as Avalanche Diva is her outstanding effort as the pioneer of Finnish avalanche education. After several years of conducting trainings as Finland's only avalanche educator, she is currently leading the Finnish avalanche education project.

Outreach has so far included public safety trainings as well as professional trainings for workers' that need to improve their avalanche understanding. Project will also produce the first Finnish language avalanche text book. This government funded project has been very well received - not least because of Eeva's abilities as an educator, organizer and change agent. She is a mover and shaker, an inspiring role model and a fun and safe backcountry partner.

I have been lucky enough to know Eeva since 1996 and she has become one of my favorite skiing, mountaineering, and climbing partners. She is skilled, confident, and thoughtful. Besides being a safe backcountry partner, she makes adventures fun and easy to enjoy. I know that she has been a role model to many outdoor professionals, men and women alike. Eeva will make an outstanding addition to the team of impressive avalanche women already honored as Avalanche Divas.



Fanny Bourjaillat (France) presented by Florence Naaim:

The private snow avalanche consultant's community remains largely closed to women. The avalanche diva event gave us the opportunity to highlight the role of a wonderful woman working as one. Fanny was born in the French Alps with her feet in the snow. She began ski racing with her brother. She has a Masters Degree in Equipment, Protection and Management of Mountains Environment from

Savoie University (Le Bourget du Lac, France). After she had an internship and then a position for MND Engineering as a snow avalanche consultant and worked on projects, conferences and operations. In 2012 she joined Engineerisk and has worked on projects as a snow avalanche consultant in USA, Canada, Kazakhstan, Russia, and Georgia on the avalanche mitigation of ski resorts, roads, buildings and for the Olympics. She leads studies on protection using numerical modeling and hazard mapping. She also works on setting up snownets and artificial release systems such as Gazex. In addition she is often in charge of avalanche training and education. She has conducted research on snow gliding. Fanny is an incredible woman full of life. She appreciates good French cheese and wine and likes jokes. Let's all raise a glass to all the amazing women working the field of avalanches.



A question that has come up over the years came up again in Breckenridge:

“Why have Avalanche Divas night? What’s the point? Why is it an exclusive event for women?”

Why is Avalanche Divas important and relevant to the avalanche industry in 2016?

Kirstin Nelson (2016 Organizer):

Divas night provides a space and time to really put names to faces and start establishing relationships. Learning about how other women have gotten to where they are is interesting and helpful in a male dominated industry.

I also think it’s super helpful to meet women in different locations and zones to understand how different the snow-pack can be and get some local beta for teaching/guiding or just personal travel in a new area. Skiing with a group of women is amazing and fun and having a night to celebrate our work is just as enjoyable.



10 years of Avalanche Divas honorees! Photo Heather Thamm

Kim Grant (2016 Organizer):

The guys don’t necessarily get it because it’s not something they think about or experience for themselves. The limited experience the many guys do have with women in the industry is the few they work with. Many times what they see is the end product, who the women are... after they’ve gone through all of their tough stuff.

Chris Pielmeier (2006 Honoree and 2009 Organizer):

- Women are still under-represented in our industry
- Women are still not at the same level of job-opportunities and salaries
- The goal to offer scholarships through Divas was achieved and is sustained
- If there is a debate about the need / no-need of the Diva’s (event/idea/network) it should come from the women
- My personal experience from 10 years Divas: women became a lot more visible and recognized at ISSWs since 2006; my network grew greatly; young women used this opportunity to build a network and to find mentors.

Evelyn Lees (2006 honoree and Utah Avalanche Center Forecaster):

I think careers in the snow and avalanche industry are amazing – with the balance of indoor and outdoor work and being involved in a dynamic profession that is constantly changing and always challenging, both physically and intellectually.

Women continue to be very under-represented in the snow and avalanche professions, from research to forecasting, guiding, education and patrolling, and diversity in any profession often helps to solve current and future problems.

From TAR 25.2, December 2006 Mailbag:

ISSW Ladies Night: It’s About Damn Time!

I just wanted to take a moment to thank the American Avalanche Association for their generous support of the first ever Ladies Night at the ISSW in Telluride, Colorado, in October. It was a great gathering of women in this field from all over the world. The food was tasty, the wine flowed easily, and the gift bags were an added bonus. The night was a way to meet new friends and honor instrumental women in the snow and avalanche field. As a first timer to the ISSW, I felt lucky to share in the tribute to Sue Ferguson given by the man who received true honorary woman status: Ed LaChapelle. As my friend Martha Crocker said, “It’s about damn time we had one of these,” and she has been coming to the ISSW for years. Thank you!

—Ellie Martin along with Sarah Carpenter and Martha Crocker

Divas’ night encourages women to start or continue in the snow and avalanche profession and explore the various career paths by meeting and talking with other women within the profession.

Aleph Johnston-Bloom:

In 2004 I drove home from the Jackson ISSW with Nicole Greene. We were both young and fairly new to the field. It was my third ISSW and I saw other women at the event but was way too shy to approach strangers to ask questions and didn’t even know what say. As we drove back to Colorado Nicole and I talked about wanting to have a way to meet and network with other women in the industry, especially older established professionals and hear their stories and how they made it in the industry. Two years later Nicole and Leslie Ross made it happen with the Ladies Night Out at the Telluride 2006 ISSW.

Now as an organizer I love getting to read heartfelt honoree nominations from around the world, travel grant applications from very smart women and hear positive feedback from women in all sectors of the industry about the event. This year putting out the call for industry sector table hosts we received an overwhelming response from women excited to share their expertise and network.

Someone asked me what my highlights of ISSW 2016 were and simply going out for a glass of wine with Janet Kellam, Patty Morrison and Sandy Kobrock one night was what rose to the top of my list. Getting to sit and socialize with three women as friends that I have looked up to throughout my career in speaks to why Divas is important. I have had very important male mentors in this field but having the opportunity to have women role models, colleagues and friends has also been a huge part of why I have stayed in the industry.

There were a record number of women attending ISSW this year from around the world but it is still less than 20%. However, the number of women presenting, being panelists and chairing sessions was noticeably increased. I hope the numbers continue to grow and that new generations of women professionals are inspired. The Innsbruck Divas Committee and the Fernie women have already contacted us about their event planning. My hope is that Divas Night continues for years to come and that the contributions of women are recognized as the industry progresses. Thank you to all the generous sponsors that made the Breckenridge event happen and to the 2016 organizing committee for including us.

For a career day last winter a fourth grade girl scout asked me if I knew I wanted to be an avalanche forecaster when I was her age. I answered, “No. I think at that time I wanted to be a librarian and had no idea that it was an option.” I love that those little Alaskan girls know that it is one. Cheers to the future Avalanche Divas and all the honorees from the past 10 years! ▲



Eeva Latosuo, presenter (left) and Eeva Mäkelä, 2016 Honoree. Photo Heather Thamm



TAR is proud to showcase Alta avalanche forecaster Adam Naisbitt's photos in this issue. You can find more of his images in Jim Steenburg's book *Secrets of the Greatest Snow on Earth*.

TOP: A rare view of the action on Superior.
CENTER LEFT: Another view of Liam Fitzgerald, same day and general area as cover photo.
BOTTOM RIGHT: Tug of war is training reward for avalanche dogs. *Photos Adam Naisbitt*



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