

# THE AVALANCHE REVIEW



EMBRACING MY INNER

## *Sledneck*

AS AN AVALANCHE PROFESSIONAL

Graham Predeger maneuvers through the flats en route to avalanche country on a particularly chilly field day in Turnagain Pass, Alaska.

Photo Heather Thamm

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# 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



**Alexis Alloway** has volunteered with Everett Mountain Rescue since 2012, and has run its winter training program since 2014. As a current senior field instructor for NOLS, she has spent years of her life living and traveling on snow teaching backcountry skiing, avalanche, and mountaineering courses. She also works in environmental consulting to help finance her big adventures. You can reach her at [alexis.alloway@gmail.com](mailto:alexis.alloway@gmail.com).



**Peter Biskind** forecasts at the Valdez Avalanche Center and is an AMGA Ski Guide—guiding wilderness, wildness, and mindfulness trips via skin track and helicopter in Alaska, British Columbia, New Zealand, Japan, and Antarctica. [@pbiskind](https://twitter.com/pbiskind).



**Derek DeBruin** lives in Ogden, Utah where he teaches at Weber State University and owns Bear House Mountain Guiding with his wife. When he's not out chasing lines in the local hills, he's chasing his two-year-old son.



**Graham Predeger** is the recreation operations supervisor for the Forest Service in Girdwood, Alaska. Winter months find him working alongside the very talented staff of avalanche specialists at the CN-FAIC as an observer, field partner and occasional forecaster. A few weekends a year he can be found teaching snowmobile-specific avalanche classes with the Alaska Avalanche School. The last several seasons he's logged more days on a snowmobile than skis, but teaching his six-year-old daughter to slide on snow is keeping him grounded to his non-motorized roots, for the time being anyway.



**Mike Duffy** is Director and Lead Instructor at Avalanche1. He travels annually across the country presenting sled-specific avalanche safety training at snowmobile dealer and club locations.

# FROM THE EDITOR

BY LYNNE WOLFE



Photo Mei Ratz

### Early winter, 2018.

El Niño has brought early season snow to much of the Western US. Personally I am evading the snow, biking and editing in the piñon-juniper country of northern New Mexico. Winter in the Tetons is plenty long for me, thanks, but I am paying attention remotely as the foundation of our snowpack is laid down. If last year's December drought layer (DDL) is any indicator, we'll be tracking today's weak layers through May.

37.2 brings you a heaping platter of food for thought for the upcoming season. Sounds like the Innsbruck ISSW was a resounding success. You'll find reports from my TAR scouts beginning on page 30; they've noted a number of leads to follow up on, from fracture mechanics to educational philosophy to an expanded focus on climate change

and its effects on our avalanche world. I'll pursue Iain Stewart-Patterson's work on sled forces upon the snowpack and Laura Maguire's research into The Human Behind the Factor, as my next priorities for this year's TAR. Thanks so much to each of the attendees who carved out time to write; it was a quick turnaround in your busy schedules.

Speaking of snowmobiles, check out several linked articles on sledder avalanche education, beginning with one of Heather Thamm's always-stunning photos on the cover and continuing on page 26, where Graham Predeger of the Chugach, Mike Duffy of Avalanche1, and Travis Feist of the Sierra Avalanche Center (SAC) share insights and strategies. I especially like SAC's integrated Flow concept that ties classroom progression to on-snow practice with two centrally-placed stickers.

You might find further tips and tricks for your upcoming season in other articles in this issue. Alexis Alloway showcases the AHA checklist that the Everett Mountain Rescue team has been developing for several years (page 16). Derek DeBruin reminds us to be impeccable in our practice with his essay Good Habits are Bad to Break, on page 25, and Peter Biskind brings us back to basics, illustrating that understanding is nothing without hard work in his essay Shut Up and Shovel, on page 22. Check out part one of Jay Whitacre and Curt Davidson's two-part series on Kodak Courage, (page 13): they bring research to substantiate WHY your Twitter and Instagram forecasting feeds are so important in today's world.

The Crested Butte (CBAC) season summary didn't make it in time for the autumn TAR; you can find it on page 14, with dramatic photos of their impressive February 2018 avalanche cycles.

TAR welcomes your photos, questions, and observations. Themes for upcoming issues include but are not limited to the following. Please contact me if you have an idea for a submission and we can develop it together. ▲

Have a marvelous winter,  
—Lynne

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37.3—February 2019—wet snow and SAW reports—due December 15  
37.4—April 2019—case studies, human factors, and decision-making—due February 15

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## FROM THE PRESIDENT

This has all been wonderful, but now I'm on my way

BY JOHN STIMBERIS

**I'm returning from ISSW and getting ready to attend USAW and NSAW.** We have an A3 board meeting and a general membership meeting coming up, plus the elections. You may have noticed my name was absent from the ballot. After three terms as president, and additional time in the VP role, I am stepping down from an active role on the board. I hope to still contribute to this organization as I feel strongly about the American Avalanche Association's role in our industry. Looking back over the years I see we have accomplished quite a bit. I'll highlight a few of the achievements, changes, and areas of growth we have experienced. I will not take claim for any of these successes though. I have been extremely fortunate to work with some incredible people on the board, advisory committees, and of course the immeasurable dedication of the three executive directors we've had during that time.

Looking back to my first board meeting, I recall how much smaller this organization was with about half the membership and an ED who was employed half time by the A3 (Thank you Mark!!). TAR was newsprint at that time, and if I recall correctly, Mark hauled much of the Association's correspondence to the post office. Times were changing, Mark wanted to ski more, and we eventually hired a new ED.


Jaime came on board and really pushed us as a board to do more and be more (Thank you Jaime!). I think our professionalism grew as did our membership. TAR changed format to a really beautiful looking publication and we began the road towards redefining recreational and professional education in the US. Internally we undertook a process to redefine the board's structure and operations. None of these were easy tasks, but our Executive Committee, board of directors, and ED saw it through. The organization continued to grow and Jaime eventually decided she needed to ski more.

This last year we hired a new ED and we continue to add more members. Dan was added as a full time employee of the A3. I have really enjoyed working with Dan and I believe he and the board will move this association in very positive directions. I need to give a big thank you to Halsted, Aleph, Pete, Jake, Blase, Eeva, Erich, Jonathan, Sean, and of course Lynne! It has been wonderful to work with each of you.

And what will I do with the extra time after my term is up? Well, I hope to ski more. See you on the slopes or on lot and have an excellent winter. ▲



Left: A3 President John Stimberis waits for USAW setup to begin.  
Photo Dan Kaveney

  
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Photo: B. Pritchett

# METAMORPHISM



## Grand Teton National Park welcomes Lisa Van Sciver

Grand Teton National Park and the Bridger-Teton Avalanche Center are pleased to announce that long-time Jackson local guide and avalanche forecaster **Lisa Van Sciver** has been hired by the park to boost the forecasting capabilities of the avalanche center. Lisa will work throughout the forecast zone to collect data, assess conditions, make public contacts, and provide education to backcountry enthusiasts. This job came about through collaboration between Grand Teton National Park, the Bridger-Teton Avalanche Center, and the Grand Teton National Park Foundation to fill a need for more information about avalanche conditions in the Park and throughout the forecast zone.

Two weather stations were also funded through this initiative. They are both located up near Surprise Lake: one is a precip station in Surprise Meadow at 9,580 feet, and the wind station is nearby and perched above Garnet Canyon on Surprise Pinnacle at 9,770 feet. Raw data from the stations is posted in 15 minute and hourly averages at <http://wxstns.net/wxstns/jhnet/>. That data will be included in the daily big sheet soon.

Growing up as a skier in northern Vermont sent Lisa on her life journey of chasing snow-covered mountains. In 2003 she received a BA from Colorado College and then moved to Jackson. After many years of climbing and skiing in the Tetons she finally got jobs with the Jackson Hole Ski Patrol and Jackson Hole Mountain Guides. Then in 2014 her winter work expanded when she began assisting the Bridger-Teton Avalanche Center with daily operations.

Both Bob Comey of the Bridger-Teton Avalanche Center and Scott Guenther of the Jenny Lake Climbing Rangers think that Lisa will be a great fit for this new avalanche job.

Scott Guenther commented, "Since the park is a significant portion of the forecast area, we wanted to collaborate with BTAC for the benefit and safety of park visitors. We are extremely excited to support an interagency program that will benefit the community and winter backcountry enthusiasts."

## Wyoming Department of Transportation welcomes Brenden Cronin

WYDOT welcomes **Brenden Cronin** to the team this season. He brings a diverse background in snow safety, education, and operations but really, he's just a ski bum. Over the past 13 years he has been an instructor for the American Avalanche Institute, a ski patroller and snowmaker for the Jackson Hole Mountain Resort, a Snow Ranger for the U.S.F.S, and a guide for Togwotee Mountain Lodge Snowcat Guides. As an avid whitewater kayaker, summers find him chasing the melting snow that he tracked all winter.

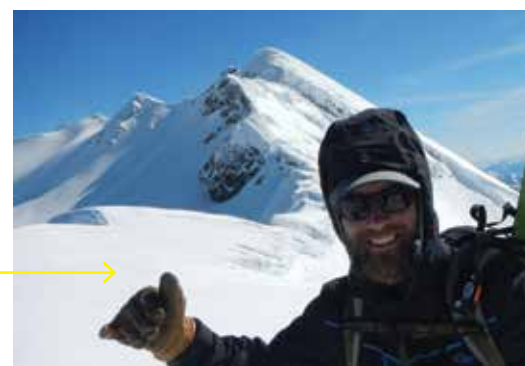
## COLORADO AVALANCHE INFORMATION CENTER CHANGES

**Mark Gober** moved on from his forecasting position with the CAIC as one of the forecasters for the very active US 550 highway corridor including Red, Coal Bank, and Molas Passes for nine years. He brought a wealth of experience and a dogged work ethic to a very challenging forecasting problem. Mark's contributions to the CAIC will be sorely missed. We wish him the best in his future pursuits, which includes training to become a helicopter pilot.

**Jeff Davis** is stepping in to fill Mark's shoes. Jeff was the backcountry forecaster for the San Juan Mountains for the last three seasons. Before coming to the CAIC, Jeff worked at the Telluride and Copper Mountain ski areas in Colorado and Mt Hutt ski field in New Zealand. We are excited to have Jeff in a new role at the Center.

With seed money from the Friends of the San Juans and support from the Friends of CAIC, we have added a new backcountry forecasting position in our Southern Mountains forecasting group. This new position will provide a dedicated forecaster for the Southern San Juan Mountains zone and allow the existing backcountry forecaster to focus on the Northern San Juan Mountains zone. **Chris Bilbrey** will hold down the fort in our new forecasting office in Durango. Chris cut his teeth at the Wolf Creek Ski Area where he worked for 11 seasons on ski patrol and as lead avalanche technician. More recently Chris has been working on a graduate degree at Montana State University, and working as an educator for the Friends of the Gallatin National Forest Avalanche Center and forecaster for the Flathead Avalanche Center. **Luke Ochs** will take the reins in the North San Juan Mountains. Luke comes to us after working at the Breckenridge Ski Resort and Mt Hutt ski field.

**Jason Konigsberg** moved positions within the CAIC. He was formerly a backcountry forecaster for the Vail and Summit County and Steamboat and Flat Tops backcountry zones. Jason is now working as a Weather and Avalanche Forecaster in our Boulder office. **Kreston Rohrig** moved from his previous position as the backcountry forecaster for the Sawatch and Gunnison zones to fill Jason's previous role. **Ben Pritchett** worked from 2006-2012 as the CAIC's education coordinator and is rejoining the CAIC team. Now he's back as the new forecaster for the Gunnison and Sawatch zones, the same mountains he's been exploring in his backyard for the last 22 years.



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Kim Haveli, Andy Wenberg and Sam Schwartz enjoy a cold one after a sandy day in the Targhee backcountry. Photos: Fredrik Marmstater

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## PRESENTING: THE AVALANCHE TRANSCIEVER APP

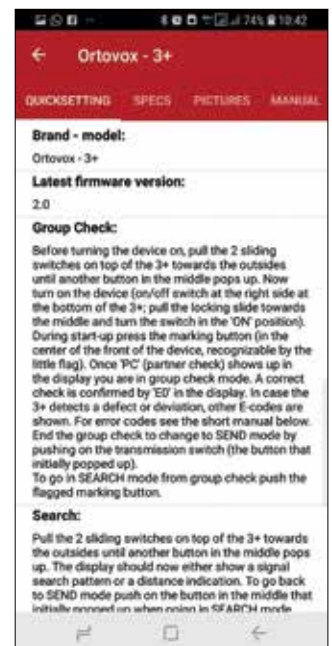
BY ROLF WESTERHOF

**First of all:** this is NOT an app to search for buried subjects in an avalanche!

Many avalanche educators are probably familiar with the problem: a participant approaches you with a particular question about an avalanche transceiver you have only vaguely seen a long time ago. 'Does my transceiver have a Group Check function? And if so how can I get to it?' It is a fact that avalanche educators (as well as Ski Patrol and Rescue personnel) need to know the functions of many different avalanche transceivers (with different software versions!).

The Avalanche Transceiver App is designed to support you in these kinds of situations. In the app you will find 'mini manuals' of a lot of transceiver models. The app allows avalanche educators and trainers to quickly find the most relevant information:

1. Select the brand
2. Click on the picture of the transceiver model
3. Find the most relevant functions listed in a well-structured format (what you first need is shown first)
4. Find special functions for advanced users
5. Remarks concerning non-intuitive functionality
6. Full list of error codes and tech specs



The app is designed for offline use, thus all data is available in the backcountry. However, if you do have an online connection the app can link you to the original manual of the manufacturer

The app is already available for Android in the Play Store and iOS will follow shortly. The iOS version will be released together with a general update for both versions, including the most recent transceiver models, many analog models as well as updates concerning some software-version specific transceiver functions.

Developer Snowsafety.nl is a not-for-profit foundation involved in avalanche education, so the goal was never to make a commercial product, but simply to make avalanche training easier.

You can find information on: <https://tranceivers.snowsafety.nl/> (including the typo: tranceivers!)

The subscription fee is 5 euro per year, which allows to cover the yearly admin fees to Apple and Google and to keep the software running. The subscription fee might be lowered in the future depending on the number of subscribers. ▲

# NOTES FROM THE STEERING COMMITTEE OF ISSW

BY RICH MARRIOTT, SECRETARY OF THE ISSW STEERING COMMITTEE

**The ISSW Steering Committee** held its biennial meeting in Innsbruck. About a dozen Committee members and 11 guests attended. Much of what we discussed was administrative, but several important pieces of news did come out of the meeting.

Probably most important, Bend, Oregon has been selected as the site for ISSW 2022. It will be the 40th Anniversary of the first ISSW in Bozeman, MT in 1982. It will be the first time in 20 years that the ISSW has been in the USA in the Pacific Northwest (ISSW 1998 was held a few miles to the south of Bend in Sunriver). The dates for ISSW 2022 should be selected by the end of this October.

In the USA-Canada-Europe geographical rotation of ISSW, we are already working on ISSW 2024 in Europe. Usually six years out we solicit preliminary presentations from areas interested

hosting the ISSW in their Region. At our meeting we had preliminary presentations from Tromsø, Norway, and Japan, as well as informal inquiries from Italy. If your area is interested in hosting a future ISSW (ISSW 2026 in Canada or ISSW 2028 in USA) email the Steering Committee at [isswsteering@gmail.com](mailto:isswsteering@gmail.com) and we can send you out a copy of the current RFP.

The ISSW Proceedings database, managed by Montana State University Digital Library, continues to make all the papers and abstracts from previous ISSWs available online for free. ISSW 2018 has set a record by transferring their presentations to the database prior to the meeting in Innsbruck!

In addition to the MSU database, general ISSW information has been available on the ISSW Steering Committee website ([www.issw.net](http://www.issw.net)). However, the website has grown old and is difficult to maintain in its current form (It was built shortly after

ISSW 2004 in Jackson Hole—thanks to funding by Rod Newcomb, the chairman of ISSW 2004). The Steering Committee has decided to rebuild and update the site (including a mobile version). Bruce Jamieson (Steering Committee member and Chair of ISSW 1996) has volunteered to take over the update. We hope to keep everyone better informed about ISSW and show more of the human side of the ISSW history—including compilations of pictures and stories from ISSW.

Finally, we are hoping to expand our social media presence. We currently have a Facebook page and a Twitter account (Instagram coming), but we will be looking for a volunteer or volunteers to help manage those accounts and keep them up-to-date. If you are interested or you know someone who would be interested in being a volunteer on this project, our funding is minimal, please email me at [isswsteering@gmail.com](mailto:isswsteering@gmail.com). ▲

## FIRST WYSSEN AVALANCHE TOWER IN THE UNITED STATES:

Swiss design protects the road to Alta, Utah

BY ROZ REYNOLDS

**Wyssen Avalanche Control**, based out of Switzerland, has been implementing avalanche systems that protect the public around the world since 2000. Their most prominent system, the Wyssen Avalanche Tower, is used for avalanche control in Switzerland, Austria, Norway, Chile, Canada, and now also in the United States.

Remote avalanche control systems (RACS) are permanently installed structures, strategically placed in start zones in order to remotely trigger avalanches. Though there are already different types of RACS systems in the United States, **the Wyssen Tower in Utah is the first of its kind in the United States**. The Wyssen Tower consists of a steel tower supported by a small concrete foundation with a

deployment box situated on the top of the tower. Charges are released from the deployment box via a web-based user interface or radio as an alternative. Once released, a charge will hang on a rope above the snowpack. Detonation above the snow allows the shock wave of the explosion to travel farther than if it had been buried in the snow and increases the effective range of the explosion.

The tower is controlled remotely via an online platform and without the need for any personnel in the field, thus decreasing the hazard to avalanche control teams. Additionally, avalanches can be released regularly to decrease the size and potential for large and destructive avalanches. For highway control, avalanches can be released at strategic times, such as very early in the day, and the road can be plowed in time for morning traffic.

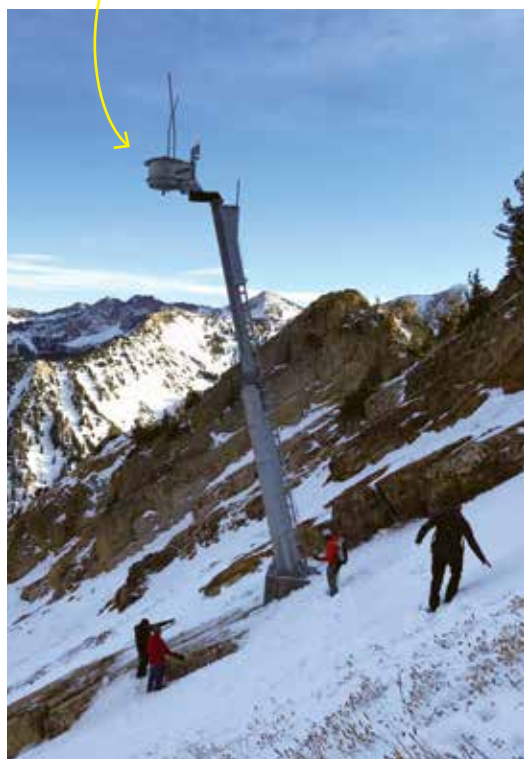
In the Little Cottonwood Canyon (LCC) of Utah where the ski resorts of Alta and Snowbird are located, traffic from eager backcountry skiers can be an issue as numerous avalanche paths endanger the highway.

According to Bill Nalli, the UDOT Avalanche Safety Program Manager, “Little Cottonwood Canyon is home to one of the most difficult avalanche safety problems in the world. The combination of numerous avalanche paths, 1200cm annual average snowfall, two major ski areas, popular backcountry ski terrain, dead-end highway, and proximity to 2 million people, creates significant challenges for our forecasters.” The UDOT avalanche control team for LCC has their hands full every winter and employs the use of artillery and RACS to mitigate avalanche hazards. UDOT has been using remote avalanche control systems for quite a few years, but recently added a Wyssen Tower to their toolbox. “The addition of the Wyssen Tower to our avalanche program has helped shape our direction”, says Bill Nalli.



The Utah Department of Transportation was keen on trying out the Wyssen Tower, and the first tower in the United States was installed in November 2017 in Cardiff Bowl, right across the canyon from Alta Ski Resort. Despite a below average snowpack, it was used regularly for avalanche control in the winter of 2017/2018 and the UDOT avalanche team is gearing up to see what the upcoming season brings. ▲

**Roz Reynolds**, originally from Boise, Idaho, graduated with a Civil Engineering degree from Colorado State University. Working as a climbing and ski instructor has taken her to interesting places around Colorado and Alaska. Currently employed as a project manager for Wyssen Avalanche Control, she now lives in Boulder, Colorado, where she enjoys spending time in the mountains close by.



# WHAT'S NEW WITH THE UAC WEBSITE

BY MARK STAPLES

**Two major goals of our recent website rebuild** were to make it mobile friendly and to rebuild the system for events, classes, and products. In revising the layout to be mobile friendly, we also made a number of other noticeable changes.

Our menu was revised to make it easier for our users to navigate and make it similar to other centers'. Our advisories will now be called forecasts. Some centers made this change years ago, and "Get the Forecast" is part of the Know Before You Go curriculum.

Basic elements of our forecasts will remain very similar to what they were. They will be *Bottom Line, Special Announcements, Weather and Snow, Recent Avalanches, Avalanche Problems, Additional Info, General Announcements.*

Danger roses are one of the most important pieces of information, and we will continue using them because people in Utah make life or death decisions based on aspect. We will have one overall danger rose and location roses for each avalanche problem.

Lastly, we upgraded icons for our avalanche problems to ones used by the European Avalanche Warning Services. These problems allow us to group some problems together and simplify our forecast. We will continue to use the same avalanche problems but they will be subsets. For example the "New Snow" problem will include Storm Slab and Loose Dry Avalanches. Another example is that "Wet Snow" will include Wet Slab and Loose Wet Avalanches. This is a much simpler system that uses plain language. Forecasters will continue to use text to specify and describe the expected problems.

We look forward to this winter and using our new website. Check it out and please send us your feedback. ▲

Mark Staples is the Director of the Utah Avalanche Center.

New problem definitions can be found at [https://lawine.tirol.gv.at/data/eaws/typical\\_problems/EAWS\\_avalanche\\_problems\\_EN.pdf](https://lawine.tirol.gv.at/data/eaws/typical_problems/EAWS_avalanche_problems_EN.pdf)

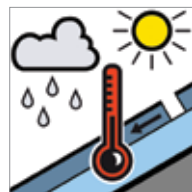
and the icons can be downloaded at: [http://www.avalanches.org/eaws/en/main\\_layer.php?layer=basics&id=6](http://www.avalanches.org/eaws/en/main_layer.php?layer=basics&id=6)



OLD SNOW



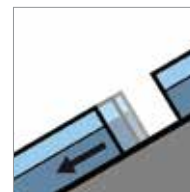
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# NEW ONLINE AVALANCHE CLASSES FROM KNOW BEFORE YOU GO

PAUL DIEGEL, SPECIAL PROJECTS DIRECTOR FOR THE UTAH AVALANCHE CENTER

The Utah Avalanche Center has created a set of interactive online avalanche eLearning courses based on the *Get the Gear*, *Get the Training*, *Get the Forecast*, *Get the Picture*, and *Get Out of Harm's Way* points. These courses, available for free at <https://kbyg.org/learn/>, are for those who want to learn more actionable avalanche safety skills after seeing the Know Before You Go (KBYG) awareness program, can't take an on-snow avalanche class, or want to refresh and sharpen their avalanche skills. The courses are ideal for use as pre-class material before taking an Introduction to Avalanches, Avalanche Rescue, or Level 1 class, so that students arrive better prepared and can spend more time practicing skills. The course content is a mix of text, images, animations, videos, links to additional content, and interactive exercises embedded in a website. Each course should take 15 to 60 minutes to complete.

A key assumption of this program and KBYG is that the target audience is heavily influenced by seeing others riding avalanche terrain in films, social media, and other sources. These influences combined with strong riding skills and capable new gear means that the target audience will be in avalanche terrain, with or without adequate training. We believe the best way to keep them alive is by promoting knowledge and good decision-making versus encouraging abstinence and avoidance.

eLearning, in which students learn introductory concepts at their own pace whenever and wherever they want with interactive decision-making, has become common in higher education and corporate training. Our goal is to deliver introductory avalanche education to more users and to raise the knowledge level of students entering formal avalanche classes. A secondary goal is to keep developing new learning tools, using the best available technology and adult learning theory, to provide a platform for teaching everything from basic awareness for general audiences to advanced training and continuing education for pros. We intend for online learning to supplement, rather than replace, on-snow learning from a qualified instructor.

We encourage avalanche educators to share this link with their students and hope to hear from educators offering suggestions or corrections. ▲

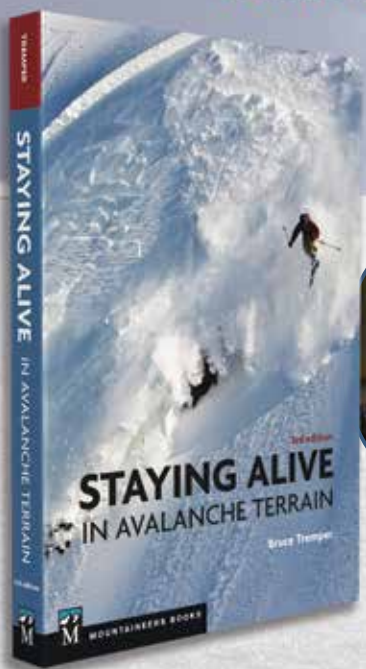



**NEW EDITION!**

## STAYING ALIVE IN AVALANCHE TERRAIN, 3<sup>rd</sup> Ed.

**By Bruce Tremper**

*"No one who plays in the mountain snow should leave home without having studied this book."*  
—Rocky Mountain News





**This edition:**


- New chapter on decision making
- New illustrations and photos
- All topics have been updated and reviewed by peer experts

**ALSO BY BRUCE:**

*Avalanche Essentials: A Step-by-Step System for Safety and Survival*

\* \* \*

*Avalanche Pocket Guide: A Field Reference*



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# COLORADO MOUNTAIN COLLEGE'S AVALANCHE SCIENCE PROGRAM GAINS GROUND

And builds on a successful first year

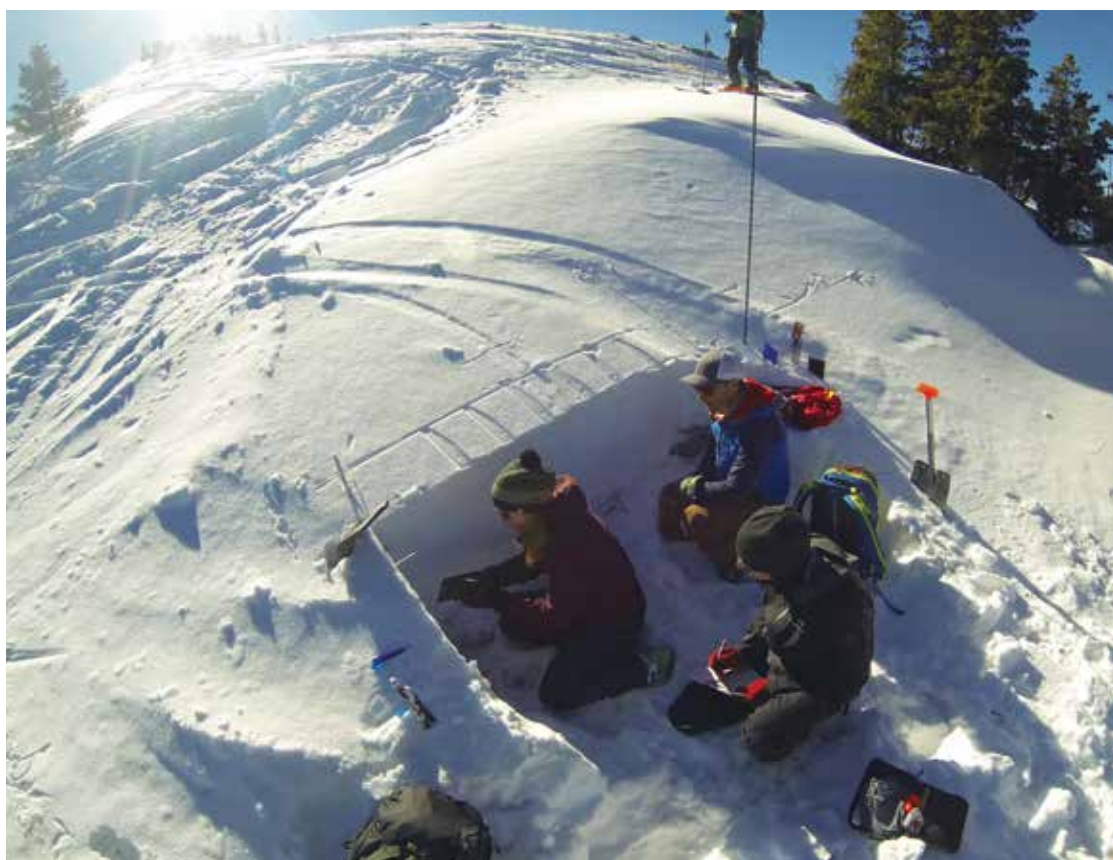
STORY AND PHOTOS BY ROGER COIT

**In the fall of 2017**, Colorado Mountain College (CMC) Leadville launched an innovative, two-year-long avalanche safety certification course. A year later, 11 students of CMC's inaugural Avalanche Science Program are in their second winter of coursework and field studies. And on their tails, 10 more students have just started their two-year program.

The concept for this unique, college-level training program for avalanche safety professionals began in 2009. Colorado Avalanche Information Center (CAIC) Director Dr. Ethan Greene and US Forest Service Research Hydrologist Dr. Kelly Elder approached CMC Leadville about collaboratively developing an in-depth online and onsite course of study in avalanche science.

Colorado Mountain College offers two- and four-year degrees, as well as certification programs throughout the north-central Colorado Rockies. Of the college's 11 locations, our Leadville campus provides an ideal setting for such a program, with high-elevation snowpack, and related educational programs such as Ski Area Operations, Natural Resource Management, and Outdoor Recreation Leadership, of which I am a faculty member.

With the College's endorsement in 2014, I chaired the Avalanche Science Program design team comprised of Ethan, Kelly, and CAIC Deputy Director Brian Lazar. Now joining us on faculty is a team of top-notch avalanche safety professionals that includes John McKinnon, and from CAIC, Rebecca "Beccs" Hodgetts, Blase Reardon, Nick Barlow, and John Snook.



Avalanche Science Program students visit Leadville three times during the winter for classroom instruction and field studies.

## Live anywhere

The first year of the program is rigorous. By the end of the year, all the students completed American Avalanche Association Pro 1 certification, which is built into our curriculum. The Avalanche Science Program is one of six A3 approved Pro Course providers and the only one with such an extended course duration. Each visit to Leadville is about a week; the rest of the winter, students study remotely.

We require online coursework and the three visits the students make to CMC's Leadville campus for intensive classroom time and field studies.

Our students learned how to use relevant equipment, while they practiced new-found skills. We used the program's remote sensing weather stations for data collection at both our Leadville campus at 10,200 feet and on nearby Mount Zion at 11,800 feet. Students also participated in a variety of community outreach events such as staffing avalanche safety demonstrations at Monarch Ski Area's Backcountry Days and at Copper Mountain's Safety Fest, and they serve as teaching assistants with CMC's rec avalanche safety classes.

Most students from our first cohort told me the program was a lot more work than they thought it would be. The depth of the content, plus the breadth and duration of this program, set it apart from other current avalanche safety training programs.

**Second-year students: operationalizing first-year learning**

To prepare for the second winter, the faculty team and I spent all summer polishing the curriculum with a focus on practical application of first-year learning. During their second year, students are working on mock projects, creating avalanche safety plans for a variety of operational applications—from industrial to forecasting to ski area based. In this way, they put into practice the skills and knowledge gained from their first year, preparing them for the workplace after program completion.

These second-year students are already seeing the value of their intensive training. Students who currently work as ski patrollers are being tasked with more on-the-job snow safety work, and other students are also seeing new opportunities now that they have increased education in avalanche science. One student is lined up to intern this winter at the Flathead Avalanche Center in Montana.



**The future**

As the snow safety industry recognizes our program, I'm getting more and more requests for students to be placed in internships at various worksites. A group of our second-year students and faculty recently attended the International Snow Science Workshop 2018 in Innsbruck and were proud to display a poster describing the program to that community. The word is getting out about CMC's Avalanche Science Program.

With the first student cohort heading towards certification in 2019, and the second cohort on its way, we're looking forward to growing the program. We'll be accepting applications after the first of the year for our next group of students who'll be starting fall 2019. It's a competitive application process with academic, certification and professional prerequisites. The students we've attracted so far are just fantastic and we're really excited to develop our next student cohort. ▲

**Roger Coit** is the Avalanche Science Program Faculty Lead at Colorado Mountain College Leadville. Among his extensive wilderness rescue, EMT and paramedic experience, Roger is an AAA Pro Course Instructor, and a Course Leader with the American Institute of Avalanche Research and Education. From 1991 to 2001, Roger was the Ski Patrol Assistant Director and Snow Safety Coordinator at Monarch Ski Area. Since 2009, Roger has instructed Wilderness Medicine, EMS and Outdoor Studies courses at CMC.



Left: Rebecca "Beccs" Hodgetts, Colorado Mountain College Leadville Avalanche Science Program faculty.

Right: Some of the Avalanche Science Program faculty head to class at CMC's 10,200-foot Leadville campus. Left to right: Kelly Elder, Blase Reardon, and Ethan Greene.



Above: A student in the Avalanche Science Program during A3 Pro 1 assessment. All first-year students completed and received A3 Pro 1 certification.

# COLORADO MOUNTAIN COLLEGE Avalanche Science Program

"If you want to take your knowledge to the next level of snow science while you learn from incredible teachers and are prepared to work hard, CMC's program is for you."

— Gabi Benel, 2nd year student and Snowmass ski patroller



Learn more at

► [Coloradomtn.edu/avalanche-science](http://Coloradomtn.edu/avalanche-science)

Leadville, Colorado  
Elevation 10,200 ft.



# SAFETY ADVANCEMENTS BORN OUT OF AVALANCHE TRAGEDY

## Deaths of U.S. Ski Team Athletes Spur Change

BY TOM KELLY



The dedication of the Bryce and Ronnie memorial on the Glacier Road leading up to the glacier in Sölden. On lower level are Cindy Berlack, Mikaela Shiffrin, and Steve Berlack. On top left is Patrick Riml, Sölden native and former long time alpine director for U.S. Ski Team.



Cindy Berlack presenting at ISSW.

The film is available on BRASS channels on Facebook, YouTube and Vimeo. For more information about BRASS, check out [www.brassfoundation.org](http://www.brassfoundation.org).

Tom Kelly was the spokesperson for the U.S. Olympic Ski and Snowboard Team for over 30 years, leaving that role in June 2018. He now spends his time at his Park City home, on the road with his Behind the Gold public speaking tour, and as a marketing consultant. One of his favorite roles is working with the Bryce and Ronnie Snow Safety Foundation.



A tragic accident in 2015 that claimed the lives of two young U.S. Ski Team athletes has become a catalyst for change. The deadly avalanche sent shockwaves through the ski racing world on a day where heavy new snow had scrubbed a morning of gate training then ultimately left teammates frantically searching for their friends buried in the snow.

Bryce Astle (Sandy, Utah) and Ronnie Berlack (Franconia, N.H.) were killed on January 5, 2015, a clear blue day with seemingly joyous ski conditions. They were among a group of six athletes skiing on the Rote Karl run off the Gaislachkogel lift in Sölden, Austria. The athletes were in the resort west of Innsbruck attending an on-snow training camp.

“The accident was a great tragedy for our families and our sport,” said Steve Berlack, father of Ronnie and a ski coach himself. “But we are committed to using this accident as a platform for change so that something like this doesn’t happen again.”

Following the accident, the families and the U.S. Ski Team formed the Bryce and Ronnie Athlete Snow Safety Foundation (BRASS). Now, just over two years since its formation, BRASS is starting to have impact. BRASS had a presence this fall at the International Snow Science Workshop in Innsbruck, Austria this fall, lobbying for changes to global avalanche warning systems. Bruce Tremper, the retired director of the Utah Avalanche Center, produced a detailed accident report for the BRASS Foundation in October, citing lack of knowledge and preparedness. The report included official reports from the Austrian agencies responsible for management of the accident, and was subsequently released to the public by BRASS.

Unclear avalanche warnings as well as lack of snow safety education and knowledge of the local ski environment by athletes and coaches were primary issues cited in the report. The skiers had not seen avalanche warning reports so were unaware of the danger and unfamiliar with the nature of off-piste skiing at the European resort. The report outlines the fact that the athletes did not know they were skiing in an uncontrolled area of the resort and there was no English language signage. BRASS plans to use the report as a tool to advocate for changes in snow safety warning systems as well as to expand education in the aim of preventing future accidents.

The report outlines precise details of the morning, citing a variety of situations that led to the accident. With new snow, avalanche warning conditions were at Level 3 that morning, on a scale of five, indicating danger was ‘considerable.’ The report cited that the skiers and coaches did not have a distinct understanding of the danger level and that signage at the lift was not clear.

“Our initiative from the accident is to improve snow safety culture,” said BRASS Foundation Board Chairman Jamie Astle, Bryce’s father. “It’s a two-pronged approach for us. First, we will look at ways we can influence the avalanche safety community to improve warning systems. Second, we will advocate for greater avalanche education, especially for ski racing athletes and coaches.”

Since its formation in 2016, BRASS has been active in the avalanche education community. Last spring, BRASS helped fund a series of three-day on-snow AIARE avalanche education sessions for U.S. Ski Team athletes and coaches at Snowbird, Utah.

In October, Cindy Berlack, Ronnie’s mother, lobbied avalanche safety officials at ISSW, seeking an evolution of the warning scale used by resorts as well as universal multilingual signage standards.

At Sölden in late October, resort officials unveiled new English-language signage across the resort, as well as dedicating a memorial to the two athletes along the road leading to the Rettenbach Glacier race course. Located at the base of the avalanche runout on Piste 30, the sign carries images of the athletes and a reminder of the danger.

“The entire Sölden community has rallied around our sons and taken aggressive steps to make their mountain safer for all,” said Steve Berlack. “Cindy found a welcome reception by the avalanche community at the ISSW workshop. We already feel we’re having positive impact.”

The advancements by Sölden have been quite expansive. English signage on lifts and electronic avalanche warning signage now advises: “ATTENTION: HIGH ALPINE TERRAIN—LEAVE MARKED RUNS AT YOUR OWN RISK. The resort also installed an avalanche mast detonation device at the trigger location of the accident on the Rote Karl run.

“We want Sölden to be the leader in creating a safe and exciting environment for our customers to ski off the prepared runs that are all accessed by lift service,” said Sölden Ski Club President Sigi Grüner.

The Sölden resort leadership is also taking the cause outside its own valley, seeking integration of English-language warnings on the present standardized German-language signage in Austria, Germany, Italy and Switzerland.

A BRASS-produced film *Off Piste: Tragedy in the Alps*, featuring a re-creation of the accident as well as comments from noted athletes Mikaela Shiffrin, Bode Miller, and Ted Ligety, was released to the public in November. The film opens with a dramatic scene of teammates frantically digging in the snow for their friends, offering an emotional impact that grabs audiences. It showcases star athletes like Shiffrin, Miller, and Ligety in carrying a basic Know Before You Go message. The combination of the drama and education is designed to awaken audiences to the dangers that avalanches present and to provide initial direction to encourage participation in educational programs. It also features gripping interviews with the other skiers involved in the slide.

The film’s title—*Off Piste*—focuses on the fact that the skiers had no real understanding of the fact that they were skiing an uncontrolled area. It’s an awareness that BRASS wants to instill in others, especially ski racers who grew up on hardpack and controlled resort environments but also have that instinct to seek adventure. ▲

# KODAK COURAGE REKINDLED

## PART 1: How Technology is Influencing Decision-Making in The Snowsports Industry

BY JAY WHITACRE AND CURT DAVIDSON

Let them who have not stood in a more risky spot or skied a hard, questionable line for a better Instagram shot cast the first stone. This phenomenon, previously dubbed as “Kodak Courage,” has seen a resurgence with the ease of capturing the moment. If you have not noticed it popping up in the news media, trade magazines, and even research journals then you have been living under a rock. But the increasing influence this idea actually has on decision-making in risky outdoor environments has remained largely unmeasured. We’ve all heard the stories at the bar or seen the epic fail videos on YouTube, but the question remained: is this a serious trend that needs to be addressed, or just a fun way to pass the time while scrolling through our news feeds?

This project set out to answer these tough questions. More importantly, to what extent does “getting the right shot” factor in to an individual’s decision-making in resort skiing or when traveling in backcountry avalanche terrain? The snowsports industry has continued to witness technological advances such as beacons, RECCO, ABS, and apps designed to help individuals mitigate and manage avalanche risk that are actually leading these individuals to make more risky decisions. Those are the questions addressed in this groundbreaking research project. It is the *perceived risk* of these activities that may be directly influenced by the increased introduction of technologies. Traditionally, individuals have used experience to build their skill sets, but now we are witnessing an increased false sense of security through the use of technological devices.

This study is essential and timely for many reasons. Here are a few: first, the results from this study are intended to inform recreationalists and industry professionals of **the extent to which certain technologies influence decision-making tendencies** when utilized in adventure activities like backcountry snow travel. Second, this study was meant to provide a more nuanced understanding of the **level of impact** these technologies can have on developing a false sense of safety among a range of snowsport enthusiasts. Finally, the findings contribute to an understanding of the **overall power** that the use of these devices have on the perception of risks associated with certain adventure activities and how heavily they can both consciously and unconsciously influence our decisions.

The population under study consists of individuals who consistently perform specific outdoor adventure recreation activities (backcountry snowsports). The sample population was chosen from those who completed an AIARE 1 course. They should all be familiar with the technologies described in the questionnaire; all had a bench-marked understanding of proper decision-making and safety assessment in the backcountry (i.e.—completion of Level 1 avalanche training). This study utilized a questionnaire that had been converted to an online survey that could be emailed to the AIARE members and other affiliate list-serves.

The responses concerning the respondent’s use of social media:

The majority of the respondents (n = 173, 73.6%) used social media. About one half of the respondents (n = 114, 48.5%) liked to showcase their adventures on social media. A substantial proportion (n = 98, 41.9%) frequently (from daily to once a month) posted something on a social media site about their adventures. More than half of the respondents (n = 119, 50.9%) reported that they were influenced by the images /videos that they saw of people doing adventures on social media. A higher proportion (n = 39, 16.7%), however, thought that Point of View (POV) cameras influenced them to make bad decisions.

The variable of technology, in this case devices used for social media posting, was thought of as a combination of [1] Use of Devices, [2] Use of Resources, [3] Use of Emergency Services, and [4] Influences of Social Media. The variable PERCEPTIONS was operationalized as a combination of [1] Attitudes Toward Risk Taking and [2] Beliefs About Rescue. Analysis showed technology **DID** influence individuals’ thinking about the aforementioned variables like use of smartphones. These data provided the statistical evidence to provide an affirmative answer to the research question due to the analysis, which led researchers to conclude that a negative relationship trending towards riskier decision-making was found between technologies and the user’s perception of risks associated with outdoor adventure recreation activities. Attitudes toward risk taking and beliefs about rescue were higher among those respondents who used a greater amount of technologies, and lower among those respondents who used less technologies. In other words, the more technology you utilize in avalanche terrain, the more likely you are to use that technology as an enabling tool to make more risky decisions.

So, what does this all mean for those of us trying to make decisions in avalanche terrain, monitor people in a ski area, or understand how accidents happen in backcountry? Perhaps most obvious is that our society (as well as backcountry travelers) is coming to rely on technology instead of actual “outdoor sense” or experience. The false sense of ability that technology can instill is leading more people to take an interest in backcountry skiing at a more rapid rate and thus is likely to increase the number of accidents we see happening in the recreation activity. It is imperative for all of us to acknowledge this trend and start to think about the ramifications of it on the activities we love.

The repercussions for professionals to understand this information are virtually unlimited. Understanding that people who pull out their cell phone for a better Instagram post are more likely to make riskier decisions, ski riskier lines, and ultimately make decisions that can have costly implications for themselves and rescue personnel seems to be supported strongly by these data. The push for avalanche education should continue as an essential element of supplemental knowledge pointing to how to better utilize these technologies. ▲

Jay Whitacre has been involved in educating and empowering individuals to strive for greatness for almost 20 years. He has his Ph.D. in Leisure Behavior and utilizes his professional knowledge in researching market trends and product needs analysis. As a former adventure programmer and guide he realized his passion for research and development can add to the Outdoor Industry by helping to develop better products that fill the desires of its customers.



In addition to his position at Alpenglow Education, Curt Davidson is a faculty member at California State University where he serves in the Recreation and Leisure Studies Department. He is interested in the intersection of the natural environment and education. Researching, teaching, and guiding, he fell in love with the idea of alternative forms of education such as Experiential Education. Having worked for over 10 years as a field instructor, he has been able to hone his skills as an experiential educator, while grounding his work in theory through obtaining his Doctorate. He is also the author of several peer-reviewed publications and two books including *The Outdoor Facilitator’s Handbook* and *Behavior Management in Outdoor Adventure Education*. His passion for research and teaching has shown through in his efforts to provide valuable information to the field of Adventure Education and how it can contribute to building a more robust society.





Afley Peak, both from a distance and close up, failing at the end of a week-long string of very large avalanches pushed to failure by incremental loading and modest wind transport. Notice how the avalanche propagated around a nearly 90° ridge line. Photos Ben Pritchett

**Editor's Note:** The Crested Butte Season Summary was not available at press time for the October TAR, so is included in this issue.

## Crested Butte Avalanche Center

The winter of 2017-18 would likely be written off by powder hounds as a season to be forgotten, nearly on par with 1977, “the year without a winter.” However, from the avalanche observer, the slides seen across our Elk Mountains with massive propagation measured in the thousands of feet, and fracture line depths over six feet deep on many occasions easily eclipsed avalanche sizes observed during the near-record winter we saw in 2016-2017.

A prolonged drought through the fall and into December allowed what minimal snow accumulations we had to transform into large grained, striated depth hoar which would plague the base of our snowpack the entire season and “re-activate” with significant snowfall, wind events, and rain and warming events through April, allowing impressive persistent slab and wet slab avalanche cycles well into spring.

December and January were far below average, and though the avalanche center did continue to issue daily advisories through this drought, the danger fell to a consistent Low danger rating. The community held its collective breath as we waited for that big “Elk Mountain Special,” the multi-foot mega storm that washes away the basal facets a few times a “normal” winter (if we are lucky) and starts our snowpack anew.

February finally showed some promise, but rather than one big Pacific slugger of a storm,

the Crested Butte backcountry received a string of small to medium sized storms that incrementally loaded our snowpack, building a slab without causing widespread avalanching until the last week in February when the sky seemed to come crashing down with a slow motion, long duration deep slab avalanche cycle. Observations and near misses came pouring in once the storm clouds from one storm cleared out, allowing observations into the deeper portions of our forecast area. The time between February 16th and March 1st showcased one after another staggeringly wide crown lines zig-zagging terrain between 29-45° in steepness. Several close calls and one incident requiring assistance from Crested Butte Search and Rescue for two injured skiers on Schuylkill Ridge (Birthday Bowl) after triggering a size 2 slab avalanche on 2/19. One could say that all the excitement of a “normal” winter was just all packed into February this year. Deep slabs worked into the daily jargon on the forecasts and although danger never officially bumped to high danger, we flirted with it for many days, 17 days at Considerable to be exact.

Over the course of the month of February we effectively doubled the season’s snowpack with 80” measured at Irwin, 6”+ of snow water equivalent. We anticipated that there would be a large avalanche cycle, what was tricky was trying to nail the timing. The snow favored forecast area north and west of Crested Butte had largely been the major players in the avalanche game leading up

to February, but we also began to see avalanches increasing in size and occurrence spread to the Brush and upper Cement Creek drainages during the latter half of February. As the snow piled up, so did stories and observations of more near misses, with experienced skiers underestimating the unpredictability of such a pronounced weak layer near the ground, growing deeper and deeper with every small disturbance, and therefore, more and more stubborn and hard to evaluate. One such incident was on Schuylkill, another in the Anthracites, another one on Anthracite Mesa, and potentially others went unreported.

After the nice parade of storms in February, March came in like a lamb, and left like the month of May... Strong high pressure took hold, that intense early spring sun returned, and the few storms we did see roll through the Elk Mountains saw unusually warm characteristics with pronounced rain/snow levels well above valley floor. The first wet loose avalanche cycle of the spring oozed down east through south facing slopes as early as March 2nd. Another very pronounced wet avalanche cycle, both wet loose and wet slab, was spurred by rain in late March, and produced an especially impressive wet slab cycle as the early winter’s large grained facets saw free water for the first time on north, east, south, and southwest facing terrain.

The CBAC once again forecasted for the Grand Traverse, and just so happened that race night fell on one of the major storms of the winter. Despite

best efforts, forecasters on course decided that a Reverse was the safest and most prudent option. Once the storm passed, observers noted many size 2 avalanches on or adjacent to the race course and the decision was re-affirmed.

In addition to the unusually warm temperatures and bouts of liquid precipitation, the now regular addition of dreaded red desert dust from the desert southwest blew in on several pre-frontal wind events in mid to late March. In addition to rainfall limiting snowpack growth, the red desert dust decreased albedo (reflectivity of the snow surface), and increased snowmelt through April. The near record low snowfall kept the Gunnison River basin snow water equivalent estimated at around 25-50% of average, the lowest snowpack in nearly 38 years.

Our CBAC team continued to meet and exceed our community's growing thirst for timelier, more accurate, more engaging, and more multi-media soaked avalanche resources. Despite the slow start to the season, our annual Awareness Night in early December was bursting at the seams, standing room only seating for about 450 people who came out to listen to the variety of presenters and educators and socialize amongst the local tribe. The following day, our Beacon Brush-Up event, offering free community avalanche rescue education and equipment demos, had over 100 people in attendance. Despite minimal snowfall, and with a big help from the Town of Crested Butte heavy equipment operators, we dumped enough plow debris to enable realistic shoveling practice for the 200lb fire department cadaver.

This season, the CBAC issued 131 daily weather and avalanche advisories beginning on December 1st, 2017 that were disseminated to the public through our website, email, and radio broadcasts. Surprisingly, even despite the slow start to the season and meager snowfall for much of the winter, we only produced seven fewer forecasts than our blockbuster, record setting winter of 2017.

The CBAC continues to expand and improve upon its social media presence. The center uses Instagram and Facebook on a daily basis to reach a broader audience while providing visual media and dialogue to highlight current conditions. The CBAC also regularly produces YouTube videos to demonstrate avalanche concerns in the field. Our social media audiences continue to grow and mature: our Instagram followers, Facebook reach, and Youtube view-time all dipped in traffic due to last season but our engagement, and interaction per post does grow. We plan to continue our avalanche-related social media products and look for new opportunities to expand and improve in this arena.

We'd also like to acknowledge several professional operations for their continual data sharing. Irwin Guides sends us daily observations from their cat ski operation, and Irwin's backcountry guides share their field observations with the CBAC on a regular basis. Billy Barr in Gothic maintains meticulous weather records and makes a special and timely effort to email us weather and avalanche data during storm cycles. The Crested Butte Ski Patrol also made a large impact this season with increased information sharing to our avalanche center from very pertinent northerly facing avalanche mitigation routes in previously unopened terrain.

—Ian Havlick



There were some close calls in late January, involving "repeat offenders." Slopes which had slid already earlier in the winter filled back in, reloaded lingering persistent grains (facets and depth hoar), and were much more easily triggered. For example, on 1/29/2018, experienced Crested Butte locals were surprised when they accidentally triggered this slab north of Crested Butte. They chose the terrain because it had previously slid and would be dealing with a shallower slab than the surrounding persistent slab problems, but underestimated how sensitive this slab remained on the residual large grained depth hoar from December. The skier was able to ski off the slab and was uninjured. Photos Mark Robbins



Basin-wide avalanche in Baxter Basin, north of Crested Butte following a week of incremental loading on February 21, 2018, failing on buried near surface facets from mid December. Crown depths ranged from 3-8ft deep. Photo Jeff Smith

# THE “AHA MOMENT”: MANAGING RISK IN AVALANCHE SAR

BY ALEXIS ALLOWAY



Poor visibility, deteriorating weather, and overhead objective hazard . . . just another typical day for a winter SAR mission. In this photo, members of Everett Mountain Rescue package a subject for litter transport. In the Pacific Northwest, winter SAR missions tend to happen during conditions when a helicopter cannot fly, requiring a lot of people and a lot of risk exposure to get the job done. Having an “AHA moment” before the mission can help minimize risk to rescuers.

*Photo courtesy of Everett Mountain Rescue*

**It’s 9:40 p.m.** on a stormy winter evening, 28" of new snow around 1.5" of SWE in the past 24 hours (that incident had over 2" in 48 hours, with 1.5" in past 24 hours), winds have been steadily blowing, and weather conditions are showing no signs of improvement. The avalanche danger is High, and a thin layer of facets lurks atop a crust several feet below the snow surface. You’re about to turn in for the night when you receive a text message announcing that two teenage boys are overdue after departing earlier that day for an afternoon ski tour. The general area where they were last seen consists of challenging to complex avalanche terrain. As an Operations Leader in your local Mountain Rescue Unit, how do you respond?

This scenario was a real avalanche accident that happened near Snoqualmie Pass in February of 2018, and these dangerous conditions are somewhat typical of the handful of winter missions that nearby Mountain Rescue teams field each year. Common themes include terrible weather, considerable or high avalanche danger, darkness or impending darkness, challenging to complex terrain, poor visibility, and lots of uncertainty. Most of our winter missions are searches, which further increases risk to rescuers by requiring them to travel through more terrain than if they are responding to a known location, thus increasing their exposure.

Besides the objective hazards, another risk management challenge is that most SAR teams consist of volunteer rescuers, many of whom have little or no professional risk management or avalanche experience. These members don’t get paid to attend trainings, they don’t have a supervisor, and they don’t receive coaching, feedback, or other professional development related to terrain selection, stability assessment, and group management. Most rescuers have learned about avalanches in the wicked learning environment of the backcountry, meaning they do not have adequate experience in an instant-feedback environment to develop true avalanche expertise. Even those rescuers who frequent the backcountry may be unconsciously incompetent when it comes to managing risk, perhaps having gotten lucky over the years instead of making good decisions.

As if the objective hazards and lack of expertise aren’t enough, human factors run rampant during a SAR. When someone is missing or injured in a winter environment, people’s lives are on the line, and the pressure to act and get results can feel enormous. Common human factors include expert halos, rushing, people being afraid to speak up, and what can only be described as good, old-fashioned “testosterone poisoning” (overconfidence in one’s abilities and underestimating hazards).

If we look at accident potential as the realm where objective and subjective hazards collide, it’s pretty clear that avalanche rescue is a risky business, especially when undertaken by volunteers. In Everett Mountain Rescue, we recognize that avalanche response is the skillset where our volunteers are least equipped to identify and manage risks. Of our membership of 70 people, only about a third recreate in avalanche terrain in the winter, and most of them only a handful of times per year. The average team member has a Recreational Level One training, and while a few of our members volunteer to assist with teaching Level One avalanche classes, almost none are paid avalanche professionals. Our team does not get many winter SAR missions due to the fact that most alpine terrain in our jurisdiction is inaccessible all winter. For us, avalanche responses are a “low probability, high consequence” event, meaning we have few similar historic events to learn from, yet there is a lot at stake.

Risk management starts long before your team sets foot in the backcountry. In this photo, members of Everett Mountain Rescue practice using the Avalanche Hazard Assessment (AHA) during an evening training at our base.

*Photo Chris Moriarty*





After fielding several winter missions where members raised concerns about risk management, we started to really see our team’s vulnerabilities. The resounding advice from the professional avalanche world seemed to be “get a system,” so we decided to give that advice a try. After reviewing a couple of existing checklists, we felt they were not detailed enough to work well for our users, so we decided to create our own. During the winter of 2017-18, a small group of our volunteers developed and piloted an Avalanche Hazard Assessment (AHA) system designed specifically for our Mountain Rescue unit. For the rest of this article, we will explore the components this system, its benefits and limitations, and tips for implementing an “AHA moment” into your own organization’s culture.

**HOW IT WORKS**

Upon receiving a request for SAR resources, our In-Town Commander (ITC) pages out the known information to a group of Operations Leaders (OLs) using the GroupMe app (an instant messaging system). Upon receipt, two OL-level individuals respond to the group that they will perform the AHA. Using a standardized AHA worksheet (see page 18), each of those individuals independently spends 15 minutes gathering information about snowpack, weather, and terrain. Once the raw data is gathered, each OL analyzes the information and decides whether to deploy field teams or wait for better conditions. If they do opt to deploy, they create a run list for field teams, with an emphasis on identifying terrain that needs to be closed.

Once each of the two OLs has completed the AHA, they call each other on the phone and collaborate to create a finalized AHA that includes a run list and notes to field teams. Rescuers in the field can choose to close additional terrain based on what they find, but terrain closed in the AHA cannot be opened. If the OLs can’t agree on a run list, they are encouraged to yield to the more conservative judgment call. Our local avalanche center, the Northwest Avalanche Center (NWAC), has agreed to have their staff review our completed AHA forms during missions and give their input about our terrain choices. They also are able to provide us with point-specific weather and avalanche forecasts for locations further away from the ski areas, where data is more scarce.

The completed AHA worksheet, along with supporting documents like slope-angle shading maps, Google Earth images, and terrain photos, is then paged out to all rescuers with the mission announcement. If we are not able to get OLs working on the AHA immediately, we have agreed it’s okay to start mobilizing resources toward the trailhead, but the AHA must be completed and communicated to Command before teams are actually deployed in the field. Our AHA also includes a standardized briefing sheet for all teams to complete before heading into the field, allowing them to make additional assessments at the trailhead.

**ADVANTAGES OF THIS SYSTEM**

Human factors are why smart people can do stupid things. The AHA is an attempt to minimize human factors in our decision-making by using a checklist and assessing obvious



If the helicopter can’t fly, it takes tremendous manpower to pack an injured or deceased subject out of the backcountry. More humans equals more human factors that can influence our risk management decisions, and taking an AHA moment during mission planning can help mitigate these risks.

**SLOW IS SMOOTH,  
AND SMOOTH IS FAST.**



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**EMRU Avalanche Hazard Assessment**

**INFORMATION TO BE PREFILLED BY OL'S:**

**A) WEATHER DATA PAST 24 HRS** (click here)  
 Station Location: Click or tap here to enter text. Elevation: Click or tap here to enter text.

Low Temp	Current Temp	24 Hour Temp chg	Avg Wind Speed	Max Wind Gust	Wind Direction	SWE Past 24 / 48 hrs	New snow past 24 / 48 hrs
XXX	XXX	XXX	XXX mph	XXX mph	XXX	XXX / XXX	XXX / XXX

Notes: Click or tap here to enter text.

**B) NWAC AVALANCHE FORECAST** (click here)  
 Paste current NWAC avalanche forecast and avalanche problems here or print and attach full forecast (Windows snipping tool)

West Slope Central - High Rise to South of CR  
 Height: 10000 ft, Summit: 10000 ft

*SAMPLE*

*P2*

*P3*

**C) SUMMARY OF RECENT AVALANCHE ACTIVITY** (click here) (Note: Location, Elevation, Aspect, Size and Type)  
 Click or tap here to enter text.

**D) TODAY'S NWAC WEATHER FORECAST 12-24 hours** (click here): (temp, sky cover, precip, winds, snow level, confidence)  
 Click or tap here to enter text.

**EMRU Avalanche Hazard Assessment**

**E) OL OVERALL ALPTRUTH SCORE**

Clue	DESCRIPTION	SCORE 0, 1, or Unknown
Avalanches	Same aspect/ elevation; past 24-48 hours.	Choose an item.
Loading	By wind (sustained 15+ mph); SNOW (2" or more in 24 hours; rate of 1"/hr 6-hours) or rain in past 24-48 hours.	Choose an item.
Path	Identifiable to a novice.	Choose an item.
Terrain Trap	Consequence magnifiers: gullies, dips, trees, etc.	Choose an item.
Rating	Considerable or higher on current avy bulletin.	Choose an item.
Unstable Snow	Cracking, collapsing, whumping, hollow snow.	Choose an item.
Thaw Instability	Rapid warming (>12-15°) after cold spell; temps going above freezing.	Choose an item.

ALPTRUTH Score: Click or tap here to enter #. **points with** Click or tap here to enter #. **Unknown**  
 92% of fatal avalanches have had 3 or more clues present.

**F) AVALANCHE DANGER IS EXPECTED TO** (Select ONE): Choose an item.

**G) OL TERRAIN ASSESSMENT FOR ALL TEAMS DEPLOYING** (terrain characteristics or specific areas):

**CLOSED:** Click or tap here to enter text.  
**Standby:** Click or tap here to enter text.

Notes:

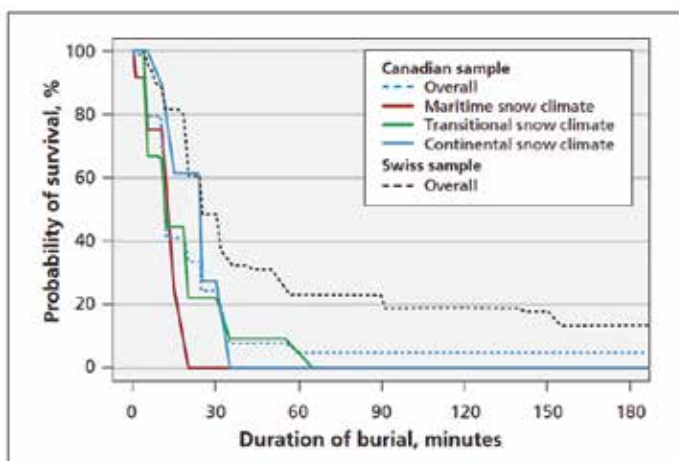
**H) SNOW & WEATHER OBSERVATIONS TO BE MADE IN THE FIELD** (AIARE Avy Obs Reference) (Avy Problem Toolbox): (What should teams be looking for in the field and why? Where should observations be made?)  
 Click or tap here to enter text.

**I) NON-AVALANCHE RELATED HAZARDS/ CONCERNS:**  
 Click or tap here to enter text.

**J) NOTES TO FIELD TEAMS**  
 Click or tap here to enter text.

**K) CURRENT DATE AND TIME:** Click or tap to enter a date.

**L) PLANNED REASSESSMENT TIME:** Click or tap to enter a date.



hazards from a level-headed perspective. By having our more experienced team members assess risk, and by using a collaborative approach rather than relying upon the judgment of one individual, we are harnessing the collective brainpower of our team and providing some checks and balances against strong opinions from one person. If you are familiar with the Swiss cheese model of accident causation, we are adding another layer of risk management to protect individuals from harm.

Another benefit of the AHA is that it slows us down and allows us to engage our logical, proactive brains instead of just our intuitive, reactive brains. This slowing down is minimal in the grand scheme of things, but it's enough time that it does allow for critical and thoughtful analysis of complex variables. The systematic approach of working through a pre-set worksheet ensures that we don't skip steps that can easily be forgotten in the adrenaline-fused excitement of mission planning. Having the OLs complete the AHA ultimately saves the team time, as individual rescuers don't have to spend mission prep time checking the avalanche forecast and pulling data themselves.

To maximize effectiveness, our AHA was intentionally designed to be flexible and to avoid rule-based decision-making, which can prevent the use of situationally appropriate judgment. There is no mandate within our AHA that states that if data points meet a certain threshold, we can't send teams in the field or we need to close terrain. It's up to the OLs making the assessment to determine whether conditions warrant terrain closure or delaying or declining the mission from the start, or whether field teams can make that assessment on their own. We recognize that sometimes you can't truly assess conditions until you are in the field, and we encourage OLs to only close terrain preemptively if they feel certain that there is an imminent threat to rescuers.

Finally, maybe the best part of the AHA system is that it has proven to be an excellent training and communication tool that is improving the overall avy savvy of our team. By using the AHA even for routine trainings, we are role-modeling what a thoughtful hazard assessment looks like. The more people practice using it, the better they get at analyzing and communicating about avalanche risk. We even had one of our rescuers use the AHA worksheet to help her teenage son analyze his intended snowshoe trip during High avalanche danger and make the decision to postpone the trip for another day. Our mission of saving lives through rescue and mountain safety education? Accomplished.

### DISADVANTAGES OF THIS SYSTEM

The AHA process does take time, and we all know that time matters in avalanche rescue . . . but does it? In companion rescue, yes. Organized rescue is another story, though. The greatest myth perpetuated among SAR volunteers is a misguided belief that time is of the essence and that they must hurry to deploy teams in the field. The reality is that, at least in our region, by the time rescuers from Seattle or Everett make it to the mountains (a minimum one-hour drive), anyone who has been fully buried by an avalanche will be dead (*see graph of survival times in maritime climate*). Our SAR teams either perform body recoveries of people fully buried, or we assist people who can wait the extra 15 minutes it takes to perform an AHA (read: they are not having an airway emergency). With rescuer safety as a priority over subject safety, there is ALWAYS time to assess conditions before heading into the field, even for SAR teams within

**EMRU Avalanche Hazard Assessment**

INFORMATION TO BE FILLED OUT BY FIELD TEAMS PER THEIR ASSIGNMENT.

TEAM #: \_\_\_\_\_ TEAM ASSIGNMENT: \_\_\_\_\_

FIELD TEAM ALPITUDE SCORE

Clue	DESCRIPTION	SCORE 0, 1, or Unknown
Avalanches	Same aspect/ elevation; past 24-48 hours.	
Landings	By wind (sustained 15+ mph), snow (1" or more in 24 hours; rate of 1"/hr for 6 hours) or rain in past 24-48 hours.	
Path	Identifiable to a novice.	
Terrain Trip	Consequence magnifiers: gullies, cliffs, trees, etc.	
Rating	Considerable or higher on current any bulletin.	
Unstable Snow	Cracking, collapsing, whumping, hollow snow.	
Thaw Instability	Rapid warming (+12-15°F) after cold spell; temps going above freezing.	

ALPITUDE Score: \_\_\_\_\_ Points with \_\_\_\_\_ Unknown

FIELD TEAM TRAVEL PLAN: \_\_\_\_\_

TERRAIN ASSESSMENT FOR THIS ASSIGNMENT (terrain characteristics or specific areas; decided by OL):

CLOSED: \_\_\_\_\_

Standby: \_\_\_\_\_

Planned re-assessment times/points: \_\_\_\_\_

HUMAN FACTOR MITIGATION: (familiarity, herd instinct, commitment, expert halo, prior tracks, poor communication, rushing, inexperience, overconfidence, etc.)

Factor #1: \_\_\_\_\_ Mitigation Plan: \_\_\_\_\_

Factor #2: \_\_\_\_\_ Mitigation Plan: \_\_\_\_\_

Factor #3: \_\_\_\_\_ Mitigation Plan: \_\_\_\_\_

GAA: Supervision/communications plan, Assignment (see above), Fitness of team, Environment (see above), Team composition, improvisation

Avy Gear  radios  Beacon check  Avy Field Guide  Review equipment checklist



closer proximity to the mountains. To borrow from the Special Forces, remember that slow is smooth, and smooth is fast.

Even though time doesn't matter as much as in a companion rescue, we still want to perform our AHA efficiently and get teams in the field. The first time we piloted the AHA, it took nearly 30 minutes for the testers to complete the worksheet. The biggest challenge was not gathering the information, but getting that information into the electronic worksheet format. Through piloting and revamping the worksheet, we designed a more efficient and user-friendly system. Like any system, the AHA works best with training, and we have seen trained users can complete it in about 15 minutes.

Members of Everett Mountain Rescue enjoy a brief respite from wet winter weather underneath the protection of a bothy bag. The maritime climate of the Pacific Northwest can often prevent air rescues during winter, requiring ground teams to complete the dangerous task of evacuating injured or deceased subjects from the backcountry.

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Fresh avalanche debris is the perfect setting for rescuers to experience the difficult realities of performing avalanche recoveries in Cascade concrete. During this training, Operations Leaders assessed that weather had improved enough to minimize the wet loose avalanche hazard on this particular day and location. Field team members kept an eye on changing conditions, and the team was able to enjoy a challenging, incident-free training day.  
*Photo Alexis Alloway*



Poor visibility, stormy weather, and high uncertainty are common challenges faced by mountain rescue teams in the Pacific Northwest. Taking a thorough and systematic approach to mission planning can help rescuers identify hazards and minimize risks.

That brings us to another disadvantage of the AHA system: user skillset and backcountry experience. Our AHA is designed for “expert” backcountry users who are proficient with gathering online data and analyzing terrain using topo maps, satellite images, and their own personal terrain knowledge and experience. Inexperienced users will struggle to find this information in a timely manner, and they may struggle to visualize what terrain on a topo map actually looks like in real life. Additionally, inexperienced users tend to overestimate risk and they struggle to use judgment and make decisions in the face of complexity and uncertainty. But it’s a start, and within the framework, inexperienced users can learn to find the appropriate resources and do so more efficiently over time.

Because our AHA is being performed indoors, before our teams are in the field making their own snow and avalanche observations, the AHA output is only as good as the data input into it. While we are lucky to have pretty good information available online for western Washington, we still have all seen times when conditions in the field did not align with conditions reported online, or where we can’t find information that we need or want. AHA users need to be able to make judgment calls, such as recognizing when weather data seem a little “off” or recognizing when they need to skip a data field if the information isn’t available. They also need to have the common sense to communicate areas of uncertainty in their assessment so that can be addressed.

## NOW WHAT?

For Everett Mountain Rescue, the AHA system is still new, and we have only gotten to deploy it on a small number of missions and trainings. Despite its newness, the preliminary results from using this system have been incredibly positive. By using the AHA during routine winter trainings, we have provoked excellent discussions about avalanche risk, with high engagement from participants. People are showing up to trainings and missions better prepared than ever with knowledge about weather, terrain, and snowpack. Using the AHA has sparked a renewed interest in avalanche safety and education within our members, and EMRU is paying for nearly two dozen of its members to take avalanche trainings in 2019, including a customized recreational level two in January of 2019. Finally, other regional Mountain Rescue units have been asking to see our AHA system, which shows that there is a regional interest in improving risk management during winter SAR missions.

The biggest challenge for our team in using this AHA system was navigating through the process of change. While the majority of our team members openly welcomed the new system, there was a small but vocal minority that opposed it. We encouraged these people to give their input on how to improve the system, and soliciting this input helped gain buy-in.

If you are involved with a Mountain Rescue group, I encourage you to up your team’s risk management game this winter by adopting a systems approach to avalanche safety. Feel free to use our system as a template, or create your own. Regardless of what you do, something is better than nothing, and even a small simple checklist can go a long way in improving your team’s performance.

And finally, if you are going to adopt a systems approach, a few words of advice: have a plan. Many people struggle to embrace change, and you will need to create a change management plan in order to set yourself up for success. Identify progressive, like-minded people within your team, and recruit those “early adopters” to the cause. Get the support of people in key leadership positions. Once your leadership agrees on the need for change, start planting the seed to unit members that change will be coming, and explain why. Get group input in developing and piloting your system, and have respected team members voice their support and role model using it. Be realistic and frame your AHA as a work-in-progress that will require troubleshooting and modifications. Start using your AHA during trainings and missions, and be sure to consistently use it for every winter field event. Before you know it, people will come to expect it and appreciate it, and you will have made a substantial improvement in your team’s professionalism and culture of risk management. ▲

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SHUT

Left:  
Peter snorkeling  
through the  
consistent  
White Room  
near Furano,  
Hokkaido,  
Japan.  
*Photo Brett  
Thomas*

Right:  
Avalanche  
Control at  
Temple Basin  
Ski Club, New  
Zealand.  
*Photo Zoya  
Lynch*

UP

**Four Seasons in the Snow**

by Peter Biskind

AND

SHOVEL

Left:  
Patrick Chu and  
Troy Hoff down-  
ski Squirrel Hill  
on Denali's West  
Buttress.  
*Photo Peter  
Biskind*

Right:  
NSF scientists  
shoveling to  
expose a crack  
in seasonal  
sea ice.  
Ross Island,  
Antarctica.  
*Photo Peter  
Biskind*



### Japan

“Boys, it’s a twenty centimeter day,” I say to my housemates. What I mean is: we have a normal amount of work to get the vans cleared and safely out of the unplowed driveway. It’s January 2016 in Niseko on Hokkaido, Japan’s powder-heaven island. It’s snowed 28 of the last 31 days and we’ve gotten into the habit of looking out the window to assess new accumulation on the vans. Ski patrol reports aren’t up and we don’t need to check the Internet. Our guide meeting is at 7 a.m. no matter if it’s blizzarding or blue.

This parking lot shoveling feels like a whole season of Tahoe storms in one month. Our vans get bermed in daily and I whine about needing a snowblower. I choose what I am going to eat for breakfast based on the condition of a bunch of automobiles, which feels unusual and silly to me, but so be it. Thirty centimeter mornings start with rushed convenience store breakfasts and turn into fantastic days of snorkeling and clients baffled by the white room. Ten centimeters or the rare blue day means I slowly eat an egg scramble, toast, and even drink a second cup of coffee at home before I pour one for the road.

The beatdown of working seven days a week and unburying the vans twice a day takes its toll on my body. But I’m not complaining.

### Alaska

“Get up! Vern is losing his kitchen!” Willie is yelling at the top of his lungs. Troy and I look at each other with astonishment. It’s 3 p.m. and we’ve been in lazy-mellow ‘wind-hold’ mode for days. It’s not the altitude that’s hard—we’ve acclimatized for the past eight days at 14,000’ camp on Denali’s West Buttress. It’s switching to rapid response that isn’t easy. I gear up and crawl through the snow-filled vestibule.

The wind hit records with 80 mph gusts in camp today and Vern’s entire team is out and working hard but need more help. Two tent poles have snapped and at least one four-foot-long gash runs through the wall of the Hilleberg kitchen tent. We quickly divide into groups to reinforce snow walls, take down and move the kitchen, and check the rest of the tents. We saw and cut blocks at our neighbors’ camp for the next two hours, and then the work really starts: our camp is filling in.

We are the farthest camp east and therefore take the brunt of the wind and snow: we had built and rebuilt our snow walls several times already during our week-long hideout at Advanced Base Camp. Nevertheless, our wind walls are disappearing. We have to move ten tons of snow and recreate a baseline. My training in the ‘conveyor belt shoveling method’ has only slightly prepared me for this field camp application. We bump the snow at least twice to get it from the wind wall to the front of the tents, and then twice again to get it out of camp. This five-day storm made our backs sore; but kept us happily active compared to lying around the tent.

On day 3 of this storm, I made a suggestion to my trip leader about our camp location . . . he rapidly responded, “Shut Up and Shovel.”



### New Zealand

I can’t believe we’ve only been open for four weeks. It’s September and the last time I checked, that is the end of winter in the South. Not only did we have a late start to the season; but now the sun and rain combo has crushed the tow-line snow. It is my second season as the Snow Safety Officer at Temple Basin Ski Club so I know how rain can affect this place, but shoveling snow because of a lack of snow? We fill barrels, we cover and drag tarps, we ask for help from guests, sometimes guests just feel bad and offer to help, and for the rest of the season we shovel. Yeah, yeah, yeah, Temple Basin is inbounds backcountry but when the tow-line to get up to the bootpack has boulders, gravel, and up to 15 meter-long sections of scree, it is just time to close.

Back in the good ol’ USA we all have a pair of rock skis for early season, right? Well, skiing uphill via tow-rope over Arthur’s Pass scree gives a new meaning to rock skis. Anyways, enough whining about sparks flying and rock-painting with P-Tex, at least there was still snow to ski down!

### Antarctica

“How far did you get, Kyler?” I ask my grooming partner after an eight-hour session on the runway.

“I rough-toothed up to 2000’, but I got bucked off twice from the sastrugi,” he replies. “It’ll be a lot better once you’re finished with the tents and can come help me break it up.” He means that we need to take turns grooming, with a skidoo powered tow-behind grooming trailer, and hand shoveling the remainder of the 10,000’ by 250’ skiway. We are in no man’s land in the middle of the Ross Ice Shelf—not quite land, and definitely not sea, with one mile of ice beneath us (at approximately 80 S and the International Date Line.) When we prework the sastrugi ridges with a 5’ spade the grooming is much easier and much safer. Luckily I only have to do this for three days before our scientists show up and I switch to another kind of work: digging trenches.

After a week of setup our science team flies into camp on Twin Otters (which do not need groomed skiways.) The field mission is to remove 28 tectonic observation stations that were installed two years ago. Each station has at least one 250-pound battery box under six feet of snow and a fancy seismic sensor thirty feet away and a little deeper.

I guided this team for ten days of field missions via Skidoo and Twin Otter. On weather days, I rejoin Kyler on the skiway, breaking sastrugi or driving the Ago-groomer. On day 18 of flat white we completed the skiway and made the call to Ross Island to send the Hercules. Eighteen days later the enormous planes arrived and took us and our 30,000 pounds of gear back to base.

Thirty previous snowy winters at least raised my shoveling proficiency from neophyte to intermediate. But it really was the year of 2016, where I crammed in four winters, when I truly became a professional shoveler. ▲





With an avalanche bulletin forecasting high hazard for the day, Jamie Bernstein elects to ski some lower angle powder (though that's probably a good decision just about any time). Photo Mike Henderson

When I worked for the Outward Bound school, we typically slept under tarps (away from widow makers). On one of my first courses, my co-instructor and I built our shelter hastily and, frankly, poorly. I was concerned this would prove problematic, but my desire to get to sleep allowed me to write it off. Because the mountains are a great teacher, I awoke the following morning soaked by rain with a sleeping bag that wouldn't be fully dry again for another five days. From that point forward I emphasized to my students that if they were going to make a shelter, they should really make a shelter. Anything less than a bomb-proof set up was simply wasted effort. I was beginning to collect my own set of rules and habits for success in the mountains. This particular rule about making shelter paid off one day after climbing in 70mph gusts in Red Rock, Nevada when we returned to the campground to find that ours was the only tent still where it had been left. Anyone else not sleeping in a vehicle was picking up scraps out in the cactus.

When I learned to paddle whitewater, I was fortunate to fall in with a crew of serious Class V boaters almost immediately. Despite the fact that they had boats someone else paid for and I had a dry top that didn't actually keep me dry, they were happy to run rivers with me simply because they loved paddling that much. On my third day of paddling, after a series of hypothermia-inducing swims, my friend noticed the non-locking carabiner on my PFD. He admonished me. His system was simple. Carabiners go in zippered pockets. If a carabiner must be exposed on your PFD (such as on a quick-release harness), it is a locker that always stays locked. It would only take one time with an unlocked carabiner accidentally clipped to a rope or tree branch while underwater to learn this lesson, if that experience didn't kill you first. I nodded, shivered violently a bit more, and stuffed the carabiner in a pocket. New rule: locking carabiners only on the river.



Josh Whitmore opts for second tracks, letting the author punch down on breakable crust, leaving the softer snow beneath for the second skier.

BY DEREK DEBRUIN

I sat quietly in the back of the Subaru, speeding home through the darkness, exhausted from a long day of touring. My compatriots in the front seats were debating the merits of boot flex and carbon skis for their advantages in various snow conditions. These seemed like insignificant details to me. As long as the boot fit on my foot and into the binding on the ski, I thought they all skied just fine. It was then that I realized I must not have been skiing hard enough for it to matter—the particulars of boot flex or ski stiffness were clearly not the things keeping me from shredding steep couloirs. My mediocre skiing ability took care of that. As the conversation turned to weight and durability, my friends agreed this didn't matter as much out of the resort gate or on a day tour, but was certainly consequential for big ski mountaineering missions. It seemed reasonable to take the lightest possible kit on huge days deep in the backcountry, but I thought counting grams was overkill. Clearly, a couple extra grams on my feet wasn't what was holding me back. But as I've grown as a skier, I consistently find that the closer to the limit the more these small things matter. And when there's real consequence involved, managing the details is everything.

In *The World Until Yesterday*, Jared Diamond introduces the idea of “constructive paranoia,” a seemingly obsessive and unnecessary preoccupation with mundane details as a way to manage the risk of low-probability events. As one piece of evidence, he cites native peoples of Papua New Guinea. During one of many stints doing field work there, he was struck by how consistently his hosts refused to sleep under or near any “widow makers”—standing dead trees or limbs. This seemed absurd as the likelihood of a particular individual being struck by deadfall while sleeping was quite low. However, Diamond soon noted that on any given day he would witness or hear deadfall at least once, often multiple times. He realized the aversion to sleeping under dead limbs was completely rational if living in these forests every day. Sleeping under widow makers was simply a numbers game that was far more likely to catch up with a local than a Westerner visiting for a few weeks or months. This bit of information created a cultural norm that New Guineans only dared violate at their own peril.



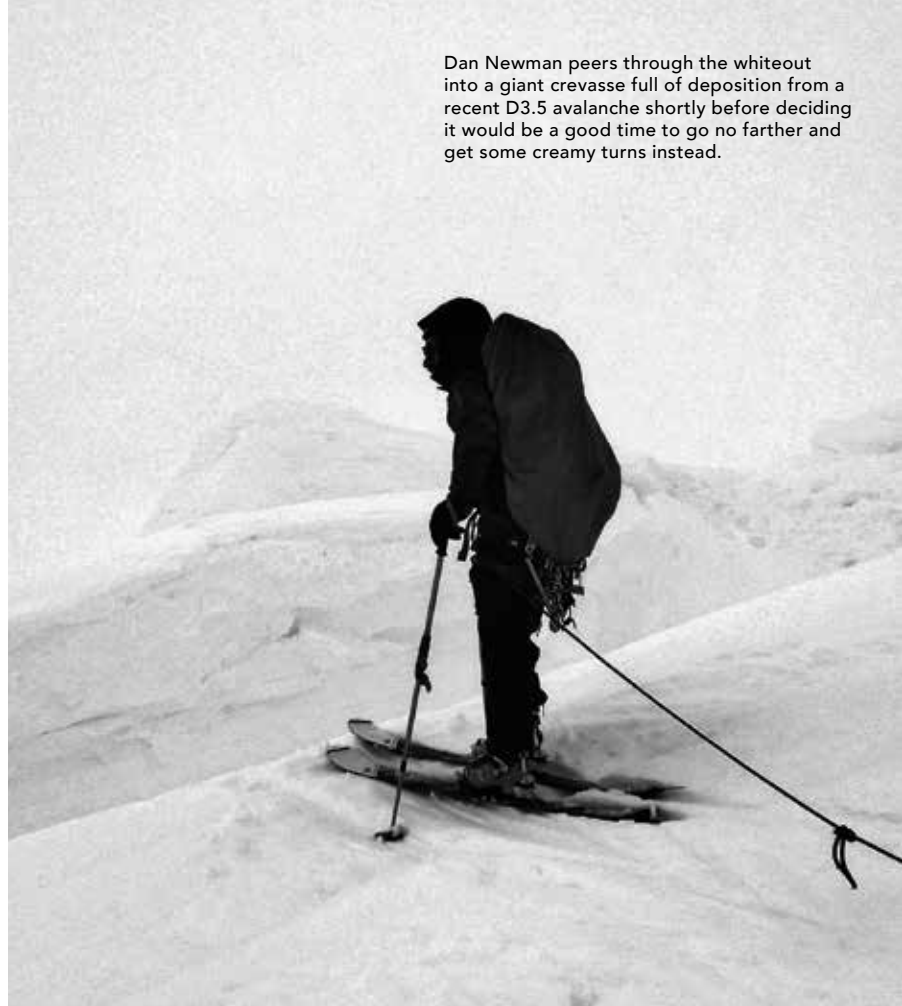
Here and Right: Dan Newman makes the questionable decision to climb technical terrain with skis on his back. Hopefully the descent will be worth it.



Years spent working in the Southeast meant days on end with wet feet, and that meant immersion foot was a real concern for me and those in my care. On an expedition, one's feet might be the only realistic way out of the backcountry, emphasizing the importance of treating them properly. I quickly learned the system to manage this from a more experienced guide. Every morning started with donning the driest pair of socks available. The midday lunch break doubled as a blister check. Socks were dried against the chest all day. The evening routine included at least 15 minutes of bare feet followed by judicious application of lotion on hot spots. Clients and students were instructed in the same. Diligence was a requirement and these daily chores were not optional. As a result, when working one season with 26 straight days of rain, no one had a foot injury more severe than a blister.

When learning to ski, a patroller taught me a basic tenet of ski patrol: never stop above someone. When pulling into the safe zone at the end of a run, stop below your partner. It would be a pretty shitty day to accidentally let loose a sluff or take an uncontrolled slide that sent a co-worker downslope just because you stopped above them. A long-time avalanche forecaster and field observer taught me another: at the bottom of the run, get out of the way and put your skins back on immediately. At the base of the slope, it's much harder to search for someone if there's an avalanche, and having skins on skis could be a life-or-death difference. "10cm and 10mph" is the succinct rule for closing uphill traffic at my local ski resort. When I've asked about this, the assistant director of mountain safety gives a straightforward answer based on decades of experience on that hill. Wind greater than 10mph is fast enough to transport snow and four inches of fluffy white stuff is plenty to form all manner of slabs. If both those conditions are met overnight, the ski patrol will be throwing charges in the morning, meaning no inbounds uphill travel. While it may seem unnecessarily conservative to always follow these rules, all three of these professionals follow their respective maxims religiously. They each also have at least one story where not heeding these rules cost them dearly.

Dan Newman peers through the whiteout into a giant crevasse full of deposition from a recent D3.5 avalanche shortly before deciding it would be a good time to go no farther and get some creamy turns instead.



# Bad TO BREAK

With early season snow but no base to ride on, Azissa Singh makes the smart choice to go storm climbing instead.



Many strong alpinists have similar rules and habits. Conrad Anker is incredibly diligent with foot care. Steve House always carries mittens when climbing so his hands are guaranteed to work if he needs to bail. Colin Haley habitually wears a nose protector on his sunglasses because looking cool is less important than not getting sunburn (or skin cancer). Rolando Garibotti weighs every piece of gear to the gram and writes the weight directly on the item. Will Gadd has pretty strong opinions about racking with a gear sling. Reinhold Messner maintained a daily diet that was the same as he would eat on expeditions, so there was never a need to transition diets and he was always assured a regular morning bowel movement.

The common thread among all of these anecdotes is in the consequence for breaking the rules. These are not idle whims, nor are they meaningless compulsions. Each habit is based on an axiom that serves to decrease risk in an unforgiving environment. It might seem obsessive to count grams. However, attempting cutting-edge lines in big mountains with little margin for error by definition does not leave any margin for unnecessary weight. The flex of a boot or responsiveness of a ski is no longer an inconsequential detail when you factor in variable snow surface, poor visibility, fatigue, and no-fall terrain. It could be the difference between sending or not, or even making it home. Inadequate shelter might only mean an unpleasant night out, until the one time it means death by exposure.

Consequently, nearly all of the guides, skiers, climbers, and other outdoor professionals I respect the most have strong opinions on the manner in which they conduct themselves in the mountains. They follow their own rules diligently and use habits they can't always explain. They are of course open to learning new systems and engaging with new ideas, but each moment of an expedition from initial research to logistical preparations to execution of a descent is the result of a certain carefulness born of years of near misses, close calls, and shiver bivies. Everything is done with purpose, nothing is left to chance. The mountain is already unpredictable—that shouldn't be exacerbated by doing anything haphazardly. I'm wary of those who haven't figured out the rules yet. I just hope I'm following the correct ones. ▲

EMBRACING MY INNER

# Sledneck

AS AN AVALANCHE PROFESSIONAL



The author's preferred tool for investigating a snowmobile-triggered avalanche in "God's Country," Turnagain Pass, Alaska.  
Photo Graham Predeger

BY GRAHAM PREDEGER

*Virtually every avalanche center* and avalanche school in North America (and probably the world) has roots in the skiing community. The vast majority of forecasters and educators identify as 'skiers' first and foremost. This makes sense given that many have ski patrol or guiding backgrounds. However, without making a concerted effort to infiltrate the snowmobile community and understand first-hand how a sledder uses terrain differently than skiers, avalanche forecasters and educators are doing a huge disservice to the snow and avalanche community. As the popularity of backcountry snowmobiling increases, technologies improve, and users become more savvy, it's up to educators, forecasters, and land managers to not only keep up, but to tap this user group as a resource. If done effectively, the entire snow and avalanche community will benefit.

I had spent my youth in Alaska mostly on cross country skis and started pushing into our local backcountry as a blissfully ignorant teenager, skipping school to explore the Turnagain Pass backcountry in the late-90s. Digital transceivers were just hitting the market alongside the first 'mountain-specific' snowmobiles. In March of 1999 as a senior in high school and weeks after taking a Level 1 avalanche class, I watched the most tragic avalanche accident we've seen on the Chugach NF play out on a shaky 8mm video recording. The local news reported that six snowmobilers were killed or missing in a single ava-

lanche, minutes from the Turnagain Pass parking lot and in full view of the Seward Highway. I had skied this exact slope a week to the day before this incident, wonderfully unaware of the weak layer responsible. Though I didn't know anyone involved, and didn't even identify with this user group at the time, the 1999 avalanche left a mark in my psyche.

It wasn't until working for the Forest Service in Colorado, managing a busy winter recreation area where I really learned to efficiently and effectively ride sleds, that I would eventually identify as a snowmobiler. From 2003—2011 I logged ~2500 miles/ year on snowmobiles in and out of avalanche terrain, witnessing first-hand the technology far outpacing the skills and education of an average 'mountain rider.' It became apparent that this user group was in need of some basic skills and info. It made sense; my experiences to date as an avalanche school student and consumer of daily bulletins were very skier-centric. Just 10 years ago virtually nobody was communicating directly to snowmobilers even though they were dying in avalanches at a greater rate than their non-motorized brethren.

Fast forward to the winter of 2011/ 12 when I moved back to Alaska in pursuit of a dream job, working in support of the Chugach National Forest Avalanche Center (CNFAIC). A stated goal of mine was to "further involve and engage the local motorized community in THEIR avalanche cen-

ter." I wanted snowmobilers to see the CNFAIC as a respected pillar in their community that would act as a central hub, and a resource for all user groups. After all, the CNFAIC (and early seed money) was a direct result of the 1999 avalanche in Turnagain Pass. Our short history had a very direct tie to the snowmobile community. In pursuit of my goal, I had some fails along the way. Like the time I slipped a "We want your observations!" brochure into the window of a jacked up Ford truck at a local trailhead, only to get an irate phone call the next day that the leaflet had slipped in between the power window and door panel, where it probably still is today! Unfortunate for me, he didn't have any relevant info for my advisory that next day.

Aside from the aforementioned fail, we (and I say *we* as the entire CNFAIC staff, past and present) have had some incredible successes along the way that have improved every aspect of our operation from financial support to increased public observations and info sharing. Corporate donors have given snowmobile-specific grants that have allowed us to purchase a new trailer and sledding gear. We have great motorized representation on our Friends Board and a lasting partnership with our local BRP/ Ski Doo dealer (AK Mining and Diving Supply) who provides us with a new snowmobile annually for the past six years. Local riders are sending observations and photos into the avy center and tagging us

Chugach NF Avalanche Center Staff investigating a large human-triggered (likely) avalanche in the back bowls of Turnagain Pass via snowmobile in January of 2011. This particular path, aptly named "Widow Maker," is popular with snowmobilers and sled-skiers and was the site of a double snowmobile fatality in February of 2008.  
Photo Kevin Wright



on Facebook and Instagram with pertinent info. Individuals have been very willing and open to sharing stories post-accident. This user group is getting more involved, interested, and educated. This wasn't always the case but a concerted effort to foster relationships, seek information in a respectful way, and perhaps more than anything, interact with snowmobilers in the backcountry have all helped raise our stock with local Alaska riders. From relevant images and appropriate language to what jacket we're going to wear at an outreach event all allow us to more effectively communicate. It's been a conscious effort and affects how we write advisories, post on social media and generally promote the CNFAIC. (Pro

tip: leave your Patagonia gear at home when showing up to a Sledneck event!)

We also recognized none of this should come at the expense of connecting and communicating with skiers, climbers, or snowshoers. It has simply required a more concerted effort to step outside our comfort zones and see the backcountry as a snowmobiler would. So from my perspective in the 49th State, I see the tides are changing and motorized users are increasingly becoming more eager, educated, and involved. These are our future avalanche instructors and forecasters, not to mention students, observers, donors, and consumers of avalanche bulletins.

More than ever, now is the time for the greater avalanche community to put the politics and

stereotypes aside. Snow and avalanche professionals need to be the bi-partisan voice in the sometimes-splintered backcountry community. We need to throw open the doors, seek creative solutions, and continue to foster relationships and build bridges with the snowmobile community. Even in 2018, this is a largely untapped resource with incredible potential. I'm convinced that if the snow and avalanche community can successfully bring motorized users into the fold, we all stand to benefit. At the end of the day the goal of all backcountry users is the same; safe travel in a winter environment to crush powder then return home alive. And of course repeat! ▲

## *Tips from Ed Klim*

**Here is what every snowmobiler could do to find out more about Avalanche Safety opportunities in their area:**

- 1. Join their state or provincial snowmobile association. They will receive a lot of information about opportunities in their areas from the publications.**
- 2. If you live in the United States, become a member of the American Avalanche Association. They send out a lot of information about avalanche safety and opportunities to learn more about avalanche safety.**
- 3. In Canada become a member of Avalanche Canada and receive the same kind of information.**
- 4. In the United States, especially out west, every snowmobiler should become aware of the US Forest Service groups in the individual states that deal with avalanche awareness and support them to get their newsletter and updates about snowmobile avalanche safety—especially in specific areas that they ride.**

Ed Klim is President of the International Snowmobile Manufacturers Association.

# TERRAIN TRAPS AND TRAUMA: U.S. Snowmobile Avalanche Fatalities 2017/18

*This article first appeared on BCA's blog and is reprinted here with permission.*

BY MIKE DUFFY

**Did you know that** for the last eight years, every other year has been a high fatality year for snowmobile avalanche deaths? The truth is that the 17/18 winter season was indeed a bad one for snowmobile avalanche fatalities in the U.S., and the eight-year trend forecasted this. Riders are very reactionary to accidents, then soon forget and go back to bad habits. Technology, training and good decisions led to many saves in 16/17, but fewer this season. Some riders have been relying on technology for a save, instead of knowledgeable decisions. It's much easier to "wing it" or continue as usual and hope for the best than it is to take the time to get the education, practice new skills and change riding habits. Many areas that are known for snowmobile avalanche fatalities had very few this season, most likely due to low snow, but many were due to smart decisions. But other areas such as Washington, had more fatalities than normal.

We can learn from these facts about tragic avalanche deaths to reduce accidents and the suffering of all involved.

## TOTAL US AVALANCHE FATALITIES 2017/18:

1. U.S. Avalanche fatalities: 25
2. U.S. Snowbike fatalities: 1
3. U.S. Snowmobile avalanche fatalities: 11

## Breakdown of U.S. Snowmobile Avalanche Fatalities 2017/18:

- 44% of the total US avalanche fatalities were snowmobilers, the user group with most deaths
- 36% of the snowmobilers killed did not have a transceiver (2), a transceiver turned on (1) or a functioning transceiver due to 0% battery strength (1).
- 45 % of the snowmobilers died from trauma. The average is approximately 30%.
- 64 % of the snowmobilers killed had airbags.
- 43% of those killed with airbags did not deploy the airbag.
- 57% of those killed with airbags died from trauma.
- 36% of the snowmobile fatalities were from Washington State.

If we had the instability of this past winter ten years ago, we probably would have set a record ten years ago for snowmobile avalanche fatalities. But fortunately, in many areas, properly equipped riders, successful rescues, and good decisions kept the fatality rate in check.

## WHAT CAN WE DO TO REDUCE SNOWMOBILE AVALANCHE FATALITIES?

1. Take your education to a higher level. The area with highest snowmobile avalanche fatalities last year, Washington State, has a low percentage of riders who have current higher level training (24-hour Level I course).
2. Use and practice with transceivers and do transceiver checks daily.
3. Analyze terrain: do not have multiple riders on the slope or in the runout area (40% of victims). Remember, an airbag doesn't work as well if you're caught at the bottom of a slide initiated by others.
4. Alter your riding according to the danger.

## Why are we seeing riders with avalanche airbags killed?

1. Riders are counting on avalanche airbag technology instead of avalanche education/good decisions.
2. A higher percentage of riders now have airbags.
3. Riders sometimes aren't deploying their airbags.
4. Riders aren't recognizing terrain traps they are in—or that they could be taken into from an avalanche.

Avalanche airbags are more popular now, yet this past season's avalanche fatalities indicate that riders did not always deploy them, and that trauma was the most significant factor in airbag fatalities.

## How can you be more effective with an avalanche airbag?

For higher effectiveness, an airbag must be used in conjunction with training, avalanche gear (transceiver, shovel, probe) and avalanche trained riding partners.



1. Check the airbag pack every time you ride. Make sure trigger handle is out at the beginning of the day and practice reaching for it.
2. Use the leg strap. It keeps the pack on the body.
3. Consider the consequences. Many avalanches are not survivable. Where will the avalanche take you? It is extremely hard to survive being taken into trees, rocks and off cliffs. Is all the mass of the avalanche above you? Where are you parked?
4. Check the forecast and alter your riding accordingly.
5. Use progression of terrain and stability tests to verify instability. See what's happening in lower consequence terrain and remember that stability tests are to confirm instability, not to negate it. Avalanche forecasting is a difficult job and conditions can vary within a forecast zone. The forecast is the starting point and you need to gain more information throughout the day. Some days it is best to stick to low angle terrain.
6. Advanced education is essential for the sleds we are riding and our riding skills. These are very preventable fatalities. In many cases, the instability and mistakes made are very obvious to riders with level I and II training. These are the classes with extensive time spent on the snow. Your entire group needs the training.
7. Speak up, don't just follow. You can voice your opinion by hitting the brakes or getting out of an area. Radio ahead that you don't feel this is a good terrain decision.
8. Ride like a professional. A true professional has both riding skill and professional level avalanche training. Many well-known riders do not.

Top: American Avalanche Institute AAA motorized Level I class at Togwotee Mountain Lodge, Togwotee Pass, WY.

Center: A Motorized Level I avalanche class at Silverton Avalanche School.

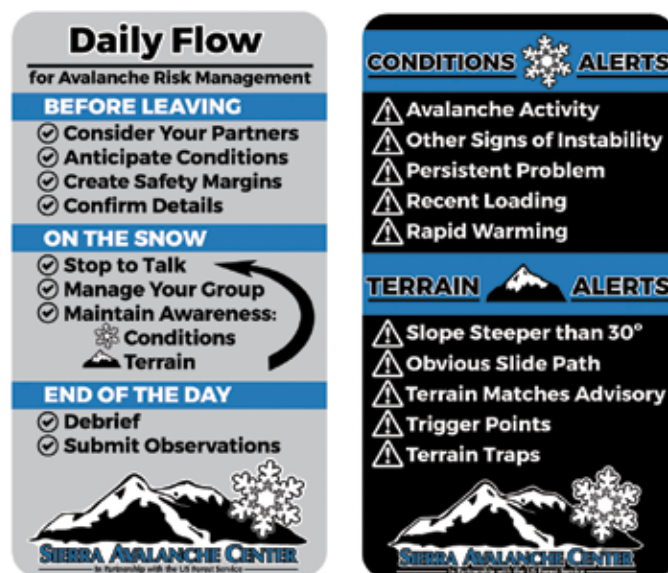
Bottom: Graham Predeger teaching the motorized Level 1 class for The Alaska Avalanche School last winter on Turnagain Pass. Photos Mike Duffy

## SAC'S DAILY FLOW: Avalanche risk management for snowmobilers

BY TRAVIS FEIST

*In the Tahoe area*, skiers and snowboarders wanting to pursue an avalanche education can almost start from a popular trailhead and trip over an avalanche class. But up until a few years ago, a snowmobiler would have been out of luck, even with advanced planning. No local avalanche educators had classes dedicated to motorized users.

In the winter of '13/14, Sierra Avalanche Center lead forecaster Brandon Schwartz began teaching motorized Introductory classes, modeled after those offered by the Gallatin National Forest Avalanche Center. They were well received, and the waiting lists grew quickly. Feedback from students indicated that Tahoe snowmobilers also wanted full Level 1 classes.



The SAC Board of Directors was able to expand the program to meet the need, thanks to grants from the California Off-Highway Motor Vehicle Recreation Commission and the Nevada Off-Highway Vehicles Program. For the upcoming winter, SAC has ten motorized Awareness events and five Level 1 classes scheduled, all at no charge to participants.

The commitment to Level 1 classes included the decision to develop a dedicated curriculum, to best suit the realities of modern snowmobiling. This was achieved by aligning the techniques already in use by savvy snowmobilers with best practices in recreational avalanche risk management. The resulting process was formalized into the **SAC Daily Flow**.

"Flow" is a nod to the studies of extreme athletes done by psychologists in the 90s, who theorized that athletes who could intuitively make complex decisions in life-threatening environments were subconsciously following a flow that put them into a heightened state of awareness. The concept of flow is very procedural, with close parallels to processes for risk management.

For teaching purposes, each step in the Daily Flow has its dedicated time slot in the Level 1 class agenda, taught in the same order as the process. Learning outcomes and lesson plans support each step, plus presentations and indoor exercises for the steps that take place "Before Leaving," and outdoor exercises for the rest.

The Daily Flow and Alerts images shown here are stickers that students put onto their machines near the handlebars, so the process is always visible and easy to reference. SAC supplies a book with chapters that coincide with the Daily Flow, and has a video showing how to put it all together.

The stickers, book, and video will also be used for Awareness presentations at shops throughout Tahoe and Northern Nevada. The book and video were major projects, funded by the Nevada Off-Highway Vehicles Program, that will help SAC reach rural areas where it's logistically difficult to offer Level 1 classes. ▲

Travis Feist is a Field Observer and the Education Coordinator for SAC. When the snowmobiling and dirtbiking are no good, he can be heard making "braahp braaaahhp" noises while skiing.



## Snowmobile Education

*Mike Duffy: My philosophy on education* is to provide extensive hands-on training and practical knowledge in actual avalanche terrain following AAA standards.

### Student's preparation:

Attend snowmobile specific awareness seminar, read transceiver instruction manual and know features of your transceiver before class, learn your gear, I provide a gear list, and start learning on [www.backcountryascender.com](http://www.backcountryascender.com).

Also make sure your snowmobile is in perfect running order, the class should not be the first time you start it for the season.

### Who are the victims?

It has shifted from 15–20 years ago when, in some years, the Midwestern riders were accounting for 50% of the fatalities. Those riders are now better equipped and more knowledgeable than many Western riders. The long term Western local accounts for most of the fatalities now, with a slight resurgence in Midwestern fatalities (due to some dry winters back there and riders looking for a new location to ride).

We had a big surge in Midwestern avalanche fatalities in the mid-90s due to lack of snow, but the machines then were not capable enough to access the areas the current models can go. Better technology=increased exposure to avalanches and many riders are not matching their education to that exposure. The long term Western local has perceived knowledge that is much greater than actual knowledge. They have outdated or minimal training. Riders do not understand persistent weak layers and that the terrain needs to be avoided. Riders are making the mistake of thinking an airbag will let them survive any avalanche. More snowmobile avalanche victims had airbags last year than ever. They are being killed from trauma and many are not deploying the bags. Many are forgoing advanced training and are purchasing an airbag instead. Not the formula for success. Good news is that more snowmobilers than ever are taking level I classes. ▲



ISSW

Innsbruck by day.  
Photo John Stimberis

Hello Friends of The Avalanche Review,

Thanks to all of you for volunteering to report back from ISSW for the December TAR. Here's how I'd like to frame your assignment:

Please start by identifying your perspective. Are you a forecaster, an educator, a rescuer, a researcher, a ski patroller, a combination of those? Categorize yourself so that our readers can find whose perspective might be most useful for them.

No one needs to report on the *WHOLE* ISSW. I would like your individual impressions, focused around two big areas:

**#1-** What affects your practice? New perspectives, technology, connections that you made with colleagues in your subspecialty? Are there presentations that stand out? A panel? A field trip? If you are presenting, feel free to use this space for an infomercial on your paper. If you want to spotlight your paper in *TAR*, let's talk.

**#2-** What piques your curiosity? Maybe you teach rec courses but you're really interested in fracture mechanics, and so you found Johann Gaume's latest theory fascinating. Or papers that caught your eye, left you saying, "I never thought about it that way before..." Or the quality of the beer at the socials? Or how do they deal with a variety of languages from the crowd?

Details: Keep it under 1000 words please. Bullet points are fine. Take notes as you go, otherwise you *WILL* forget. A few photos are welcome, please include a caption of the story of your photo. Along with your piece, please send a short bio and a mug shot.

To me by October 15 if possible. Write it up on the plane.

Thanks in advance. Drink an Oktoberfest beer for me please.

lw

# International Snow Science Workshop 2018

## Highlights from a couple Forest Service snow geeks

BY ZACH GUY AND KARL BIRKELAND

**Before we dive in**, we want to let you know that there were literally hundreds of presentations at the Innsbruck ISSW. That's right, 140 oral and 285 poster presentations! Clearly a recap of all that went on at the conference is impossible, but we wanted to share at least a sampling of some of the presentations/papers that captured our interest. All the papers are up on the Montana State University ISSW papers website, and you can peruse the list of papers by subject by looking at the program on the ISSW 2018 website located at: [http://www.issw2018.com/images/ISSW\\_2018\\_program.pdf](http://www.issw2018.com/images/ISSW_2018_program.pdf)

By chance, we were both independently putting together a document to share with co-workers. Also by chance, we attended similar sessions and had relatively similar views of the papers we wanted to highlight. So, we combined our thoughts into one document and shared it out with our fellow Forest Service avalanche workers. Lynne then approached us to share the document through TAR, so here it is!

### 01.1 Unified modeling of the release and flow of snow avalanches using the Material Point Method. [Johan Gaume](#)

**Karl:** Johan's presentation kicked off the workshop. This was his recent work that was published in Nature Communication that I shared with this group previously. The avalanche simulations of this work are pretty amazing and well worth watching (one of them is here: <https://actu.epfl.ch/news/the-subtle-mechanics-of-an-avalanche-as-seen-in-3d/>). And, you might want to check out his ISSW paper.

<https://arc.lib.montana.edu/snow-science/item.php?id=2474>

### 05.1 Climate change in the Alps and its consequences for snow. [Andreas Gobiel](#)

**Karl:** A bit of a depressing assessment of the future of snow in the Alps under our changing climate, but good to be aware of—and prepare for—these upcoming changes.

<https://arc.lib.montana.edu/snow-science/item.php?id=2564>

### 05.6 Climate Patterns Associated with Major Avalanche Years in A Regional Tree-ring Based Avalanche Chronology for the US Northern Rocky Mountains. [Erich Peitzsch](#)

**Zach:** Erich's local tree ring study suggests a return interval of D3+ avalanche cycles every ~6 years, and these events tend to correlate with La Nina/negative PDO patterns.

**Karl:** Erich's work is one of the more extensive avalanche/tree ring studies done and his record of avalanche activity stretches back to the 17th century.

<https://arc.lib.montana.edu/snow-science/item.php?id=2569>

### 010.1 Localized Dynamic Loading in Extreme Snowmobile Maneuvers. [Iain Stewart-Patterson](#)

**Zach:** This Canadian study buried sensors at different depths in the snow to measure forces exerted by several moves on snowmobiles. The maneuver with the greatest track penetration and force is the "full-throttle climb". In soft surface conditions, they measured stress to depths of at least 1.6 meters. Part of this is explained because the spinning tracks effectively decreases the depth of the snowpack by tunneling the snow surface away, as much as 65 cm in this study. Their study reiterates the increased stresses on deeper weak layers by snowmobiles.

**Karl:** An interesting study on the stress caused by snowmobiles, though they admittedly had fairly limited data. Besides what Zach mentions above, downhill turning was found to put a lot of stress on the snowpack. An open question is how this affects triggering, since informal observations by some avalanche centers suggest that snowmobilers and skiers tend to be similarly effective at triggering avalanches in many situations.

(Sorry, can't seem to find this with a simple search on the MSU site).

### 010.6 Anti-crack Nucleation in Snowpacks Without Assuming Initial Defects: Modeling Dry Snow Slab Avalanches. [Philipp Laurens Rosendahl](#)

**Zach:** This team of German physicists modeled a new unified approach to failure and fracture propagation. Unlike previous models, this one does not require an initial crack or flaw. This model allows simulation for critical loads (natural or human triggered) while incorporating terrain characteristics such as slope angle. In theory, you could show a terrain map that highlights more or less dangerous areas based on evolving input snowpack conditions. In practice, of course, spatial variability of the snowpack seems like a major obstacle.

**Karl:** One advance of this model is the simulation of a more realistic weak layer as opposed to the rigid weak layer assumed in the original anti-crack work. It's great to have solid fracture folks working on the avalanche problem!

<https://arc.lib.montana.edu/snow-science/item.php?id=2669>

### 010.4 Distributed Modeling of Snow Cover Instability at Regional Scale. [Sascha Bellaire](#)

### P10.15 On Combining Snow Cover and Snow Instability Modeling. [Benjamin Reuter](#)

**Zach:** This Swiss study simulated spatial instability patterns using the SNOWPACK model. A novel idea, but the models struggle without parameters such as radiation transfer and wind redistribution, and still have a lot of room for improvement for forecasting instabilities. The models did pick up important weaknesses and slab property changes, though. So sleep easy, we will still have forecasting jobs this winter and will be using SNOWPACK primarily to supplement structure tracking like last year.

<https://arc.lib.montana.edu/snow-science/item.php?id=2667>

<https://arc.lib.montana.edu/snow-science/item.php?id=2684>

### 010.2 Snowpack Stabilization Following Storms: Field Experiments and Modeling of Temporal Changes in Snow Mechanical Properties after Loading. [Karl Birkeland](#)

**Zach:** Karl added a slab to a recently buried surface hoar layer by filling a cardboard cutout with disaggregated snow. He then tested PST cut lengths over a period of 4 days. His study showed the most rapid change occurred in the first



An avalanche warning sign. Photo Karl Birkeland



few hours, with a more constant change in subsequent days...consistent with what we would expect to find with avalanche activity. The increase in critical crack length (aka PST cut length), was due to both weak layer strengthening and slab stiffening. He suggests this technique could be used informally to test how near-surface weak layers will respond to loading events.

**Karl:** Who is the nutcase that goes out with a bunch of cardboard and duct tape and tries to call it science? Hahaha! If you have any questions about this work, be sure to give me a holler.

<https://arc.lib.montana.edu/snow-science/item.php?id=2665>

### 010.3 Measuring snow mechanical properties typical of storm snow instabilities. **Benjamin Reuter**

**Karl:** In this paper Ben made some careful laboratory measurements of different weak layers. One interesting finding was that new snow instabilities were initially just as weak as surface hoar.

<https://arc.lib.montana.edu/snow-science/item.php?id=2666>

### P10.1 Release of Avalanches on Persistent Weak Layers in Relation to Snowfall and Loading Events in Colorado, USA. **Jason Konigsberg**

**Zach:** Jason is a CAIC forecaster who looked at avalanche activity on persistent weak layers in Colorado since 2011. He found that only ~3% of persistent slab avalanches released after more than 7 days without measurable snowfall. This has implications for dropping the danger to Low during long periods of high pressure, even when a poor snowpack structure exists.

**Karl:** This is the sort of information that can be really helpful for giving forecasters some useful information during a difficult decision time (i.e., “Should we drop the danger to Low?”).

<https://arc.lib.montana.edu/snow-science/item.php?id=2670>

### 011.1 When do Avalanches Release: Investigating Time Scales in Avalanche Formation. **Alec van Herwijnen**

**Zach:** Alec used radar and seismic monitors at a number of sites in Switzerland to pin down exact timing of avalanche release. He also correlated avalanche activity to meteorological drivers: wind and precip (for dry snow avalanches) and temperature and radiation (for wet). The time scale for drivers on dry snow avalanche release was on the order of several days, whereas the time scale for drivers on wet avalanches was several hours to less than a day. Nothing surprising here, but helps reinforce why we can be more aggressive with lowering the danger or removing problems in the spring.

<https://arc.lib.montana.edu/snow-science/item.php?id=2702>

### 011.3 Forecasting for Dry and Wet Avalanches During Mixed Rain and Snow Storm. **Scott Savage**

**Zach:** Scotty shared a case study of a unique slab avalanche cycle last March in the Sawtooth area that resulted from a warm storm with a mix of rain and snow. He lamented on the challenges of fitting the continuum of avalanche problems into “dry” and “wet” snow avalanche types. Welcome to our world, Scotty.

**Karl:** One thing Scotty’s paper emphasized is just how important the existing snow structure was for the pattern of avalanches observed during this avalanche cycle.

<https://arc.lib.montana.edu/snow-science/item.php?id=2704>

### 011.6 Quantifying the obvious: the avalanche danger level. **Juerg Schweizer**

**Karl:** As advertised, this paper quantifies the obvious. Still, it’s interesting to see how the number of avalanches and the distribution of avalanche sizes varies for differing avalanche danger levels. As expected, there are more avalanches as the avalanche danger rises.

<https://arc.lib.montana.edu/snow-science/item.php?id=2706>

### P11.3 Patterns in Avalanche Events and Regional Scale Avalanche Forecasts in Colorado, USA. **Spencer Logan**

**Zach:** Spencer compared days with reported avalanche activity to forecasted danger as a way to assess the accuracy of forecasts for the CAIC. They showed a linear increase in percentage of avalanche days with increasing avalanche danger. Although looking back at avalanche data to assess forecasts is a worthy objective, I’m not sure this technique would be as useful for our region, given the sparsity of good visibility, observers, and human triggers. Furthermore, a probabilistic approach seems to have spatial scale issues for comparing region to region. Rather than focus on avalanche likelihood as a



Avalanche defense structures. Photo Karl Birkeland

percentage, I personally favor the distribution vs. sensitivity matrix we used last year, but a good discussion point.

<https://arc.lib.montana.edu/snow-science/item.php?id=2707>

### 012.4 Establishing the Link Between the Conceptual Model of Avalanche Hazard and the North American Public Avalanche Danger Scale: Explorations from Canada. **Taylor Clark**

**Zach:** Taylor looked at 14,000 avalanche bulletins since AvCan adopted the CMAH to look for classification patterns in applying the CMAH to avalanche danger ratings. His results show a variety of inconsistencies in classification, highlighting the interpretive component of danger ratings and suggesting development of meaningful decision-aids for avalanche forecasters.

**Karl:** Lots of data analyzed for this paper and some really cool graphics were shown. Showed the probability of a given danger rating based on the likelihood and size of the expected avalanches.

<https://arc.lib.montana.edu/snow-science/item.php?id=2718>

### 012.7 Avalanche Problem Solver (APS)—A Decision Support System for Forecasters. **Karsten Muller**

**Zach:** The Norwegians are developing a model that would automatically populate danger, problems, and text to support forecasters. I could see a tool like this improving consistency, but I also fear it would also compromise forecaster skill and dehumanize the writing/public engagement component of our bulletins. An interesting topic of discussion.

<https://arc.lib.montana.edu/snow-science/item.php?id=2721>

### 012.8 Distilling Regional Patterns from Weather and Snowpack Models. **Simon Horton**

**Zach:** The Canadians developed a software program that aids in visualization of SNOWPACK model outputs across changing aspects, elevation, and location. This is a pretty slick program that they used operationally last winter, and I would love to have a resource like this as a supplemental tool for our operation. I’m sure it wasn’t cheap or easy to figure out...but we have an intern this year.

**Karl:** I found this to be a really compelling talk. One of the problems with SNOWPACK, from a forecasting perspective, is the challenges in creating meaningful visual output for forecasters. This presentation presents a compelling way to look at the snowpack in a zone, and that might be a useful future way of utilizing SNOWPACK output as an additional tool for forecasters. I’m sure Zach’s intern can get this all sorted out for us this winter.

<https://arc.lib.montana.edu/snow-science/item.php?id=2722>

### 015.3 Sense-making in the snow: Exploring the cognitive work of avalanche professionals in a Canadian ski resort. **Laura Maguire**

**Karl:** The author of this paper is a Cognitive Systems Engineer from Ohio State. She suggested that we not talk so much about “human factors”, but instead work to better understand the complexities in avalanche forecasting,



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Kim Havell, Andy Wenberg and Sam Schwartz enjoy a cold one after a sandy day in the Targhee backcountry. Photos: Fredrik Marmstater

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how experts deal with them, and then try to arrange the work environment more appropriately. I haven't had a look at the paper yet, but the presentation gave me some interesting things to consider.

<https://arc.lib.montana.edu/snow-science/item.php?id=2180>

### 015.5 The Risk of Death and Major Injury from Natural Hazards in Mechanized Backcountry Skiing in Canada. **Matthias Walcher**

**Zach:** Matthias used 47 winters of accident data in Canada to compare fatalities and injuries for heli and cat skiing operations. ~80% of fatalities are due to avalanches, and ~20% are due to non-avalanche related deep snow immersion. This ratio becomes more balanced if you look at just cat skiing, where the terrain is more gladed. The majority of injuries relate to ski accidents and collisions. Just a good safety reminder, especially for skiing in trees, that avalanches aren't the only risk we need to manage with our touring partners.

<https://arc.lib.montana.edu/snow-science/item.php?id=2756>

### 015.6 Do Avalanche Airbags Lead to Riskier Choices in the Backcountry? **Pascal Haegeli**

**Zach:** Pascal's survey was inconclusive in assessing the effect of "risk compensation" on airbags, but he suggests avalanche educators highlight the potential for increased risk taking when presenting airbags as a piece of safety gear.

<https://arc.lib.montana.edu/snow-science/item.php?id=2757>

### 016.3 Are Avalanche Courses the New High-Risk Sport? Use of Sensation Seeking Scale in Avalanche Education Highlights the Need for Reassessment of Participants' True Nature and Suggests that the Test Itself Can Serve as a Learning Tool.

**Zach:** The Sensation Seeking Scale (SSS) is a questionnaire that has been used for 50 years in risk research. This study found that participants in avalanche courses test in line with other high-risk sports, which may explain why fatality rates don't decrease with increase education. The study suggests the SSS is a useful learning tool in avalanche education classes so students can self-reflect on their own risk-taking.

<https://arc.lib.montana.edu/snow-science/item.php?id=2778>

### 016.6 Avalanche Rescue—Training and Body Position Determine Extrication Time. **Bernd Wallner**

**Zach:** Bernd conducted randomized mannequin experiments and found that prone victims' airways take the longest to free. He found significant decreases in extrication time on 2nd or 3rd test cycles compared to the initial, emphasizing the importance of regular training and awareness of the body's buried position during rescue.

<https://arc.lib.montana.edu/snow-science/item.php?id=2781>

### P16.13 Simplifying the Signal Search: Why You Don't Need to Rotate Your Transceiver Vertically. **Bruce Edgerly**

**Zach:** BCA testing concluded that, contrary to previous teachings, you only need to rotate your beacon on the horizontal axis when conducting the initial signal search. This is more intuitive for students and provides a better transition into the flux line path as well.

<https://arc.lib.montana.edu/snow-science/item.php?id=2794>

### 017.1 Consistency and Accuracy of Public Avalanche Forecasts in Western Canada. **Grant Statham**

**Zach:** Grant looked at advisory archives from AvCan and Parks Canada and showed impressive inconsistencies in danger ratings and problem types for adjacent regions and by different forecasters within one region. We have certainly noticed similar issues with our bordering avalanche centers at FAC. The take-home point is that conflicting information leads to confusion for backcountry users, and avalanche centers should strive for consistency by 1) refer to definitions (in the CMAH), 2) minimize the number of avalanche problems and overlap. 3) Minimize switching the ranking of problems without good cause, 4) Look for consensus for major changes (adding/dropping PS or DPS) 5) Provide feedback and analysis.

Overall, I think we do a good job of referring to the CMAH and communicating within our staff to maintain consistency. I hope to do some analysis on FAC's patterns at some point this season. Unsure of how to address inconsistencies with Missoula, IPAC, and Fernie.

**Karl:** This was a really interesting presentation. I circulated the article prior to the ISSW, but if you haven't had a look at it yet, it's worth a look for all



Steve and Brendan from the Sierra Avy Center clinging to a via ferrata route high above Innsbruck during a break from the presentations. Photo Zach Guy

public backcountry avalanche forecasters.

<https://arc.lib.montana.edu/snow-science/item.php?id=2806>

#### 017.2 Consistency and bias in avalanche forecasts: a look across borders in the Alps. Frank Techel

**Karl:** This is another paper looking at the consistency in avalanche forecasts, both within countries and across borders. Lots of interesting stuff here. Another good read for all public backcountry avalanche forecasters.

(Can't find it on the ISSW papers page, but the peer-reviewed paper is available here: <https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2018-74/>)

#### 017.4 Avalanche Danger Ratings and Deaths, Putting Things into Perspective. Terry Eyland

**Zach:** Terry looked at how skier visit days at Rogers Pass overlapped with danger ratings. One point was to dispel the interpretation that "Considerable days are the most dangerous" because the most fatalities occur on this danger rating. Humans interact with High Danger much less than other danger ratings. 90% of ATL skier visits are when the danger is either Considerable or Moderate. He also noted that there isn't a notable drop in skier visit days between Moderate and Considerable, suggesting people don't take Considerable as seriously as we intend it. He suggests consolidating High and Extreme into one danger band so that Considerable is given more weight as a 3 on a scale of 4. I think this is valid argument, especially considering that Extreme is so infrequently used across the globe.

**Karl:** This presentation did make a compelling argument for consolidating High and Extreme into one danger rating for more effective public communication. Definitely worth talking about.

<https://arc.lib.montana.edu/snow-science/item.php?id=2808>

#### P17.5 Important Skills for Modern Avalanche Forecasters—Social Media, Photography, Videography, Blogging. Lukas Ruetz

**Zach:** Lukas offers a few pointers for the evolving information sharing world, including: 1) Be aware of Facebook's algorithms which can impede information distribution. 2) Videos should be less than a minute and keep it simple. 3) Rule of thirds for photography, etc.

**Karl:** This one caught my attention because social media is becoming such a big part of getting information out to the public. Being aware of Facebook algorithms can really help make sure you are pushing your information out to the largest possible FB audience.

<https://arc.lib.montana.edu/snow-science/item.php?id=2820>

#### 017.6 Show Don't Tell: Modeling Behavior on Social Media as a Strategy for Influencing Behavior in Data Sparse Regions. Jennifer Coulter

**Zach:** The folks from AvCan's Southern Rockies touted the effectiveness of their social media strategy: Using "we did..." instead of "You shouldn't..." in a fun and engaging way, with images of snowmobiling in avalanche terrain when appropriate, modeled off of Social and Behavior Change Communication models. This is a strategy we should continue to incorporate into our products, and worth doing some more reading on the SBCC models.

**Karl:** I think most avalanche centers in the U.S. are using these strategies to help reach snowmobilers, but this is a good read for everyone to remind us what works and what doesn't for public communication.

<https://arc.lib.montana.edu/snow-science/item.php?id=2810>

#### 017.9 Words of Estimative Probability and the Language of the Forecast. Are We All Communicating the Same Risk? Jimmy Tarf

**Zach:** Not surprisingly, Jimmy's survey showed that the public's and professionals' interpretation of terms such as "likely" and "possible" are inconsistent. My take-away: until we come up with a better set of terms, we should be transparent with the public on how we define those terms, i.e. the ADAM matrix (distribution vs sensitivity).

<https://arc.lib.montana.edu/snow-science/item.php?id=2813>

#### 017.10 Avalanche Canada's Special Public Avalanche Warning: Development and Evolution of an Effective Risk Communications Tool. Mary Clayton

**Zach:** Mary described how AvCan's SPAW has come to be a useful strategy for reaching the public through mainstream media during periods of higher risk, such as when high hazard overlaps with holidays or weekends. This reinforces our use of Avalanche Watches and Warnings, and is a good reminder we should be proactive with issuing Special Advisory Statements when conditions warrant.

<https://arc.lib.montana.edu/snow-science/item.php?id=2814>

#### 019 Session on terrain-based decision-making

**Karl:** This session looked interesting, but I had a scheduling conflict and wasn't able to attend it. Just based on the titles, you might want to check out some of the papers.

#### Note on poster sessions and other papers

**Karl:** I wasn't able to check out many of the posters, and in the afternoons I often had to choose between "competing" sessions. So, I'm sure Zach and I missed some interesting stuff. Your best bet is to peruse the program ([http://www.issw2018.com/images/ISSW\\_2018\\_program.pdf](http://www.issw2018.com/images/ISSW_2018_program.pdf)) and then if you find something you like, look up the paper (<https://arc.lib.montana.edu/snow-science/>).

Congratulations to the 2018 ISSW team for putting on a fantastic workshop! The next ISSW will be in Fernie, British Columbia in 2020. Rumor has it that they are considering making a parking lot available for people wanting to sleep in their cars and do ISSW dirtbag style. The Fernie team is particularly excited to get more practitioner presentations. So, if you've always thought about putting together an ISSW presentation, maybe 2020 is the year for you to do it! ▲



Zach Guy is the director of the Flathead Avalanche Center in Montana. He has presented at several ISSWs and has been going to ISSWs since 2008...this one definitely had the best gelato and wienerschnitzel.

Karl Birkeland is the Director of the Forest Service's National Avalanche Center, where he tries to squeeze in some avalanche research around his other duties. He's gone from dragging his daughters around the hills to now just trying—often unsuccessfully—to keep up with them!



Photo Kelly Elder

## ISSW Reports

BY STEVE RAYNAUD

ISSW Innsbruck was an amazing conference and exchange of ideas and cultures. The Austrians were great hosts and the location was perfect for learning and adventure. As a forecaster, many things stood out to me over the course of the week.

- Climate change was a large focus during the workshop. It's easy to think that changes are only occurring in your own mountain range backyard. Changes are happening worldwide with some places feeling more pressures than others. Scott Savage, of the Sawtooth Avalanche Center, gave a presentation on "Forecasting for Dry and Wet Avalanches During Mixed Rain and Snow Storms." This mirrors my local area over the past few years with increasing snow levels, large rain on snow events, and deep slab issues.

- Snowpack modeling has become an effective tool for many forecast centers around the world. The Europeans seem to be using snowpack and avalanche modeling more widely than their North American counterparts, especially in data sparse regions. These models continue to improve over the years and will be beneficial to aid in forecast operations.

- Grant Statham presented "Consistency and Accuracy of Public Avalanche Forecasts in Western Canada." This study identified forecaster biases and inconsistencies in public forecasts with some similar results from Lazar et al. 2016. Recommendations included minimizing the number of avalanche problems, avoiding overlap and prioritizing problems, and avoiding switching them to reduce public confusion. Forecaster training that includes direct feedback is essential for accuracy and consistency. A forecast center takes teamwork, and internal communication is needed to present a uniform and consistent message.

- Other great insights to forecasting in remote areas of Canada were presented by Jennifer Coulter. She presented a show, don't tell strategy to communicate avalanche hazard and risk to a mountain snowmobile user group. Gaining respect with the local community and influencing behavior via social media was vital to include this user group in the avalanche center mission.

- There is an interesting merging of psychology, economics, and social sciences, to name a few, into the snow science field. I value the input and different perspective that they all bring to our world. There were some key insights to human factors and decision-making that are valuable to snow professionals. Laura Maguire presented on cognitive systems engineering, focusing on how we make decisions and how we can help training and learning for forecasters and guides. Cognitive strategies could be beneficial for professional groups as well as refining public safety messaging.

Time to get back to work and try to implement some things I learned. I'm already looking forward to Fernie, BC in 2020. ▲



Steve Reynaud is an avalanche forecaster for the Sierra Avalanche Center, based out of Truckee, CA. He is also a ski guide and avalanche educator for Tahoe Mountain School. Currently, he is on a beach in Northern California waiting to return to work.



[backcountryskiingcanada.com](http://backcountryskiingcanada.com)

All four days of oral presentations and posters had talks or concepts that I found interesting but Thursday and Friday applied most practically to what I do in the winter. Here are a few of my highlights. The Snowpack: Stability and Variability session opened with Iain Stewart-Patterson presenting his research on Dynamic Loading in Extreme Snowmobile Maneuvers. In forecasting for a region that sees lots of snowmobiling, it was great to see more research into this topic. Track penetration has a significant impact on triggering, so looking more closely at how people ride their sleds seems like a great platform for education as well as a forecasting consideration. I also appreciated that he recognized that using the word “extreme” didn’t necessarily fit because the maneuvers described are normal snowmobile travel but seem extreme to the non-snowmobiler. He also engaged pro riders in the research to accurately capture use. It sounds like this is a project that will continue with an expanded data set and an interest in potentially adjusting the ECT and CT to snowmobiler needs. This was followed by Karl Birkeland’s talk on *Snowpack stabilization following storms: Field experiments and modeling of temporal changes in snow mechanical properties loading*. I always appreciate his skill in merging theory and practice and recommend reading the paper.

In the Avalanche Forecasting session later in the morning, Scott Savage’s talk on *Forecasting for dry and wet avalanches during mixed rain and snow storms* and Jurg Schweizer’s *Quantifying the Obvious: the avalanche danger level* stood out as talks useful to my job.

Consistency in avalanche forecasting in regards to assigning danger ratings and avalanche problems is often discussed within our office and throughout the industry. Presentations and posters around this topic showed the consistent inconsistencies that public avalanche forecasters struggle with. Friday’s session on **Hazard Communication and Perception** including Grant Statham’s talk *Consistency and Accuracy of Public Avalanche Forecasts in Western Canada* and Frank Techel’s talk *Consistency and bias in avalanche forecasts: a look across borders in the Alps* really highlighted these issues. Grant: Danger levels changing with forecaster shift changes or one office always having three avalanche problems in every forecast when adjacent regions have two or Frank: Switzerland consistently rating avalanche danger lower than neighboring countries. Jimmy Tart presented his survey results on *Words of estimated probability and the language of the forecast. Are we all communicating the same risk?* He found wide ranges of perceived values per words (i.e. possible, likely, very likely), wide ranges per word and no difference in consistency between pro and rec survey participants. I think the topic of consistency will be so interesting to follow as the industry progresses. Will modeling, remote sensing, mapping and technology advances make it easier to be consistent? How will our humanity factor in with the decision-making to assign a danger rating? Will it eventually be a click of the button that determines considerable avalanche danger? We will definitely continue our discussions about consistency at the CNFAIC and always welcome input from other professionals.

Another topic that is of personal interest is glide avalanches after experiencing the unusual 2015-2016 glide season in Southcentral Alaska. Unfortunately the talk on Thursday *The 2017-2018 glide snow avalanche winter above Innsbruck: A nightmare with unpredictable end for local avalanche safety control*, didn’t happen but the paper showed some interesting similarities and some future prompts for research and modeling. There was also a handful of posters on glide avalanches presented during the Monday Snow and avalanche dynamics poster session and the **Thursday Snowpack: Stability and Variability** poster session. I hope to participate in more research if winters allow and look forward to seeing what happens with future seasons around the world at different latitudes and in different snow climates. I was struck by the fact that the changing climate was discussed way more than it ever has been at an ISSW; specifics ranged from snow-making technology to the economics of climate change. **There was a striking similar photo** of an unusual wet avalanche debris flow pattern from a warm storm in Switzerland to one taken in Alaska two winters ago.

Overall there were lots of great posters but the session set-up was fairly challenging to move through and actually talk to authors. I had a poster Friday with Eeva Latosuo on the second phase of our mentorship project. *Wise ones –case study on prominent mentors of the US avalanche industry*. Look for a more in-depth article in a future TAR. One benefit of the space confines is that I had a really engaging conversation with Lucas Ruetz, the author of an adjacent poster and an intern from the Avalanche Warning Service, Tyrol, Innsbruck about his poster on social media. *Important Skills for Avalanche Forecasters: Social Media, Photography, Videography, Blogging*. Effective use of social media is always a topic of conversation at the CNFAIC and it was interesting to see what works in another region. This tied into one of my favorite talks of the week in the **Hazard Communication and Perception** session by Jennifer Coulter, *Show Don’t Tell: Modelling Behavior on Social Media as a Strategy for Influencing Behavior in Data Sparse Regions* with great reminders on how to connect with snowmobilers and being part of the community and culture. Jennifer was an Avalanche Divas honoree and has an impressive resume.

Avalanche Divas night was again a highlight for me. The celebration and recognition of the accomplishments of women in the industry and the opportunity to hangout and chat with women from all over the world doing interesting research, guiding, patrolling, educating, and forecasting was inspiring. I feel lucky casually getting to chat with both Christine Pielmeier about forecasting and research in Switzerland and with Lin Ballard about her career, the climate, and early work on snowpack modeling. This ISSW was 15% women and there were many presenters from all sectors of the industry in the line-up throughout the week. The definition of a Diva is a woman of outstanding talent and there are many in this industry. I am excited that Fernie ISSW 2020 is already planning their Divas night. ▲



There was a striking similar photo of an unusual wet avalanche debris flow pattern from a warm storm in Switzerland to **one taken in Alaska two winters ago**.



Iain Stewart-Patterson’s presentation on snowmobile forces on the snowpack has direct application in my everyday forecasting.

**Aleph Johnston-Bloom** is an avalanche specialist for the Chugach National Forest Avalanche Information Center in Girdwood Alaska. Over the past 19 years she has garnered experience as a highway avalanche forecaster, a backcountry avalanche forecaster, a patroller, an educator, and a ski guide. She is the former director of both the Silverton Avalanche School and the Alaska Avalanche School.

As she starts her sixth winter in Alaska, she is looking forward to riding snowmachines and really hopes there is snow to sea level.

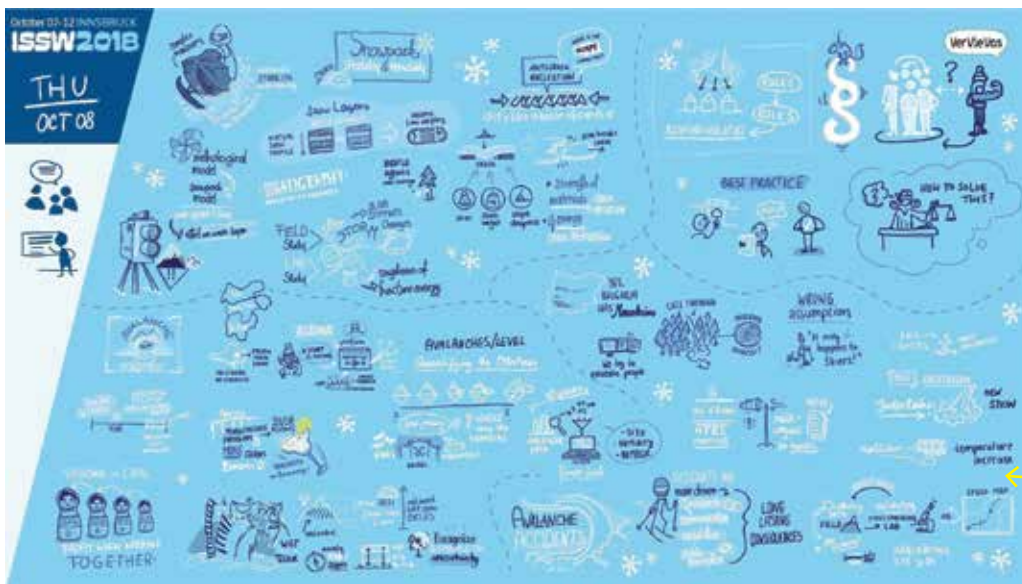


## Avalanche Omnivore's Dilemma

BY EVA LATOSUO

Arriving in Innsbruck for my eighth ISSW, I was greeted by the quintessential Alps welcome. Cobblestone streets of the pedestrian downtown district were juxtaposed against the ruggedness of the 2600m/8500' ridgelines on the sides of the Inn River valley as they basked in the pink sunset at pleasant +18C/64F temperatures. Happy to be in Austria after 18 hours of travel from Alaska, it seemed ridiculous that, a few months ago, I had been uncertain about attending the conference. Numerous North Americans had heeded the invitation to participate and present at the conference despite the cost and inconvenience of overseas travel. There must have been approximately 80 Americans and 50 Canadians in the mix of 1,000 attendees. The reservations about having Europe in the conference cycle are gone for me. After all, International is this workshop's first name.

As an avalanche educator, snow scientist, and avalanche SAR volunteer, I am an omnivore with ISSW topics, but even I was faced with many dilemmas on how to use my time well. The conference was organized in a tight four days that packed in 140 oral and 285 poster presentations. While the morning sessions had a singular program, the afternoons were divided into two separate special topic sessions and two separate training courses that ran concurrently. This made reading the schedule and using the conference app a necessity for getting what one wanted out of the event. All the posters were on display for the whole week and promoted through "Poster Wrap-Ups" at the related topical sessions. The wrap-ups were illustrated in real-time by very talented doodlers, which was a super-creative and fun way of sharing! Still, it was impossible to keep my snow geek brain tuned in 100% for so much new information in 10 or 20 minute snippets. Luckily, we had Wednesday to take a break from conference halls.



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### 1. Climate Change

Impeccably timed with the IPCC's most recent report on climate change, a majority of conference authors presented evidence on the changes happening in the snowpack and winter weather around the world. The Austrian Alps have already documented average 2°C warming since pre-industrial age (Gobiet) and the Italian Alps have experienced major snow deficit, -30% from the mean, in the last 80 years (Valt). The common themes included warmer winters with changed precipitation patterns emphasizing the need to research Rain-On-Snow events, dynamics of wet regime avalanches and the impact of bio-albedo on snow surface among many other phenomena. Several presentations touched upon the economic impacts of the climatic changes (Hagenstad) as well as the variety of ways ski resorts manage the lack of snow and warmer temperatures (Spandre).

**Why this matters?** Avalanche professionals and recreationalists need to pay attention to the climate change as it is already impacting the amount of snow and the duration of seasonal snow cover. Read up and participate in the conversation.

### 2. Remote Sensing, Simulations & Model Chains

Even if you don't think like an engineer, it is time to embrace the science and technology that helps us to understand the physical properties of snowpack and avalanche occurrences more accurately. Big brains around the globe are working on improved modeling and detection technology so that maybe in the future automated prediction of real-time avalanches is possible.

**Why this matters?** Learn about advanced technologies so that you can keep up with new knowledge and tools. TAR 37.1 had a nice introductory article on avalanche detection systems. Pick a technology per week to read about, my current reads include Terrestrial Laser Scanning and Synthetic Aperture Radar Imaging.

Time to move on from moping about the perils of human factor traps into transparent biases and the next level of humanness even in the avalanche environment.

### 3. Show not Tell

Avalanche education & Hazard communication sessions shared exciting and effective approaches for reaching audiences. Coulter (CAA) presented South Rockies Field Team's "Show Not Tell" philosophy for working with their main user group, snowmobilers. Being authentically part of the snomo crowd and offering consistent messaging on social media and blog sites has developed productive relationship between the forecasting team and the end users. Mayer's Backcountry Ascender learning platform introduces incentive-based gamification and peer accountability to successfully deliver an avalanche education path to snowmobilers. Similarly, Edgerly emphasizes the importance of peer-to-peer communication as a guiding principle on BCA's new "Send and Return" video series.

**Why this matters?** Building community engagement through effective communication and modeling behavior actually used in the field works better than expertise-driven top-down lecturing.

### 4. Embrace being human

As the decision-making sciences continue to impact avalanche industry, I was thrilled by the talks on Friday. As a matter of fact, I might have geek crushes on Mannberg, who delivered a stellar presentation on how others' backcountry activities impact the level of contentment on backcountry traveler's own activity, and McGuire, who explained the sense-making processes of ski patrollers at a Canadian ski resort through cognitive steps between written protocols and the way things are done in practice. On a more practical note, the Swedish avalanche courses use a **Sensation-Seeking Scale** to evaluate participant's risk-tolerance to be discussed during the course (Martenson & Johansson). This seems worth experimenting with to create more concrete and effective decision-making lessons.

**Why this matters?** Time to move on from moping about the perils of human factor traps into transparent biases and the next level of humanness even in the avalanche environment.

### Random reading picks for Avalanche Omnivores

Gaume et al: *Unified modeling of the release and flow of snow avalanches using the material point method*

Stewart-Patterson et al: *Localized dynamic loading in extreme snowmobile manoeuvres*

Van Herwijnen et al: *When do avalanches release: investigating the time scales in avalanche formation.*

Landro & Pfuhl: *Analysis of factors used in existing decision-making frameworks for avalanche terrain*

Walcher et al: *The risk of death and major injury from natural hazards in mechanized backcountry skiing in Canada.* ▲



The poster hall. Photo Jenny Cloutier



AAS instructors at ISSW: (left to right) Santiago "Chago" Rodriguez, Aleph Johnston-Bloom, John Sykes, and Eeva Latosu. Photo Eeva Latosu



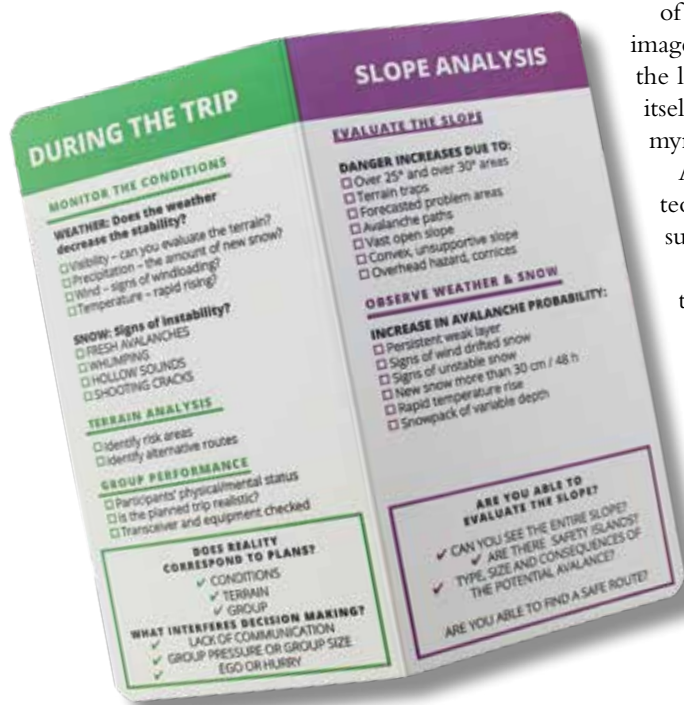
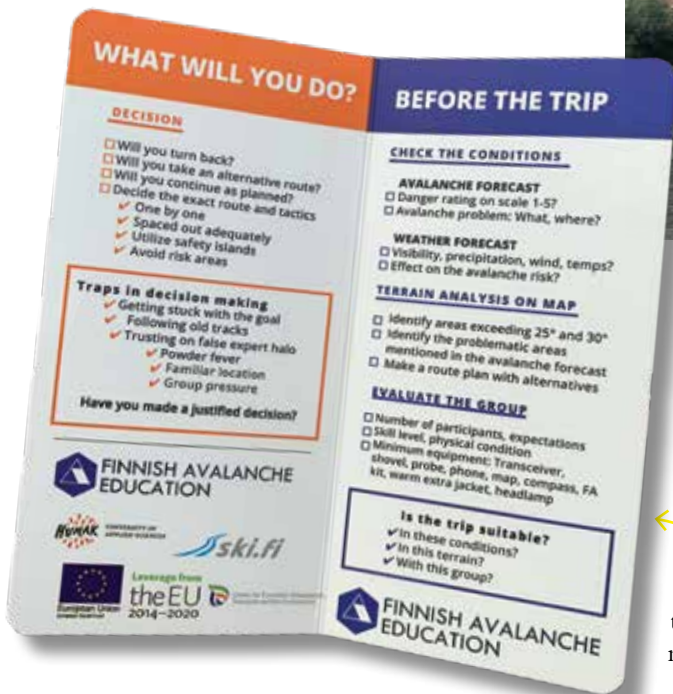
Born and raised in the northern edge of the Old Continent in Finland, Eeva Latosu was excited to visit the Tirol Alps for the first time in 25 years. Things that she brought back home from Austria include high quality chocolate, a brass bell, capri tights for runner husband and a plethora of new snow science concepts to share with her students and peers at Alaska Pacific University and Alaska Avalanche School.



# ISSW Reflections



Innsbruck across the water.  
Photo Jenny Cloutier



BY JENNY CLOUTIER

**How to best summarize the galaxy of points** one takes away from the dizzying days and nights of learning and social interactions that is ISSW? Personally my eye is constantly searching for information to enrich the Flathead Avalanche Center's overall programming with a particular emphasis on how to reach youth and our snow machine community. The following are a few of the countless observations brought into focus by the trifocals of this educator, field observer and friends group coordinator.

The first two days focused on the theory side of this international merging of theory and practice. I set out with a two personal goals for those days: learning more about Glide Avalanches and mitigation measures surrounding Innsbruck, and of course came away with so much more.

I was immediately awestruck by the first session of talks. In particular Barbara Figo's "Analysis of the avalanche dynamics of the 19th of January 2017 Regopiana disaster in Italy". The interplay of the 200 cm of snow that fell in the 48 hours before the earthquake that triggered the slide, the imagery of the massive amounts of wood entrained, its subsequent high velocity, and the location of the lodge elucidated this tragic event in which 29 of the 40 people in the lodge were lost. The slide itself was horrific to hear recounted and the Search and Rescue volunteer in me was engrossed by the myriad difficulties encountered by the response teams.

As for my goal of better understanding Glides I came away with expanded knowledge of the meteorological parameters present at the onset of winter through exploring a variety of posters on the subject. As usual further investigations are needed!

The final two days of the conference were packed with information that, as I look to develop the curriculum continuum in the Flathead was a joy to behold. Jennifer Coulter, of Avalanche Canada, spoke about the Show vs. Tell communication strategy they have employed in the South Rockies to engage the snowmobile community, an ongoing goal of the Center I work with. The final poster system was rife with examples of curriculum development and educational tools employed around the world. A relief in a quest to cease with recreating the wheel and move forward into teaching content! One poster I found especially useful was The Finnish avalanche education program and their **Check List Card**. This card is a helpful list of topics for trip planning and while in the field. It is not another decision-making framework, but rather a tool to create common language among the community and a simple tool to reflect upon for planning.

I find myself time and time again drawn to research the cognitive factors at play for both recreationalists and professionals, and then to explore how best to share these concepts with the thousands of students in northwest Montana. The variety of talks on the cognitive and behavioral exploration of travel in avalanche terrain certainly left me wishing many of these talks could go on for longer than the allotted ten to twelve minutes. It also left me with an extensive reading list leading for the season ahead!

Andrea Mannberg of the University of Norway raised questions about positional preference and how that influences decision-making, a subject that seems especially relevant in these #everything times.

Laura Maguires's work exploring the cognitive work of avalanche professionals spoke to the dissonance between protocols and the cognition involved in forecasting. Drawing to light the cognitive workload present in the day-to-day life of forecasters, patrollers and other professionals who abide by various protocols yet experience a workload far beyond the parameters outlined in a typical operational plan or job description.

Finally Stephan Mårtensson's talk provided a tool for students to assess their risk tolerance and explored the risk taking behavior the is participating in a avalanche course.

Once again I was repeatedly struck by the differences and similarities of the work being undertaken around the globe. From hearing of nascent programs on the roadways of northern Quebec to the incredible modeling employed throughout the Alps there is simply so much to garner from this community working toward a further understanding of such a complex subject. ISSW truly is a stunning merging of theory and practice! Once again being immersed in this community has enriched me in innumerable ways and motivated me to continue in my quest to better the programming in my region. It has also left me counting the months to Fernie 2020! ▲

Born and raised in the Flathead Valley, Jenny Cloutier has spent the last decade teaching ecology, outdoor medicine, and avalanche courses throughout northwest Montana and western Washington. Through coordinating programming for the Flathead Avalanche Center, working as a patroller, teaching in the Flathead National Forest's winter safety and avalanche program, or writing and instructing avalanche curriculum, Jenny has followed her passion for snow and education.

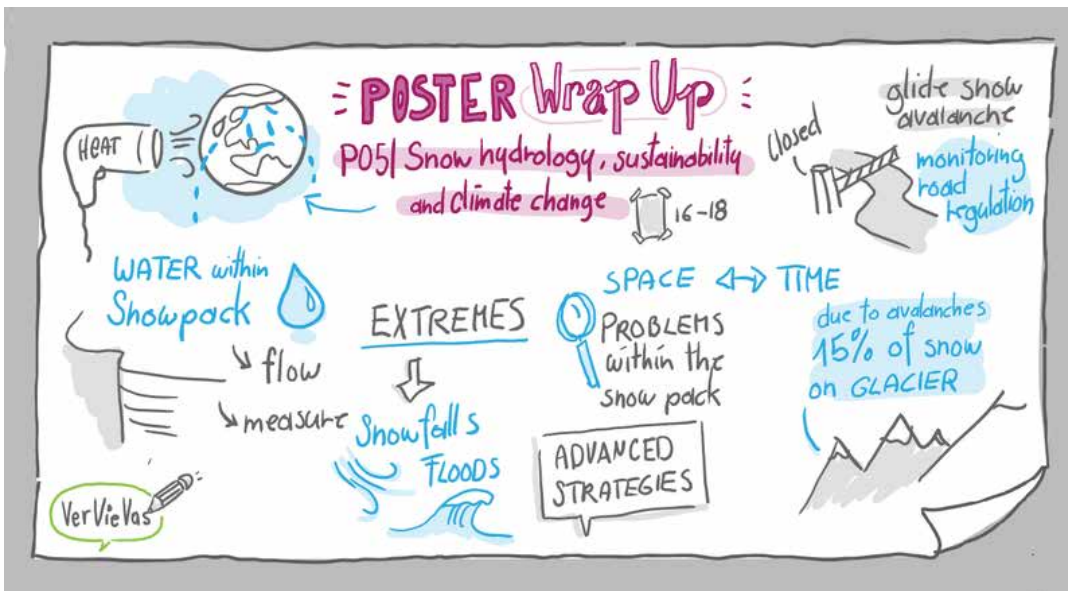




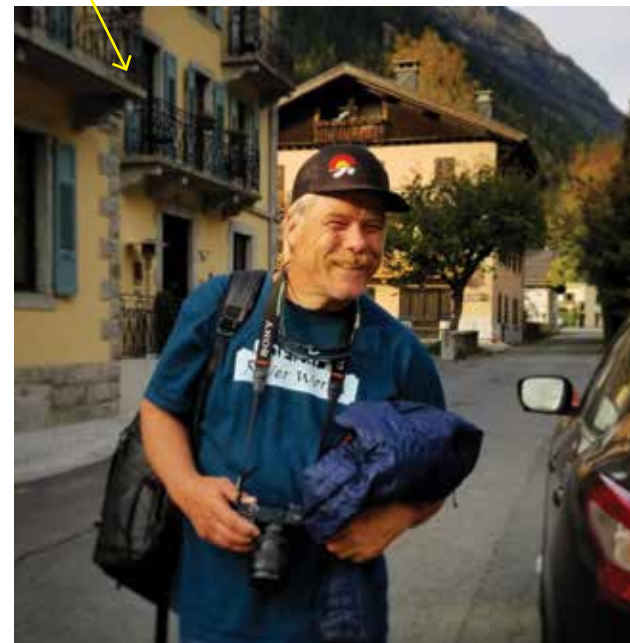
BY ERICH PEITZSCH

**We all know that weather is a major driver** for snowpack development and avalanche activity. Climate, in turn, drives weather, but teasing out the influence of climate patterns on avalanches is more difficult. A session chaired by **Kelly Elder** and Nicolas Eckert provided insight into climate drivers, climate change, and snow hydrology throughout the world. The implications of a changing climate on snow are likely to have some effect on avalanches (i.e. change in type, timing, and potentially frequency). To start the session and lay a foundation of climate change in the European Alps, Andreas Gobiet highlighted the 2°C increase since 1880 and a 0.3°C rise in temperatures per decade and the implications on numerous industries. However, uncertainty in precipitation (i.e. snow levels and type) makes it difficult to determine the direct effect on avalanche occurrence.

Next, Yuta Katsuyama showed how scientists modeling snowpack in Japan suggest a 30% decrease in snow height and snow water equivalent in western and eastern Hokkaido. Snow cover duration is also likely to decrease. Remote sensing and snow depth models are used to capture such change in numerous areas throughout the western United States particularly in Alaska. Katreen Wikstrom Jones and Gabe Wolken illustrated how citizen scientists are helping to improve and validate snow remote sensing products in south-central Alaska through the NASA-funded Community Snow Observations program. Any backcountry traveler using their avalanche probe can measure and then later send simple snow depth measurements. Results suggest an improvement in accuracy on modeled snow depth and SWE.



Numerous terrific posters comprised the poster session for snow hydrology, sustainability, and climate change. Thanks to the ISSW 2018 team for incorporating these graphics as a way to highlight the poster sessions.



Kelly Elder in Chamonix  
Photo John Stimberis

Ned Bair illustrated the feasibility of using remote sensing products, SWE models, and daily manual snow depth measurements in Afghanistan to provide snow products for non-existent or data sparse areas. Florie Giacona then presented a record of 240 years of avalanche activity in northeast France derived from a variety of sources (i.e. databases, media, photos, oral history, novels, etc.). They report maximum avalanche activity associated with the coldest years (1790–1850) with a drop in activity around the middle of the 19th century associated with a decrease in snow amounts at low and mid-elevations. This could help predict future scenarios of climate change as precipitation changes, particularly at these elevation bands.

To wrap up the session, we presented our work using tree rings to create an avalanche chronology that extends back to the mid-1600s. We found, thus far, that large magnitude avalanches tend to occur on years characterized by above average SWE, cold temperatures, and interaction with the negative phase of El Niño and the Pacific Decadal Oscillation. There was also a terrific poster session associated snow hydrology and climate change. The image below graphically depicts the topics covered. Overall, these sessions detailing climate change and snow hydrology dovetail with potential changes in frequency and timing of wet snow avalanches. This topic will be discussed in the next issue of TAR. So, keep an eye out. ▲

Erich Peitzsch is currently studying avalanches using a chainsaw and drones.



Right: Erich "I'm only going for 10 minutes" Peitzsch hours into the dance party on Diva's Night.  
Photo Zach Guy

# Getting to Know the Industry

BY DAN KAVENEY

**After a few months of executive directing** while perched in front of my computer I couldn't have been any more delighted to take a break from the glowing screen in order to drop in to the milieu at ISSW. Since I'm not an avalanche researcher or practitioner, my goals at ISSW were different from many other attendees'. I enjoyed attending talks and learning more about avalanches, but I focused my energies on getting to know the industry: its goals, methods, aspirations and, most importantly, its people. What follows is a perspective from someone who walked in to a crowded room full of friends and colleagues he hadn't yet met.

The meeting was very international. It felt like I was attending a meeting of the United Nations, but without rancorous exchanges between superpowers or (much) talk of global catastrophe. People from all over the world attended, and I personally met people from all over Eurasia (Austria, Germany, France, England, Scotland, Norway, Sweden, Finland, Spain, Georgia, Italy, Russia, Croatia, Poland, Uzbekistan), East Asia, North America, and South America. Many presentations were in English, but simultaneous translation was available on headphones for those who preferred to present or listen in other languages. I was expecting people from all over the world, so that wasn't a surprise, but standing together in the same room with such a multi-national group cemented the abstract reality into something much more tangible. I discovered there is tremendous international interest in partnering with the American Avalanche Association in various different ways. Many people had ideas about possible A3 group memberships for their organizations, or about using A3 educational standards for avalanche courses in Europe and beyond. I'll keep you posted if any of these things develop.

In addition to the international diversity, the conference highlighted the enormous breadth, depth, and scope of avalanche work. Papers were presented about a wide array of topics, from large-scale engineering projects to small-scale studies of snow grains as well as all manner of things in between. Participants included college professors, engineers, guides, ski patrollers, and business people. The conference seemed very inclusive and to take seriously its goal of integrating theory and practice.

The final overriding impression I took from the meeting was one of warmth and welcome. The thing I enjoyed most about the conference was getting to know all the people, especially the A3 members, sponsors, and board (some of whom I hadn't met in person yet!). Thanks to all of you who stopped by the A3 booth to introduce yourselves and discuss the various things on your minds. I'm looking forward to continuing to get to know all of you better. ▲



The Wiener causing startled glances in Innsbruck. BTW he is proudly wearing his neckerchief presented to him by ISSW 2013 in Grenoble. Photo Dan Kaveney

Photo Kelly Elder



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# ISSW 2018 Innsbruck, Austria

BY JOHN STIMBERIS

I arrived a couple days early to get adjusted to the time change and do a little sightseeing. These events have gotten busier for me over the years and once underway there is little time for diversions. This was my 13th ISSW and the 20th anniversary of my first one I attended. The Innsbruck experience began under an absolutely gorgeous sky with a walk around town and a trip to the top of the mountain at Nordkette. Lunch at mid station included my new favorite Speckknödel and of course a large beer. Sitting on the side of a mountain eating a bacon filled dumpling and sipping a beer overlooking Innsbruck with the exceptional company of Ethan Greene?? That's why we travel to these events.

I began the week with a somewhat informal TARP/transportation meeting that David Hamre largely instigated. TARP is our research funding group (Transportation Avalanche Research Pooled fund) and many of the people in attendance would continue to be part of the trip for the next two weeks. Sunday evening arrived and the ISSW 2018 was officially underway. After 20 years of attendance, I've gotten to know quite a few of the "regulars" and this week would be a combination of catching up with old friends and colleagues, reinforcing and strengthening informal relationships, and of course building new ones.

On that note the social events are just as important as the presentations themselves. From Innsbruck night, to Divas night (thank you to the women in our field and their willingness to let the guys crash the party), and of course the banquet, each event allows a far more personal response to the workshop. The ISSW is billed as a merging of theory and practice and these informal events are when we really get a chance to talk and exchange ideas.

As far as the workshop is concerned, I could easily fill a few pages with a synopsis of each day, but that really isn't the point here. I will mention a few outstanding or notable presentations and try to keep it to one or two per day (almost impossible). Maybe I learned something, was entertained or intrigued, or just had one of those moments where we really get IT. Overall I thoroughly enjoyed the week.

Day 1 and the very first presentation was quite interesting with 3D simulations of avalanches. I liked the presentations about defensive structures and look forward to reading through the new *Planning Methods for Assessing and Mitigating Snow Avalanche Risk* edited by Bruce Jamieson.

Day 2 was filled with climate change info, but what I really took from the day were two things not included in the scheduled workshop. I attended a CAA meeting (Not the Canadian Automobile Association Joe) and came away with this point for American practitioners: maintain a portfolio of your experiences, training, and CPD. It's not required, but I will venture to guess that it will be at some point in your career. Getting started now will help organize your experiences and allow you to compile a solid resume.

Following the CAA meeting I went directly to the ISSW Steering Committee meeting. Big take away from this meeting and I will put it in bold: **ISSW 2020 in Fernie, BC will be very accessible to practitioners throughout North America. Start your study, research, or idea this winter. We really want you to present!** There will be a follow up article in TAR to help get you in touch with an experienced practitioner and/or researcher to help design, write, or otherwise inspire your work. You can do it!

Day 3 was the field trip. I went to Isghgl to look at highway and municipal avalanche control, detection, and protection measures. The trip did not disappoint.

Day 4 included a slew of interesting talks again. Karl Birkeland's continued work on snowpack stabilization follow storms was very interesting. I also really enjoyed Scott Savage's presentation on rain on snow response. I take particular interest since I work in a rain on snow environment.

Day 5 had a very good response considering the banquet the night before. My biggest takeaway and possibly favorite presentation of the week was from Laura Maguire. For her presentation she took a look at the cognitive work of avalanche professionals. Besides stating that avalanche forecasting is hard work she also implored us to "Stop using human factors as a pejorative!" I hope to see her paper published soon and delve further into this issue.

Following the ISSW I was fortunate enough to continue the avalanche theme through the Alps of Austria, Switzerland, and France. Our crew consisted of avalanche professionals from Washington, Utah, Colorado, and Alaska. For roughly the next week we traveled to Zermatt, Chamonix, Chambery, and finally ended in Geneva. We were introduced to a variety of detection, defense, and avalanche control products (known as RACS or Remote Avalanche Control Systems). Manufacturers and local officials gave us the opportunity to see these installations first hand. I was more than impressed with the dedication and funding that goes into avalanche related products and design in Europe.

In addition to seeing the installations, and of course the ever impressive Alps, we shared a unique opportunity to spend some quality time with each other. All too often we work and exist in isolation from other leading professionals. I can't begin to describe how much this additional week meant to me and what I learned and came away with. Thank you Ethan, Dave, Bill, Kelly, Adam, Mark, and Ted!

I will also extend a big thank you to Wyssen, T.A.S./MND, CatEx, and GeoPraevent for taking the time to show us around and see the many installations dedicated to public safety. ▲



At the banquet, A3 board, staff, and ISSW scholarship awardees gather to celebrate another successful conference. Front row, left to right: scholarship winner Andrew Schaur, A3 board members Erich Peitzsch and Aleph Johnston-Bloom, A3 President John Stimberis, and A3 ED Dan Kaveney. Back row: A3 board member Eeva Latosuo and scholarship winner Erica Engle.  
Photo Dan Kaveney

Stop using human factors as a pejorative!



While riding the train to Zermatt Bill Nalli and Walter Steinkogler discuss the finer points of avalanche control, or possibly where to find the best wienerschnitzel.  
Photo John Stimberis

BY RICH MARRIOTT

**ISSW in Innsbruck was a remarkable week.** As Secretary of the Steering Committee, I tend to focus on the organization and general content of the Workshops. Having attended all 21 ISSWs since Bozeman in 1982, I continue to be amazed by how each ISSW has its own distinctive flavor. And the Organizing Committee in Innsbruck was no exception. The setting in Innsbruck was spectacular, surrounded by high mountains with a funicular/gondola station just outside the conference center that could whisk you up over 2,000 meters. The weather was sunny and warm everyday—leading to a great field day—but making it hard to sit inside.

The main distinction I saw with this ISSW was described by Karl Kleemayr, one of the co-chairs, on the first day, when he described the week as dense. It was packed and many times there were several things happening at once. Organizers tried to not overlap similar topics but, as has been the case in the past with concurrent presentations of any kind (first tried at ISSW 1994 in Snowbird), some attendees felt frustrated by not being able to attend all they would like. However, over 400 abstracts were submitted, making it difficult to fit even half of them into the normal four days of presentations without concurrent sessions.

The days were long with sessions running from 8AM to 6PM. Mornings were typical, with oral presentations, followed by a couple of questions. Topics were generally broader based. However, following each session there was an author's corner where the presenters and attendees could gather for more discussion or questions.

Afternoons had several options. There were two concurrent sessions covering more specialized topics. Rather than brief questions afterwards, all the presenters would hold a 10–15-minute panel discussion—similar to the workshops held at ISSW 2016.

Each Session had two chairs. And at the end of all of the oral presentations one of the chairs would summarize all of the posters being presented on the sessions topic in the afternoon. This was made uniquely entertaining by an artist sketching something representative of a group of posters (projected on the main screen). This helped keep everyone engaged during a mainly non-visual 10 or 15 minutes.

Although all of the posters remained up all week, each day the day's poster topics were highlighted after the end of oral sessions. As usual the poster sessions were presented with “refreshments!”

A very unique addition to ISSW 2018 were the afternoon training courses, offered during the time of the afternoon special topics sessions. ISSW 2018 offered training courses on two different topics each day to “... give attendees professional development opportunities by teaching the state of the art.” Every attendee was allowed to register for just one course and most of them were filled.

Still another innovation was Public Day. On the day of the field trips, ISSW 2018 invited public groups to the Conference Center to view the posters and hear discussions ending with a buffet and social hour for the public. Numerous school groups visited, as well as many mayors and government officials. This had the advantage of giving the Workshop a broad reach locally.

Finally, the Innsbruck organizers, helped to promote ISSW 2020 in Fernie, BC by holding Fernie Night on the last evening of the Workshop. 200–300 people showed up for more “refreshments” and a chance to socialize one more time while hearing from the Organizers of ISSW 2020.

Overall, ISSW 2018, the third European ISSW, appears to have been immensely successful. There were around 1,000 people from 27 countries who attended. There were as usual many opportunities for socializing, idea exchange, and networking—carrying out the motto of ISSW: A merging of Theory and Practice!”

There were, as usual, many opportunities for socializing, idea exchange, and networking—carrying out the motto of ISSW: A merging of Theory and Practice!” ▲

**Rich Marriott** researched the earth's upper atmosphere at UCLA before working in Snow and Avalanches under Ed LaChapelle at the University of Washington. Rich and Mark Moore cofounded the Northwest Weather and Avalanche Center in Seattle in 1975. Rich spent a decade managing the Blue Glacier Research project for UW before becoming an on-air meteorologist for the NBC affiliate in Seattle where he continues to work. Rich has been a member of the ISSW Steering Committee since its inception in 1982 and he has been the Permanent Secretary since 2002.



## A SHORT HISTORY OF AN ICON!

By Rich Marriott

The ISSW Wiener has had a long and sordid past in association with ISSW. He was captured at a Bingo Gas Station in Thorpe, Washington as a group of Avalanche forecaster and graduate students headed by Ed LaChapelle were driving late at night on the way to the first ISSW in Bozeman in 1982. (As a side note: the Wiener was purchased legally by Rich Marriott for \$10 as it hung from the ceiling of the mini-mart—after a 2AM call to the owner of the gas station by the frightened employee—just to get us out of their store!).

We dressed The Wiener in shorts, a hat, and sunglasses and attended all of the sessions of the first ISSW. The Wiener has attended every ISSW since.

The Wiener has always enjoyed a large public following, but this has led to several unfortunate episodes. He was beefily taken hostage by a Washington DOT gang at ISSW 2002 in Penticton, but quick negotiations and a 6-pack of beer regained his freedom. But a larger tragedy ensued when he was wiener-napped in Jackson Hole at ISSW 2004. There was no word of his whereabouts until he was seen photographed on a Mexican beach with Coronas and a bikini-clad girlfriend after he escaped his captors. He attended ISSW 2006 incognito—but several photographs confirmed his presence. He finally returned to his public at ISSW 2008 in Whistler displaying a poster he had co-authored with the late Ed LaChapelle.

The Wiener traveled to the first European ISSW in 2009 at Davos, where he was regarded with some surprise. However, once again, his popularity was a negative, as he was abducted from the banquet by an unnamed Alaskan. He was returned at ISSW 2010 in Squaw Valley after being smuggled into South America—though in slightly deflated state.

The Wiener's most recent excitement was at ISSW 2012 in Anchorage, when Rich forgot to bring him along—however, Rich's wife overnighted the Wiener (deflated) and he arrived in time to attend the Banquet and the final sessions.

The Wiener continues to hold air after all of these years. He had a wonderful time in Innsbruck at ISSW 2018 meeting old friends and visiting the land of his ancestors. He spends his time between ISSWs mostly hibernating among a collection of old ISSW T-shirts and occasionally going out with swinging sausages he has met along the way. He is anticipating another great time in Fernie at ISSW 2022—his 22nd ISSW and his 40th Anniversary as The ISSW Wiener!



# Avalanche Divas' Night 2018 in Innsbruck

BY SUSANNA MITTERER

**What is the Avalanche Divas' Night about** and do we really need an event like this? Many questions arose in the context with this event. The Avalanche Divas' Night is an evening event during the ISSW, which aims to make women in the avalanche industry more visible. It provides networking opportunities among female professionals in the snow and avalanche research and industry and so far remains a necessary feature of the ISSW. In Innsbruck the female proportion of the approximately 1100 attendees was at around 15 %. The female part at the oral presentations was better; 17 % of the presentations were given by women, 24 out of 140. Still, the Avalanche Divas' Night is an opportunity to get connected and network.

This year's Divas Night was very well attended. Around 90 women met in the Orangerie of the Congress building in Innsbruck to get to know each other, discuss, and exchange ideas. Other essential agenda items at the Divas' Night were the Avalanche Diva Awards, a raffle, and a live band. The doors were open for men as well after 9 PM.

## Avalanche Diva Award:

Pioneering and outstanding female professionals in the field of snow and avalanches were acknowledged. A brief explanation of how the Avalanche Divas 2018 were singled out:

In a first step, we called for nominations, which lead to the nomination of six excellent female professionals in the snow and avalanche industry.

In a second step, these nominations were communicated to an international committee of 28 snow and avalanche experts. The committee ex-



The honorees: Ingrid, Jennifer, and Barbara

isted of previous avalanche divas, ISSW steering committee members, and ISSW 2018 reviewers, both scientists and practitioners. Each of them could give a vote either for one, two, or three of the nominated women.

The three women with the most votes were announced as the Avalanche Divas 2018 at the Divas' Night. The Avalanche Divas 2018 are Jennifer Coulter, Barbara Frigo and Ingrid Reiweger.

The Divas' Night is an important social component of a male dominated ISSW! I was happy to be involved in organizing the Divas' Night this fall in Innsbruck. In connection with the Divas' night, the German speaking mountain safety magazine "Berg und Steigen" ([bergundsteigen.blog](http://bergundsteigen.blog)) created a video of nearly all participants of the event, which clearly shows that the snow and avalanche industry is not masculine only. The video can be seen at the Avalanche Divas facebook site or at [bergundsteigen.blog](http://bergundsteigen.blog).



The organizing committee: Susanna Mitterer, Ingrid Reiweger, and Lisa Dreier. Not pictured: Hanna Krismer.

We want to thank our main sponsors BFW, Austrian Research Center for Forests, Black Diamond, Skhoop.us, Wyssen Avalanche Control, Arc'teryx, SmartWool, Maloja, McElhanney, Avalanche Canada, American Avalanche Association and many others which contributed to our raffle.

**Susanna Mitterer** is a geographer in Innsbruck, Austria and interested in everything that involves snow, ice and mountains. She worked at WSL Institute for Snow and Avalanche Research SLF in Davos (Switzerland), at Alps Centre for Climate Change and Adaptation, and at the Austrian Board of Alpine Safety in Innsbruck (Austria). Together with Lisa Dreier, Ingrid Reiweger, and Hanna Krismer, she organized the Divas' Night at ISSW 2018 in Innsbruck.





**Barbara Frigo, Italy**

Barbara did her PhD in Structural Engineering at Politecnico di Torino discussing the thesis “Mechanical models of the release and the propagation of snow avalanches.” Afterwards she was a Post-doc research assistant in Structural Mechanics at the Dep. of Structural, Geotechnical and Building Eng.—Politecnico di Torino (IT). Since 2012 she has been Assistant Professor of Structural Mechanics at Dep. of Structural, Geotechnical and Building Eng.—Politecnico di Torino (IT).

She is author of more than 120 scientific publications (published on international conferences and in international journals) on subjects of Structural Engineering, Materials Engineering, and Fracture Mechanics. She has participated in about 20 national and international projects, including ERASMUS and teacher in undergraduate courses (Structural Mechanics and Seismic Risk) at Politecnico di Torino.

—Margherita Maggioni

Photo Kelly Elder



**Jennifer Coulter, Canada**

Jennifer is an Avalanche Canada forecaster for the South Rockies team (a leading edge team with great innovation). She is actively involved with many aspects of the avalanche industry including, but not limited to:

- Ski patroller
- Canadian Avalanche Rescue Dog Association senior dog handler and instructor coordinator
- Volunteer Search & Rescue with Fernie SAR for over 10 years and their “go to” avalanche safety site officer for callouts in avalanche terrain
- CAA Industry Training Program instructor
- Avalanche Skills Training instructor
- A self-titled “Snow and Search & Rescue geek”

—Emily Grady



**Ingrid Reiweger, Austria**

Ingrid is a physicist who got her PhD at WSL Institute for Snow and Avalanche SLF, Davos in 2012. She continued her work at SLF as a scientist until 2015. She has written numerous publications on the little details in avalanche formation called fracture mechanics. On the one hand she worked deeply in the theory of how snow fails and on the other hand she designed and carried out laboratory and field experiments as close to practice as possible to verify her theoretical work. Along with that work, Ingrid also raised her two children Adrian and Ladina. In 2016, she moved back to her home country Austria and joined the University of Natural Resources and Life Sciences in Vienna, Austria, and is now Assistant Professor at the Institute of Mountain Risk Engineering.

—Chris Pielmeier




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