

Avalanche

REVIEW

VOLUME 32, NO. 1 • OCTOBER 2013

www.AmericanAvalancheAssociation.org

Season Roundup 2012/13

From Tighe Stoyanoff:

Here's a shot of a slide on March 1, 2013, in White River Canyon. This path is actually across White River Canyon from the Mt Hood Meadows permit area and within a couple hundred yards of Timberline Lodge ski area. That canyon has similar aspect and elevation to some of our Mt Hood permit area, and we often use it as an indicator slope of sorts. The day we went in there to grab some information, the surface conditions were a freezing rain layer over runnels in the morning, so we had to wait until it softened up in the afternoon. The overhanging cornice section before the fracture line was dripping pretty aggressively on our way in. I have seen much larger slabs that have run about two miles from that same path, yet this one was still interesting. This particular slab had a lot of taper and less volume than similar events from the past.

■ For more about last winter in the Pacific Northwest, see the NWAC summary beginning on page 18 ➡

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We started warning skiers and riders of potentially large "facet sluffs" entraining the entire season's snowpack, a type of avalanche that doesn't quite fit into our current list of avalanche problems. I propose new SWAG code, such as LSP (Loose-Shit-Pile) or DBS (Don't-Bother-Skiing).

—Zach Guy, CBAC Summary, pg 29



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The mission of the AAA is:

- A. To provide information about snow and avalanches;
- B. To represent the professional interests of the United States avalanche community;
- C. To contribute toward high standards of professional competence and ethics for persons engaged in avalanche activities;
- D. To exchange technical information and maintain communications among persons engaged in avalanche activities;
- E. To provide direction for, promote, and support avalanche education in the US;
- F. To promote research and development in avalanche safety.

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Contributions: Please submit material eight weeks prior to publication date. Include address and telephone number. Please submit typed manuscripts by e-mail or disk (CD or DVD), using any popular word processing program. Submit any figures as an EPS (preferred), PDF, TIFF or JPG file (300 dpi resolution at 100%). We will return materials if you include a stamped, self-addressed envelope.

Articles, including editorials, appearing in *The Avalanche Review* reflect the individual views of the authors and not the official points of view adopted by AAA or the organizations with which the authors are affiliated unless otherwise stated.

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from the executive director

Welcome Jaime Musnicki!

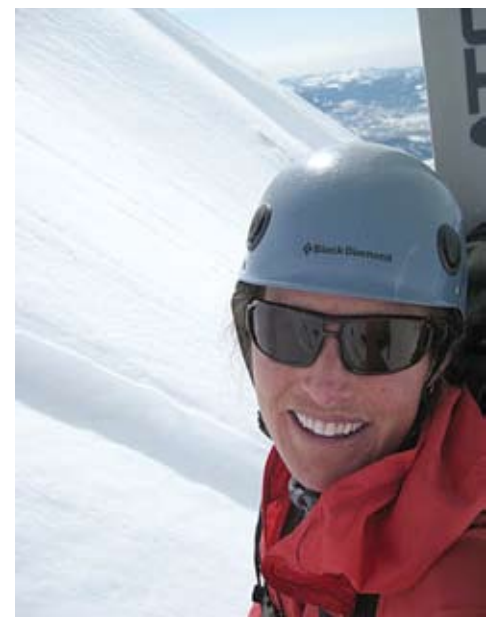
Welcome Jaime Musnicki. After a months-long process that began in the spring, Jaime Musnicki has been chosen as the American Avalanche Association's new executive director.

Nearly 40 persons responded to our request for interested applicants. This list was whittled down to a dozen qualified applicants, and from there to a final five persons before interviews began. The AAA Executive Board spent countless hours evaluating the candidates before coming to a decision in early August.

Jaime brings great enthusiasm and strong communication skills to the ED position. Most recently, she was a winter program supervisor for the National Outdoor Leadership School as well as a backcountry ski guide and avalanche educator. Jaime has also contributed to TAR: see December 2010 and April 2012.

I look forward to working with Jaime over the next few months during the transition to her new position at AAA. The AAA office will now move to Jaime's home in Victor, Idaho.

—Mark Mueller, outgoing AAA executive director ❄️



Helmet, sunglasses, and that smile: you will recognize her anywhere.



Your editor and your new executive director check out layers on a cold day in the Tetons. Photo by Kate Koons

Hello AAA members, subscribers, and friends,

I'd like to take a few minutes to introduce myself as I begin to transition into my new role as executive director of the American Avalanche Association. First and foremost, I feel honored and excited to be taking on this new responsibility with the AAA. I very much look forward to learning the ropes of my new role; getting to know the AAA community more closely; and beginning to better understand how I can best help, support, and guide our organization to most effectively serve our membership of inspiring, talented, and diverse avalanche professionals.

I have called the Tetons home for the past 11 years, residing in Teton Valley for over eight years now. I did begin my official education in snowy climes and activities at the ripe age of two in rural upstate New York, the Finger Lakes region to be more precise (think: rolling hills, lake-effect snow, and night skiing). More recently and professionally speaking, I have worked mainly for

NOLS over the past 10+ years in a broad range of roles and capacities – from field instructor (predominantly backcountry skiing, glacier mountaineering, rock climbing) to avalanche educator to winter program supervisor to facilitating customized leadership and risk management trainings with private clients.

One of my main goals as I move into this new position with the AAA (in addition to further honing my office savviness!) is to learn more about the different varieties of avalanche professionals we aim to support and represent at the AAA: Who are you? What do you do? What topics and issues are important to you as avalanche professionals? What are we currently doing that supports you? Are there new or different things we can do to support you even more effectively? I don't want to limit myself in this position to only my direct personal experience (largely from the guiding and avalanche education realms); I seek to broadly listen to you, our members, and gather information that will enable me to make decisions and work to better support all avalanche professionals. With that said, please feel free to be in touch with me at any point to ask questions and/or share your perspectives, opinions, experiences, ideas, or feedback.

Mark and I have been working together on this transition for a few weeks now and will continue into the fall. Mailing address and phone number for the AAA has officially shifted to me in Victor, Idaho (*see masthead, at left*). I plan to communicate these changes via email, TAR, and the websites (and regular mail, as needed).

I genuinely look forward to meeting and working with/ for all of you in the weeks, months, and years to come.

—Jaime Musnicki, incoming AAA executive director ❄️

WILD APRICOT: Membership Database Management Tool Now in Place

Last spring the AAA began using an online membership database management tool called Wild Apricot (WA). With the growth of our membership, managing our database had gotten so time consuming that we needed to implement a modern tool like WA. Using this program will allow the AAA to use your membership dues for the benefit of the avalanche community rather than paying for time spent performing outdated administrative tasks.

The key component to this update is your email address. Your email address is your unique identifier in WA, so you need to provide AAA an email address that you regularly use. Two or more members cannot share the same email address.

When prompted to renew as a member or subscriber, or to update

your membership information any time, you will first set up an account by logging into Wild Apricot at aaa19.wildapricot.org/Content/Members/MemberProfile.aspx with your email address. The first time you will be prompted to create a password; click on the Forgot Password link to set up your password at aaa19.wildapricot.org/Sys/ForgottenPasswordRequest

After setting up your account you will be able to change your email address or any other contact information at your convenience when the need arises by logging into your Wild Apricot account.

If you can't log in or create a password for some reason, email aaa@avalanche.org for assistance. This is a new system for all of us, and we may encounter minor glitches along the way. So far, WA has worked

very well, and over time we hope to make further use of its advanced features, particularly the Membership Directory. Online payments are made through PayPal (you don't need to have a PayPal account) a trusted third party payment service we have used for many years.

Individuals and groups that make multi-member renewal payments, or subscribers who use subscription services (e.g., Ebsco or Swets) may not be able to use WA for renewal payments, but individual members will still be able to set up an account and update email or contact information in order to receive important messages from AAA including renewal notices.

Thank you in advance for helping us make this work. If you have any questions, do not hesitate to contact AAA for assistance. ❄️

from the editor

A Look at Loyalty and Honor



Lounging in the green forest of Oregon's McKenzie River, working on TAR from the road. Photo by Dan Powers

Lately I have been thinking a lot about the old-fashioned concepts of loyalty and honor.

We have personal and professional loyalties, and sometimes they overlap, in which case the loyalty is incredibly strong. Currently, my primary professional loyalty lies with *The Avalanche Review*, and by extension to the greater avalanche community, or "our tribe," as Janet Kellam puts it.

But loyalty and honor are abstract concepts. The real question is "what does this

loyalty look like?" It looks like sitting down at the computer and opening the TAR folder first, making lists in my head and then waking up in the night with ideas and edits when the deadline is approaching, then getting it done right. A host of other words represent how I conduct myself: professionalism and honor top the list. I try to double-check stories, include the deep background and the "rest of the story." I'll call folks who know more about a topic than I do, and I try to hold humility front and center, print a correction or apology if I get something wrong. Because of that effort, I'm proud of *The Avalanche Review*, and I know that you are too. We're the connector between avalanche workers out there on the front line, often in remote places, small groups, with the support of the greater avalanche community as an intangible presence far away. We bring you the news, the gossip, the latest tools or questions that we're separately pondering over coffee or beers.

So why do I bring this up? Because I am grateful to the others in my tribe who share my dedication to excellence. It's easier to do so as a paid staffer (full disclosure: I am paid for my work on TAR), but it can be a stretch for a volunteer to donate free time and extra effort to a cause. I want to thank the hardworking Governing Board of the AAA, and especially the Executive Committee, for stepping it up this summer; for example, sifting through 40 applicants to hire a new executive director, and sorting through thorny questions behind the scene. In other words, these volunteers have shown deep loyalty to the avalanche world: I honor your considerable commitment, which in turn inspires further loyalty.

In this issue of TAR, first off you'll meet our new executive director, Jaime Musnicki. I hope you meet her in person too. She's smart, understated, funny, and incredibly competent. She knows how to phrase the hard questions both clearly and tactfully. I strongly feel that she can fill Mark's shoes (although I will miss him tremendously – no one can exude calm like he does) and look forward to watching her grow within this position both personally and professionally. TAR has a new ad manager: welcome to Paul Nordquist who had to hit the ground running; find his profile and contact information on page 5. Welcome also to Dallas Glass, the new AVPro director; you'll see a more in-depth introduction to him in the December TAR.

In this season summaries issue of TAR, you'll find a series of well-written reports from last winter around the AAA. It was bittersweet putting this issue together, as both the NAC and the UAC summaries were inextricably tied to obituaries of prominent avalanche workers who have left big voids for this coming winter. Karl Birkeland calls us to pick up the loose threads of all the projects that Doug Abromeit was involved in; we must also emulate his good cheer and effortless role as community connector. Bill Nalli and Drew Hardesty both mourn for fallen colleague Craig Patterson. Again and again we return to the central question of risk and tolerance: how to manage and minimize, recognize and avoid dangers, build in enough room to make mistakes and learn without irreversible consequences.

The rest of this 32nd volume of TAR will follow similar themes as the last couple of years: 32-2, the December issue, will loosely revolve around what's new, what's been in the works from the end of last season and over the summer. The February issue, 32-3, generally follows a science theme, although this year I hope to report to you the latest work on sidecountry education as well. Then the April issue, 32-4, will further our conversation on risk and decision-making, including significant case studies/accidents/topics from the winter underway.

Thanks once again for your support and your loyalty as AAA member and TAR reader. Send a note or photo of what's new, what you're pondering.

—Lynne Wolfe ❄️



Aloha Lynne!
 Hope you are well! I'm missing the snow, icicles hanging outside the office window, digging pits and making turns! But I'm trying to stay caught up with TAR!
 Thanks for the great work you and all the contributors do to put out such a great publication!
 Aloha from the Big Island,
 Eric White
 (former official outhouse snow shoveler from the Mt Shasta Avalanche Center)

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Aleph Johnston-Bloom (left) takes over the reins at Alaska Avalanche School as Tucker Chenoweth (right) moves to a new position at Denali National Park.

Alaska Avalanche School Welcomes Aleph Johnston-Bloom as New ED

Story by Eeva Latusuo

When leaves start changing, some Alaskans switch gears and head south for the winter. Alaska Avalanche School is observing a different migration pattern. Aleph Johnston-Bloom is stepping to the helm of Alaska Avalanche School in October, heading north to Anchorage from Durango where she has been ski patrolling and teaching avalanche courses for an extended period of time.

Anchorage cannot boast the perfect mountain weather of southwest Colorado, but Aleph is looking forward to learning more about high-latitude snow climates and becoming an active member of the Alaskan avalanche community. As AAS executive director, Aleph will be in charge of keeping the school on a path of outstanding education, as well as running the business operation.

Previous ED Tucker Chenoweth has moved onto a permanent year-round position with Denali National Park's mountaineering program, an opportunity not to be missed. Tucker led AAS through four exciting years of growth and re-organization. At the time,

he was the first boss to be hired outside the "home community." With hard work and a diverse skill set, he paved a solid path for Aleph to follow. Tucker will continue to share his teaching skills as a senior instructor.

Many know Aleph as one of the leading Snow Divas dedicated to strengthening the community of female avalanche professionals. As a long-time snow pro and a Prescotteeer, she has many areas of expertise, including curriculum development, explosives work, and mountain biking. Stay tuned to what flavor Aleph will add to the south-central Alaska snow scene.

Alaska Avalanche School is an Anchorage-based independent nonprofit teaching Alaskans about snow since the '70s. AAS offers diverse programs from bread-and-butter courses to customized training for varied audiences.

Eeva Latusuo, a senior instructor with AAS, is overloaded with vitamin D after an amazing summer up north, but low on vitamin P (powder). ❄️

Congratulations and thanks to our new AAA members as of spring 2013:

Professional Members

- Bill McCabe, Columbia Falls, MT
- Timothy GLassett, Girdwood, AK
- Chris Eckel, Douglas, AK
- Heather Thamm, Girdwood, AK
- Mark Kelly, Valdez, AK
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- Chris M. Edwards, Jackson, WY
- Ryan Smeedlling, Salt Lake City, UT
- Josh Beckner, Princeton, NJ

Paul Nordquist Joins AAA Team as New TAR Ad Manager

Paul Nordquist is excited to be working with and contributing to the American Avalanche Association as the new advertising manager of *The Avalanche Review*. His more than casual interest in snow began while completing the Ski Area Operations program at Colorado Mountain College in the late '80s where he was introduced to avalanche education by Rod Newcomb. After working for Mammoth Mountain Ski Area Paul transitioned to business development, marketing, and sales in the beverage industry, media services, and most recently a Fortune 100 medical company where he spent the last 10 years. He lives in Tacoma, WA, with his wife Melissa where they eagerly anticipate the first snows of the new season.



Paul Nordquist looks forward to explaining the benefits of advertising in TAR.

Contact: Paul Nordquist, 1101 Lenore Drive, Tacoma, WA 98406, pwnordquist@gmail.com, 253-830-4444 ❄️

WANTED: Ethics Committee Chair

The American Avalanche Association (AAA) is seeking to fill the Ethics Committee Chair position. The Ethics Chair keeps the AAA Governing Board updated regarding any ethics concerns within the avalanche industry as based on the existing code of ethics (see www.americanavalancheassociation.org/mem_ethics.php). Interested applicants should:

- Possess strong written and oral communication skills
- Be tactful, diplomatic, and professional in all AAA-related matters
- Attend biannual board meetings
- Regularly participate in Governing Board discussions via email and/or conference call

Committee Chair positions are appointed by the Governing Board and are volunteer positions. The successful applicant is responsible for travel expenses related to AAA biannual meetings.

Interested applicants should send a letter of interest by October 20 to John Stimeris, AAA vice president, at stimbuck@hotmail.com. ❄️

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Carlson Takes FoCAIC to Next Level

Aaron Carlson joined the Friends of CAIC as executive director this September. In addition to his primary role of fundraising, Aaron will also lead our efforts to increase avalanche awareness opportunities for students in Colorado's public school system. The FoCAIC will take over some of the responsibilities of former CAIC education specialist Ben Pritchett (see story...), and Aaron will be instrumental in getting this up to speed. With Alan Henceroth now on the board and Aaron as full-time ED, the FoCAIC is excited to see the nonprofit go to the next level.

Aaron grew up skiing the 299' vertical hills of Minnesota and later discovered his passion for the backcountry while living and skiing in Utah, Colorado, and New Zealand. Aaron has a bachelor's degree in Parks, Recreation and Tourism from the University of Utah, which has allowed him to work in and experience many different parts of the world. In 2008, Aaron brought his passion to the CAIC Benefit Bash. As the co-organizer, he was able to design, organize, and run the largest fundraiser in CAIC history. With this momentum, Aaron has been an asset to the development of the FoCAIC.

"The Friends of CAIC plays an important role in supporting the CAIC and avalanche education throughout the state of Colorado," Aaron states. "I am excited to help bring avalanche education into Colorado's school systems and to be a part in supporting the most active avalanche center in the nation." ❄️



Ben Pritchett Moves to AIARE Full-Time Status

Ben Pritchett has moved on from the CAIC where he was the education coordinator from 2006 through spring 2012. During this tenure, Ben also worked as program director for AIARE. With hopes of spending less windshield time bounding around Colorado and more time at home, Ben decided to focus on AIARE, continuing as program director, but now in a full-time capacity.

The CAIC would like to thank Ben for his great work, dedication, and enthusiasm for avalanche education, and wish him many happy days chasing his wife and kids around Crested Butte's backcountry. ❄️

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l-r: Mark Ridders, Denny Hogan, Pat Ahern, Jerry Roberts, Peter Shelton
Photo by Lisa Issenberg

From Jerry Roberts: Old Snowmen Of The San Juans Summer Rendezvous at Casa de Jerry Hi Lynne... Ya a nice get together of old snow Negros. Denny was visiting Colorado for a month vacation and came over for a few days of R&R with old friends. Quite fun and many pisco sours later Seldom Seen Denny crawled off in the darkness to lick his wounds and return to Kalifornia...think he's retiring in Jan or may work the entire season to buy new drapes for his casa in Buena Vista...



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AAA AVPro Course Provides Something for Everyone

Story & photos by Amber Moran

Nine students gathered at Crystal Mountain, WA, for the American Avalanche Association's 2013 annual AVPro course February 23 - March 3. Instructors Jake Hutchinson and Brad Sawtell presented a wide range of subjects that challenged the students' knowledge and built on their existing foundations. The course is aimed at working professionals in the snow science and avalanche field. Eight out of the nine students in this year's course were ski patrollers. Other AVPro courses often have included highway-control workers, guides, and other professionals in avalanche-related fields. In order to gain the most out of the course, students are expected to be proficient and current in many skills prior to the course.

The course began with classroom instruction, beacon skills checks, and group rescue scenarios. The course alternated between field time and classroom time allowing the skills learned in the classroom to be applied during field time. In the classroom, instructors strengthened the fundamentals and introduced new ideas, while introducing some of the latest topics from ISSW and current research such as the anticrack theory. Time was spent reviewing valuable case studies that any professional could learn something from.

A significant amount of the time was spent at Crystal Mountain ski area. The ski patrol pointed out the challenging routes that they manage and discussed ski area management policies. It was interesting to learn about different boundary policies and how they are managed compared to other resorts across the country. Both Crystal Mountain and Alpental ski areas have open boundary policies that are managed through education and interaction with the public. For avalanche control work, tram lines and hand charges were common – as opposed to artillery. Many of the course participants were accustomed to different snowpacks and different ski area management techniques which provided opportunity for a unique learning experience.

A highlight of the course was working with the Washington State Department of Transportation (WSDOT) on Snoqualmie and Chinook Passes. One day was spent at Alpental ski resort learning about the partnership between the resort and the highway department to keep the interstate open. The ski patrol at Alpental also explained their management techniques and showed the class some control routes on their challenging



Students got up close and personal with the business end of the M60 tank WSDOT uses to help control Snoqualmie Pass.

terrain. On Snoqualmie Pass students had the opportunity to see the M60 tank WSDOT uses to control major avalanche paths – a unique tool to keep the highway open in winter. On another day, WSDOT cleared portions of Chinook Pass to allow access to spring control routes. While most of the course was spent with the heavy cloud cover and precipitation typical of the Pacific Northwest, during the trip up Chinook Pass the weather cleared, providing wonderful views of Mt Rainier.

The last part of the course was spent taking the final tests. To pass the course, students must demonstrate that they can proficiently dig a pit to a set depth and document all observations and tests within an hour time frame following SWAG guidelines. Students must locate three beacons in a 100m x 100m area in less than seven minutes. The students must also pass a written exam and instructor evaluation.

The AVPro course lasts eight days with 9-10 hours of instruction each day, including approximately 60% field time and 40% classroom time. The course is taught by AAA Certified Instructors with a pass/fail format. Typically taught at a different location each year, the course strengthens knowledge from previous courses and introduces new information to challenge students. The course varies from a Level 3 in breadth, so students are encouraged to take the AVPro course in addition to their Level 3.

Overall the course challenged everyone in their own way. Spending time with other working professionals and learning their methods is one of the most valuable parts of the AVPro course. The course teaches you how to take the numerous pieces of data and information that you have learned to gather previously, and fuse them together into one big picture. It then teaches you how to apply the big picture effectively to whatever your profession may be.

I was the only one in the course who wasn't a ski patroller, but I was able to gain the maximum for my professional applications from this course. I am an environmental engineer at a local mountain mine. My avalanche-related professional functions include avalanche education, mine rescue, meteorological network engineering, and search and rescue. I will be able to apply the knowledge from this course to every element of my avalanche career and my recreation as well.

For more about AVPro courses or scholarship opportunities go to www.americanavalancheassociation.org, where the dates for AVPro 2013/14 will be posted.

Amber Moran is freshly engaged to long-time sweetie Aaron Parmet, with nuptials to be held this upcoming spring on the summit of Denali, conditions allowing.



Drew Gibson practices his skills in a snowpit.

aaa news**AAA Spring Board Meeting Minutes**

In attendance: Dale Atkins, Scott Savage, John Stimberis, Lynne Wolfe, Mark Mueller, Brad Sawtell, Kirk Bachman, Halsted Morris, Gene Urie, Stuart Thompson, Mike Ferrari, Blase Reardon (via Skype)

Financial report

Operated at close to flat (zero net income/loss) in last fiscal year. AAA lost \$5200 on AVPro due to low enrollment and needs to collect past-due TAR advertising debts. A combination of factors lead to the low enrollment and will be addressed by the Education Committee and the incoming AVPro coordinator.

Membership report

AAA is now using Wild Apricot membership database management software. This shows more expired members than would've have been shown in the past.

Pro development grant proposals

AAA received two new requests from Alaska and the Sawtooth Avalanche Center and a total of \$9500 in "assumed" requests (events funded in past years). We expect to fund all requests partially or in full.

SWAG update

AAA sold 450 this year, has 225 on hand, and needs to reorder soon.

Awards

Patricia "Patsy" Hileman, Christian Cabanilla, Craig Patterson, Bill Foster, and Rick Gaukel were added to the memorial list.

Publications/TAR

TAR editor is pleased with the last issue. TAR issue themes are working well and becoming easier to deal with. Wild Apricot is working well to answer "Why didn't I get my TAR" queries; many of these are expired memberships. To reduce international postage costs, we need to have a viable electronic version of TAR. We need to emphasize electronic publishing and have E versions of all our published materials. AAA must consider formats that produce quality ebooks.

TAR book

Further discussion on size, scope, format, and plan for book on history of TAR. Publications chair will work with this committee to further clarify project goals and scope.

Membership

New professional members approved. Brief discussion about the philosophy of professional membership and professional standards. Application forms need revision; will work on this over the summer.

Education committee review

During skype meetings over the winter, the education committee addressed the makeup of the committee (number of members, background/vocation/affiliation of members) and committee goals and missions. The education committee is trying to represent and consider the needs of all avalanche professionals – not just educators. Further discussion on where the National Avalanche School fits into

the education spectrum/progression and having committee co-chairs. Sarah Carpenter stepped down as AVPro coordinator and committee co-chair, leaving Kirk Bachman as sole chair.

Certified Instructor program

Brad Sawtell presented a plaque from NSAW to AAA for financial assistance to continue the educational event this year when the Friends of the NW Avalanche Center declined to provide financial assistance. CI instructor program wording on the website was revised. AAA accepted four out of six CI applicants. Discussions about paying application reviewers for denied applications, CI continuing education requirements, and creating active/inactive CI status.

SAR

Rich Browne and others (Tom Murphy and Zack Slutsky) have been working on a rescue course curriculum. Zack Slutsky and Tom Murphy on SAR course committee. Discussion about SAR chairperson needing to be more involved with AAA.

Research

There were no practitioner grant applications this year.

Google Maps/avalanche.org project

Discussion about integrating Google Maps-based national avalanche danger and warning map into avalanche.org website. Product is expected to come online in fall 2013.

Wild Apricot

AAA will offer similar information through Wild Apricot as we do now in printed membership directory, saving approximately \$3000 per printing. Wild Apricot costs ~\$1000/year and we can drop Constant Contact ~\$250/yr. Executive director is experiencing some glitches with Wild Apricot, but they're getting worked out. We will create a digital membership directory where individuals can determine what information gets shown and to whom.

Membership survey

Results posted on AAA website. President notes that it gives us a wealth of information. Summary=80% professional, 90% men, 35-45 years old is the biggest age group, 45-65 is biggest two-segment age group, 40% of affiliates are educators. "Why be a member" question response=TAR+community+research. Professionals=25% ski patrol, 17% education, 12% forecasting, 17% guiding. 60/40 on should we require continuing education for professional members. AAA priorities=education, professional development, network+standards+guidelines. Future benefits they'd like to see=improved online avalanche library, discounts, and discounts on attendance to programs.

Strategic plan

The Canadians (CAA) have done this well, creating a clear vision and mission. Philosophical discussion about educational track missions, progressions, and goals. Discussion about making the AAA more visible on avalanche.org.

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- ❄ Winter 2013 new integrated MySQL database

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Online store

It's not working well in its current state. AAA plans to discontinue it and explore options this fall.

Donation button

AAA expects to add a donation button to the website in 2013.

Corporate partnerships

There needs to be empowerment for someone to approach potential partners; we need to have a clearer vision. Discussion about current sponsorship agreement(s). New AAA executive director will have some role in attracting and managing corporate sponsorships.

Alaska avalanche centers

Discussion about avalanche center-related issues in the Alaskan avalanche community. AAA will revisit the avalanche.org "dot-listing" guidelines and criteria.

ISSW 2012 donation/NAC account

AAA received \$5000 from ISSW 2012 and \$5000 from an individual to fund research in honor of Theo Meiners. AAA decides to continue charging 5% to manage funds for other organizations, following historical precedent with avalanche centers and other organizations.

Bylaws

AAA decides to put association bylaws on the AAA website.

ED and AVPro coordinator openings

Discussion on hiring new executive director. AAA hopes to fill position by early August. AAA executive committee

and current executive director will hire this position. AVPro coordinator will be hired following ED search. Executive committee, education committee chair, and outgoing AVPro coordinator will hire this position.

Voting on committee chairs and other positions

GB elects Kirk Bachman as education committee chair, Brad Sawtell as certified instructor program chair, Halsted Morris as awards chair, and Stuart Thompson as membership representative. Becs Hodgetts elected as new Colorado section representative.

Web/IT

Discussion about web/IT chair vacancies and whether these chairpersons should be paid. GB decides that these are volunteer positions, and we will continue working with our current IT contractor for website and IT needs.

Miscellaneous

Ski Industries of America established a backcountry safety committee, and the AAA is part of the committee. Meeting on May 15 with AAA president to attend. Regarding recent ski area accidents: Dale will be attending the NSAA meeting in May as a RECCO representative; do we have any questions to ask them? We'd like to hear their thoughts on sidecountry language and education initiatives.

Fall meeting

GB meeting tentatively set for Friday, November 1, in conjunction with USAW in Alta/Salt Lake City; general meeting to follow on November 2. ❄

Theo Meiners Snow Safety Foundation Up and Running

The Theo Meiners Snow Safety Foundation (TMSSF) – a Wyoming nonprofit whose mission is to further Theo Meiners’ dedication to avalanche education, safety, and study – is up and running. A professional ski instructor and examiner, backcountry guide, heli-ski operator, snow science researcher and presenter, Theo passed unexpectedly in September 2012.

TMSSF plans to establish and operate avalanche education programs for the public as well as provide resources and mentoring to snow professionals. This past summer, TMSSF worked with the South American Beacon Project to finish equipping the El Colorado, Chile ski patrol with avalanche probes and shovels. Theo had been a ski patrolman at El Colorado, always making it a point to return and visit his friends and the mountains he loved.

This winter, TMSSF will continue the avalanche awareness training that Theo regularly provided to new ski instructors each season in Jackson. In addition, the nonprofit is working with



Photo of Theo Meiners by Jessica Baker

the Bridger Teton Avalanche Center and the Utah Avalanche Center in an effort to bring UAC’s *Know before You Go* or similar avalanche awareness programs to middle schools in various mountain communities.

The nonprofit has applied for IRS 501(c)(3) tax-exempt status. To check out the TMSSF’s website go to www.snowsafetyfoundation.org. ❄️

Collaboration is our Theme AAA Education Committee Moves Forward

Story by Kirk Bachman, AAA Education Chair

Last winter, the AAA surveyed its membership as to what we value in being part of this professional organization. Our membership consistently chose education, either in the form of the *The Avalanche Review*, guidelines for US avalanche education, sponsorship of regional workshops, or for the AAA to create a forum for the exchange of ideas for the advancement of US avalanche education.

The AAA Education Committee takes to heart the notion that its work should embrace the importance of forum. Currently, the working group includes members from small and large avalanche course providers, college education programs, avalanche forecast centers, avalanche education trainers, and guide services. Each of these individuals and organizations provides access for avalanche education to the general public as well as professional level training.

However, our working group also recognizes that there might be avalanche education interests whose needs are not adequately represented. Some examples include education for snowmobilers, education for youth recreationists, or the needs of specific regions or organizations. To this end, two AAA education committee members are specifically charged with outreach: Dave Lovejoy, dlovejoy@prescott.edu and Jake Urban, climb_high@mac.com. It is their job to specifically seek input from members of the avalanche education committee who have ideas or issues that need to be heard in the discussions of our committee.

Our most recent effort in this vein was to more specifically address the needs of the snowmobile community and seek input from those who have experience presenting avalanche education to snowmobilers. This effort is ongoing, and we want to hear from anyone with a contribution on that front. How can we meet the needs of that user group?

This season, the AAA Education Committee will take a more focused look at what is in place for a professional avalanche education stream. This will include revisiting the current guidelines for avalanche education and how existing professional avalanche training can best meet industry needs and standards. We hope that avalanche professionals from around the country will provide us with constructive input. We are particularly interested in hearing from professionals who are in a leadership role – either supervising a pro team or running professional-level avalanche training.

It is the education committee’s hope that those of you who have an idea, opinion, or contribution will contact us. Our effort is to collaborate with those who share in the profession of avalanche education. This is an invitation to join us. Feel free to contact anyone of us who serve on the AAA Education Committee: www.americanavalancheassociation.org/education.php. ❄️

Theo Meiners Research Grants to be Awarded End of October

In honor of Theo Meiners’ tireless efforts to support avalanche research prior to his passing in the fall of 2012, new funding is available to support avalanche research projects. ISSW 2012 has teamed with John Byrne III, the owner of Alyeska Resort, to offer two separate grants of \$2,500 each during the fall of 2013, and two additional grants of \$2,500 during the fall of 2014. These funds will be administered by the AAA grants process.

Applications for the research grants had a submission deadline of September 30, with the awards scheduled for dissemination by October 31. The same dates will apply for the 2014 grants.

One of the two grants, the “research” grant, can be applied to basic research projects in avalanche behavior or

modeling. The “practical” grant will be awarded to a practitioner project with an emphasis on a subject relevant to helicopter skiing.

Applicants should describe their proposed project, identify the need for grant funding as well as where the funding would be applied, and present a proposed timeline. All grant recipients will be required to submit a paper for presentation at the ISSW.

Theo Meiners 2013 grant recipients will be required to submit for ISSW Banff in 2014. Grant recipients in 2014 will be required to submit for ISSW Breckenridge in 2016.

As of press time, all grant deadlines are now September 30 in order to insure consistency. Please contact Jordy Hendrikx with your questions. ❄️

mailbag

More Sidecountry Thoughts

Regarding several articles discussing the topic of Sidecountry in TAR 31-4

I agree with Paul, and unsurprisingly I think Scotty, Simon, Ethan, and Doug hit the nail on the head. If we don’t acknowledge that it is *sidecountry*, then we are just ignoring the issue. As Paul stated, “We don’t address a health risk by agreeing not to mention it by name.” Travel habits and demographic are different than the backcountry, yet the snowpack and rescue possibilities are the same. Therefore, we must approach these users differently and develop new tools and strategies for them to make their assessments.

We can’t make much of a snowpack assessment from the chairlift, so we need to rely more on our advisories, reports of previous avalanche activity, and observations from previous days in the sidecountry. The medium and attitude in which this information is shared is integral in how it gets used as well. Savage et al., note that many previous incidents in the sidecountry have involved users that frequently travel in this terrain, and they should therefore be more familiar with the snowpack in these areas. These individuals’ higher frequency visits statistically make them more likely to be the victims in a sidecountry incident, but if they apply their intimate knowledge to their decision-making, they can greatly reduce their likelihood of an incident by choosing a few key times to travel more conservatively, or not at all. Even if they ignore all snowpack clues and choose to not go there, or travel more conservatively based only on weather, they will reduce their likelihood of involvement greatly.

Realizing that the best skiing often occurs in avalanche terrain at times of higher hazard due to recent loading of sick pow is one step in recognizing when we should trade the gnar terrain for mellower terrain to ski the sick pow, or maybe we should ski the gnar terrain and take slightly more tracked-up snow by staying inside the lines.

—Alex Mariantal, MS candidate, Snow & Avalanche Laboratory, Department of Earth Sciences, Montana State University. ❄️

Editor’s Note: Doug Abromeit was coordinating a group of stakeholders to contribute to “Project Zero.” With Doug gone, who will spearhead this project? We’d like to continue this conversation/exploration of sidecountry issues for the February TAR. Contact me with your ideas and outreach; deadline is December 15.



Lynne,
I really enjoyed the “Temperature Effects” issue. Good stuff to chew on. Thanks for putting it together. Back in 1998 I witnessed a size D3 on Mt Hood that ran 2000’ vert killing one climber, critically injuring a second and taking down two more. The late May sun had just hit the slope of brand-new storm snow no more than 30 minutes before having risen high in the sky topping the opposite ridge. In subsequent years I saw that same avalanche recur naturally under almost identical conditions. Always it failed directly after a storm cycle without enough time to melt sufficient snow to drain through the pack down to the weak bond or layer. I scratched my head for years. And while I still don’t fully understand the physics involved, I came to the same conclusion most of these researchers and practitioners have come to: the stresses and deformation of the top of the snowpack caused by the radiation are somehow concentrated at a weak interface/layer deeper in the cold storm snow. A house of cards + first radiation following a storm = big problems

I thought you might appreciate a few of these photos of perhaps your youngest fan, Morris, my 7 month old on the beach in FL.

—Glenn Klesser

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AAA RESEARCH GRANT: Using Time-Lapse Photography to Measure Changes in Snow Depth

Story by Andrew Hedrick

Last year at the 2012 International Snow Science Workshop, we were fortunate enough to be awarded an American Avalanche Association Research Grant for the purpose of using off-the-shelf time-lapse cameras to observe snow depth evolution in avalanche starting zones. The goal of this project is to develop an inexpensive, stand-alone method of making automatic snow depth measurements at multiple point locations over the duration of a winter season.

Designed to be simple and robust, the measurement system currently involves just three components:

1. Time-Lapse Camera: 8.0 Megapixel Moultrie™ Game Spy Plot Stalker
2. External weatherproof battery box with two 12V, 9 amp-hour gel cell batteries
3. Bright orange depth markers fixed in the ground with cement or guy wires.

Once every daylight hour the camera shoots a picture of an array of depth markers within the field of view. After the image is captured, a pixel counting algorithm locates the transition from the snow surface to the brightly colored depth marker. This works because the camera is in a fixed location all winter long, and since the size of each pixel is known as a function of distance, the total snow depth at that location can be calculated from a reference image of a snow-free site (see photo, below).



Sample image of the two depth markers deployed at the Bogus Basin snow study site. The white posts are cemented and mark the boundaries of lysimeters used to measure snowmelt.

Last November, we installed a prototype camera and depth marker at a snow study site maintained by the Boise State University Cryosphere Geophysics and Remote Sensing (CryoGARS) group. This site, located just 16 miles northeast of Boise, Idaho, at Bogus Basin ski area, was chosen as a test site to iron out any problems in our camera system at an easily accessible location. Two depth markers spaced about 12 feet apart were cemented into the ground within the field of view of a single camera, and the snow surface was tracked all winter. The complete snow depth results are shown in Fig. 3 where it can be seen that they follow the nearby SNOTEL measurements closely.

Two of our main concerns at the onset of the season were camera power and storage. We set the camera to capture images every hour from 8 a.m. to 5 p.m. and the batteries proved to be more than enough to power the camera for the whole winter. Also, image storage was never an issue. As the last snow melted at the study site we had gathered over 1,700 images, which easily fit on a standard SD card.



Checking the camera mid-season to make sure it still has power and storage. The grey box houses the batteries.

Photo by Rialin Flores

But there were certainly other hurdles that could not be overcome. Originally a major goal was to place a camera in an avalanche starting zone 2000 ft. above Highway 21 in central Idaho. But due to time constraints, this was not accomplished before the snow began to fall. Instead, to simulate a similar scenario, a camera was mounted to a tree along a ridge directly across the highway in a safer, more easily-accessible location. But we underestimated the size of the wind drift along that ridge and the depth marker was obscured from view by the end of December, making any measurements impossible. Another problem was the lack of images overnight and during storms. To cope with these issues, the processing algorithm has been adjusted to discard any images where the depth marker cannot be seen, and we are tinkering with infra-red game cameras to test our ability to take nighttime images.

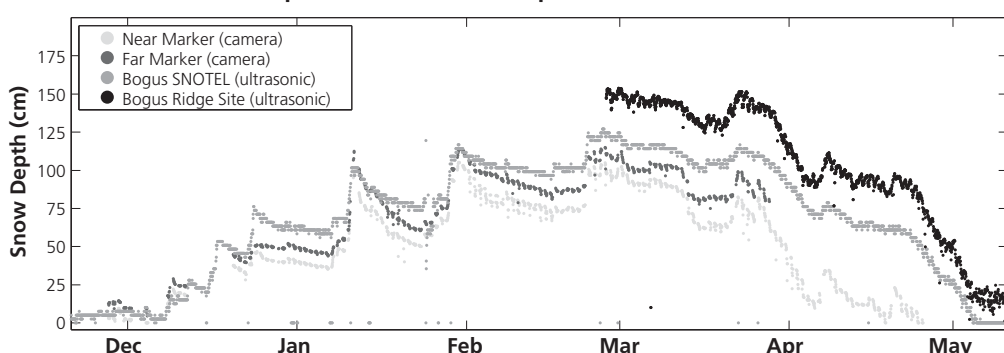
As for the future of this project, currently the system is not real-time and the snow depth is only determined after transferring the images to a computer. But eventually we are aiming to outfit each camera with an individual mini-PC to process the images and output only depth values. This will hopefully allow measurements to be transmitted wirelessly and act as a supplemental dataset to the SNOTEL network. This winter four more cameras are slated for installation at Bogus Basin to work on gathering real-time depths.

While not all of our goals were accomplished this first year, the test season was largely a success, mainly because the calculated snow depths were found to agree well with standard ultrasonic sensors at a nearby SNOTEL site and along a nearby ridge. With the overall method proven to work, we can now focus on placing more cameras in complex terrain and avalanche starting zones.

Andrew Hedrick grew up in Boise and attended Montana State University where he obtained his undergraduate degree in physics. He is currently seeking his MS degree in geophysics from Boise State University where he studies Lidar remote sensing and spatial variability of seasonal snow with Dr Hans-Peter Marshall. When not researching snow, he enjoys skiing on it.



Comparison of 4 Snow Depth Measurement Devices



Snow depths over the 2012/13 winter season. The SNOTEL is located 1/2 mile northwest of the study site; the ridge site ultrasonic sensor is located 50' higher within the study site area.

what's new

USAW Scheduled for Saturday, November 2

The Utah Snow and Avalanche Workshop brings avalanche professionals from around the West together for a day of professional development in a workshop environment. We will learn from each other with presentations on current hot topics related to snow science, safety equipment technology, worker safety and liability, human factors, and history – as well as deconstructing accidents and lessons learned and networking with other avalanche professionals.

Once again, the morning session is for pros only and the afternoon is open to the public. The morning session is for avalanche forecasters, ski patrollers, snow scientists, DOT avalanche workers, search & rescue personnel, mountain guides, avalanche educators, and anyone else who works in avalanche terrain. The presentations will be 15 minutes long, with five minutes for Q&A and social time to catch up and engage in deeper conversations. Equipment manufacturers and retailers will once again display their goods and be available to chat.

We keep our skills sharp and develop professionally by practice and by continuing our education. This is your opportunity to spend a day learning with and from 500+ top avalanche professionals in North America. This year, we plan to have the strongest lineup of presenters from around North America to date.

When

The one-day event takes place on Saturday, November 2, from 8:00am to 5:00pm. The morning session is open to snow professionals only and the afternoon session will be open to the public. A social will follow the day's events.

Where

South Towne Expo Center 9575 S. State Street, Sandy, Utah. www.southtownexpo.com

Tickets

Tickets for the entire day are \$41 in advance and \$45 on the day of the event. A swag bag, lunch, and happy hour social are all included in the entry fee. ❄️

SAVE THE DATES: Regional Professional Development Seminars

Colorado Snow and Avalanche Workshop
Friday, October 4: Leadville, CO

Northern Rockies Avalanche Safety Workshop
Saturday, October 12: Whitefish, MT
www.avalanchesafetyworkshop.com

South Central Alaska Avalanche Workshop
Friday, November 1: Anchorage, AK

Utah Snow and Avalanche Workshop
Saturday, November 2: Sandy, UT

Northwest Snow and Avalanche Seminar
Sunday, November 3: Seattle, WA

Eastern Snow and Avalanche Workshop
Saturday, November 9: North Conway, NH
www.ESAW.org

Southeast Alaska Avalanche Workshop
Saturday, November 9: Juneau, AK

Sawtooth Avalanche Center Avalanche Workshop
Friday, December 13: Sun Valley, ID

Gallatin National Forecast Avalanche Workshop
Friday, March 14: Bozeman, UT

Sierra Avalanche Center Avalanche Workshop
Monday, April 14: Lake Tahoe, CA ❄️

Lessons Learned: GNFAC Professional Development Workshop examines take-away messages from near-miss incidents in the field

Story by Andrew Kiefer

On March 6, 2013, the southwest Montana snow and avalanche community assembled in Bozeman to participate in the fourth annual Professional Development Workshop hosted by the Gallatin National Forest Avalanche Center.

The day-long workshop featured a medley of presenters with broad expertise in snow and avalanche research, avalanche forecasting, ski patrolling, ski guiding, avalanche education, mountain search and rescue operations, and institutional risk management within the scope of outdoor education and recreation.

Titled *Lessons Learned*, the workshop was essentially a compilation of personal incident accounts in which significant injury or loss due to avalanche hazard occurred or was narrowly avoided.

Throughout the day, many themes emerged, the most consistent of which was the simple fact that, regardless of years of experience, even the most renowned and experienced practitioners in the field of snow and avalanches are not immune to making mistakes. Efforts are made to maintain the highest standard of safety possible, and our professional community has made great strides in understanding the dynamic behaviors of snow and avalanches. Nevertheless, we continue to chart unknown territory, and the eerie reality of trial and error remains. By shining a spotlight on errors and miscalculations, and by being accountable for analyzing our mistakes, great contributions are made to this field.

The workshop began with Drew Leemon's presentation titled *Risk Management: The NOLS Perspective*. By sharing the ins and outs of the NOLS risk management system, long-time risk management director Leemon established a foundational framework for the workshop. With 28 years of incident data that documents remote rescues, medical emergencies, evacuations, and "near misses," NOLS analyzes risk and safety practices constantly and has established risk management as a core component of its institutional culture. With such an extensive incident database, NOLS has established a systematic incident review process. Through documenting, categorizing, and analyzing incidents, NOLS can learn from experience, strive for self-improvement, and continuously revise institutional program standards when necessary. Leemon broke the ice and set a standard of transparency and critical self-analysis for the rest of the workshop speakers.

As Randy Elliot put so bluntly, "If you can't be good, be lucky." Listening to renowned avalanche practitioners recount heart-pounding stories of narrowly avoiding getting caught in avalanches is unnerving. But, in recognizing how dynamic and complex the winter backcountry environment is, sometimes lessons are just learned the hard way and, as Karl Birkeland said, "as professionals, we need to recognize when we have close calls and change our behavior." Workshop speakers, fortunately for all in attendance, walked away from their near-miss incidents informed, grateful, and better prepared for the future.

A recurring refrain was the importance of terrain selection. As Doug Chabot and Eric Knoff learned on several occasions, appropriate terrain selection is crucial when digging snowpits. Speaking about a slope outside of Cooke City, MT that he and his partner named "Almost Died," Chabot pointed out that it is never worth risking your life or your partners' lives (much less both at the same time) in order to collect data. In support of Chabot's views, Karl Birkeland stressed the significance of route selection and the importance of ascending slopes by the safest up-track possible. Long-time Big Sky Snow Safety Director Jon Ueland underscored the importance of always choosing islands of safety that will offer real protection. "You only know you are in a safe zone if all the snow around you disappears and you are still standing," he said.

The concept of professionalism and the importance of communication came up time and again throughout the workshop. Decisions made and opinions expressed by professionals carry great significance, and they can and should have a disproportionate influence on the safety and well being of others. As Nick Meyers, Mike Buotte, and Lynne Wolfe all noted, good communication skills are essential for avalanche control work, while discussing and analyzing the stability of the snowpack, or while simply working with a partner or team in an intense situation.

The familiarity professionals develop with a season's snowpack or specific terrain can often breed a dangerous sense of overconfidence. As Karl Birkeland attested, it is so important to be thinking about the worst-case scenario and to be intentional with whom you travel in avalanche terrain. "Ski with a partner who will be thinking about avalanches and skiing appropriately," he advised. And, as Nick Meyers suggested, "Ask yourself: are my thoughts, words, actions an asset or liability to the situation?"

An additional theme that surfaced was the fundamental importance of recognizing and assessing the type of avalanche problem you are dealing with. According to Rod Newcomb, professionals need to be aware that they often analyze the snowpack only from their scope of experience. Instead, he urged professionals to have heightened awareness of obscure and unfamiliar conditions, and to recognize that even the most experienced avalanche practitioners may still be novices to what can happen. Obscure and unexpected conditions are often responsible for close calls and fatalities involving professionals. However, depth hoar, he asserted, is the primary avalanche problem associated with patroller fatalities. According to Newcomb, a reliable rule of thumb with regard to depth hoar and depth hoar-like snowpacks is to always "expect the crown and the slide to exceed your expectation of how far it will propagate and how large the slide will be."

Experience with obscure stability conditions offered other workshop lessons. Doug Chabot recounted a near miss during which he learned that even low-density powder snow can act as a slab and produce avalanches. The 1996/97 winter avalanche that demolished the Shedhorn chairlift at Big Sky taught Scott Savage to never trust a rapid load on ice, a crust, or a hard surface, regardless of whether or not facets exist at the slab-weak layer interface. And, regardless of what kind of avalanche problem is believed to be present, Lynne Wolfe urged professionals to ask, "How detectable is the problem?" and "How manageable is the problem?" with the intention of forming an honest, specific, and unbiased opinion of current snowpack stability. Professionals often tend to overestimate manageability; even a small avalanche can pack quite a punch.

As risk management practices develop and become ever more ingrained in the work of outdoor professionals, near-miss or close-call incidents (where significant injury or loss is narrowly avoided) have become focused opportunities for learning. However, negative repercussions to outdoor professionals revealing such incidents – ranging from embarrassment to the loss of a job – are not pleasant to contemplate. Putting egos aside, the workshop speakers acknowledged the uncomfortable truth that if you spend years in avalanche terrain, sooner or later you are bound to make a mistake.

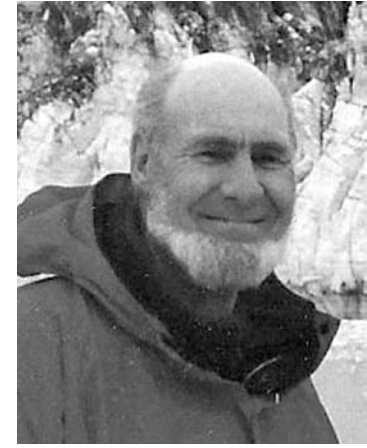
To view the GNFAC workshop presentation archives, visit www.youtube.com/user/AvalancheGuys.

Andrew Kiefer graduated from Prescott College this past spring and attended the professional development workshop during his internship with the Gallatin National Forest Avalanche Center. ❄️



In Memoriam: Richard C. Gardiner

Story by Jonathan Shefftz



Richard C. Gardiner, of Canton, CT, died unexpectedly on July 18, 2013. Although I never would have suspected it, he was 84. Dick had been a National Ski Patrol member since 1966, started the Connecticut

Nordic patrol program in the 1970s, and served as an NSP instructor and instructor trainer for avalanche, mountain travel/rescue, and emergency care longer than anyone can precisely remember.

I first met Dick at a ski patrol mountaineering course in 2005. At the course conclusion, he announced that NSP was always looking for new instructors. I had already taken avalanche courses through L3 yet had never thought of instructing. But Dick was so warm, friendly, and welcoming that I immediately asked to learn more.

At his July memorial service, the ski resort parking lot looked like a moderately busy winter ski day, with many in ski patrol uniforms. The lodge displayed Dick's mementos: NSP national appointment badge, trekking poles he used as canes, bike shoes, well-oiled hiking boots, and one of the many stunningly beautiful wooden kayaks of his creation. Plus so many pictures, always with that same warm and welcoming smile – I kept thinking he would just come around a corner and say hello.

After the service, I drove my daughter to a children's museum that was affiliated with the family designed Roaring Brook Nature Center charity, and then realized that I was replicating the daily 36-mile round-trip commute that Dick took for decades starting in the 1960s to teach math and science in the Hartford public schools. Connecticut may not be known for mountainous terrain, but this route features many steep climbs and drops, which Dick navigated every work day, until retirement, no matter what the weather – on his bike.

This daily commute no doubt helped him become the Connecticut time-trial champion in 1976. "Dick was passionate about education and empowering students in Hartford," his official biography notes. "He led bicycle and hiking clubs to reach out to students, teaching them about the environment, self-worth, and respect."

Dick would die on his bike in an automobile collision, but dying on a bike at age 84 speaks of a life well lived. A friend immediately emailed, "I will keep that image of him [skiing down steep terrain at an avalanche course] maintaining good form with a pack on, whooping it up with us on a bright sunny chilly morning." My friend (as did I) mistakenly thought Dick was merely (!) in his 70s at the time, not his 80s.

Dick leaves behind his loving wife of 56 years, his son and daughter and their spouses, three grandchildren (two of whom he trained as they became ski patrollers), and countless grateful fellow patrollers as well as students (whether avalanche, mountaineering, and emergency care from patrolling or math and science in Hartford).

Jonathan S. Shefftz lives with his wife and mondopoint-size 15 daughter (still too small for "Tech"-compatible ski touring boots) in western Massachusetts, where he patrols at Northfield Mountain and Mount Greylock. He is an AIARE-qualified instructor, NSP avalanche instructor, and AAA governing board member. When he is not searching out elusive freshies in southern New England, he works as a financial economics consultant and has been qualified as an expert witness in federal agency Administrative Court, US District Court, and state courts. ❄️

mag·nate noun \ 'mag-, nāt, -nət \

1. a person of great influence, importance, or standing in a particular enterprise, field of business, etc.

2. a person of eminence or distinction.

Magnate. That is by definition who Christian Cabanilla was and how he will always be remembered. "Cabs" navigated his way through the Alaskan heli-ski business starting at the age of 18. First as a base attendant then working administration and on to operations, Cabs learned every facet of the business. Within five years Christian was guiding clients through the Chugach, and within the next eight years he was a certified helicopter pilot, flying the same clients to the same mountains he had guided them down before.

I and dozens of others have had the privilege of working with Christian in the Alaskan heli skiing genre from near its inception. From Valdez to Cordova to Haines, Christian was an embodiment of the AK heli-skiing experience. With a keen sense of run selection, snow science, and terrain mitigation, Christian led his clients through some of the most daunting terrain in the heli-ski world.

A friend noted, "Christian was one of the most gifted people I've ever met at calming people in a generally uncalming environment. He was poised, calculated, and a true professional to all clients he guided and people he worked with."

A friend, inspiration, and leader – it is often been stated that Cabs was the glue that binds the distant relationships between all the mountain-enthusiast brethren who knew him. Christian's mountain savvy led him to photo shoots in Europe, guiding expeditions in Antarctica, tours through the Canadian Rockies, and chasing first descents in the High Andes of South America. Whether via helicopter, splitboard, or bootpack, Cabs was on the ascent armed with a smile that crushed the ladies and the skill to make the descent look easy.

The following words further define Christian Cabanilla as the man people knew and the guide who led them through the mountains:

"...delivering you to the most defining moment you had yet to experience. He would arm you with

snow science

The Case for Metric

Story by Greg Gagne

I have long been frustrated by the reluctance of the United States to adopt SI (metric) as the standard system of units and find it especially confusing in reports related to snow and avalanches. As an avalanche professional and/or backcountry traveler, consider the following areas where SI units dominate:

- all ski and snowboard equipment
- virtually all snowpack observations and profiles
- snow safety and rescue gear
- beacons and rescue techniques
- all column and block tests

Although most professionals correspond using SI, all US advisories and most reporting to the general public still adhere to imperial units. (There are exceptions – for example, the CAIC allows users to select units when viewing data.) It is indeed odd that we travel on 182cm skis, perform temperature profiles with measurements every 10cm, identify 1mm facets, isolate 30cm x 90cm columns, etc., but our communication is most often in terms such as "6 inches of snow has fallen overnight" and "be wary of that layer of surface hoar down about a foot and a half."

The argument in favor of imperial units is simple and compelling. Page 1 of SWAG states, "In the US, personnel of avalanche operations and users of their products may not be familiar with all SI units. For this reason, individual programs should choose a

Christian "Cabs" Cabanilla: 1978-2013

Story by William Spilo



This is the last picture taken of Cabs, showing him happy and at peace in the mountains.

Photo © Cedric Bernardini

confidence and reverence for the mountains so that you felt you had gotten there yourself. A truly savvy guide."

"While taking part in any level of adventure, Christian loved sharing it with others. Always a smile, with that signature 'chuckle laugh'."

"The only pilot that would know the snow quality of runs miles away... he would be like, 'I have to take you to Tiger Penis Soup,' and be right about the snow quality and stability when we got there! Love that."

"I skied many times with Chris and I appreciated a lot his humor, sense for security while skiing, and his good spirit at the pipeline bar in the evening. Great guide, great consciousness. We will miss you Chris."

"One of or the most compassionate people I knew. His kindness and generosity was given to everyone around him, with a unique skill to make great friends in an evening's time!!!"

"He just goes to show that all of your dreams can come true. You don't have to choose just one. He was amazing at everything he did."

His supporting and loving family and all who knew him will suffer the loss but cherish the memories. Until the next my friend...

unit system that suits their particular application." No one disagrees that a primary function of snow-safety operations is to clearly and unambiguously inform their user base of current and forecasted hazards. And, for the most part, in the US this obviously means reporting in imperial units.

I argue that it is time for avalanche operations to fully embrace the SI system. Not only for communication between professionals, but also for reporting to the public. Furthermore, by continuing to adhere to imperial, I believe we are in fact bypassing an opportunity to further educate the backcountry travelers who use avalanche advisories.

My argument is based on a few observations:

1. The rest of the world uses SI, so should the US. The continued embrace of imperial in the US has been ignored by the ski and snowboard industry, as all gear is specified in metric units. Why can't the avalanche industry adopt the same attitude?

2. The challenge for avalanche education.

Outside of those with a background in science, medicine, or engineering, I often find students are surprised to learn that virtually all snowpack observations and stability tests are done in metric. And yes, they often initially struggle with measuring the width of a 90 cm column. But if our language embraced SI throughout, it would ultimately contribute toward more capable and better-prepared students.

Editor's note: Christian Cabanilla died on March 3, 2013, in a cornice collapse while heli ski guiding near Haines, Alaska. His name will be added to the AAA's memorial list of professionals who have died in the line of work.

William Spilo has been a helicopter snowboard/ski guide for the past 17 years from Alaska to Chile and Utah. He has guided snowboard mountaineering trips in Europe, Asia, and North and South America. He currently resides in Vail, CO. ❄️



Natl Avalanche School Curriculum Follows AAA Guidelines

The National Avalanche School (NAS) began in the 1960s and continues to this day. The school manages its programs and updates curriculum under the guidance of the National Avalanche Foundation and the NAS instructors' steering committee. It provides state-of-the-art avalanche forecasting and mitigation training for operational professionals such as ski patrollers, highway and backcountry forecasters, and snow rangers. The school also ensures a solid avalanche foundation for helicopter guides, mountain ski guides, and experienced backcountry skiers and mountaineers.

NAS instructors include some the most knowledgeable and experienced avalanche professionals and educators in the US. They impart skills to students that help assure students will be capable of reducing inbounds avalanche risk safely, effectively, and efficiently. In addition, students will be capable of assessing avalanche danger in the backcountry, effectively recording and communicating stability evaluations, and making informed and rational decisions.

This winter, all NAS students will attend four days of intensive classroom and workshop instruction from October 27-31, 2013 at Snowbird, UT. Four days of hands-on field work will take place in late January and early February, with students selecting a location of their choice at Jackson Hole, Snowbird, Crystal Mountain, or Arapahoe Basin. NAS provides a unique opportunity for students to spend four full days covering technical material with over a dozen of the country's leading avalanche professionals and then complete the program by spending four days in the field with established regional professionals in a ski area and backcountry setting.

For information and registration, go to www.avalancheschool.org or contact Jennifer Larson at jl Larson@nsaa.org ❄️

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2012/13 Avalanche Center Season Summaries



Rogue's gallery in the Lesser Himalaya, near Manali, India, following the 2004 avalanche symposium. Abro got the highest skiing line in the nearby couloirs. l-r: Francois Valla, Karl Birkeland, Chris Pielmeier, Doug Abromeit, Indian guide, Martin Schneebeli, Ed Adams, Howard Conway, Matthew Sturm. *Photo by Kelly Elder*

■ Forest Service National Avalanche Center

It came as a shock to all of us. An early morning call from a somber colleague who broke the unexpected news. Doug had died suddenly the day before while mountain biking. Had he been overweight, out of shape, a poor eater, or had anything but a vibrant bill of health, maybe it would have made sense. But it sure was tough to figure that a guy like Doug, who obsessively ate the healthiest food around, who was always sure to get his exercise and his sleep, and who greeted each day and each person with his trademark grin, had died. The finality of it was crushing, and the effect of Doug's passing quickly rippled far and wide through the avalanche community, not only in this country, but also in Canada and even as far away as Europe.

I always thought I'd be writing something like this for Doug in support of the Honorary Membership award for the American Avalanche Association. It sounded like ISSW might come to Sun Valley a few years down the road, so that seemed like good timing. I imagine I will still do that, but something rings a little hollow about doing these awards after the person has left us; I wanted Doug to receive his well-deserved moment in the sun, fully knowing the impact he had on his colleagues and the broader avalanche community. Looking at the deserving recipients of the Honorary Membership award, I am sure Doug would have been right in the mix.

I may not have all the facts at my disposal, but I would argue that Doug did more for the military artillery for avalanche control program than anyone since Monty Atwater. Doug's role was not as glamorous or dramatic as Monty's stories about getting the program started, but it was critically important for keeping the program running through some difficult times. Doug was the driving force behind the artillery users group (AAUNAC), and he served as the chair of that organization from its inception through just last year. He was a tireless advocate for the program both at the Forest Service and with the Army during times when there were many questions about the usefulness of the guns, whether sufficient ammunition would be available, and if other alternatives could be used as folks transitioned away from outdated recoilless rifles and their dwindling ammo supplies. He was instrumental in protecting the program during tough times, such as in 1994 following the 106mm recoilless rifle in-bore explosion at Alpine Meadows that claimed the life of a Forest Service employee who was on the gun mount.

I first met Doug on a trip through Utah in the early 1990s. I was struck by his big smile, engaging personality, and his love for his work. In the coming



Doug Abromeit
1948 - 2013

years, I interacted more with Doug and learned about what he was calling the National Avalanche Center (NAC). He had some big goals for the NAC, but with only part-time funding for him, he was having a tough time meeting the mission he had set forth. After finishing my doctorate, he and I began working together to get truly national funding for the NAC and to staff it with two individuals. The effort took over a year and involved attending numerous meetings and giving a multitude of presentations, but in the end we managed to get the Forest Service's national recreation directors to buy off on the program and fund it in 2000.

Doug was a phenomenal NAC director and a great boss. He gave me some invaluable life lessons, including making sure that you mix in a bit of fun with work, especially if your work involves being out in the field on the snow. He was a strong believer in our technology transfer program and we talked often, dividing up work with him striving to provide enough time for me to pursue our tech transfer goals. As such, Doug had a backstage role in much of the tech transfer work I have been able to do. In addition to his continued artillery program work, he also spent countless hours on the

phone working with fledgling avalanche centers. When I look at the map of avalanche centers at www.avalanche.org, Doug had a hand in helping to guide and establish several of them, and he provided expert advice on a number of different issues to all of them.

Doug's passing leaves a huge personal and professional hole for me. However, he left behind a legacy of bringing cohesion to an amazing community of avalanche professionals. As the NAC has gone through some trying times in a difficult budget environment, I have been gratified by all the words of encouragement and support from throughout our great group. I know that the community that Doug helped to foster will rise to the challenges ahead, and we will continue with our mission of improving public safety. In my mind, issues of TAR (like this one) showcasing our great avalanche center network are, in a sense, a tribute to the supportive community of avalanche professionals and avalanche centers that Doug envisioned and helped to foster over his career. So, as you read through the season summaries for this past year, realize that there is a little bit of Doug's hard work, his passion, his enthusiasm, his laughter, his smile, and his love for work and play, in each one.

—Karl Birkeland

Doug Abromeit

PORTRAIT OF A LIFE WELL LIVED

Doug's story centers on Bottle Bay, an inlet on the south side of Lake Pend Oreille, near Sandpoint, Idaho. The family cabin there is a place to which Doug returned again and again, at every stage of his life. The family's roots in Bottle Bay extend several generations back through Doug's mother, Betty. Her family – the Warrens – homesteaded there, while the Abromeits from Germany had settled further south, at Cocolalla Lake. The Warrens and Abromeits came together in 1945, when Betty married Ed Abromeit. She'd finished college, and he'd returned from the war in Europe, where he served as a B-17 gunner. They raised Doug and his younger brother Duane in Sandpoint. Betty taught third grade; Ed made furniture and owned a sporting goods store and built the cabin at Bottle Bay with his father-in-law, Herb.

Doug grew up in the woods and on the water around Bottle Bay and Sandpoint, hiking, hunting, picking berries, and fishing with Ed, Duane, and Herb. When Doug recollected this time in his life, he said, "I ate pretty healthy." In high school, Doug and some friends started skiing at the recently opened Schweitzer Basin, kindling both lifelong friendships and a passion for skiing.

Doug first left Sandpoint for the University of Idaho in Moscow, where he graduated with a degree in education so he could teach English and history. He worked summers in Yellowstone National Park, first on a Blister Rust crew and then as a firefighter. He finished his student teaching and returned to his hometown. Shortly after, in 1970, his father Ed died suddenly of a heart attack; he was only 48, and the loss left the family stunned and grieving.

A '65 Mustang with No Reverse

Suppose that we could go back to 1972 and ask this young Doug a question about his life-to-be. He is 24, just back from a six-month trip to Europe with a childhood buddy and working as a carpenter; he has a shelter dog named Maggie, and his hair is long, even though it is 1972 in a small town in north Idaho. He is rooted in his home but exploring the wider world. In that context, one question about his life-to-be might seem improbable: "What would happen if two blonde sisters from Southern California showed up in Sandpoint?"

Given the obstacles Doug had encountered in the previous few years, he can be forgiven for not imagining the following answer: "Well, one of the blonde sisters and I would guide a group of Inupiat Eskimo school kids to Disneyland on their spring break. And bring fresh strawberries back to the North Slope." But that is, indeed, part of what happened next in Doug's life.

The two blonde sisters from Southern California were Janet and Pearls Surber. Janet, the older one, had spent a few winters ski-bumming at Alta; Pearls suggested they both take a break from college and visit Sandpoint, where they had friends and thought they might find work and ski. The sisters had a '65 Mustang with no reverse; their parents pushed them backward down their California driveway, and the Surber sisters

drove north, stopping in Sandpoint because, as Janet said, "We couldn't go backwards."

The next summer, the Surber sisters met Doug and some of his Sandpoint friends, and eventually, Doug and Janet started dating. They were married a year later, in August 1974, at Bottle Bay. The Abromeit boys and friends arrived by boat, in beards and Western shirts. Janet's parents – Bob and Esther Surber – arrived from California in a car that had both forward and reverse. Bob stood out in a red and white striped suit jacket. There was fiddle playing and dancing before the newlyweds left for a honeymoon backpacking in Kokanee Park in British Columbia. For their first few years together, Doug and Janet alternated winters in Sandpoint with summers in McCall. Doug taught English in several Bonner County schools, taking a break one winter to ski patrol.

One winter, Doug and Janet and many Sandpoint friends took a train to Essex, Montana, for their first avalanche class. There they saw skiers making a turn they'd heard about, the telemark turn. When they returned home, Janet and Doug skied away from the Schweitzer Basin with a page torn from a magazine and started learning the turn themselves. Many backcountry trips followed, including an attempt on the highest peak in the Cabinet Mountains in minus-30-degree temperatures that left Doug and Janet's toes numb for a week.

The Inupiat in Disneyland

In 1979, Doug and Janet broke their Sandpoint-McCall rhythm and worked as teachers in Nuiqsut, a traditional whaling village on Alaska's North Slope. It was a long, sometimes dark winter, and neither Doug nor Janet ever developed a taste for quaq – frozen raw fish. But with Bob and Esther Surber's help they brought 15 kids – none of whom had been outside Alaska – to Southern California, where they biked along the beach and toured Disneyland, Hollywood, and Sea World. Teachers and kids alike returned with fresh fruit or a taste for it.

When Doug got a permanent job in McCall in 1980, Doug and Janet bought a house and moved there full time. Doug loved smokejumping but also took the opportunity to use his writing skills drafting the Payette Forest Plan. Doug and Janet returned each summer to Bottle Bay and Sandpoint, where the Abromeit and Surber families were coalescing.

Smokejumping to Snow Science

Doug's deep friendships with his smokejumper brotherhood meant a lot to him. But he'd also been fascinated by snow since his first avalanche class. In 1985, he applied for several jobs – not all snow-related – was offered two, and fortunately for the American avalanche community, Doug chose a position as Little Cottonwood Snow Ranger. It was a return to Alta for Janet, but Doug stepped into a charged atmosphere. He was not only The New Guy in a canyon full of experienced avalanche professionals, but the ski areas were rankled by a recent Forest Service decision to give the Utah Department of Transportation responsibility



Karl and Doug with Alaska Rendezvous Lodge Heli-Ski Guides near Thompson Pass, Alaska. Photo by Karl Birkeland

for the highway avalanche-control program. Doug made it through this trial with lifelong friends in Little Cottonwood, thanks to mentorship from Binx Sandhal and Peter Lev, and thanks to his own disarming smile and winning personality.

For seven years, Doug and Janet lived in the Alta Guard Station; Doug marked the trail with a climbing rope so they wouldn't get lost in the canyon's famous deep snow. Janet's parents made the hike on numerous holiday visits, inspiring her father Bob to start skiing. In that time, Janet also commuted to Pocatello while she finished a graduate degree in speech pathology. In 1992, they moved down to Salt Lake City in part so Janet would have less of a commute to her work at Primary Children's Hospital and home health. Shortly thereafter, Janet's father Bob grew sick and died. Despite this hard and painful loss, they went on to share their passions for climbing, skiing, and yurt trips with a growing circle of friends. On many of these adventures, Doug and Janet were accompanied by their dog Julio, another rescue dog, this time from a sheep camp near McCall. Julio was an avalanche dog, Doug said, "But only if you have a pork chop around your neck."

In Doug's first few years as snow ranger, he began untangling the issues facing the programs using surplus military weapons for avalanche control. He and the other snow rangers and winter sports administrators in the Salt Lake office brainstormed, dreamed and schemed various ways to improve the agency's management of winter sports and avalanche issues. In 1988, the Forest Service established a National Military Artillery Coordinator position on the Salt Lake Ranger District; Doug was selected for this position. The next year, the Chief's office formally chartered Doug's position as the Avalanche Control - Center of Excellence. Over the next several years, Doug and his co-workers developed this into the National Avalanche Center. Doug's talents – his sincerity, writing skills, and knack for getting people to see and work toward a common interest – shone. His ability to build and maintain relationships brought him deep respect and friendships among his colleagues.

Back to Idaho and the NAC

Despite their success in Salt Lake, Doug and Janet wanted to return to Idaho's wide-open spaces. Doug

Continued on next page ➡



Doug on the summit of Mt Superior, Little Cottonwood Canyon, UT, sometime in the mid-1980s. l-r: Al Soucie, Doug, Roger Atkins, Doug's dog Julio, Bruce Tremper, Brad Meiklejohn, Duain Bowles. Photo courtesy Al Soucie



Doug and a group of Snowbasin ski patrollers watch the racers at the start of the 2002 Olympic Downhill at Snowbasin. Photo by Karl Birkeland

DOUG ABROMEIT

continued from previous page

knew that legendary snow ranger Butch Harper would be retiring; Doug's experience and the funding that accompanied the National Avalanche Center made him a strong candidate. He got the position, and in 1994, Doug and Janet bought a house in Hailey and Doug started working on the Ketchum Ranger District. Doug's time was divided between running the NAC and snow ranger duties, in which he was humbled to build on Butch's legacy. Mostly by himself, Butch had maintained one of the longest-running avalanche hotlines in the country, and Doug continued that service. He gradually expanded it into a backcountry avalanche center.

Janet continued her career as a speech pathologist, working first out of a rehab center in Twin Falls and then as a contract speech pathologist until she retired. In addition to their days of downhill skiing, Doug spent his retired time skate skiing, backcountry skiing, and climbing, often with Zorra, a red Australian shepherd mix (*see photo at right*). Each summer and many Christmases, they returned to Bottle Bay and Sandpoint to be with family.

At work, Doug devoted his energy to institutionalizing the National Avalanche Center. In 1999, he and Karl Birkeland convinced the Forest Service's regional recreation directors to formally establish the NAC and expand it to include Karl as an Avalanche Technical Specialist. As center director, Doug provided leadership and technical assistance to snow rangers and avalanche centers across the country, tirelessly striving to unite a disparate group of strong personalities. Behind the scenes, he negotiated time and again to preserve the use of military weapons for avalanche control from numerous bureaucratic threats. Though ever youthful, Doug eventually retired in 2011 so he could spend more time with Janet, his family, and friends.

While Doug's passion for his work and adventures were highly visible, he also had quieter talents. He was renowned as a mentor. The schoolteacher in him loved kids and he and Janet opened their home to several teenagers, once so a friend's son could attend school and be in the outdoors, and again to Pearls's son Andrew so he could work on the Ketchum District. At the time of his death, Doug was looking forward to sharing the summer with two of his nephews, Alex and Nick.

As might be expected, Doug was in the midst of various projects when he passed. He was mentoring numerous younger forecasters and professionals. He was advising several Forest Service offices on snow ranger positions. He was contracting with the NAC to help Karl with the transition and the workload. He was moving into leadership of the National Avalanche School and developing a class for it. He was planning trips and anticipating his annual visit to Bottle Bay. He was doing all this with his contagious smile and the sincerity that left people who'd met him once feel like they'd known him for years.

Doug's story, above, was compiled from a variety of sources and read by friends and family at his memorial in June. ❄️



Last Turns with Abro

Story by Blase Reardon

It was the second week in April, and Doug and I were staring down the steep chute on the backside of The Funnel.

The wind hadn't touched the 8-10" of new snow, and it looked like beautiful skiing. Usually Doug would be eager to ski a line like that, but that day he didn't have the energy to boot back up. He'd been sidelined the past few weeks with what was diagnosed as vertigo. Nausea and other symptoms kept him in bed some days, but he'd managed a short bike ride the day before. When we left the car, he'd said, "I don't even know if I can handle skinning."

He'd skinned to the top of The Funnel nonetheless, under heavy, dark clouds that aren't typical of central Idaho. It was warm, snowed off and on, and we had a popular backcountry destination to ourselves. It was a slow skin up, but not due to Doug's vertigo or the trailbreaking. We were just busy talking. We hadn't seen each other much in the past few weeks, and we had some catching up to do. Our conversations that day dove deep into difficult issues – aging and health and fears and frustrations. They were among the more meaningful talks I've ever had with a friend, and the memory of them has made his passing easier for me.

We turned away from the chute and set up to ski down The Funnel. Doug fell uphill while pulling off one skin. "That wasn't vertigo," I said. "No," said Doug. "Just bumped a rock." We were entering the slope from a rocky knob with shallow snow and a pair of trees at the bottom. It was the kind of place I'd start into with slow turns, to feel out the snow depth and avoid a high-speed face plant if I tagged a rock. Especially if I was worried about my balance. I held my dog in a sit beside me. The last thing I wanted was her tripping him up at a time like that.

Doug and Zorra, doing what they did best. Photo by Ed Cannady

There was nothing hesitant about Doug's first turns. He dropped straight into the fall line, held it until he had speed, then arced right through the two trees and down The Funnel in giant, fast arcs. I let my dog go, and though I've never seen her move faster downhill, she couldn't come close to catching him. I started laughing. So much for vertigo. And so Doug. Stylish, smooth, and fully committed, with no hint of the doubts he'd voiced earlier. When I reached him, he told me that the big turns were so he didn't have to cross the fall line much and risk aggravating his vertigo. But he was smiling, and I could tell he was just immersed in being outside again, reconnecting with the snow, and happy in his body.

That turned out to be one of Doug's last days skiing, if not the last. Six weeks later Doug was gone abruptly, felled by a heart condition that was perhaps presaged by the vertigo. He was again in the mountains he loved, with old friends he loved and had stood by for years.

His contributions to the avalanche community are huge. Many of them are organizational and administrative, like the creation of the National Avalanche Center and his ongoing fight to keep military weapons available for avalanche control. Not glamorous stuff, yet critical foundations. His more significant achievement, though, may be that he simply pulled people together. Thanks to his disarming smile and deep, warm sincerity, the many characters and iconoclasts in the avalanche community around the world are closer and more united. Personally, I'm left with – and comforted by – the image of him dropping into The Funnel and arcing easily out of sight. It's the person he was, and the person so many of us in the snow world will miss. ❄️

Agency Avalanche Centers 2012/13 Season Summaries

■ Bridger-Teton National Forest Avalanche Center

Western Wyoming experienced below-average snowfall during the 2012/13 season. Conditions were dry and warm during the early fall with the first significant snowstorm arriving in late October. Mostly dry and mild conditions returned and continued into mid-November. Abundant moisture began to move into the region at the end of November and continued until Christmas. December snowfall was 144% of our 47-year average and created a decent base for the rest of the season. January was exceptionally dry, and below-average snowfall was recorded in February and March. April was moist.

This season's weather patterns favored the Teton Range, which received over 400" of snow. Lesser amounts (330") accumulated in the Wyoming and Salt River Ranges in the southern portion of our forecast region and on Togwotee Pass (290") in the eastern portion of our forecast region.

Surface hoar growth on an October melt-freeze crust created a persistent weak layer that became the bed surface for deep-slab avalanches that occurred during a high-impact storm on December 8. No other avalanche activity occurred on this weak layer in the Teton region after this storm. In the outlying areas to the south and east a base layer of depth hoar developed and was a concern for the rest of the season. A five-day storm cycle at the end of January produced the only Class IV size avalanche of the season on February 1. It failed on a January drought surface. This season was notable due to the lack of large avalanches and limited number of medium-size avalanches. There were only 16 Class III size avalanches, one Class IV size avalanche, and no Class V size avalanches observed.

Twenty-five people were caught and carried by avalanches. Of these, eight were partially buried, and three were fully buried. Six sustained injuries, and three were killed. The fatalities all occurred on very steep slopes. Two persons were swept into trees by very shallow slides and died of trauma on impact. A third was swept down an extremely steep, narrow couloir and also died from trauma. All three of these events occurred during low hazard conditions.

There were four avalanche incidents when air bags were deployed. In mid-February two snowmobilers were caught in a Class III size slide in the Salt River Range. One deployed an airbag and floated on top of the debris without injury. The other, who did not have an airbag, was fully buried to a depth of three feet and recovered by his companions without injury. This airbag likely saved the person who deployed it and also allowed this group to focus all of its resources on the buried person and therefore also likely contributed to his survival. On March 9, a snowmobiler who deployed an airbag was overrun by debris and completely buried except for a hand. He was also rescued by his companions. The two other incidents involved small slides.

The center began issuing daily avalanche hazard bulletins on November 7, and issued bulletins every 12 hours for 165 days until April 21. Snowpack summaries were posted once a week for eight months from the end of September until the end of May. A high danger rating was issued for a portion of our forecast region on only two days of this season (December 17 and February 14). Extended periods of low and moderate hazard were common. Our center did not issue any avalanche warnings or watches and issued only one Special Avalanche Bulletin during this season.

Improvements for this season included a redesign of the web version of our daily avalanche hazard bulletins. These efforts included the addition of avalanche problems when conditions warranted, and upgrades to the email version of these products. A website and Facebook page were created for the Friends of Bridger-Teton National Forest Avalanche Center. Other projects included the development of a national map that uses Google map technology to display the daily avalanche hazard rating issued by other avalanche forecast centers in the country. This project was funded by the American Avalanche Association and the National Avalanche Center. Several centers have embedded this product into their websites.

Use in our forest was vastly increased, especially in December when our area was receiving abundant precipitation and other areas were not. The parking lot on Teton Pass was frequently full and often included vehicles from other states. The number of calls to our telephone hotline continues to decrease and was 25% less than the previous season. The center experienced a 15.5% increase in email subscriptions to our avalanche hazard advisories. Website page views and unique visitor data for this season compared to the previous season had not been compiled at the time of this writing.

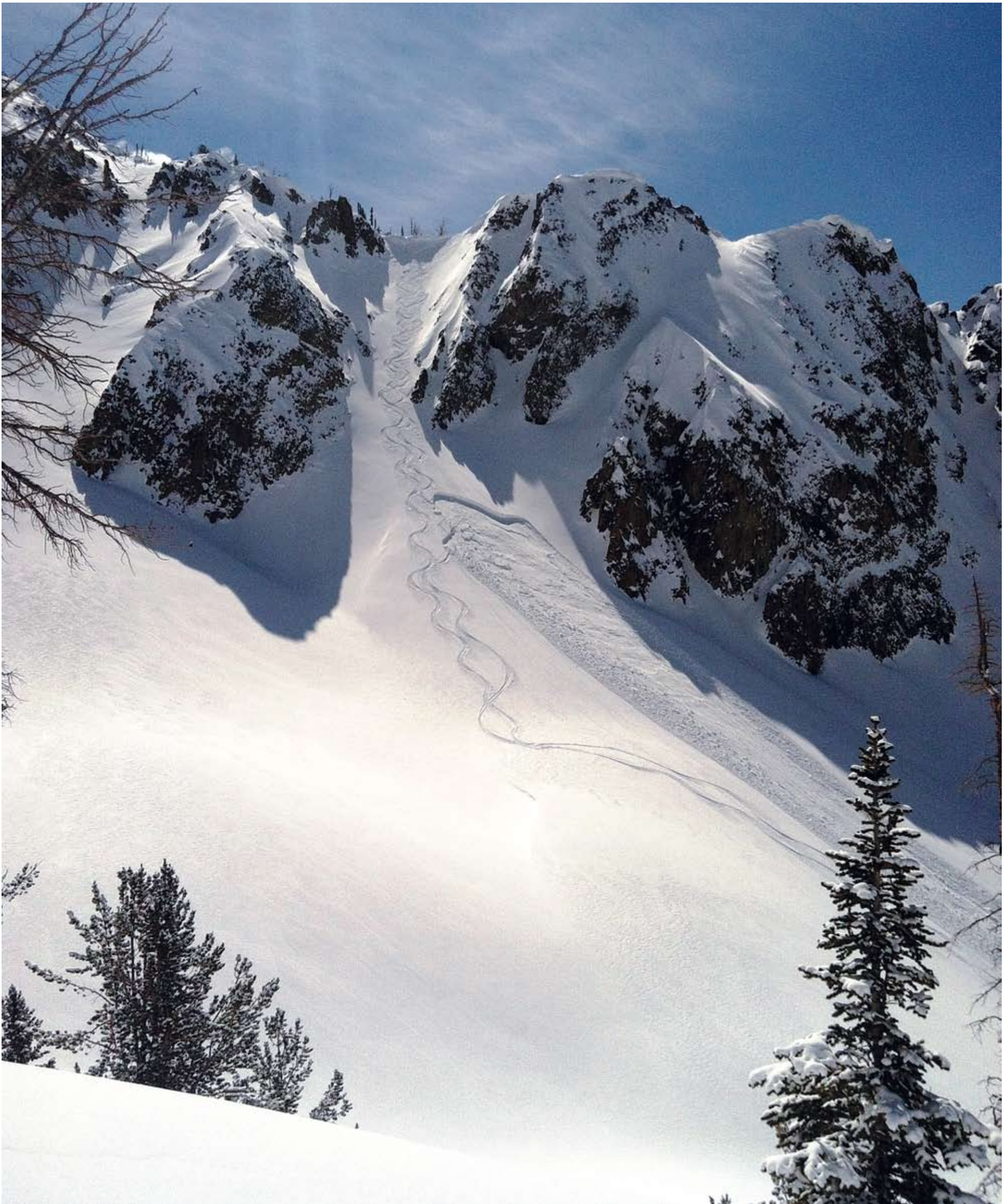
In December two of our avalanche specialists traveled to West Yellowstone, Montana, to participate in an avalanche education field session with avalanche educators/forecasters from the Gallatin National Forest Avalanche Center. A Recreational Trails Program Grant obtained at the end of this season will enable the center to expand avalanche education statewide during the next two seasons. This scope of work provides funding for avalanche-hazard education presentations in 20 Wyoming communities per season during the next two seasons. Our intent is to involve avalanche specialists from nearby centers when these presentations are provided in border towns such as Cody (Gallatin National Forest Avalanche Center), Evanston (Utah Avalanche Center - Wasatch), and Laramie (Colorado Avalanche Information Center).

—Bob Comey, director

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A ski mountaineer was swept to his death by sloughing snow as he was ascending Apocalypse Couloir in Grand Teton National Park on March 1. Apocalypse Couloir is the narrow slot with the prominent snow-covered talus slope at its base in the right-hand portion of this image. Photo by Bob Comey



From Patrick Graham
 March 23, 2013
 Boulder Mountains, Sun Valley, Idaho

The story started the day before when I was skiing (for fun) in some of the more confined and protected chutes further down the ridge. We just couldn't get enough! The snow was super-low density, and all stability tests we did indicated that there was a slab (20-30cm) sitting on top of a complex matrix of old wind slabs, decomposing crusts, and small faceted grains. The slab just hadn't acquired the critical mass to cause failure and propagation.

This being the case, we farmed a fair number of slopes, gradually working our way into less treed and more alpine terrain. With no obvious instabilities present, I requested that we save the pictured run, as I was guiding the following day and would love to take this guy down that pretty couloir.

Not much changed overnight. No wind, consistent cold temps, and OVC skies overnight kept snow quality high. We were psyched. Upon arriving at our ski run, I created a ramp for the guest and kicked some small cornices around to mostly investigate the snow-surface condition. The top third of the run was pretty firm and scoured from moderate up-slope winds over the past week, but the skiing was good for making calculated, controlled turns. As I worked my way through the choke, the snow got markedly deeper, but not chalky like an obvious windslab. As I was making a right turn I noticed a crack shoot away from my ski tail, and the slab silently released and slowly started to gain speed. I stayed pretty calm, actually, and turned further away from the slab – just changing my course down the fall line every so slightly as I watched the slab move downhill and away from me.

I pulled into the bottom of the apron fully expecting to communicate with my client, whom I had specifically told over the radio to wait for me to stop before skiing.

So as I turned and looked up the couloir with my finger on the radio trigger, I realized he was already six turns into the run. Too late. I crossed my fingers and watched as he came down the run, mimicking my tracks and then reaching my location safely.

I triggered this thing because I think I touched the sensitive spot. I had gained confidence the day before and was caught by surprise as the slab was perched only on the apron and well below ridgetop start zones. I often think back to that run and wonder if I would have triggered the same slide if I had stayed way far skier's right, out of the cross-loaded zone.

Turns out these conditions were only present in very specific locations in the Boulder Mountains. Across the Big Wood River Valley on Titus Ridge, for example, there was a very different-looking structure and problem.

Patrick Graham is a backcountry ski guide for Sun Valley Trekking. ❄️

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■ Sawtooth National Forest Avalanche Center

Staffing

Chris Lundy moved on to greener pastures in 2012, and Simon Trautman stepped from seasonal forecaster to center director, which meant less field time and more time addressing all those other things. He managed the transition with *most* of his hair, and his sense of humor and his composure remain intact. We replaced him with Scott Savage, formerly Snow Safety Director at Big Sky ski area. Thanks to Scott's experience and badger-like tenaciousness, he easily jumped from forecasting at the scale of a large ski area to forecasting for five mountain ranges he'd barely seen. Blase Reardon returned for his fifth winter at the center and worked as the old hand who kept advisories engaging, coordinated avalanche classes, and steadily checked into numerous corners of our advisory area.

Weather and Snowpack

The winter of 2012/13 didn't follow usual patterns, providing us with some great opportunities to see and learn from atypical conditions. First, there was *The December to Remember*. Automated stations in our advisory area recorded snowfall on roughly two of every three days, and by Christmas our upper-elevation snowpack was 135-175% of the 30-year average. This deep, early season snowpack didn't metamorphose into widespread faceted layers, and although great riding and skiing conditions pulled far more people than usual into the backcountry, we received few reports of human-triggered slides or avalanche incidents (thanks to the unusual snowpack development). We issued a High danger rating only once that month, and our advisories focused on storm-snow and wind-slab avalanche problems, not the persistent and deep-slab problems we're so accustomed to in the early season.

The storms shut off at Christmas, and for the following three months we saw one- to three-week-long dry spells punctuated by brief periods of light snow, inversions, and/or bouts of strong, northerly winds. Several times, weak layers that formed at the surface were tempered by warming in the few days prior to snowfall, and the subsequent instability wasn't widespread or prolonged.

The season closed with yet more anomalous conditions – an extended period of unseasonably warm temperatures followed by a very winter-like storm. We saw a prolonged, wet loose avalanche cycle that circled the compass from sunny to shady aspects, then on the tenth day started all over again on sunny aspects. In early April a very cold low settled overhead, bringing one to two feet of snow, single-digit temperatures, and a powerful blast of northerly wind. On April 14 (the last day of our advisories), snowmobilers triggered a D3 slab high in the Boulder Mountains on a recently wind-loaded slope. This was the closest call of the season. The two riders involved – a father and son – survived uninjured after the father rode through the moving debris, picked up his son, and drove through the swash to safety. Whew.

We ended the season with a snowpack representing roughly 87% of the 30-year average and 78% of last season. On average, only 25% of the season's snowfall fell after December 26.

Operations

Things Fall Apart is the most famous novel by Chinua Achebe, a Nigerian novelist who died this winter. The title's also an apt theme for a series of equipment challenges that marked our winter. First, lightning strikes fried the radios at two of our five automated weather stations. The strike at our Peak 2 station also blasted the anemometer into the next county, but miraculously spared the ancient CR10 data logger. We were able to get both stations back running before the forecasting season started in earnest, though the Peak 2 repairs involved moonlit skiing on just a foot or so of snow. In February, we discovered it is possible for two snowmobiles to die within seconds of each other...which also resulted in some moonlit skiing.

We logged 145 days in the field, which exceeded a field day to advisory ratio of 1:1, and used snowmobiles for ~20% of that fieldwork. This year local ski guides and snow-safety workers submitted over 200 observations to our professional observations database. A big thank you to the guides at Sawtooth Mountain Guides, Sun Valley Heli Ski, and Sun Valley Trekking, and to the ski patrols at Bald Mountain and Soldier Mountain ski areas. The public also contributed an additional 77 observations. Next season we want to increase that number, with a focus on motorized areas and the backcountry access areas around Bald Mountain.

We went live with the first phase of our website overhaul in March. Over the summer we will work on a new advisory and mountain weather format, and we will streamline some of the forecaster tools on the backend. This year's numbers are as follows:

- 135 daily advisories and 10 general snow and avalanche updates published
- ~1200 daily advisory views
- The advisory was accessed ~160,000 times through email, web visits, and the phone hotline

Education

Our staff made 28 education presentations, about evenly split between professional and recreational audiences. Each of us presented at one of the regional snow and avalanche workshops – Simon at USAW, Blase at ESAW, and Scott at NRSAW. Over 1000 people heard those presentations. Scott co-authored two papers at ISSW and presented a case study at the Gallatin National Forest Avalanche Center's Professional Development Seminar. We hosted a professional development seminar of our own for local snow workers in early December. Blase served as a

guest instructor at a NOLS instructors' Level II avalanche course in the Tetons. Closer to home, we developed an Urban Avalanches and Rescue seminar and field session for 21 local first responders; the course aimed to prepare them for accidents involving residents, motorists, and snow-removal crews. Attendance was up at our four regular Avalanche Awareness and Basics classes – with 156 people at the classroom sessions and 59 in the field sessions, despite bitter-cold temperatures for the December session. All told, our education programs reached over 700 people outside the regional avalanche workshops.

Fundraising

The Friends of the Sawtooth Avalanche Center continued to strengthen their organization, fundraising efforts, and support of the avalanche center. They established independence as a 501(c)(3) organization (outside the umbrella of the American Avalanche Association), signed a five-year collection agreement that provides 50% of the avalanche center's budget, hired a new executive director, and provided funds to overhaul our web presence. The group now has 10 board members, and their fundraising efforts included a fall mailing campaign, hosting the Banff Film Festival and Incredible Raffle, and organizing the second annual Skin It 2 Win It race at Dollar Mountain.

Our heartfelt thanks go out to the Friends and to all those who contribute their time and money to the avalanche center. We rely heavily on your support and literally could not do our jobs without you!

—Simon Trautman, director



55,000 acres of terrain burned over in 1967 in the Selkirk Mountains north of Sandpoint is popular snowmobile country. Photo by Kevin Davis

■ Idaho Panhandle Avalanche Center

The trend of winter 2012/13 was set by what appeared to be a "mild El Niño" prediction, meaning the Pacific Northwest should expect average amounts of precipitation with mild to cooler trends for temperature. This seemed to be playing out in November with just average amounts of snowfall. The storm tracks picked up in December with very heavy snowfall and avalanche concerns developing due to multiple situations of unstable slabs over rain crusts. The first avalanche accident, no fatality, was an inbounds ski area burial involving wind-deposited storm snow over an ice crust. January was highly atypical for snowfall with almost no new snow accumulation for the month. We have never issued three Low hazard ratings in a row for the month of January. Surface hoar became a concern going into March, which made for some challenging forecasting situations since the distribution of the weak layer was highly variable due to wind and sun factors. Some mid-April storms brought heavy snow and created narrow windows of instability; these were the same storms that dumped several feet of snow in the Cascades, claiming the lives of two people on Snoqualmie Pass. In all it was an average winter for snowfall, and the weather patterns often resulted in a more stable snowpack.

We began the year with a successful fundraiser for the avalanche center, hosted by the Friends of IPAC. Of course there was an extreme skiing film to get everyone frothed up about the oncoming winter. Raffle items donated by local vendors were auctioned off, and in all about \$2500 dollars were raised. The Friends also spearheaded the new website for IPAC. It is much easier to update than the old gov website, and we can issue an advisory from the comfort of our own home if we wish. With almost 12,000 hits, the public seems to like it also. We'd like to go into next year with some IPAC brochures, hats, shirts, and stickers to increase our visibility and cred. I was thinking about a logo with something catchy like, "Beacon, probe, shovel – you packin'? IPAC."

Outreach to all groups of winter recreation included focused classes for snowmobilers and backcountry skiers and the regularly scheduled free avalanche awareness classes. Our partnership with Idaho Parks and Recreation continued to be a good one, and I hosted Scott and the new trails specialist on a ride in the Cabinet Mountains and showed them how we collect pit data for the Friday avalanche advisory. We partnered on three snowmobile avalanche classes this year. I have families attend several years running now, and they say the class is very well done, so that is great feedback on the education we are providing. Volunteers tracking wolverines with Idaho Fish and Game asked us for avalanche classes. I've seen where wolverines go from their tracks, and they should be attending our classes

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This rescue scenario concluded the field session of an IPAC snowmobile avalanche awareness class. Photo by Kevin Davis

SEASON SUMMARIES 2012/13

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too! IPAC was asked to present at the annual Association of Professional Patrollers, held at Schweitzer Mountain this year. IPAC presented on snowpack and weather variables and conducted a field session on how to evaluate snowpack stability. The workshop trains ski patrollers in various critical elements in their field and provides continuing education to advance their careers. It was a great experience for us as well. We continued our partnership with the National Weather Service in Spokane but did not issue an avalanche warning on the NOAA website this year. This year we concluded our workshops with one last class for the Spokane Mountaineers Mountain School – a field session in the Stevens Lake basin south of Mullan, Idaho, near Lookout Pass. (see photo below) Avalanche dynamics were geared toward mountaineering, and the following day the group made a decision to attempt to summit 6838' Stevens Peak, but the day was snowing and blowing, resulting in a “no-go.” IPAC fielded increased requests from the Spokane and Coeur d'Alene community for avalanche education around the Lookout Pass area.

Silver Mountain was a great partner at providing avalanche information and observations again this winter. Patroller Ty Foltz sent weekly pit data via SnowPilot. At Schweitzer, Tom Eddy, snow safety patroller, regularly updated IPAC with changing snow and weather conditions. Thanks to Scott Rulander and Gary Quinn of the Friends of IPAC for assisting with snowpit investigations this winter. IPAC has good momentum coming out of this year with our partnerships, increased outreach, new website, and help of the Friends group to hit the slab hard next year and plan for some website improvements and additional education programs.

—Kevin Davis, director



Spokane Mountaineers learn about assessing snow stability before a summit attempt on Stevens Peak the following day. Photo by Kevin Davis



above: Mark working hard to light the Chinook precip gauge fire just one Moore time!

right: Mark stepping off the big platform into retirement.



Northwest Weather and Avalanche Center

The 2012/13 season would feature a slide of epic proportions, one that eventually released after layering more than three decades of winter experience and running down the path to retirement.

This epic slide was of course the retirement of long-time co-founder and director of NWAC, Mark Moore, at the end of 2012 after 37 years at the helm. Kenny Kramer, a NWAC forecaster since 1990, became the center's second director in the mid-season transition.

From Kenny: “With the help of Mark, Garth and I were able to receive a thorough crash course of the inner workings of NWAC before Mark's departure. They were incredibly helpful in my first season, guiding and encouraging me through the season and most importantly, making sure they were available to field my questions that undoubtedly cropped up while working alone during the season. Having worked at the Seattle NWS office co-located with NWAC for the preceding six years, I already knew they were great guys. However, my eyes were opened to the extensive and supportive network of avalanche professionals in the Pacific Northwest. I tried to visit as many of our partners as I could during the season and I was always blown away with their knowledge and willingness to share.”

Perhaps in response to Mark's retirement, the weather pattern would not let him ride easily into the sunset. After a mild and somewhat dry start to November with no snow at our stations through November 11, the snow quickly piled up through the start of our forecast season on November 20. Mt Baker picked up 11" of water in six days with a cooling trend that resulted in about four feet of snow through November 22, with other stations receiving one to three feet. But it wasn't really until December that the snow really started to fly. Long-term predictions in the fall of '12 indicated an El Niño winter; one of potentially warmer temperatures and a lower than average snowpack. That forecast eventually fell by the wayside as ENSO neutral conditions prevailed. A strong jet drove cool storms off the Pacific beginning early in December and kept the snowpack building rapidly through the month. After 11" of water in the first week of December, Mt Baker (4210') surpassed 100" snow depth on December 8. Not to be outdone, Stevens Pass picked up over five feet of low density snow in just three days. Tree well/snow immersion suffocation (SIS) messages accompanied the avalanche forecast

during this time. The stormy and cool pattern lasted until Christmas Eve. The first avalanche warning of the year was issued on December 17, and deep, soft, storm and wind slabs were reported throughout the forecast area. A relatively isolated pocket of surface hoar in the Crystal Mountain area allowed for a remotely triggered soft slab avalanche three feet deep to bury a skier in the resort after the area opened in the afternoon. The slide initiated uphill of the skier in sparse trees in an area not targeted for control work or a usual slide path. The victim was not wearing a beacon, but a quickly organized search party of patrollers and public were able to find her and dig her out unharmed. From south to north, snowfall totals for December were impressive: 160" at Mt Hood Meadows, 128" at Snoqualmie, and 232" at Mt Baker.

Late December and early January were uneventful with periodic weak systems and clear periods that allowed for surface hoar growth that was buried by subsequent light snowfalls. A stronger system impacted the area January 7-9, prompting another avalanche warning and a widespread natural cycle as snow changed to rain at lower elevations. Some slabs stepped down to buried surface hoar or a localized freezing rain crust from earlier in the month. A notable strong and stationary upper-level ridge took control in mid-January with most stations experiencing 12 days of no precipitation. One of the strongest winter ridges in years dominated the region; strong high pressure trapped cold air and fog in the passes and lowlands while upper mountain sites basked in the sunshine and freezing levels near 10,000' for most of this period.

While this period was uneventful weather-wise, two separate avalanche accidents featured pockets of sensitive wind slab lingering above 5000' near Stevens and Snoqualmie Passes. The Snoqualmie Pass area slide on Chair Peak resulted in a broken arm for a pro guide. The slide east of Stevens Pass failed on a buried surface hoar layer not destroyed during the previous storm cycle, while the Snoqualmie area slide failed on a recent melt-freeze crust.

A moderate storm cycle resumed for the latter half of January with 2-4" of water recorded for west-side locations and generally good bonding to the existing snow surface. A storm cycle at the end of the month was accompanied by some very strong alpine winds that loaded lee slopes lower than normal with reports of sensitive soft slabs beginning further downslope off of Shuksan Arm near Mt Baker. Isolated wind slabs up to six feet failed on a mid-January freezing rain crust in the Mt Hood Meadows alpine during control work with explosives.

January could be summarized by receiving roughly half or less the amount of water (and snowfall) versus December and freezing levels averaging about 3000' higher. The strong storms of December were not matched for the rest of the season, allowing many east-side telemetry stations to peak in snow depth in January. The lack of a lower or mid-elevation rain event in the northeast Cascades allowed surface hoar layers from early and late January to become buried and reactive in field tests. Thorough field reports from the North Cascades Mountain Guides helped NWAC forecasters identify the PWLs, with the persistent-slab concern showing up in their regional forecast for nearly a month.

February was characterized by a split-flow pattern with weak weather systems arriving every few days. Snowfall totals for the month were about the same as January but with cooler freezing levels. A more active storm cycle returned for the end of February with two to four feet of snow falling over the five-day period ending on February 26. Most natural avalanches were direct action, but some larger slides failed on surface hoar formed during a lull on Washington's Birthday, even on the west slopes.

A juicy atmospheric river with rising freezing levels took aim at the Pacific Northwest at the end of the February and into March. The warming trend and subsequent rain loaded earlier storm snow and caused another widespread avalanche cycle. A very deep slab released in upper White Canyon on Mt Hood during this cycle (see cover photo); luckily no one was caught. Worsening conditions deterred many backcountry skiers, but rapid loading and warming caught one skier inbound at Stevens Pass before the area closed early for the day.

After a warm and wet start to March, the first half was uneventful with light to moderate snowfall events falling on a stout rain crust. Strong and cool NW flow set up mid- to late March, delighting powder hounds as the period ended in relatively cold and light (and deep) snow for the Pacific Northwest. Four to six feet of snow fell for Mt Hood and the western Cascade slopes. Storm and wind slabs were active during the beginning of the cycle. The end of March and beginning of April were quiet with northerly slopes preserving the good snow.

Just as NWAC and cooperators began to wind down the season, a cool and active period returned for the last 10 days of operations through mid-April. A vigorous trough followed by a strong Puget Sound convergence zone pummeled the central Cascades, especially the Snoqualmie Pass area where they received almost three inches of water at Alpentel in just three days, ending April 14. Intense precipitation rates on Saturday, April 13, coupled with diurnal warming, created a dangerous and in the end deadly combination on this day. The base of Alpentel averaged roughly one inch of snow per hour for most of the daylight hours. Interstate 90 over Snoqualmie Pass would eventually close in the evening for avalanche control work with a max hourly precipitation rate of almost a quarter inch/hr recorded between 6-7:00pm. Control work that evening resulted in slides running down to and below I-90.

Very sensitive storm slabs on April 13 turned back many backcountry skiers near Snoqualmie Pass. Unfortunately, two separate Snoqualmie Pass area accidents occurred on Saturday early in the afternoon; the first included a trio of climbers



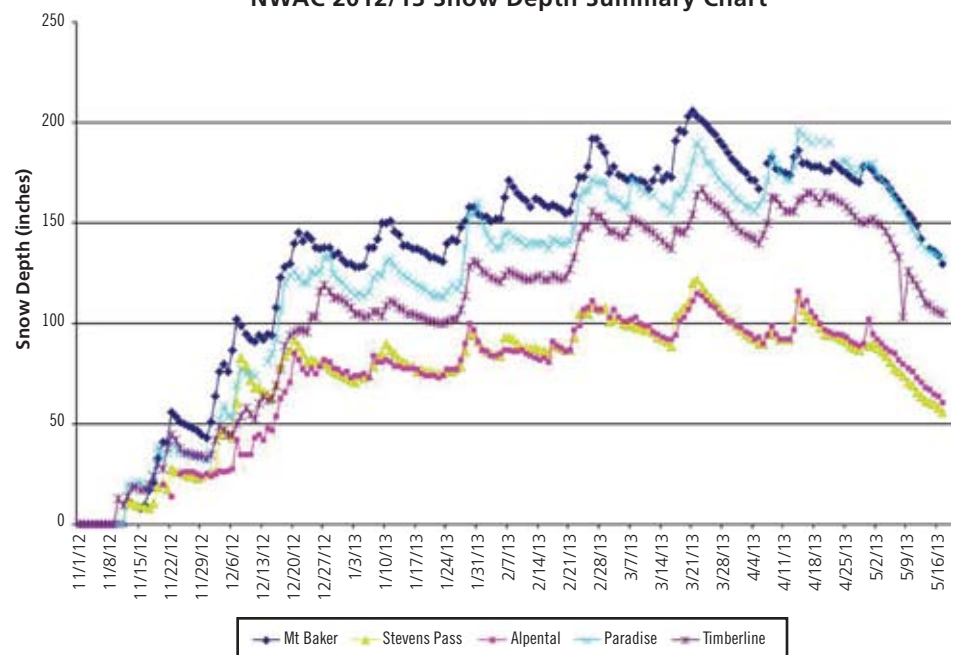
12/20/12 Snoqualmie Mountain phantom trees. Photo courtesy J Davis

on Granite Mountain who were climbing directly up an active slide path. The slide was triggered around the 4700' level, and the two surviving members went for a 1300' ride according to their GPS. The other accident involved a solo snowshoer who had joined a large group headed up Commonwealth Basin to Red Mountain. The Granite Mountain victim was not recovered for about a month due to weather and avalanche concerns that complicated rescue efforts.

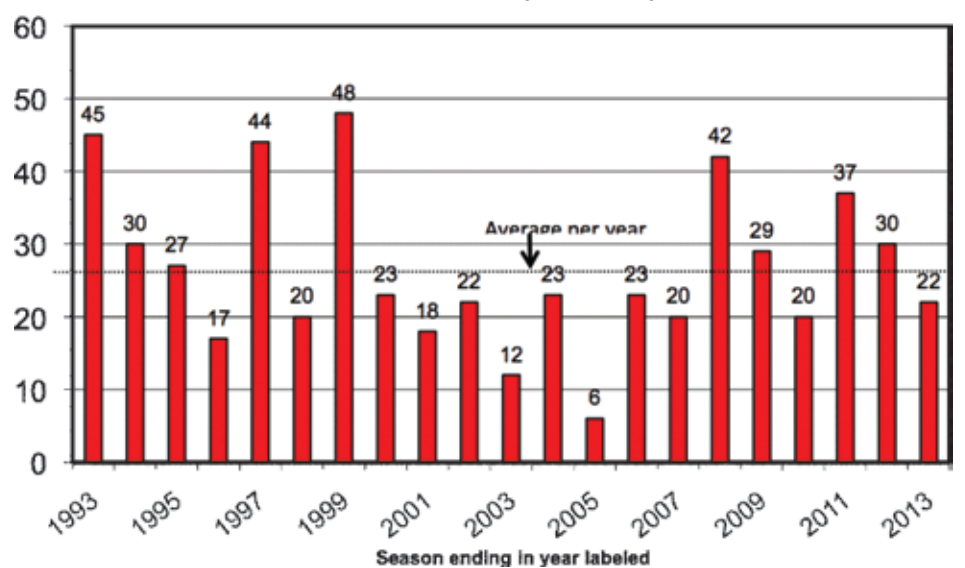
The second half of April kept NWAC forecasters on their toes with special avalanche statements issued for an unusually strong and cold weather system around the end of April. The winter-like conditions gave way to an unusually long stretch of warm May weather. More special avalanche statements were issued for wet slides as freezing levels averaged above 10,000' from May 2-11. This caused a rapid consolidation of the snowpack along with numerous shallow, wet loose slides and a few large wet-slab or climax slides on steeper bedrock surfaces. The snowpack had entered May around normal, but the warm spell led to a much faster retreat than the previous two spring melts.

—Kenny Kramer, director

NWAC 2012/13 Snow Depth Summary Chart



NWAC Days with Avalanche Warnings or Special Statements Past 21 Years (1993-2013)



Continued on next page ▶



December 28, 2012: Remote trigger on Gobbler's Knob takes out a host of tracks. Photo courtesy UAC

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■ Utah Avalanche Center – Wasatch

From my April 10 advisory:

While an east wind blows
Friend looks cancer in the eye
Magnolia tree blooms

I often like to say that nothing good comes of an east wind...but sometimes there are good things that are coincident with it. Just ask the old man in the haiku.

One friend – a mentor – is cleared of cancer the day before...the following day a good friend – a colleague, a husband, and a father – dies in an avalanche. In my advisory just after the accident, I was reminded of words my friend Tim wrote from Glacier Bay years ago. Re-reading it reminded me of our lost colleague Craig Patterson. Much of his heart was in Alaska, too.

“We camped on a gravel slope below White Thunder Ridge, and we might have gotten some sleep were it not for the damn Northern Lights, which arced across an ebony starfield like green smoke interspersed with dozens of red lightning bolts running in ultra-slow motion. All the while, the sound of calving ice rumbled off the ridge above. It was like having the whole damn philharmonic orchestra come over to play Beethoven for you at midnight. The mindless and ungrateful go to sleep so they can rise up in the morning fully rested and spiritually impoverished.”

“We are all in this journey together; we’ve either lost someone or will lose someone down the road. It’s the lesson we share of impermanence and a reminder to be grateful for each day that we have with the ones we love. Lose some more sleep tonight, friends – remember that we live charmed lives; remember that always.”

At first glance, one might think that this last winter blended in with many others; but the truth is each winter is defined as “unusual,” punctuated by real events with real people affected by close calls and, unfortunately, tragedy. If you look at the pure numbers, we suffered our “average” number of fatalities across the state – four – but in terms of the mark it left upon communities and families, particularly our avalanche family, it sits among that loose plurality of “second to none.” By this I mean we, the Utah avalanche community, lost one of our own – Craig Patterson – a Utah Department of Transportation avalanche team member from Little Cottonwood Canyon.

On the afternoon of April 11, Craig was killed by an avalanche he presumably triggered high on Kessler Peak, a prominent and jagged mountain that is nearly wall-to-wall with avalanche paths, including avalanche paths that threaten Big Cottonwood Canyon. I say “presumed” because he was traveling alone that afternoon. He was carried nearly 1300’ over a couple of cliff bands and was

killed by trauma. Eight avalanche professionals from the Utah Avalanche Center and the Utah Department of Transportation went in the next day to conduct the investigation. To say that this was part of a cathartic or healing process would be missing the point. We all travel in the mountains alone and all agreed that this could have happened to anyone of us. The investigation was the easy part. The hard part was going in the night before to retrieve Craig at the base of the Kessler Slabs. Hardest of all was going to see his wife and six-year-old daughter.

But each person killed in an avalanche has his or her own family and community, and their passing triggers waves of denial, shock, sadness, even anger.

On January 18, a family snowmobiling in the Uintas stopped for lunch just off the groomed road of Mill Hollow in the west fork of the upper Duchesne River drainage. What follows may be more than a family can bear. Four young family members walk to the edge of what appears to be a packed trail to overlook the upper Duchesne. The “edge” happens to be a cornice, which immediately collapses, sending two boys Traven and Coleman Sweat (aged 7 and 14) over the edge, triggering another avalanche below. Each was fully buried and died from asphyxiation. This twin fatality stops us in our tracks. Many times people like to employ platitudes, “They were risk takers,” “They were doing what they loved,” “They shouldn’t have been out there,”...but this one leaves one speechless with sorrow. This family, too, will never be the same.

A fourth fatality was a Pleasant Grove local, snowmobiling down along the southern end of the Manti-Skyline Plateau. James Childs, 32, was riding with a number of others when they all became separated, side-hilling and high-marking the numerous slopes east of Twelve Mile Canyon, just north of Interstate 70. When the riders regrouped, they noticed that one of their party was missing. He was later found buried 4’ deep from a 2’ deep and 350’ wide avalanche below a steep northeast-facing slope at 10,400’. He is survived by his wife and four children.

There are tragedies and there are reasons to rejoice. This winter marked a time where we investigated three full and complete avalanche burials with three full and complete recoveries. This is a testament to teams being equipped and practiced with rescue gear and luck, as nearly every involvement one could argue the presence or absence of it. Famously, Shakespeare’s plays were categorized as either comedy or tragedy. To wit – on Friday, January 11, a party of ski patrollers and avalanche educators on their day off decided to test the snow stability in the well-named Depth Hoar Bowl of Alexander Basin of upper Mill Creek. The terrain sits between Gobbler’s Knob to the west and Wilson Peak to the east. The second skier down the slope unintentionally triggered an 18” deep and 50’ wide avalanche that washed around him but didn’t carry or sweep him off his feet. The following day, another experienced party skied the remaining portion of the bowl, only this time it was the third skier on the slope that triggered the slide, and he was subsequently buried with the top of his helmet sticking out of the snow. With some amusement (that everyone was okay, and now there was little danger left in that particular terrain), the next day’s forecaster highlighted the events and asked, “Okay, any more takers for Depth Hoar Bowl?”

By the numbers:

Avalanche involvements reported to us included 51 caught and 34 carried, 10 partial and six full burials, and four out of 24 nationwide fatalities. Colorado alone suffered nearly half of the national fatalities with 11. By comparison, the West had 34 avalanche fatalities for the 2011/12 winter. The Alta Guard Station in upper



Andy Rich examines a remotely triggered crown on the Park City ridgeline. Photo courtesy UAC

Little Cottonwood Canyon, with annual snow measurement going back to the 1944/45 season, recorded a well-below-average 381.5"/33.13" (snow/water as measured November 1 - April 30) for the year, 76% of average. We didn't see any overwhelming avalanche cycles or struggle with any widespread or significant weaknesses for the 2012/13 season.

A couple of weather events that caught our eye:

- Four rain events in the last day of November through the first week of December (a portent of things to come?)
- The "upside-down storm" of January 10-12 that put a foot of snow in the mountains and up to 20-44" in the valleys and mid-elevations, followed by...
- As Professor Jim Steenburgh of the University of Utah Meteorology Department put it (on his blog www.wasatchweatherweenies.com) "The Mother of All Inversions" – A bullet-proof ridge of high pressure parked itself over Utah, sending temps down to -46°F (near Logan) and -21°F (Solitude). Not coincidentally, declining air quality in the valley made national news, comparing our choking smog with areas of China.

The UAC kept the same staff. Toby and Paige Weed ran the Logan branch; Craig Gordon the western Uintas; Bruce Tremper, Evelyn Lees, Brett Kobernik, and Drew Hardesty held down the Wasatch; Kobernik and Gordon shared the Manti-Skyline Plateau. Max Forgensi ably managed the office for the La Sals and Abajos in southeastern Utah. Paul Diegel continues to steer the powerhouse nonprofit side of the Utah Avalanche Center, raising over \$360K for the year. Over 650 avalanche pros and enthusiasts attended last October's Utah Snow and Avalanche Workshop; mc'd by a sleek and tanned Craig Gordon in his best formal Hawaiian attire – tuxedo and bowtie above the belt, shorts and flip-flops below. His patented *Know Before You Go* program has now reached over 165,000 youth since its inception in '04. Drew Hardesty was the keynote speaker for the annual Skinny Skis Avalanche Awareness Night in Jackson and gave a standing-room-only crowd of 700 musings on *The Past, Present, and Future of the Backcountry – Freedom and Responsibility for the Individual and Community*.

Other news from the year:

- With the help of Garafa, LLC and sponsored by a generous grant from Backcountry.com, the UAC developed the first of its kind iPhone app and went live this spring. It allows users to get all the latest info as well as take photos and submit obs to the UAC.
- Steve Achelis, long-time board member, Search and Rescue IC, ski patroller, author, and philanthropist, created and developed an exhaustive online place-names map on Google Earth to aid in communication and search and rescue missions (wbskiing.com). Water- and tear-resistant maps were also tough to keep in stock, with all proceeds supporting the Utah Avalanche Center.
- Outdoor Research (OR) and KLIM contributed generous winter gear, keeping the staff comfortable and (some would argue) professional during field days.
- New avalanche-informational signs with beacon checkers were installed at many trailheads.
- We continued developing a website utilizing "basic" and "advanced" page to customize our user needs and will continue refining this for the 2013/14 season.
- A Forecaster's Blog was a giant success with over 30 topics submitted, ranging from Early Season Faceting, to Effectiveness of Airbags, to Slope Steepness, to Danger in the Danger Ratings, as well as *Case Study: The Effects of Solar Radiation and Temperature on the March 4, 2012 Avalanche Cycle* (see TAR 31-3).

—Drew Hardesty, forecaster

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Craig Patterson 1979-2013



Near the end of last winter on April 11, 2013, we suffered the tragic loss of our good friend and colleague. Craig Patterson died in an avalanche accident in the Wasatch backcountry while working for the Utah Department of Transportation. He was

34-years old. (The full report is at utahavalanchecenter.org/avalanches/accident-kessler-slabs).

Craig was born in Detroit, Michigan, and he grew up in Pittsburgh, Little Rock, and Lausanne, Switzerland. Early on, Craig developed a love of the mountains and eventually obtained a degree in geology at Miami University of Ohio. After completing a thru-hike of the Appalachian Trail in the spring of 2001, he moved to Alaska to be an avalanche instructor and guide. Here he not only fell in love with Alaska but also his future wife Renae. Together they moved to Utah where they made a home for their daughter Kaya.

Craig spent time working for Black Diamond Equipment and continued his passion for the mountains, where his accomplishments included climbing and skiing in South America and summiting Denali. He became a Utah Mountain Adventures guide and AAA-certified instructor. At UMA, his skill as an instructor really began to shine when he re-wrote their avalanche training program and inspired hundreds of budding avalanche minds. He eventually found his dream job as an avalanche forecaster for the Utah Department of Transportation in Provo Canyon where he worked for six years. Last winter, he transitioned to Big Cottonwood and Little Cottonwood Canyons where he continued as a forecaster.

Craig had an insatiable drive and a powerful stride to explore the mountains that was hard to match. That drive extended also to his work at UDOT where his influence and contributions to better the avalanche



safety program will be felt for many years to come. He developed great skill at working with remote weather stations and a willingness to work on those things during even the worst of conditions. I often wondered if he actually enjoyed getting pelted by blowing graupel while hanging from his harness high in a weather tower.

Craig's adventurous spirit was palpable and emanated to those around him. He genuinely enjoyed life and lived to spread that feeling to his friends and loved ones. People were drawn to Craig not only because he was humble and fun to be around, but also because he was just really good at most things he tried. The list is long: skiing, climbing, biking, trail running, rafting, kayaking, biscotti baking, mountaineering, marriage, fatherhood, artillery gunning, VW buses, cooking, carpentry, guitar...

With all his skill, he also knew not to take life too seriously and knew how to make you laugh and conversely, laugh at himself. I will forever miss watching Craig slice his way down a big mountain

face laying only a few arcing turns only to end the run with his perfect and legendary yard sale. He had great skill at that maneuver as well. So much so that sometimes I wondered if he was doing it just for my enjoyment. Whatever the case, Thanks Craig. You were taken from this place far too soon, leaving the world a little less bright. But something that we'll never be left without is the memory of your shining spirit and your passion for life.

In honor of his spirit and to celebrate Craig's life, a memorial service was held at Albion Grill at Alta. Donations to the family can be made to the Craig Patterson Memorial Fund at any Key Bank or mailed to the Craig Patterson Memorial Fund, 520 Crestview Dr, Park City, UT 84098. Also, his family has suggested that anyone with a similar passion for avalanche education make a donation to one of the many avalanche education institutions.

Bill Nalli, UDOT avalanche forecaster, wrote this story and took the photos as well.



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Rescue Drainage below Nyack Mountain, late March, about a week after the Pineapple Express arrived in northwest Montana. Photo by Tony Willits

■ Flathead Avalanche Center

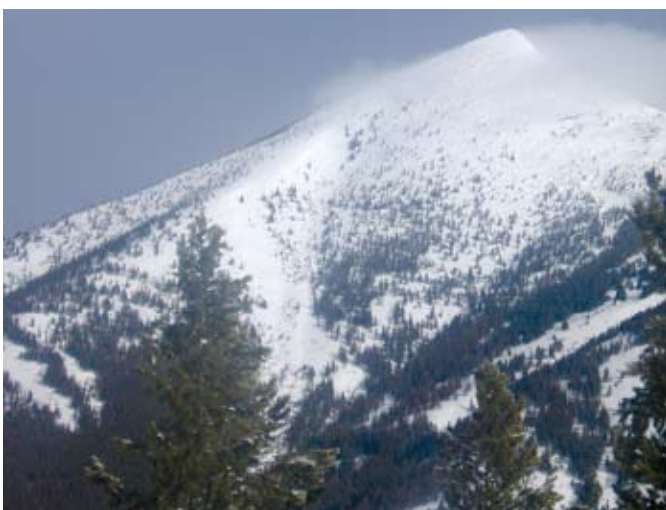
The winter of 2012/13 was a first for the Flathead Avalanche Center (FAC) with a new website and new personnel to aid in producing advisories for the backcountry recreationists of northwest Montana. This change came about after the retirement of Stan Bones who guided the avalanche program for over 30 years. Derek Milner designed the website with lots of volunteer time while accomplishing his day job. The site seemed to work well for a broad range of users within the local avalanche community. Joy Sather, a not-so-new face around here, continued to provide quality data from her observations as well as advisories and education endeavors. Another familiar face, Seth Carbonari, provided good observations and advisories as well, and served as a liaison to the avalanche community for educational opportunities. Kootenai National Forest partnered with us in providing observations and an advisory skeleton two to three days per week via long-time contributor Jon Jerešek. Yet another regular voice in providing observations to FAC was local ranger Jason Griswold and his colleagues from Glacier National Park.

In response to public requests, FAC increased advisories from two days per week to three: Tuesday, Thursday, Saturday. Pit profiles, pictures, and videos graced the advisories in another response to input. Our website included an active "Observations" page that was a big hit and contributed pictures and observations for our northwest Montana region with 54 observations submitted from a broad array of contributors that also included the BNSF safety coordinator, Ted Steiner.

The winter of 2012/13 was a good one for northwestern Montana. December went well, but by mid-January we were hit with high pressure that hung on for three to four weeks. Snow accumulations picked up again in late February and early March. By the middle of March the real warm up came with a Pineapple Express that affected weather in our region and up into British Columbia. This produced a moderate avalanche cycle of wet-slide activity. The latter part of March brought great spring conditions with sunny clear skies and great skiing.

Overall we had a warm winter with only very short periods of temperatures bouncing near or below zero. Periodically our freezing levels would climb to above 6000' in two or three different warming events, accompanied by rain. The warm winter instigated a lower than normal snowpack below 5500' and about 116% above 5500' in elevation at the time of this writing. Northwest Montana had several bouts with temperature inversions along with a high-pressure system that settled on us through mid-January resulting in surface hoar development, but the warm ups tended to mitigate those weak layers.

Northwest Montana only had two documented avalanche incidents: the first a skier on Christmas Day who was partially buried and did not sustain any injuries in



Elk Mountain aspect of accident on January 8. Photo by Tony Willits

a very small slide in a popular backcountry skiing destination. Our second incident involved a backcountry skier and snowboarder in the Elk Mountain area in Glacier National Park during an early January storm cycle. Fortunately only one of them was partially buried after being sifted through a gully of scattered saplings

but was purdy banged up and then had to endure a slow walk out. The twosome was later helped out by Glacier National Park rangers. The weak layer in this accident was a thin layer of facets over an ice crust.

Cooperative endeavors to coordinate education offerings were enhanced through the FAC gaining a new partner in Big Mountain ski patrol, who offered a Level I and Level II for backcountry recreationists in the Flathead. In addition, the Kootenai National Forest offered two Level I classes with 60 students total, plus five two-hour avalanche awareness sessions with 90 students in total. FAC also offered one free Advanced Avalanche Awareness class with 50 attendees (down from two the previous year) in the first weeks of January. Finally, the FAC presented a Level 1 to 12 interagency government personnel.

The Glacier View-Hungry Horse Ranger District of the Flathead National Forest and the Flathead Nordic ski patrol installed five avalanche beacon checkpoints at popular snowmobile trailheads and backcountry access points to promote safe backcountry travel in our region. The goal was to get more backcountry users to realize that transceivers are a necessary safety device in avalanche terrain. The Northern Rockies Avalanche Safety Workshop donated \$3500 to the Nordic patrol for the beacon checkers.

—Tony Willits, avalanche & snow specialist



Class 4 deep-slab avalanche on Seattle Ridge's infamous "Repeat Offender" slide path. Photo by Kevin Wright

■ Chugach National Forest Avalanche Information Center

Feast or famine. A so-called "average winter" looks normal until you start to look at the details. This season was bipolar, back and forth, alternating between all or nothing. Following the deluge of rain during ISSW in Anchorage, October and November were mostly cold and dry. The shallow snow that was on the ground became nothing but facets, laying the foundation for the rest of the winter.

We went through a historically dangerous period this year – starting on Christmas Eve and continuing through mid-January. Our very weak and shallow snowpack was overloaded by three solid weeks of stormy weather, ending in a thick and heavy maritime slab sitting on a continental weak layer. Very large and destructive deep-slab avalanches were common across the region.

Human factors were significant at this time, as early season skiing and riding had been poor and the copious amounts of new snow coincided with the Christmas holidays. As the snow stacked up we began a long stretch of issuing avalanche warnings through the National Weather Service as well as rating 23 consecutive days with a high or considerable danger. Public feedback was enormously positive, and people seemed to be heeding the warnings and taking extra precautions.

However, there were a couple close calls as people tested the limits of this backcountry snowpack. The first, on January 2, was a large full-depth avalanche triggered by skiers on a very popular ridge called Tincan. The group was traveling in relatively steep terrain, given the known deep-slab problems and large avalanche potential. They followed good travel protocol exposing one person at a time, and consequently only one person was caught and carried – luckily ending up okay. The event was not a surprise to our forecasting staff as we tracked the problems.

The second near miss was at the site of the 1999 avalanche that killed six snowmachiners off Seattle Ridge, commonly known as Repeat Offender (see photo, above). Again, the deep-slab problem was the culprit. This one occurred on January 8, as the danger began to taper but still earned a solid considerable rating. The avalanche was remotely triggered by a snowmachine near the upper flank. The slide released full depth, over 1000' wide and up to 8' deep. It was very fortunate that no one was caught, as the debris ran far enough to cover an area where snowmachiners often congregate. Following that avalanche, skiers and riders noticeably subdued their terrain choices.

Other avalanche programs in the Girdwood/Turnagain Arm region were also challenged by the early season weak layers. Alyeska Resort spent months triggering avalanches to the ground, stripping all the snow off their steep terrain multiple times. They employed some modern public relations techniques, releasing a YouTube video of their avalanche-reduction efforts to educate the impatient public about the unprecedented dangers. The snow-safety teams did an admirable job managing terrain and mitigating the problems as best as they could.

During February snow kept falling in small amounts, and by early March the November weak layers were buried meters deep. Finally, after well over a month of no signs of activity on our basal weak layer, a solid stretch of low danger ensued allowing much of our signature steep terrain to be safely skied.

On the operations side of things we had several new developments. We started the season with a new website design, incorporating elements developed by avalanche centers in the lower 48. For the first time the Friends nonprofit and the



Alyeska's North Face, one of several large deep slab avalanches triggered by Alyeska patrol.
Photo by Heather Thamm

Forest Service entered into a legal collection agreement to allow community money to fund forecaster salaries. With decreasing federal budgets, this will give us an essential buffer to continue providing high-quality service by augmenting baseline funding provided by the Forest Service. BRP/Skidoo and retailer AMDS loaned us a 2013 Summit 800 sled for the year, allowing us unprecedented access to the far reaches of our forecast zones. We also teamed up with BeadedStream LLC who installed and operated a vertical temperature array to monitor real-time snowpack temperature every 10cm in the heart of our forecast zone. All these contributions help us continue providing forecasts and education to the public.

The winter of 2012/13 brought some stability to the avalanche center, with staffing finally reaching optimal levels to maintain our level of service. Wendy, Graham, and Kevin all returned from previous seasons, and John Fitzgerald joined the team in Girdwood. Alex Mclain continues to observe the Seward District areas and writes the Saturday summit advisory. Sean Fallon from Alaska Pacific University joined us this year for an internship, serving as a reliable field partner and creating a useful paper on common storm patterns in Turnagain Arm. With this level of staff, community, and Forest Service support I am confident that we can maintain a high level of quality and competence to continue providing the best avalanche forecasting product to the public in Alaska.

—Kevin Wright, director



After a mid-April warm up with some rain, a small but deep wet-slab pocket released naturally at 12:30pm on 4/19/13 beneath an area of running water. Photo by Joe Klementovich

■ Mount Washington Avalanche Center

Winter 2012/13 won't go down in the record books as a stellar season on Mt Washington. It's been a few years now since we've seen what we'd call a "good winter." However, there was enough snowfall and other things going on to keep MWAC forecasters/snow rangers on our toes. Whether it was waiting for snow in December, watching rain fall in late January, or admiring the long-awaited larger snowstorms in February, we were able to do it with smiles on our faces.

MWAC issued a total of 145 advisories between December 18 and May 26. The initial General Advisory was issued on the 18th, but it wasn't long before the first 5-scale advisory was issued on December 26. That's what happens when the month of December gives 40% more snow than the historical average, and 90% of this snow comes in the second half of the month. If this had been a "normal" early season, we would have started seeing good-sized avalanches before Christmas. However, this year there was very little snow on the ground by mid-December, so this stretch of snowfall only began the process of filling in the ravines and gulfs of the Presidential Range.

The promise of the good season that started in late December didn't last very long. Once the New Year rolled in, the snowfall rates dropped tremendously. With a grand total for the month of 36", 68% of the January average, it quickly erased the memory of the snowy end to 2012. As if to add insult to injury, the all-time high temperature for the month of January on Washington was shattered, hitting 48°F on the 13th, followed by a 2" rain event in the last two days of the month.

Heading into February and March, New England snow lovers and avalanche aficionados were wondering if the second half of the season would be similar to the first? But a total of 156" in these two months was just what the doctor ordered. Or was it? Digging deeper into the data reveals that though this is about 60% more snow than we typically get during this period, the snow water equivalents were 2.4" below normal. So if you were hoping for light-density powder, it was not too



MWAC Snow Ranger Frank Carus investigates a human-triggered avalanche by a group of six skiers on 4/4/13. Crown length 150m, avg depth 80cm, 40-degree slope at initial failure, CLP- Resistance/Hardness P+ --> P- failing on 1cm crust. Photo by Joe Klementovich

hard to find. But if you like to see the gullies filling in and avalanches running long distances, this wasn't the winter for you. It wasn't until late March that large avalanches finally began to run. It took an entire season, but it finally looked like we might actually have a reasonable good spring ski season.

In the end, 2012/13 was the winter of up-slope snow. Although orographic lift is a very usual snowfall producer for our mountains, it really stood out this season. For the four months from December through March we had measurable snow on 96 of the 121-day period for a frequency rate of 79%. Although we certainly had our share of synoptic-scale snowstorm events, the vast majority of precipitation days would categorize as localized up-slope snow events. Due to many periods of scant up-slope snow plot measurements, we joked nano-micro-scale forecasting may be a better option to our usual micro-scale system.

In addition to avalanche forecasting MWAC also has lead-agency responsibility for search and rescue events in our area. In recent years there seems to be a trend in our SAR incidents. We've been responding to fewer overall incidents, but seeing more avalanche close calls and fatalities. This trend continued in 2013. Two avalanche incidents stand out as examples of note for close calls and serious accidents. First, in late January a team of 12, broken into four roped teams of three, was involved in an avalanche in Central Gully. Although all teams were carried at least a short distance, by a miraculous stroke of luck, only one rope team was carried to the bottom, and no one was critically injured. The other three rope teams were able to rappel the route without incident. The other notable incident in 2013 involved a 24-year-old solo ice climber who was killed when he triggered a slab in the middle of a three-pitch alpine ice route. In both of these incidents, avalanche danger was rated moderate. This prompted MWAC Lead Snow Ranger Chris Joosen to blog his thoughts on Moderate danger. Those who know Chris well understand that it's worth your time to read if Chris goes so far as to blog about it.

Excerpted from Chris Joosen's blog post of April 7, 2013
www.mountwashingtonavalanchecenter.org/author/chris/

In recent years there has been an increase in the backcountry use in avalanche terrain in winter, particularly in March. That fact, coupled with an increase in avalanche class participation, and visitors equipped with avalanche safety gear more individuals are getting into avalanche-prone conditions. It really is critical to understand that Moderate is not the new Low as I've heard it referred to as, and it's not only at the 20% mark as the second in a scale consisting of five ratings. It is second on a scale that attempts to predict a natural occurrence that will always have an associated degree of uncertainty.

As we have seen worldwide so many times before, a human-triggered avalanche under Moderate or High can very often have the same results...not good. Certainly I am not saying Moderate and High are the same, but what I am saying is human-triggered avalanches happen under a Moderate rating...period. This reality plays out every day, all winter, across the slopes of North America. Understanding this well I therefore have a respect for the "Moderate" snowpack, as on a given day it can be a wolf in sheep's clothing.

I comprehend that to live a long life working in avalanche terrain I must never believe I know exactly what's going on all the time, so I follow protocols to mitigate risk. We travel one at a time to islands of safety, we don't travel over or under our partners without their ok, and always think through the consequences of our intended routes. So...take the Moderate rating seriously, respect it, and realize there can still be plenty of fun to be had in our snow for the skilled and experienced user by knowing what to look for as you plan your route or travel through it. As a natural force, there will always be a degree of uncertainty in regards to avalanches and because the consequences are so high, namely our lives, respect and awe must be our starting point.

See you in the hills. Chris

Spring on Mt Washington would not be complete without crowds making the pilgrimage to Tuckerman Ravine. This is when the majority of our incidents and accidents typically take place, but aside from one busy day, there were few injuries to respond to this season. We suspect this was due to a combination of factors, such as an increasing tendency to come on days when conditions are favorable and hazards are less. This past season, one contributing factor was the

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lack of good weather on Saturdays, which kept the crowds down. Most of the good weather came on week days, which worked well for keeping a steady flow of traffic to the steep slopes.

It would not be a complete picture of the season if we didn't acknowledge the good work taking place off the mountain. Starting long before the snow fell, the second annual Eastern Snow and Avalanche Workshop was held in North Conway, NH. This was deemed a success, so another is in the works for November 9. Also behind the scenes, we work with two nonprofit groups: Friends of Tuckerman Ravine and Friends of the Mount Washington Avalanche Center. Both groups helped support our work with very successful fundraisers this season. We appreciate all they do for us so we can help fulfill our mission. The Mount Washington Volunteer Ski Patrol continued to expertly yet humbly assist skiers in the springtime months. Because of this work they were distinguished with the NSP "small patrol of the year" for the Eastern Region. Our jobs would be very different without this group of committed volunteers, so our hats are off to them.

—Joe Klementovich, Frank Carus, Jeff Lane, and Chris Joosen, snow rangers

■ Cordova Avalanche Center

If you attended the ISSW last September in Anchorage, you experienced some of Alaska's extreme weather. To put Cordova in perspective, we received 50" of rain in September. Rain continued into October, but the weather began to flip flop. Spells of clear skies brought drastically cold temperatures, while warm storms brought rain to our local peaks.

By December, enough snow had accumulated for the avalanche season to be in full swing. Several medium-sized avalanches occurred during storm events. The snowpack continued to grow through the month until temperatures rose dramatically around the New Year and remained unseasonably warm through most of January. The snowpack became isothermal and glide cracks started to appear. The ski hill lost so much snow that it looked like it was done for the season. Then, in February, the freezing line started coming down. The mountains quickly accumulated snow as strong winds filled in all features. By March, snow began accumulating at sea level. Again, several medium-sized avalanches occurred during storm events. Rapidly increasing days brought some strong sunshine, but cool air temperatures limited warming. The cold air continued through April.

As of this writing, the mountains still haven't begun their spring thaw. Large cornices loom. No avalanche has yet reached the highway. In early April, one snowmobiler was reportedly buried and rescued by companions with no injuries.

—Steve "hoots" Witsoe, title???



Natural deep persistent slab avalanche occurring on December 23, 2012, in Drifter Bowl near Donner Summit, CA. Photo by Andy Anderson

■ Sierra Avalanche Center

Winter got off to an early start. The first storm of the season deposited 1.5' to 3' of snow in late October. Additional snowfall events during the month of November led us to start daily avalanche advisories on November 16. Storm events continued to impact the forecast area with a rain-changing-to-snow event on December 2, setting the stage for a persistent weak layer of near-crust facets. Snowpit data targeting December 2 and December 12 near-crust facet layers with the Propagation Saw Test and Extended Column Test gave a 10-14 day lead time on forecasting persistent slab avalanches in various locations around the forecast area. A large storm cycle in late December deposited 4' of snow across the forecast area. During this time numerous persistent deep-slab avalanches occurred across the forecast area with crown height ranging from 4-7'. Two fatalities resulted from deep-slab avalanches inside ski area boundaries during this avalanche cycle. While no fatal incidents occurred in the backcountry, nine close calls did get reported to the avalanche center over the course of the season.

The cold weather that persisted through mid-January kept the snow cold and dry for an extended period. Many backcountry travelers sought out new terrain during the first few weeks of what would become a record dry spell. The period of January 1 through March 31 turned out to be the driest on record for that time of year. On January 1 the snowpack was at 146% of average for the date. On April 1 the snowpack was reduced to 52% of average for the date. The significant snowfall from October through December provided the base and usable snowpack for the remainder of the season.



Natural deep persistent slab avalanche occurring on December 25, 2012 in Echo Bowl near Echo Summit, CA. Photo by Justin Befu

The nonprofit Sierra Avalanche Center's board of directors raised \$91,567 with a variety of fundraisers despite the dry January, February, and March. The Ski Days Fundraisers that traditionally bring in the bulk of the fundraising by the not-for-profit performed reasonably well despite the overall lack of snowfall.

The most significant sponsors for the 2012/13 season were: Alpenglow Sports, Alpine Meadows ski area, Heavenly ski area, Homewood Mountain Resort, Kirkwood ski area, Lake Tahoe Television, Liftopia, Mt Rose ski area, Northstar at Tahoe ski area, On the Snow, Polaris, Porters Lake Tahoe, Sierra at Tahoe ski area, Squaw Valley USA, Sugar Bowl ski area, and Truckee & Tahoe Independent Radio KTKT 101.5. Each of these sponsors provided cash, goods, or services in excess of \$3000. The board still contributed some of the funding for the program and held onto enough savings to provide a financial cushion in the event of future lean times. The board added a paid program manager position to its ranks in hopes of leveraging more funding for the program in the future.

The board continued to fund two field observer positions for Steve Reynaud and Travis Feist. The observations provided by Steve and Travis remain an invaluable asset to the avalanche center. Their data, analysis, and willingness to dig deep into the snowpack help make the avalanche forecasts more accurate across the entire forecast area.

On the Forest Service side of things Andy Anderson and Brandon Schwartz continued in their roles as permanent avalanche forecasters with the Tahoe National Forest. The implementation of these positions highlights the Forest's commitment to the program and its long-term importance. Monies from the Lake Tahoe Basin Management Unit (\$23,000), Region 5 (\$17,000), and Region 4 (\$6,650) echoed this message by providing 50% of funds to operate the program this year.

Over the course of the winter we issued five early season conditions updates and 147 daily avalanche advisories. These products covered the Sierra Nevada Range of California and Nevada from Yuba Pass south through the Lake Tahoe Basin and Carson Pass down to Ebbetts Pass. This spanned areas of the Tahoe National Forest, Humboldt-Toiyabe National Forest, Lake Tahoe Basin Management Unit, El Dorado National Forest, and Stanislaus National Forest.

This season website traffic increased in page views by 2.5% and unique visitors by 17% over the previous busiest year. A total of about 501,067 page views from 83,068 unique visitors were recorded this season. A new single day record of 14,247 page views was set on December 26, 2012.

We launched a new website in the middle of April, collaborating on the design and construction of unified overall appearance and presentation with other avalanche centers in Colorado, Idaho, Utah, and Wyoming. Our users continue to send us positive feedback on the accuracy, reliability, usefulness, and timeliness of the forecasts and other information provided by the avalanche center.

The winter of 2012/13 once again exhibited the fundraising and management strengths of the nonprofit Sierra Avalanche Center (SAC) in partnership with Tahoe National Forest. The proven business plan between these two organizations goes beyond typical Friends Group support with the SAC providing 50% of the avalanche center's total operating costs for the season. This ever-evolving relationship, executed through an annual operating plan and collection agreement, allows the SAC to collaborate with the Forest Service to provide continued avalanche center operations while collectively focusing on future development.

—Brandon Schwartz, forecaster

■ Eastern Sierra Avalanche Center - Inyo National Forest

THE WINTER THAT WASN'T

The winter of 2012/13 started out with great promise with early snow in November and December. December 2012 was the third wettest December in 30 years with over 18.5" of water equivalent and 146" of snow recorded in the Mammoth Basin and Mammoth Mountain. By the end of December, the Mammoth area received 65% of the winter's precipitation – but we didn't know that the winter was over.

By the end of January, all hope was abandoned for those hoping for a classic eastern Sierra winter with deep stable snowpacks and numerous multi-day storms. After December, one storm the second week of March provided a foot or so of fresh March powder. Otherwise, Pacific storms abandoned the eastern Sierra for the second year in a row. This time, lack of precipitation set records for dry conditions in January, February, and March.

BIG WATER, BIG AVALANCHES

From November 29 to December 3, 54" of snow accumulated at the study plot on Mammoth Mountain. Over 1.5" of rain fell, mixed with almost 8" of water equivalent. Rain fell up to 10,500'. Rapid loading of the snowpack from rain and high rates of snowfall resulted in a full-depth avalanche cycle, running on depth hoar formed from November snowfall. Six and eight foot crowns were common along high-elevation ridgetops.

A regional snow accumulation pattern emerged that continued throughout the winter. Due to a favorable topographic position that wrings moisture out of small, weak storms, the Mammoth area picked up a few inches of snow here and there throughout the winter. The forecast area south of Mammoth with high-elevation granite ridges blocked storms and received only 50% of average precipitation. On April 1, the traditional date of peak accumulation, the Mammoth area snowpack water content was about 80% of the long-term average and the southern Sierra is the driest since 1932.

WHEN WILL THIS END? It'll snow next week...

The January dry spell that California typically experiences lasted far longer than anyone expected – in fact, the dry spell produced one the driest winters on record for the eastern Sierra. The storm track favored the Tahoe area and northern California. Storms were measured in the inches rather than feet. In addition to being dry, cold temperatures persisted along with buried facet layers. January and February were record breaking dry AND cold with average temperatures similar to Bozeman, Montana. Inside sliders moving over a blocking high brought meager amounts of precipitation with northwest flow, leaving the Sierra dry. The interior and eastern Nevada mountain ranges had more snow than the southern portion of the forecast area.

The legacy of the December rains in the southern forecast area was two facet layers sandwiched between stout rain crusts. Ned Bair's Big Ass Beams – 3-6m extended column tests – provided plenty of cheap entertainment watching facets blow out above the rain crusts. And we thought facet blowouts were only observed in Craig's Wasatch videos.

Adding insult to dry conditions, record-breaking cold temperatures in January and February contributed to the facet machine. Pathetic storms dropped a few inches of snow that immediately became near-surface facets instead of familiar Sierra rounds. Subsequent small cold storms then buried the near-surface facets, creating thin facet-crust sandwiches throughout the upper snowpack in January, February, and early March. In mid-January, skiers descending a south-facing, wind-scoured slope in alpine terrain triggered a hard slab that failed on buried facets. One person took a ride, deployed her balloon bag, and stayed on top. Fortunately, no one was hurt.

Persistent weak layers were the culprit in all of the reported skier- and rider-triggered avalanches this winter. I'm sure there were many more than the three incidents that were reported. For perspective, fewer than 100-150 users a day visited the advisory area on winter weekends, so any avalanche incident here was celebrated as a break from the monotony of rounds and ECTXs. Recreational users were caught off guard when the forgiving and reliably stable snowpack proved unpredictable and reactive to human triggering many days after the last storm.

The day after 12-18 people skied a popular slope, a group with two local skiers and an aspiring ski guide followed a well-worn uptrack from the previous day when the slope collapsed. Two hundred feet above them, an R3 D3 soft-slab avalanche cracked and propagated 200'. No one was caught as the avalanche flowed 600 vertical feet downslope from their position below the crown.



A skier-triggered slide in March. In typical eastern Sierra backcountry form, the group heard the slope collapse and continued to ascend the skin track. Lucky.
Photo by Sue Burak

The local ski community reacted with disbelief – some folks didn't know they were in avalanche terrain, more sophisticated users attributed the avalanche to warming of the slab. Since large skier-triggered avalanches that occur on persistent weak layers are anomalous in the eastern Sierra, the avalanche provided a rare "teachable" moment for a few interested folks.

Ned Bair and I were keen to explore the idea that the slab had warmed enough to change its physical properties. Energy balance modeling showed the north-facing slope at 10,500' was losing energy during and after the storm. The warming effect was too small to account for any more than a secondary effect.

In most eastern Sierran winters, long periods of dry weather, moderate temperatures, and deep snowpacks form uninteresting, well-sintered slabs. Most of the avalanche activity is due to storm-snow instabilities. This season, long dry spells, very cold temperatures, and shallow snowpacks created tricky avalanche conditions. The winter of 2012/13 was a great year for snow science and my continuing education, thanks to Ned Bair. After December's storms, memorable powder days were few and quickly forgotten. The eastern Sierra spring corn show was ON for a short window, despite low snowpacks and skiers and riders and enjoying generally stable conditions in the steep chutes in the Tioga Pass area.

As of April 24, I wrote 61 advisories, 50% of which rated the avalanche danger as Moderate; buried persistent weak layers meant skier triggering was possible for most of January through March, despite days and weeks without precipitation. I teamed up with Ned Bair for two educational talks.

The long-range outlook for winter 2013/14 is for neutral El Niño-Southern Oscillation conditions. If the ENSO neutral conditions of the winter of 2012/13 are any indication of next winter's weather, anything could happen.

—Sue Burak, forecaster

■ Colorado Avalanche Information Center

The 2012/13 season marked the 40th year of avalanche forecasting in Colorado, and the eleventh annual Colorado Snow and Avalanche Workshop appropriately kicked off the season with a historical perspective. We willfully ignored predictions from NOAA for a less than stellar snow year, and began the season with high expectations for a deep, stable snowpack.

Colorado suffered through a long winter of deep persistent slab problems that haunted the backcountry until the end of April. Winter was slow to start, and limited snowfall and cold temperatures in November and December led to a weak foundation that struggled to support the new snow that finally arrived early in the new year. Most storm cycles from January through the end of April produced large, natural and human-triggered avalanches. Of the 3139 reported avalanches this season, many of them failed on deep, persistent weak layers.

We had several tragic accidents this season. A total of 100 people were caught in avalanches, with 15 complete burials and 11 deaths. The number of fatalities is sadly double our 10-year average of 5.4. There is no way to determine the true number of people caught or buried in avalanches each year, because

what's new



TAR received incredible photos of Christian Cabanilla's last ski days from photographer Cedric Bernardini: it was difficult to choose just one to publish, but here is our favorite. See story on page 11.

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SEASON SUMMARIES 2012/13

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This avalanche ran on April 18, 2013, with photo taken the next day by Brian Lazar. The location is off Ptarmigan Knob on a path called, ironically, Avalanche Bowl. Triggered by a skier, the weak layer was the usual suspect around here: depth hoar.

non-fatal avalanche incidents are increasingly underreported. However, of the 44 reported avalanche incidents, four are particularly notable.

The first of these accidents killed a 49-year-old professional ski patroller from the Snowmass ski area on December 30. The ski patroller was skiing alone in a permanently closed area and triggered a small (R1D1) unsupported slab that quickly ran through some timber and then over a large cliff, leaving the victim on the surface of the debris at the bottom. A search for the patroller was initiated when the victim did not respond to several radio calls. This is the second ski patroller in the last three years killed in Colorado by an avalanche while on the job.

A second ski area incident occurred on February 16, when a group of 14 riders and one ski patroller were conducting "directed skiing" in Montezuma Bowl at the Arapahoe Basin ski area. As the last member of the group descended to the ski patroller, a large (R3 D2.5) deep-slab avalanche released, catching all 15 members of the group. One person was completely buried, six members of the group were partially buried, and four people were injured. Miraculously no one was killed or seriously injured.

The third incident of note occurred on March 2, when both skiers in a group of two were caught in a large deep-slab avalanche near Cameron Pass in northern Colorado. A group of nearby backcountry skiers responded to the accident and located and extricated one skier. Unfortunately he had already perished. They could not locate the second skier, who was ultimately located by organized-rescue personnel who arrived on the scene a couple hours later. The rescue team located and began extricating the second skier only to be shocked by groans coming from underneath the snow. The response quickly turned from a recovery to a rescue. Rescuers finished digging out the second skier, who was in bad shape but still alive after being buried for nearly three hours. After a complicated evacuation, the survivor was flown to medical care and ultimately recovered from the minor physical injuries and severe hypothermia. It is unusual for victims to survive a critical burial of over an hour. To survive a burial of nearly three hours is rare and added a silver lining to an otherwise tragic accident.

Finally, on April 20, as most avalanche centers are closing down for the season, six backcountry tourers were ascending Sheep Creek near Loveland Pass when they were caught and buried in a large, deep-slab avalanche. Five members of the group were killed, and the sixth survived a four-hour partial burial. He was finally located and dug out by responding rescuers.



A view of the dramatic crown in the Sheep Creek avalanche of April 20 at Loveland Pass. Watch for an analysis of this accident in an upcoming TAR. *Photo by Brian Lazar*

Details on these and other avalanche accidents across the state can be found on our website, www.colorado.gov/avalanche. There are a couple interesting side notes from the 44 incidents that were reported. Thirteen people were caught in avalanches preparing to ascend, or while ascending in avalanche terrain. This is roughly 30% of the people reported caught this past season. In addition, five ski patrollers were caught in avalanches while working. One of the ski patrollers was killed (Snowmass) and another was injured (Crested Butte).

By May 1, the deep-slab problem finally began to subside, leaving only thousands of shallow wet slabs and wet loose avalanches to count as winter finally departed in June. It was one of our best spring ski seasons across northern Colorado in memory, as ample April snowfall led many ski areas to reopen. Corn skiing was excellent through June and into July.

It will be interesting to see what year 41 has in store for our forecast center; here's hoping everyone has above-average snowfall for the 2013/14 season.

—*Scott Toepfer, forecaster*



Mark Staples conducts a quick stability test near West Yellowstone, MT. With good sleds we can dig countless pits and see endless terrain in a single field day. *Photo by Dave Brown*

■ Gallatin National Forest Avalanche Center

We just wrapped up our 23rd season at the Gallatin National Forest Avalanche Center, one of the best winters ever: lots of snow, good stability, and no fatalities. It has been nine years since we've had this combination. Plentiful early snow, drenching rain, and warm temperatures set the stage for a strong snowpack with a dense foundation for the rest of the year. There were no avalanche fatalities and about half as many reported avalanche incidents than the previous year. Luck was certainly a factor but so were snowpack conditions. Avalanches tended to be smaller and shallower than in years past. In at least one area the danger was High only 8% of the time and Low 40% of the time.

In southwest Montana the snowpack began building around October 20. On the last weekend of October, the Bridger Range received 18-24" of new snow, and three skiers were caught in an avalanche. The following day, October 29, most areas received heavy rain that saturated the snowpack. By Halloween trick-or-treaters were strolling through Bozeman in warm sunshine instead of below-zero, depth-hoar-forming temperatures. November brought colder weather that refroze the snowpack and created a thick layer of strong snow at the ground. Snowfall continued through November, and the snowpack tripled in snow-water equivalent (SWE) throughout the advisory area.

Snowfall really took off in the month of December with 4" of SWE falling in the mountains near Bozeman, 7" of SWE near West Yellowstone, and 10" of SWE near Cooke City. The snowpack easily supported this loading with surprisingly few avalanches. During December the avalanche danger was High only once, a stark contrast to most seasons. While the snowpack was strong on most slopes, some avalanches did occur in weaker areas where less snow had accumulated.

Snowfall ended at the start of January and the danger quickly dropped to Low. Most of January was dry and cold, forming small facets at the snow surface and some depth hoar where the snowpack was thin. One exception was the second week of January that featured a large storm and a short-lived Avalanche Warning and High danger. Snowfall returned more consistently at the end of the month building a slab on top of a variety of near-surface weak layers. With these facets lurking on most slopes the danger remained elevated during February but never spiked too high as there were no major storms or wind events. Two separate, non-fatal accidents occurred in February on these faceted layers.

Dry snow avalanche activity limped along until mid-March when conditions warmed well above freezing for about three days. During this time both wet loose and wet slab natural avalanches occurred. By March 17, the snowpack refroze and stability quickly improved. More wet avalanches occurred when temperatures warmed again at the end of March. By the last advisory on April 7, cold temperatures returned and refroze the snowpack. New snow fell and bonded well to the underlying ice crust creating stable conditions and good riding.

A quick review of the numbers: We averaged 4491 people per day receiving or accessing the daily advisory. Our website had 490,000 unique page views with folks averaging 2:18 minutes on the site. We had 98 field days, dug 129 snowpits, and performed 137 stability tests. Between us and the Friends, we taught 67 classes to 3473 people of whom 658 were snowmobilers. Jay Pape, the Friends education coordinator, was instrumental in managing our programs. A new field course this year was Companion Rescue which ran about a half day. We offered it several times to both skiers and sledgers. For the fourth year in a row we hosted a Professional Development Workshop for avalanche professionals. The workshop



Snowmobilers in a class near West Yellowstone, MT, find stable snow in a class co-taught by the Gallatin and Bridger-Teton Centers. Photo by Eric Knoff

was supported by the AAA, and we again filmed and posted all nine lectures on YouTube (see the workshop review on page 10).

We continue to receive strong support from both Gallatin National Forest and the local community. 57% of our funding came from the Gallatin NF. Both the Friends and Montana Fish, Wildlife & Parks contributed over \$40K each. Many other businesses and organizations including ski patrols at Big Sky, Bridger, Moonlight, and the Yellowstone Club made significant contributions. For the eighth year running, Yamaha put us on their snowmobiles through Cooke City Motorsports, but this season we entered the realm of turbocharged snowmobiles, a definite game changer.

On April 7 we issued our 136th and final avalanche advisory and closed the doors. Running the GNFAC is a community effort relying on volunteers and broad financial support for our daily operations. The Friends of the GNFAC continue to play a huge role in fundraising and avalanche education. We are indebted to the recreation community and local businesses for supporting the Friends every year. The success of the GNFAC is a direct reflection of these strong local ties.

—Mark Staples, forecaster



Mt Shasta Avalanche Center forecaster Nick Meyers skis Crater Lake National Park during a considerable/high avalanche danger day. We were able to kick off a decent-size wind slab that day and thus decided to just tease the edge of the trees. While we don't specifically forecast for Crater Lake, the snowpack is generally very similar to ours. Photo by Garrett Smith

■ Mt Shasta Avalanche Center

Mt Shasta: US Snowstorm Record in Jeopardy, read local and national media outlets as December was just getting underway. Northern California snow freaks were freaking... was this the whopping winter we'd all been waiting for, albeit impatiently, for years? A storm was on its way, and all were hopeful that it would be the canary in the coal mine indicator for what the rest of the winter held in store.

Leading up to this point, September and October were warm and dry with September recording exactly zero precipitation. November remained warmer than



Our bi-annual interagency helicopter training day is spent conducting flights on Mt Shasta and practicing ground exercises with Siskiyou County Search and Rescue, CAL Fire, Army National Guard, USFS, and local guides. Photo by Brett Wagenheim

normal with almost double normal precipitation values, 9.16" vs 5.08". A local weather co-op observed the second wettest November on record. In fact, during a four-day period, nearby Shasta Lake recorded 13.57" of rain. In one day, the reservoir rose nearly seven feet with an inflow of almost 75,000 cfs!

According to the National Weather Service, Mt Shasta was supposed to get between 171-213" of snow over a four-day period that ended on December 2. That's 14' to nearly 18' of snow. The previous world record was 189" over six days in 1959, measured in the Old Ski Bowl at approximately 8000'.

Mother Nature's record-breaking attempt failed. At the Old Ski Bowl weather station, snowfall totals were near 100" after the storm. Not bad, but about half of what was expected. December began warm and wet, but temperatures cooled and brought snow to very low elevations for the second half of the month. On December 20, a storm brought about 30-50" of fresh snow over a four-day period and gave us our most pervasive avalanche activity of the season. Naturally triggered storm- and wind-slab avalanches were widespread on multiple aspects in the forecast area. Persistent, deep facet layers were the common weakness with most of the slides. The two fatality slides that happened in our nearby friends' territory, the Sierra Avalanche Center's Lake Tahoe area, also occurred on these same persistent deep facet layers.



Nick Meyers digs a pit on east aspect of Grey Butte at 7,500'. Photo by Hanne Meyers

The year 2012 came to a close and as 2013 came into existence, many were feeling exalted. The snowpack was thick for this time of year and winter was off to a grand start. Allow me to now choose a few words to describe the rest of the season: flounder, fade... uh, rain check! January was below normal in precipitation with a long period of high pressure that kept our faces brown and survival skiing at its best. Scattered storms for the remaining portion of the season brought us glimpses of winter weather and windy conditions, but nothing to write home about. California and the Sierra Nevada recorded the driest January and February on record. For the period September 1, 2012 through April 1, 2013, Mt. Shasta sits at 70% of normal. For 2013, we are at 23% of normal.

Mt Shasta Avalanche Center, despite a somewhat dry winter, experienced some positive changes. With the help of Sierra Avalanche Center, we launched a new website in mid-February. Steady progress is being made to adjust the site to fit our avalanche and climbing information needs. MSAC issued a total of 54 advisories this year and continues to issue them Friday through Sunday. November 1 through April 1, the site saw 39,489 visits and 17,533 unique visits. We had 58.57% returning visitors and 41.43% new visitors.

We have maintained our free avalanche awareness presentations and transceiver clinics, once a month, December through March. Education remains a large focus. This season a total of 389 people (65 hours) were educated about avalanches and transceiver use; 64 of the 389 were under 18 years of age. While MSAC has conducted snowmobile-specific avalanche awareness/transceiver clinics in the past, it's been a number of years. This year we put on a snowmobile-specific one-day course and had fantastic attendance. 28 riders came out and began the day with a 1.5-hour indoor presentation and then proceeded onto the mountain for an afternoon of beacon searches, great discussion, and scenarios. MSAC looks forward to continuing to reach out to snowmobilers and hosting this training day next year. Other highlights include special avalanche and winter travel training for Southern Oregon University students, Mt Shasta Ski Park ski patrol, and Siskiyou County Search & Rescue. MSAC always works in close cooperation with Siskiyou County SAR in all mountain-rescue incidents.

On the Friends (FMSAC) side of things, some change occurred. FMSAC Executive Director Keith Potts resigned. After advertising in October and November, Adam Teel was hired as the new ED/part-time forecaster. Adam comes from Utah and has great snow experience from patrolling at Solitude Mountain Resort and good energy toward directing the board. The board saw two other resignations, but gained five new youthful, full-of-energy board members. Federal funds continue to be unavailable to provide a second forecaster through the Forest Service. The plan first implemented last year that allowed a seasonal forecaster to be paid by the Friends group but work as a volunteer for the Forest Service continued this season. Adam served that position by working 15-20 hours per week assisting Forest Service Avalanche Specialist Nick Meyers in forecasting, field observations,

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I decided to bivy on the summit of Shasta on my 30th birthday. With the clouds and sun, we had quite the photo session. Didn't sleep worth shit, but had a great time and witnessed some weird lights in the sky. Photo by Brett Wagenheim

SEASON SUMMARIES 2012/13

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avalanche awareness training, and public outreach. The annual Snow Ball fundraiser saw incredible attendance this year. A full house of stoke brought in record dollar amounts, and it was great to have the event back in Mt Shasta city limits.

Nick Meyers, the lead climbing ranger and director of MSAC had the opportunity to attend a professional development workshop in Bozeman, MT. The Gallatin National Forest Avalanche Center hosted a one-day workshop on the theme, *Lessons Learned*. Nick contacted Doug Chabot and was invited to the workshop and asked to present a story. Day one was spent at the workshop, followed by four days of shadowing GNFAAC forecasters. Nick says, "The workshop was fantastic. I think my presentation went well, and my time in Bozeman with the Gallatin boys was awesome. Being around all of their experience was invaluable, and I hope to go back next year! I want to thank the Forest Service, FMSAC, and GNFAAC for allowing the trip to become a reality." Nick continues to enjoy his position and is excited to further his avalanche knowledge to no end.

Looking ahead, goals and ideas for the 2013/14 winter season include upgrading the weather station communication to avoid gaps/delays in data, potentially adding one more weather station on the east side of Mt Shasta, continuing to hone the new website, increasing snowmobile avalanche awareness classes, acquiring an advisory text editor to help improve writing skills, starting a weekly newspaper column, applying for grants, and lastly, continuing to strive for a second Forest Service forecaster position.

—Nick Meyers, director

■ West Central Montana Avalanche Center

The West Central Montana Avalanche Center (WCMAC) enjoyed a successful winter characterized by better-than-usual stability, very good skiing and riding conditions, and great community support.

In early 2012, the center lost a \$20,000 grant that has been an integral funding component for our education and advisory programs. The Lolo National Forest, our host agency, eliminated a \$5000 avalanche center operating budget due to continued loss of recreation program monies. We were initially concerned that much of our education effort and advisory days would have to be cut severely to meet this funding shortfall.

But our Friends organization, the West Central Montana Avalanche Foundation (WCMAF aka missoulaavalanche.org), stepped up and contributed \$20,000 to cover this lost grant. This allowed us to continue offering free public avalanche awareness, companion rescue, and other avalanche-safety programs as well as a basic avalanche-awareness program in local middle to high school science classes.

Early season snowfall was nearly nonexistent in western Montana valleys but exceptional above 6000'. Warm, wet early storms and continued moderate temperatures gave us the most stable conditions we've seen in a long time.

An early January cold dry period allowed surface hoar and near surface facets to set the stage for our first and only avalanche warning issued on January 9 after a warm, wet storm dropped up to 20" of storm snow on this weak layer.

This was soon followed by the first and only avalanche accident (that we are aware of) which occurred on January 14 near Montana Snowbowl in a backcountry area easily accessed from the resort. The individual triggered a storm slab in a small opening on a steep, treed slope, was strained through trees, and completely buried against a large spruce tree. His partner found him within a couple of minutes, dug his head free, and assured that he was able to breath on his own. He sustained a minor injury to his leg and was able to skin out of the area under his own power. (see photo spread, below)

The rest of the winter was mostly uneventful, and we stayed busy providing avalanche safety classes to a variety of groups. Our season ended on April 5, with 85-90% of average total snowpack in the western Montana mountains.

Winter 2012/13 - Education

- 22 public classes
- 14 one-hour to three-hour awareness classes
- 3 16-hour advanced awareness classes with a field component
- 4 Level 1 classes
- 403 participants
- 124 snowmobilers attended five classes tailored for snowmobilers
- 412 middle to high school students attended an avalanche awareness class
- 939 western Montana residents attended an avalanche class

Avalanche Advisory:

- 34 advisories issued: started December 14 and ended April 5
- 3 early season and 1 post-season information updates posted
- 1 avalanche warning issued (January 9-10)
- 25,433 advisory page visits (November 1 - April 15)
- 748 average number of advisory viewers



January 14 avalanche incident site near Montana Snowbowl. One backcountry skier was pinned and completely buried against a tree, yet sustained only minor injuries. Photos by Steve Karkanen, except for the pic of Steve and the crown taken by Dudley Improta

- 298 email subscribers
- 121 Twitter followers
- 250 average number of Facebook viewers of each post
- 12 YouTube videos uploaded, viewed 1905 times

Funding:

- Friends group funds Avalanche Center operations \$20,000
- In-kind agency contributions estimated at \$35,000 (11 Forest Service employees contributed 16 days each)
- NOAA Missoula Weather in-kind contributions estimated at \$15,000 (110 backcountry weather forecasts requiring 4 hours prep time for 1 GS12 forecaster)
- Friends group in-kind contributions \$5500 (instructor services and misc education expenses)
- Pray for Snow Party at Caras Park in early October raised over \$7000 for the WCMAF
- The Kettlehouse Brewery Community Unite Pint Nite benefit netted over \$2000 for WCMAF
- Montana Snowbowl ski patrol (National Ski Patrol system) donated \$1000 of their license plate earnings to WCMAF
- WCMAF received \$12,000 Recreation Trails Program Grant from Montana Fish, Wildlife & Parks for avalanche -safety information and education programs which will be used to support avalanche safety education during winter 2013/14

Accidents/Incidents:

- 1 full burial with minor injury - January 14 on Point Six
- 2 minor incidents with potential (caught but not buried) reported to the center

—Steve Karkanen, director



Max Forgensi stitches together a panorama of this crown/ bed surface/ block composition in the LaSals.

■ Utah Avalanche Center - Moab

The Utah Avalanche Center-Moab opened its doors on December 3 and was in full swing by the 15th of December, issuing at least two advisories a week until the 9th of March, when "other duties as assigned" prioritized over forecasting, yet the snow continued to fall through the beginning of May. UAC-Moab had 15 volunteers contribute 360 hours of time to assist Max Forgensi as field partners, and seven classes were held which taught 96 students. Observers submitted observations through the website more than ever before, and the Utah Avalanche Center-Moab Facebook page extended avalanche information into the social media arena.

Stability throughout the season was better than our northern San Juan counterparts and allowed for field days to travel into seldom-visited locations with above-average snow quality. The incredible spring coverage has allowed new lines to be pioneered, and although attempted, a single push across the entire La Sal massif has yet to be accomplished on skis.

—Max Forgensi, forecaster ❄️



45 degrees at crown



View down slide path



Burial site

Non-Agency Avalanche Centers 2012/13 Season Summaries

The following avalanche centers are nonprofit, volunteer-based information centers who have met the standards to be listed as such on www.avalanche.org.



December 3, 2012: 4" deep soft slab remotely triggered from several hundred feet away. This slide highlighted the reactive the layer of near surface facets that formed during November's dry spell and was well-preserved on northerly aspects prior to the December storm cycle. SS-ASr-R2/D1-I
Photo by Drew Holbrook

■ Crested Butte Avalanche Center

Following a prolonged dry spell and facet-forming November, the snow guns were pointed at our corner of the Elk Mountains through December. Constant storms dropped over 7.0" SWE in favored zones. Touchy persistent weak layers and obvious signs of instability (*see photo, above*) kept most skiers and riders on low-angle terrain or seeking refuge on southerly aspects that were dirt prior to December storms, and our snowiest month and most active cycle of the season passed without any reported incidents.

The onslaught of heavy snowfall and avalanche activity subsided around the New Year. With 20 days of high pressure in January, we braced ourselves for a long period of "Scary Moderate" advisories warning of low-likelihood/high-consequence persistent slabs. Perhaps our most effective tool in educating the public about this threat was when one of our forecasters remotely triggered a slide to the ground (*see photo, below*). The frightening crown up to 8' deep was plainly visible from town and made our jobs easier as it glared down on locals.

It is amazing how quickly snow will rot in Colorado when it is not snowing. Toward the end of January, many lower elevation slopes had metamorphosed to all facets. We started warning skiers and riders of potentially large "facet sluffs"

entraining the entire season's snowpack, a type of avalanche that doesn't quite fit into our current list of avalanche problems (*see photo, below*). I propose new SWAG code, such as LSP (Loose-Shit-Pile) or DBS (Don't-Bother-Skiing).

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December 31, 2013: Remotely triggered persistent slab in Coon Basin with crown depths upwards of 8' deep. The slide was in plain view from town and served as a good reminder of lurking weak layers. SS-ASr-R3/D2.5-O
Photo by Josh Hirshberg



January 17, 2013: Skier-triggered "facet sluffs" on low-elevation northerly slopes. LSP-ASc-R2/D2-G
Photo by Roman Kolodziej



April 15, 2013: Deep-slab avalanches in Redwell Basin following a major spring storm. HS-N-R3/D3-O Photo by Pete Sowar

NON-AGENCY SUMMARIES 2012/13

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The January dry spell ended uneventfully but left us with a fresh coat of widespread persistent weak layers. Southerly aspects joined the game as well by serving up a not-so-tasty crust/facet sandwich.

In the last five days of January, upwards of 55" of new snow (3.5" of SWE) clobbered the Elk Mountains, and the danger spiked back to high for two days. Avalanches were widespread around the rose, with a number of close calls involving backcountry users and 33 reported human-triggered slides. A skier triggered a 10' deep slab and managed to grab a tree to avoid getting swept downslope.

Small but steady doses of snow through all of February kept considerable danger present somewhere on the rose through the entire month. All of the slides reported in the last three weeks of February involved just storm snow or windslabs. While the northern half of Colorado was in a deep-slab cycle, our zone held a relatively deeper and stronger snowpack from favorable December storms and was holding tough under gradual loads.

Spring weather arrived in March with a mix of warm, sunny days and several short but potent storms. Two prolonged warm-ups initiated some wet-slab activity (see photo, below). Approximately 6" of SWE fell in March, and with each major storm, we'd receive one or two observations of persistent slabs failing near the ground along with the usual storm instabilities. The problem had reduced to higher elevation slopes on northerly aspects (see snowpit profile, below).

A 12-day lull in snow and windloading with cooler temperatures allowed us to trim the danger to low by early April. Skiers and riders were enjoying big lines in the Elk Mountains. The jet stream quickly snuffed out all green lights by lining up directly over Colorado. The mountains picked up over 3.5" of SWE between April 9 and April 15. The heavy snowfall was accompanied by the strongest winds of the season and lots of dust. Numerous wind-slab avalanches failed up to four feet deep, and several natural deep-slab avalanches ran on northerly alpine bowls (see photo, above). Due to all of the avalanche activity in mid-April, we extended our forecast season two weeks. The season ended with the Gunnison River Basin reaching approximately 80% of its average peak in snow-water equivalent.

We feel fortunate that only a couple of incidents and no fatalities occurred during this challenging season and applaud our community for the constant stream of observations. We published 339 snow and avalanche observations – nearly twice what more populated forecast zones around the state receive.

2012/13 Challenges, Successes, and Deep Persistent Thoughts

We continue to struggle with putting our square avalanche problem pegs into the round danger scale holes. To ease the headache, we tossed around terms like "Moderable" with fellow forecasters. Which of our three columns from the danger scale (travel advice, likelihood, or size/distribution) takes trump when reality doesn't nicely fit? From discussions with forecasters around the country, I found that we aren't all in unison on what a loose term like "large avalanches" in the danger scale really means.

It is a constant challenge to forecast one danger and one problem list for the two different snow climates that our topography lends itself to. Our western zone gets battered by storms with an almost Wasatch-type snowpack, while the easier accessed peaks near town sit in the rain shadow with purebred Colorado characteristics. By late December, we knew some slopes in Ruby Range were holding stubborn deep slabs over 10' deep, while areas near town had 18" touchy persistent slabs on the same weak layer. We addressed this by describing both types of problems under one persistent-slab icon and conveying what subtleties we could within our text. Our transition from the persistent-slab icon to deep persistent slab was certainly not black and white, and it was fraught with many lengthy email threads between our staff and forecasters around the state.

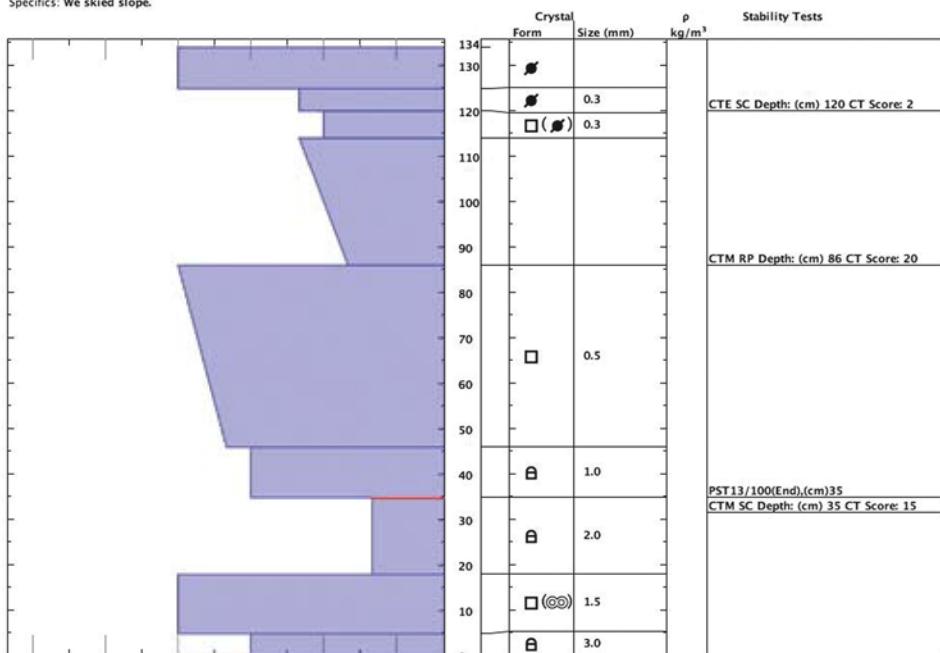
This year our forecasting staff focused on incorporating more media into our product: we produced 10 YouTube videos and published 84 photos to help illustrate avalanche problems or snowpack structure. We received lots of positive feedback from the community, with over 9000 online YouTube views. One of the videos was featured on Colorado Channel 9 News. Other successful outreach projects included several trailhead days, an ambassador team, awareness night, and other fundraising events.

—Zach Guy, forecaster



March, 2013: A destructive wet slab that failed at the ground sometime during March warm-up in Rustler's Gulch. WS-N-R4/D3.5-G Photo by Zach Guy

Snow Pit Profile	Observer: Joshua Hirshberg	Stability on similar slopes:	PF40 HS150	Layer notes:
Chrystal Peak	Wed Mar 27 14:00:00 MDT 2013	Air Temperature: -8.3 C	Stability Test Notes:	18-35: Problematic Layer
Elk Mtns, CO	Co-ord: N W	Sky Cover: sky 4/8 to 8/8 covered	35: Deep Tap not CT	
Elevation (ft) 12280	Slope: 35	Precipitation: None		
Aspect: 25	Wind loading: yes	Wind: W Light Breeze		
Specifics: We skied slope.				



Notes: This slope slid 14 days later. Pit location is close to the lookers right side of crown.

March 27, 2013: Snow profile from Crystal Peak on a north-facing aspect above treeline, illustrating the deep-slab problem. The location of the pit was wiped out two weeks and several storms later when a snowmobiler triggered the whole slope.

Valdez Avalanche Center

The Valdez Avalanche Center started producing regular bulletins in October and did so until June, as it has done each winter since 2006.

Before ISSW last September, enthusiasts were still riding the previous season's snow. The heavy rains during ISSW contributed to September's 26" of rain in Valdez. This briefly built a snowpack that riders took advantage of in early October. It proved too good to be true as warm temperatures in mid-October did a fantastic melt job up to 5000'. High pressure in November and December brought cold temperatures and outflow wind to finish off any snow we had hopes of riding. It wasn't until late December that a few storms dumped the snow needed to provide coverage and decent conditions. January brought a number of storms that totaled 93.5" of snow with 10.96" of water equivalent. February and March brought equal doses of onshore storms and outflow wind periods, while temperatures remained cool. A few locals encountered close-call avalanches in February: one was a remotely triggered size 2 to ground, the other was a cornice drop that triggered a deep slab that barreled a size 3 avalanche down on climbers below. At the end of April, Valdez continued to set records for April's deepest snowpack with six feet of snow at sea level.

This season marked the fifth annual avalanche center FUNdraiser as well as the Thompson Pass Snowkite Festival, Tailgate Alaska World Freeride Championships, and the 23rd Annual Valdez Mountain Man Hill Climb presented by the Valdez Snowmachine Club.

—Peter Carter, forecaster



WAC board member Paul Arentsen leads a group of grade school students on a field session studying snow layering and safe travel techniques. *Photo by Lorna Cook*



The KPAC season was typified by wind scouring of upper-elevation terrain. This photo also displays David Lovejoy, ski patroller, avalanche educator, and mentor, surrounded by San Francisco Peak's characteristic dose of wind rime. *Photo by Derik Spice*

■ Wallowa Avalanche Center

The majority of our 22 weekly advisories, beginning on November 21 and developed by staff at the Wallowa Avalanche Center (WAC), described a snowpack somewhat less reactive than during previous years. Avalanche activity reflected this with lower numbers of human-triggered and natural avalanches reported. As we enjoyed Thanksgiving dinner, the upper elevations were sporting about 18" of snow cover. This began changing immediately with small to mid-size storms coming through at regular intervals until the pre-Christmas week winds began in earnest. I'll take three helpings of wind slab, please, with two helpings of wind scour.

Early January provided a good shot of snowfall with clearing and warming temps for the remainder of January. Mid-February provided a noticeable strengthening of our snowpack with relatively quiet warmer weather. Late February through early March brought much-needed snow and the "Wind-lows" lived up to their nickname as the snow was blown to northwest Montana. Average weather events concluded our reporting season on April 12, 2013.

Weekly bulletins were written by Keith, Julian, and Michael Hatch – providing a welcome variation in style and content. Michael wrote the bulk of the bulletins and played a huge part as our education coordinator, conducting the majority of our educational events and our L1 and L2 courses. He further expanded our awareness lecture outreach to include more snowmobile audiences and a lecture at Whitman College in southeast Washington. Many Whitman College students frequent the Wallowas.

For a second year we continue to strengthen our relationship with Eastern Oregon University (EOU). WAC and EOU professor Brian Sather developed an avalanche intern program whereby EOU senior Trent Manns provided much-needed support and assistance to WAC staff. In return, Trent continued to further his avalanche education attending a L2 course sponsored by WAC, providing many backcountry observations, assisting in our lecture circuit, and writing a weekly bulletin with staff oversight. Jerry Isaac of EOU's Outdoor Program launched the first annual Eastern Oregon Backcountry Festival. This multi-day event appealed to backcountry travelers with films, on-snow events, human-powered races, clinics, and tours. Proceeds from the event were donated to WAC.

Julian, as deputy director representing WAC, developed a new three-hour workshop delving into the backcountry communications aspect of human factors. Thanks to his experience and teaching credentials in the airline industry studying communication errors in the cockpit, he was approached by the Friends of NWAC to create this backcountry mountaineering workshop, which was well received in Seattle and Portland, as part of the *Going Deep* series. Friends of NWAC provided WAC with a handsome donation for Julian's effort. Beginning with a short lecture, the program segued to participants filling out a survey to get an idea of their own communication style. Later in the workshop, participants applied skills in small groups with a mock real-life scenario that required consensus on a complex route-finding problem.

The WAC board of directors is placing increased emphasis on reaching children at the youngest age possible to instill a lifelong appreciation for avalanche safety. A grade school avalanche curriculum developed by WAC focuses on three topics: safe travel protocol, basic snow layering and weather, and beacon introduction. We continue to develop tools and on-snow activities that grab and hold the attention of younger minds. The success of this program reaching out to these 28 students motivates WAC to make this age group a continuing future priority.

—Keith Stebbings, director

■ Kachina Peaks Avalanche Center

Despite below-average snowfall – 84% of the 30-year mean – the timing and productivity of the storms made our winter feel quite robust. By season's end, a total of 219" (547.5cm) had fallen at 10,800'. Storm winds, and especially post-storm northerly winds in excess of 60mph, once again characterized much of our winter. Snow cover was stripped clean from wind-exposed starting zones throughout most of the season. The wind confined our avalanche problem mainly to isolated pockets of wind slab, while a lot of our high-elevation snow returned to the atmosphere through sublimation.

Snow started falling in late November and early December with a succession of three storms between Thanksgiving and December 18, dropping 56" of snow at

the 10,800' study plot. Post-storm wind immediately scoured much of the high-elevation coverage on north, northwest, and northeast aspects above tree line. Between Christmas and New Year's Eve another 32" (80cm) of snow fell, followed by more ridgetop winds from the north at 80-100mph.

Much of January was dry, with highly variable temperatures and a couple of short-wave troughs bringing wind and a little new snow. During January 11-15, polar air encroached, bringing some of the coldest weather in more than 20 years. Flagstaff's airport recorded a low of -9°F (-23°C). Predictably, basal faceting ran rampant on all snow-covered slopes. January's big event was an unseasonably warm storm that started with rain at elevations below 11,200' and resulted in 33" (82.5cm) of high-density glop (3.5+ SWE) in 72 hours. This storm was responsible for our only significant natural avalanche cycle all winter. On January 27, the Coconino County Sheriff's Office issued a winter hazard advisory. The conditions resulted in several natural avalanches in the Inner Basin, including the Heck Yeah Chutes and Jay's Slide on Fremont Peak (*see photo*) which avalanched to the ground. Snow continued to fall, and by month's end, storm-cycle totals were at around 4' (96cm).

February started out dry, but then a cold storm dropped 36" (90cm) of powder snow (4-7% water). This was followed by several days of unseasonably warm weather, providing the catalyst for worrisome near-surface faceting associated with newly formed surface crusts (*see image*). Several slow-moving cold troughs and some wind piled on another 23" (57.5cm) of low-density snow. Thankfully, only about 3/4" of SWE was measured at our 9,730' Snowslide SNOTEL station. Perhaps due to the lack of threshold loading, what we speculated might result in a dangerous sandwich never produced natural or skier-triggered avalanches.

During March, temperature gradients within the snowpack were lost, not only from the upper pack but throughout, as springtime warmth and near-isothermal conditions developed. A warm spell at the beginning of the month produced some wet-snow avalanches, but no major wet slabs were reported. The season ended with more wind, variable temperatures, and a few flurries as mid-latitude cyclonic storms passed to our north.

Our avalanche problems were almost exclusively wind slab and storm snow. Our only natural avalanche cycle occurred in late January with rapid loading of high-density snow (and rain) on a faceted shallow snowpack. No avalanche accidents were reported. Several small skier-triggered avalanches occurred. Coconino County Search and Rescue only responded to three winter backcountry missions on San Francisco Peaks, a record low for a reasonably good snow year. Hopefully, this was at least partly attributable to KPAC's ongoing educational efforts.

New this year was a more systematic tracking of the snowpack in conjunction with weekly summaries of snowpack conditions. Snowpack summaries in bulletin format were posted on our website by Friday afternoons to benefit accelerated weekend activity, with updates as needed after big storms. We posted 16 bulletins between December 21 and March 22, all archived on www.kachinapeaks.org.

Despite some pretty bony high-elevation conditions from wind stripping, and a loss of low-elevation approach snow during the January 24 rain event, significant backcountry activity took place. Some of the best skiing was accessed from the Arizona Snowbowl ski resort via open gates to the south-side gullies below tree line, or by booting to the ridge and skiing Inner Basin where wind-protected high-elevation terrain could be found.

Backcountry activity was quantified by two methods:

1) There were 726 winter backcountry permits issued this winter.

2) This year personnel for the Flagstaff District of the Coconino National Forest installed and collected data from an infrared trail counter at the south side backcountry access gate at the top of Arizona Snowbowl. According to the counter there were 19 days when more than 50 skiers or snowboarders were recorded, and eight days with more than 100. The record was set on February 26 when 340 were counted following 23" of new snow. This data will help track future trends for out-of-bounds skiing and riding activity.

Between December 1 and April 21, www.kachinapeaks.org had 18,776 page-views by 3976 unique visitors. Our public discussion/observation boards had 29,878 page views by 1420 unique visitors. Our new weekly snowpack

Continued on next page ➡

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GOING METRIC

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3. The role of forecast centers.

Perhaps I live in the bubble of the Utah Avalanche Center (UAC), but I believe forecasting operations not only need to effectively communicate avalanche hazards, but also provide avalanche education as a part of daily advisories as well as other products. As an example, UAC forecasters will not only mention existence of a persistent weak layer, but will also describe the very factors that led to its formation. If we want to both inform and educate the general public, it is best explained in units that are standardized throughout our profession as well as the world.

Of course some mixing of imperial and SI is still necessary. The following identifies four different areas where SI or imperial units may be used:

Meteorological data

Mostly imperial, but whenever possible report temperature in SI, as Celsius is standard for temperature profiles as well as partially explaining snow metamorphism. I recognize this may be difficult as many automated weather observations often arrive in imperial units.

Elevation

Imperial. All topographic maps use feet, and there is no reason to challenge this.

Avalanche dimensions

This is a tricky one as many find measuring large distances in meters quite challenging. However, unless one is using a precise measurement tool (such as a rope or GPS), accuracy often suffers regardless of whether the guess is in SI or imperial. I would argue for SI whenever possible.

Distances at or below the snow surface

This is perhaps the most important area where reporting needs to be done in SI units. If we ideally want backcountry travelers to ultimately conduct their own snow observations and stability tests, all communication must be done in SI, as we cloud the conduction and analysis of these tests by mixing SI and imperial where imperial has no role in formal snowpack tests and stability measurements.

I recognize adopting this practice challenges the belief that avalanche advisories and other similar products must be reported as unambiguously as possible, yet I also think the user base is more prepared to adopt SI than we may think. Skiers and snowboarders all seemingly understand gear specifications in centimeters, and climbers understand rope lengths in meters. I also realize most of us were raised in – and still live in – an imperial world. With this in mind, from some successful experiences, I would like to offer a few suggestions that may ease such a transition:

When reporting in SI units, do the translation for the reader by also including the equivalent imperial measurement in parentheses. For an avalanche advisory, this may mean reporting “25cm (10”) of snow fell overnight,” “overnight lows are expected to dip to -15°C (5°F),” or “a layer of surface hoar is still being found down 60-75cm (24-30”) beneath the snow surface.” I also provide some simple rules for my students: their probe pole likely has markings in centimeters, that 30cm is about a foot, a meter is a few inches longer than a yard, and if you form the letter C between your thumb and middle finger, its width is about 15cm. These may all sound somewhat silly and even arbitrary, but students have indicated they have found these helpful as they try to wrap their heads around metric measurements.

I am curious how you feel about this topic. Is this an UN-inspired conspiracy, lofty but impractical, or an idea whose time has come and is worthy of consideration? I welcome your thoughts.

Greg Gagne's day job is computer science professor at Westminster College, but you can also find him in the Wasatch backcountry about 75 days each season where he moonlights as an avalanche educator as well as providing field observations (in metric of course!) for the Utah Avalanche Center. He can be reached at ggagne@westminstercollege.edu and @greg_gagne. The author would like to thank Ethan Greene for his invaluable insight as he prepared this story. ❄️



David Lovejoy gets deep into Level 1 curriculum on Dutchman's Path, February 10, 2013.

Photo by Derik Spice

NON-AGENCY 2012/13

continued from previous page

summary page had 3487 page views by 1439 unique visitors. The average time spent on the snowpack summary page was over three minutes.

KPAC, in affiliation with Prescott College and Arizona Snowbowl ski resort, ran five Level 1 avalanche courses for a record-breaking 44 students. We offered four \$200 scholarships to students enrolled using funds raised at our annual Mikee Linville Scholarship Fundraiser. We also conducted two “Introduction to Avalanches” clinics for approximately 65 participants. We continued our involvement with Flagstaff Festival of Science, running our popular avalanche simulator at the Science in the Park event for hundreds of local schoolchildren.

—David Lovejoy & Troy Marino ❄️