

THE AVALANCHE REVIEW



ON THIS DAY IN FEBRUARY, my wife and I had brought some friends out to ski and enjoy the amazing views of Shasta as seen from the top of Ash Creek Butte (8,378 ft), but kept getting stymied by the clouds.

Ash Creek Butte is a special place, within the Mount Shasta Avalanche Center forecast area, about seven miles east of Mt Shasta.

This little microclimate stays several degrees colder and gets twice as much snow as the surrounding area east of the mountain.

The north and east bowls have the best skiing, along with large avalanche paths above treeline that slide regularly.

This brief moment didn't reveal Shasta, but gave us some ethereal light nonetheless while we scoped our line.

— Nick Meyers

Read more about MSAC's season on page 27.

2014/2015 SEASON

REMEMBERED
REVIEWED
RECOUNTED

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THE AVALANCHE REVIEW

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

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AVALANCHE
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AAA STATEMENT OF PURPOSE

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

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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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CONTRIBUTORS



Sean Zimmerman-Wall spends his winters in Little Cottonwood as a Snowbird ski patroller, backcountry ski guide, and AIARE avalanche instructor. Each summer he travels to the wind-swept peaks of Argentina, where he co-owns Patagonia Ski Tours, a small adventure travel and tourism company. This winter, Sean prepares for his biggest challenge yet, fatherhood. Read his thoughts on the Pro/Rec Split on page 6.



Greg Gagne: when he's not belaying Kimbrough on the send of his latest project, or asking him advice about the snowpack, he is an observer for the UAC, moonlighting from his day job as professor of Computer Science at Westminster College in Salt Lake City. Read his update on Alpine Meadows on page 21.



Doug Krause lectures on communication then proceeds to speak broken Spanish to Japanese people. He currently works in Hakuba, Valdez, Silverton, Lima, and Chile yet dreams of spending a full year in a single region. See his article on avalanche control in Japan on page 22.



Liam Bailey started working at Kirkwood in 98/99 in the demo shop, and started patrolling near the beginning of the 00/01 season. He did a season patrolling at Falls Creek, Australia in 2001. He has been a station foreman (on hill supervisor) from the start of the 05/06 season to the end of 14/15, then became Kirkwood's first assistant forecaster at the start of 06/07 (Kirkwood never had an avalanche forecaster or snow safety director prior to 2006/07). He took over lead forecaster duties unofficially near the end of last season; 15/16 will be his first full season as Lead Forecaster/ Snow Safety Officer. He is also one of the patrol general knowledge trainers and the lead ropes/rescue trainer, in charge of coordination of all rescue operations for the freeride/freeskiing/snowboarding events held at Kirkwood from 2006 to present. His education article is on page 18.

FROM THE EDITOR

BY LYNNE WOLFE

We hope you like our new look here at *The Avalanche Review*. We've been working hard on this look all summer. We think that the photos pop off the page in the full color glossy format, and our graphic designer, McKenzie Long, has splurged on color highlights to heighten your reading experience. She's done a great job: thanks McK!

When planning for the season summary issue this year, I wanted more than just "we got this much SWE and had this many avalanches." I pre-loaded our hard-working avalanche centers with a question to answer for this year: "what were your strategies for dealing with a low-tide year? How did you keep up interest in your products?" I found it very interesting to hear from around the country, gain some insight from the variety of ways to work with and around a distinct lack of snow. A final reminder about the summaries: for the time being, we will follow our long-standing policy of printing season summaries from avalanche centers who have either a "dot" or an "I" on our avalanche.org map.

In addition to the season summaries, we have some articles and letters that hopefully will get your brain tuned up for snow and avalanche season. Liam Bailey addresses ski patroller training and complacency in a down-to-earth style that makes the reader want to tag along with him on his daily route on the mountain. Doug Krause took on the challenge of bringing western ski patrol skills to Japan, setting up routes and teaching his Japanese patrol much more than hazard reduction. Mike Buotte took the opportunity to comment on our provocative cover photo from the April TAR: Brett Kobernik and Mark White and I respond to Mike and really listen to one another. We also say farewell to three important avalanche workers who were lost in tragic accidents this spring: our condolences to friends and co-workers of Peter Inglis, AJ Linnell, and Andy Tyson.

For the rest of this volume of TAR, once again I welcome your stories, photos, ideas, questions. The theme for the December TAR revolves around history and mentorship. Send me comments, quotes, musings on your learning curve as a mentor or from a valued mentor. How has your work or recreation culture evolved over time and with what guidance? Send me your thoughts and high resolution images by October 15, please.

I hope you can make it to a snow and avalanche workshop in your area: they're a great way to jump start your season and reconnect with our community. The AAA supports them generously as a way to add value to your membership.▲

Our new glossy format requires better photos! Please submit high resolution (300 dpi at 100%) images and figures only.

What were your strategies for dealing with a low-tide year?



FROM THE EXECUTIVE DIRECTOR

BY JAIME MUSNICKI

Hello AAA People,

I don't know about you, but here in AAA world the summer flew by! I do get asked sometimes about what I do in the warmer months for an avalanche association. The answer is... a LOT. This summer's projects have included overseeing the creation of the AAA's new logo, website, and video about what we do, contributing to the beautifully redesigned TAR that you have in your hands right now, continuing to engage committed stakeholders in the Pro/Rec training project, working to develop details for AAA oversight and administer of professional avalanche training in the U.S., getting industry supporters on board with our mission, and of course numerous day-to-day tasks - emails, membership applications, finances, budget projections, etc. It's fun... most of the time!

Heading into winter 2015/16, I think that, as an organization, we're on the edge of something big. Since I came into my role two years ago, the AAA has embarked on a number of significant transitions, as has the industry (think: Pro Training in the U.S.). This process has certainly not been without its bumps and moments of despair and wondering if all our efforts and invested energy are in vain. However, overall, I continually come back to thinking that we are moving in a positive direction for the industry as a whole. And I think that we're about to start seeing real, tangible results in return for all the energy and resources invested.

We've been building to this point for a while, almost 30 years now. This fresh new look for TAR that features our brand new logo is just one manifestation. You're going to see more of these external visual changes this fall and winter. Know, as you look at these things, that they are not only a new face to our organization, they also represent deeper change going on within the AAA, which will enable us to do more for you, our members, for all avalanche professionals in the U.S., and for other companies, organizations, and individuals who are also invested in the world of snow and avalanches. Though change can be difficult and painful at times, we are convinced that the results will be more than worth the efforts.

I encourage you, in the coming weeks and months, to consider how you can contribute to and engage with the new AAA programs, initiatives, and direction.. How can you be part of the solution for a better supported and higher-functioning community of avalanche professionals in the U.S. and beyond? Here are a few suggestions: write an article for TAR, encourage your friends and colleagues to become members of the AAA, support the AAA further with an end-of-year donation, connect with other local avalanche professionals in your area, attend a regional fall professional development event, become a mentor to a new pro in your area, actively expand your own knowledge and experience base, contribute (time, energy, money, observations) to your local avalanche center. Let's strive to do better collectively. Our lives, our colleagues lives, our friends, families and fellow recreationists lives are all worth the effort.

As always, please don't hesitate to be in touch with me directly if you have questions, concerns, or ideas to share. I look forward to seeing many of you this fall and winter at various official and unofficial snow and avalanche events around the country. In the mean time, here's to a beautiful late summer and a seamless transition to copious snowfall come late fall! ▲

SMALL CHANGE OUTSIDE
BIG CHANGE INSIDE

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30 YEARS

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A CONVERSATION ABOUT A PHOTO: COVER OF TAR 33.4

Hi Lynne. I am wondering if the photo and comments by Brett Kobernik on the April cover have generated any mail or discussion? From my point of view, I disagree with some of the ideas in the comments.

Generally, talking about “exact timing” of dry soft slab avalanches, and “most pronounced wind loading” causing avalanches, and “minor avalanche activity” as justification for skiing the slope right next to that slide is cutting it pretty close. It sounds more like rationalization to ski good snow on a pretty day than sound decision-making. “You would only know this by following the snowpack and weather closely at this particular location, giving you the intimate knowledge which allows you to make such a decision.” Right... “I’m so diligent, so in tune, that I have this dialed, and THIS slope isn’t going to slide, so let’s give ‘er.” We’re talking avalanches here, and no one is that good. If forecasters put out the vibe that we are that good, I think that is a bad thing. Eventually one is going to wind up in a pile at the bottom wondering how this could happen to such a diligent, smart person. Hell, we all know that could happen even if you don’t make a habit of laying tracks adjacent to fresh avalanches.

On that day the folks were correct and skied some good snow- we’ve probably all done something like this (maybe not as obvious) and gotten away with it. I know I have, and on the drive home I have found myself wondering just what it was I got away with up there... So, to see that photo and that caption on the cover rubbed me the wrong way- I ain’t buyin’ it.

I’m interested in your thoughts on this.

Mike Buotte

Snow Safety Director

Big Sky Professional Ski Patrol



Hi Mike-

I too wondered why I got no comments on that cover. I deliberately chose that photo (first of all it is a stunning photo) as it was getting a mile of comments on Facebook, most of which were something like "why would you ski that with a slide right next to it?" I then asked Brett to write the caption as he is one of the UAC forecast team. I knew that his comments were the far other side of the coin, and designed to combat the MMQB syndrome that I am really tired of seeing. (Monday morning quarterback) So in truth I was trying to stir it up, generate some thought and some commentary. You're the only one so far. I'll let Brett take it from here... Thanks for your thoughtfulness.

Lynne Wolfe

Editor, *The Avalanche Review*

Hello Mike,

The bottom line is you really can't make too many conclusions from just looking at a picture. I'm guessing if you had been out on that day, you would've easily figured out the stability was good at the time of the photo. I was in the office that day. It was a new snow event with no underlying persistent weak layers. There were a few naturals during the storm but a few hours after it ended you couldn't buy an avalanche even with explosives.

"I'm so diligent, so in tune, that I have this dialed, and THIS slope isn't going to slide, so let's give 'er."

Point taken. We definitely don't want to 'put out the vibe that we are that good.' I don't feel too sheepish about my comments since this is TAR, a forum for professionals. I will, however, be careful not to put out that vibe when writing for our public in Utah. My words were in response to some other comments people made on that photo. There were comments like "what a dumb ass" and "lucky to be alive." It was hardly the case. The point I was trying to make was you can't necessarily judge stability or people's decisions just from a photo.

Thanks for your interpretations of my comments. It's made you think and it's made me think, just as Lynne had hoped.

Brett Kobernik

Forecaster, Utah Avalanche Center

Hi comrades. Yeah, I figured there was a little editorial fishing going on when I saw the photo and the caption.

A couple of things- the MMQB thing is a bad deal, especially among the general public- I see and hear it all the time where folks try to convince themselves and others they are smart by calling others dumb- I get it, and don't like it either. Among pros with some experience, the problem is (hopefully) less due to experience- there are a lot of ways to look at things and to go about one's business in the mountains.

My comments were not intended to make anyone feel sheepish- the caption had the feel of someone trying to make a point. It's just that I fear the idea that we know exactly what is going on out there. Yeah, maybe I would have come to the same conclusion that the snow has probably (apparently?) stabilized since the soft slab event. But I often wonder, is there still a lingering pocket that hasn't quite stabilized? Am I really sure that the transient danger has passed? Is the adjacent slope stable or is it waiting for a bit more of a trigger than what it took to natural the adjacent slope a few hours ago?

Yes, this a professional forum (although anyone can read it online), but as professionals I believe in a healthy dose of humility when it comes to believing what we think we know. We are operating on best guesses much of the time, and I hope that whenever I am dropping in I am considering all that I don't know. I think that among the public, and some pros, the feeling is that if we do our due diligence, dig our pits, think about what we are doing, and yes, think about others' and our own "bad" decision-making, we can figure it out and keep ourselves safe (and mostly, get a lot of really good skiing in a lot of the time). If that thought process leads us to feel that we can outsmart and out-analyze the snowpack, especially during periods of obvious instability (even transient), we are in more danger than if we keep it more simple and keep a larger safety margin.

So, maybe the skiers who laid the tracks are smart, are diligent, and more than just "lucky to be alive"- I get all that. But maybe they will come across a similar situation in the future and make a similar decision about a slope that might be just different enough that things turn out differently. It comes down to how much room we want to give ourselves for the potential differences, and potential right or wrong analysis, to manifest.

Thanks,

Mike

JOURNAL ARTICLES QUERY

From Doug Krause:

Here's a general sort of question/comment/observation: I've done a lot of research over the last few years and frequently run into problems with accessing peer-reviewed journal content. Most of the journals want you to pay per article and they are not cheap. When I was a student, having that affiliation allowed me access via the institution. Institutional subscriptions to various journals are also quite expensive, more than the AAA could afford.

Do you think there is a place (MSU?) that might allow AAA members (or CIs, or those approved by the board) to use their credentials to access research?

DK

From Jordy Hendrikx, Research Chair on the AAA governing board and Director of the Snow and Avalanche lab at Montana State University:

Hello Doug,

I feel your pain — I have also spent some time outside of universities, and at the time also struggled to obtain access to the journal articles I wanted. It's a real challenge!

Most universities use an IP address-based log on — where a journal can see that you are “on campus” and allows you access to a subset of journals, as per your subscription. You can also log into a portal remotely to get this access — but an institution is not able to share this with non-students or non-employees based on their subscription agreement (otherwise we would all just sign in via the Harvard portal!). So I am sorry — but we can't help out there.

However, this model is starting to change. Increasing numbers of journals are going the “open access” route — and rather than have an institution pay a hefty subscription fee, the authors pay a fee at the time of publication (which is often funded by their institution), which then provides free access to their work for everyone. This is a trend that is likely to increase over time.

The other source of papers is a new web platform called “Research Gate”. Most journals allow authors to post a personal copy of their paper to a “personal space” — Research Gate is that “personal space” for many authors now. This is obviously being contested by some journals — but RG now has a critical mass, which is unlikely to be stopped by a few journals protesting. Here is a link to the RG page: <https://www.researchgate.net/home> and my personal page: https://www.researchgate.net/profile/Jordy_Hendrikx

The other source for access to good snow science papers is the MSU-hosted ISSW database: <http://arc.lib.montana.edu/snow-science/>

Here you can access almost all of the ISSW papers ever published. Please note that ISSW papers are not peer-reviewed like journal articles, so tend to be less rigorous at times. However, many of the papers from the ISSW do end up being published in peer-reviewed journals (with additional analysis and review) at a later date. Many of these can be found on Research Gate, or elsewhere on people's personal or institutional web-pages.

I hope that these resources help. If all else fails, and you don't have too many papers on your list, you can always contact the authors directly or a friendly professor and ask them to send them to you.

Regards,
Jordy

**From the photographer**, Mark White:

If I saw that photo without the details I would be wondering the same thing, but the devil is in the details. I'm gonna give you my thoughts on my decision-making process that day so you have a better understanding of my actions.

First of all I'd like to state that if I walked up to a slope like that with no prior info on it I would have not skied it after seeing the recent avalanche.

I had been monitoring that slope since the first snowflakes landed on it in October; if you look back on my observations I have photos from day one all the way until it melted out. I had documented all the avalanches in that area throughout the season and traveled there after every storm or wind event.

Here's a breakdown of the slope history:

1. **That side of the bowl** had avalanched to the ground earlier that year, cleaning the slope of all the previous snow, and with our weak and warm winter melted out and had not received much new snow thus no persistent weak layer was present.
2. **The other side of the bowl** had not slid and I had been treating it with respect all year.
3. I was there the day before in the storm and couldn't see a thing, but could tell that the more N-facing aspect where the avalanche occurred was getting wind loaded much more heavily than the more-protected other side.
4. Walking over there I looked into the adjacent steeper bowl and noted a little new snow activity but it was from quite a bit earlier. After stomping a few cornices it was obvious the new snow instabilities had subsided.
5. This one was the clincher for me: I didn't just dive in and center punch it, I eased off the cornice and probed the snow. What I found was no wind load, no slab, just 18 inches of light density snow on a firm frozen bed surface, which was only a little above the dirt.

So here was my thinking:

1. no persistent weak layer
2. new snow instabilities were a thing of the past
3. no wind load
4. no connected slab
5. not as steep as the slope that avalanched
6. different aspect, though its hard to tell in the photo
7. had recently avalanched to the ground

It wasn't gang skied, I sussed it out and skied first and got to a safe place and so did each skier after me.

Definitely not a case of the expert halo or letting my guard down in familiar territory, just taking all the facts into account and making a rational decision.

I agree that you can never be 100% sure that a slopes not gonna slide if it's steep enough, but this is where the risk-tolerance part comes in {by the way my risk tolerance is very low} seemed like a rational decision to me, as you probably know if you don't ski in areas that have recent avalanches after a storm your not gonna ski shit in the Wasatch. Oh yeah, one last thing I always think about before I ski a slope is what if it does avalanche, what are the consequences, that day the consequences were acceptable to me, taking a ride in 18 inches of 7% snow with no slab and a clean run out, wouldn't have been optimal but I don't think it would've ruined my day either.

I think the ski-patrol community has a bit of a different take than the purely backcountry users; they are more accustomed to controlling the environment than listening to what it tells us on any particular day.

Hope my long winded explanation cleared things up, I'm fine with people questioning some of the lines I ski, got more than a earful on that photo haha!

Mark



PRO / REC SPLIT: 2015 PROGRESS REPORT

Colin Zacharias utilizing a study plot for manual weather obs.

EVERYTHING CHANGES, AND NOTHING STANDS STILL.
— PLATO

BY SEAN ZIMMERMAN-WALL

From the outset the Pro/Rec Avalanche Education Project was viewed as a multi-year endeavor.

We are all connected by change, and change is the only constant. I think about this concept often as I apply it to my chosen profession. Ten years in the mountains working amongst the snowy torrents has impressed upon me a valuable mindset that I never thought I could achieve. I'm no philosopher, but I do understand that in order for humans to grow, new perspectives must continually be sought and evaluated. Voices of those who came before should be heard, and the collective wisdom of our tribe should flow through the conduits we have laid out as a means of moving forward. Some might call it a paradigm shift; others might call it an evolution. The principle tenant remains: keep charging ahead.

The avalanche industry in the United States has a rich history and an indelible cast of characters. From the days of Atwater and LaChappelle, through the era of Fitzgerald and Tremper, on up to the age of Stimberis, Greene, and Lazar, there has been continued dedication to advancing the art of forecasting, mitigation, and education. The road leading up to this point has been marked by triumph, tragedy, and tedium, but the spirit of creativity and perseverance has remained intact. As the industry prepares for yet another change, it will rely on its innate strength to step across the precipice and support the next progression.

It is amazing to think that it has been two full years since the American Avalanche Association (AAA) began entertaining the idea to divide the professional and recreational educational tracks. The initial proceedings of the Educational Committee and Governing Board addressed many topics and set the tone for how the implementation of such a change might take place. An audit of all the major course providers (American Avalanche Institute, National Avalanche School, American Institute for Avalanche Research and Education, and the AAA) was performed to assess variation amongst courses and gather valuable insight into how professionals and recreational users trained. After the audit was complete, Kirk Bachman of the AAA was assigned the duties of Project Manager and tasked with developing a framework for a proposal on how the division would take place.

"From the outset the Pro/Rec Avalanche Education Project was viewed as a multi-year endeavor. The most daunting aspect of this is to build a process which truly supports a broad-based collaboration which will achieve consensus so that all parties can support a larger common goal," says Bachman.

Smaller working groups were formed during 2014 and the collaborative efforts of course providers, veteran forecasters, snow safety workers, and guides helped push the professional side of the project into the next phase. This process is detailed in 33.3 of *The Avalanche Review*. During the 2014 ISSW in Banff, Canada, the AAA's Proposal was introduced and publicized across various mediums. An open comment period ensued and all thoughts were

gathered by the end of March 2015. Those in charge of compiling the comments and placing them into a digestible format had their work cut out for them. Thousands of comments from the membership of the AAA were carefully read and cataloged in an effort to determine if the Proposal had enough support to move forward. A resounding amount of positive feedback came from this comment period and Bachman had the go-ahead to form a group of industry professionals and invite them to a workshop that would address the intricacies of the Avalanche Technician (AvTech) course.

Bachman reached out to Colin Zacharias of Canada to serve as workshop facilitator. Zacharias has a decorated career as a guide and educator, and he does a wide variety of consulting work with multi-national agencies on the topics of risk management in avalanche operations. His vast knowledge on all things avalanche and remarkably calm demeanor made him the perfect candidate to direct the efforts of a large group of discerning and opinionated professionals. How I ended up in this group is a topic for another day, but I can tell you that it has been an inspiring process.

Gathering in late April at Snowbird Ski Resort in Utah, the diverse group hashed out the core worker competencies that would be covered and evaluated during an AvTech course. After three days of lively discussion, brainstorming, and fieldwork, the group came to basic conclusions on what an AvTech graduate would look like. A rudimentary evaluation rubric and marking scheme were devised as well. The ball was rolling faster and those invested in the project were beginning to see that this goal might actually be achievable.

“For the professional community, the actual workplace industry/employers need to have confidence that [this] training is relevant to prospective employees they would want to hire. Training has to have relevancy to the workplace,” adds Bachman.

Keeping the momentum moving forward was critical to achieving the next series of objectives. These revolved around tying up any loose ends left by the Snowbird workshop and developing a baseline oversight document that the AAA could use to maintain a grasp on the project as a whole. AAA Executive Director Jamie Musnicki, AvPro Coordinator Dallas Glass, and Bachman drafted this “live” document over the next several months and solicited feedback from the various parties involved up to this point. The oversight document addressed things like prerequisites for moving through the professional track, AvTech and Avalanche Forecasting for Operations (AvFo/OAF) core proficiencies, and the development of a professional trainers program. The latter portion is particularly important to maintaining quality control for each course that is being taught.

In late July, the AAA hosted a very small workshop in Victor, Idaho. The purpose of this workshop was to review the oversight document and ensure that the details enumerated within were sound and realistic. A group of seven individuals, as well as four others via tele-conference, mulled over the document and followed up on the lingering questions that have arisen over the course of the project. Being a part of this tighter-knit group provided me with additional insight into just how difficult an undertaking like this truly is. It is evident that our industry is more diverse than ever, and that developing a clear picture of a common goal that satisfies all constituents is about as easy as pinpointing the presence of depth-hoar on a broad slope. Although schedule constraints often prohibit group gatherings, I will agree that these types of small meeting have served to advance the project in a meaningful way. The mountain of work seemed insurmountable at first, but each small step has allowed the summit to finally come into view.

As Bachman notes,

“Continuing to remind ourselves when we engage in each piece of the work on the Project— this helps overcome the challenges and frustrations. If we succeed in this project, I am confident the collective avalanche community in the US will be the winners.”

Stay tuned to *The Avalanche Review* as this project continues to evolve. It is worth noting that the Recreational aspect of the split is well on target to reach the 2016/2017 roll out. The professional side is also on track to meet the launch date and continued collaboration and cooperation will ensure the best possible outcomes for everyone involved. ▲

If we succeed in this project, I am confident the collective avalanche community in the US will be the winners.

Colin Zacharias demonstrating profile techniques.



Colin Zacharias and Bill Nalli measuring the water content of the newly fallen snow.





Opportunity for Case Study Presentations at 2016 ISSW

Everybody has an interesting story. Case studies offer unique opportunities for education and shared experience. At the upcoming ISSW in Breckenridge, we will have oral case study presentations that are focused on operational challenges, solutions, interesting observations, and open questions. We are targeting practitioners for these case study presentations. We hope to have one session with two presentations each day before the afternoon break. The presentations will be 15 minutes long with no questions, but we encourage discussion during the following break and throughout the week.

We need your help. We want to hear your story. Please write us with a tale that might fit in this session. We will help you with presentation logistics, graphics, and a short paper for the proceedings if you wish.

You can reach us at casestudy@issw.org.

ISSW 2016 Papers Committee: Will Barrett, Ethan Greene, Kelly Elder, Dallas Glass, Aleph Johnston-Bloom, Andy Lapkass, Hunter Mortenson.

METAMORPHISM

Congratulations to **Zach Guy**, who was just promoted to become Executive Director of the Crested Butte Avalanche Center. Ian Havlick and Evan Ross will join him for another year as forecasters.

Congratulations also to **Bruce Tremper**, 30-year director of the Utah Avalanche Center. Look for a retrospective of Bruce's career in a future issue of TAR.

Congratulations to Bruce's replacement, **Mark Staples**, from the Gallatin National Forest Avalanche Center.

Mark Staples named the new Director of the Utah Avalanche Center



Mark Staples has been selected as the new Director of the Utah Avalanche Center. He will be filling in behind Bruce Tremper, who is retiring after 29 years of running the UAC. Mark brings an extensive avalanche background to the job, including ski patrolling and snow safety work at Big Sky Ski Area, an MS degree in Engineering at Montana State University doing snow avalanche research, several special projects for the National Avalanche Center, and eight seasons of backcountry avalanche forecasting at the Gallatin National Forest Avalanche Center.

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The Alaska Avalanche School (AAS) is pleased to announce the hiring of **Jeremy Allyn** as Executive Director. Jeremy has a diverse and long-standing background in avalanche education, ski patrolling and mountain guiding and has been working in avalanche terrain for over 25 years. He is the former North America Program Director for Mountain Madness and has guided domestically and internationally for MM and the American Alpine Institute. He is trained as an American Institute for Avalanche Research and Education Level 1 and 2 Course Leader. He has served on the Advisory Council for the Northwest Avalanche Center, as well as worked on NWAC's Professional Field Observer Team. From 2004-2006 he worked as a visiting AAS instructor in what was a critical and successful period in the school's growth. He is proud to serve as AAS's new Executive Director as the school moves into its fourth decade. Jeremy is a published photographer and skilled carpenter and continues to climb, ski and explore the mountains of this world as much as possible. Welcome and all the best Jeremy!

IN MEMORIAM: PETER INGLIS

July 10, 1959 - April 1, 2015

BY CRAIG STERBENZ WITH HELP FROM JONATHAN TUKMAN AND OTHERS

Veteran Telluride Ski Patroller and mountain guide Peter “Pi” Inglis passed away April 1 in Alaska’s Wrangell St. Elias National Park. Peter was a longtime fixture in the Southwest Colorado avalanche forecasting and education community. In addition, he was a pioneering ski mountaineer, accomplished guide, dedicated teacher, and friend to many.

Peter grew up in Underhill Center, Vermont, where he grew up in the shadow of Mt. Mansfield. One of his friends growing up posted on Facebook, “Even as kids, his ski-hikes up Mt. Mansfield (on the Underhill non-Stowe ski area side) was stuff of local legend.” It was during those years growing up in Vermont when Peter really developed his love for ski mountaineering. After several trips up Tuckerman’s Ravine he was hooked. It was also during those years growing up where he learned to be the strong yet humble, caring and dedicated person we all knew him to be.

After graduating Mt. Mansfield High School, Peter attended the University of Vermont, graduating in 1983 with a degree in Recreation and Resource Management. Growing up near Smuggler’s Notch he had tested the waters of ski patrolling, instructing, and bump skiing while trying to figure out where he wanted to be and who he wanted to become. After college he spent a couple of years skiing and climbing in the Alps while living in Chamonix, France, which only furthered his love of life and the mountains. He returned to the US from France, moved to Telluride, Colorado, and called it home.

After moving to Telluride, he spent much of his time making friends and getting to know his new playground, the rugged San Juan Mountains. Peter quickly became an icon of the local climbing and skiing community. He was well known for his bold and legendary backcountry ski descents of steep narrow couloirs like ‘The Wire’ and ‘Heaven’s Elevens.’

In 1987 he co-founded the Telluride Mountain Club to create a platform for communication among local enthusiasts and to foster more responsible backcountry use. His experiences in the Alps helped shape him and solidify his firm belief in the ‘freedom of the hills.’ According to Telluride Mountain Club President Tor Anderson, “He was very well-loved and well-regarded as a mountaineer and snow scientist and a nice, humble, all-around good person. He was such a nice person to everyone and set such a high standard for what he did.”

From his earliest days in Colorado, Peter was involved in avalanche education. He helped start, the Telluride Avalanche School and he developed into a respected teacher and evangelist for avalanche education. After some local avalanche fatalities in 1987, Peter raised grant funding to begin the monthly Avalanche Forums in Telluride which continue to this day.

Peter was a 22-year member of the Telluride Ski Patrol. He was a veteran member and leader of a very tight-knit group. He was much more than just a coworker to his brother and sister patrollers. Pi was also a core member of the snow safety team serving as avalanche forecaster and assistant snow safety director for a number of years. He was keeper of the famous “Pi Chart,” hand plotting our daily weather and avalanche observations in a season-long line and bar graph.

Last winter, Pi was also instrumental in successfully organizing Telluride Ski Patrol workers to unionize. He knew that the lofty cost of living combined with the dimly low ski patrol wage made it difficult to get from paycheck to paycheck and that the young ski patrollers of the future could no longer afford to make it here without a living wage. He truly cared about his patrol brethren and was always there as a mentor to teach the young patrollers and keep an eye on the old ones.

In addition, Peter was a three-decade member of San Miguel County Search and Rescue, where he participated in saving many lives over the years. He was the main interface among the Telluride Ski Patrol, the Telluride Mountain Club, the Telluride Avalanche School and San Miguel County SAR. Whenever there was an incident that required a rescue he was always the first (and on a couple of occasions the only one) to stand up and say “I’ll go!” His dedication and drive to insure the safety and well-being of his fellow mountain traveler in distress was unsurpassed.

Peter also had a long guiding career working for several local guiding companies. When not patrolling, Pi spent most of his time traveling the world, following his passion for climbing, ski mountaineering and working as a mountain, rock climbing, and ski guide. He climbed and skied all over the world from South America, Europe, the Himalayas to all over the United States. His accomplishments are both impressive and too numerous to list comprehensively.

He conquered such remarkable ski descents as the east face of the Matterhorn, the Marinelli Couloir, the west face of the Eiger, the north face of Mont Blanc, Grand Teton and many 14,000 foot peaks in Colorado including extreme lines on Pyramid, Capitol, Mt. Sneffels, Mt. Wilson and Wilson Peak. One of his most recent adventures was a ski descent on Mt. St. Elias, the 2nd highest mountain in the United States. He worked as an AMGA Certified Ski Mountaineering Guide for Mountain Trip Guides on Denali since 2004. He reached the summit of Denali a total of 17 times, including three times with his then wife-to-be, Julie Hodson. Peter had a special passion for exploring places, mountains, and ski lines where people never or rarely went. On one of these occasions PI climbed an unclimbed remote peak of 5965 meters in a rarely traveled area of China. The route was named in honor of friends that died in nearby mountains the prior year. Peter thought of everyone but himself and included anyone who was willing to participate in his fabulous endeavors.

Pi had been working for the last several seasons as lead ski guide for the Ultima Thule Lodge in Alaska’s Wrangell-St. Elias National Park and Preserve. He had just recently arrived there from Colorado and was on a tour, presumably to take a look at snow conditions and have some fun with friends, when a large chunk of cornice collapsed under him at around 7,000 feet on a steep rocky ridge-line above Tebay Lake.

Pi is survived by his wife Julie, his brother Andrew, uncle Peter, aunt Emily and a plethora of friends and co-workers who will miss him dearly. Peter was a skier, mountaineer, climber, professional, and friend of the highest order. He embodied the greatest qualities of our community and worked tirelessly to educate people about avalanches. A fund to advance his passion for avalanche education has been started in his name.

As Pi was fond of saying, “Ski ya later!” ▲



Photographer Brett Shreckengost captured Pi’s first descent of the wild Telluride line Heaven’s Eleven. <http://brettschreckengost.com/>.



(Above:) Pi pulls out a Q1 shear in a CT, Telluride.

(Below:) a photo of one of the famed “pi charts.” Photos courtesy Jonathan Tukman and Craig Sterbenz

Donations may be sent to:

Peter Inglis Memorial Fund
Alpine Bank
P.O. Box 2040
Telluride, Co 81435

IN MEMORIAM: AJ LINNELL

BY SCOTT PALMER

On April 10, 2015 this community of snow lovers, workers and educators lost a key member, AJ Linnell. AJ died in a plane crash while flying out from a jobsite in the Frank Church Wilderness. The pilot, and AJ's two coworkers, Andy Tyson and Rusty Cheney, were also killed in the crash. The men had flown into a remote ranch in the Idaho wilderness to survey the site for a potential solar installation. AJ, Andy, and Rusty were all long-time residents of Teton Valley, Idaho. The community is reeling from their loss. To those of you who are just hearing this news I am truly sorry.



AJ with a big smile, having fun in the mountains.
Photo Scott Palmer

AJ was my friend, ski partner, co-worker, mentor, and biggest supporter. When I first met AJ in December 2006 he taught me how to tune skis for the NOLS rental fleet. While doing inventory later that day he proved that a grown man (a large grown man) could fit into a small women's sports bra with only a little bit of wriggling. I could say that I wasn't sure what to think, but who would I be kidding. I was sold, this guy was special and I needed to learn all I could from him. For many years AJ was a mythical figure to me, someone of tall Teton tales; skiing the gnar, guiding on Denali, teaching avalanche courses, working for NOLS in the Himalaya and crushing 100-mile bike rides all while balancing a loving relationship with his amazing wife Erica. Stories of his physical ability are almost as legendary as his ability to slay plate after plate of any kind of food that was put in front of him.

The first time I ever skied with AJ was an accident. I was doing a dawn patrol on Glory with two friends and so was AJ. We didn't meet in the parking lot though. AJ passed us as we were trying to figure out what the hell was up on top of Twin Slides. We exchanged some friendly banter and discretely asked AJ if we could join him down Twin Slides as none of us knew how to tell if a run like that was safe to ski or not. Of course we could join him. Everyone was welcome in AJ's world. There were no divisions between radical and punter, just friends who liked snow.

Anyone who had the opportunity to take an avalanche course from AJ or be guided for a day out in the Tetons with him knows this. He loved teaching and guiding and the two were indistinguishable in his world. AJ's

clients received the best care a guide can give, just as his students were always given clear concise and thoughtful instruction, no matter how many feet of vertical he had skied before an evening classroom session. And all were offered chocolate and hot chai before a descent. AJ was always looking to perfect his craft. I clearly remember having an very one-sided (I tried to partake, but figured breathing was the priority) conversation with AJ about the best way to make slab mechanics palatable for level 1 students while he was breaking trail through heavy snow. Watching him teach slab mechanics later that week using the strategy he had developed on a ski tour inspired my own teaching.

To many of us AJ seemed super human at times, and yes he was a naturally gifted athlete, but it was his work ethic that gave him the edge, his discipline and dedication to his dreams that allowed AJ to achieve so much and inspire so many. Most mornings in the winter my alarm is set for the pre-dawn, either preparing for an early start at the hill, getting kitted up for a day of guiding or, if I'm lucky, going out in the park with good friends. Most mornings this past winter I was rarely woken by my alarm. Most likely it was a 5:00am text from AJ asking about my schedule or if I could guide the next day or better yet an excited weather report and a plea to get a certain day off because that was the day to go big. While everyone else was sleeping AJ was up working; studying for his electrician's exam, setting up ski tours for Yostmark Backcountry Tours, riding his trainer, or just dreaming about going big.

We could all go on forever about AJ's physical strength and how inspiring it was. Helped me become a better stronger ski tourer just by forcing me to keep up, but it was how he did it that was truly inspiring. AJ had a small catch phrase stuck to the top tube of his bike to help him through the pain of a 100-mile single speed mountain bike race: "HTFU" or "hard the fuck up". The ironic thing about this simple yet powerful statement is that when AJ was with some who was struggling, client or friend, he would "soften the fuck up." This was AJ's true superhero quality. No matter the situation or how much someone was struggling, AJ had only kind supportive words and actions to offer. He knew the balance between "hardening" and "softening" and executed it perfectly because he cared about others' success more than his own.

In AJ's home there is a wall plastered with USGS quads of the Teton Range in its entirety; AJ called this the "Wall of Dreams". To AJ the mountains were a place for dreaming. I and many others shared these dreams with him in the mountains and it is hard to know that we won't ever share these dreams with him again. His wife Erica Linnell reminded me recently that while I may have dreamed of mountains with AJ, his dreams went even bigger. AJ dreamed of making his community a better place and put his dreams to action as a city councilman in Victor, Idaho. He dreamed of racing fast and making friends with strangers. He dreamed of a community that was sustainable and cohesive where everyone rides bikes and eats big plates of good food. He dreamed about spending time with friends, anywhere that felt like home, not just the mountains.

In the wake of AJ's death it is hard to figure out how to move on, but the best course seems to put as much of AJ into the world as we can: to work a bit harder to make our communities stronger, to make ourselves stronger, and to extend ourselves to others in an honest and selfless way. We might have to "*harden the fuck up*" at times to get through this tragedy, but next time you are struggling with a client, student, co-worker, or loved one remember what AJ would do: "*soften the fuck up.*" ▲



Scott Palmer will work for hot food, cold powder and warm granite. He spends his time instructing for NOLS, climbing the Grand with Exum Mountain Guides, breaking trail up and down with Yostmark Backcountry Tours and occasionally runs a wreck or two with the Grand Targhee Ski Patrol.

IN MEMORIAM: ANDY TYSON

BY MOLLY TYSON

This spring Andy Tyson, along with three other men, died in a plane crash. In addition to running a successful renewable energy business, Tyson was an accomplished mountain guide, educator and talented all-around outdoorsman known for his humility; ability to suffer with a smile and love for adventure in remote mountain ranges around the world.

Andy's outdoor career began at Wittenburg University, then with NOLS where he led mountaineering, climbing, backcountry skiing, sailing, caving and hiking courses in the Rocky Mountains, Pacific Northwest, Alaska, British Columbia, India and Patagonia. Tyson was recognized as a NOLS "Instructor of the Year" and spent time as a Program Supervisor in the Pacific Northwest and Wyoming. Tyson's work as Expedition Manager for Alpine Ascents International and later with Antarctic Logistics and Expeditions, took him the high peaks of Antarctica, the Andes, Tibet and Nepal. In 2014, he was poised to guide on Everest and was among first on scene with rescue and recovery efforts when a massive avalanche struck the Khumbu Icefall. Tyson authored two how-to-books on climbing and mountaineering: "Climbing Self Rescue" (with Molly Loomis) and "Glacier Mountaineering."

Andy was equally passionate about the wilderness's potential as a classroom as he was for exploring those places. As he said in a recent presentation, "Succeeding on a problem is rewarding but finite. We should try another problem and build upon the experience.... Unless we challenge ourselves we go nowhere." Remote, wild places were where Andy loved to challenge himself and recent personal expeditions included trips to Oman, Kyrgyzstan, the Arctic, India, Tibet and many others including multiple first ascents in China's Genyen Massif and Alaska. In 2013, Tyson led an American-Burmese team that made the first ascent of Gamlang Razi (19,258 and possibly SE Asia's highest peak.)

When the crash occurred, Tyson was flying into a remote job site with a team from Creative Energies, the renewable energy company that he co-founded in 2001. Through Creative Energies, Andy strove to find innovative ways to build a sustainable energy future for our world. In supporting this vision, he was involved in organizations such as the Charture Institute; the Idaho Clean Energy Association; chairman of Idaho Strategic Energy Alliance's Solar Task Force, Teton Valley Recycling; the Jackson Eco-Fair; Teton Tomorrow and One Percent for the Tetons. Andy volunteered to teach climbers in Myanmar and most recently, Nepal, at the Khumbu Climbing School.

Andy was known for his physical strength, stamina, grit and determination, but more importantly to his friends and family, he was loved for his kindness, curiosity, energy and willingness to try whatever was thrown at him. He could jump off the couch and run 20-plus miles through the mountains, make a difficult climb look easy, fly a kite, ski a steep couloir, longboard twisty roads and build or fix just about anything. Yet he carried himself with humility and relished in others' successes. He made the people he touched better people. He was a rare mix of intelligence, kindness, mischief and playfulness. He loved his family, community and dog tremendously and often spoke of how lucky he was to live in such a place among such people. We miss him tremendously. ▲



Andy was infinitely curious; here he investigates a chunk of wind slab in China.

In his honor, The Andy Tyson Memorial Fund has been created to develop and support outdoor leaders in the developing world. The fund will provide resources for expeditions, training in mountain skills and match outside expertise with local interest. To learn more and to contribute please visit:

www.AndyTysonMemorialFund.org

ELECTROMAGNETIC INTERFERENCE FROM ELECTRONIC DEVICES USED IN THE MANAGEMENT OF TYPE 1 DIABETES CAN IMPAIR THE PERFORMANCE OF AN AVALANCHE TRANSCIEVER IN SEARCH MODE

PREPARED BY DALE ATKINS, RECCO AB.

From the journal of Wilderness & Environmental Medicine, a synopsis of current literature. (Wilderness Environ Med. 2015 Jun;26(2):232-5) S Miller.

Many type 1 diabetes sufferers use small electronic blood sugar monitors and insulin pumps to dispense insulin automatically. With type 1 diabetes one's pancreas no longer makes insulin, a hormone that allows the body to use sugar for energy. The monitoring devices, called Continuous Glucose Monitoring (CGM), measure blood sugar levels in real-time throughout the day and night, and provide valuable information about one's levels and the directions those levels are going. This is especially important for those times before and during exercise. For those who require insulin therapy, a glucose monitor can be combined with insulin pump technology for real-time control of blood sugar levels. Being electronic appliances these devices have the potential to adversely affect avalanche rescue transceivers, yet their influence was unknown. The purpose of this study was to investigate the influence of electromagnetic interference from electronic diabetes devices on an avalanche rescue transceiver in SEARCH mode.

New Zealand endocrinologist Dr. Steven Miller evaluated two avalanche transceivers — Arva 3 Axes and Mammut Pulse Barryvox — with the Dexcom G4, Medtronic Guardian CGM, and Animas Vibe insulin pump in close proximity — within 30cm. He also checked for the effect of three other portable electronic

devices — Baofeng UV-5R two-way radio, iPhone 4 and iPhone 5.

In SEARCH mode the ability of each transceiver to determine the proximity and direction was checked at set distances of 1, 5, 10, 15, 30 and 45 meters. Miller recorded the most distant point where the receiving transceiver could accurately determine both direction and distance to a transmitting transceiver. Then the electronic medical devices and portable electronic devices were held below either receiving or transmitting transceivers and the effect assessed.

There was no interference observed when any electronic device was used within 30cm of a transmitting transceiver or when more than 30cm from a searching transceiver. Results were identical with both transceivers in SEND and SEARCH modes.

However, when the electronic devices were held within 30cm of the searching transceiver the receiving range was reduced. The effect depended on the device used. Each device was tried three times and the mean distance reported. The Animas Vibe, iPhones reduced the receiving range to 5m. The Medtronic Guardian fell to 10m, and the Baofeng radio to 15m. The Dexcom G4 did not produce any apparent interference. The results were the same regardless of which transceiver was transmitting or receiving, and no effect was observed when the device was more than 30cm from the receiving transceiver. While the medical devices did affect the performance of the transceivers, the transceivers did not affect the medical devices.

While Miller looked only at the affect of a single electronic device on a transceiver, he suggested an interesting point for future research. Is potential electromagnetic interference additive when carrying multiple devices (insulin pump and CGM along with cell phone, radio, gps, action camera, etc.)? In other words, does carrying multiple devices enhance interference?

While this study was limited by small sample size, the findings were similar to those observed with other small consumer electronic devices. As interference was experienced when the electronic diabetes device was held within 30cm of a searching transceiver, the results were also in line with current recommendations to separate electronic devices from transceivers (20 to 50cm). The effects of electromagnetic interference are fickle. Not all electronic devices interfere (e.g., the Dexcom G4 did not cause interference) and if they do, the interference effects are not always identical.

While it is unknown how many people with glucose monitoring systems and insulin pumps use transceivers this study showed the adverse effect can be significant, which could cause delay for a buried victim. Avalanche educators should also include mention of electronic medical devices as potential sources of interference when teaching or reviewing transceivers. From the results of his study, Miller recommends that all electronic diabetes devices not be used within 30cm of an avalanche transceiver. His recommendation can be expanded to say that all electronic devices be kept as far away as possible from an avalanche transceiver. ▲

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Southern Hemisphere Avalanche Conference keynote speaker Karl Birkeland.

SOUTHERN HEMISPHERE AVALANCHE CONFERENCE REPORT: JUNE 2015



More than 100 people attended the MSC's 2015 Southern Hemisphere Avalanche Conference held in Christchurch from 12-14 June.

The conference was a fantastic opportunity for participants to share knowledge and challenges, discuss opportunities and solutions, and network with other attendees from across the sector.

The conference kicked off with an optional Workshop Day on the Friday, covering everything from weather forecasting to explosive use in avalanche management. The conference itself hosted a great range of New Zealand and international speakers who presented on the themes of planning and preparation, management and mitigation, and reaction and rescue response across the two days. Keynote speaker Karl Birkeland, Director of the US Forest Service National Avalanche Centre, presented an overview of the scientific research being undertaken in the Northern Hemisphere - what is known, what is questioned, how it fits into the bigger picture and what it means for practitioners in the Southern Hemisphere. Karl also spoke at the Snowball Dinner, held on the Saturday evening.

For more information or to read the Mountain Safety Council's journal, The Crystal Ball, go to www.avalanche.net.nz ▲

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SIERRA AVALANCHE CENTER PROFESSIONAL DEVELOPMENT WORKSHOP: APRIL 2015

BY DON TRIPLAT, EXECUTIVE DIRECTOR, SIERRA AVALANCHE CENTER

The 2015 Sierra Avalanche Center Professional Development Workshop, held in memory of Bill Foster, was conducted on April 2, 2015. This is the fourth year of the workshop, held to provide continuing education for professional avalanche workers in the Sierra Nevada. Its attendance and scope of presentations is growing and bringing together avalanche center forecasters from SAC, BWAC, and ESAC along with Pro Patrol from Alpine Meadows, Squaw Valley, Kirkwood, Homewood, Mammoth Mountain, Heavenly, Mt. Rose, two CalTrans field stations and professional mountain guides from Tahoe Mountain School, Sierra Mtn. Guides, Shasta Mtn. Guides and educators from University of Nevada, Lake Tahoe Community College, and Sierra Nevada College, plus representatives from AAA and AIARE.

This year presenters came from a wide range of fields: practitioners, a meteorologist, a climatologist, and professional patrol workers presented topics of emerging research and interest to focus the group on the task of decision-making, information gathering, and analysis of situational problems to develop operational expertise and continue the professional development of the group.

Ned Bair, US Army Corp of Engineers, presented research on developments in fracture dynamics and analysis comparing the shear model vs the anticrack model of failure dynamics as they relate to fracture propagation and recording of data. Zach Tolby of the NWS presented the field of predictive meteorology and forecast modeling providing excellent coverage of how and where to source weather information specific to mountain operations. These scientific topics were balanced by professional avalanche workers from attending mountain patrols presenting case studies in snow stratigraphy and forecasting at Alpine Meadows, avalanche hazard models in daily forecasting and decision-making at Mt. Rose, Post Control avalanche case studies from Kirkwood, and the Mammoth Mountain artillery program. These presentations are the heart of the workshop as it gives pro patrol a chance to review situations and share information with other patrollers to build a network of experience that supports individuals making crucial decisions for mountain safety and operations.

Simon Trautman from the National Avalanche Center also presented two sections; "10 Things to Know about Wet Snow" which revealed the large amount of unknown in forecasting and understanding wet snow avalanches, plus a second afternoon session that delved into the grey area between work and play for avalanche professionals and how to maintain a focus on decision-making and objectives when working in the mountains where the goal is safety for recreation. Ben Hatchett, University of Nevada, also presented an in depth review of climatology that affects an upside down snowpack in the Sierras with focus on specific storm tracks and the resulting snowpack conditions. Zach Tolby, NWS, then reviewed what we know about the drought in the West and what we may expect in the future from predictive modeling.

Gene Urie, AAA, presented an overview of the Pro/Rec education split that is being facilitated by the AAA, and how this may shake out for recreationists and professionals seeking training and continued education. Each presentation was followed by a short question and answer session.

Sierra Avalanche Center is happy to host this event and continues to work toward a Network-building approach to bring avalanche professionals together. This year's workshop was the largest in attendance. As the Executive Director of SAC I am pleased to be a part of this workshop and look forward to its continuation to support our professional forecasters and avalanche control workers as they maintain public safety in our winter playgrounds. ▲

WYSAW The Wyoming Snow and Avalanche Workshop will be held on November 7 in Jackson at the Center for the Arts. It will be open to the public and geared towards advanced recreational skiers and riders and guides, educators, and professional avalanche workers. It will be a one-day event that will include a keynote speaker, presentation sessions, a panel discussion, vendors and will end with an evening showing of Meru, a movie by North Face. It's being hosted by Teton County Search & Rescue with Jake Urban acting as the lead.

SAW SCHEDULE

(for links and more information please go to the AAA Home page)

October 9th - Colorado (Breckenridge)

October 17th - Northern Rockies (Whitefish)

October 17th - California (Tahoe)

October 31st - Utah (Sandy)

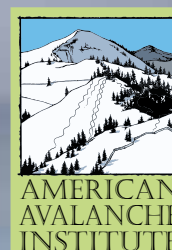
November 6th - Southcentral AK (Anchorage)

November 7th - Wyoming (new this year, Jackson)

November 7th - Eastern (North Conway)

November 8th - Northwest (Seattle)

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WINTER 2015-2016 COURSES

Winter Weather Forecasting

October 2-4, 2015, Jackson, WY
October 9-11, 2015, Salt Lake City, UT

Advanced Winter Weather Forecasting

October 17-18, 2015, Jackson, WY

Professional Rescue Course

December 14-17, 2015, Park City, UT

Level 3

January 9-15, 2016, Jackson, WY
February 6-12, 2016, Salt Lake City, UT

See our website for Level 1, 2, and refresher course dates!

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AVATECH UPDATE: SEPTEMBER 2015

Overview of Winter 2014 – 2015

AvaTech is a Park City and Chamonix-based outdoor technology company developing the first global crowdsourced platform of mountain safety information, powered by connected hardware and software tools.

AvaTech's first products, the SP1 and AvaNet, help snow professionals instantly record and share snowpack data and other mountain safety observations. This past winter, AvaTech's AvaneNet safety platform was used by over 500 organizations from 34 countries. Over 85% of data was shared across the entire professional network, demonstrating a desire among the global professional community to work together and learn from shared information.

US organizations represented the largest AvaneNet user group at ~53% of organizations, followed by ~23% in Europe and 16% in Canada.

SP2 Technical Specs:

- Weight: 530 grams (1.2 lbs.)
- Collapsed Length: 49 cm (19.3 in.)
- Measurement Length: 147 cm (57.9 in.)
- Operating Temperature Range Viewing Data: -15° to 50° C (5° to 122° F)
- Water Resistance IP55 Water Resistant
- Battery Type: Two non-rechargeable lithium 1.5 volt AA batteries
- Data Storage: 8 GB. Can store more than 30,000 tests

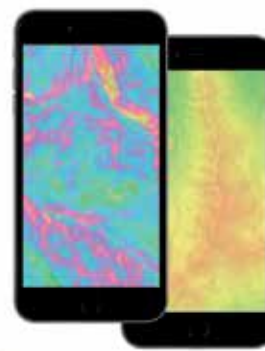
Rapid Observations and Red Flag Analytics



Route Planning and Tracking



Terrain Visualization



What's New at Avatech

This summer Avatech moved into a new office in Park City, UT. The office is equipped with state-of-the-art electronics, an advanced software and hardware prototype lab, and a real-time global AvaneNet observation center.

The team has also grown significantly to 12 in Park City. Recent hires include the former Senior Director of Mobile from Visa Checkout and the former Industry Relations Manager of the US Ski Team. Avatech's intern program also brought in top notch software and hardware engineering talent from graduate programs spanning Stanford, Dartmouth, UVM, Duke, and Tufts.

A Note from Avatech:

We want to make sure that the professional community knows we are only selling the SP1/SP2 to the professional community. While that may change in the future with new generations, the current hardware is only for pros, very intentionally, and we've even turned away recreationists who have wanted to buy, because we first want to learn how professionals use the device and can benefit from it. We believe its greatest value is for those that understand how to use it, both what it does and doesn't do.

*Hope this helps,
Brint Markle
Co-Founder & CEO, Avatech*

Update on AvaneNet Mobile & Web

This past season, AvaneNet primarily focused on professional peer sourcing of geo-spatial information from the SP1 as well as snowpit observations via Snowpit Editor and avalanche observations.

Responding to feedback, Avatech doubled down on their development of AvaneNet. This season, Avatech will be releasing many new software tools for professionals spanning rapid peer-shared observations via photo, video, & audio, route planning and analysis, and dynamic terrain visualization. These software tools will be available on AvaneNet web as well as a new mobile app that will be available in November on iPhone.

Rapid peer-sourced observations: This season professionals will be able to instantly document, geo-tag and share avalanche, weather, wind, snowpack, snowpack test, and snow condition observations. Information sharing will be more dynamic than ever.

Red flag analytics: AvaneNet web and mobile will highlight red flags in your specific area. For example, if an avalanche, cracking, or wumpling, a concerning snowpack test, or other red flags have been shared nearby, you can instantly receive a push notification alerting you of the danger.

Route planning: On AvaneNet web, you can plan out routes on over a dozen topographic and aerial map overlays, all with the context of peer-sourced safety observations. AvaneNet will automatically calculate distances, elevation gain and loss, estimated Munter times between segments and more. These routes can be immediately downloaded to the mobile phone and you can track your actual route vs. what you planned.

Dynamic terrain visualization: Avatech has also built GIS-level terrain visualization tools into their web and mobile platform, so that users can dynamically visualize terrain based on aspect, elevation, and slope angle, select go / no go zones, and more.

Update on SP2 Improvements

The SP2 is currently in manufacturing with a host of improvements that include an enhanced user interface, a more robust and durable design, faster GPS and BLE connectivity, and a backlit screen so early starts or late evenings in the field won't be an issue. New sensors have also been added to improve depth accuracy in shallow snowpacks. ▲

AVATECH SP1 REVIEW

BY ZACH GUY

LEAD FORECASTER FOR THE CBAC AND ASSISTANT SNOW SAFETY DIRECTOR
FOR IRWIN BACKCOUNTRY GUIDES

I've had the opportunity to work with the SP1 Probe a handful of days this past winter, both at Irwin and in the backcountry. It is an exciting new tool and a great resource for the snow science community.

Let's jump straight into the pros and cons of the SP1 Probe, which measures and displays the resistance (essentially the hardness) of the snowpack. In my experience, the probe was quite accurate when compared to hand hardness profiles that we conducted side-by-side. It typically gives a higher amount of detail than my hand profiles, and it commonly identified hardness changes that I missed in my hand profiles. The probe is intuitive and easy to use; it takes a little practice to get the technique dialed in, but luckily it identifies poor probe strikes and will give you an error message if your form is off. I found that in most cases, a couple of attempts were enough to produce a satisfactory profile. It can be challenging to maintain a steady probing speed on crusty south aspects as it punches through ice layers, which frequently called for multiple attempts before it would accept my profile. With the press of a button, you can quickly log slope angles to your profiles. The automatically-logging GPS function is brilliant; allowing all of the profiles to be viewed in a geospatial context later when you upload them to Avonet (the accompanying online software which maps profiles and allows users to add snow profile data into a geospatial and query-able database). The results from your profiles can be instantly viewed and organized on the probe's screen. The probe folds down into a nice, sleek package that packs around easily, about twice the volume of a standard avy probe. All around, it is a thoughtfully designed device. (Would you expect any less from a team of engineers from MIT?)

This isn't the first instrument to measure snow resistance. Professionals and researchers have used tools such as the Ramm Penetrometer and the Snow Micropenetrometer, but the SP1 probe is more of a practical tool by many leaps and bounds. These other tools were either far more expensive, too burdensome to carry in the field, much more time consuming or prone to errors, and often required hours of number crunching or data processing to produce a profile after you had returned home. The SP1 is a game changer. With my limited use of the SP1 Probe this past winter, we found it useful for monitoring slab size and extent across terrain features, the presence and absence of certain weak layers, the thickness and variability of different crust layers, and later in the spring, the depth and quality of overnight refreezes. It helped in identifying the best placements for targeted stability tests or full snow profiles. I've used my avalanche probe to accomplish all of these tasks in the past, and feeling the snowpack with your own hands should not become a lost art. But the SP1 looks to bring a more quantifiable, accurate, and precise approach to probing the snow.

I haven't used the probe long enough to put it through the full wringer, but I've noticed a few limitations. The probe is only 145 cm long. While most human triggered avalanches occur on weak layers in the upper meter of the snowpack, we almost always deal with basal weak layers in Colorado, and it is rare that I don't dig down the ground when I'm conducting snowpack assessments. This often means going 150 to 200 cm deep. Secondly, the rubber O-ring on the tip of the probe, which helps protect the sensor, broke somewhat frequently. The guys at Avatech are aware of the problem and sent a bunch of extra O-rings which are easy to replace, and they are in the process of engineering an improved O-ring.

For professional users, the SP1 Probe is hands-down a great tool. For recreational users, I think it is also a nice addition to the backcountry kit, but it depends on your level of experience and how you intend to use it. The probe doesn't replace sound judgment and terrain management skills: it supplements your decision-making with additional observations. The SP1 provides a lot of detail, and it can be difficult to interpret at times. When confronted with information overload, we humans respond by shutting down our cognitive skills and instead take shortcuts. In the avalanche world, we call these human factors or heuristic traps: blips in reasoning because our brains don't want to process all of the info. Sometimes, simple is better, and the probe shouldn't replace key field observations (avalanche activity, cracking, collapsing, etc) or unstable snowpack tests, which give less room for misinterpretation. The SP1 is best used to strategically extrapolate a thorough understanding of the snowpack to new terrain or monitor for subtle changes in the snowpack as you travel, not to blindly probe around en route to your line hoping the probe will give you a go or no-go decision. If it came down to a conflict of budget, I would prefer to see backcountry users invest their money towards an avalanche course over the probe. A holistic approach to decision-making, with an emphasis on terrain management, is more sustainable than focusing on pinpoint observations, some of which may provide an overwhelming or confusing amount of detail. If the SP1 Probe is used to compliment your well-honed skill set and knowledge of the snowpack, then it can be a very powerful and useful tool. ▲

BLACK DIAMOND, INC RECALLS ALL BLACK DIAMOND, PIEPS AND POC JETFORCE AVALANCHE AIRBAG PACKS

Black Diamond, Inc - on behalf of its subsidiary brands, Black Diamond, PIEPS and POC - is issuing a voluntary recall for all JetForce avalanche airbags in order to carry out a required firmware update.

In a limited number of cases, system malfunctions have resulted in involuntary shutdown and/or failure to deploy. There are two product defects that may pose a safety risk for the user once the system is armed and ready for deployment. The first is a loss of synchronization between motor control and the electric fan motor, which creates a system error that shuts down the fan motor. This can result in the failure of the system to deploy when the handle is pulled. The second defect is very high-voltage electrostatic discharge, which resets the system to the 'off' position. This can result in the JetForce Controller disarming after the system has been successfully armed. Both these problems can be resolved by an update to the firmware. These malfunctions can be resolved by a firmware update at one of our global service centers.

THERE HAVE BEEN NO ACCIDENTS OR INJURIES RESULTING FROM THESE MALFUNCTIONS.

This firmware update, and the shipping to and from our service centers, will be done at no cost to our customers. All users and retailers of first generation Black Diamond, PIEPS and POC JetForce Avalanche Airbag packs should immediately stop using and return their pack(s) using the link below.

How To Identify Affected Units

All JetForce Avalanche Airbag Packs sold between November 15, 2014 and July 7, 2015 should be returned to one of our global service centers. Affected units can be identified by a four-digit manufacturing date code printed on the back of the largest label located inside the front pocket. Units bearing date codes from 4275 to 5077 are subject to this recall. If your pack does not have a four-digit date code on this label, you should find a serial number/barcode located on the inside of the back panel (on the bottom-left corner of the sewn-in instructions). If your pack has a serial number/barcode, it has the most up-to-date firmware and is not affected by this recall. If you are unsure if your pack is affected, please contact us at service@jetforcerecall.com.

The affected units were sold under the following model names:

- Black Diamond Pilot 11 JetForce Pack
- Black Diamond Halo 28 JetForce Pack
- Black Diamond Saga 40 JetForce Pack
- PIEPS JetForce Tour Rider 24
- PIEPS JetForce Tour Pro 34
- POC Thorax 11 Backpack

Recall Return Procedure

Please follow these steps to complete a recall:

1. Go to <http://www.jetforcerecall.com> to initiate a return.
2. Follow the instructions provided to return your pack to one of our service centers, using the provided pre-paid shipping label.
3. Your JetForce pack will be inspected, the firmware updated, and the pack tested to ensure proper function of the system. We'll then return the pack to you at no cost.

When updates are complete, you will receive a shipping confirmation and tracking number for the return shipment of your JetForce Avalanche Airbag pack.

We apologize for any inconvenience caused by this recall. Your safety is our top priority, and we take very seriously every issue that could compromise that safety. If you have any questions or concerns, please contact us directly at service@jetforcerecall.com or at 800-775-5552.

Even if you have previously sent in your JetForce Pack for service, you still need to send it in, as previous service work would not have included this most recent firmware update. ▲



Max King catching early morning light on the Hayden Glacier of Middle Sister. Photo Kevin Grove

Jason Moyer climbing on North Sister in the Cascades. Photo Kevin Grove



COAA LAUNCHES PROFESSIONAL OBSERVERS NETWORK, WEB TRAFFIC INCREASES

BY KEVIN GROVE

The Central Oregon Avalanche Association (COAA) continues to make solid progress toward its goal of increasing avalanche safety and awareness in Central Oregon since gaining 501(c)3 status in 2009. With Bend's population, tourism numbers, and backcountry users continuing to grow at a dramatic pace, along with two avalanche fatalities in the region in the past 5 years, COAA's directors continue to work hard to create cost-effective broad-scope strategies for public engagement that will help the organization's mission continue to grow.

Since 2009, COAA has provided a platform for the public to post snowpack and avalanche observations via its website, www.coavalanche.org. COAA Directors have noted that over the course of a winter season, public avalanche/snowpack observations would remain relatively dormant until the occurrence of a normal avalanche cycle. These cycles would produce a flurry of posted observations for a few days, only to go quiet again until the next near-miss was posted.

In an attempt to provide the public with more current and real-time snowpack observations, as well as demonstrate the value of an avalanche forecast center in Central Oregon, COAA used raised-funds to launch a Professional Observers Network for the 2014/15 season. The Pro Observer Network consisted of 4 observers submitting a snowpack summary once per week. Throughout the season, observers posted 69 observations, while the public helped by submitting 16 observations.

While the 2014/15 snowpack in Central Oregon was not super interesting and could be summed up as a winter-long freeze/corn cycle (very few avalanche problems), the posting of regular, comprehensive snowpack information increased COAA's website visits by 34% over the previous year. The feedback from the Central Oregon community was very positive and it is clear there is a desire for increased information getting out to the backcountry community.

COAA has approved funding the Pro Observers Network for the 2015/16 season, and is planning to add a weekly snowpack summary to this service. Other COAA initiatives include fundraising to add a weather station in the Cascade Mountains and to fund and establish an avalanche forecast center in the next 2-3 years.

Kevin Grove is an Engineering and Physics Professor at Central Oregon Community College and a COAA board member. ▲

NEW MAP-BASED WEATHER PRODUCT FROM SNOWBOUND SOLUTIONS

BY SIMON TRAUTMAN

Scott Savage and Scott Havens went the extra mile in developing a tool that makes our jobs as avalanche forecasters easier. In addition to benefiting forecasters, the Sawtooth's new weather product provides a user-friendly platform for the public, ski patrols, and guide services to mine local weather data. This spring the NAC asked Snowbound Solutions to create and package a generic version that can be easily distributed to, and used by, other avalanche centers. The package consists of:

- A map-based weather product
- Remote data access to stations in your advisory area
- Directions on how to integrate the product into your website
- Javascript and PHP files necessary to plot weather data and/or create new web pages

The NAC and the Sawtooth Avalanche Center have covered the cost to develop and package the weather product in a generic form. Avalanche centers interested in adopting this product can simply pay the cost of integration into their existing website (estimated at ~500 dollars).

Contact Simon Trautman at strautman@f.fed.us for more details. ▲



Station Map: hover over a station to see observations.



Station Map: weather stations around the advisory area, including the danger rating and area webcams.



Station Wind: hourly data charts for 24 hours and 7 days.



Project Consultation, Design, Installation, & Maintenance Support



jay.bristow@mnd-group.com | brandon.dodge@mnd-group.com | 970-328-5330

Date	Temperature	Wind Speed	Wind Gust	Wind Direction	Humidity
06:00:00-04	49	17	7	SE	80.0%
07:00:00-04	49	13	19	SE	80.4%
08:00:00-04	48	17	15	SE	80.5%
09:00:00-04	50	9	13	SE	80.2%
10:00:00-04	50	9	7	NW	80.3%
11:00:00-04	52	8	4	SE	80.2%
12:00:00-04	52	10	17	SE	80.2%
13:00:00-04	50	12	19	SE	80.2%
14:00:00-04	49	7	14	NW	80.2%
15:00:00-04	49	10	11	SE	80.2%
16:00:00-04	47	10	11	SE	80.2%
17:00:00-04	47	9	19	SE	80.2%
18:00:00-04	48	9	19	SE	80.2%
19:00:00-04	49	7	18	SE	80.2%
20:00:00-04	49	10	19	SE	80.2%
21:00:00-04	49	15	26	SE	80.2%
22:00:00-04	49	7	13	SE	80.2%
23:00:00-04	49	9	13	SE	80.2%
00:00:00-04	49	10	13	SE	80.2%
01:00:00-04	49	10	13	SE	80.2%
02:00:00-04	49	10	13	SE	80.2%
03:00:00-04	49	10	13	SE	80.2%
04:00:00-04	49	10	13	SE	80.2%
05:00:00-04	49	10	13	SE	80.2%

Station Data Table: hourly data in tabular form with observation summaries.

T Ski

BY LIAM BAILEY, FORECASTER, KIRKWOOD SKI PATROL

As I look at articles like “Ski Patroller Avalanche Causes” (TAR 33.3 – Bergeron and Johnson) or “Professional Avalanche Near Misses” (TAR 28.1 Savage/Simenhois), and I examine my personal experience, I think the range of incidents that has been encompassed by “near miss and close call” is quite broad.

At one of my now sister resorts a patroller reported being caught in a slab that was approximately fifteen feet wide by twenty feet long by four inches deep. No injury.

Verdict? Near miss.

Should being caught or nearly caught in an area that is effectively a test plot be that big of a concern? Is it automatically a big deal just because it is avalanche-related even if there is an extremely minimal or no chance of burial and no greater risk for injury than anything else you’re doing on the job? And if you have effectively assessed and managed the avalanche risk, but happened to sustain an injury, what’s the difference? Professional patrolling is a dangerous job; many more are injured in non-avalanche related accidents at resorts than avalanche related and you are likely going to be injured on the job if you do it long enough. Perhaps a better skier would not have had a problem and we should think about hiring, retaining and striving for better skiers rather than solely focusing on whether or not there was moving snow.

Test plot ski cutting has been used since the beginning for good reason. There’s minimal chance of getting buried and great opportunity to feel what the snow is doing without assuming great risk. It is a very important tool for forecasting and one of the best ways to gain experience. And often, patrollers performing ski cuts is akin to test plot work, which is done any day it snows in order to keep the resort open. If we’ve done our job with explosive control work, addressing lingering snowpack problems and closing areas as required, then any avalanches we get ski cutting should be new snow accumulation only. While we have many areas with terrain problems (cliffs, trees), there are still plenty of slopes and conditions with minimal risk of burial and no more risk of injury than anything else a patroller might do that day.

Conversely, prior to (and occasionally after) Atwater made an appearance with recoilless rifles and explosives, Dick Reuter was ski cutting large avalanches on belay (sometimes) at Squaw Valley. He was, by his description, once caught in a class 5 slide in the Headwall path (considering the stories from that era of 20’ crowns in that path, for Reuter to call it a class 5...) that inexorably ejected him out on the surface at the bottom, uninjured. I think his words were ‘spit out like a watermelon seed’ or something to that effect. **Verdict? Near miss.**

I once fell off a very large cornice in a whiteout with my partner about to place a shot in an adjacent path. I was able to contact him before he lit the shot and climb back up the slope/slab and over the cornice. We then shot it, which resulted in a R3/D3/HS in a path that would bounce you off immovable objects the entire way down. On my hike back up I stepped over the future crown where the slab had released but only moved downhill about six inches. Had that triggered completely with the cornice fall or while I was hiking back up I would not have been ok. **Verdict? Near miss.** But nonetheless a very significant incident.

The only way to be absolutely certain no one is injured by any incident (avalanche or otherwise) at your ski resort is to not open it. Patrols have been attempting to perfect their programs since their resorts opened and rarely are the problems with the snow safety plans themselves. I think it makes sense for all involved if the quality assessment of a near miss or injury is weighted more heavily to quantify the gap between “I fell over and there might even have been a tiny avalanche somewhere around me” and “I should have died.” Just because there was an injury with something avalanche related does not make it a big deal. Just because there wasn’t an injury doesn’t make it ok. My cited incident was not a single mistake of falling off, but a cascade of errors that required examination. There are no absolutes, but if someone triggers an R5 avalanche with a ski cut, there were likely penultimate errors, mistakes or failures. I think these quality assessments are being included for the most part, the important thing is to promote an environment that fosters discussion and not fail to look at the big picture during review of these incidents.

“People do tend to learn better from failure than success, but we do not recommend building expertise by attempting to make every mistake in the avalanche field”

(TAR 28.1 ‘Professional Avalanche Near Misses’). At the spring SAC workshop, I was talking with Simon Trautman after his very good ‘work-play’ talk that discusses causes of self-blinding to dangers and the need to openly discuss mistakes. He was battling with the idea of whether one can learn enough without assuming risk and without making mistakes. He (as well as the authors quoted above) was hopeful; I am less convinced. The question I pose is whether operating in a relatively risk free zone, as detached from avalanches as possible, just sets you up for the greatest mistake.

An explanation I’ve used roughly grades the experience anyone who deals with avalanches gets. I view there being a white area, where you see avalanches, but are never really at any risk and aren’t that close to them. The extreme example would be a gunner, who gets to see avalanches, but is never close, never feels the snowpack and should never be in danger. You absolutely will learn from this, but your rate of learning may be so slow and your experience may be detached enough that it does not help you much (or enough) when you are in danger. On the other end of the spectrum is the black area, where you or someone else directly associated with you or your area of work was injured or worse. You may learn the most from this, but that’s obviously never worth the injury or worse and it may also be a black area because if the incident is bad enough, one may be too traumatized to learn from it?

The white and the black bookend a grey area, what I consider to be the sweet spot for professional avalanche workers. The closer you get to the black without crossing the line the more your learning curve will rise. Please don’t try to go pull a Reuter (see anecdote above); that’s a recipe for disaster. In my example above, I was much closer to the black than I would ever intend, but I did benefit from exponential learning curve growth. Ideally you have a feel for what part of the grey area you’re operating in or, early in your learning curve, you can work with a partner/mentor who provides insight and helps you plan in a margin for error. Even if you’re closer to the white zone, your learning curve is still rising at a more useful rate. You have to be confident to do the job and I try to err on the side of always assuming a slope will avalanche. If you’re overly confident or too scared to go out the door, you need a re-assessment at least and maybe a change of profession. A healthy amount of time spent in the grey area where you’re triggering avalanches and seeing and feeling them first hand can only be a help in the battle against complacency. Don’t ski check alone, choose your test plots wisely and don’t separate yourself from avalanches so much that you risk falling into the mouth of the dragon.

Patrollers and Complacency: Part 2- Learning from Someone Else’s Experience

According to Webster’ Dictionary, complacency is “self-satisfaction accompanied by unawareness of actual dangers or deficiencies.” I stumbled recently on an older Simenhois/Savage article, “Professional Avalanche Near Misses” (TAR 28.1). I will start by saying I absolutely agree with them that “debriefing incidents, openly discussing near misses, and participating in decision-making exercises...could aid in preventing near misses.” You would be missing a great opportunity if you don’t attempt to learn from other’s mistakes or mistakes you witnessed but weren’t directly involved in.

The problem with this is human nature. If you can’t admit there was a problem or listen to anyone else’s analysis of your situation/event then not only will you not learn anything from it but your potential for complacency is level at best and may even increase. Further, your self-justification affects how much anyone else learns from it. Rather than hearing a lot of potential solutions and lessons learned, patrollers who were not directly involved hear a little bit of assessment and analysis and then a lot of defense of actions, which makes it more difficult for others to learn from the incident. As our culture becomes more and more politically correct, it is much more likely that a person will simply back off so as not to offend or cause further discomfort to a co-worker. The best situation is objective self-criticism of an incident with following discussion, but that is probably the hardest to achieve, as it requires self-awareness, situational awareness, and lack of ego.

Does operating in a relatively risk free zone, as detached from avalanches as possible, just set you up for the greatest mistake?

NO RISK SLOW LEARNING	SOME RISK MAXIMUM LEARNING	HIGH RISK HIGH PRICE
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I can tell you stories all day about the many times I've triggered cornice (large, extensive, over exposure, all of the above...) collapse with a ski pole probe, and even if you absolutely take my experience to heart, it will never carry the same weight for you as your own experiences. I think about it in terms of generations of knowledge. First generation is something you've been a party to and that will always be the most upfront and vivid in your mind. Second generation is something you've heard first hand, which is important, especially when you are early in the process of gaining experience yourself. Third generation is something person x witnessed, then told me about it and I told you. This can be useful information, but the farther from the source you get, the less effective the knowledge is, the more gets lost in translation and the less likely it is to carry the kind of weight it needs to keep us on our toes.

In the West we're currently also dealing with another difficulty. As everyone is aware, it hasn't been snowing much around Tahoe. At some point it will. We're getting patrollers into mid to senior levels who have very minimal experience with avalanche control. At many resorts where only a small percentage of the patrol performs avalanche control and they can cherry pick the most experienced people to do this work, this is significantly less problematic. We don't have that luxury - everyone we have is involved in avalanche control operations. My estimates are that a patroller on our crew who has completed four years probably has 10-20% of the avalanche control hours I did after four years. And even a patroller who just completed eight years probably has 20-40% of the experience performing avalanche control that I did after my first four years, when it used to snow. This is a problem, although maybe the most for/from those who cannot dissociate total experience and avalanche control experience. But that might be almost everyone. It might be more accurate for me to say I see it as a significant potential problem. As long as we don't fall into the trap of assumption and force responsibility in the avalanche control realm onto patrollers who at another time would have been more prepared for greater responsibility, it should be controllable. Opening times at the resort will suffer, but safety should not because of the recent lack of snow. But that is a very theoretical and optimistic "should" that doesn't account for realities of human nature. It may be difficult for an individual to limit themselves in regards to avalanche control when they may expect more of themselves than their actual avalanche control experience may warrant. It likely is also very easy for them to think others expect more of them and push farther trying to meet expectations that may or may not be reality. Every patroller on our crew is well aware that for most of the resort's history, six to eight years of work history was a standard amount of time to have gained enough experience on all 18 of our control routes to lead them. But those generations of patrollers might have 250-300+ days out on one or more control routes, therefore pushing the experience level of the patrol to a much higher plateau.

What do you do when you've worked six years and you have maybe 50 days where you did a control route and most of those in 2010-11? How do you separate your total experience from specific experience with avalanche control? It is difficult, and all that being said, my even greater worry is the specifics of the experience the new patrollers are getting. These severely low snow levels are prompting those of us with experience to constantly be saying a version of "Normally, I wouldn't go/be here..." This is just a function of the snow levels we're experiencing. I might be walking down on rocks to get to where I need to be for shot placement purposes. On a normal year, those rocks might be buried in a start zone. It's not that we're doing anything unsafe in the realm of the snow levels we have, it's that "Do as I say, not as I do" doesn't generally work in my experience. And what you can very safely do in a low snow year with minimal buildup in the start zones can get you caught in other years.

Who really knows what will sink in when you bombard someone with inclement weather, ski mountaineering and explosive use, each of which is intimidating on its own, let alone in conjunction? Odds are and history proves they're likely to remember most clearly what they actually did and where they actually went and less clearly what they were told. How do you combat this with patrollers who have now



Greg Cunningham performs an aggressive grey zone ski cut with moderate risk. Photo Liam Bailey

Patrollers

and Complacency

Thoughts from the Front Lines

worked four seasons and all they've seen is low tide? My best answer is repetition and inculcation. I have to hope that if we keep talking about it and all of us who have the experience keep talking about it then we can break from the normal rule and make what we're saying the memory they take away from a situation. I think the normal rule can be bucked, I think if someone hears your commentary a hundred times but they only see you do something else a few times, that you can ingrain what you're saying as the lesson, not what you're doing. At least I have to believe that because that is what we can control. We will also need to all be hyperaware when it does start snowing again. ▲

Any mistakes or offense caused by these articles is mine alone. Credit should go to Simon Trautman and Adam Ikemire for influencing me to write down parts of our discussions and other things I've thought about for some time now.

Heather Dent contemplating a test slope. Photo Liam Bailey



Alpine Meadows: March 31, 1982

BY LARRY HEYWOOD

Excerpted from TAR 10.5, March 1992

On March 31, 1982, at 15:45 a large soft-slab natural avalanche released at Alpine Meadows Ski Area. The avalanche, releasing from the Buttress, Pond and Poma Rocks slide paths, swept down into the base area and parking lot of the ski area. The avalanche hit the Summit Chairlift Terminal building, the main ski lodge, several small buildings, and two chairlifts, and it buried the parking lot under 10 to 20 feet of snow. The Summit Terminal Building, which housed the ski patrol, avalanche control headquarters, lift operations, ski school and the main avalanche rescue cache, was completely destroyed. The day lodge sustained superficial damage, the two chairlifts were extensively damaged, and several small buildings were destroyed, as were several over-the-snow vehicles.

Of the seven people in the Summit Building at the time of the avalanche, three were killed. Three were recovered alive almost immediately, and one young woman was recovered alive after a five-day burial. Four people were buried in the parking lot and were killed. Altogether twelve people and one dog were victims of the avalanche. Seven of those twelve were killed. The dog survived a one-day burial. Total monetary loss was approximately 1.6 million dollars.

Alpine Meadows Ski Area is located on the east side of the Sierra Nevada. It is situated five miles north of Lake Tahoe at the head of the Bear Creek Canyon. It shares its northern ridge with Squaw Valley Ski Area, which is located one valley to the north. Alpine is classified as a Class "A" avalanche area and annually records the largest number of avalanches of any ski area in the United States. The ski area includes approximately 2000 acres with elevations from 6800 to 8600 feet.

On the morning of March 31 the Tahoe area was snowed in. It had snowed 17" overnight at Alpine Meadows. It had been snowing for 4-1/2 days and had snowed six to seven feet throughout the area. Most roads were impassable due to the county's snow plows' inability to stay ahead of the snowfall. Many of the avalanche control crew arrived late that morning due to poor roads and buried cars.

It was obvious from the ridgetop wind graph that the avalanche control crew would not be riding any chairlifts to do control work. The winds had been very high over 100 mph and were still high—too high to ride chairlifts. Avalanche Control Plan D was in effect. Plan D is for intense storm conditions with little or no lift operations. It included control measures to protect the base area, parking lot, access road and Scott Chairlift using a 75mm recoilless rifle, a 75mm pack howitzer and hand charges. The rifle was used to control the Wolverine Bowl, Beaver Bowl, Kangaroo and Poma Rocks slide paths. The howitzer controlled the area above the parking lot including the Pond, Bernie's Bowl, and Buttress slide paths. Results in all these areas were not visible due to poor visibility. Hand charge teams on Scott had few avalanches, but did produce one large class 4 slide.

The decision to keep the area closed for the day was made at 7:30 by Bernie Kingery, Mountain Manager, and Howard Carnell, General Manager. After avalanche control, most patrollers went home. Most other employees had been called to stay at home. A few of the A.C. crew were to remain to do control on the ski area access road in the afternoon and then spend the night in the Summit Terminal Building.

The A.C. crew left the ski area at 15:00 for Squaw Valley. Alpine's control teams ride Squaw's KT-22 chairlift to gain access to the slidepaths affecting the Alpine Meadows road. Bernie Kingery was at Base 4, avalanche control headquarters, located in the Summit Terminal Building, to coordinate the closure and sweeping of the road prior to control work. With him were Beth Morrow and Jake Smith. Beth was acting as scribe and Jake was preparing to act as a road guard for the control team.

The four members of the control team were driven to Squaw Valley in a pickup truck. On the way they were impressed with the instability of the new snow. It was very low density cold snow and contained considerable graupel. Every knoll, small gully and depression along the road produced surface slabs as the truck went down the road.

As the crew went through the parking lot and down the access road they noticed many people out cross-country skiing and walking, people who just wanted to escape their snowbound houses. Certainly within this group were Anna Conrad and her boyfriend, Frank Yeatman. Also on their way to the parking lot were Dr. LeRoy Nelson, his daughter, Laura, and David Hahn.

During the time it took the control team to get to Squaw Valley, Conrad and Yeatman arrived at the Summit Terminal Building, Jake Smith left it to prepare to road guard, three more employees, Randy Buck, Tad DeFelice and Jeff Skover, joined Kingery at Base 4 and the Nelsons and Hahn arrived at the Alpine Meadows parking lot.

At approximately 15:30 the control crew arrived at the base of Squaw Valley and made contact with Kingery via radio. They reported they would soon be loading the KT-22 chairlift. At some time shortly after 15:40 the message "Avalanche!" was yelled into the radio. The voice was that of Jake Smith, who, in the lower parking lot, must have seen an avalanche from the Buttress slidepath coming at him.

From survivors we know Kingery, at Base 4, immediately asked Smith's position. Moments later the building began to shake uncontrollably and moments after blew apart from the avalanche's air blast. Survivors reported the wind picked up entire walls and blew them away. Kingery's and Morrow's bodies would be found later 100 feet from Base 4. At the same time, an employee near the parking lot heard trees snapping and watched as a cloud of snow engulfed three figures running from the avalanche. The bodies of the Nelsons and Hahn would be found later in this area.

The normal people to take charge of a rescue were not immediately available. Bernie Kingery was a victim of the avalanche. The other possible rescue leaders were either at home or on the control mission to Squaw.

Quick-thinking employees immediately started a search of both the Summit Building area and the last-seen point in the parking lot, using whatever was available for probing. The three young men who were in Base 4 when the avalanche struck were quickly recovered with few injuries.

Since the control crew at Squaw Valley was called back before completing their mission, there remained a considerable avalanche hazard on the ski area access road. The local fire department and Sheriff's department set up a road block and rescue staging area at the base of the road. It was now necessary to use the unplowed back road to gain access to the ski area. The first organized rescue teams with search dogs reached the ski area at approximately 17:30, one hour and 45 minutes after the avalanche. It was necessary to use snowcats to reach the ski area. As the trained rescue personnel reached the ski area, the search became more organized. The devastation to the Summit Building and the loss of the rescue cache was a shock to the rescue leaders. Years of training had been under the assumption that rescue headquarters and rescue equipment would be intact and available.

After assessing the accident site, the rescue leaders established a command post at the bottom of the access road in a county office. Both power and telephone service were out at the ski area as a result of the avalanche. With the county office as a communication center, ski area personnel called in off-duty ski patrollers to assist in the rescue. Additionally, neighboring ski areas and friends of Alpine responded immediately, providing needed personnel and equipment.

The search continued that first night, March 31, until 23:00 hours. It was suspended for the night due to rescuer fatigue and concern about safety. Recovered that night in the parking lot were the bodies of Jake Smith, LeRoy Nelson and David Hahn.

Thursday, April 1, blessed us with blue sky. Daylight provided searchers with a clearer picture of the magnitude of the destruction and the size of the avalanche. After control work with artillery and helicopter hand charging, the rescue operation resumed. Recovered that day were the bodies of Laura Nelson in the parking lot, Anna Conrad's boyfriend, Frank Yeatman, in the Summit Building, and Beth Morrow 100 feet southeast of the building. Conventional avalanche probing located all victims in the parking lot. As the rescuers were tired and wet, and the avalanche hazard was again increasing in the approaching darkness, the search was suspended at 18:00.

Friday morning, April 2, it was snowing heavily. Efforts went into controlling the access road which had been closed since the slide. Hand charge teams got inconclusive results along the road. It was decided around noon the avalanche hazard to the base area was too high to continue the search.

Attempts were made the next two days to return to the ski area. Intense snowfall kept helicopters grounded and made safe return to the area impossible. Jake Smith's funeral was held in Tahoe City on Saturday, April 3. Jake's many friends, fellow employees and would-be rescuers attended.

Monday morning, April 5, the storm abated enough to allow artillery and helicopter hand charge control work. All efforts were to be put into locating the bodies of Bernie and Anna. At shortly after noon rescuers were excavating the northwest side of the Summit Building. They noticed a hand move. When rescuers saw her hand move, one shouted "Anna, is that you?" "I'm OK, I'm alive," Anna called back. She had been buried five days. The surge of emotions, relief and joy spread through the gathered rescuers. As Anna was evacuated by the medical helicopter the searchers let out a tumultuous cheer.

As Anna was evacuated
by medical helicopter
the searchers let out a
tumultuous cheer.

An Update from Alpine Meadows

BY GREG GAGNE

“My mother was caught in an avalanche” answered Carissa Allen, responding to the question I posed to students in a field session for a Level 1 avalanche class I was leading for Westminster College in Salt Lake City. That was not an answer I was expecting, and when I asked her for further details – which I shall get to shortly – I couldn’t wait to get home to tell Tom Kimbrough the story.

Tom gave me my start in avalanche education back in the late 1990s. By then I had been living in Salt Lake for almost a decade, and was an active backcountry skier as well as contributor of field observations to the Utah Avalanche Center (UAC). Tom initially helped me get established as an instructor for Level 1 classes offered through the UAC, and my work now also includes leading field sessions for classes offered through Westminster College. I owe so much of my personal avalanche education, as well as what I can offer to others, to Tom Kimbrough.

Enough of that, let’s return to the details of Carissa’s reply. Carissa’s mother, you see, is Anna Conrad (now Allen). Although she likely never planned for fame this way, Anna is best known as a survivor of the 1982 Alpine Meadows avalanche that killed seven, including her boyfriend Frank Yeatman. Anna was trapped for five days among crushed lockers in the Summit terminal building, one of the many structures destroyed from the large slide releasing from the Buttress, Pond, and Poma slide paths on March 31, 1982. Anna’s story of survival – as well as the story of the Alpine Meadows avalanche – is well known and widely documented. (see opposite page for an excerpt from a previous TAR article.)

After Carissa told me who her mother was, I couldn’t wait to return home that evening to call Kimbrough as I knew from his past how much that slide shaped his life. (See Tom’s story reprinted from 1992.)

“In that picture in National Geographic of Anna with the oxygen mask, I am the one in the green vest and maroon sweater” said Tom after I told him that I had Anna’s daughter in my class that morning. Tom was among the rescuers who extracted 22-year old Anna Conrad from the wreckage! Tom followed up with “The last time I saw Anna she was being whisked away in a helicopter.” So here’s where the few degrees of separation really hit me: Tom is my mentor and role model who got me into avalanche education; one of my students is the daughter of Anna Conrad who took an avalanche class in part due to her mother’s encouragement; her mother whose rescuers included Tom Kimbrough 33 years ago; who is the guy who got me involved in avalanche education.....

At the center of this tightly-knit story are, of course, two very special people – Tom Kimbrough and Anna Allen. Tom left Alpine Meadows shortly after the 1982 tragedy and settled in Salt Lake where he patrolled at Alta and later worked for several years as an avalanche forecaster for the UAC. Tom retired several years ago, and still climbs and skis regularly. Tom and his wife Barb Eastman now spend summers adventuring on wild and remote rivers in the far North. And although Tom taught avalanche classes for several years after retirement, he has since given that up. But Tom’s influence in the Salt Lake avalanche community is embedded deeply, and he remains one of the most widely-respected avalanche professionals in the Wasatch. And although it seems you can’t walk through downtown Salt Lake without bumping into an avalanche expert, when I am trying to make sense of a funky snowpack, I first call Kimbrough. Tom’s advice about a cranky or unpredictable snowpack often reminds me of the Sherlock Holmes quote “When you have eliminated the impossible, whatever remains, how improbable, must be the truth.”

Anna Conrad’s story of survival is simply beyond belief, but it helps us better understand her strength, resolve, and hope, traits that kept her alive for five days while awaiting rescue. When she was lifted away from the avalanche debris at Alpine Meadows on April 5, 1982 she endured several weeks with various life-threatening medical conditions, and later faced multiple surgeries, ultimately losing one foot and part of another. But as Anna said, “That avalanche took so much from me, I wasn’t going to let it take anymore.” Anna never did let that avalanche have the final word, and decided she was going to live the life she was now given, but on her terms.

Anna returned to UC Davis to complete her education, and later married Brent Allen and raised two children. Anna courageously returned to a career in the ski industry where she still works and skis at Mammoth Mountain.

In June 2015, Anna’s daughter Carissa Allen graduated from Westminster College in Salt Lake City, and her mother and father attended. Joining Anna and her family were close friends Sandy and Mike Horn. Sandy was Anna’s roommate at Alpine Meadows, and Mike worked there as well. A day after the graduation ceremony several of us met for breakfast in Salt Lake where Tom and Anna met again for the first time since Anna was airlifted from the chaos at Alpine Meadows on that early April day in 1982.

Tom and Anna ran in different circles when they were employed at Alpine Meadows – Tom a patroller; Anna a lift operator. They didn’t know each other very well at the time, and at most only exchanged friendly greetings. But like all those that lived through this tragedy, Tom and Anna share a bond, a story, an experience that the rest of us will never fully understand. And it has shaped the lives of these two very remarkable people. ▲

That
avalanche
took so much
from me, I
wasn’t going
to let it take
anymore.

Anna Allen and Tom Kimbrough. Photo Greg Gagne



SHOGANAI:

A JAPANESE SEASON SUMMARY

STORY AND PHOTOS BY DOUG KRAUSE



Japan: Moriyama-san and partner contemplate a morning's work.



JAPAN AVALANCHE SPECIALISTS

It was snowing about five centimeters per hour as the van skated to a stop next to what was maybe the Nakiyama Lodge. The driver said something to me in Japanese, and I said something to him in English. We exchanged blank looks. Headlights pegged the van, and I slid the door open as a giant Canadian pressed greetings through the pounding snow. “Good timing eh? Welcome to Hakuba.”

The Tsugaike Kogen study plot at 1,600 meters recorded 1,222 centimeters of snow between December 23, 2014 and February 20, 2015. That was spread over 15 storm cycles with nice little fresher-uppers between the cycles. A storm began at the 30 centimeter threshold, and ended when we received less than 20 centimeters in a 12-hour period. There were numerous large storms before and after the period of record.

Lows coming out of Siberia and crossing the Sea of Japan from the northwest are responsible for the bulk

of the snowfall in Hakuba, but warmer storms that approach from the Korean Peninsula and track up the Japanese Archipelago from the southwest are increasingly common. These Korean events may bring mid-winter rain. Fortunately, the higher elevation of Tsugaike (relative to its neighbors) spared us rain during the heart of winter.

Go for it. I think we got this gap that's coming up. Really?

Maybe. Should be ok either way. Go for it.

He sparks the torch and holds it to the fuse, watching for the telltale spit. It fires up; he looks at me, shrugs, and tosses it onto the convexity under the gondola line.

JAPAN DOES NOT HAVE A TRADITION OF EXPLOSIVE AVALANCHE MITIGATION WORK. MOST AVALANCHE HAZARD IN HAKUBA IS MANAGED WITH CLOSURES: PERMANENT CLOSURES.

While alpine terrain in the Northern Japanese Alps is frequently racked by strong winds and the avalanche problems that come with them, Tsugaike lies below treeline in a pocket of greater tranquility. Its avalanche paths are well confined, and in 2015/16 they loaded and avalanched in consistent patterns with generally limited destructive potential.

Mid-way through the season I began forecasting mitigation results based on a six-hour guideline. If it stopped snowing before midnight, and the wind didn't hit us too badly, the odds were good that action would be limited or non-existent in our happy little forest.

“Shit.” The gondola is moving. We're supposed to be done with control work under the gondola line before it starts moving. One shot left. That pregnant roll where the line dips closest to the snow surface is the spot for it. Hmm. Hard to say how fast the cabins are moving and how long the fuse will burn. I whip out the torch and toss it to my partner.

A cabin passes overhead and the line is free for a while. We wait. The gap closes. The fuse burns. We cover our ears, but I hear an apprehensive groan. A cabin passes over the roll.

Another cabin approaches, and I can see a lone figure inside, going to work, ruminating on spindrift in the morning light, fading from dull pink to bluer. As the cabin passes over the roll his reverie is interrupted by a violent explosion that hoses the cabin with powdery detritus. Whoops. The fully alert employee stands and peers out the window as he passes by. Dude didn't even flinch. I wave. Sumimasen!

Japan does not have a tradition of explosive avalanche mitigation work. They use a few shots at Niseko, Arai used to have a program, and Cortina uses black powder charges, but that's about it. Most avalanche hazard in Hakuba is managed with closures: permanent closures. Last winter the Japan Avalanche Specialists (JAS) team at Tsugaike Kogen Ski Area implemented

a new explosive program to manage avalanche hazard in permanently closed terrain. The JAS off-piste skiing program opened that terrain.

Several avalanche fatalities in recent years (including one on an in-bounds beginner run) suggested to the ski area ownership that a mitigation program might be appropriate. Declining numbers had them looking for new ways to attract skiers. Enter local ex-pat Dave Enright and his twenty-year mission to free the Japanese powder. Dave convinced the owners to let us have a crack at mitigating and opening all of that beautiful terrain in the name of safety and progress.

On a variety of below treeline aspects between 1,650 and 1,000 meters, the Shakunage, Buna Bowl, and Kashiwa Creek zones accepted the aforementioned 1,222 centimeters. The skiing was really good. Buna Bowl opened on February 1 and we shut down the off-piste program on March 8. Terrain openings will probably extend through most of January for 2016. Second time is easier right?

We used 500 gram emulsions delivered by hand or on a stick. Not much bang for your buck, but when you tape a few together they have a pleasantly wild-west aesthetic. They got the job done.

Pull-wire igniters were impossible to get, hence the aforementioned butane torch. The torch technique is not recommended. I don't know why igniters are classified as weaponry, but there was no problem with possessing the actual explosives, caps, and fuse. Many things in Japan are difficult to understand.

The factory on Honshu ran out of blasting caps and didn't want to make more, so restock had to come from Hokkaido. That's a different island, and using public transportation to move the caps was not an option. We discussed chartering a fishing boat but it never came to that, sadly.

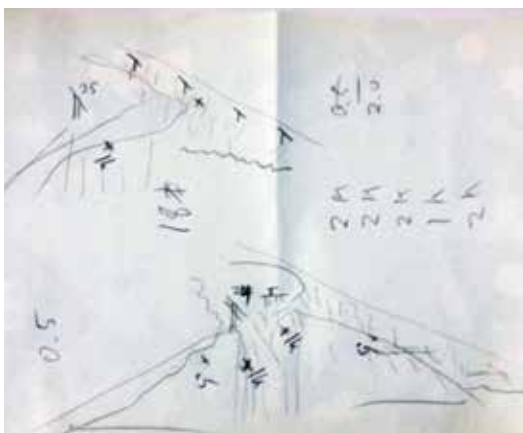
"Shoganai" literally means "No ginger" and translates roughly to "It can't be helped." It is a term of acceptance. That was the first phrase I learned, and I used it a lot. "Abunai" means danger. I used that one a lot too. They work well together.

How are you gonna get it up there?

He throw. He used play baseball. Professional.

No. That is a bad idea.

Mori erupted in laughter, as he was wont to do any time I said using explosives in a particular way was a really bad idea. The top terminal had a full seasons snowpack on the roof. It was settled and scoured down to a cap more than two meters thick. Stout. I convinced the powers-that-be that someone should climb up the ladder and scoop out a little hole well above the apex of the roofline. Put the shot in there; don't chuck it. They really liked that idea. Murata took the shot and leapt up the ladder. Despite the general enthusiasm, this still seemed like a bad idea to me. I looked around,



Japan: Route Plan #2.



Japan: Kindred soul at the Zenko-ji Temple in Nagano.



Japan: Briefing the dawn on Umano-se.

and there stood the mountain manager, the lift manager, and our lead blaster, chatting excitedly. Seemed like we had our bases covered. Shoganai. The shot went off with a crack; the slab parted, dozed off each side of the roof, and broke into Toyota-sized blocks. The crowd went wild.

Developing and training control routes was hard. Motomura is the most experienced avalanche blaster in Japan, but the scope of this program was new to Japan. The other local fellas had a whiff of blasting experience at Arai and Niseko. Bill and Dave were usually busy teaching or guiding in the backcountry. We had a strong, smart crew that was highly motivated and eager to learn, but there were communication challenges. The main one was that I don't speak Japanese, and the team's English skills were rudimentary at best. Shoganai.

I drew pictures in our morning meetings. While we waited for the sun to rise I sketched the routes, shot


placements, and the movement plan for each patroller. We focused on basic communication: like using the radio to alert your neighbor that you are about to blow something up. It was stressful - for me - but it worked. As time passed and our base depth surged past three meters, everybody became more familiar with the route and communication patterns. I learned a little Japanese: Abunai! Moto, Moriyama, Murata, and Toshi learned a little English: Fire in the hole! It even went smoothly after a while.

The storm total pushed past 120 centimeters on the morning of January 18. We needed to get up the last pitch to the summit ridge, where control routes begin. I tried to rally the snowmachine up what is normally an intermediate groomed run, but it was not groomed. It was dark. The headlight was of limited use as I punched it up the hill and porpoised through the storm snow; it became useless when the wind ripped up and blotched out everything. I pinned the throttle, clenched my teeth, and followed the hidden fall line to its crest. On my return to the bottom Motomura greeted me like a conquering hero emerging from a Tsunami of snow. He snapped a pic on his flip phone. "Now two and ex-

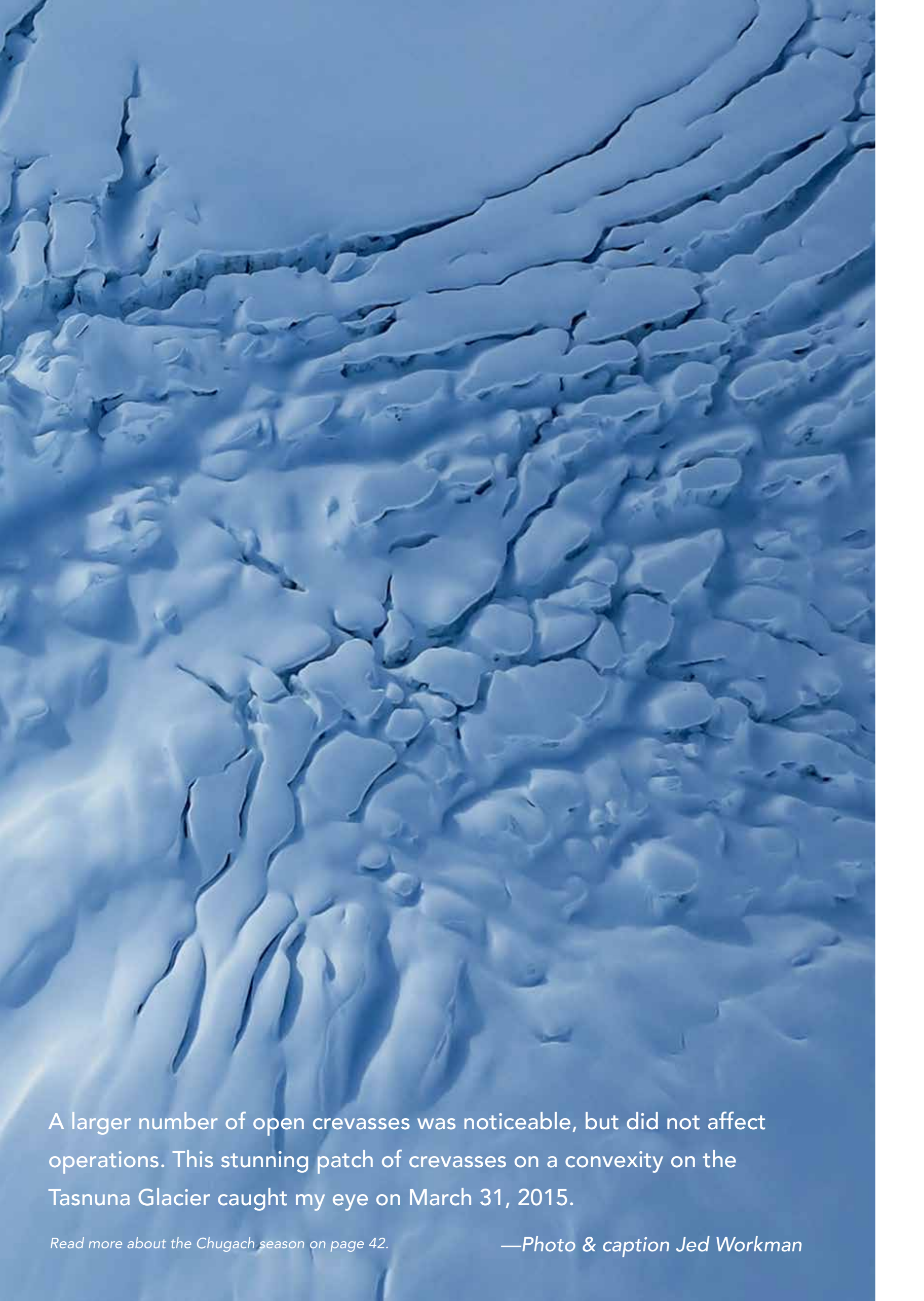
plosives!" he cried, threw the gear on the snowmobile, and jumped on behind me. The second lap was harder. We rolled, but just once. The sun came up.

I am profoundly humbled by the respect, gratitude, and friendship that were bestowed on my surly little self by my new cohorts. I thought I was flying under the radar in the sleepy rural hamlet of Tsugaike. Wrong. One does not fly under the radar in Japan. The "Keeper of the Forest" was apparently the subject of much gossip.

The idea is to open everything, all of it, in the whole country. Why not? Most of the permanently closed terrain at Japanese ski areas can be managed with a modern snow safety program, and that terrain can then be made available to all the happy little powder skiers. But change comes very slowly in Japan. The JAS Tsugaike Kogen program is just the first little step. Hopefully it gets easier. I miss the fried octopus balls. ▲

An aerial photograph of a vast, snow-covered mountain range. The terrain is rugged, with numerous ridges and valleys. The snow is bright white, while the shadows in the valleys and under the ridges are a deep, cool blue. The overall scene is serene and majestic, showcasing the beauty of a winter landscape.

While most of North America was suffering from a lack of snow during the spring of 2015, the Chugach delivered excellent conditions even though snow depths were below normal.



A larger number of open crevasses was noticeable, but did not affect operations. This stunning patch of crevasses on a convexity on the Tasnuna Glacier caught my eye on March 31, 2015.

Read more about the Chugach season on page 42.

—Photo & caption Jed Workman

2014/2015 SEASON

REMEMBERED VIEWED COUNTED

MOUNT SHASTA: On December 12, 2014, the skies cleared after an intense three-day storm on Mt Shasta. Four feet of new snow fell over the three days and was accompanied by consistent southwesterly winds. Skinners came across the toe of this large avalanche at 7,600 feet in Avalanche Gulch. The avalanche (HS-N-D3-R3) started at the upper end of Avalanche Gulch, Redbanks, The Thumb, and Sargents Ridge areas (11,500 to 12,000 feet) and was funneled into Avalanche Gulch proper, the drainage seen in the photo. The slide ran an estimated 2.25 miles and 4,400 feet. The crown line was approximately 1/4 mile wide. —Nick Meyers, MSAC. Photo Robin Kohn, www.mountshastaguide.com



**NATIONAL
AVALANCHE
CENTER**



The Forest Service National Avalanche Center (NAC) had a great year.

The addition of Simon Trautman last summer allowed the NAC to operate fully staffed for the first time in more than three years. This enabled us to be more proactive to the many issues coming through our office rather than simply reacting to the latest crisis.

Simon hit the ground running, logging plenty of travel miles in his first winter with the NAC. He gave talks at the ISSW in Banff, and at the snow and avalanche workshops in Whitefish, Seattle, Ketchum, and Truckee. Among many other duties, he worked through various issues with our avalanche centers, attended military artillery training, met with partners at the National Ski Areas Association annual meeting, and served as the NAC representative for Project Zero and the American Avalanche Association's Pro Industry Training Advisory Committee.

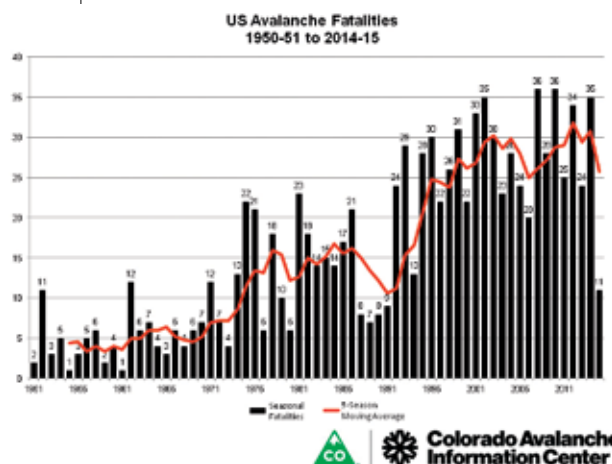
Perhaps the biggest – and most proactive – accomplishment of the NAC this year is the development of

draft policy for the Forest Service manual. Forest Service policy dictates what our agency will do and how we will do it. In spite of the fact that we've run the avalanche center program for more than 40 years and that it is one of the biggest and most visible public safety programs in our agency, currently there is absolutely no policy pertaining to the program. This creates problems for decision-makers trying to manage scarce resources. Without policy, decision-makers can easily question the need to fund the program. The draft policy is currently undergoing review by several different folks in the agency. It's a long process to get it accepted and published, but we will be working toward that ultimate goal this coming year.

The weather seemed to get stuck in place during the winter 2014/15. Snowfall in the Sierra was even worse than the previous three drought years, while the skiers in the east enjoyed what the media dubbed the "snowpacalypse". In Alaska, persistently high snow levels left lower-elevation slopes snow-free much of the winter. In areas of Washington and Oregon, near normal precipitation fell but warm temperatures and rain resulted in historically low snowfall. Notably, throughout much of the west the low snowfall and mild temperatures led to

long periods of unusually stable conditions. This, combined with the great work by our avalanche centers, helped push down our avalanche fatalities to just 11, the fewest since 1992.

One thing that has troubled me in recent years is the media's insistence that avalanche fatalities are rapidly increasing. In the past year I have seen reputable avalanche folks proclaim in grant applications and in press releases about this large increase. While doing so might attract grant funding or sponsors, I think it behooves all of us to



look at the numbers and paint a realistic picture of fatality rates. Using Colorado Avalanche Information Center data, it's clear that our five-year moving average for fatalities has stayed fairly consistent for the past 15 years (generally 25 to 30 fatalities per year) (*see graph*). Though we don't have hard numbers for use, I think everyone who goes into the backcountry would agree that the numbers of people in the backcountry over the past decade and a half have increased by a factor of four or more. It is a testament to our avalanche centers, and to our avalanche community as a whole, that we have been able to keep the fatality numbers fairly stable while our use has skyrocketed. Thus, I believe a much stronger message for us to send would be that our hard work has helped stabilize the number of fatalities despite rapidly increasing use, but with additional funds we believe we can use our current techniques and tools to move those numbers even lower.

Speaking of tools to move fatality numbers even lower, one awesome tool our avalanche centers have utilized for the last decade has been the Know Before You Go program developed by Craig Gordon at the Utah Avalanche Center. This summer the UAC crew (Craig, Bruce, Trent, Paul and others) have been working hard to update the program with significant input and financial contributions from Avalanche Canada, the Colorado Avalanche Information Center, and the National Avalanche Center. We are all excited to be able to use this updated program to target youth avalanche education for the coming winter and beyond.

With that, I'll step back and let you enjoy the annual avalanche center summaries. Thanks to the avalanche centers for the vitally important public safety work they do, and thanks to our whole avalanche community for the support you give these centers!

—Karl Birkeland



MOUNT SHASTA AVALANCHE CENTER

Shastafarians have an uncanny way of keeping the winter stoke alive. Some might say it's the half dozen crystal and spiritual stores in town (not joking) that help keep energy on high flow. It could also be the clear, cold and magically delicious water. A handful might attribute it to the fields of green they just returned from. Or, it simply might be from the genuinely stoked people that live here and relish the fact that their feet hit the floor everyday. Recreationalists swept the unspeakably poor winter of season's past under the mat and despite three winters of drought conditions, we're ready for a winter of epic proportions.

Late November and early December brought a few decent storms to begin our snowpack. On December 10, a whopper blew in and deposit four feet of snow in three days. A 24-hour Mt Shasta City record for rainfall was set at 3.77 inches, smashing the old record (1969) by over an inch. The latter half of December was noted by consistently windy conditions (clocked up to 120 mph!) and intermittent snow.

January started cold and clear. The cold temps didn't last long and things warmed up considerably. On January 7, a record high was set at 68 F in town. Conditions on the mountain turned sour and things got rock solid with slide for life potential. January finished off as one of the driest months on record with .48 inches of water recorded, normal is 7.06.

The beginning of February, we dodged comments like, "Winter is OVER...grumble, grumble...". This

was the time of year when the norm is supposed to be "frozen fingers and raging wood stoves", well said by SMG owner Chris Carr. On February 10 we were soon rewarded for our month-long test in powder patience as a storm rolled through breaking records and dumping 3-4 feet of new snow over the course of several days. All said and done, we had received between 10-11 inches of water. The Sacramento River raged at just shy of 50,000 cfs near Shasta Lake.

March brought a couple smaller storms with clear and sunny conditions in between. Just when we thought winter was over and spring corn the soup de jour, April 6 and 7 gave us an unexpected two feet of snow for one last powder blast. We are fairly certain that a lot of time sheets will have "sick day" listed for those two mid-week days.

The MSAC was able to hire Jonathan Dove to fill the field observer position this winter. Jon has been a seasonal climbing ranger for over a decade and has a great set of skills to fit into the program. Nick Meyers continues as the Director of the MSAC and Lead Climbing Ranger. Winter duties include running the MSAC, issuing forecasts, and teaching avalanche education for the center along with climbing ranger and search and rescue duties for Mt Shasta and Castle Crags Wilderness areas. Two search and rescue incidents occurred during the avalanche centers operational season. Professional development was attended by both Jon and Nick. Jon went to the San Juan Mountains of Colorado for a Level 2 course while Nick went to Bozeman for the Gallatin professional development workshop. Both Nick and Jon also both attended the first annual Sierra Avalanche Workshop in Lake Tahoe.

Mt Shasta Avalanche Centers standards of operation:

- Advisories Friday, Saturday and Sunday for a total of 57 advisories issued, plus one Avalanche Watch. The information is disseminated through the website, phone recordings, emails and wilderness trailheads. The MSAC is still working toward the goal of going back to 7 day a week advisories and likely for next season.

- 60 hours of educational outreach that includes:
- Free 1.5 hour avalanche awareness presentations, monthly December – March.

- Companion Rescue / Beacon Clinics, monthly December – March.

- Snowmobile Avalanche Awareness and Companion Rescue Workshops, monthly December – March.

- Other education and collaborations: winter trainings and presentations with Siskiyou County Search and Rescue, Southern Oregon Nordic Club, USFS snow survey crews, local school groups, Mt Shasta Ski Park.

- Volunteer hours for work such as on the snow partners, observations and fundraising efforts: 75

- Website www.shastaavalanche.org for dates of December 1st – April 12th : 53,897 Sessions (38% new) / 98,785 Pageviews / 21,646 Users.

The MSAC applied for and received a California OHV grant for the second year in a row. The grant this season helped with field observer and Friends of the MSAC executive director salaries, a new weather station on Ash Creek Butte, website development, trailhead signs, brochures and equipment. This funding has allowed for a nice boost to the operations of the center.

The Friends of the MSAC are alive and well. New executive director Justi Hansen has taken a firm grip of the wheel and is doing awesome work. Several new and fresh board members have joined ship as well adding more great insight and stoke for the group. Fundraising events included several movie nights, the annual Snow Ball (2nd best profiting event in FMSAC history this year) and the 2nd Annual Mt Shasta Ascension Backcountry Rando Race, which was awesome by the way.



MOUNT SHASTA: Looking over at Shasta from a trip up Shastina. Photo Stiles Larsen.

Mt Shasta finished off winter with precipitation for the wet season (since October 1st) at 32.77 inches of water, normal is 36.68, putting us at 89% of normal. Snow survey for the Sacramento, Shasta and Trinity watersheds was far below normal. Snowpack for the Mt Shasta area ended in April at 24% of normal with water content at 26%. For the Trinity and Northern Sierra zones, the April 1st snowpack was the lowest in California history (since about 1950). The majority of Southern Siskiyou Counties snowpack existed above 7,000 feet in elevation. Snowpack above this elevation actually showed a favorable increase from last year. However, after entering the fourth year of below average snowpack and no current snowpack in the lower elevations, the drought will have serious implications to water supplies and on the health of natural resources and wildlife.

—Nick Meyers



EASTERN SIERRA AVALANCHE CENTER

The ongoing western U.S. drought (2012-2015) is a fine example of how variable the climate in this region can be. Prolonged dry periods are common on geologic timescales and may be the rule rather than the exception, contrary to what we would prefer. The eastern Sierra of California is known for deep seasonal snowpacks and classic ski descents from alpine summits to sagebrush trailheads, but those days will not be happening very often in years to come. Good snow years will return occasionally, but over the coming years as global warming amplifies, the advantages of the high elevation terrain above 10,000 ft. in the Eastern Sierra will increase as the lower elevations take a greater proportional hit to snowfall and snowpack. High elevation snowpacks may persist into May and possible June but plan on hiking several thousand vertical feet to get there.

I thought the winter of 2013-2014 was as dry as winters could get: 170 inches of snow fell at the 9,000 ft. elevation on Mammoth Mountain where the average annual snowfall is 357 inches. Hard to believe that 2015 would make 2014 look good but when only 113 inches of snow fell from December through April in 2015 and snow vanished before the April sun, it is clear we are in trouble.

After the avalanche center closed at the end of April, winter returned in May and blanketed high elevation north facing slopes with over two feet of snow. More avalanches occurred in two weeks in May than in the entire winter.



Eastern Sierra: Icy glazed snow on Mammoth Mountain, February 10, 2015 Photo Sue Burak.

I hope we have hit bottom— the combination of the driest winter on record, scaling back to part time work for a Type 4 center and pervasive apathy about back-country skiing made for a character-building winter. The daily routine of field work three days a week and writing snowpack summaries were focused on finding slopes with enough snow to dig pits and safely descend without hitting too many rocks. The season's avalanche activity consisted of a few loose and dry slab avalanches in March and April followed by widespread activity in May when the biggest storm of 2015 dropped two feet of snow in eight hours.

Most likely, a decent or even great snow year will occur in the next few years but there are no guarantees. In the nine years of avalanche center operations, four winters were above average (2006, 2009, 2010, 2011), five have been dry to very dry (2007, 2012, 2013, 2014, 2015) and one (2008) was just below average. If climate scientists are right, the trend towards warmer storms and higher snowlines could make deep snowpacks and limitless ski lines a bittersweet memory.

Back-to-back dry winters have created a lot of consternation and many skiers and riders have modified their recreational activities in response to low snow conditions or moved to Canada. Perceptions of what most folks once considered a day of good skiing evolved over the last several winters as we adapt to shallow snow coverage and the ever present threat of hitting rocks. Phrases such as “back when it used to snow” are common in everyday conversations.



Eastern Sierra: First ECT of the winter December 18, 2014. Hopes were high for a snowy winter. Photo John Dittli.

The winter began with promise with 48 inches of snow and six inches of water content falling in December. We enjoyed the first turns of the season in TJ Bowl. Slope cuts produced small wind slab avalanches on wind loaded slopes. Of course there were a lot of rocks, but I thought surely the next couple of December storms would cover rocks with deep east side powder.

Only three moisture starved storms reached the area in January “dropping” only 2.5 inches of snow. Psyche for skiing and riding began to wane as every forecasted storm never delivered the amount of snow promised. Nature's New Year's gift was a strong north wind event that created 2 to 3 foot high sastrugi on the San Joaquin Ridge. After the first week of January, temperatures reached the upper 50's above 9,000 ft. What happened to the winter?

In early February, weather forecasters identified an atmospheric river event that would bring heavy snow to the area. The much advertised storm brought the tropics instead of winter with more precipitation falling in the form of rain than snow. A rain/snow mix reached the 11,000 ft. summit of Mammoth Mountain. Just when I thought skiing conditions could not be worse, icy glazed surfaces glistened on all aspects and elevations up to 11,000 ft. After the early February storm, a thick, knife hard layer became the prominent feature of

the snowpack. Combat ski conditions replaced soft near surface facets. Digging snowpits became tedious and time consuming because the hard layer had to be cut into 12 inch squares before a shovel could get through. I should have carried a small chain saw. I posted many boring snowpit pictures of facet/crust combinations in February and March that all looked the same no matter what elevation or aspect the pit was dug. Not everything was bad about the layer— new cold dry storm snow that fell at the end of February bonded well to the layer resulting in great skiing and mostly stable snow conditions in the Negatives and the Mammoth Crest into the first week of March.

Warm weather returned after the first week of March and another month of crust/facet sandwiches created lousy snow conditions, though if you braved rocky approaches, steep sheltered north facing slopes held settled powder. Only three storms reached the area in March, dropping a depressing 7 inches of snow in a month that usually delivers many feet of snowfall.

The biggest storm of the season occurred in the first part of April when 21 inches fell in two days. We enjoyed great conditions on Mammoth Mountain and in the Mammoth Basin. How nice it would have been if storms like this occurred earlier and more often this winter, but the high pressure ridge did not breakdown and move east until April— giving the East Coast their first days of spring.

At the end of April, 8 to 12 inches fell in the Mammoth Basin. After a few days of widespread loose wet slides in north facing alpine terrain, good spring conditions could be enjoyed after a short hike. Even in the driest winter since the 1930's, there was enough snow on north facing slopes in the Mammoth Basins to enjoy limited spring skiing in early May. Yes, I have lowered my expectations to accommodate the lack of snow and lousy conditions. I'll be watching the developing El Niño, the AMOC slowdown, the PDO, AO and the PNA, hoping that one will load the dice for snowfall next winter.

—Sue Burak

A PERSONAL NOTE FROM SUE BURAK

It has been my pleasure to serve as the Forecaster for the Forest Service Eastern Sierra Avalanche Center for almost a decade. Working in the mountains of the Eastern Sierra Nevada over these years provided moments of joy as well as moments of deep sadness during avalanche fatality investigations. Throughout that time, I faced the numerous challenges inherent in forecasting for a large remote mountainous area with maritime to transitional/intermountain snowpacks. I am moving on to work as an avalanche consultant in the private sector and as an avalanche specialist for the Bridgeport Forest Service Avalanche Program.

I'll remember my many winters with ESAC with a mix of regret for what could have been but also many positive memories. I am fortunate for the mentoring Walter Rosenthal provided in 2006, for patient support from Doug Abromeit during the often fractious relationship between the nonprofit and the Forest Service, and for Doug Chabot's consultation regarding what could and could not be done with limited field data. Craig Gordon and Andy Anderson's expertise was appreciated. Finally, I am grateful to have received the benefit of Karl Birkeland's expertise and guidance over the years.

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TAHOE NATIONAL FOREST SIERRA AVALANCHE CENTER

Drought 4.0

December started out with promising snowfall and the ski and snowmobile season began in earnest on Dec 3. Periodic snowfall continued to build the snowpack during the rest of the month. Relatively small storms frequently produced more snowfall than forecast. This was welcomed by the community after three winters of drought conditions.

A fourth year of drought conditions returned in January and continued for the rest of the winter. The 2015 winter was the warmest on record for the region. The significant atmospheric river type storms that brought several inches of precipitation per storm to the forecast area were associated with high elevation rain that kept the vast majority of snowfall limited to the highest elevation areas. In January, well above average air temperatures set in for the start of a prolonged melt cycle. By mid-January, free water drainage was established from the snowpack with creeks open and flowing. Above average air temperatures and snowpack melt continued for the rest of the season. Several additional storms (mostly warm) impacted the forecast area during the months of February and March. Following each one of these storms, conditions quickly returned to above average air temperatures and continued melt.

While seasonal precipitation for the forecast area measured 51% of normal on March 29, the snowpack measured a mere 9% of average SWE. This prompted the earliest ever end to daily forecast operations for the season on March 29. Of interest, the historic drought winter of 1977 was both drier and colder than the winter of 2015. Precipitation that year came in just shy of 30%, yet significantly more snow existed on the ground. HS measured at the Central Sierra Snow Laboratory on March 29, 1977, was 23 inches and on March 29, 2015, it was 0 inches. While the overall less than average precipitation contributed to the well below average snowpack, it was the significantly warmer than average air temperatures that had the greatest impact on the season's snow coverage and snowpack depth.

Despite the drought conditions, 12 human triggered avalanches were reported to the avalanche center this past winter. Of the human triggered avalanches reported, four avalanches involved incidents where single individuals were caught. No burials or injuries were reported in these cases. An unknown number of other natural and human triggered avalanches went unreported. More info can be found online at www.sierraavalanchecenter.org.

Fundraising and TNF-SAC Partnership Success

The winter of 2014-2015 once again exhibited the fundraising and management strengths of the not-for-profit Sierra Avalanche Center (SAC) in partnership with the Tahoe National Forest. The proven business plan between these two organizations goes beyond typical Friends Group support as the SAC Board of Directors provides up to 50 percent of the avalanche center's total operating costs each season. This ever-evolving relationship, executed through an annual operating plan and collection agreement, allows the SAC to collaborate with the Tahoe National Forest to provided continued avalanche center operations while also collectively focusing on future development.

This past year, the non-profit partner Sierra Avalanche Center Board of Directors contributed 33% of

the funding for the Forest Service avalanche forecasting program. Additionally, the Board of Directors employed Don Triplat as the Executive Director to help raise funds and manage fundraising efforts. Don began collaborating with other avalanche center Friends groups to enhance potential fund raising opportunities. The Board of Directors also funded two field observer positions.

Steve Reynaud and Travis Feist continued their positions as professional field observers. The observations provided by Steve and Travis remain invaluable assets to the avalanche center. Their top quality data collection and analysis help make the avalanche forecasts more accurate across the entire forecast area.

On the Forest Service side, Brandon Schwartz and Andy Anderson continued in their roles as permanent position avalanche forecasters with the Tahoe National Forest. The continued support for these positions highlights the Forest's commitment to the program and its long term importance. Monies from the Lake Tahoe Basin Management Unit (\$22,761), Region 5 (\$17,000), and Region 4 (\$7,875) echoed this message of support by providing 67% of funds to operate the program this year.

Over the course of the winter we issued three early season conditions updates and 116 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.



Central Sierra: Jan 21, 2015 – SAC Board member Todd Offenbacher at 7,600' on a low tide approach, typical this season due to high snow levels and record warmth. Photo Andy Anderson.



Central Sierra: Winter solstice natural loose wet avalanche activity. Red Lake Peak, Carson Pass, CA, E aspect, 9,600'. Photo David Reichel.

Despite the ongoing drought, this season website traffic increased in page views by 40% and unique visitors by 8% over the previous year. A total of 288,821 page views from 62,499 unique visitors were recorded during the daily forecast season.

—Brandon Schwartz



WALLOWA AVALANCHE CENTER

I would like to shelve a discussion on the disheartening snowpack depth and meager snowfall quantities last season and focus on some of the new products and services WAC is now offering the public. Our sixth season launched our first year of providing two day per week advisories complete with the danger scale and problem icons as requested by our survey respondents and our major benefactor. It was an easy year for us to begin this feature as the bulk of the advisories had a LOW danger rating. These were issued early Thursday morning with an outlook for Friday. The forecaster on duty was required to monitor weather closely for changes and update the advisory Friday morning if warranted. Source data acquired weekly from the field by the on-duty forecaster was supplemented by four Pro Observers collecting data throughout our four zones.

Building on WAC's already strong relationship with the National Weather Service the two entities developed a novel protocol and the underlying website mechanics to issue avalanche warnings on the regional National Weather Service home page. The IT specialist at NWS and WAC's IT guru were able to replicate WAC's four home page polygon forecast zones exactly for display on the NWS home page during an avalanche warning event. The message is also broadcast on the weather radio. We continue to enjoy and appreciate the tremendous support we get from NWS. On December 20 we issued our first and only avalanche warning for the season. Four feet of snow with nearly five inches water over approx a 36-hour period lead us to believe this was a sure sign of a slam bang winter to come. Sadly, however, we all know "the rest of the story."

All these nifty new products would be of no use unless we could broadcast them to the public. Our Deputy Director, Julian Pridmore-Brown, in concert with a contractor (La Grande Ride), redesigned the entire website to accommodate all these new products, gave it a new look, reformatted certain observation forms for ease of use and incorporated password entry for our Pro Observers. In addition, WAC incorporated a website tracking form (called a Travel Plan) for forecaster safety when in the field do-

ing observations. Prior to launching on a field mission the forecaster inputs various information on the form. Things like departure time/expected return, zone and proposed route, communications plan, etc. Once saved, an email is automatically generated and sent to key people. Should the forecaster not return in a timely fashion those key people would take appropriate action.

After a many year effort on the part of WAC, we finally succeeded in getting a formal MOU with the Forest Service signed and effective November, 2014. This provided formal recognition at the Forest Supervisors level of the avalanche safety information we provide to visitors recreating in our local National Forest as well as opening the door with NWS to allow avalanche warnings to be broadcast through them.

WAC continues to build and install our own weather stations with a third one ready to go for winter 2015/2016. We thank the Wildhorse Foundation of Pendleton, OR for the grant funding for this important location at a high point snopark and one of the most visited launch points in our region for snowmobilers and foot travelers alike.

Last season was quite uneventful with regard to incidents, never mind accidents. What a change from the 2013/2014 season when two avalanche related fatalities occurred in our mountains. We begin a new season hopeful the low numbers of accidents recorded by the CAIC nationally last season is indicative of a trend in human factors awareness and not because of such a crappy snow year. Cheers to all in promoting safe travel in avalanche terrain.

—Keith Stebbings



Northwest: Get in line if you want to ski. Backcountry skiers ascend “PanFace” to Panorama Pt from Paradise, MRNP. Photo Scott Rinck

subtropical moisture. The vast majority of NRCS Snotels across our forecast area were near or above average for precipitation since the start of the Water Year (Oct 1st). A great description of the upper level weather pattern and above average sea surface temperatures in the western Tropical Pacific that contributed to our dismal snowpack can be found in a blog post by local UW atmospheric science professor Cliff Mass: <http://cliff-mass.blogspot.com/2015/03/why-has-weather-been-so-unusual-past.html>

One of these atmospheric rivers followed a wintry stretch seen the latter half of December and led to the one avalanche warning NWAC issued this season on Jan 5th. Three to seven inches of water fell over 48 hours, ending Jan 6, and snow quickly turned to rain, which led to a natural avalanche cycle.

Insert Jan2015_ParadiseGlacier_JAllyn.jpg

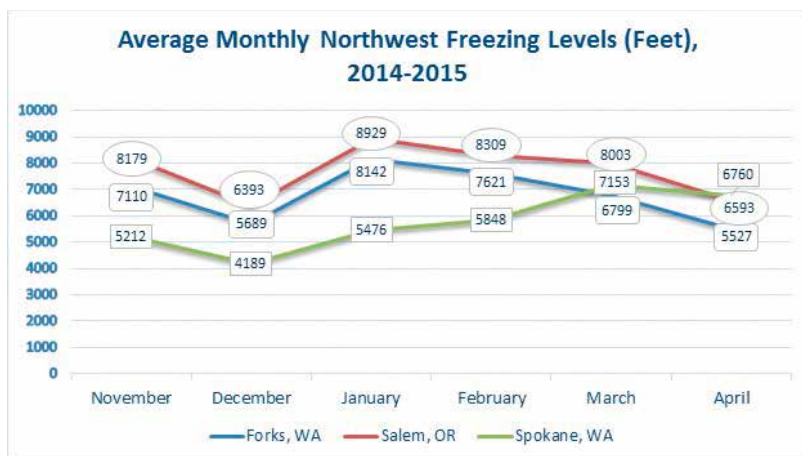
Persistent weak layer concerns surfaced along the east slopes of the Cascades in late December and part of January with a few large persistent slab avalanches failing on large facets above a crust in the Mission Ridge backcountry. Several rain events followed by warm periods later in January ended the PWL threat along the east slopes as they erased much of the snowpack at lower elevations and on solar aspects.

Bright spots this winter included the northeast Cascades where backcountry users enjoyed a near normal snowpack off of their stretch of closed SR 20. Particularly in this area, cold air trapped on the east side of the Cascades kept precipitation as snow longer

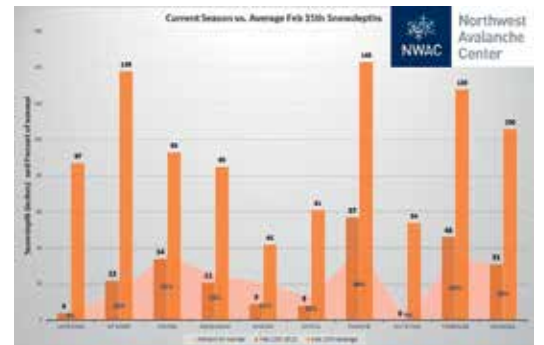


If we counted the number of phone calls to the forecast office, this season would likely show a record low. When the long stretches of cricket chirping were interrupted, many folks wanted to talk about the forecast, as in the two-week or longer outlook! Snow desperation was temporarily placated with unlikely long range possibilities, because even a small chance of a weather pattern shift was better than the current situation for many in the PNW. With another nod to the unusual season, the annual NW forecaster’s meeting was held mid-March at NWAC’s Seattle office instead of at a ski area.

Behind the seasonal misery was a dominant upper level ridge over the northeastern Pacific that led to long stretches of dry weather with high freezing levels. However, these stretches were periodically interrupted by atmospheric rivers aimed at the PNW that tapped into



Northwest: Winter in reverse: West side freezing levels peak in January and descend into April.



made summit attempts more common on the volcanoes. Paradise (Mt. Rainier) became the go-to spot for backcountry tourers and avalanche classes as it was the only location that provided a relatively deep and reliable snowpack from the parking lot.

Ski areas in general, and especially those without snowmaking or higher elevation terrain limped along for much of the winter with lower elevation terrain melting away in March as meaningful snowfall never returned. Below is a mid-season snapshot of our snow depths vs. normal conditions.

Winter teased us in late March with cool temperatures and significant snowfall followed by quick warm-ups and a few periods of storm-related elevated avalanche danger. A cool long wave trough pattern finally set up in April, delivering several moderate snow events. However, it was too little too late for many ski areas that were already closed.

Many of our upper weather stations’ snow depths (above 5000 ft) peaked during this period along with

some of the best snow conditions of the season. However, the April snowfall was not enough to keep



Northwest: Debris from a remotely triggered persistent slab in the Lake Clara (Mission Ridge backcountry), 12-31-14. Photo Jamie Tackman.



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Photographer: Adam Clark

Chinook, Cayuse and Washington Pass from opening early. The late season snowfall caused NWAC forecasters some anxiety as a powder-starved backcountry community suddenly had access to high mountain passes at an unusually early time of year. There were a few close calls with skier triggered avalanches during this period, but luckily no serious accidents.

Notable Lowlights for the 2014-15 Season:

- The Mt. Baker Heather Meadows station (4210') drowns in 13+ inches of water over four days ending Feb 8. Only three inches of snow fell at the end of the storm.
- Mt. Baker ski area closed March 9 and (re-opened last weekend in April.
- Snoqualmie Pass's only double digit snowfall occurred on April 1.
- The Summit at Snoqualmie only opened for 40 days this season.
- Hurricane Ridge rope-tow (Olympic Mountains) never opened.
- Paradise snow depth never rose above 100 inches (Zero NWAC stations reached the 100" depth.)
- Earliest opening for Chinook Pass (SR410) and Artists Point (SR 542) on record (WSDOT.)
- Latest start to NWAC avalanche forecasting, Dec 20.
- Only one avalanche warning (1/5/15) and one special advisory 4/16/15 issued (average ~25/season.)

Program Highlights, Including Non-Profit NWAC Activities

- NWAC Blog launched Fall '14 – 13; blog entries included two guest posts.
- Data Portal for NWAC weather station data successfully debuts mid-winter.

- Beta version of NWAC app launches for Android and iPhone.
- NWAC Instagram launches, photos also embedded within appropriate forecast zone.
- 150 NWAC/AIARE public awareness courses conducted (free.)
- Six Going Deep sessions hosted by Seattle REI (three hrs, focused topics outside of awareness classes.)
- Northwest Snow and Avalanche Workshop (NSAW) – NWAC is pleased to announce that we will be taking over NSAW and continuing this excellent fall tradition beginning November 2015.
- Two new professional observers hired, bringing our outstanding field staff to eight for the program's second season.

—NWAC Staff



WEST CENTRAL MONTANA AVALANCHE CENTER

Weather/Snowpack Summary

With SNOTEL sites recording near and above 100% of average snowpack, Western Montana residents braced for what looked like another big snow year at the start of 2015.

By mid-January, the snowpack in Western Montana was good enough that a few ski areas claimed to have the deepest snow in the country. They may have been right at the time, but it didn't last.

Snowfall amounts were paltry after mid-January, and by May, Western Montana's mountain snowpack receded to 30-50% of seasonal averages. Still, we fared better than most other locations in the West because of the high moisture content of the early season snow.

Initially we focused on the weaknesses associated with basal facets in areas where October and early November snow was exposed to temperature extremes during the clear and cold weather of early December. Subsequently January's prolonged periods of above freezing temperatures and rain at up to 8000 feet strengthened the base layers, and our attention turned to tracking surface hoar and other near surface facet layers.

Avalanches/Incidents

After a tragic 2014 winter, no avalanche fatalities and only two close calls were reported to the center this winter.

On December 27, 2014, an avalanche caught four in a group of five riders climbing and side hill carving on steep, open terrain in the North Fork Placid drainage of the southern Mission Mountains. Of the four caught, two were completely buried and two escaped. One of the trapped riders did not have a transceiver.

Within 10-14 minutes, a rescue team recovered the rider with the radio transceiver from a depth of approximately 3' below the surface. The rider with no transceiver was buried next to his sled, approximately 3' below the surface. After about 10 minutes, and close to succumbing from lack of oxygen, the rider felt his sled shift next to him. He was able to move the sled in response, and feeling this motion, his rescuers dug him out. His total time under the snow approximated 14 minutes. No one was hurt and they all rode out after on-site medical assessment from Missoula County Search and Rescue members.

The lucky rider bought an avalanche transceiver, probe, shovel, and airbag the very next day.

Tragically, two days before this avalanche incident, two riders from another party died when their sleds broke through the ice on Seeley Lake. Both riders de-

ployed avalanche airbags, which kept them afloat and visible, but did not keep their heads above water. The Missoula County Search and Rescue organization, Two Bear Air, as well as other first responders from the Seely Lake area deserve special thanks for dealing with these back-to-back incidents in difficult conditions.

Website and Social Media (in response to current usage, we have changed our style (but didn't update stylesheet) to use Website as one word)

Our website, missoulaavalanche.org, was upgraded and brings all the platforms and social media outlets we use onto one seamless and integrated system which allows users to view our information on their mobile devices. These upgrades also enhance the ease with which we post and distribute information.

For example, in late December, we posted an avalanche warning, complete with narrative and video, directly from the Ski Patrol station at the top of Montana Snowbowl and just a few hundred yards from where these dangerous avalanche conditions were observed. Our ability to report in real time from the field made the expense worthwhile.

Education

Avalanche specialists and instructors presented a wide variety of avalanche safety programs to over 2,500 participants this winter. Grant funding awarded by the Missoula County Resource Advisory Committee and Recreation Trails Program, as well as an allocation from the Lolo Forest, allowed us to more than triple the number of classes we offer. We hired a part-time educator to coordinate KBYG programs in nearby schools, specifically focusing on local high schools and the University of Montana. We also hired a former backcountry snowmobile guide and shop owner who brings a skill set to our program that will benefit our students and staff in the future.

This Year's Numbers are as Follows:

- Five part-time educators and two avalanche specialists edavalanche safety programs throughout Western Montana, with 225 participants in snowmobiler-specific avalanche classes.
- 1004 educational contacts with minors through KBYG and other school programs.
- 1,310 participants in other programs ranging from basic one-hour presentations to three-day Level 1 classes (5).

In addition, we co-sponsored a popular Level 1 for Women class with the Yurtski and She Jumps organizations.

We also assisted the Missoula County Disaster and Emergency Services (DES) office with an urban avalanche response workshop in February. Tom Mattice of the Juneau, AK DES was the lead instructor for this two-day workshop, which focused on basic rescuer safety, organization, and procedures related to avalanche incidents in residential areas.

Our Friends organization bought a wireless beacon park that will be added to the three others currently in use at Lost Trail Ski Area, Lolo Pass Visitor Center, and Montana Snowbowl. The location of the new unit is yet to be determined.

—Steve Karkanen



When trying to craft an engaging introductory sentence to this seasonal summary I typed “promise and heartbreak” into the powerful Google™. A mere 0.62 seconds later I found that apparently the season here in northwest Montana was akin to the “1960s: A Decade of Promise and Heartbreak” that “contained hope and failure, innocence and cynicism.” (U.S. News and World Report headline). Perhaps it's hyperbole, but I suppose I can work with this. Certainly there was hope, probably some failure along the way, maybe a splash of innocence, and a very healthy dose of cynicism. I'll try and check the cynicism at the door, but here is how the season panned out.

Despite the lack of consistent snowfall, it was a decent season. Indeed it was a great start to the winter. During the fall avalanche workshop USGS Research Scientist Greg Pederson discussed the development of El Niño and the potential effects on our region. His prediction was not promising, but most folks laughed it off during the bounty of those early season storms. Northwest Montana hovered above average in terms of snowpack depth and snow water equivalent through the middle of January. A layer of surface hoar buried in late December kept avalanche conditions interesting until mid-January (Figures 1 and 2). A large storm in early January deposited up to 50 inches at upper elevations and led to a widespread and large natural avalanche cycle. Then the faucet turned off, winter began to look more like spring, and Greg's predictions were coming to fruition. A widespread natural wet loose and more isolated wet slab cycle occurred in late January into early February due to increasing temperatures and abundant sunshine (Figure 2). A series of intermittent storms through March kept the snowpack viable above 5500 ft. (mid-elevation), but many of these were quite warm and brought rain at lower and mid-elevations. Decent natural avalanche cycles ensued with these

warm, wet storms. However, lower elevation snowpack suffered and access started becoming an issue. Our last advisory of the season was April 5. After that the spring brought sunny days, cold nights, and very little precipitation for about six weeks leading to very fine corn skiing conditions. So that was nice. Hence, promise in the beginning of the season that developed into a fairly lackluster winter.

During those periods of low hazard, no new snow and a rather uninteresting snowpack we continued to produce advisories in the same manner but tried to keep folks engaged. Many folks just simply stopped recreating in the backcountry. However, we employed a couple of tactics in hopes of keeping it interesting. First, given the sub-par conditions, we encouraged users to continue to dig into the snow with the intent of looking at a snowpack during a relatively stable period thus providing them with that information in their toolbox for the future. We also encouraged them to continue to submit observations during those periods as it was still extremely important information for us and the community. Second, to keep ourselves engaged, we rode and skied many miles in search of any instability, and greatly enhanced our snow biking skills. A strong measure of sarcasm amongst center staff also helped.

While the snowpack failed to produce a captivating highlight reel, there were still very positive developments for the FAC. The FAC is in the midst of transitioning from 3 days a week (Type 3 center) (this year we provided 4) to 7 days a week (Type 2 center), and this year saw substantial achievements on many fronts. Here are just a few highlights:

We completed a makeover of the website including a new look to the advisory format. The new format is user friendly, visually pleasing, and received numerous accolades from users. It is also more consistent with other avalanche centers throughout the western United States. This new website was funded, in part, by the Friends of the Flathead Avalanche Center.

27 classes that reached 1,272 students of all ages.

The first ladies specific avalanche courses in northwest Montana were conducted this year with a great group of women teaching the classes.



Flathead: Cut bank along snowmachine trail in northern Whitefish Range that failed on a layer of surface hoar buried 45 cm deep. Photo Flathead Avalanche Center



Flathead: The culprit failure layer (prior to burial) of a period of natural and human triggered avalanches in late December. Photo Flathead Avalanche Center

Motorized specific avalanche awareness and Introduction to Avalanche classes.

The Friends of the Flathead Avalanche Center, a newly minted non-profit, hosted numerous classes and a couple of fundraisers to help support FAC and avalanche education in northwest Montana. This group of dedicated and passionate volunteers is doing wonders for the community thus far.

Penco Power Products and Yamaha donated two new Viper M-TX sleds for use during this season, and Penco is continuing their generosity by donating two snow bikes for next season's use.

Flathead: Overview of wet slab avalanche in Picture Chutes, Hellroaring Basin, Whitefish Mountain Resort. The avalanche (within ski area boundary) ranged from 48-75 cm deep and failed on a layer of moist facets above a melt-freeze crust, was 100 ft. wide, and ran 300 vertical feet. Photo Flathead Avalanche Center



The wildly successful Northern Rockies Avalanche Safety Workshop (held annually in the fall) contributed funds from the workshop toward a new remote weather station located atop Big Mountain at the Whitefish Mountain Resort that was installed in September. This weather station is a collaborative project funded by the Northern Rockies Avalanche Safety Workshop, Burlington Northern Santa Fe Foundation, and Whitefish Mountain Resort.

FAC continued to host a two day per week avalanche advisory for the Kootenai National Forest as part of our website.

Overall, it was a successful season for a developing avalanche center despite the somewhat bland conditions during the latter part of the season. An army of volunteers helped the avalanche center with everything from installing weather stations, field days, and teaching avalanche classes. The FAC staff thanks everyone for their effort and time. We are already planning and looking forward to next season full of hope and promise.

—FAC staff



**GALLATIN NATIONAL FOREST
AVALANCHE
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The season in southwest Montana started strong with many storms and plentiful early season snow followed by spring weather in February and March. Although skiing and snowmobiling conditions were bipolar, the snowpack was generally stable with more days of “Low” avalanche danger than any of us can remember. The season started and ended with two tragic avalanche fatalities. One occurred the day before Thanksgiving and one in early April. The first was a large, remotely triggered avalanche on a faceted layer near the ground during an Avalanche Warning. The second was a very small wind slab triggered by a skier in extreme terrain when the avalanche danger was Low.

Early Snow and Cold Weather

In December we often get extreme cold weather causing depth hoar that plagues us all season. Instead, ex-

treme cold weather arrived during the second week of November when there was less than a foot of snow on the ground. The resulting facets could not support heavy snowfall in late November, and a snowmobiler died when he remotely triggered an avalanche near Cooke City during an Avalanche Warning. More storms kept this layer active through December.

By early January this layer was no longer a problem. What happened? Fortunately cold weather came early when there was little snow on the ground thus the layer stayed thin and was compressed or flushed out. If the extreme cold weather had occurred a few weeks later when there was more snow on the ground, it would have created a thicker and more persistent layer of depth hoar, causing avalanches for the rest of the winter as it did the previous season.

Gallatin National Forest: Early December riding can be costly! Forecaster Mark Staples is 30 seconds from tagging a buried stump and damaging the left spindle. Photo Jason Bacaj





Gallatin National Forest: Cutoff Mountain looms behind a natural avalanche near Cooke City, MT. Compared to other seasons, there weren't many avalanches to investigate this year. *Photo Eric Knoff*

Calm Winds and Surface Hoar

By January 1, local SNOTEL sites had 80-140% of average SWE. January was notable for a lack of wind, temperature inversions, and multiple surface hoar events. These surface hoar layers became our main challenge. In many cases, winds created spotty distributions of the surface hoar. In other cases, surface hoar layers survived and were buried but never became a widespread problem. Maybe it was slow loading, minimal loading, or warmer than normal temperatures. Despite the challenges of surface hoar, the overall lack of wind gave us great riding and opportunities to ride powder in high alpine zones.

Warm Weather

Unusually warm weather in February and March brought wet avalanches but a gradual warm up with refreezing most nights (except one three-day period) prevented this activity from being a significant problem. Cooler weather and a little bit of snow returned in early April. Even though avalanche conditions were generally safe, a skier died near Big Sky when he triggered a very small wind slab that swept him over cliffs and he died of trauma. Snowfall was below normal overall, but some areas did well. By April 1, local SNOTEL sites had 55-107% of average SWE.

The Avalanche Center and the Friends

Despite below average snowfall, it was a successful season on other fronts. Doug, Mark and Eric continued forecasting and enjoyed the slower pace and opportunities to ski, ride, and climb in avalanche terrain with no worry. Alex Marienthal worked as education coordinator for his second year, and we taught a record number of classes to 5,562 people. Snowmobile education has been always been a major focus of our program. In past years we've mostly taught awareness classes and a few intro classes with field sessions. Recently we started offering snowmobile Level I and Level II classes and very popular Companion Rescue Clinics. Our Level I snowmobile class this winter sold out in only three days! We also traveled to Minnesota this winter teaching several classes to Polaris employees. In April we hosted the 6th Professional Development Workshop with and all-star roster of Don Bachman, Liam Fitzgerald,

Rod Newcomb, Dale Atkins, Dave Hamre, and Bill Williamson talking about "What I would tell myself as a 25-year-old rookie." By the time this article appears in TAR, we should have all their talks posted on our YouTube channel AvalancheGuys.

Surveying our Students

Lastly, we continue encouraging students in all our classes (even snowmobilers), to dig quick snowpits and perform at least one Extended Column Test. We surveyed 715 students from the past three years in our MSU Avalanche Class with Field Session (it's like a Level .75). We asked if they dig pits, perform stability tests, and how useful the results are in their decision-making. In general 75% of our students dig snowpits and perform ECTs and say they are helpful in decision-making. See the February TAR, volume 33, no. 3, page 12 for more info on our reasoning and results from our surveys. We conducted a follow-up survey this April. One question was "What are some things you learned in the class that have been most useful for you? Most memorable?" Overwhelmingly, our students responded with answers like snow science, snowpits, stability tests, and understanding layers in the snowpack. We are alarmed by what appears to be a national trend away from teaching snowpits and stability tests. To counter this trend, we will keep emphasizing these life-saving skills as a key component in the decision making process.

Come October we will start gearing up for next season which I'm forecasting to be epically deep.

—Mark Staples



**IDAHO PANHANDLE
AVALANCHE
CENTER**

Early season snow laced the mountains in October this year and fairly frequent snowfall kept the white stuff visible on the high peaks. In November the snowfall became more persistent. The weather around Veteran's Day developed our first weak layer in the pack due to cold temperatures followed by light snowfall. By Thanksgiving more snow mixed with rain was creating

a layer cake out of our snowpack. By December snow was still scarce and it was not until Christmas that IPAC issued the first advisory. By that time, still only three feet of snow or less had accumulated in the mountains. Our mountains typically need about five feet of pack to fill in loading zones and avalanche paths and cover brush and thick trees. After a very lean January, people of the Inland Northwest were becoming highly suspect that winter would ever really kick in. January is typically a very snowy month and the net accumulation of snowpack, after many episodes of melting rain, was only a few inches across the forecast region. Statements like, "Ok, we're done building up the base. We need a few inches of powder now", were common among the snowgoer crowd.

Heavy wet snow became the main avalanche problem early in February, loading less dense layers and a couple persistent weak layers from December. Subsequent rain events saturated our snowpack to the highest elevations and lead to the thickest ice crust I have ever experienced. We literally had to chip through it to dig a pit. Rain eliminated all snowpack on south and west aspects below 4,000 feet. As we held our breath about a last gasp from winter, the conditions worsened into March. We had to ditch the snowmobiles for access to the mountains so on the first week in March we hiked up to 4,500 feet before we hit the snowline. With the conditions looking bleak and future-casts of warmer than average and lower than average precipitation we decided to essentially end the weekly advisory and issue the General Spring Advisory on March 16. Very few avalanche accidents and no fatalities were reported this year.

In October IPAC was asked to present an avalanche awareness seminar for the Idaho State Snowmobile Association annual convention hosted by the Sandpoint Winter Riders. IPAC prepared a booth and set up for both days at the convention. The following weekend Eric Morgan went to Spokane to represent IPAC and partner with Panhandle Backcountry at the Snowlander Snowshow. This is the second year in a row that IPAC and Panhandle Backcountry have sponsored a booth at the ski/media and local beer industry's winter season promotional event. Also in November, IPAC conducted an avalanche workshop for the newly reformed Bonner County Search and Rescue unit in Sandpoint.

IPAC submitted a grant to Idaho Parks and Recreation for \$20,000 to support the avalanche center next year. The primary goal of the grant is to hire a new Director of the AC. The funding would provide for a full time position, which I feel the Director responsibility has become. This level of funding may enable two



Idaho Panhandle: This was the coolest thing I saw all winter; these icicles under the river ice that formed as flood flows receded. Also the rain event that essentially ended winter. *Photo Kevin Davis*

advisories per week. IPAC's snowmobile classes with IDPR got nipped a little by the low snow leading to canceled classes. We did get one field class conducted in Sandpoint in early January.

The Friends of IPAC were key this year at getting to the high schools for Know Before You Go programs. In all, the combined KB4YG effort reached 360 kids from Potlatch, St. Maries, Plummer, Post Falls, Coeur d'Alene, Sandpoint, Clark Fork, Priest River, and Bonners Ferry, not to mention Gonzaga University in Spokane WA. For the fifth year in a row IPAC lead the avalanche discussion for the Spokane Mountaineers Mountain School. It was another great day in the mountain classroom teaching route finding, avalanche dynamics, and stability assessment.

The Friends of IPAC spearheaded the organization of Pit Day this year. Bill Williamson, Mountain Manager at Schweitzer, was gracious enough to allow us to convene in the Selkirk Lodge. Tom Eddy, Snow Safety Patroller, introduced the group to SnowPilot. Liam Fitzgerald, a recent transplant to Sandpoint, shared his knowledge and wisdom on big picture snow safety and awareness. Snow conditions for the field portion were less than favorable since we had just experienced a deluge of rain but we did expose some PWLs in the pack and compared notes when we got back to the lodge. We concluded the day by awarding the Abromeit Avalanche Scholarship to Miles Rinne, who was in attendance. Miles was an excellent candidate since he is studying geography at Eastern Washington University with an interest in snow science and avalanche safety. In fact, he is working on a directed study where he is mapping avalanche terrain in and around the St. Regis Basin. IN addition, special thanks to FIPAC for sending IPAC Director Kevin Davis to ISSW.

IPAC constructed a float for the Sandpoint Winter Carnival. We piled on as much snow that a double-axle trailer could handle and adorned it with snowshoes, skis, snowboard, runner sled, and the snowmobile was placed on the pile of snow as if climbing a mountain with none other than Smokey the Biler putting the Highmark on the whole parade. IPAC won Grand Prize for the float and Smokey accepted the trophy. If you haven't donned the Smokey suit, it's a career must. I just wouldn't try it on skis.

As of this writing, values of percentage of median peak Snow Water Equivalent from south to north are; 55% at Lost Lake, 0% at Lookout Pass, 33% at Bear Mountain, 53% at Schweitzer Mountain, and 31% at Hidden Lake. Some good news to offset the bumner snowpack is IPAC received \$25,000 from the Regional Office in Missoula. The R1 Director for Recreation chose to earmark some of the additional funds toward support for the region's avalanche centers.

—Kevin Davis



Idaho Panhandle: Natural avalanche (HS-NS-R3-D3) in St. Regis Basin, a popular backcountry destination near Lookout Pass on Idaho/Montana border. Photo Dan Frigard



Payette: December 23 slide that buried a snowmobiler. Photo Dave Bingaman



PAYETTE AVALANCHE CENTER

What a long strange winter it's been...

The winter of 14/15 is going to be remembered as a weird one. Is this the beginning of the demise of the ski industry or a cyclical drought? That topic was raised and debated across the internet and locally over many beers. The Boise NWS office published an interesting report in January looking at climate stats in Boise, ID showing 2014 to be the fifth-warmest year in their database with 11 of the 12 months boasting above average temperatures. Ironically, it also turned out to be the 11th wettest year on record. 2014 also boasted the longest growing season on record with 200 days between freezes in the Treasure Valley and almost year around golf, mountain and road cycling. Despite the happy farmers, golfers and cyclists in the lowlands, skiers and snowmobilers had little joy.

Our winter started early with several good November storms. Rumors of abundant algae blooms on Pacific atolls hinted at a big winter which quickly stalled after a few early season teasers. PAC issued several hopeful backcountry updates but we did not put out our first advisory until December 20. An early Christmas present brought almost a week of light, dry snow on top of a buried surface hoar and NSF layer. These storms resulted in the best skiing and riding of the winter and a snowmobile rider getting buried and self-rescuing while his companions watched from above. As is turned out, this was the only reported near miss through the winter. The week following Christmas added .3-.5" inches of SWE almost every day with cold temps which just added to the stability and quality of skiing. Sledgers and backcountry skiers had a blast.

While other Western areas waited for winter, a series

of storms blasted wind from all directions and high density snow over the West Central Mountains. By January 8, daytime temperatures skyrocketed into the 40s and gave us a good idea of what we were going to see for most of the rest of the winter. A series of unseasonably warm cycles followed by short periods of cold clear weather took its toll on the snow quality but provided immediate stability and low hazard. January at PAC was characterized by high temps, shallow wind slabs moving around the compass with each storm as well as a smorgasbord of crusts. The month ended with a mid-winter corn cycle that surprised everyone.

February was very similar to January with a few heavy wet storms accompanied by high winds. Local ski resorts clocked winds in excess of 50 mph several times through the month and one storm produced 100+ mph winds. Between the storms freeze and thaw cycles quickly stabilized the snowpack and made travel extremely easy to the point where skiers ticked off far out and never or rarely skied lines in every corner of the forecast area. Snowmobilers from drier portions of the West flocked to the McCall area and took full advantage of the deep and stable snowpack by traveling everywhere and playing in incredibly steep, remote areas. Informal use monitoring showed another season of increased motorized recreation with overflowing snowmobile parking lots at multiple sites even mid-week.

March added a few more feet of upper elevation snowpack but high elevation rain and low elevation melting made accessing backcountry areas tougher as trailheads and groomed snowmobile routes began disappearing. During March we had two short windows of Considerable hazard followed by most of the month being Low hazard.



Payette: Women's only Backcountry Avy Basics class at Tamarack Resort. Photo Erin Laine

The end of the season and April brought several more storms and some of the colder weather of the winter. The snow continued to melt and although Fresh snow was hard to find, skiing and riding stayed good with stable conditions and plenty of opportunities to pick off steep lines.

PAC forecasters made light of the variable conditions through the winter by describing a variety of ways to ski crust and at what elevation rain became snow, we also took advantage of the conditions to visit some remote corners of our advisory area. We offered more detailed condition reports and reported on access as it became more of a challenge. In addition, we added more media features to our daily advisories and on our Facebook page which saw a huge increase in activity. We also found it necessary to replace weathered Gore-Tex for newer, drier fabrics to combat the high elevation rain. Both forecasters purchased large amounts of stock in companies that specialize in high fluorocar-



Utah: We had record-breaking low snowfall, but hey, at least it was windy. Nukin' downslope wind along the foothills of Salt Lake City, which prompted an avalanche warning for the foothills, but not the mountains. *Photo Bruce Tremper*

bon and high temperature ski wax which should allow for early retirement as the winters continue to warm. Our biggest challenge was to find ways to continually describe the same three avalanche problems throughout the winter: wind slab, dry snow on crust sluffs, wet, loose...over and over and over again.

Throughout the winter, PAC issued 108 advisories by using the strategy of alternating field days for both forecasters in order to provide seven-day/week advisories. Throughout the winter we also logged just over 400 hours of volunteer time to help with daily data collection on field days and as extra teachers for classes. In addition we hosted several early season classes that filled up with separate classes for snowmobilers and skiers. By far our most successful class of the year was a one-day women's only Avy Basics class that started with coffee and yoga and ended with some great new friendships and comradery among the participants. This class was so successful we had to turn students away and ended up offering a second session later in the winter. PAC and the Friends of PAC successfully applied for two grants that helped fund the second full time seasonal forecast position and awarded matching funds to replace one of our older snowmobiles.

Looking ahead to next season, staffing and coverage may be affected by increasing funding challenges. Our Friends group is striving to augment the money needed to fund two seasonal forecasters and keep the program at a 5-7 day per week advisory schedule. Kent May, from Alaska, moved into the Lead Forecaster/Trails job in May and will be steering PAC as we head into the 2016 season.

—Dave Bingaman



UTAH AVALANCHE CENTER

The 2014-15 season will live in infamy as the least amount of snow and the warmest temperatures in the last 70 years of record keeping at the Alta Guard Station. The old record was 314 inches of snow; the new record: 267.5. I can hardly type it without cringing. So you wouldn't think that we would even need to issue avalanche advisories for a winter like last, much less write an annual report. Yet even "the winter that never was" as it was called, produced its share of excitement and unfortunate tragedy.

It all started out innocently enough with relatively normal snow in November and a nice series of snowstorms around Christmas. Then what became known as the "ridiculously persistent ridge" built in off the west coast, which pushed the weather systems north for the rest of the winter, giving the west coast (and unfortunately extending into Utah) a record warm, snowless winter. The ridge-displaced storms then plunged back

southward into the eastern US giving them a record snowy winter. It just wasn't fair. Thus it was that our snow spigot shut off almost entirely after Christmas.

By April Fools Day we just couldn't stand the embarrassment of issuing low and moderate avalanche danger advisories for mostly bare mountains, day after day, so we mercifully pulled the plug. It was our earliest closure in many years. Then, a couple weeks later—and this seemed to be specifically aimed at our audacity—the fickle weather gods slammed us with the largest snowstorm of the winter with 38 inches of snow at Alta, then a couple more big snowstorms in May, leaving me—the only forecaster left minding the store—scrambling to issue warnings and post observations for a public that had completely given up paying attention to the avalanche report several months earlier. The universe was clearly messing with us. So what's up with that?

Thankfully, avalanche activity for the winter was as stingy as the snowfall. We had far fewer human triggered avalanches than normal with only one fatality compared to Utah's average of four. Nationally, avalanche deaths also plunged to only nine compared to the average of nearly thirty.

We thought we could squeak through the season with no fatalities but unfortunately on

March 4, a snowboarder went out of bounds from Snowbasin Ski Area triggering an avalanche in very steep, unforgiving terrain and died from the trauma of hitting trees on the way down. Complete accident report: <https://utahavalanchecenter.org/avalanches/23779>.

The closest call of the winter occurred the day before Christmas. People were hungry for powder in the early season with fresh snow on top of a very weak layer of basal depth hoar.

A group of three backcountry skiers descended a very steep, rocky chute appropriately called "Jaws" in Day's Fork of Big Cottonwood Canyon, which is easily accessible from the Little Cottonwood road. The first two skiers descended one at a time and tucked in beneath some cliffs in a safe spot at the bottom. When the third skier entered the slope, he triggered a large, deep avalanche that carried him down through rocks and small trees and completely buried him at the bottom. He suffered an open tibia-fibula fracture of his left leg with quite a bit of blood loss. His partners, along another nearby group who happened to see it from the flats below, quickly located him using avalanche transceivers and dug him out within



Utah: A very close call occurred in the early season when a group of backcountry skiers triggered a full depth avalanche in a very steep, rocky chute appropriately enough called "Jaws." One skier had an open tib-fib break and was completely buried, dug out unconscious but responded to CPR. *Photo Bruce Tremper*

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3-4 minutes. He was not breathing and unconscious but he began breathing on his own after they cleared the airway. He was buried with his face about a foot under the surface and his hand just under the surface as well. Complete accident report: <https://utahavalanchecenter.org/avalanches/22607>.

Yes, it was a heartbreaking winter but at least we had something to show for it. We SMASHED the previous record for the least amount of snow in recorded history! We feel like making t-shirts—We Survived the winter of 2015! But then again, maybe not. At least we got a lot of office projects done.

—Bruce Tremper



**BRIDGER-TETON
NATIONAL FOREST
AVALANCHE
CENTER**

Western Wyoming experienced significant marine-type climate influences during the 2014/15 season. Temperatures were warm with numerous periods of rain at the lower elevations. The total precipitation for the season ended up being close to normal; however this season's snow density was 133% of average. Season snowfall ranged from 300 to 370 inches, depending on reporting location. Had it been cooler (normal temperatures) with average snowfall densities those season snowfall numbers would have equated to 390 to 490 inches. Due to the high snow densities snow depths were generally below normal.

Unlike last season, this winter started late. On November 9, people were riding bikes and slopes were mostly bare. Winter arrived November 10 and nearly 100 inches of snow fell between November 10 and December 8. Record low temperatures occurred during the early portion of this storm cycle; however warm temperatures ensued and the moisture content of our snowpack was well above normal at the end of this storm cycle.

December snowfall was near average but well above average in moisture content. End of the month snow depths were well above average. January brought below average snowfall with near average moisture content. End of the month snow depths were slightly below average. Snowfall in February was well below average with a moisture content that was below average. March was exceptional dry and warm. Early April snow depths were below average, and it remained fairly dry and warm. May was warm with above average precipitation.

There were 22 days during this season when record daytime high temperatures were recorded. Five of these were in January, seven were in February and ten occurred in March. There were eight days with record cold temperatures. Seven of these occurred in mid-November and the other occurred in December.

The maritime-type conditions significantly impacted our snowpack. Warm storms produced unusually dense snow and numerous lower elevation rain events. There were multiple occasions in November, December and January when dry conditions and cold temperatures created weak layers of faceted snow that had potential to become problem layers. Fortunately warm storms with periods of intense snowfall buried these persistent weak layers and created enough strength to keep the deep slab avalanche hazard limited to isolated occurrences.

Twenty people were caught and carried by avalanches. None of these people was fully buried. Two persons sustained significant injuries and two ski mountaineers



Colorado: An early season powder cloud reminds Telluride residents how close they live to the avalanche dragon's lair. Photo Josh Williams

were killed in mid-May when they were swept over cliffs by a small wet slide.

Summer 2014 and the ensuing winter season were busy times for the Bridger-Teton National Forest Avalanche Center. There were three Recreational Trail Grant Projects (RTP) that provided funding for improvements to the center's infrastructure and enabled us to provide avalanche education to backcountry users located hundreds of miles from our center's forecast program. Aging electronics were replaced in 17 of our remote weather stations before the snow began to fall. These efforts were accompanied by hardware and software upgrades to the resources which communicate with these stations and disseminate that data to the public. These upgrades will enable our weather station network to operate for another 10 to 15 years. Six web cams were purchased and installed at selected weather stations. These cams can operate in a low power environment (solar) at our most remote locations and transmit images via spread spectrum radio frequencies. We intend to provide an extensive weather cam presence on our website next season.



Bridger-Teton: Image of one of our new web cams which was installed on the Continental Divide on Lava Mountain at an elevation of 10,400 feet, south of Togwotee Pass. The image from this cam is posted once per hour from 7 AM to 7 PM and can be viewed at <http://wxstns.net/wxstns/jhnet/lava.jpg>. Photo Bob Comey

One of the RTP grants funded avalanche classes that were hosted by snowmobile clubs or Search and Rescue Organizations in Afton, Cody, Dubois, Lander, Riverton, Pinedale, Rock Springs, Alpine and Saratoga. These efforts included a Level 1 course for Search & Rescue volunteers in Afton and a joint effort between staff from the Bridger-Teton and the Gallatin National Forest Avalanche Centers on the Beartooth Plateau situated between Cody, Wyoming, and Red Lodge, Montana. These classes were in addition to our normal slate of avalanche education presentations. During the past two seasons this grant has enabled over 800 people in Wyoming to attend field sessions that our center would not typically provide. This grant also enabled the center to purchase two new snowmobiles and new safety gear (beacons, probes, shovels, airbags and snowmobile clothing) for our staff. It also funded daily reconnaissance missions to the backcountry.

The center hosted a visit with two avalanche forecasters from the Norwegian Avalanche Center in February. This was a great opportunity for our program to exchange information with a new international avalanche center.

In March a new website was launched using the resources of our center to crowd source observations in the Medicine Bow National Forest. The Medicine Bow area is a seven-hour drive from the BTAC and is heavily used by snowmobilers from Wyoming, Colorado, Iowa, Nebraska, Michigan, Minnesota and Wisconsin. There have been six avalanche fatalities in this area since 1975. This site includes snow and weather products in addition to crowd sourced observations and can be viewed at <http://jhavalanche.org/mbow/index.php>.

—Bob Comey



**COLORADO
AVALANCHE
INFORMATION
CENTER**

For much of Colorado the 2014-15 snow season had a personality not often seen in our usually dry, cold continental climate. We experienced rain-on-snow events and long stretches of dry, mild weather that were punctuated by warm, wet storms with snowfall measured in feet. The big storms and warm-up events were marked by several widespread avalanche cycles. We ended the season with three avalanche fatalities (nearly half of our ten-year average), 44 incidents and 50 people caught



Colorado: Creston Doverspike of Dillon, Colorado, sent the CAIC this stunning black and white photo of a persistent slab in the Summit County mountains.

(both numbers well below historical average), and only a few, thin layers of the four-letter d-word (d*st). Whew.

October and November brought ample snow, particularly in the Northern Mountain zone. Avalanche season kicked off on October 13, when the first reported avalanche ran in the Tenmile Range above Breckenridge; four days before we held our annual Colorado Snow and Avalanche Workshop 3,000 feet lower at the Breckenridge Riverwalk Center under warm and sunny skies. The winter's first recorded human encounter with an avalanche occurred November 3, when two backcountry skiers were caught and carried in a D2 avalanche while hiking up Mt. Owen near Crested Butte.

For the rest of the winter, backcountry incidents – defined as a person caught and carried in a slide or a structure damaged – tended to come in clusters during the booms of our boom-bust weather pattern. After two weeks of sustained snow in the second half of December, on the last day of 2014, three climbers attempted Torreys Peak, a popular 14,000 foot peak in Colorado's Front Range zone. They were ascending along the normal summer route when the second climber was caught, buried and killed in an HS-R2D2 Persistent Slab avalanche. The next day, a cat-skiing guide was injured in a slide near Aspen Mountain. On January 6, the second fatality of the winter occurred on Kendall Mountain near Silverton. The Persistent Slab avalanche was rated as an HS-ASuR2D2. The victim was a student at Montana State University who was home on winter break and had worked as an intern out of our Silverton office. That accident struck our staff especially hard.

Shortly after the New Year, things dried out and many areas saw a prolonged mid-winter drought. In the Central Mountains, Aspen Mountain Ski Area recorded just 18 inches of snow and 1.17 inches of SWE between January 1 and February 15. The seven-week drought ended in mid February with three weeks of storms across much of the state. A double-barreled storm slammed Wolf Creek Pass with 91 inches of snow and 8.1 inches of SWE between February 22 and March 4.

The season's third fatal avalanche accident occurred on February 23 when a backcountry skier was caught, buried and killed in an SS-ASu-R2D2 Persistent Slab avalanche on Aspen Mountain outside the ski area boundary. The second member of the group was unable to find a beacon signal and called 911. Aspen Mountain Ski Patrol responded and located the victim after an approximate 50-minute burial.

More storms followed in March including an upslope storm that dumped 37 inches of snow in 24 hours at one site in the northern Front Range. In early March, two patrollers in the Southern Mountains earned places in our incidents tally, and a backcountry skier was caught and carried in a SS-R3D2 avalanche in the Gore Range near Vail. The skier suffered a badly broken leg and the subsequent rescue required a National Guard Blackhawk helicopter.

The storms dried out in mid March, but a 3-day spike in temperatures and radiation was followed by rain-on-snow. We recorded 230 Loose Wet and Wet Slab avalanches in a week-long cycle. Three houses in East Vail were 'kissed' by debris and a skier near Ashcroft was buried up to his helmet strap after being caught in a wet slab and deploying his air bag. There were some close calls, but fortunately no fatal avalanche accidents.

Despite the March-April snow, monthly snow totals were still less than last winter and weren't enough to rebuild the thin snowpacks across the state. As of April 30, the snowpack in Colorado's river basins ranged from 34 to 97% of the 30-year median, with sites in the Northern Mountains showing the most snow and those in the southwest corner of the state the lowest accumulations.

With little avalanche activity, and no storms on the horizon, we transitioned from zone forecasts to our statewide avalanche summary the first week of April; about a week earlier than most years. April ran its course fairly quietly, but May came roaring back to remind us that we were not out the woods.

May snow storms were frequent and wet. Snowpack spiked back to near or above long-term average across

the northern half of the state. Warm temperatures and ample sunshine formed crusts in between the snow storms and avalanche activity continued right through the end of the month, mostly running on buried crusts. It turned out to be one of our busiest months for avalanches. Observers reported 265 avalanches to the CAIC in May alone. There were 10 people caught in seven separate incidents, but fortunately no fatalities, despite some close calls and severe injuries. On the last day of month, a snowboarder triggered and was caught in a wet avalanche, which carried him approximately 1,000 vertical feet down slope and over a cliff/waterfall feature 75 to 100 feet tall. He sustained multiple injuries, including a broken leg, but fortunately survived the ride.

For comparative purposes, here are May avalanches reported in the last five seasons:

May 2011: 196 reported avalanches
May 2012: 2 reported avalanches
May 2013: 150 reported avalanches
May 2014: 81 reported avalanches
May 2015: 265 reported avalanches

The lack of dust and the wet May storms that plastered many mountain-sides kept snow cover in better shape for many mountain ranges, particularly in the Northern Mountains, than any other late spring in recent memory. Avalanche activity slowed down, but continued into June. Lots of rarely "in" lines were in great shape. Spring skiing stayed in great shape all the way through June and into July at the upper elevations. We even got a fresh dusting of new snow above 13,000 ft in mid July before summer seemed to finally take hold.

It was a weird season in Colorado that spurred talk of climate change, rain-on-snow events, and how to better forecast mid-winter wet avalanche cycles. At least we had snow.

—Scott Toepfer



CRESTED BUTTE AVALANCHE CENTER

The 2014/15 winter season in the Crested Butte back-country was punctuated by three significant storm and avalanche cycles, with unusually warm and extended dry spells between these cycles. Snow water equivalent (SWE) in the Gunnison River Basin peaked at 72% of normal, and the peak arrived in mid-March, 22 days earlier than average. Gothic, which has historical weather data back to 1974, set 38 record high temperatures this winter. Although our atypical warm-ups and droughts presented some unique problems, our Colorado snowpack is no stranger to challenging conditions and our center is well practiced in ground-hog day style forecasting situations. We may have actually put less focus on persistent slab problems than normal as our snowpack took an early turn towards wet avalanche problems in early March and our lengthy mid-winter droughts brought some periods of stable conditions.



Crested Butte: Figure 1: 12/19/14. The December 13th facet layer showing early warning signs. Photo Xavier Fane

Our first avalanche cycle came in mid-November. Upwards of 3" of SWE fell on a thin, faceted snowpack on shady aspects and dirt elsewhere, spurring a widespread cycle on paths holding snow prior to the storm. A month of mostly dry conditions followed, ripening our snowpack into a fully faceted beast that would burden our snowpack for several months. This December 13 facet layer was in the early phases of being buried and becoming reactive (Figure 1) when our first and only avalanche incident of the season occurred. A skier on Schuykill Ridge was caught in a relatively shallow slab avalanche and swept through trees, suffering a broken leg. He and his partner were able to descend 1,300 feet of steep terrain before coming to a suitable landing spot for Flight-for-Life evacuation and eventual healthy recovery. (More info here: http://avalanche.state.co.us/caic/acc/acc_report.php?accfm=inv&acc_id=554).

Our widespread December 13 facet layer continued to be incrementally loaded until the knock-out punch



Crested Butte: Figure 2: 1/7/15. Human and deer triggered persistent slab avalanches continued to be triggered into January despite a lack of loading. Here, a deer works the low angle terrain, after reading our advisory. Photo Gary Dotzler



Crested Butte: Figure 3: /10/15. Record setting high temperatures in January and February led to some unusual snowpack conditions for that time of year, such as these wet slabs that released in early January. Photo Chris Miller

came with our "Solstice Storm." Over a two-day period during the winter solstice, as much as 4" of SWE dumped under strong to extreme winds. This spurred a large natural avalanche cycle around the compass, with dozens of slab avalanches running on the pronounced crusts and facets that had formed previously. The end of the year marked the end of our bountiful winter. Only negligible amounts of snow fell through January, but the December 13 facet layer remained astonishingly active on northerly aspects, particularly in the shallower parts of our zone. We received almost-daily observations of continued collapsing or skier triggered avalanches in the three weeks after the storm ended, despite only a few light snowfall events during that time frame (Figure 2).

The tide eventually retreated to yellow and green dangers as drought set in through the rest of January and most of February. Staff and public morale gradually melted back alongside our snowpack while record setting high temperatures prevailed. In one absurdly hot day on January 26, temperatures soared to 59 degrees at Taylor Park (elev 9,500 feet) and 50 degrees at Lake Irwin (elev 10,200 feet). 18 record high temperatures were set in Gothic in late January and early February, and we observed meltwater reaching the ground on most south facing slopes (Figure 3). Reports of dirt conditions in Fruita or Montrose became more prevalent than snowpack observations, and our forecasts would take on a jubilant tone when a few small disturbances managed to drop a couple inches of new snow. An unusually widespread surface hoar layer was buried in mid January by just enough snow and later wind drifting to create some unusual slab avalanche behavior and spare our forecasters of writers block. We had all but given up on winter when the blocking West Coast ridge shifted seaward opening the doors to our largest storm of the winter and one of the most impressive avalanche cycles I've observed.

Snowfall began in late February and continued for 13 nearly-continuous days, culminating with the largest pulse in the first four days of March. The storm dropped over 7" of SWE on Schofield Pass and over 5" of SWE at Kebler Pass, burying a very widespread and well developed facet layer that had been forming during our mid-winter drought on shady slopes. An avalanche warning was in place for the last four days of the storm. In its wake, it appeared that almost every avalanche path on the northern half of the compass ran during this

cycle, with countless D2 to D3 slides observed around our zone, and many of these propagating the full width of their start zones (Figure 4).

This taste of winter left as abruptly as it had arrived, with another round of record high temperatures and this time, poor overnight freezes. By mid March, our snowpack was mostly saturated on all but north facing slopes, and we observed a natural wet avalanche cycle on these aspects. Our center coasted to a halt in operations by early April as a return to cooler weather put a lid on avalanche concerns, although unusually snowy and wet weather returned for most of May.

Our forecast center continues to strive for new or improved ways of reaching our public users. We launched a new website with help from the CAIC, incorporating improved media imaging and adopting the forecasting layout used by the CAIC. We focused on a more aggressive Facebook outreach, with the goal of some kind of interesting post each day, especially during dangerous conditions. Posts of recent avalanche activity are commonly followed by nervous moms tagging their loved ones in the response comments, such as "@Johnny, b safe out there dear". During times of low tide, we would hijack interesting photos, videos, or stories from outside of our region. The public responded positively, especially to real-time updates of storms and avalanche occurrences. We also continue to bring multi-media approach to our forecasts by publishing youtube videos of relevant avalanche conditions, broadcasting our forecasts on local radio, and publishing blog articles. We are looking forward to a snowier and colder season next winter!

—Zach Guy



Crested Butte: Figure 4: Skier triggered avalanche during the unstable period following our early March avalanche cycle. Photo Anonymous

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Photo: Freya Fernwood Photography
Leif Whitaker and crew on East Kariba peak in Shimamaki, Hokkaido, Japan.



KACHINA PEAKS AVALANCHE CENTER

A dramatic storm blasted us between February 28 and March 4. This event initiated our only significant avalanche cycle. By spring equinox we had recorded 149 inches of snowfall at 10,800 feet. Weekly snowpack summaries went into dormancy at the end of March with snowfall totals reaching just 57% of our 30-year mean. A final spring storm on April 25–26 dropped another 21 inches, bringing the total to 170 inches at 10,800 feet for a 2014–15 seasonal snowfall of 65% of mean. Weekly snow storms continued into mid May extending winter and adding as much as another two feet at high elevations. By summer, we had received 75% of mean.

December:

Most of the precipitation fell as rain below 11,000 feet in northern Arizona. Actual snow totals for the early season varied dramatically based on elevation and aspect. Above 10,800 feet light intermittent snow showers fell on the peaks between December 25 and 27, with accumulations between 1–1 ½ feet (30–45 cm).

January:

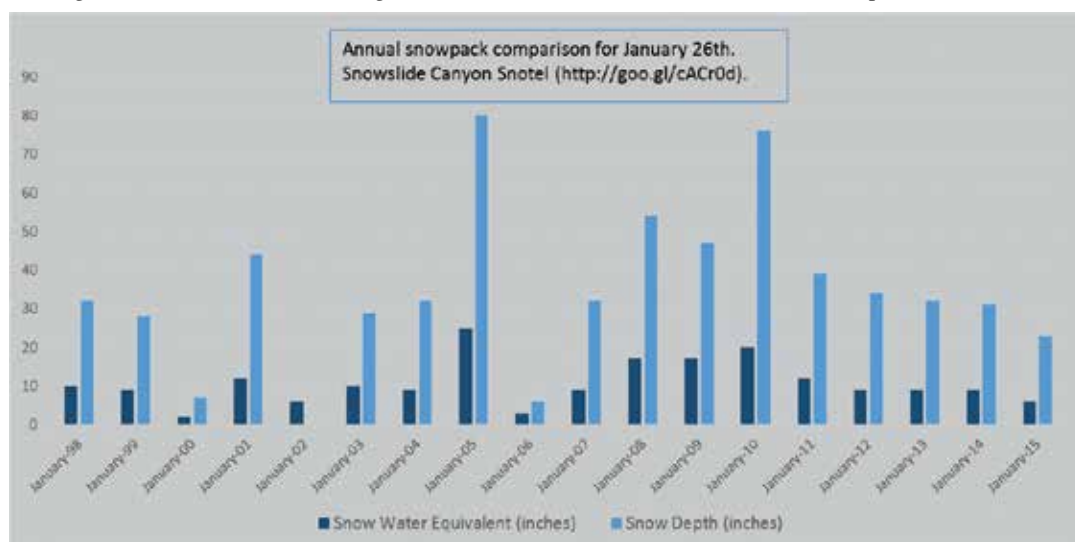
New Year's Eve storm was encouraging, adding 1 to 2 feet (30–60 cm) of low-density snow, with a snow water equivalent (SWE) of 1 inch (2.54 cm) bringing the snow depth at Snowslide Canyon SnoTel site at Inner Basin (9,730 feet) to 22 inches (56 cm). On January 6 and 7 the wind howled and high temperatures of 49 degrees F were recorded at 11,800 feet. During a five

day heat wave, between midday on the 5th and evening of the 9th no below freezing temperatures were recorded. Warm temperatures and high winds continued throughout the month, stripping snow from windward starting zones and converting it to patchy hard slab on shaded lee slopes. January was the third driest winter in the past two decades and one of the warmest on record with a monthly average high elevation temperature of ~27 degrees F with midday highs exceeding the freezing point (Agassiz Peak Station, 11,500 feet) on more than half of the calendar days.

Insufficient residual snow cover in the backcountry forced cancellations of four consecutive level 1 avalanche classes. Interest in attending these was surprisingly high, but it is tough to learn about snow when the ground is bare.

the warmest February on record for Flagstaff, Arizona. Temperatures exceeded freezing during midday on 19 out of the first 20 days of the month at 10,800 feet. A monthly average temperature at this site was 32.16 degrees F.

A prolonged slow-moving low pressure complex was the only fireworks of the season starting February 27 and lasting until March 4, and dropping 44 inches at 10,800 feet, and over 6 inches of SWE. Unusual for us, the storm occurred within a relatively moderate wind regime, filling in chutes and bone yards that had not seen skiable coverage in years. Not surprisingly the event also induced a dramatic avalanche cycle, the likes of which has also become a local rarity. Many protected north, northeast and northwest aspects avalanched on old



February:

Until the next to the last day of the month, no precipitation had fallen and it was reported to have been

depth hoar, or on mid-storm density breaks often stepping down to the ground. Crown lines extended for over a mile in some locations. Rapid warming on the days



Kachina Peaks: This avalanche (20150302:SS-NS-R4-D3.5) ran on multiple bed surfaces, with the newly deposited windloaded slopes failing on everything from the new snow/old snow interface down to old basal facets near the ground. Interpreting the details in these occurrences is difficult since the avalanche took place mid storm and the bed surface and crown has been subsequently covered. We estimate that walking the crown fracture line would be a distance of over 1 mile! Photo taken March 5, 2015. *Photo Troy Marino*

following added to the natural avalanche count on other aspects. Thankfully, no skiers were buried, nor were skier triggered slides reported; a testimonial to rapid stabilizing of the snowpack in the days that followed.

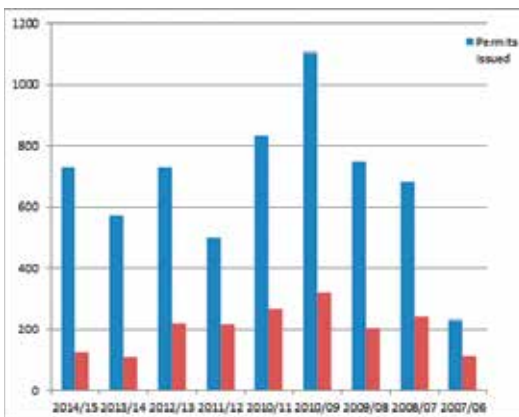
March and April:

The remaining winter/spring started in typical southwest fashion with gradual warming, 40 degree F diurnal temperature swings, and “red flag” winds, quickly leading to isothermal conditions and rapid ablation. This was followed by several weeks of summer-like weather interrupted by one last significant Pacific snowstorm on April 25–26 which produced 21 inches (53 cm) of snow at near treeline. Locals reported some of the best powder skiing of the year. A series of cold fronts spaced at weekly intervals continued to refresh the snowpack and even create some short lived avalanche activities. These are still active at the time this report was written in mid May, adding as much as two additional feet of snowfall to the annual total.

Backcountry Activity:

There were 726 winter backcountry permits issued for Kachina Peaks Wilderness for the season. This was an increase of approximately 20% from last winter with similar drought conditions. Snow overage was sparse until March and then skiing and boarding had a revival.

Permits issued (blue) and inches of snowfall (red) between 2006–2015.



Avalanche Education:

Seasonal drought impacted the number of courses run, and to a lesser degree numbers of participants. We ran two; free “Introduction to Avalanches” seminars for approximately 70 individuals, one at Northern Arizona University (NAU) and another at LEAF Auditorium, Coconino County Sheriff’s Office. We ran two successful level1 courses for 17 participants. We had a KPAC

display, and ran our notorious avalanche simulator at the Science in the Park event as part of Flagstaff’s Festival of Science (September 2014), and at the Science Technology Engineering & Mathematics Conference (STEM) held at the NAU sports dome.

Website Activity:

Website page openings remained stable compared with last year or diminished slightly (Arizona only) in regards to public observations/discussion boards. One notable success was the 77% increase in subscribership to our weekly snowpack summary. Unique users of the snowpack summaries increased 45 percent.

Fundraising:

Our financial needs are modest; hence our fundraising goals are easily attained. We raised approximately \$4,000 from events, product sales and private contributions; \$1,100 from avalanche courses and ~\$2,000 for future avalanche course scholarships. Scholarships funds are raised during our annual Mikee Linville commemorative fundraiser. Appreciation is extended to Arizona Snowbowl Resort and to the family of Mikee Linville for their generous contributions.

—David Lovejoy



Winter 2014–2015 on the second tallest peak in the eastern United States was a good one, although the mountains of northern New England didn’t receive as much snow as some coastal urban areas. The region’s larger ski resorts ended the season in the vicinity of 200” of snow which kept smiles on the faces of skiers and riders for much of the season.

Statistically, this was a good year on Mt. Washington. Looking at snowfall numbers in conjunction with consistently cold temperatures and winds, one can see how the perception of an epic winter took hold. The Mount Washington Observatory recorded a season total snowfall (November–April) of 317”, an above average winter. Snowfall persisted well into April, keeping avalanche

danger elevated for much of the traditional early spring ski season, but offering rewarding conditions for those savvy enough to pick the right days and the right terrain.

Cold air dominated the northeast, with very few threats of rain throughout the season. In fact, from January 4 through April 2, summit temperatures did not rise above freezing. A typical winter will often bring some substantial periods of thaw, which were notably absent this year, with Christmas Eve bringing the only real rain event of the winter.

Winds also seemed exceptionally strong throughout the winter. In 103 of 181 days from November through the end of April, the Observatory recorded hurricane force wind gusts (≥74mph). The strongest winds since 2008 were recorded on February 16 at 141mph. During this 24 hour period, average wind speeds were from the north at 91mph. The MWAC Pisten Bully snow tractor was down for repairs during this storm, which made for interesting snowmobiling over and around very large wind drifts and fallen trees. One local avalanche instructor was so concerned that morning about falling tree limbs that he actually put on his helmet for the ascent to Hermit Lake, a 2.5 mile ski up through the woods well outside of steep terrain and generally considered a very safe route. What a helmet would have done for an actual fallen tree we’re not sure.

Despite the snow, strong winds, and persistent cold, for much of the season the eastern slopes of Mt. Washington didn’t look a whole lot different than recent years that had less impressive numbers. A combination of factors led to the scarcity of large avalanche cycles. For one, the cold temperatures brought low density snow, allowing it to be blown out of start zones more



Mount Washington: Chris and Cutler heading into a Tuckerman burial scenario. Retired search dog Cutler (shown here in his younger days) passed away this year at the age of 14. *Photo Brian Johnston*

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easily by the strong winds rather than loaded into heavy slabs. Consistent cold temperatures also limited mixed precipitation events and rain which are common natural factors for large and frequent avalanche cycles for us. We also saw some storms drop snow in periods of relatively low wind, which contributed to a lesser amount of wind slab development and fewer large avalanches. Finally, in contrast to many recent winters, we didn't have the regular small upslope snowfall events that can often add significant amounts of depth to the overall snowpack from week to week. By and large, the avalanche cycles we did see fell short of our expectations given the conditions.

While we may not have had many large avalanche cycles, we continued to see an increasing trend of human-involved avalanche incidents. These events range from small pockets of wind slab to large wet loose slides. We believe this trend is simply a factor of more people getting out into the backcountry during the cold snow winter months. Many of the people involved in incidents had avalanche training in their history, so the trend probably won't soon change as levels of education increase.

The White Mountain National Forest has the unique charge within the Forest Service system as being the lead agency for search and rescue events. This pertains only to the eastern slopes of Mt. Washington where MWAC Snow Rangers avalanche forecast and work daily. This

was a relatively quiet year for SAR, with no callouts prior to early March. Thankfully, none of the avalanche incidents in the Whites resulted in injuries greater than a broken leg, although the potential was certainly there in a couple close call events. Even the spring ski season in Tuckerman, which can have a dozen injuries in a single day, was fairly quiet. A heart attack, a broken femur, and a near drowning topped the list of notable injuries.

In addition to forecasting and SAR, MWAC continued

its outreach and education efforts. The Eastern Snow and Avalanche Workshop (ESAW) was again successful at reinforcing educational concepts and bringing people's minds back toward snow at the start of the season. We had many great talks most notably by Sam Colebeck, Karl Birkeland and Toby Weed. The monthly ESAW Continuing Education Series, programs at the visitor center, meeting with avalanche classes, and countless informal discussions in the field rounded out the educational offerings. Snow Rangers also continued to train with its rescue partners such as New Hampshire Department of Fish and Game, Mountain Rescue Service, AVSAR, and others.

Our longtime search dog, Cutler, passed away in April after 14+ years on this earth. He'd been retired for the last couple years, but was still a willing participant in a game of find the victim. His protégé, Lily, has some big shoes to fill and continues to come into her own as an eager young working dog.

In March, MWAC welcomed a new Snow Ranger to the team. Helon Hoffer made the leap from board member of the Friends of MWAC to year-round Snow Ranger/Trails Program Supervisor for the Androscoggin Ranger District. This brings the team back to four full time employees, but we couldn't do the work we do without the help of numerous partners. Many, many thanks go out to Friends of MWAC and Friends of Tuckerman Ravine, the MWVSP, and all the volunteer SAR groups and other partners for the help throughout the year. These groups play a vital role in keeping us moving forward, so thank you.

—Helon, Jeff, Frank, and Chris



Mount Washington: Spindrift is a fact of life on Mt. Washington.
Photo Joe Klementovitch



Mount Washington: Snow Ranger visual observations in Huntington Ravine. Pinnacle and Odell Gullies in the background. Photo Joe Klementovitch



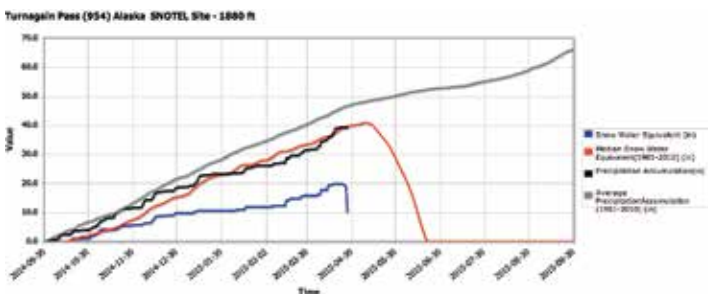
Weather and Snowpack Summary

Like most of the Western US, South-Central Alaska also suffered a less-than-spectacular snow season. Warmer than normal temperatures brought rain instead of snow to most places below 1500'. The famous Iditarod Dog Sled Race was forced to move its starting location to Fairbanks to avoid hundreds of miles of snowless tundra. On the Chugach National Forest, all of the motorized use areas stayed closed the entire season. Despite the unusually warm temperatures, precipitation amounts remained average for the season and most skiers/riders became accustomed to bootpacking through dirt and alders to access powder in the alpine.

Human triggered avalanches began in mid December as a widespread layer of surface hoar was buried under a several-foot storm. On December 18, the first sunny day after the storm, a skier was fully buried after triggering a 3' slab. Luckily his hand was still exposed and the debris was soft enough for him to dig the snow away from his head while waiting for his partner to dig him out.

January was noted for its extremely warm temperatures and saturated snowpack. Glide avalanche activity reached a peak by mid-January and after several weeks glide movement eventually slowed and became dormant.

Multiple layers of near-surface facets formed in February and early March during several clear high-pressure systems. Preceding these dry periods wind, warm temperatures, sun, rain and uneven precipitation amounts caused significant spatial variation in the weak layers and slab thicknesses. For the remainder of the season this variability would set the stage for a persistent slab problem that was challenging to pinpoint. Despite advisory caution many people were skiing and riding the steeps without consequence. On April 1 a skier triggered a 2.5' slab in a thin area of the snowpack and went for a 1000' ride without injury or burial. This would be the first of several close calls over the next few weeks, as both rapid and incremental loading would bury these layers anywhere between 4' -12' deep.



Chugach: Turnagain Pass season totals – (NRCS) Although precipitation was close to average, SWE for the Turnagain Pass Snotel was at a record low as of April 28th.



Chugach: A high snow line – all winter – didn't deter many Alaskans as they bashed alders to get to the goods. Photo Heather Thamm

This cycle culminated on April 17, just prior to a large storm, when two D3 avalanches were remotely triggered (at the same time and on different aspects) by a group of four snowboarders from a ridge. Many people were in the area, but luckily no one was caught. Over the next three days gale force winds and heavy rain to 3000' caused a widespread deep slab avalanche cycle. Due to the intensity and very wet conditions the deep slab problem was mostly flushed out. The snowpack stabilized quickly with cold temperatures for a week until several evenings of above freezing temperatures and hot sunny days moved us into an exciting shed cycle during the end of April.

Accidents

Alaska unfortunately saw three fatalities this season; none of which occurred on the Chugach National Forest. The first accident of the year was in the Delta Range near the Richardson Highway and involved two backcountry skiers, both caught, and one who died as a result of being fully buried. The second fatality occurred in mid-March near Cantwell when a snowmachiner triggered an avalanche on a 60' tall cut-bank feature and was buried under 6' of snow. The third fatality was in early April in Wrangell-St. Elias National Park and Preserve after a climber collapsed a cornice feature and suffered a large fall. See obituary of Telluride patrolman Peter Inglis on page 9 of this issue of TAR.

Advisories

A total of 144 daily advisories was issued for Turnagain Pass. We experimented with a new advisory tool for our periphery area of Summit Lake. Instead of issuing a



Chugach: Aftermath of the April 19 deep slab avalanche cycle in the Turnagain Pass region. Photo Heather Thamm

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danger rating, we provided a weekly weather summary on Saturday mornings and included current snowpack observations. Historically, Summit Lake receives far less snow than Turnagain Pass and this season many areas were inaccessible with no snow coverage. A total of 24 Summit Lake Summaries were published.

New Changes

Several new changes occurred this season. Director Kevin Wright resigned and Forecaster Wendy Wagner became the new Director upon her fifth season with CNFAIC. Longtime Girdwood local and Alyeska Ski Patroller Heather Thamm joined the team in December as a new forecaster. John Fitzgerald returned for his third season and Graham Predeger for his fourth.

A new observation page was launched making it easier for people to submit snow and avalanche information. The biggest highlight is that the page prompts users to fill in pertinent information rather than being intimidated by a big text box. A total of 320 observations was submitted this season and 77 were from the public.

Outreach and Media

Despite the low snow season 1132 people were directly connected through outreach and education events; almost 400 people more than last season. Outside of the Turnagain Pass zone, CNFAIC forecasters collaborated with the Hatcher Pass Avalanche Center and the Alaska Avalanche School to offer a well-received rescue workshop in Hatcher Pass.

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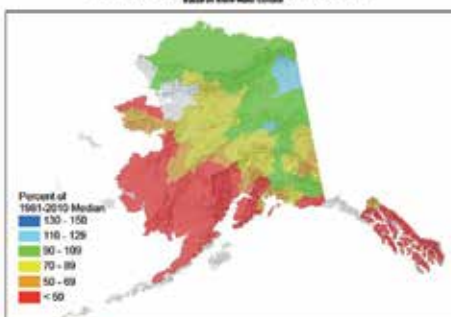
For the fourth season in a row CNFAIC staff provided outreach at the world-renown Arctic Man and Sno-Go Classic. Since snowmachining never opened on the Forest, this was our biggest opportunity to interact with the motorized users in Alaska. Over the course of three days, we introduced over 100 snowmachiners to avalanche rescue basics by utilizing a wireless beacon park, probe lines and more. This event is also a unique opportunity to work closely with the Alaska State Troopers and continue to build multi-agency partnerships.

Facebook and Instagram were used frequently to interact with the community and Youtube videos received 5310 views. CNFAIC staff communicated regularly with TV news reporters, journalists and radio stations during periods of elevated avalanche danger.

We are looking forward to next season, despite the El Niño outlook, and hoping for at least a few storms with snow to sea level!

—Heather Thamm

Alaska Snowpack as of April 1, 2015
Based on Snow Water Content



Chugach: (NRCS) South-Central Alaska's snowpack averaged less than 50% in most places



Low tide in Alaska affected Hatcher Pass with shallow coverage and lurking sharks throughout the season. While avalanche danger did not appear to have changed dramatically due to less snow, we have seen an increase in mid-winter rain events over the past few years that trigger more avalanche cycles.

What seems to be an emerging pattern is winter's new mood, kind of lazy to get started and staying out later. Warm temperatures persisted through what is normally a very cold autumn. November and April both averaged 29°F with the rest of "winter" about the same. Bunny boots, which are classically Alaskan and mandatory issue in most winters, stayed in the shed this season.

HP's typical persistent snowpack structure produced a large avalanche cycle in early March which highlighted the season. A number of close calls, (mostly snogo's) in large avalanches resulted in no significant injuries. In response to the avalanche cycle and the increased number of backcountry users at Hatcher Pass, HPAC, CNFAIC, and the Alaska Avalanche School hosted a free rescue workshop with support through a DPS grant from the Alaska Avalanche Information Center. Collaboration between the existing agencies has been strong. HPAC's avalanche advisory user numbers continued to grow exponentially this season, due to the lack of snow elsewhere in the state, and a growing demand for avalanche information and education.

—Jed Workman & Allie Barker



Hatcher Pass: While reliable and accurate avalanche warning information and excellent avalanche educational programs continue to become more available through avalanche centers, avalanche schools and through social media, backcountry riders continue to push the limits. Better gear, powder fever, and more people in the backcountry appear to be increasing the number of human triggered avalanches each season at Hatcher Pass.
Photo Jeff Kase



Photos: Deciphering the guidebook takes on new dimensions after the international red-eye, but Caroline Gleich and Donny Roth are happy to reap the rewards. Jalovec Couloir, Triglav National Park, Slovenia. **Jay Beyer** © 2015 Patagonia, Inc.



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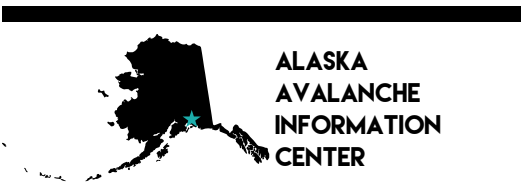
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Alaska: Low-angle Alaska light illuminates widespread crowns from a storm snow cycle on Thompson Pass. *Photo Sarah Carter*



On November 6, 2014 AAIC hosted the seventh annual statewide summit on Snow Safety. This event, facilitated by the Foraker Group, was attended by more than 75 individuals representing practitioners, business owners, politicians and government officials.

AAIC supports the continued growth of grassroots avalanche centers in Anchorage, Cordova, Haines, Hatcher Pass and Valdez to serve areas otherwise unserved with avalanche safety information and forecasting. Currently we are assisting the Eastern Alaska Range communities of Fairbanks and Delta find ways to increase avalanche information in their region.

AAIC provided AIARE Level 1 & 2 courses along with backcountry safety training across the state from Anchorage to Juneau in partnership with the North America Outdoor Institute. This effort included collaborations with the Chugach National Forest Avalanche Information Center in Hatcher Pass and at Alaska's annual temporary fourth largest city, Arctic Man. AAIC continues to respond to the wide range of Alaskan requests for assistance: individuals heading to a non-forecasted area, accident investigations, information for remote military operations, and research requests from across the nation and abroad.

We directly reached 1,250 people with avalanche information and safety messaging, approximately 1 million reached through indirect messaging (radio, website, friends/family...etc.)

- Total of all centers: Published forecasts: 248
- Total of all centers: Website Hits: 1,043,559
- Total of all centers: Education programs taught: 28
- Total of all centers: Individuals served through education programs: 1,557
- Total of all centers: Avalanche (close calls or fatalities) accidents dealt with – 4

Cordova:

Produced 48 forecasts disseminated via email. Had 1887 web visits. Fall so warm soon spring followed then winter before summer took over.



Alaska: A snowmobiler without a beacon was caught in this avalanche. The debris was quite deep, but he luckily was found by proximity to a detached section of his running board. *Photo Kevin Salys*

Hatcher Pass:

(See separate summary from Hatcher Pass on page 45.)

Valdez:

The Valdez Avalanche Center celebrated its 10th winter with five forecasters, a full time paid forecaster and three paid part time staff. The VAC produces a four-day forecast with an emphasis on the avalanche problem rather than a danger rating. Due to low snowfall, many Alaskan backcountry areas did not open to motorized use this winter. Many of those users came to ride Thompson Pass, doubling the motorized traffic over previous seasons. The low snowfall was only a valley perspective. Although Valdez and Thompson Pass had 16 feet below average snowfall, ten feet fell at sea level and over 30

feet was recorded at 2500' elevation and considerably more in the upper elevations.

The VAC produced 141 forecasts over 28 weeks, provided 14 free or contracted community backcountry safety courses, completed three major contracts for snow safety education and support, reaching a total of 652 individuals directly. The local Valdez website traffic had unique 48,894 visits.

January 1st a snowmobile group triggered a D2.5 avalanche that slid on early season facets. One rider was caught and buried without a beacon. He was luckily located due to his detached running board, a surface clue that saved his life. See photo above for fracture line and debris.

—AAIC Staff

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