THE Avalanche REVIEW

A Publication of the American Avalanche Association

US $4.95

VOLUME 24, NO. 4 • APRIL 2006

www.AmericanAvalancheAssociation.org

Matt McKee gets caught in a little slide on Mt. Raymond, Big Cottonwood Canyon, Utah. He was caught in that slide, got tumbled a few times, self-arrested on the bed surface, and the slide passed over him. The crown was initially 12" x 25' x 50' before it ran through some rocks and broke out twice that size but the same depth and ran 850' vertical. The debris at the bottom fanned out pretty evenly, no piles except on the uphill sides of trees. He came out of it alive but lost a ski and calls it a fair trade.

Photo by Bill Deleo

OF TIME & TEACHERS

Story by Tom Kimbrough

Imagine a time when there were no avalanche classes, no advisories, not even any books on avalanches. It wasn't a big deal though because there were only a handful of backcountry skiers and zero snowboarders or snowmobilers. But gradually ski equipment got better and a few resorts were beginning to put their guests onto avalanche terrain. Here and there, a small number of Forest Service rangers began paying attention to the snow and the weather and the terrain. Their job was to keep people from getting killed on public land.

I only saw him on a handful of occasions. A few times I came into the patrol room and there he was, sitting with Norm Wilson in the office. I quietly did my business and got the hell out. The first time I saw him, Bernie whispered in my direction, "That's Monty!" Monty Atwater, that is: the Man, the guy who, along with Ed LaChapelle, invented the whole thing—snow science, avalanche control, the nomenclature, the whole idea of "avalanche professional" as we know it in North America. He authored the first edition of *The Avalanche Handbook* in 1952. He was Alta in the '40s and '50s, the Squaw Valley Olympics, the Avalanche Hunter.

Monty was very old, ancient really, in my eyes, but we would see him out skiing from time to time. Once he stopped on the unloading ramp where I was on stand-by. He thought we should close the High Traverse—it was a warm spring day and the snow was getting dangerously sloppy. I said, "Sure," and checked with Norm. The answer was quick. "If Monty says it should be closed, close it!" He was Norm Wilson's mentor.

This was about 40 years ago, California in the '60s, the age of the hippy, Haight-Asbury in full swing, the Golden Age in Yosemite. Monty didn't live much longer and his health faded towards the end. I heard that he put in an appearance at the first National Avalanche School to a standing ovation. And with good reason: Atwater started the first organized avalanche training at Alta in the '50s.

In the '50s and '60s, if you wanted to learn about avalanches, you had to get a job at a ski resort that had avalanche problems. As snow ranger jobs were scarce as hen's teeth, your best shot was getting on as a ski patroller. Then, if you showed interest and aptitude, somebody might start feeding you the basics.

When I arrived at Alpine Meadows in 1967, Norm Wilson was already carrying Monty's teaching into the future. Those of us lucky enough to be at Alpine in that period had our guru, just as Norm had Monty at Squaw. The early morning pre-control-work briefing sessions were pure gold, followed by a practical lesson in terrain and route finding, snowpack layering and avalanche behavior, topped off by some good powder skiing! Life as a young patroller was good. I'm sure it still is. ***Of Time & Teachers*** **continued on pg 19** ➡

in this issue

From the AAA 2
From the Editor 2
Metamorphism 3
AAA News 3
What's New 4
Education
PAWS Update 6
Assessing The Unconscious Patient 7
ISSW 2006 8
Media
The New Media Age 9
Photo Contest 15
Snow Science
GIS Avalanche Work Applications 10
Stability Roadmap 12
Crown Profiles
Sue Ann Ferguson 16
Artist Point Avalanche 18
Of Time & Teachers *(continued from cover)* 19

I feel privileged to have been fated to play my part. I have loved every minute of it: the triumphs, the defeats; the frustrations, the half victories; the controversies, the Hearts games; the rescues that ended in tears and those that ended in the nearest bar; the Spectaculars and the day-to-day drudgery.

—Monty Atwater, *The Avalanche Hunters*

THE Avalanche REVIEW

APRIL 2006 • VOL. 24 • NUMBER 4

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

Please send submissions to:
Lynne Wolfe — Editor
PO Box 1135
Driggs, Idaho 83422
tel: (208) 709-4073
lwolfe@tetontel.com

Advertising:
Marcia LeMire
P.O. Box 1400
Jackson, WY 83001
tel: (208) 787-2223
fax: (307) 733-5916
mlemire@tetontel.com

Production:
Fall Line Design
76 N Main, Suite 208
Driggs, ID 83422
tel/fax: (208) 354-6500
karen@FallLineDesign.com

Business and Subscription Office:
Mark Mueller — AAA Executive Director
P.O.Box 2831
Pagosa Springs, CO 81147
tel: (970) 946-0822
fax: (970) 731-2486
aaa@avalanche.org

american avalanche association

Executive Director ..... Mark Mueller

AAA Officers
*President ..... Russ Johnson
*Vice President ..... Doug Richmond
*Secretary ..... Andy Gleason
*Treasurer ..... Dave Ream

Committee Chairs
Awards ..... Denny Hogan
Data ..... Dan Judd
Education ..... Michael Jackson
Ethics ..... Janet Kellam
Membership ..... Stuart Thompson
Research ..... H.P. Marshall
Search & Rescue ..... Dale Atkins
Ski Area ..... Bill Williamson
Standards Awareness ..... Craig Sterbenz
*Publications ..... Blase Reardon

Publications Committee
Editor ..... Lynne Wolfe
Assistant Editor ..... Toby Weed
Editor Emeritus ..... Steve Conger
Editor Emeritus ..... Sue Ferguson
Editor Emeritus ..... Blase Reardon
Editor Emeritus ..... Bruce Tremper
Web Asst ..... Jay Gress,
Karl Birkeland, Janet Kellam, Gary Murphy

Section Representatives
Alaska ..... Bill Glude
Eastern Section ..... Bob Bailey
European Section ..... Peter Höller
Intermountain North ..... Fay Johnson
Intermountain South ..... Sam Davis
Northwest ..... Evan Woods
Rockies ..... John Brennan
Sierra ..... Gary Murphy
Member Representative ..... Halsted Morris

Executive Committee denoted by *

The mission of the AAA is:

A. To provide information about snow and avalanches;
B. To represent the professional interests of the United States avalanche community;
C. To contribute toward high standards of professional competence and ethics for persons engaged in avalanche activities;
D. To exchange technical information and maintain communications among persons engaged in avalanche activities;
E. To promote and act as a resource base for public awareness programs about avalanche hazards and safety measures;
F. To promote research and development in avalanche safety.

Subscription: $20 per year (4 issues). Subscription is included with membership dues to AAA. For subscription and membership information, see **www.AmericanAvalancheAssociation.org**.

Contributions: Please submit material eight weeks prior to publication date. Include address and telephone number. Please submit typed manuscripts by e-mail or disk (3.5", Zip or CD), using any popular word processing program. Submit any figures in B & W, or as a TIFF or JPG file (300 dpi resolution at 100%). We will return materials if you include a stamped, self-addressed envelope.

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

Layout & Design: Karen Russell, Fall Line Design, (208) 354-6500, karen@FallLineDesign.com.

from the aaa

I can still remember the day I saw my first *Avalanche Review* as it was plucked from my mailbox at the main office of the Squaw Valley ski area in the fall of the soon-to-be-record winter of 1982-83. With a keen interest in avalanches that was about 10 years old at the time, my first reaction was, "Cool, very cool!" I immediately clipped out the form to begin my subscription. Subscriptions were $8 per year for six issues of eight pages each. I don't remember what happened to that first issue, for my collection now contains every *Avalanche Review* except that first one. The content was practical, engaging, and fresh at a period when avalanche literature, let alone a periodical, was pretty limited. Sue's *From the Pub* was stimulating and fun and *Avalanche Acres* was mysterious and at times hilarious, although I'm sure much of the nuance and inside jokes were completely missed by me.

In the fall of 1986 at the Tahoe ISSW, Sue again presented the concept of the American Association of Avalanche Professionals, which only recently has been operating under the name of the American Avalanche Association. To quote from her paper, "[The] diversity of avalanche programs has led to a growing lack of communication and cooperation among professional individuals involved in avalanche safety. Without combining efforts to share knowledge, ideas, and needs, there is a concern that the gap between existing avalanche hazards in the United States and currently effective safety measures could become unmanageable...To help create a more consistent pattern of cooperation and open the lines of communication, a new association has been recommended." During a break, an enthusiastic discussion ensued on the deck of the Squaw Valley Theater. I must admit that I was a little skeptical. I thought the journeyman "bomb chucker" might not be able to attain professional status. That didn't really turn out to be the case, but even before I knew that, I joined within a year. At my ski area, we patrollers weren't valued and the opportunity to be a part of something that could represent and potentially enhance my vocation as well as feed my passion could not be ignored and needed to be supported.

Well, it's 20 years down the road for our organization and next fall begins the 25th year of publication of *The Avalanche Review*. It ain't perfect, but AAA is getting something good done. So it was with much sadness that I heard of the passing of Sue Ferguson. I didn't really know Sue although we talked and e-mailed a few times, but I always found her open, friendly, and warm when we did happen to cross trails. Sue's energy and creativity helped create something we now almost take for granted and she can be justly proud of what she has left us.

I'd also like to take the opportunity to write a few words about Norm Wilson. I didn't work much with Norm, just a couple of professional avalanche courses, but Norm provided me with an example and an inspiration of what kind of life I might be able to make for myself in the mountains. In the Sierra, where I moved after high school to share the spirit of the mountains with those of a like mind, Norm was something of a legend. I didn't know much about avalanches, but Norm's name kept coming up in local climbing guides and in the long out-of-print classic, *Sierra Spring Ski Tours* by H. J. Burhenne. My interest in ski mountaineering led to an early encounter with an avalanche that had a fortunate outcome and to the path of the ski patroller. Norm had spent considerable time at Squaw Valley, my mountain, before moving over to Alpine Meadows in the next drainage to the south. Some of Norm's experiences at Squaw made it into Monty Atwater's *The Avalanche Hunters* which I read passionately and yearned for my own "battles of the Headwall." Those battles came (along with more than a few with the front office) and so did a casual friendship with Norm. I truly valued the sense of respect that I felt from Norm. Norm was an instructor at my first real avalanche course with Rod Newcomb's American Avalanche Institute at Jackson Hole in January of 1976, and my wife Sandy's first avalanche course with Norm's Sierra Avalanche Seminars at Echo Summit, California, in 1981.

Sandy and I visited Norm in Reno last spring. We caught him on moving day. He was moving to a new apartment where he could better deal with the constraints ALS was throwing at him. It was good to be able to help, but mostly to let him know how much he had meant to us. Norm showed us that a life (and a living) could be made of this passion for mountains and pursuit of avalanches. It's been a different path than Norm's, in a different time, and a darn good life. Thanks for your inspiration Norm.

Now for some business:

- We still need some willing candidates for AAA governing board elections this summer. Think of the glamour.
- Are you current with your dues? Check your TAR mailing label and if not, pay up, dang it!

By the time you read this, winter will be pretty well over. I hope you had a good one. If you're heading for Alaska or the southern hemisphere, be safe out there. And for gosh sakes make it to ISSW '06 in Telluride to celebrate 20 years of AAA and to drink a toast to Sue.

—Mark Mueller, your executive director

from the editor

MARCH 1, 2006, DRIGGS, IDAHO. TAR 24/4 NEAR COMPLETION. We are putting the finishing touches on the final issue of my first full year as editor of *The Avalanche Review*. We've moved to color this year, tried to keep themes in place, and begun the photo contest. I have been surprised and gratified by the responses to the call for photos. Your images and humor help me understand the richness of our membership base. Thank you.

The theme for this issue, mentorship, has been percolating in my mind for months, even years. The enclosed articles on the lives and legacies of Sue Ferguson and Norm Wilson brought the concept of mentorship from theory to the sharp focus of how we stand on the shoulders of those who came to these places and insights before us.

This job of editing *The Avalanche Review* has given me the privilege of working with many of my mentors; you answer my questions and respond patiently to my bullying and pleading in the e-mail. My peers have become my mentors as well; Blase Reardon let me work out the editing process for myself, giving me useful and timely guidance when he could have done the work better and faster himself. In this issue, Bill Glude and Brad Sawtell took concepts and ideas from other people and disciplines then developed useful teaching tools, which they have generously returned to us. Michael Jackson learns from a novice as he helps an avalanche survivor extract lessons for improving basic avalanche education. I applaud your collective willingness to publicly share your curiosity and innovativeness. That risk takes more courage than any in the mountains, I believe.

I am continually amazed by the lifelong-learning attitudes of some of the strongest mentors among us. Rod Newcomb tells me "good idea" and throws his considerable resources into a common project like the tribute to Norm; his enthusiasm sustains me for weeks. Tom Kimbrough brings me to tears with his heartfelt tribute to his mentors we read on the cover: he didn't have to do that, but he chose to share his depth of experience. In return for this trust and respect from the older generation, I try to stay humble and self-aware, and in my own teaching attempt to empower my students to ask the right questions, and to trust them to stand on our shoulders in years to come.

—Lynne Wolfe, editor, The Avalanche Review

TAR Photo Contest

We received more entries than we can print in one issue, so enjoy a sampling of our winners on page 15 plus Matt McKee's great cover submission. Watch for more exposures from Emily Johnston (below) and others in future issues.

emily johnston

Emily Johnston livened up the patrol at Grand Targhee before she left to attend med school in Seattle. She still ski patrols at Crystal Mtn and competes in the occasional adventure race.

Emily and Quaker the rescue dog on the job, providing avalanche-rescue services with style.

metamorphism

Congratulations to **Ian McCammon** and **Craig Sterbenz**, the newest AAA Certified Instructors.

call for submissions

- Seen any good avalanches lately?
- Got some gossip for the other snow nerds?
- Developing new tools or ideas?
- Learn something from an accident investigation?
- Send photos of a crown, of avie workers throwing bombs, teaching classes, or digging holes in the snow.
- Pass on some industry news.
- Tell us about a particularly tricky spot of terrain.

SUBMISSION DEADLINES
Vol. 25, Issue 1.....08/01/06
Vol. 25, Issue 2.....10/15/06
Vol. 25, Issue 3.....12/15/06
Vol. 25, Issue 4.....02/15/07

Lynne Wolfe, TAR editor
POB 1135, Driggs, ID 83422
lwolfe@tetontel.com
(208) 709-4073

Write it up; sent it to us. *The Avalanche Review* is only as good as the material you send.

The next issue, TAR 25/1, will mark our 25th Anniversary and will be available at the 2006 ISSW in Telluride, Colorado on October 1-6.

corrections

Mike Bartholow was stoked to see his photo in TAR 24/3, but he wishes to point out that he works at Eaglecrest Ski Area, not Eagle River.

Steve Conger also clarified that he is a graduate student at UBC: University of British Columbia, in Vancouver, not the "University of Vancouver."

The Avalanche Review regrets the errors.

aaa news

Call for Nominations for Fall 2006 Awards

Note which award your nominee should be considered for. Nominations for the following Awards will be considered:

- **Honorary Membership Award—** the highest award to be conferred. It recognizes a long record of accomplishment in North American avalanche-related activity. The person need not be an AAA member though membership is customary.
- **Bernie Kingery Award—** recognizes the sustained career contributions by an AAA Professional Member primarily engaged in field avalanche forecasting, mitigation, research, education, and safety.
- **Honorary Fellowship Award—** recognizes the contribution of an individual who has contributed significantly to avalanche-related programs in countries other than then United States. The person need not be an AAA member.
- **Special Service Award—** given in recognition of specific and outstanding achievement in the service of North American snow avalanche activity. The person need not be an AAA member though membership is customary.

Nominations must be accompanied by a citation that identifies the individual's history, accomplishments, and contributions to avalanche programs and/or research, education and public safety. This 300-word citation and five signatures of current AAA Pro Members for support will be the basis for recommendation by the Awards Committee. Final action rests with the Governing Board to recommend or deny the award.

Send nominations to: Denny Hogan , P.O. Box 74. Silverton, CO 81433

AAA Spring Governing Board Meeting

Date: April 22, all day
Location: White Pine Ski Area, Pinedale, WY
All members are welcome to attend.
Contact Mark at: aaa@avalanche.org or 970 946 0822 for more info.

Update your Address Please

As 3rd class mail, TAR is not forwarded by the US Postal Service. Please send your updated mailing address to aaa@avalanche.org or call (970) 946-0822.

News from Kelly Elder and ISSW 2004

First, a paper was inadvertently left out of the proceedings. The paper, *Public Participation in Snow Science* by Birgit Ottmer and Julia Wessels,will be included in the 2006 proceedings. Kelly regrets this omission and encourages you to review this interesting paper when it is published.

Second, he included the wrong version of another paper which is incorrectly formatted in the proceedings. That paper, *Temporal changes in the spatial variability of shear strength and stability* by Logan, Birkeland, Kronholm, and Hansen, appears on page 315. The authors request that you open your copy of the proceedings to that page and note that it is the incorrect and unformatted article. The correct, formatted article is on the Web at: www.fsavalanche.org/NAC/techPages/articles 04_ISSW_Logan.pdf and will be included in the 2006 ISSW Proceedings.

Kelly has had about 30 proceedings returned due to incorrect addresses. If you did not get your copy, please send him your correct postal address right away. Kelly Elder: kelder@fs.fed.us

Notice Anything Different?

This issue is printed on different paper than we have been using due to supplier issues. Stay tuned for our new look in the ISSW issue for September 2006.

AAA Membership Updates

Over the past few seasons, the AAA executive board has become concerned that the application process may appear confusing and even arbitrary because applicants from different parts of the avalanche industry may be held to different standards of documentation. To remedy that, the executive board has defined the application process and the kind and level of avalanche experience that meet the requirements of each membership category. Those expanded definitions are below. The categories themselves have not changed and remain as stated in the AAA by-laws.

PROFESSIONAL MEMBER

Open to persons active in avalanche science and practice and qualified through education and experience. To apply, send $40 membership dues and a resumé that documents four or more winters of education and professional experience, significant research and/or teaching in the field. For each item on the resumé, provide a tally of the days spent in avalanche-related activities, give a brief description of your responsibilities, and list contacts including references for self-employment.

The AAA defines four years of experience as four full winter seasons of avalanche-related operations. Full-time employment over the bulk of a winter allows avalanche workers to observe and work in the wide range of conditions that develop through a variety of seasons. The resumé documents that experience, so the AAA requires a clear, detailed resumé from all applicants.

The AAA also recognizes that full-time, winter-long employment is uncommon in many parts of the snow-safety industry, and many avalanche workers have gained tremendous professional-level experience prior to paid or full-time avalanche employment. The AAA welcomes professional members with such backgrounds; applicants should ensure their resumés provide a clear, detailed record of their education and experience observing and working in a range of conditions that develop over the course of at least four winters. In some cases, more than four calendar years may be needed to accumulate the experience needed for professional membership; the AAA encourages these applicants to become member affiliates as they gain experience.

Resumé Guidelines

- The purpose of the resumé is to provide clear, detailed documentation of your professional-level experience through at least four winters. Shape it accordingly.
- As a general guideline, you should show a tally of 20 days of active avalanche work per winter over four winters. That represents an average number of control days at ski areas with active snow-safety programs.
- If your duties in a position include more than avalanche work, provide a tally of days spent directly performing avalanche-related fieldwork. Ski patrollers, for instance, must document number of days spent in active snow-safety or avalanche-control work.
- You must document avalanche activities that extend throughout the season for four winters, to show you are actively observing and working in a variety of conditions as they develop. The activities can be for different operations or employers over the course of a winter.
- Your experience must be based primarily on forecasting, route finding, rescue, explosive delivery, research, guiding, or similar field work.
- You may include days instructing field-based avalanche-safety courses. However, the primary basis of your experience must still be four or more winters of avalanche-related fieldwork.
- You may include completed avalanche courses and continuing education. Acceptable courses are those that follow the AAA or CAA guidelines or AIARE curriculum, those from AAA-certified instructors, the National Avalanche School, or equivalent in-house or ongoing ski patrol and guide training. Acceptable continuing education includes events such as the ISSW, AAA professional-development seminar, CSAW, and AIARE continuing education.
- You may include advanced academic education directly connected with snow and avalanche studies.
- You may include mentored but unpaid professional-level experience such as volunteer fieldwork for an avalanche center.
- You may include recreational experience such as significant climbs, descents, traverses, or expeditions if avalanches were a primary hazard and professional-level avalanche skills and decision-making were essential to your safety.
- You may include a paragraph explaining why you believe your experience meets the requirements for professional membership.

Application Deadlines

The application review begins when applications are received. The AAA office forwards resumés to the appropriate region's section representative for review. Once reviewed, they are sent to the membership chair, who presents them to the board for approval at one of the two board meetings scheduled each year. To allow time for section reps to contact references listed on your application, we recommend that applications for consideration at the fall AAA board meeting be sent in by July 15 and by February 15 for the spring board meeting, though approval can be quicker in some instances.

MEMBER AFFILIATE

Open to persons qualified through education and interest but with less experience and/or education than required for professional membership. Member affiliates are typically entry-level professional patrollers or assistant guides, volunteer patrollers in avalanche-prone areas, law enforcement SAR specialists, and agency administrators. To apply, send $35 membership dues and a resumé providing evidence of strong interest in snow avalanches.

Your background should include more than one field-based avalanche course such as those listed in the professional membership description. Advanced academic education directly connected with snow and avalanche studies may substitute for some field experience. Send member affiliate applications with $35 membership dues to the AAA office, which will forward them to the secretary for review and approval.

LIFE MEMBER

Open to anyone with an interest in promoting the American Avalanche Association mission objectives. Applicants should apply as professional or member affiliates and meet the requirements for the relevant category. To apply, send $800 dues and a resumé documenting the appropriate experience and/or education for the chosen category.

SUBSCRIBER

Open to anyone wishing to subscribe to *The Avalanche Review*; send your address and a check for $20 to the AAA office.

what's new

European Meteorologists Meet

The Sixth Annual Meeting of the European Meteorological Society (EMS) will be held in conjunction with the 6th European Conference on Applied Climatology (ECAC) on September 4-8, 2006, in Ljubljana, Slovenia. This meeting is an open scientific conference with lecture and poster sessions as well as symposia and a scientific exhibition.

The ECAC conference is organized by the European Climate Support Network (ECSN) of EUMETNET: it aims to promote a fruitful exchange of information on the applications of climatology at a European level between all parties concerned, as national meteorological and climatological services, universities, international organizations, agencies, and private service providers.

Abstract deadline is April 28, 2006. More information can be found at: http://meetings.copernicus.org/ems2006/

Safety Think Tank Convened at ISPO

Rather than shackling our sports with stricter rules or constraints, new technology has the potential to both improve the personal safety net and fuel a faster evolution. Is our broader community taking full advantage? Is our collective potential limited by a poor interface between the athlete, industry, rescue, and resort spheres?

RECCO® presented the Safety Think Tank at this January's ISPO to bring winter sports together in order to generate new ideas, energy, and partnerships. Highlighting the initiative was a contest calling for a five-star idea to improve safety without limiting progression.

Finding a balance between freedom and safety, the relationship between on- and off-piste skiing, the pace of equipment innovation, and what role the industry should play in advocating for safer alternatives are all subjects that can be explored with a forward-thinking solution. The only certainty is that there will be no shortage of ideas and opinions offered in this radically charged environment. Stay tuned to *The Avalanche Review* for contest results.

Internat'l Avalanche Conference Set

The Third International Avalanche Conference will be held September 4-8, 2006, in Kirovsk, Murmansk, Russia—just beyond the Polar Circle in the Khibini Mountains.The conference will cover results of ongoing avalanche work and provide idea and information exchange between members of the world avalanche community.

Topics for 2006 will include snow-cover stability; avalanche dynamics; temporal and spatial avalanche forecasting; avalanche control techniques; awareness, education and public warning systems; avalanche search and rescue; slushflows; properties of snow and snow-cover evolution; snow drift; and instrumentation.

Registration and information is available at www.cas.kirovsk.ru

Barryvox Pro Integrates RECCO

The Barryvox VS 2000 PRO is the first transceiver to integrate a RECCO reflector directly into the unit's body, allowing the device to be located in the event of a burial both by traditional beacon-search method and by RECCO-detector pinpointing. Willy Zurkirch, the electronic engineer behind both the analog Barryvox PRO and the dual-antenna Mammut Barryvox, says, "They are not two competing systems–the RECCO system and the avalanche beacon–they are systems that work together. The RECCO reflector adds additional safety to our Barryvox beacon.

RECCO Aids in Live Recovery

On New Year's Eve, a 29-year-old German woman was caught in an avalanche and trapped under 1.5 meters of snow, then pinpointed with the RECCO avalanche-rescue system and recovered alive after being completely buried for 45 minutes. The woman and her partner had been snowshoeing to a backcountry cabin when the slide hit and swept her 150 meters downhill, trapping her under 1.5 meters of debris in a narrow, hard-to-reach gully. She was not wearing a transceiver even though the avalanche danger in the surrounding mountains was rated considerable on the international scale.

Her partner was not caught and placed a cell-phone call to police who deployed Mountain Rescue of Hinterstein. Two rescuers equipped with an avalanche dog and a RECCO detector were immediately transported to the accident scene by helicopter, ahead of a rapidly approaching storm and descending darkness. After a 15-minute search, the buried woman was located with the RECCO detector, pinpointed with probes, then dug out alive and conscious. She was then transported by military rescue helicopter to a nearby hospital where she has since recovered from the ordeal.

Munich ISPO Winter 2006 Trip Report

Story and Photos by David George

The ISPO trade fare, held in Munich at the end of January, was one of the biggest exhibitions of winter-sports gear in the world. It consisted of 14 football-field-sized halls and 1800 exhibitors. *The Avalanche Review* took a look at some of the backcountry safety gear that will be available next season. On the battlefield are user-friendly three-antenna beacons. The major contenders in this Battle Royale are the Germans represented by Ortovox and the Swiss represented by Mammut.

Mammut Pulse

Mammut demonstrated the Pulse, which looks more like a personal organizer than a beacon. It comes in a small sturdy black and red box with a large dot-matrix display. Andres Lietha, head of Mammut marketing, says the advantage to the large display is the ability to integrate future software developments into the same hardware. Mammut assures us that the Pulse has been tested in a wide range of temperatures and its LCD display hasn't had any problems with the cold. The display is visible under bright light and protected by a plastic screen.

The Pulse has an easy-to-use slider switch, which can lock the beacon into send, receive, and off. The case is shock-resistant and waterproof. The beacon is controlled by large, glove-friendly buttons on either side.

When the Pulse boots up into receive mode, there is a short delay before a personalized message appears. The beacon analyzes all the signals within range, displaying information about each victim. These beacons can detect small body movements of the transmitter, and the receiving beacon will display a heart symbol if vital signs are being detected with the beacon signal. (If the beacon has shifted during the slide or if the victim is wearing another type of beacon, no vital signs are detected and no heart will be shown on the display.) The receiving beacon will also show if other searchers within range are already honing in on a victim. The searcher can then decide to either go for live victims or use the "Easy Search" mode to select the nearest available beacon. While it does make sense to search first for live victims in avalanches, this feature will no doubt spark debate about how much information should be displayed during a search.

As the searcher scrolls through the list of victims, the distance and direction to each is shown. Once a victim is selected, a 360º compass-type arrow is displayed indicating the direction to the victim. There is no risk of following the flux line in the wrong direction. The addition of the third antenna increases the accuracy of the depth and distance information, regardless of the victim's orientation under the snow. Within three meters, the display switches to a crosshair mode, giving the direction the beacon should be moved over the surface of the avalanche debris in order to pinpoint the victim. Once the location has been confirmed by a probe, the searcher can mark the subject on his or her beacon. The Pulse will display a cross symbol in the victim's information and then select the next nearest victim. The receiving beacon will also communicate with other Pulse beacons that this victim has been found.

The Pulse really comes into its own when all members of a party are wearing it. Within the limited confines of Mammut's stand at the expo, the Pulse certainly performed as claimed and made multi-victim searches very straightforward. Daniel Forrer, an engineer from Mammut's R&D company, Ascom, says the software requires finalization, but the beacon should be ready for production by the end of the summer. Obviously, software reliability is a major concern; most people have experienced crashes with their mobile phone or pocket PC. Forrer says that the software in the Pulse is extremely reliable and if a crash does occur, it will automatically reboot. Like the older Opto 3000, the Pulse will also switch back into transmit mode if there is no activity, in case the searcher is caught in a second avalanche.

The Ortovox d3 transceiver has three antennas, is completely digital, and adds an LED to indicate if there are multiple signals.

Ortovox S1 and d3

The Ortovox S1, announced last year in a blaze of publicity, could be the beacon to compete with the award-winning Mammut Pulse. There have been delays in its release, however. Franz Kröll, part of Ortovox's Communications team, explained that Ortovox originally wanted to use a single-antenna design. Franz admits that was too ambitious given the amount of information to display. The company since opted for a three-antenna design similar to the Pulse and Pieps DSP which requried an extra year of development. The third antenna is used for pinpointing.

The S1 is certainly the most futuristic of designs, resembling a Star Trek communicator. The clam-shell case may raise some eyebrows from mobile phone users regarding reliability; but the case and display appear well-built and solid. When the S1 boots up, each victim's direction and geographic location appear on the dot-matrix screen. The location of the searcher is indicated by a crosshair. The searcher simply moves over the search site until the cross-hair displays above the beacon symbol. Within 3 meters of the victim, the third antenna helps pinpoint and concentric circles around the beacon indicate distance. Once the location is confirmed, the next beacon can be located. Like the Pulse, the S1 reverts to transmit mode if activity stops. The pre-production version at the Ortovox stand worked fine for a two beacon search, and first samples promise to hit the shops in late November of 2006.

Ortovox has a second weapon, the d3: digital 3-antenna technology. This beacon looks like the classic X1 in styling, yet it has three antennas, is completely digital, and adds an LED to indicate if there are multiple signals. Like the S1, a third antenna allows for greater precision when pinpointing victims. The display and operation are very straightforward. Two LED lights indicate distance and three arrows indicate victim location. Thanks to a powerful processor, the d3 is fast. It competes with the X1 (which remains in the Ortovox armory), Tracker DTS and Arva Evolution+.

Ortovox controls over half the worldwide market and some of their beacons are well into their second decade of use, so backward compatibility is important. According to the company, both the d3 and S1 inter-operate with all other models using the standard 457KHz frequency. In terms of whether or not beacons have reached the limits of the 457KHz signal and the EN 300 71 B standard, Franz Kröll believes that further improvements are possible, both in performance and ease of use.

Nic-Impex Evolution+ & A.D.vanced

The French manufacturer, Nic-Impex, has emphasized evolution, not revolution. The consumer model, Arva Evolution+, gains a second antenna to become a truly directional beacon and is now housed in the same case as the Arva A.D.vanced. Marketing director Rachel Mugnier explained that the principal cost of short production runs of electronics is R&D and case molds, prompting case mold dual usage.

When a user switches the Evolution+ to search, the beacon scans for signals. This beacon indicates if there are multiple burials by cycling through the distance and direction to each beacon for the first few seconds. It then locks on the nearest one. A fast 16-bit processor shows little of the lag associated with early digital beacons. The display has five direction arrows which guide the user. Nic-Impex believes the user interface should be straightforward in the stressful environment of a real search.

The A.D.vanced also has two antennas and a 16-bit processor. Improved for 2006, it handles the multiple-victim problem by splitting the search area into 10 user-selectable concentric search rings. Users scan each ring for signals. Once a ring is selected, the beacon stays locked onto the beacon(s) within that ring, ignoring other signals. The A.D.vanced also offers an analog mode. This beacon will appeal to users willing to invest the time to learn its advanced features. Current A.D.vanced owners can get a software update from their distributor. All of Nic-Impex's safety gear is now marketed under the ARVA brand with both beacons in production. Nic-Impex has recently changed their US importer to LifeLink, shipping nearly 1000 beacons last season.

Backcountry Access Tracker DTS

No changes were made this year to the BCA Tracker DTS since last year's revision. BCA president Bruce McGowan says it's time to allow other manufacturers to play catch-up. He is confident that the Tracker provides the performance and ease of use that backcountry enthusiasts demand and believes that sales reflect this desire. The Tracker DTS is not only number one in its home American market but also in many European countries where it faces stiff local competition. According to McGowan, BCA will monitor other company's developments, particularly the new three antenna beacons.

Black Diamond Deploy has a curved handle which slides over the blade for storage and prevents the shovel from spinning around while digging.

Sexy Shovels and Probes

It's hard to imagine how technology as mature as the humble snow shovel and avalanche probe could be further improved, but next season we will see a number of interesting developments to these old hands in rescue equipment. It is also curious how manufacturers come up with very similar developments at the same time. Mammut, Black Diamond, and Nic-Impex all presented ultra-compact avalanche shovels. Nic-Impex's design features a telescopic handle for better leverage while shoveling avalanche debris or snow from the driveway. In some ways this shovel is a return to army-style "pioneer cores" used back in the '80s, but with an emphasis on digging performance. A big advantage of integrating the handle and blade is that they cannot become lost when separated.

The Mammut Raptor won the Volvo Active Safety award in conjunction with the Pulse beacon. It has a strong oval-shaped handle and its D-grip at the top of the blade increases shoveling power and efficiency. The blade can be used as a snow anchor. Both Nic-Impex and Raptor use man-made materials for the blade. But nothing beats a metal shovel for cutting through ice. The Black Diamond Deploy has a curved handle, so it can slide over the blade for storage and can prevent the shovel from spinning around when digging.

Ortovox and Nic-Impex have addressed the problem of assembling collapsible avalanche probes quickly. Using clever joints and a quick-locking cord, the user simply flicks the parts open and pulls tight on the cord lock in a single operation.

AvaLung-Equipped Backpack

Black Diamond showed off a new range of AvaLung™-equipped Anarchist backpacks. According to Anke von Birckhahn, the AvaLung is gaining acceptance among backcountry enthusiasts and will eventually become as widely used as beacons are today. BD displayed backpacks in 42-, 32-, and 22-liter sizes. The packs integrate the AvaLung into the shoulder strap and pack body. The AvaLung expels used air from the rear corner of the pack, increasing the time a victim can breath to well over an hour (assuming they have been able to get the breathing tube into their mouths). The packs won the ISPO 06 European Ski Award. Black Diamond lists a number of successes for the AvaLung in real incidents.

David George was able to attend the recent ISPO in Munich as a representative of The Avalanche Review. He runs and manages a Web site devoted to European backcountry skiing: www.pistehors.com

California Blasting Procedures Change

Story and Photo by Russ Johnson

In the wake of 9/11 and the Big Sky accident, changes were inevitable in most avalanche programs of U.S. ski areas. For California, another influence played a key role as well: the change at Cal OSHA of the chief engineer of the Division of Mining and Tunneling. The changes, such as not riding lifts with armed explosives and arming charges on the hill, didn't affect every area in the same way. Mammoth Mountain had been following these practices for years, so no significant changes were made to their program. For others like Alpine Meadows and Squaw Valley, the changes entailed a major shift of practices requiring expensive infrastructure. I spoke with Curtis Crooks, AAA pro member and assistant patrol director at Squaw Valley, to find out if the required modifications affected safety or other operational considerations.

At the heart of the transformation is the concept that the charges should be armed as close to the deployment point as is practical. For Mammoth this means arming at the shot point; but Mammoth controls their mountain largely with artillery and the hand-charge routes are largely clean up. At Squaw the entire program is hand charges. To further complicate the issue, there are six "high points" where the arming must be done and the routes spread out from these high points. For example, the other day one troop-carrier snow cat carried 13 patrollers to a cap and fuse magazine up on the hill. Then the machine moved to another location where some of the patrollers got out. They took some of the charges out of the special type-2 magazines attached onto the blade of the machine and went to an arming shack with the appropriate cap and fuse. The other patrollers travelled on in the machine and moved to a safe location for arming, which was done in the machine. From these points the patrollers spread out to their routes. Squaw had two troop-carrier snow cats already but they needed to be modified to have non-sparking interiors and then wood-lined type-2 magazines were added to the blades.

Previous to these changes, all charges were armed in the base area in the morning prior to the general show-up time. The armed charges were stored temporarily in a day box in the patrol building so they were never unattended. After the morning meeting, the armed charges were handed out to the teams by a patroller designated for that job. The teams would then go by lift or snow cat to starting points and deploy on their routes. Now the unarmed charges are kept in their boxes and transported up on chairlifts or by cat and then armed on the hill. The existing patrol shacks are used but since there is not supposed to be any flame or electricity, the heaters and pilots are turned off when the patrollers arrive in the morning. The other regulation says to arm in a warm and dry environment, so there has been some compromise: the day I went on snow safety, our team armed in a freezing cold shack which had no heat or light so we used headlamps.

Operationally the new system works pretty well. However, since it is significantly more complicated, if anything goes wrong there is less flexibility to save time. The other day one of the troop carriers was frozen in the morning and wouldn't start, so the teams proceeded up the mountain with their unarmed shots on the lifts and had to wait for the machine. If it is a deep day when the going is slow anyway and there is any kind of glitch, then the program can be slowed down.

Unarmed charges are kept in their boxes and transported by cat to be armed on the hill. Trooper carriers now feature non-sparking interiors and wood-lined type-2 magazines on the front blades.

Another consideration is the counting of cap and fuse and the charges. When there were only three magazines it was easy to keep count of the explosives. All the caps and fuses were kept in a type-2 magazine in the patrol base. This was legal because it totaled less than 50 lbs. When cap and fuse was made up, it was added to the existing amount, and when arming was done in the morning, the cap and fuse used was subtracted from the total. ATF wants a daily summary of explosives used and this basically took care of itself when there were just the few magazines and only one cap and fuse magazine. Now with the satellite magazines for cap and fuse, there is a form to be filled out and a senior patroller has to call down to the base and say how many cap and fuse he removed and what the current inventory is. With 13 magazines on the hill and several patrollers responsible for the count there has been some confusion, and the patroller making the weekly count has had to deal with discrepancies.

"It's a bookkeeping challenge," states Crooks. " The whole program is definitely more cumbersome. I don't think it's any less safe really but it tends to be slower given any glitches. Given the choice we wouldn't have made any changes. We thought that what we were doing was safe and manageable, and we'd done it for so long, and we were so comfortable with it, that's still the way we would prefer to do it. But because we're adaptable and we're smart enough, we were able to come up with a new program that he (the OSHA chief engineer) was comfortable with, that seemed to fulfill the regulations, and we're making it work."

Russ Johnson: Squaw Valley Ski Patrol 1985-2004, Squaw Valley Avalanche Forecaster 1993-2004, AAA Governing Board 1994-2006, currently the AAA president.

education

The Professional Avalanche Worker School, an Update

Story and Photos by Don Sharaf

After four years of brainstorming, false starts, head scratching, and word-smithing, the AAA ran the first Professional Avalanche Worker School (PAWS) from December 10-17, 2005. The decision to run the course was made in late September at the annual meeting, so the word went out late for budgets and scheduling. Despite these challenges, the net result was a fantastic course taught for five participants.

Much of the preparation for this course involved creating course standards and measures so that expectations would be clear, goals would be attainable, and evaluations would be accurate. Thanks to Steve Conger and Michael Jackson who were instrumental in creating a balanced and comprehensive system for the development of the course details and expectations. The specifics on these standards and measures can be found online at: www.americanavalanchea ssociation.org/PAWS.htm. The goal was to create a course that could be run by various qualified individuals, as long as an organized model could be followed.

The instructors are what make or break any course and this one was stacked. So you want to learn about ski-area avalanche control? Dean Cardinale, assistant snow safety director at Snowbird, can speak to the subject. Want to learn what is involved in highway forecasting? Liam Fitzgerald can share some insights. Need some tips about talking to the media? Bruce Tremper can help. Any questions about the human factor's influence upon decision-making, avalanche mechanics or anything else? Ian McCammon would be a rational choice.

Rod Newcomb of the American Avalanche Institute was the sole reason this course could run this past winter.Through Rod's dedication to the concept of AAA-conducted professional training, the AAA operated under his permit in Little Cottonwood Canyon and was covered by an extension of his insurance. Since future iterations of this course will have to be under its own insurance and permitting, the acquisition of these elements poses the largest challenge for the longevity of the PAWS course in the future.

We will have more details on when and where future PAWS courses will be held following the April AAA board meeting. We will limit course size to 18 participants at each venue and never exceed more than six participants per instructor (the ratio will likely be less with guest instructors). The vision for this course is to introduce and refine skills that would meet avalanche industry standards for observation, documentation, and practice for ski patrols, guides, and forecasters. The first course accomplished this goal and more – we look forward to seeing it build momentum into the future around the West.

Dean Cardinale explains Snowbird's daily weather documentation.

Nick Armitage and Hoots Witsoe, two PAWS students, plan the next part of their route.

Don has put his house plans, powder skiing, and avalanche-course design on hold for the next two months so that he can ski sastrugi, hard slab, and facets in Alaska. He looks forward to his return to soft snow in whatever state or country that may be.

Assessing Stability: Interpreting an Unconscious Patient

Story by Brad Sawtell

The problem with snow is that it is white. It always looks good. It is pristine. It is beautiful. We are drawn to beautiful things. Beautiful things make us feel special. We all like to feel special because those feelings make us happy. We all can tell stories of events that made us feel good and the story gets better with age. Think of your last powder day. Was it epic?

Beauty is only skin deep. Unless we dig snowpits, we only see the pristine surface of the snow. The snowpack is a multi-layered structure with a mix of both strong and weak layers. For avalanche assessment, the relationship of the layers is more important than the snow surface. To make a good avalanche assessment we need to get beyond the superficial beauty and get to know the whole snowpack.

In avalanche classes, we have to encourage students to take time and get to know the snowpack. Over the years I have developed a set of questions and analogies that provide that encouragement.

I encourage my students to ask themselves a few basic questions that many of us intuitively ask before we go on a backcountry tour. I first encourage them to call their local avalanche hotline to find out what the avalanche danger is rated for the area to which they plan on going. Then I encourage them to ask themselves the four questions from the book *Snow Sense* by Doug Fesler and Jill Fredston:

1. Is the weather contributing to instability?
2. Is the snowpack capable of producing an avalanche?
3. Is the slope steep enough to slide?
4. What is my group like?

I have learned that, for the same reason it is hard to die in a car accident if you are not in a car, it is also hard to die in an avalanche if you are not in, on, or below avalanche terrain. So if the answer to the third question is no, then there is little to worry about. If the answer is yes, then the savvy backcountry traveler must answer the other three questions. As an experienced traveler you may not cognitively ask yourself these questions, but I am sure the concepts from the basic questions run through your mind.

Answering the weather and group questions can, in some cases, be straightforward. The group question in most cases gets us in trouble, but decision-making is another topic to be discussed later (or visit Ian McCammon's research at www.snowpit.com). Answering the snowpack question can be a daunting task. We all have practiced and performed stability tests. That's what makes us snow-science practitioners or professionals. As an avalanche educator, I am continually asked by students to break things down into an understandable format. As a professional, it's easier to explain technical concepts. What follows is a series of analogies I have have used successfully while trying to interpret the stability of the snowpack. I have also found the analogies to be an aid in teaching others how to make field observations and evaluate stability, especially if they have a basic level of wilderness medical training.

For starters, let's say that all snowpacks on a slope steep enough to slide are "unconscious." A sliding or avalanching snowpack is "conscious." I will borrow a patient assessment process used in wilderness medicine and taught by the Wilderness Medicine Institute of NOLS to help me recognize and make field observations.

The Scene

You wake to sunny skies and 4" of fresh light snow. Over a fresh cup of coffee, you call a couple of friends to join you in skiing the NE face of Mt. Quinzhee. They decide to meet you at the trailhead at 9am. You have all taken a Level 1 avalanche course and a Wilderness First Responder course. You pack your gear and, of course, you call your local avalanche hotline which says that the system passed by overnight with light SW winds. Today winds will be light from the N with clear skies above, and temperatures will be 18-25° Fahrenheit. The avalanche hazard is rated moderate with areas of considerable above tree line on lee slopes steeper than 35 degrees facing NE.

You finish breakfast and drive to the trailhead. Along the way you notice a small natural avalanche on a NE aspect of Mt. Loki. You meet up with your friends, get on your skis, discuss the morning's avalanche bulletin, and perform a beacon check. All systems are a go.

In wilderness medicine, a thorough patient assessment helps not only your patient but also directs you as the first responder to stabilize or fix the patient's injury. Like first aid, field observations are important to determine the snowpack's stability and make good choices. Starting from the trailhead, start your assessment. Metaphorically speaking, it's time to put on the rubber gloves.

As a first responder, the first thing on your list is to stop and perform a "scene size-up" to confirm that the scene is safe or acceptable to enter. Then you check A, B, C, D & E: Airway, Breathing, Circulation, Disability, and Environment & Exposure. In the backcountry, check for:

Avalanches: Have you seen any avalanches?
Bad layers: Have you felt facets or weak layers in the snowpack with the ski-pole test?
Collapsing/Cracking: Have you felt any collapses (basal or mid-pack facets)? Have you experienced any cracking in the surface layers from breaking trail?
Deep slab: Do you have a deep-slab instability problem? Can you feel it with your ski-pole test?
Environmental/Exposure: What is your weather history? How exposed are you?

So you cruise along, break trail, feel how the snow reacts under your feet, perform ski-pole tests, and talk about snow conditions and route-finding options with your partners. By now, you have stopped several times. Your scene size-up has included measuring the slope angle, confirming you are approaching avalanche terrain. Because you have cognitively paid attention to your trail breaking, the results from the ski-pole tests, and talked about the snowpack with your partners, you determine it is relatively safe to approach the slope. It is a short slope but faces NE, the same aspect of the natural slide you observed earlier on Mt. Quinzhee.

What do you see? "Look at all the pow!" What do you think? "Can't wait to let 'em rip!" or, "Let's build a booter!" Traveling in a snow-covered backcountry setting, I perform the scene size-up and A, B, C, D & E check on the go, which allows me to get to my intended location using conscious choices. This toolbox also helps me choose a location to dig a snowpit. I dig a snowpit when the vitals of my snowpack have changed. I know they have changed when I notice a change in my patient's A, B, C, D & E. I seek more information by digging a snowpit in order to check my unconscious patient's vitals.

In a first-aid setting, how frequently are vitals checked? Every 15 minutes, every 30 minutes, every hour, or when there is a significant change in the patient's Level of Consciousness (LOC). The snowpack's LOC changes with different aspects or elevation (below, near, or above tree line). Additionally, the LOC changes when there is a significant weather shift (wind speed, direction, exposure to the sun, etc.). Change is also evident when results from a ski-pole test indicate a different snowpack.

Other acronyms from the wilderness medicine world can crossover into your snow observation tool box, for example SAMPLE: Symptoms, Allergies, Medications, Pertinent medical history, Last intake/output, and Events. With snowpack, check for:

Symptoms: natural signs of instability (collapsing and cracking).
Avalanches: slab, loose, and wet slide activity
Mechanics: slope shape and size, stability tests (compression, shear and tension)
Pertinent weather history: trends (both long and short term) and changes in those trends
Last storm: new snowfall quantity, rate, and intensity—when was the last avalanche cycle (nearing a new cycle or trending towards settlement)?
Events: First, what trend has developed in the avalanche advisory? Second, what events created the white structure I am standing on?

As in first aid, the focused exam or head-to-toe is performed rapidly. Go through the process quickly, looking for patterns. The above-mentioned acronyms may be an aid for those struggling with how to use the tools in their observation toolbox. I use these concepts to help my students be more observant not only of their surroundings but also to maintain cognitive, thoughtful

Continued next page ➡

UNCONSCIOUS PATIENT

continued from previous page

choices. Unlike a first-aid setting, in the backcountry I want my snowpack "patient" to maintain a state of unconsciousness. The fail-safe alternative is to seek lower-angle terrain. But if higher-angle terrain is chosen, more information is needed about my patient's consciousness by using my observation toolbox, digging snowpits, and being aware of the snowpack.

The Assessment Continues

Back to our ski tour, the vitals and LOC of our patient have changed as we climb toward the summit of Mt Quinzhee—we are now above tree line from where we began down in the trees. We decide to stop to gather another set of vitals and cautiously move onto the NE face to dig another snowpit and perform the necessary stability tests. We find a reactive layer of small facets. We perform a rutschblock test, getting a score of RB6, Q1 on a layer where there are four lemons. It's a beautiful day, the snow looks great, but by paying close attention to our patient's LOC, we chose to stop to gather more data. I'm glad we did.

While teaching these concepts in the field, I continually ask my students about our patient's LOC. For example, when traveling up a narrow drainage, the group can split up to check the snow on both sides as if feeling the left arm of a patient and then the right. Such analogies help students maintain a heightened level of awareness.

Keeping in mind that the problem with snow is that it is white, I encourage students to imagine that the snowpack is color coded (like the photo at the top of the next page). Figuring out avalanche danger would be much easier if stable snow was green and unstable snow was red. Would the surface snow look as inviting if it was fire-engine red?

Look and listen for clues. Feel for data. Only then appreciate the snow for being pristine and beautiful.

Brad Sawtell (right) works for the CAIC as a forecaster in the Summit County office and also as an educator where many of his students are ski patrollers and outdoor educators. He can be reached at caic@qwest.net.


Brad checks the vitals of a snowpack at the Silverton Avalanche School, winter 2006.
Photo by David Geiger

ISSW 2006: Telluride, Colorado

Story by Martinique Davis

Molded by the highest concentration of avalanche paths in the country and swathed in a notoriously unstable snowpack, the San Juan Mountains near Telluride have historically served as a paradigm of avalanche study. Peppered with more than 500 recorded avalanches every winter (thought to be only 50% of the total avalanches that occur in the region each year), the San Juans boast an enriching learning environment for snow-science researchers.

Next fall, some of the snow-science and avalanche industry's most influential minds will take advantage of the Telluride region's impressive outdoor classroom as the community hosts the International Snow Science Workshop (ISSW), October 1-6, 2006. Snow scientists and avalanche practitioners from around the world will converge in Telluride for this biennial international conference. A five-day meeting of the minds will offer a forum in which avalanche industry experts discuss theories, present papers, explore innovative research topics, as well as explore the avalanche terrain which shaped the historic culture of the Telluride area and continues to govern transportation, habitation, and recreation to this day. In keeping with the long-running theme—*A Merging of Theory and Practice*—the Telluride ISSW team is currently requesting abstract submissions from researchers and practitioners.

Telluride Ski Patrol's Snow Safety Director Craig Sterbenz has been selected by the ISSW as the conference chair. A 35-year veteran of the snow-science and avalanche-forecasting profession, Sterbenz is gearing up for an event expected to draw close to 600 snow and avalanche professionals. "The idea behind the conference is that it gives those who are regularly out in the field, working in snow – ski patrollers, mountain guides, highway workers, and the like – the opportunity to meet and exchange ideas with the people who are on the industry's cutting edge of research and technology," Sterbenz explains.

The ISSW has its roots in meetings between snow scientists and avalanche workers held informally in the '50s, which prompted an ongoing tradition of conferences that led to a 1982 meeting at Montana State University that began the contemporary ISSW. Over the years, attendance at ISSW conferences has grown from 220 people during the early '80s to more than 700 people from 18 countries at the 2004 ISSW in Jackson Hole, Wyo. From the perspective of snow-industry workers in the region and beyond, Telluride is a fitting location for such cutting-edge snow-science research typical of the ISSW. Silverton was the sight of what many avalanche experts agree was the birth of modern avalanche forecasting and study during the '70s: INSTAAR (Institute of Arctic and Alpine Research) San Juan Avalanche Project. Telluride ski area was the site of the first North American Avalanche Guard/Blaster Box, a significant tool used for avalanche mitigation. The region is also home to two world-class avalanche schools: the Telluride Avalanche School and the Silverton Avalanche School.

Next fall's conference is expected to generate intriguing new research, as well as provide a forum for avalanche experts from around the world to explore the infamously avalanche-prone San Juan Mountains. Dr. Ed LaChapelle, considered by many to be the grandfather of avalanche research in the San Juans, has agreed to come out of retirement to join in the Telluride ISSW discussion. Other well-known researchers such as Richard and Betsy Armstrong, of the ground-breaking INSTAAR San Juan Project, will be in attendance. The San Juan range's considerable avalanche history is slated to make the conference schedule, with a strong focus placed on the Red Mountain Pass area (known as one of the most active avalanche areas in the country) and the INSTAAR avalanche research that took place there in the '70s.

During mid-week field sessions, participants will be able to explore some of the notorious avalanche terrain in the San Juans, visit the high reaches of Telluride ski area and discuss the resort's avalanche-control procedures and ski-area expansion process, survey the Ophir area where heavy avalanche activity during the winter of 2005 imperiled local private property and disrupted a major power transmission line, discuss local mining and avalanche history with local historians in the Pandora Mill and Bridal Veil Falls area, as well as travel to Red Mountain Pass and Silverton Mountain ski area to investigate specific avalanche issues related to those areas.

"There is always new and interesting research and information that comes to the ISSW from around the world," Sterbenz says. "It really becomes a very dynamic discussion where the exchange of ideas is shared across a broad platform of avalanche workers and researchers."

For more information, visit www.issw.net.

A Colorado native, Martinique Davis decided to forgo a "real" career in journalism after college and instead returned to her hometown of Telluride to become a ski patroller. She balances life on the hill with a newspaper job at ***The Telluride Watch*** *and freelances for regional publications.*

ISSW Call For Submissions

The International Snow Science Workshop, ISSW 2006, will be held October 1-6 in Telluride, Colorado, USA. We cordially invite all snow scientists and avalanche practitioners to join for *A Merging of Theory and Practice* amidst a rich history of mining and avalanches in the spectacular San Juan Mountains.

Suggested topics include: avalanche forecasting; avalanche case studies; avalanche risk management; avalanche search and rescue; avalanche education; avalanche motion dynamics; avalanche control systems; accident case studies; instrumentation and electronics; snow metamorphism; snow, weather terrain and climate; new innovations in operations/research; Operational avalanche programs; and snowmobiling.

Special Sessions: snow research and avalanche forecasting in the San Juan Mountains, spatial variability of the snowpack.

The poster sessions will be given more emphasis during this ISSW. One poster session each day will relate to topics presented in the oral presentations. There is just not enough time for everyone to give a talk on his or her topic. We hope that daily poster sessions, with fewer posters per session, will facilitate more in-depth discussion between authors and participants.

ISSW 2006 will offer a full social agenda to complement this week of learning and enlightenment. We are pleased to announce that Dr. Ed LaChapelle has agreed to come out of retirement for an evening to deliver the keynote address at the banquet. Several other well-known and a few long-lost contributors to the San Juan Project will be in attendance to defend their name and integrity.

For more information, online registration, and abstract submissions, visit **www.issw.net**

media

Avalanche Advisories in the new media age

Story by Bruce Tremper

Color-coded avalanche terrain helps backcountry users understand the complexities of varying snow conditions at a glance.

I've always known that it's hard to communicate complex avalanche information to the public. But it hit me between the eyes several years ago when I was backcountry skiing with three of my best friends and most regular backcountry skiing partners. It was one of those days with a complicated avalanche pattern: considerable danger on upper-elevation north-facing slopes, low danger on south-facing slopes, and moderate danger on the other slopes. My friend took his turn breaking trail, and I had to veto the plan when he started to head up a steep north-facing slope. He called the forecast that morning. He heard the words. Yet he still started breaking trail up something that could have killed us all. In the ensuing discussion, I polled the others in our group to see what they remembered from the morning forecast, and no one could remember exactly which slopes were rated considerable, moderate, or low.

I know what you're thinking: if they're friends of mine, they probably "don't have all their huskies barking," as they say in Alaska. But one is a successful lawyer and the veteran of several big-mountain expeditions to Nepal and Alaska. The other is a high-level computer programmer and a mountaineering partner of mine from trips to Nepal and Peru. And then there's the smartest one of all, my wife Susi, who has skied with me at least 500 days in the backcountry and has gone virtually everywhere with me in the outdoors for the past 13 years. Yet none of them could tell me which slopes were rated considerable, moderate, or low. Clearly we had a problem—a big problem. For the next few months I conducted my own informal backcountry survey and similarly found that few people could recall the details of the forecast. And it wasn't just us. In more recent years, the Swiss surveyed backcountry users and got similar results.

As avalanche forecasters and educators we tend to fall into what Ian McCammon calls the "fire-hose trap." If you give people information and it still doesn't change their behavior, then we just give them more information and hope that works. But it seldom does. Our avalanche classes just got longer and more detailed. Our avalanche advisories did the same. Yet more and more people died each year. It was hard for me to admit that what we were doing just didn't work. I eventually realized that our clientele didn't need more information, they needed a better way to perceive it and a better system to make decisions based on it.

When I first started working as a backcountry avalanche forecaster 20 years ago, there was only one way to distribute avalanche information—by calling the avalanche hotline. And it was a good gig while it lasted. I still recall fondly the baritone Tennessee drawl of Tom Kimbrough as he spun his avalanche yarns around the morning avalanche campfire. When the Internet came along, we simply published the text version of the telephone advisory on the Web, and we thought that was pretty cool. Then we figured out how to hyperlink photos or snow profiles and thought that was even cooler. The Web is a very visual medium. If you click around on the popular Web sites you invariably find mostly graphics with short bulleted text. We do, after all, now live in what one media consultant told me is "the post-literate society." No one reads anymore. Yet our avalanche advisories remained long-winded text-based products originally designed for the phone recording. I overheard a young snowboarder refer to our Web-based advisory as the "blah-blah forecast."

We are avalanche geeks, after all, not Web designers, and in the blink of an eye we found that we had not only missed the Internet boat, but we were stranded on the dock by ourselves with no one else paying attention. Our Web-based survey last year found that our users accessed the avalanche advisory by phone only 13% of the time. Sun Valley found only 8%. Canadian phone access was less than 1%.

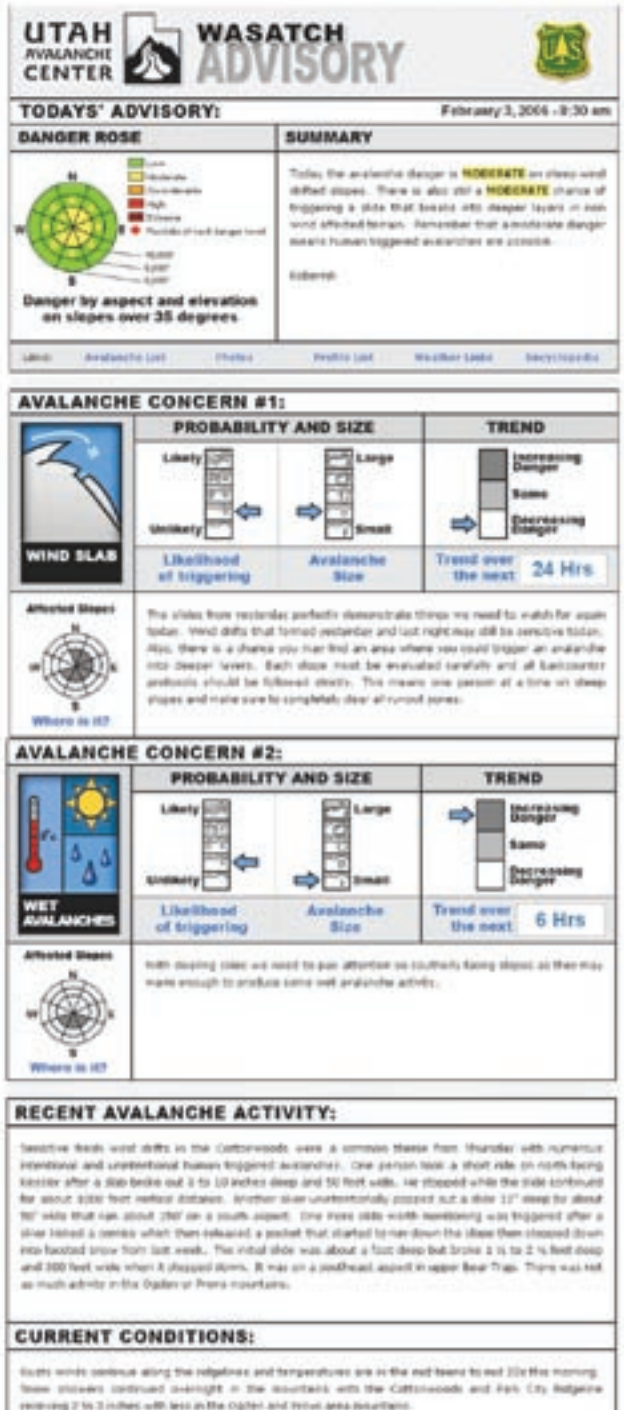
For the 2002 Olympics, I wanted a better way to communicate avalanche information over the Web. I've noticed that most avalanche professionals are visual and mechanical thinkers. We tend to communicate using our hands, and we draw snow profiles and aspect-elevation diagrams on cocktail napkins. In our avalanche classes I could finally see the students get it when I quit flapping my gums while flipping through photos in the slide projector, and I started showing videos and utilizing the rich graphic features and animations of PowerPoint. I'll bet 10 times more people will scan this article's graphics than will actually read this sentence. I'll also bet that you wouldn't have read this sentence without first being hooked by the graphics. Most would agree that a narrative is the most accurate way to communicate complex avalanche information. But few people will actually read it and even fewer retain its message. Graphics work better.

For the Olympics, we developed a graphic-based avalanche advisory, which sported an avalanche-danger rose (avalanche danger by aspect and elevation) as well as a "Powder the Polar Bear" icon that illustrated avalanche danger and snow-surface conditions. Unfortunately, the user interface was so difficult to use that after our extra staffing went away after the Olympics, we simply didn't have time in the morning to update the graphic product. So we slipped back into the old, long-winded text advisory and began planning the next-generation graphic interface.

I started working with Jim Conway (a Salt Lake-based, extreme-ski athlete and guide turned Web designer) to create a new-and-improved, graphic-based avalanche advisory. We went through at least a dozen different prototype designs, which we have regularly passed around to the avalanche-forecasting community for feedback. After we zeroed in on the current design, we posted the prototype on several Web sites and got an avalanche of feedback from the target group we were trying to reach: the hard-core backcountry recreationist who is also young and tech-savvy. Mike Shields, a programmer from Ft. Collins, Colorado, designed the avalanche-rose interface (also used on the Colorado forecast). Sun Valley forecaster Chris Lundy did the PHP programming. We went public with the graphic advisory format this Christmas. Since then we have received a flood of overwhelmingly positive e-mail and verbal responses. Sun Valley has started using a simplified version this season, and the Chugach National Forest Avalanche Information Center also plans to start using it.

The idea behind the graphic-based advisory is twofold: 1) to present avalanche information in an easier-to-understand graphic format, and 2) to de-emphasize the overall danger rating and concentrate instead on describing the nature of the avalanche problems backcountry users will likely encounter that day and where they will likely find them. Many of these ideas came from the work of Canadian helicopter-ski guide Roger Atkins. He found that professional guides made their critical route-finding decisions based not on the stability rating, but on the character of the avalanches they were likely to encounter (Atkins, ISSW 2004). Roger came up with 27 different types of avalanche problems, which he put

Continued page 14 ➡



UAC's Web advisory (above) includes graphic representations to visually describe avalanche conditions. Individual icons (below) quickly convey problematic concerns for the day and are linked to their definitions in the Avalanche Encyclopedia.

snow science

Using Geographic Information Systems for Avalanche Work

Story by Chris McCollister and Karl Birkeland

Recently there have been an increasing number of calls from snow folks, Geographic Information System (GIS) specialists, and the public to more fully utilize GIS for snow-avalanche work. And why not? Avalanche work relies on terrain, and a key component of many uses of GIS includes detailed terrain models that can be manipulated in a variety of ways. Further, GIS is a great way to create colorful, detailed maps that can help the public better understand many complex processes. But is GIS currently appropriate for some of the uses commonly suggested?

Folks commonly suggest two primary uses for GIS. The first is that GIS can be used to effectively map avalanche terrain. This typically involves mapping starting zones by looking at slope angles and vegetation cover. More complicated models use various techniques to move the snow from the starting zone downhill, thereby mapping out avalanche tracks and runouts. The second common suggestion for GIS is to use it for avalanche forecasting. Some propose the creation of a complicated model that maps factors like snowfall, wind loading, energy balance, and changes in weak-layer strength through space to come up with a detailed map of potential problem areas in the snowpack. More commonly, and on a much more basic level, people suggest using a GIS to visually display the avalanche danger currently being forecasted by a local avalanche center onto the terrain of interest.

How well does GIS reflect reality?

The first thing folks need to keep in mind when they are using a GIS is that they are looking at a depiction of reality. We tend to get excited about the graphics and colors dancing around on the computer screen in front of us and lose track of how that really reflects what is found on the ground.

The two most important data layers for looking at avalanches with a GIS are a vegetation layer and a digital elevation model (DEM). The vegetation layer gives an idea about the number of trees on a slope, which can provide insight into the anchoring of a particular slope. Ideally, these will be accurate data, though the user must be aware of when they were collected. If these data are old, subsequent logging or fires may have decreased forest density in some areas, or density may have increased through time as trees grew.

Probably a greater concern in terms of its reflection of reality is the DEM. Remember that the M in DEM stands for model, so the DEM is simply a model of reality. The resolution of a DEM reflects its detail. Thirty-meter DEMs, which are widely available throughout the U.S., have points on a 30 by 30m grid, meaning that intermediate points must be interpolated between those points. Ten-meter DEMs are available in some areas, and still other places may have finer DEMs available. The terrain model we use for Jackson Hole is based on work by planning engineers and is a 3m DEM. As you will see, even with a 3m DEM there can be large discrepancies between what the DEM depicts and what we see on the ground.

The resolution of the DEM means that in some cases small avalanche slopes can be completely missed. For example, when using a 30m DEM, a person would probably use a minimum of three points to calculate the slope angle and most likely 5 or 9. This would mean that the two outer points would, at a minimum, be 60m (or about 200') apart. If other calculation schemes with larger numbers of points are used, the problem of missing small terrain features may become further magnified.

The basis for the DEM is the elevation for each data point. The absolute accuracy of these elevation points is about 3m for a 30m DEM. So, we can see that the DEM will give us a fairly accurate measure of elevation, typically within about 10' of the actual value. The accuracy of other values will vary depending on the calculations involved and just how accurate a depiction is needed. For example, if we feel it is acceptable to break down aspect into eight different directions (N, NW, W, etc.) we can do a reasonably good job because each category is comprised of 45-degree bins. On the other hand, we may not find it so easy to differentiate between a slope with an aspect of 95 degrees and one that has an aspect of 100 degrees. Still, for most avalanche work, aspect calculations are probably sufficient.

A primary concern with depicting avalanche terrain with a DEM is the accuracy of slope-angle calculations. Slope angle is arguably the most important attribute for assessing avalanche terrain, but is relatively poorly represented by DEMs at the accuracy demanded by avalanche work. We all know that subtle changes in slope angle can mean big changes in avalanche frequency, so knowing the difference between a 28-degree slope (which almost never slides), a 33-degree slope (which sometimes slides), and a 38-degree slope (which commonly slides) is critical, and these changes are much too subtle to be picked up with a DEM. Even if we look more generally at slope angles, like at angles from 30 to 45 degrees, generating slope angles accurate enough for avalanche work is challenging. This does not mean that avalanche work with a DEM is impossible – it simply means that the user must recognize these limitations.

Mapping avalanche terrain

One suggestion for utilizing GIS in avalanche work is to map avalanche terrain. At first glance, mapping avalanche terrain seems to be a no-brainer. At the least, areas with calculated slope angles from 30 to 45 degrees ought to give us a start for identifying avalanche starting zones. To test the effectiveness of a GIS in identifying avalanche terrain, we utilize data from Jackson Hole Mountain Resort that has been used in previous research *(McCollister and others, 2003; McCollister, 2004)*.

First we created a layer of possible avalanche areas based entirely on slope angles between 30 and 45 degrees. We then compared that map to a map of known starting zones created when snow-safety director Bob Comey digitized the avalanche paths in consultation with other senior snow-safety personnel at the ski area *(figure 1)*. In general, the technique did OK, correctly identifying about 75% of the avalanche starting zones. However, about 25% of the area of avalanche starting zones was missed. In addition, there was an enormous amount of area where the GIS identified avalanche starting zones even though none existed. In fact, these false-positive areas outnumbered the correctly identified areas by a ratio of over 10 to 1. One reason for the high false-positive ratio could be that we didn't use vegetation data in our simple mapping procedure.

Next, using the same layer that identified avalanche areas based only on slope, we compared those areas to a map of approximate runout zone for size-5 avalanches created by Bob Comey and his crew. The GIS correctly identified runout zones only about 45% of the time, while they were missed 55% of the time. The bottom line here is that there were more misses than hits, so slope clearly did not adequately characterize the avalanche runout zones in the area. More refined techniques can be used to map runout zones with a GIS. But given the difficulties with mapping even individual runout zones using standard techniques such as air photos, statistical models, and dynamics models, it is clear that misclassification rates will remain relatively high.

Given the misclassification rates, how useful is GIS for mapping avalanche terrain? Clearly, more sophisticated mapping techniques can be used, and these can reduce misclassification error. For example, detailed work by Furdada and others *(1995)* mapping avalanche terrain with a GIS in the Pyrenees resulted in a misclassification rate of about 15%. Still, misclassifying more than 1 in 10 areas is probably unacceptable for many applications. Although the GIS may be able to give a person a reasonable first guess as to the avalanche terrain in a specific area, each map will have to be carefully field verified by an expert before that map can be used or released to the public. Given the data and techniques currently available, mapping avalanche terrain with a GIS over large areas accurately enough for anything more than general planning purposes is not possible. However, as higher resolution DEMs and more sophisticated vegetation data become available, we will likely see improvements in GIS avalanche mapping capabilities.

Avalanche forecasting models and displaying avalanche forecasting products

One especially common suggestion is to use GIS for a sophisticated avalanche-forecasting model that would use the existing snowpack, recent weather, and terrain to determine avalanche potential over broad areas. On the surface, it seems like a great idea. However, on closer inspection there are many problems. Campbell and others discussed in detail why such mapping over individual slopes is currently not feasible. In essence, we simply cannot model the many factors that go into assessing stability at the necessary scales. In addition to the problems with relatively simple factors like calculating slope angles, we have additional difficulties such as modeling new snow and wind loading over space and time. Once those difficulties are overcome, we still need to be able to map the snowpack in detail over particular slopes. Those who remain unconvinced need only to go to the large body of spatial variability research to see the problems in such an approach. For a start, check out the many papers and theses on the subject at the Web sites for the Forest Service National Avalanche Center: www.fsavalanche.org/NAC/techPages/techPap.html and the University of Calgary Applied Snow and Avalanche Research Group: www.schulich.ucalgary.ca/Civil/Avalanche/papers.htm. Even with increasingly sophisticated tools and intensive data-collection efforts, investigators are finding it difficult to explain, let alone predict, the patterns of shear strength or stability-test results on individual slopes.

If such complicated models are not feasible, then perhaps we can simply take the forecasted avalanche-danger rating and use GIS as an effective way to present that information to the public. This has probably been the most commonly suggested use for GIS from the public. Since many avalanche centers currently provide avalanche danger by aspect and elevation and some centers provide avalanche danger roses, transferring the avalanche danger to a terrain map would not be difficult. Further, as we discussed earlier, the GIS can do a reasonably good job with aspect and elevation.

Putting avalanche danger on a map is not without its problems, however. First of all, we have already seen how difficult it is to map avalanche starting and runout zones using a GIS. If we would like to create a map that is going to shade only avalanche terrain, we will find it impossible to accurately map all the avalanche terrain over the broad areas covered by backcountry avalanche centers without detailed field surveys that could potentially take years of effort. A second approach would be to include all areas of a given aspect and elevation in the map, regardless of whether or not they are avalanche terrain. The problem this creates is that now our map will specify an avalanche danger for some areas that, because of the terrain, may not have any avalanche danger at all, regardless of the conditions.

A second problem with putting avalanche-danger ratings from an avalanche center onto maps is that we all know there are exceptions

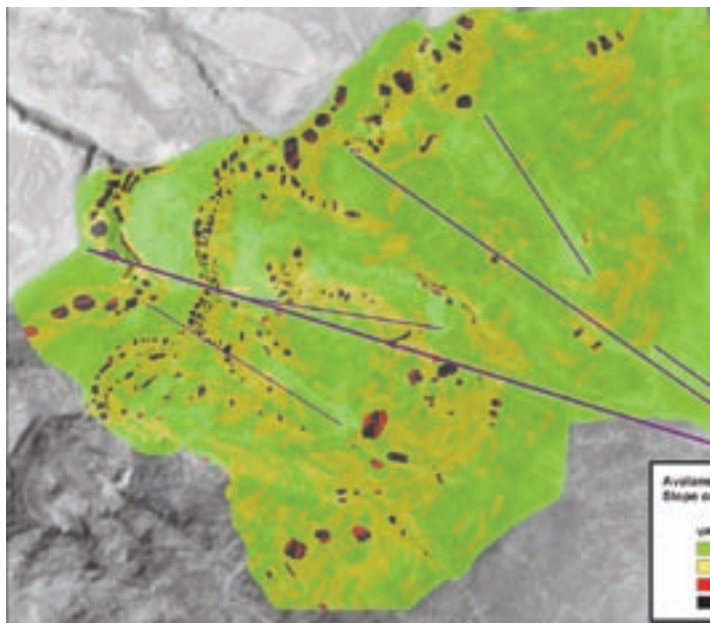


Figure 1: A comparison of GIS-mapped avalanche starting zones (with 30-45 degrees) with the actual starting zones for Jackson Hole Moun

Figure 4: The user interface for GeoWA weather data at Jackson Hole. Given probability of individual avalanche p

slope angles from
tain Resort.

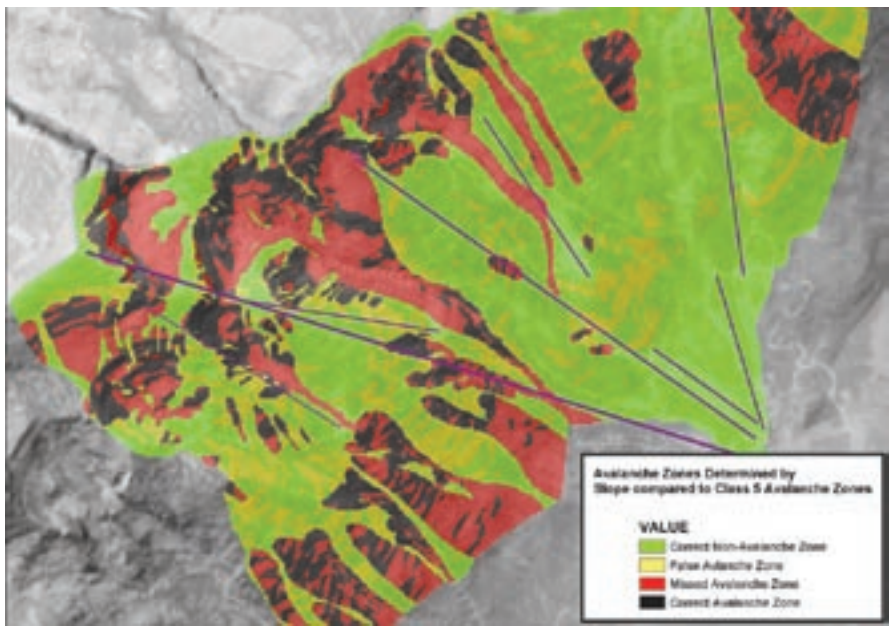


Figure 2: A comparison of GIS-mapped avalanche runout zones mapped by slope with the actual runout zones for the Jackson Hole Mountain Resort.

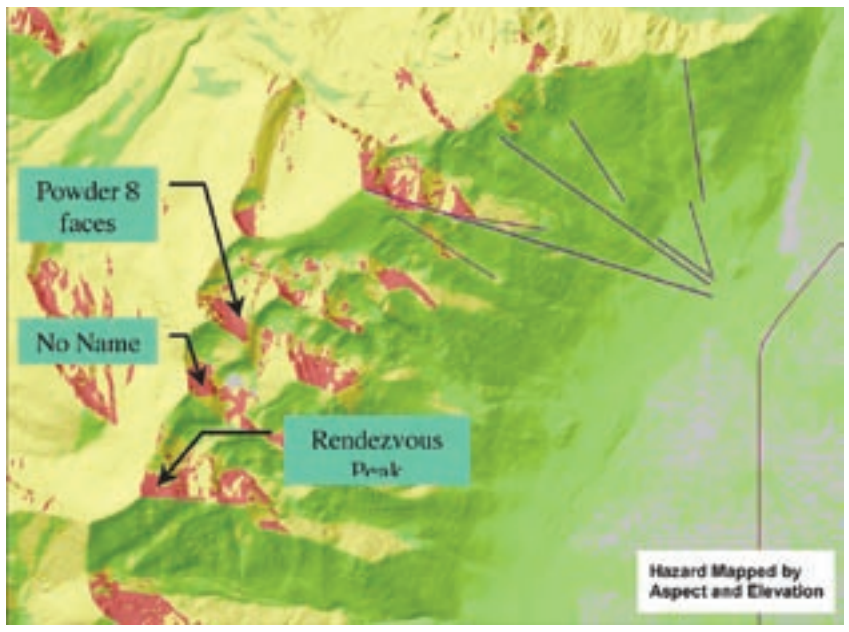


Figure 3: Avalanche danger mapped by elevation and aspect, with the higher elevation north through east aspects having the highest avalanche danger.

in the field that cannot be taken into account on a map. For example, south of there are several large slopes with similar aspects and elevations. If the Bridger-Teton Avalanche Center used a GIS to display avalanche danger by aspect and elevation, these slopes would have the same avalanche danger applied to them *(figure 3)*. However, while No Name and the Powder 8 Faces avalanche relatively frequently, the wind patterns in the range scour the face of Rendezvous Peak, so this area usually has no avalanche danger. Surely everyone can think of many such exceptions in their area where a particular slope with a similar aspect and elevation to adjacent slopes is typically much more unstable (or stable) than its neighbors. Any map released to the public must be corrected for these many exceptions or the public could misinterpret the map as showing a particular location to be more or less dangerous than it is in reality. The bottom line is that an avalanche danger rose or the discussion section of an avalanche advisory conveys a certain amount of uncertainty, which is appropriate given the problems we face when putting out avalanche information to the public. On the other hand, putting such information on a map suggests an unrealistic level of certainty that can be easily misinterpreted by the public.

How should we use GIS in avalanche work?

Thus far, the discussion has focused primarily on the limitation of using GIS. However, there are many appropriate ways that GIS can be and is being used in avalanche work. One excellent use of GIS is to allow professionals to better display and interpret ever-increasing volumes of data. The following are just a few examples. At Switzerland's SLF, the avalanche-warning team benefits from the services of GIS specialists who manage incoming data such as snowfall and wind speed/direction from numerous remote stations and map those data over Switzerland so it can be more effectively analyzed. Up at Canadian Mountain Holidays heli-ski operations, Pascal Hägeli has helped set up some GIS products currently used operationally by the guides. CMH now has a daily map of their area that displays the avalanche activity, stability assessment, and the drainages skied for each of their many operations. In addition, each operation has a daily run map for planning the day's skiing. CMH clearly recognizes the potential application of GIS for the many facets of their operation as evidenced by their hiring of a full-time GIS technician this season.

Like CMH, Jackson Hole is investing in GIS for their avalanche work. Recently the snow-safety crew at the area mapped the extent of avalanches for five different class sizes for each of the 250+ slide paths inside the ski-area boundaries. Using these data, a customized computer program now automatically creates a map depicting historic avalanche activity for any given period of time . This allows avalanche-hazard-reduction crews to view events that occurred on previous days, throughout the season, or even over several years. Additionally, start-zone information such as the average aspect and elevation is also calculated for the avalanche events. GIS data can also be used in conjunction with other database methods, such as Nearest Neighbors. GeoWAX, a program developed by Chris for his MSc degree at Montana State University, effectively links their historical weather and avalanche data with the previously mentioned map of avalanche terrain within the ski area. Using this system, forecasters can quickly create maps representing the historical avalanche activity on days with conditions similar to the current day or see how changes in a given parameter (such as wind direction) affect the pattern, type, and size of avalanches in the area *(figure 4) (McCollister and others, 2003; McCollister, 2004)*.

In addition to use by professionals, GIS can be used appropriately to better display information for the public. For example, Parks Canada recently took air photos to create 3D terrain models with a GIS. They then manually mapped avalanche terrain onto these models and are displaying it on trailheads and on the Web (see www.pc.gc.ca/pn-np/ab/banff/visit/visit7a9_E.asp for some of their maps). This approach can give the public a clearer view of the avalanche terrain in the area they are traveling.

Numerous other possible applications exist. For example, the Bridger-Teton Avalanche Center has three forecast regions. Chris used GIS to analyze the percentage of the different regions that have steep slopes and also the percentage of the regions with varying aspects. Such an analysis allows forecasters to better understand some of the differences between various forecast regions. Another possible use for GIS is mapping where avalanche events occurred. Forecasters or the public could enter avalanche observations using a GIS format to get the exact location of a slide. Then standard GIS query tools can be used to modify the map for specific time periods, avalanche size, aspect, elevation, slope, or any other information about the slide path (depth, failure layer, people caught, etc). The bottom line is that the number of applications is limited only by our imaginations and our abilities to manipulate the GIS.

Used correctly, GIS can be a useful and powerful tool for avalanche work. It can be used to effectively display and interpret the increasing volumes of data available to avalanche forecasters. However, as avalanche professionals we must also recognize its limitations. Creating maps of avalanche terrain over broad stretches of area is an inviting prospect, but we must ask if the planned use of such maps can tolerate the known misclassification in those maps or if sufficient resources are available for adequate field verification of the maps. Likewise, mapping avalanche danger on digital elevation models is a visually exciting, colorful way to show avalanche danger over an area. However, if such a representation lacks accuracy, is it useful for the public, or is it actually a misrepresentation of our knowledge of the current situation?

One thing we can be sure of is that GIS technology will continue to improve. Digital elevation models will get better, as will remote sensing techniques for identifying vegetation. As a group we should continue to monitor the progress of GIS technology; in the future we may well be able to create products such as useful avalanche-terrain maps. In the meantime, there are many practical applications of GIS in the avalanche field that can be used to improve our operations.

This article is based on a presentation Chris gave to the Forest Service National Avalanche Center meeting in Bozeman in September, 2005. Jackson Hole and their personnel (especially Bob Comey) have been extremely supportive of Chris's GIS work for the area and for the Bridger-Teton Avalanche Center. We thank Pascal Hägeli, who read a draft of this paper and gave excellent feedback and comments, and Grant Statham, who shared his experience with some of the GIS applications being used by Parks Canada.

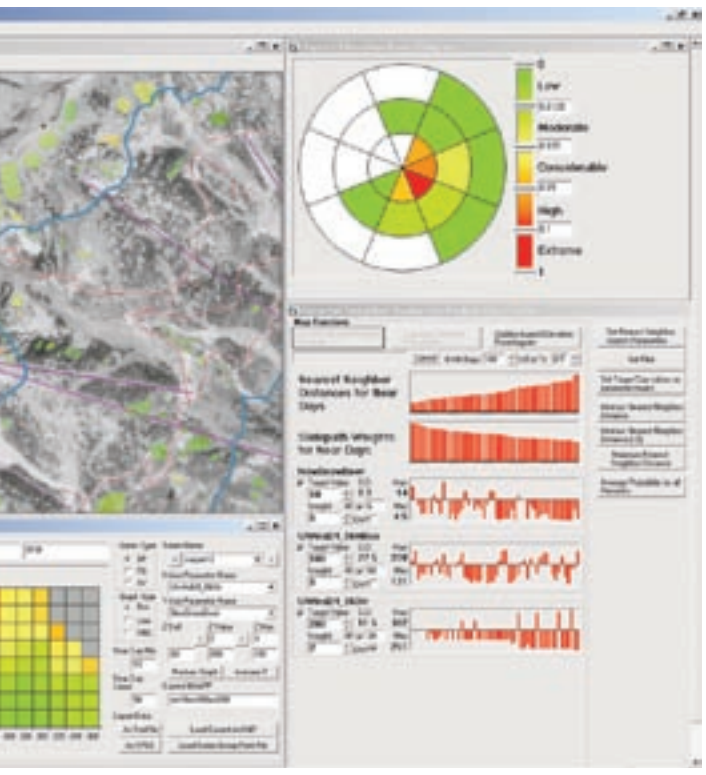
References

Campbell, C., B. Jamieson, and P. Hägeli. 2004. Small scale mapping of stability: if not, why not. *Avalanche News* 71, 45-49. Also posted on the Web at www.eng.ucalgary.ca/Civil/Avalanche/Papers/SmallScaleStabilityMapping_Nov04.pdf

Furdada, G., G. Martí, P. Oller, C. García, M. Mases and J. M. Vilaplana. 1995. Avalanche mapping and related G.I.S. applications in the Catalan Pyrenees. *Surveys in Geophysics* 16(5-6), 681-693.

McCollister, C.M. 2004. *Geographic knowledge discovery techniques for exploring historical weather and avalanche data.* MS Thesis, Department of Earth Sciences, Montana State University, 106 pp. www.fsavalanche.org/NAC/techPages/theses/mccollister.pdf

McCollister, C., K. Birkeland, K. Hansen, R. Aspinall, R. Comey. 2004. Exploring multi-scale spatial patterns in historical avalanche data, Jackson, Wyoming. *Cold Reg. Sci. Tech.* 37(3), 299-313.



AX, a spatially oriented tool developed for exploring historical avalanche and specific inputs, the tool searches for nearest neighbors, then calculates the aths producing avalanches and displays a map of those probabilities.

Editor's Note: We planned to reprint the referred article "Small scale mapping of stability: if not, why not?" from the *Canadian Avalanche News* 71, but space did not allow it. If you would like an electronic version of that article, please contact the editor.

Like many avalanche folks, Chris McCollister manages several jobs to stay afloat. In addition to working as an avalanche forecaster for the Bridger-Teton National Forest Avalanche Center, he works part time for the Jackson Hole ski patrol and does software development for avalanche-related projects (like the infrasonic avalanche-detection system currently in development). His Masters Degree in Geography from Montana State University focused on developing techniques for integrating GIS and historical avalanche and weather data, and he worked as a teaching assistant for GIS courses during college.

Karl Birkeland worked as a ski patroller and an avalanche forecaster – and spent too many years as a graduate student – before he landed in his current position as the avalanche scientist for the Forest Service National Avalanche Center, where he is responsible for transferring new and emerging technology to the regional avalanche centers. He's messed around a little with GIS, but commonly finds himself calling Chris with any GIS questions that come up. When he's not working he enjoys chasing his two young daughters around Bridger Bowl, an activity that is becoming increasingly challenging.

A Roadmap for Teaching Stability Evaluation

Story by Bill Glude

Why Students Get Frustrated

The question always comes. It may be this one or a similar one. It doesn't matter; the conversation always goes the same way.

A student is seeking a piece to hold onto for support in the overwhelming flood of information in a Level I avalanche course. "So are you saying that surface hoar is a widespread and deadly persistent weak layer?"

The instructor draws intuitively on a well of knowledge derived from years of experience, extracting the underlying principles: "Well, surface hoar usually is both tender and persistent, except when the wind blows it off the ridges in which case it might only be present in sheltered areas, except when it forms only on shaded aspects or in the colder valleys or the colder ridges, except when the storm comes in with warming before snow and it melts or lies down, except when it is small and the temperature is mild and the new snow settles it into the surrounding layers more quickly than usual, except, except, except, except..."

The student's eyes glaze over at the third or fourth "except" and you can see that they are sinking. They are lost and overwhelmed. Lamely, you say "It's complicated. It always depends." True, but not helpful.

Avalanche specialists operate at the expert level; they intuitively know the state of the snowpack without following any conscious rules, yet shuttle back and forth to the intermediate level, while checking our "gut feeling" against underlying principles. The problem is that our students are not experts, and communicating to them from the expert level where we operate does not work.

Better Frameworks

We know from research on stages of learning that beginners need simple rule-based tools, and aspiring intermediates like our Level I students need a framework of underlying principles they can follow toward a deeper understanding.

That framework has been emerging through the efforts of a number of avalanche educators. Ian McCammon and Don Sharaf presented the stability wheel concept a year ago here, and we at the Southeast Alaska Avalanche Center have extended it into a larger context that we are calling the stability evaluation roadmap. It is still a work in progress, but it is working well enough that we are sharing it here in outline form in hopes that other educators will contribute to the next stage of evolution. Our comments are in italics.

A heavy emphasis on observations and on slope and traveling tests is geared to coping with uncertainty and spatial variability and to teaching skills that people will actually use in the field. We all know that recreationists dig very few snowpits, and when they do they often dig in the wrong places, misinterpret the results, and trust too much in a few tiny test blocks amid vast mountainsides of snow. This is our best antidote to date.

The Helm's Deep Analogy

Our castle of avalanche defenses needs three walls because we know, as in the second book of Tolkien's *Lord of the Rings* trilogy, that the avalanche orcs will make it through the first and second walls and sometimes the third one too.

1. Stability evaluation is the outer wall. Use it all you can, but remember that it will be breached eventually. No one is immune; even the best avalanche specialists sometimes blow their stability evaluation.

2. The second wall is our risk-management practices: travel rituals, traveling one at a time, route selection, preparation, training, companion choice, decision-making, evaluation of consequences, and so on. This wall is the one most likely to save us.

3. The innermost keep of the avalanche-defense castle is rescue skills, but paradoxically, your own skills will not help you if you are buried. Your friends' skills will become Gandalf the wizard charging in on a shining steed to save you. Be sure your personal Gandalfs are always well trained and drilled!

The Three Roadmap Components

1. Observations
2. Slope and other traveling tests
3. Snowpits

Stability 1: Observations

The Key Signs of Instability

This is Doug Fesler's classic list, with the addition of tallying and weighting the signs.

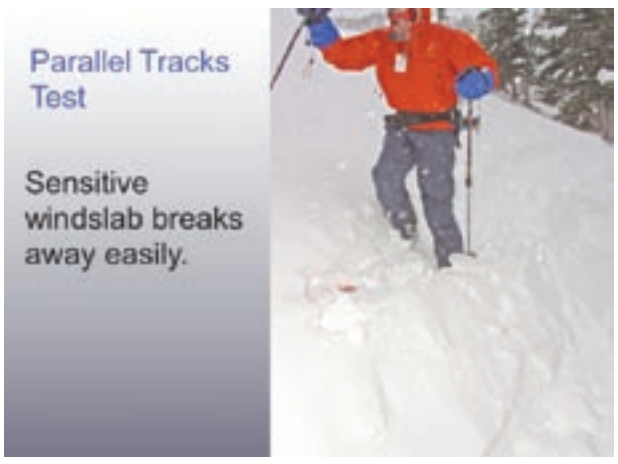
Observations are a major factor in your stability evaluation. Tally up how many of the seven signs of instability you are observing, then weight their magnitude and significance. Remember that the absence of a sign can be as important as its presence.

1. Avalanche activity - Recent activity is the clearest indicator of instability!
2. Whumpfing, collapsing
3. Hollow sounds
4. Shooting cracks
5. Recent heavy snow
6. Rain or thaw
7. Windloading

Stability 2: Slope & Traveling Tests

Test Site Choice

- Angle (38°-45° ideal)
- Aspect (match to slope in question)
- Elevation (match to slope in question)
- Loading (match to slope in question, err toward more loading)
- RISK (may require compromising other factors - test small slopes!)



Slope and Traveling Tests

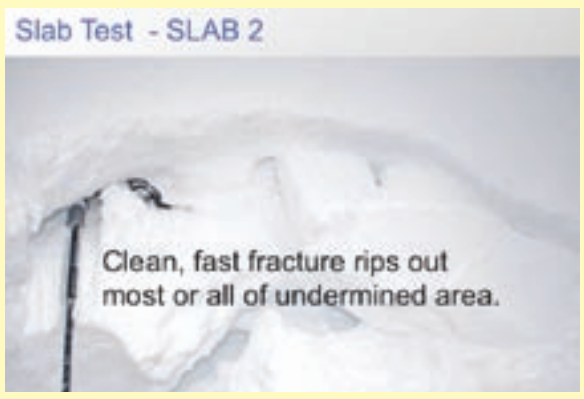
These can be done quickly as you travel, without taking your pack off or your shovel out. They are less precise than most snowpit tests, but are valuable because they allow rapid sampling over a wide area with little time and effort. Those that involve digging are limited to soft new or wind-loaded layers that can be dug with the hands, but those layers are often the primary concern.

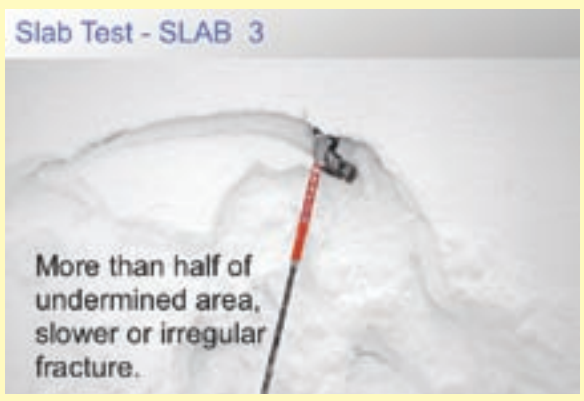
- Slope Tests— Ski, board, or bank cuts; jump tests; and trundling rocks or cornices. All are key tests, very useful. Be careful to test only small no-consequence slopes, but hit all you can as you travel.
- Drift and Cornice Tests— Kick at small drifts and cornices to see if they crack or drop off. Note how they respond. Slow, irregular local cracking or rapid, clean large break? Easy or hard to trigger?
- Switchback Test— Try to cause fracture at the switchback by kicking at the wedge of snow it creates. Especially useful for new or wind-loaded snow. With fat skis or splitboards, back off your climbing angle near the turn so the wedge is not too broad.
- Parallel Tracks Test— Try to cause fracture by cutting one track above another. Also especially useful for new or wind-loaded snow. Bounce or kick to increase shear force as necessary.
- Probing— Arm, ski pole, or probe. Allows rapid subsurface sampling over a large area. Works well for hard layers like rime crusts, frozen melt-freeze, or windslabs. Can detect depth hoar but does not work well on thin weak layers.
- Slab Test *(see sidebar)*— A key test, index of how well the slab propagates fracture.
- Hand Shear, Ski Pole Block— A key test, very quick, easy to do often.
- No-Excuse Block *(see sidebar)*— A key test. The fastest Large-Block Test, particularly suited to snowboards on descent.

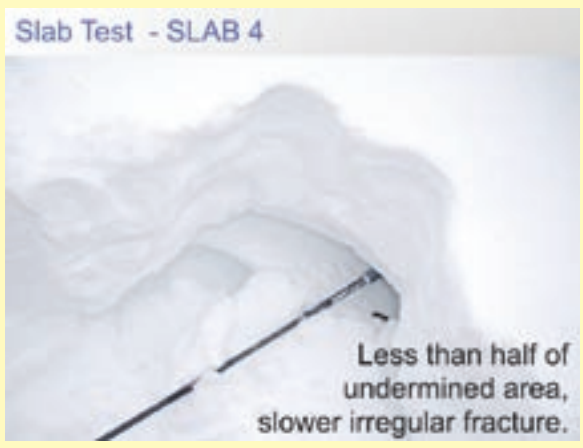
Stability 3: Snowpits

The Quick Pit Chant

We detail each step here in the classroom and field. It still needs an acronym like SAMPLE or ALPTRUTH. Ideas, anyone?







Oh you big fat slab—
THE SLAB TEST

This is a nonstandard traveling test that we have developed. It evaluates how well the slab propagates fracture, not how easily the slab breaks, which varies with slab thickness, strength, and hardness.

Dig the weak layer out so the slab is undermined to ski-pole or arm's length. If it does not fracture on its own, load the slab by striking with both hands. Carefully observe the character of the fracture. Does the fracture rip out surrounding snow, all of the undermined area, more than half, or less than half of the undermined area? Is the fracture clean and fast, average, or just localized irregular crumbling? In other words, is the slab dead or alive? Code as **SLAB**. Requires only an arm, ski pole, or other tool. The Slab Test scale is:

1. Clean, fast fracture extends beyond undermined area
2. Clean, fast fracture rips out most or all of undermined area
3. More than half of undermined area = slower or irregular fracture
4. Less than half of undermined area = slower or irregular fracture
5. Irregular crumbling in and near loaded area

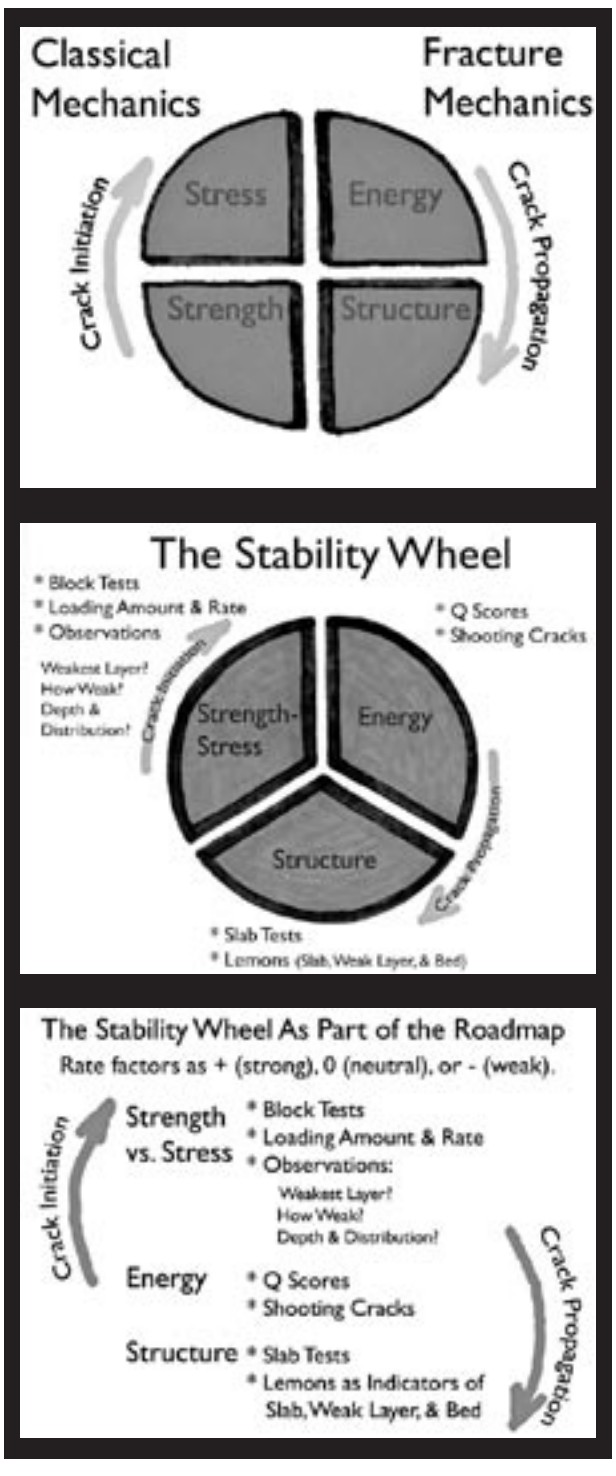
Well excuuuuuuuuuse me—
THE NO-EXCUSE BLOCK

This is a nonstandard large-block traveling test we have developed. It is by far the fastest large-block test, so named because there is "no excuse" to skip it. It works well for new or wind-loaded snow over a known base and works particularly well when descending on a snowboard.

The first rider cuts a toeside turn into a flat traverse low on the test slope, kneels, and digs the block by hand. Use your board as a reference to roughly size the block to the tester's board contact length, as for an AK Block. Trench the sides as far upslope as you can dig by hand. The second rider waits above while the first one digs, then rides down to load the block heelside with the standard large-block test steps.

Ski poles help snowboarders load test blocks smoothly. Move gently onto it. Avoid swooping onto it at speed or setting your edge abruptly as you stop. Try not to bulldoze snow onto the block or push the top layers prematurely by working in a falling leaf pattern as you sideslip onto it. If the block is firm, slip the board gently from side to side to cut a niche to hold you when you jump.

This test works for skiers too, but is a little slower because they have to take their skis off to dig it. It does not work for travelers without boards. Code it in your fieldbook as **NE**; be sure to note the slope angle and block depth.



1. Pick a representative site
2. Lay out block tests
3. Dig it
4. Smooth it
5. Brush it
6. Poke it
7. Predict it
8. Shear it
9. Move on

Lemons

In ongoing studies, four or five lemons have been shown to correspond to weak structure, regardless of block test values. Lemons are a very useful tool to help pick out likely slab, weak layer or weak bond, and bed-surface combinations.

- Weak layer depth ≤ 1m.
- Weak layer thickness ≤ 10 cm.
- Weak layer grains - persistent.
- Hardness difference ≥ 1 step.
- Grain size difference ≥ 1 mm.

Shear Quality

Note: Please see full definitions of Q1,2,3 in SWAG.

Quality 1 shears have a high correlation with unstable conditions, regardless of block test values. Be sure to note shear quality on all block tests.

Q1 - clean and fast shear
Q2 - average shear
Q3 - irregular or incomplete shear

Block Tests

In courses, we detail the strengths and weaknesses of each test so our students know how to choose the appropriate tools. Most workers are familiar with the standard block tests, so we list just the ones we teach and explain the less familiar ones in a sidebar.

Large-Block Tests

- Rutschblock
- AK Block
- No-excuse Block
- Jump Test

Small-Block Tests

- Tap Compression Test
- Hand Shear, Ski Pole Block
- Stuffblock Test (taught in Level II)
- Shovel Shear (taught but recommended only for limited uses)

The Old and New Roadmaps

The old roadmap avalanche recipe considered only the layer components of slab, weak layer, and bed surface, along with the gravity components of stress-strength balance and stored elastic energy.

The old roadmap was based on a view of stability as a balance between stress and strength. This new roadmap adds energy and structure to include both the factors for crack initiation and those for crack propagation.

Fracture Mechanics and the Stability Wheel

We have added more observations and tests to the stability wheel, and we changed Don and Ian's tilde symbol for neutral to a zero for easier legibility.

The tests and observations we use give us a way to rate each of these fracture-mechanics components, as listed in the stability-wheel diagram. Since the tests we use for evaluating the snowpack include the stress of the snow load as well as its strength, we combine the stress and strength factors into one strength-versus-stress lobe. We rate each of the stability wheel factors as **+** (strong), **0** (neutral), or **-** (weak).

The Roadmap in Practice

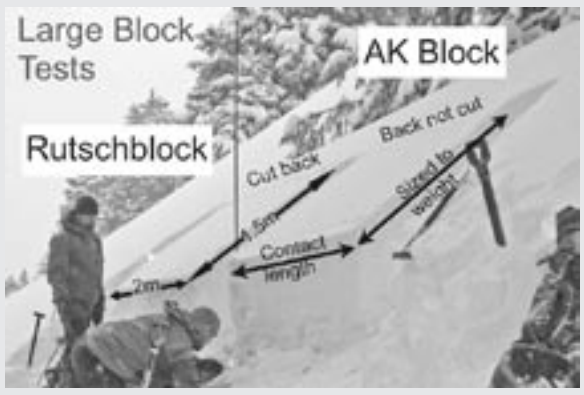
1. Observations

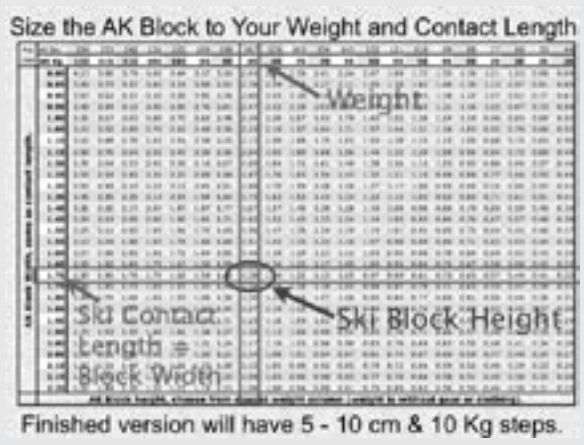
- Tally up how many of the seven signs you observe, weight their magnitude and significance.

2. Slope and Traveling Tests

- Evaluate test sites by angle, aspect, elevation, loading, and risk.
- Use slope and traveling tests to sample quickly over a large area.

Continued page 19 ➡





A chip off the old block test—
THE AK BLOCK

This is another test we developed. It's still officially a nonstandard test, but is proving reliable in ongoing research. It is a large-block test that measures both shear strength and slab properties.

It is dug and loaded as for a Rutschblock, but is sized to ski or board contact length and tester weight and the back is NOT cut.

It is faster to set up than a Rutschblock, gives consistent results regardless of tester weight, and does not require a saw or back cut. It can be done with only a shovel and skis or a snowboard marked for your block size. If you do cut the sides with a saw, be sure to trench them enough so your board ends do not hang up on the surrounding snow. It does not work with snowshoes.

To size your block, measure the contact length of whatever you are riding to get your block width (across the slope). In the sizing table, pick the closest column for your weight without clothing. The table gives your block height (up and down slope) where your contact length and weight intercept. An example is highlighted on the graphic.

The above table is a working version, as of Feb '06. The final version will be rounded to 5 and 10cm and 10kg steps. Details and the current table are on the SAAC Web site: www.avalanche.org > Avalanche Centers > Alaska > Southeast > Research. Examples are under Southeast > Advisory > Juneau.

Scale for AK Block and Large Blocks Other Than Jump Test:

1. Fractures during setup
2. On approach or first gentle load
3. On knee flex
4. On first gentle jump
5. On second hard jump
6. On three or more jumps
7. No fracture

Code the results in your fieldbook as **AK**; note the slope angle and block depth.

Go ahead & jump— THE JUMP TEST

This is a nonstandard test cut as for a Rutschblock, but sized to the number of people jumping on it. Make it 1.25m wide for one person, and add one butt width per additional person. All stand upslope and link arms: flex knees to see if that will make it go, then jump onto the block. Repeat as necessary.

It is hard to quantify, but it works for all snow travelers. Code it in your notes as **JUMP**. Can be varied by not cutting the back, sides, or even the front to test weaker snowpacks.

THE NEW MEDIA AGE

continued from page 9

into five basic subgroups. He described their character and how professional guides usually deal with them. We used similar groupings of basic avalanche dragons: wind slabs, storm snow, persistent slabs, deep slabs, wet avalanches, and loose snow. Jim developed an icon for each avalanche type. Other icons describe the expected likelihood of triggering, the expected size of the avalanche, the expected future trend of the instability, and the aerial distribution of where you will likely find it by aspect and elevation. I am developing a clickable tutorial for each avalanche type to describe what it is, how it forms, how to recognize it, and how to manage it in the backcountry.

I'm excited about the new advisory. It makes me smile every day when I pull it up on the Web and see all those pretty colors. I see it posted much more often at backcountry-access gates, kiosks, and shops. Finally, at a glance, my dyslexic brain can understand the complexities of the daily avalanche conditions. We hope it will become a better tool to communicate avalanche information to the more hard-core users and also capture the interest of the young post-literate recreationist. Most importantly, we hope it will translate into fewer avalanche fatalities, which of course is the true measure of success.

I think we're on the right track. Not long ago, I skied with a long-time U.S. Army Intelligence Officer. His sole job is to communicate details of expected enemy activity to large numbers of troops both in the Bosnian war and in Iraq. His briefings are almost entirely graphic based. He said that if his team needed to communicate avalanche information to the troops, he would design our present system exactly. He loved it. The only difference is that they would have spent a million dollars doing it.

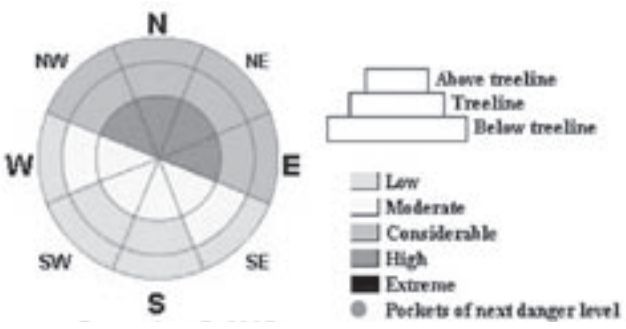
After we test it for a season and make improvements over the summer, the format will be available to other avalanche centers to use if they choose.

Avalanche Outreach Program

About 85% of avalanche-fatality victims in Utah did not consult the avalanche advisory on the day of their accident. Moreover, most of Utah's fatalities occur on slopes rated as high danger, in contrast to slopes rated as moderate and considerable danger for Europe and Canada, respectively. It seems that we have a more fundamental problem than the graphic-based avalanche advisory is designed to address: most avalanche victims in Utah simply don't have even the most basic avalanche information. As Toby Weed wrote in the December issue of *The Avalanche Review*, "I can labor away forever at 6am, internally debating the precise wording of my advisory on a day with considerable danger. But the chances are pretty good that the next person to die in an avalanche will not have heard my warning."

Two years ago, Craig Gordon spearheaded the *Know Before You Go* avalanche-education program designed for young adults, which has been phenomenally successful. The 15-minute video, alone, has become standard fare in most avalanche classes throughout North America. But even though the program reaches 12,000 people per year, it's still a small percentage of the population. To reach everyone else, we are applying for grants to design an outreach program for those who are either not aware of the avalanche advisory or who don't normally consult it before going out.

The first prong of that outreach program is to publish danger ratings in all of Utah's newspapers, television stations, and radio stations. For years we resisted publishing overall danger ratings because we believed the information was too general to be of much use. Instead, we felt that backcountry travelers need to know the details to stay safe. But it's hard to ignore the aforementioned statistics. We have finally realized that if people won't come to us, we have to go to them. We need to publish avalanche danger ratings in the media that most people already use—newspapers, television, and radio. In many cases, just one piece of information could prevent an avalanche accident. Also, when you try to capture avalanche novices, you have to first start with the basics and then spark their interest so that their curiosity leads them further to the Web site, a book, or a video. Eventually they will use the avalanche advisory on a regular basis. The Canadians realized they had the same problem after two high-profile accidents in 2002-03. They started publishing danger ratings last season, and they feel the program has been successful.



The Danger Rose, also used by the CAIC and the SNFAC in their forecasts, visually defines avalanche danger with a wheel of color.

We debated whether we should adopt the Canadian three-level public advisory system of "good, serious, and poor" stability, or go with the international-standard five-level danger scale of "low, moderate, considerable, high, and extreme." Pressure was applied by both the Canadians and Europeans, but we eventually decided to go with the five-level scale after a nearly unanimous vote by avalanche-center personnel at the fall National Avalanche Center meeting in Bozeman.

The second prong of the program will include public-service announcements for various media outlets, trailhead avalanche-education posters, and fun Web-based tutorials for beginners to learn about avalanches. An example is our newly published *Avalanche Encyclopedia* which describes avalanche terms in higher detail than an ordinary glossary (you can find the link on our avalanche advisory). A tiered approach presents several levels of complexity, depending on what the user needs. Basic, one-word avalanche-danger ratings will be sent to the mass media. A graphic-based avalanche advisory is for people who go into the backcountry to recreate. And finally, we provide detailed lists of avalanche activity and technical snow profiles for hard-core users.

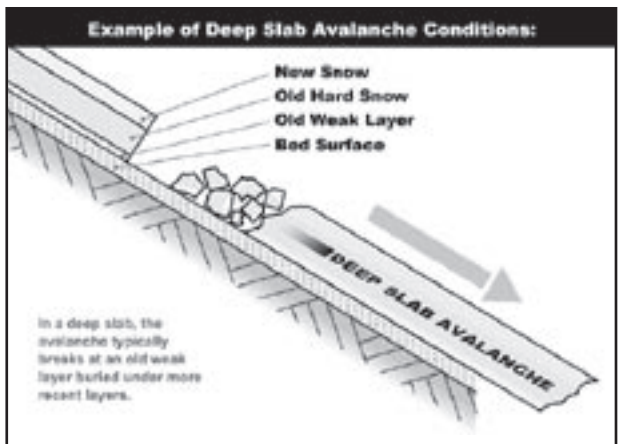
Future of Avalanche Forecasting and Education

Most our office time 10 years ago centered on the phone: talking to other avalanche professionals and observers and recording the hotlines. Now we spend most of our time on the computer, monitoring conditions and updating our Web products. As I look into the crystal ball for 5 years from now, I see a different kind of avalanche forecaster—one who not only needs the usual arsenal of avalanche and communication skills, but someone who also can design Web sites, create graphics, edit videos and still photos, manage databases, manage Web servers, and master all the new technologies that come along. It's a scary new world for old dogs like me. Forecasters who can't or won't learn the new technologies could eventually find themselves out of a job.

For years I have watched the TV meteorologists and salivated that someday we could use the same technology to give an avalanche report. Think of it: we all would have an inexpensive broadcast studio in our office, and we would stand in front of the green screen and point out weak layers with slick snow-profile graphics, show video clips of the day's avalanches, zoom in on terrain color-coded by avalanche danger, and interview various avalanche pundits for their pearls of wisdom. "That's the avalanche news from our neck of the woods. Now back to you Evelyn." Take a look at some of the programs available for video podcasting. For instance, I regularly download the latest Photoshop TV episode using iTunes. This could be the perfect distribution model for a series of avalanche tutorials.

It's an exciting new world as we figure out the best way to communicate the characteristics and complexities of avalanche danger to the public using new media. Words are probably not the best tools for the job. The job instead requires something like 80% graphics, photos, videos, and animations—which are much more expensive to produce than hiring a lone avalanche geek to type on the computer at 4am. So before any of this becomes standard, we need to figure out how to finance it, and that will be the most difficult challenge of all.

Bruce Tremper has been the director of the Utah Avalanche Center since 1986. He has a Masters Degree in Geology from Montana State University. His lifetime of experience as an avalanche professional includes time as the Director of Avalanche Control at Big Sky ski area and as an avalanche forecaster for the Alaska Avalanche Center. Bruce is the author of Staying Alive in Avalanche Terrain, published by Mountaineers Books—now standard required reading for anyone interested in avalanches. He is also a former editor of The Avalanche Review.



UAC Defines Avalanches

Just released in February, Utah Avalanche Center's new Avalanche Encyclopedia contains more than simple written descriptions of avalanche terminology. The collaboratively produced work is chock full of easily processed and visually stimulating pictures and diagrams. The encyclopedia was produced in cooperation with the National Avalanche Center and the Friends of the Utah Avalanche Center. Bruce Tremper provided detailed and interesting textual descriptions, Jim Conway designed many cool new graphics and flash animations, and Chris Lundy helped edit everything. The creators hope the encyclopedia will provide a fun way for people to learn about avalanches. Taken in full, it clearly describes the avalanche phenomenon and is a fantastic educational tool.

The idea for the encyclopedia stemmed from the need to clarify terms commonly used by avalanche professionals to describe snow and avalanches. Language used in avalanche forecasts is often not well-understood by the general public. The new encyclopedia addresses this problem with indexed descriptions easily accessed with the click of a mouse. It's easier than using a traditional glossary in the back of a book; terms used in Web-posted advisories are directly linked to their descriptions. Readers interested in avalanches can learn a lot by browsing through the descriptions at their convenience.

By its nature, the product is a work in progress. The encyclopedia is an open-source group effort, and the authors encourage comments, suggestions, and additions from the avalanche community. Anyone who would like to add terms, definitions, photos, and graphics should send them to Jim and he will incorporate them. All avalanche centers are also invited to create a public link to the page: www.avalanche.org/%7Euac/encyclopedia/index.htm.

TAR Photo Contest

As of March 1, we have received many more entries than we can print. In this issue, 24/4, we present a selection of the very best. We will bring you another installment of great photos in the first issue of volume 25, then open up the contest again. Thank you to everyone who submitted their favorite shots.

- **CROWN PROFILES:** Bill Deleo/Matt McKee (grand prize: cover shot), Denny Hogan, Spencer Logan, Doug Chabot
- **BIG MOUNTAIN AVALANCHES:** Reid Bahnson
- **SKI PORN:** CJ Ware

denny hogan

Denny Hogan is the BLM Snow Ranger for Silverton, Colorado. Every year he is beckoned by the endless amount of terrain to be explored in the San Juans.

Wham Ridge of Vestal Peak, 13,864' in the Weminuche Wilderness, San Juan Mountains, Colorado. Denny tell us, "Mark Rikkers and I toured in to ski this face in late May, but alas we were too late in the season. Lack of a hard freeze for several nights running left the snowpack rotten and dangerous. We had a good tour but no prize descents

cj ware

C.J. Ware is a recovering Snowmass patroller who now enjoys coping a good joint, crossing into Wyoming to earn his turns, and guiding for Points North Heli-Adventures in Cordova, Alaska. He does miss the smell of Pentolite in the morning.

This run is named *Better Than Sex* for obvious reasons. A Points North client enjoys virgin tracks in the Southern Chugach.

spencer logan

Spencer Logan is an avalanche forecaster for the Colorado Avalanche Information Center. He occasionally tours through the (now defunct) ski area where he first learned to ski, after stops forecasting in Northern Utah and digging too many study pits in southwestern Montana.

Spencer commented about the photo above, "I learned to ski at Hidden Valley in Rocky Mtn National Park, outside of Estes Park. They took the lifts out in the early '90s. Pretty good touring, now, with quick access above treeline."

doug chabot

Doug Chabot is the director of the Gallatin Nation Forest Avalanche Center. After spending part of a summer in Pakistan, Montana avalanches seem low-stress to Doug.

Bruce Miller descending K7 (6934m) in Pakistan, July 2004.

reid bahnson

Reid Bahnson tells us that he is just another old avalanche guy from Alaska. He is an avalanche technician for the Alaska DOT and a life member of the AAA.

Ridges are safe to travel, aren't they? A two-meter fracture across a nearly flat ridge at Mt. Alyeska, Alaska.

crown profiles

Sue Ann Ferguson: colleague, friend, and so much more

Story by Mark Moore

Sue was my friend, my very good friend. Sounds so good, I'll say it again. Sue was my friend, my very good friend. But she was also a friend to so many others and so much more than just a friend, for she affected all of us in such a positive way. She was incredibly enthusiastic as a snow scientist, glaciologist, fire and smoke scientist, atmospheric scientist, golfer, skier, hockey player (field hockey), and sailor. And she never accepted even all of these life-long accomplishments as being limits.

Time is very elusive and seductive. Days and hours and minutes—we all think we have so many. At least Sue lived every one to the fullest, and I'm grateful that she was my friend for all those days and hours and minutes. I'm grateful for having had all those shared experiences.

If Sue had a fault, it was that she tried too hard to do too much in this life. She lived life so full. Sue was most definitely an "N" lady—she was an innovator, she encouraged, she inspired, she enlightened, she instigated, and she was entrancing, interested, and interesting. And when I first met Sue, I knew she was intelligent, too. Along with her quick wit, humor, laugh, and smile, I instantly knew that I was IN trouble. Sue was, by all ways of reckoning, a shaker and a mover. She always shook up the status quo and moved quickly ahead toward a merged vision of her choosing, a melding of what was and what could be. Because that's how you get things done, how new ideas get out, and how improvements are made. Sue shook and moved, and many of us moved with her after the shaking melted away.

Sue Ferguson was an eager, beguiling graduate student when I first met her, full of ideals and ideas that stayed with her for her whole life. Upon arriving at the Avalanche Center, she lost no time in putting her mark on the operation and on what she felt were the best ways were for logging data and getting information. She was precocious and a quick learner and she had a great ability to gain a broad and reasoned perspective on whatever task she took upon herself to discover.

She was indefinable in so many ways; it's hard to get your mind around all that she was and did. She was one of the first and the leader of a close-knit cadre and fairly elite group of female snow scientists that bonded well at some early Snow Science Meetings (early ISSWs). And I remember skiing with her in some of those early years and how her exuberance at (being outside) doing and enjoying what she loved often overcame her. There was one time when Sue and I were skiing some great deep snow near Stevens Pass (Sue called it Mark's Pass, but I know she loved it too), and we were leapfrogging each other as we wallowed down the back side in deep powder. I have since learned that when you skied with Sue, you didn't stop below her or above her as she would often appear out of nowhere and a collision was inevitable. In any case, in this instance I had stopped to wait for her in a little opening below a steep, heavily treed part of the slope and didn't have to wait very long. From between some of the trees, I heard a noise resembling a brush cutter, then a gleeful shout, and then saw Sue blasting through the air in a blaze of branches, skis, and snow, straight at me. She was laughing loudly as she took me out, and together we disappeared in an explosion of powder and a tangle of limbs. Amazingly enough, after we untangled and extracted ourselves from a large snowpit, wiping snow from every part of us, Sue beamed and said, "That's what you get when you ski with me, buddy!" She landed on me twice more that day, laughing and smiling the whole time.

You can't manufacture or buy respect. You have to earn it. And I don't know of any endeavor that Sue ventured into that she didn't earn maximum respect, for both her vision and her leadership. While always or almost always softspoken, her words and the force of their presentation ensured that they would be listened to. During her avalanche years, she developed a wide variety of applications and tools that helped many of us do our job better and easier, many of which were precursors to more advanced tools that were adopted much later. She always led and was at the forefront of professional development. During the time of her life in the avalanche business when she was affectionately known as Sue from the U, Dr. Sue, or Snowpit Sue, she always thought BIG. When excavating snowpits, some researchers were happy with just little snow saws and taking their time getting information from the snow pack. NOT SUE! While some avalanche professionals had small, sometimes collapsible snow saws, at the time Sue carried around a huge homeland-security-barred snow saw that wouldn't even fit into her large pack and was a potential danger to those around her if she skied close by. Also, at this time many researchers were using a shovel to test the snow. NOT SUE! Sue jumped way ahead (no doubt encouraged or inspired by Big Ed LaChapelle) and came up with the WEDGE, an early version of some of the tools that have since become standards in the profession.

Like Snowshoe Thompson or Johnny Appleseed, Sue became well known nationally and internationally, spreading the gospel of snow science and establishing links within a hugely diverse group. She brought the avalanche community together like no other, launching *The Avalanche Review* as publisher, editor, contributor, and supporter. In a recent celebration commemorating the 20th anniversary of *The Avalanche Review*, Sue was not content just to relax and enjoy the accolades. NO! Sue arranged for a local vineyard to prepare a special wine in a special bottle to commemorate the event, and then she made sure that all the tables at the banquet had a bottle to celebrate with.

Dr. Sue Ferguson was also a Founding Mother of the American Association of Avalanche Professionals (AAAP—now the AAA or American Avalanche Association), an organization dedicated to bridging the wisdom gap between practitioners and scientists. This was at a time when divergence of opinion and independence was highly prized and was the norm within the avalanche community. In this business, no one wanted any guidelines, and the motto seemed to be, "We don't need no stinking guidelines!" There was much heated discussion amongst the group about whether or not such an organization was needed, but in the end Sue prevailed. Sue had a most unique ability to encourage and listen; in turn this made others listen. She was selfless in many ways, and I think she donated more time to more causes and ideals than almost anyone I know. In the snow and avalanche community, Sue was an educator and leader, teacher and author. She authored numerous scientific articles and wrote a book on *Glacier Ice*, as well as updating a book on avalanches originally written by her mentor Dr. LaChapelle and published by The Mountaineers: *The ABCs of Avalanches*.

The avalanche center staff went on a retreat one year toward the close of the winter season. Some might think a retreat is a relaxing, restful, rejuvenating time. Not Sue! Well, there was fun, but a lot more too, for even on a retreat Sue worked hard and accomplished a great deal. When she left the Avalanche Center and jumped from Snow and Ice to Fire, her life and visions for what she wanted to accomplish expanded much further. In every task and every application, she quickly came to the forefront. In working with Sue in Fire and Smoke Research, I learned several more practical skills. Never ride with her on an ATV. No matter what the terrain, how dark, or how muddy, or how cold, Sue drove the ATV as if a smooth paved road of infinite width ran beneath her. I ended up in a large ice-strewn lake on one ride, and when I looked over at Sue as we struggled to pull the ATV from the muddy, icy mess, guess what? She was smiling and then laughing. When working together near a fire, we launched a weather balloon to measure the vertical distribution of smoke and temperature in nighttime inversions. This balloon was big and red, and to be sure that we enjoyed ourselves while working 24-hour days, Sue—who was an amazing artist among all her other accomplishments—painted a great smiling face on the balloon we subsequently christened as Wally, the Sky Pirate. What a face!

In the end her legacy to us is the so-very-positive way that she loved and lived life so fully every hour of every day. What a lady. What a legacy.

Thanks Sue.

Mark Moore is lead forecaster at the Northwest Avalanche Center, where his forecasts often appear in rhyme.

Sue raps about and on the block perched on her shovel. Taken by Mark Moore in the Northwest during one of many field investigation outings while she was a forecaster there, most likely near Chinook Pass, WA, circa mid-1980s.

Ode to Sue
(Snowpit & AirFIRE)

—with heartfelt thanks and love,
your friend Mark Moore

A remarkable woman,
And a great friend too—
Sue's been a part of my life,
Since she went to the U.

Fresh out of school,
Her vision was grand—
And she spread her good works,
Throughout the land.

Sue's courage was awesome,
A smile like sunny weather—
And her laughter contagious,
As she brought people together.

From Alaska to Utah,
Japan to the Swiss—
She was one of our friends,
That we will always miss.

She was a shaker and a mover,
And through wisdom she acquired—
She helped us be better,
As she led and inspired.

While no one wants,
To be told what to do—
It was somehow easier,
If the hint came from Sue.

Her ability to listen,
Was second to none—
And with voice softly spoken,
She got things done.

In Fire and in Snow,
She loved every day—
And I think her gift to us,
Is to live that way.

Taking time to smell the flowers among the ash deposits on Mount St. Helens.
photo by Roland Emetaz

SUE ANN FERGUSON
February 11, 1953 - December 18, 2005
obituary provided by the Ferguson family

Dr. Sue Ferguson died at 3pm, December 18, on a gloriously beautiful, crisp, blue-sky Seattle day. Sue had been battling cancer for the past year and a half. She leaves behind a legacy of accomplishments in her and in her relationships with friends, family, and co-workers. Her enthusiasm and tenacity were an inspiration to all who knew her.

In fire research, Sue helped found the Northwest Regional Modeling Consortium (NWRMC), a multi-agency effort to develop improved weather forecasts for the Northwest. Using these predictions, she was able to offer land and fire managers real-time tailored forecast products such as the Haines index, Fossberg fire weather index, a new dry lightning index, and more.

Through the National Fire Plan, she created the BlueSky smoke modeling framework, a tool that for the first time allows users to see real-time predictions of cumulative smoke impacts from prescribed, wildland, and agricultural fire. This tool has been hailed as one of the best research products to emerge from the National Fire Plan and recently won the National Fire Plan's Excellence in Research award.

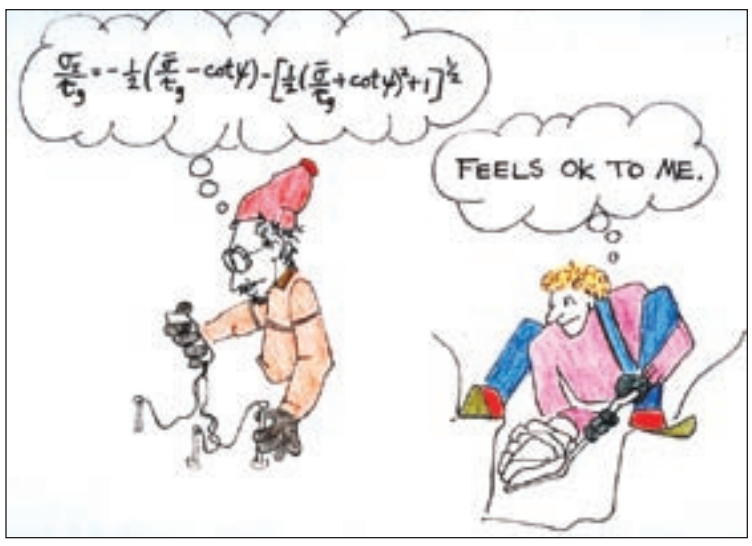
The success of the NWRMC and BlueSky prompted similar efforts around the country, and now real-time tailored forecasts of fire indices and smoke predictions are available throughout the lower-48 states.

Sue was instrumental in the revival of the American Meteorological Society's biennial Fire and Forest Meteorology Conferences. Through her efforts, the utility of meteorology in fire research was elevated to an unprecedented level. Her efforts continue to benefit and assist managers and researchers in the fire-management field.

Sue will be sorely missed by all she touched. Her talent and wisdom and her infectious laugh, smile, and good humor made us all better for being with her. She inspired, encouraged, and elevated all of us. ❄

Above: Sue at the 1995 National Avalanche School in Reno with Steve Conger (left) and Bruce Tremper. *photo courtesy Steve Conger*

Right: Sue's infamous "poster-child picture" when she posed for *Phillip Morris* magazine as a snow scientist.



Above: This cartoon was drawn by Sue for *The Avalanche Review* in 1989 and reprinted in *Snow, Weather, and Avalanche Guidelines* (SWAG).

Below: Garth Ferber pays close attention to Sue's explanation at the 1995 National Avalanche School in Reno. *photo by Steve Conger*

Sue Ann Ferguson: Inpirational Innovator and Mentor

This eulogy was delivered by Dr. Sim Larkin, Colleague and Climate Scientist, AirFIRE Team (which Sue recently directed) at Sue's recent "Celebration of Life" in Seattle this past January, 2006.

For over four years, I've worked with Sue in her second career – fire research. She was my boss, my mentor, my colleague, and my friend.

For those of you who didn't know Sue in her professional role, it is hard to adequately sum up her accomplishments. She was wildly successful. As one of only a handful of meteorologists within the Forest Service, she helped raise the status of atmospheric science within the fire community almost through shear force of will. In her work Sue was energetic, buoyant, and driven. She knew just what she wanted and she went straight after it. Sometimes that meant leaving a Sue-shaped hole in whatever got in her way, like in the cartoons.

She thought big. She thought in terms of organizing collections of people towards a common purpose. She resurrected the American Meteorological Society's Forest and Fire Meteorology conferences, and turned them into meetings with national and international standing. She helped found the consortium that provides tailored weather predictions for the Northwest and that some of you probably know from Friday mornings on NPR. She created from scratch her own research team, the AirFIRE team, dedicated to meteorology.

Through all of this, her work won numerous local and national awards including the 2005 National Fire Plan's Excellence in Research award. Her research was considered so successful that it was duplicated across the country where today it provides smoke forecasts across the lower 48 states and helps better manage forest fires and protects people from smoke.

Despite all of these successes, this is not what I remember most about Sue. What I remember most is that even while she was thinking big, she was always human and down to earth. No matter how busy she was, she always took time to care for each person who worked for her. She'd check in and see how you were doing. Even with looming deadlines, she would make sure you were taking time for yourself and even would order people to take vacations. And when the pressure would build, she'd help people try to let the stress go. She treated us as family.

But being human, Sue also had her quirks. She could organize vast groups of people, but she'd have a hard time finding things on her desk. She had a dozen people working for her, but she insisted that she was no one's boss. And despite all her success, she never thought of herself as a particularly good scientist, just someone who happened to have good people working with her. She was soft-spoken but iron-willed and that could sometimes be a pain in the ass. She always had a story to tell, even though it was sometimes an inappropriate one.

I'll miss interacting with her and learning from her each day. But most of all, today I miss her smile – that radiant smile that could cut through even the darkest Seattle day.

Sim Larkin, Climate Scientist, AirFIRE Team, US Forest Service: (206) 732-7849, larkin@fs.fed.us ❄

memories of Sue Ann Ferguson

Artist Point Avalanche: Three Years Later

Story and Photo by Michael Jackson

Level I students learn that you have 15 minutes to dig out a buried avalanche victim in order to have a 92% chance of survival, not accounting for trauma. What is the percentage after an hour? Four hours? 24 hours?

Laurie Ballew and Greg Bachmeier survived 24 hours buried in an avalanche in the Mt Baker backcountry. Their snowshoeing partner, Jacqueline "J.P." Eckstrom, did not. Surviving 24 hours buried beneath the snow is nearly impossible statistically, and going through something like that is life changing. I had the opportunity to interview Laurie and get some insights into her accident as well as some suggestions she has on how accidents like hers can be avoided in the future.

How did you know J.P. and Greg, and what made you decide to go snowshoeing that day?

Greg and I had been friends since freshman year and been going snowshoeing yearly with friends. Greg knew J.P. from working at the same summer camp. That year Greg and I planned to go snowshoeing the day after finals week, December 12, 2003, in the Artist Point area, where we'd gone previously.

At the time of your accident, what level of experience did you and your friends have traveling in avalanche terrain?

None. We didn't know we needed any. We rented our gear and nobody said anything about avalanche terrain. Even if they would have, we had no idea what avalanche terrain was or how it related to our travel plans. The only experience I had snowshoeing was twice in the Artist Point area with Greg in clear or fair weather and on other well-forested trail systems. It was J.P.'s first time snowshoeing. Despite the fact that Artist Point is in the Mt Baker backcountry, the destination is widely spoken-of and frequently traveled, and because of this, we were unaware of its hazard and the risks we were taking. Also, I didn't associate snowshoeing with high risk, as it is generally considered a fairly benign sport.

Did you call the avalanche hotline, or look at the avalanche report on the Internet?

Because I am not an avid backcountry user, I was unfamiliar with local avalanche forecasts, how to read them, or what to look for when in the snow. Although I am glad to have this resource now, I would still consider it quite technical for a recreational user to understand.

Did any of you have avalanche safety equipment?

Like a transceiver, probe, and shovel? No, we didn't. Even if we had rented them we didn't know how to use them.

Did you ever feel you were in a dangerous situation, or did turning around ever cross your mind?

Dangerous? Not really. It was snowing pretty hard and I remember working hard at trying to be positive and make the best out the situation. I don't think any of us really felt in danger, more just uncomfortable with the weather.

Did you run into anyone else out touring that day?

Yes, we ran into two other skiers who were turning around and who suggested we turn back soon due to the weather. We figured we'd make it just over the next hill, have lunch and turn back.

How long after seeing that group was your accident? Minutes? Hours?

Less than an hour.

Do you have any recollection of the instant you realized you were caught in an avalanche?

I remember being in a single-file line climbing up the slope. There was no noise, just a wall of snow pushing me back. The snow started washing over me, and I was getting buried, but it still was not really registering that I was in an avalanche.

Did you try to do anything to fight your way out of the avalanche?

I remembered, right as I started slowing down, a picture I had seen in a magazine. It was a line drawing of putting your hand in front of your face to create an airspace. I don't know which magazine it was in or how long ago I saw it. I know it's weird that I remembered that, but I did, so I put my hand in front of my face and then I stopped moving.

Do you have any memory of your time under the snow?

Not really. I just remember thinking, "So this is an avalanche," and knowing that I had to remain calm to save air. I remember being conscious for only five to 10 minutes under the snow. Although I did panic, I also prayed, and though it may be hard to believe, I received a sense of peace that I would get out alive.

Laurie Ballew with the slope where she was buried. The slope is to the right of Laurie's head where the tree branch leans. It is a road-cut, 35° slope angle, 110-meter-long slope with an abrupt transition (terrain trap) as the runout zone.

Laurie was found approximately 24 hours later, under 40-60cm of light density snow, on her side in a hurdler's position. Aaron DeBoer, her rescuer, stepped into her airspace accidentally while attempting to probe the slope. She was profoundly hypothermic, and Aaron held her in his arms, warming her and talking with her until a snowcat from Mt Baker ski area arrived to transport her back to the lodge. She says she suffers no lasting physical effects from her burial.

What separates this accident from being just another Gilligan's Island three-hour tour scenario is Laurie's interest and ongoing efforts on behalf of avalanche education. She is working with the Alpine Safety Awareness Program and their efforts to bring basic awareness to middle- and high-school students. She is also finishing up an awareness sticker for the Northwest Weather and Avalanche Center that includes snowmobiles, snowboarders, and snowshoers. She is responsible for the design, funding, and ultimately the distribution of these stickers.

Due to her accident and recent involvement in avalanche awareness, she has some insights for avalanche professionals and educators in reaching out to beginners just starting to travel in avalanche terrain. Some of these suggestions are wish-list material for an ideal world, but some of them are simple, pragmatic ideas that could be applicable. You be the judge.

Avalanche Forecast Centers

Laurie suggests a two-tiered forecast. A report aimed at the advanced recreationist might be text-based and rely heavily on avalanche-specific terminology to explain the present hazard and forecast. For the novice, a second forecast would be presented graphically using little or no terminology to explain hazard. Beginners could then look at a graphic and infer that travel on terrain facing NE above 8000' is dangerous on a certain day. Included with this basic graphic would be a photograph of local terrain for reference. A visual representation would be useful for those who don't know the difference between a convex roll and a jellyroll. Laurie thinks this would do a better job in communicating risk and consequences to those who are not able to fully understand the text forecast.

Awareness Education

When Laurie rented her snowshoes she received no information on avalanche danger and terrain to avoid. Why would she? Liability is a huge issue, and the easiest thing for outdoor rental shops is to avoid the education issue by keeping the status quo. Laurie thinks that industry (snowshoe manufacturers, safety-equipment producers, etc.) could produce a five-minute DVD that highlights the obvious risks and points the user to the local avalanche report. All users would be required to view the DVD before they rent gear. This approach may seem simplistic, but remember that Laurie recalled one picture out of one magazine that triggered her response to create an airspace. Sometimes simple is best.

Tools for Avalanche Terrain

I asked Laurie if she felt any more comfortable traveling in avalanche terrain since taking a Recreational Avalanche Course. She had an interesting response. She told me she just doesn't go. She avoids the situation because she doesn't trust her judgment. She wants a definitive formula where variables are plugged in and the right answer pops out. What she wants is a rule-based decision-making model that removes uncertainty and replaces it with a handrail to guide the user safely through avalanche terrain. Is there such a tool? Will there ever be? More importantly, should there be a cookbook for safe travel in avalanche terrain for the beginner?

Obviously there is a demand for such a tool. Some of the best minds in the avalanche business are currently attempting to answer these questions and develop a definitive rule-based decision-making model for the beginner. Time will tell as to the effectiveness and accuracy of such a tool, but in the meantime we will have to continue to rely on our inconsistent, imperfect forecasting tool – human judgment – to guide us safely through the backcountry.

If you are reading this article, chances are you are an avalanche professional, and Laurie's insights and suggestions might not seem realistic or relevant to you. Her perspective is that of a novice traveling in avalanche terrain. As professionals, we are used to telling students what we think they need to know. Maybe a more effective technique may be teaching them what they want to know and building from there. In this way, we can all learn from the experience.

Michael Jackson helps drive the AAA education committee. He is the founder of ASAP, the Alpine Safety Awareness Program. He invites your ideas and opinions on this topic. Contact him at powderhino@aol.com

Of Time & Teachers

continued from cover

There was still no way in the early '70s for a person to learn about avalanches without being somehow involved with the ski industry. The National Avalanche School was the only organized class, taught once every two years and mostly attended by Forest Service people, ski patrollers, and a few guides and ski instructors. But now backcountry skiing was looming on the horizon. Ski-touring equipment was improving and becoming more available. The telemark turn was resurrected and resort powder was getting tracked out ever faster. In the '60s around Tahoe, I don't recall ever meeting a backcountry skier who was not in my group. When I frequented Teton Pass in the winter of '72/73 there were others out there—not many, but sometimes there would be an up-track in and a few lines skied on the better runs. One of the Teton Pass skiers was a guy named Rod Newcomb. I didn't get to know him because most of the time he was off in Colorado doing avalanche research.

Lean, steely-eyed, and endowed with a razor-sharp mind coupled with a ready smile, Norm had long since earned Monty Atwater's mantle as the Avalanche Guru of the Sierras.

At the end of the next winter Rod's research job ended, probably due to lack of funding—not because they had learned all there was to know about snow. Rod saw the developing thirst for avalanche education and started the American Avalanche Institute in the fall of 1974. That first winter he taught in Wyoming and Colorado but the need for education was also growing in Utah and in the Sierras.

Norm quit working at Alpine Meadows in the early '70s to work fulltime as an avalanche consultant, and when Newcomb looked for someone to help him with AAI courses in California, Norm was the obvious choice. Lean, steely-eyed, and endowed with a razor-sharp mind coupled with a ready smile, he had long since earned Monty Atwater's mantle as the Avalanche Guru of the Sierras.

Over the years Norm taught hundreds of students, passing on Monty's legacy and his own hard-won wisdom. A generation of students grew up under his instruction at National Avalanche Schools, AAI courses, and as his plentiful personal apprentices. Those students

photos of Norm Wilson (above and in the story below) courtesy of the Rock Creek Lodge

are a magnificent monument to Norm's life work. Who knows how many are alive because of his teaching? Some of them now teach to a new generation what they first learned from Norm.

It is a different world now. There are avalanche centers in every western state. A couple of clicks of your mouse get you a fancy graphic avalanche advisory with links to remote weather stations. The Salt Lake area alone will have about 20 avalanche courses this winter. Last winter in Salt Lake over 10,000 high school and junior high kids heard avalanche-awareness talks. A Wasatch snow and avalanche conditions internet site had 93,000 hits last year. Backcountry skiing, snowshoeing, boarding and snowmobiling are big business with lots of $s at stake.

And now I'm very old, ancient really. I suppose a few young ski patrollers whisper behind my back, "That's Tom Kimbrough!" and think I know something about avalanches. Of course, I have mostly learned how much I don't know about avalanches. Monty expressed the same feelings in his conclusion to *The Avalanche Hunters* and I'll bet Norm feels the same way. The Young Hunters "were tough, eager, their nerves still unfrayed by too many close calls, their confidence still unshaken by too many bad decisions. (Even if you luck out, those bad decisions haunt you.)"

But those Young Hunters that Norm taught will go on to learn more than we can imagine about the snow: better ways to evaluate conditions and better methods for teaching what they learn to still-newer students. Some of the people I have mentored are breaking new ground; they are the legacy of Monty and Norm and Rod and the others of our generation. And a fine legacy it is.

Atwater wrote on the last page of *The Avalanche Hunters*, "I feel privileged to have been fated to play my part. I have loved every minute of it: the triumphs, the defeats; the frustrations, the half victories; the controversies, the Hearts games; the rescues that ended in tears and those that ended in the nearest bar; the Spectaculars and the day-to-day drudgery."

Good words from Monty for Norm and myself.

Thanks, Norm. You gave me my life's work.

— Old Arthritic Goat, Tom Kimbrough ❄

Norm Wilson: Long Live the Legacy

Story by Rod Newcomb

The name, Norm Wilson, was very familiar to me. He was the guy who took over from Monty Atwater. Word was that he had something to do with the Squaw Valley Olympics, the development of Alpine Meadows, helped Monty Atwater and Dick Stillman with the Avalauncher, and had the reputation of Mr. Avalanche on the West Coast.

It was either the fall of 1973 or spring of 1974 that Peter Lev, who was at the time one of the old-fashioned snow rangers at Alta, called one day and said, "There is a fine fellow here in town who you should meet." At dinner that night Norm mentioned that he was going to quit his real job and attempt to make a living consulting and teaching avalanche courses. I announced that I too was going to begin an avalanche school but needed a name for it. Norm volunteered the name American Avalanche Institute, and so the idea became a name.

When winter came, Norm began his courses under the name of Sierra Avalanche Seminars, and I began the American Avalanche Institute courses. Norm was a great help in advising how a basic course should be run and was willing and eager to travel to Jackson to work with me on my courses. Qualified avalanche course instructors were scarce in the mid 1970s, and I could just about count on my fingers and toes those in the Rockies with the experience needed to teach those courses. Norm was a real crutch in those years.

In the 1980s, Norm worked with Dick Penniman and myself on a course for Sierra Nevada College.

The best years I spent with Norm were in the 1990s when we worked with the Marine Corp instructor at the Marine Corp Mountain Warfare Training Center out of Bridgeport on Sonora Pass. He would pick me up at the Reno airport with his Subaru Justy. Packed to the roof with our gear and skis, we headed south to Pickle Meadows, where for five days each year we lived in the bachelor

officers' quarters and ate in the mess hall. We discussed our army years (both products of the draft), Norm's early years working for the state of California for Mt. San Jacinto State Park (where I was introduced to mountaineering), Norm's bad feet, and life in general. We had some great days touring around the Levitt Lake area with the Marines and with unlimited explosives, produced some Sierra-class avalanches.

Long live the legacy.

Rod Newcomb has been a mentor for many of the readers of TAR. He still skis regularly in the Teton backcountry and guides the Grand in the summer. ❄

STABILITY ROADMAP

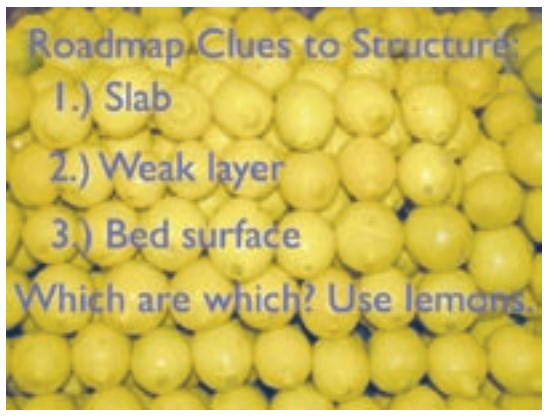
continued from page 13

3. Snowpits

- Choose test sites by angle, aspect, elevation, loading, and risk.
- Use the Quick Pit Chant to guide you through the key steps.
- Check lemons, do your block and slab tests, note shear quality.
- Plug your observations, slope and traveling tests, and snowpits into the Stability Wheel.

Evaluation

Summarize your results in terms of observations, slope and traveling test results, and the stability-wheel factors of strength versus stress, energy, and structure on the +, 0, - scale. This process will give you a go/no-go decision, but it will give you a good index of the likelihood of triggering slabs.



Examples:

- Only three of seven key signs, but all severe and significant: several medium-size slabs, numerous shooting cracks, heavy SE wind-loading. Slope Tests produce mini-slabs, Switchback and Parallel Tracks Tests produce same, Hand Shears weak, Slab Test 2. No-Excuse Block 3 at Q1 on 38°. Two lemon weak layer. Based on observations, slope and traveling tests, and snowpits, we rate strength versus stress - (strength and stress both -), energy -, and structure -.
- Three out of seven key signs, all minor: localized cracking in drifts, slight whumph heard once, light NE wind-loading. No results on slope tests. Hand shears weak. Slab Test 4. No-Excuse Block 3 at Q2 on 40°. AK Block 4 at Q2 on 35°. Four lemon weak layer. Based on observations, slope and traveling tests, and snowpits, we rate strength versus stress +, (strength - due to medium weak block test results but observations show loading is still not critical so stress is + and we give the observations more weight than the block tests), energy +, and structure -.

Decision-making

Congratulations, you now have a good first-cut stability evaluation! Your next task is to factor that in with the likely size and consequences of potential slides, the timing, terrain, route-finding alternatives, and other decision-making factors specific to your situation—then decide what you are going to do.

Note

A downloadable PDF of the entire SAAC stability evaluation course handout is available at www.avalanche.org > Avalanche Centers > Alaska > Southeast > Education > Handouts, under Topic Handouts as Level I+ Snowpack III Stability Evaluation & Notetaking.

Bill Glude recently visited Japan to ski and to pray in the Zen temples. Now he thinks he might retire as a crazy Zen monk, live in a cave up in the mountains, sell everything he owns, and seek oneness through riding powder as he goes about in his robes with a little begging bowl, living on rice and pure mountain air. Before he departs on his quest he welcomes your ideas on the Stability Roadmap; contact him at snowcom@mac.com. ❄

THE Avalanche REVIEW

A Publication of the American Avalanche Association

VOLUME 24, NO. 4 • APRIL 2006

The Avalanche Review
P.O. Box 2831
Pagosa Springs, CO 81147

Non-Profit Organization
U.S. Postage
PAID
Livingston, MT
Permit #93

PUT LABEL OVER THIS TEXT AND ABOVE THE LINE BELOW