THE Avalanche REVIEW

A Publication of the American Avalanche Association

US $4.95

VOLUME 25, NO. 1 • OCTOBER 2006

www.AmericanAvalancheAssociation.org

20 Years of the AMERICAN AVALANCHE ASSOCIATION

Photo by Emily Johnston, who tells TAR, "The photo of Hunter was taken from Kahiltna Base, as I recall we had several days of storm (no flying) so everyone was stacked up at base waiting to fly out. I just happened to have my camera in hand when I heard someone shout and saw this slide break loose."

Emily just finished her final year of med school and is hoping to re-enter the avalanche world in some form.

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

in this issue

I heard a sound like a rifle crack. This entire slope took off below me. I fell straight down about 7 feet to the bed surface. I was looking at this huge mass of snow. It was like I was in the front seat of a Greyhound bus, looking out the window. —Art Judson, p10

THE Avalanche REVIEW

OCTOBER 2006 • VOL. 25 • NUMBER 1

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

Editorial Assistants:
Ron Matous
Ellie Martin

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 AAA

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 aaa president, russ johnson

I had the opportunity this summer to attend two pretty unique if diverse events. The first was Jim McConkey's 80th birthday. Jim, the father of well-known skier Shane, was probably one of the first free skiers (you would have to mention Stein Erikson and Pepi Stiegler as well). He had first descents in the Bugaboos while his friend Hans Gmoser was initially searching out terrain for an infant Canadian Mountain Holidays heli-ski operation. He helped develop and was the initial ski school director at Park City. Later he ran Whistler's ski school and owned a ski shop there. A picture of Jim jumping over a plane is prominently featured in the Goldminer's Daughter at Alta.

The party, while missing the recently deceased Hans Gmoser, was punctuated by first-generation ski pioneers. Guests included Junior Bonous who ran the ski school at Sugar Bowl in the early '60s and was the initial ski school director at Snowbird (still teaching at age 80); Mike Weigle, whom Junior hired as an instructor for a couple of years at Sugar Bowl and who later ran the ski school at Lake Louise before becoming the heli-ski operator we know him as today; Leo Grillmair, Hans Gmoser's great friend and climbing partner who came over with Hans from Austria ("with just the shirts on their backs") and remained his partner in the Canadian Mountain Holidays heli-ski operation; and Franz Gabl, the first Austrian to win an Olympic skiing medal (silver in the downhill in 1948). Franz was an instructor at the famous Hans Schneider ski school in St. Anton before coming to Canada with the FIS team. He became the Canadian women's ski team coach and later the ski school director at Mt. Baker. The stories of war, of early ski days in Canada and the U.S., and of the modern day all meshed into a three-day celebration not just of Jim McConkey's remarkable life but of the birth of the ski industry, especially from the ski school and area development perspective.

The second event, markedly different of course, was Norm Wilson's memorial at his daughter Robie's house in Truckee. Different, but it as well was a celebration of a remarkable life in the ski world. And here too were some pioneers in the avalanche control side of the spectrum, including Dick Rueter (who calls himself an old logger), who with Monty Atwater and Norm headed up the control work for the 1960 Olympics at Squaw Valley. He later went on to run Kirkwood Ski Area (probably was loggin' in that drainage anyway). Also attending the memorial, Leroy Hill was also on the crew under Monty Atwater, consulted on avalanche issues in the Rogers Pass area and became ski school director at Squaw. Represented at this event as well were many whom Norm had affected: Bela Vedasz (Alpine Skills International, AIARE), Larry Heywood (Alpine Meadows), Bill Williamson (Sugar Bowl, Alpine Meadows, Schweitzer), Jim Zaloga (Alpine Meadows, Sugar Bowl), Gary Murphy (Alpine Meadows), Jim Plene (Alpine Meadows), Curtis Crooks (Squaw Valley), and the list goes on.

As I step away from this world mid-way through my sixtieth year, I marvel at what a privilege it has been to meet and learn from some of these folks and to work with others. I took my first ski lesson from Junior Bonous in 1963. I took my first avalanche class from Norm Wilson in 1984. To have shared the Governing Board table with Knox Williams, Don Bachman, Stuart Thompson, Larry Heywood, Liam Fitzgerald, Onno Wieringa, Mark Mueller, Gary Murphy, Karl Birkeland, Craig Sterbenz, Janet Kellam, Ethan Greene, and so many more who solidified the work of people like Monty, Norm, Ed LaChapelle, and others has been truly an honor.

As Larry Heywood said at the memorial, "Norm broke trail for us in the avalanche industry." True as it is, the people who followed up the trail brought into full fruition the legacy of the well-known pioneers. I think that the men and women of the American Avalanche Association exemplify this legacy. For me, I made it up the trail as far as I could but I'm glad I skinned up. It's been a great walk.

Russ Johnson is stepping down as president of the American Avalanche Association, a position he has held since January 1, 2003. He initially came on the board around 1994 as the Sierra Section rep. The AAA has benefited from his level head and steady hand for the last three years and sincerely thanks him for his service.

from the editor

September 2006 brings you a landmark issue of TAR and an important milestone for the AAA. *The Avalanche Review* begins its 25th year of publishing with a group of retrospectives, some from recent events and others of more distant history. The National Avalanche Center summaries offer us many images of last winter. A reprint of the first year of *Avalanche Acres* reminds us of the twisted characters among us. Stories from Art Judson, Bruce Tremper on Doug Coombs, and Jim Stinson on Walter Rosenthal give us insight into the lives of three remarkable avalanche pioneers. That's a lot of important material, so we have expanded to 28 pages for this issue. More permanent changes to TAR include a new printer—the *Bozeman Daily Chronicle*—and new paper. Let us know what you think.

This year also marks the 20th anniversary of the American Avalanche Association, the parent organization of *The Avalanche Review*. The AAA invites you to celebrate with us at the ISSW at the Gondola Plaza on Wednesday, October 4. Help us continue our service to and representation of the avalanche community for another 20 years; here are some paths toward involvement:

- subscribe to TAR
- become a member of the AAA
- offer your input on the AAA education committee *(this year we plan to refine progressions and revise the Level 1 and 2 course outcomes—see the AAA board meeting minutes on pg 3 for details)*
- participate in the mentorship project *(see Michael Jackson's article on pg 5)*
- write an article or submit a photo to TAR

As the AAA moves into its next 20 years, some changes will occur. Two hardworking AAA board officers will finish their terms of office in 2006. Russ Johnson is stepping down after 12 years on the board and three terms as AAA president. His humor, calm focus, and firm hand made AAA board meetings more a pleasure than a task. Welcome to our new president, Janet Kellam, who seems to know everyone and has insight into many of my questions, snow or otherwise. Dave Ream will be handing over his treasurer's books to Bill Glude, who accepted the job because, as he says, "I was coming to all the meetings anyway." Coming all the way from Alaska, in fact. Thanks to Dave for his attention to detail, plenitude of opinions, and dedication to the AAA mission. I speak for the entire AAA in offering sincere thanks to both Russ and Dave for their hard work and look forward to future work with Janet and Bill.

I am looking forward to seeing everyone at the ISSW; to matching faces with the e-mail personas that I correspond with all year; to hearing your presentations and stories, your discoveries and recurrent problems, your new or same bad jokes; and to catching up as we attempt to deplete Telluride's beer supply. I eagerly anticipate the upcoming exchange of ideas and hope to gain insight to bring back to my own teaching and practice for this coming winter. And for those of you that cannot make it to Telluride, here at TAR this winter we plan to bring you a sample of 2006's "theory and practice" that we hope you can use in your own work or play.

—Lynne Wolfe, editor

call for submissions

SUBMISSION DEADLINES

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
PO Box 1135
Driggs, ID 83422
lwolfe@tetontel.com
(208) 709-4073

- 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 or interesting terrain.
- Send photos 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.

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

aaa news

AAA Spring Board Meeting

The American Avalanche Association (AAA) Governing Board spring meeting was held on April 22, 2006 at the White Pine Ski Area and Resort near Pinedale, Wyoming. In attendance were 13 board members, three members, and Executive Director Mark Mueller.

President and Vice Presidents' Remarks

President Russ Johnson welcomed the group and Vice President Doug Richmond gave a report on the National Ski Areas Association Explosives Committee, which is staying abreast of the ongoing changes in explosive use and ever-increasing regulation. John Brennan is working on an updated, lower-cost avalauncher.

Treasurers' Report, Dave Ream

Our sources of income in order of amount are: dues, TAR advertising, donations, SWAG sales. Our operations fund balance is about the same as last year: healthy and holding steady at a little over $17,000. Membership and income are growing slowly. Our expenses are up but so is our income. We lost a little on the Professional Development Seminar and the first run of the Professional Avalanche Workers' School, but these are priority services for our membership and income from SWAG sales is allowing us to subsidize them.

Executive Director's Report, Mark Mueller

SWAG will need an addendum if a new avalanche danger scale is decided on this fall, and we may be looking at revision or addenda when the new ICSI classification for snow and ice is released in about two years. We will also post any addenda on our Web site. Membership is steady. Our 20th anniversary is coming up with this ISSW and will be a good time to recruit members. A service mark for our name is in the final notice period.

Publications, Lynne Wolfe

We are seeking better quality paper and printing, will have special ISSW issue content, and will adjust our editorial staff. The photo contest was a success. We are looking for a student who will do a school project of taking selected back articles putting them online as part of the Moonstone Library and possibly on a CD for instructors to use in courses. We will look into producing a new AAA brochure.

Research, Mark Mueller for Chair HP Marshall

We vote to award $800 to Spencer Logan for tap compression test research. HP could not attend but will be here next time.

Awards, Denny Hogan

Nominations are open, and we discussed fall ISSW award presentations.

Education, Don Sharaf

Improving avalanche education has been a major AAA focus and will continue to be.

The Professional Avalanche Workers School (PAWS) was a success and will be offered again this season. The first course only had five students, but interest is already strong for the next course at $975 tuition ($875 for AAA members). It worked out to 60% field time and 40% classroom time. Somewhat humorously, we may need to come up with a new name as some people mistakenly thought PAWS stood for some kind of rescue-dog training. Future courses will be limited to 18 students and a 6:1 student-instructor ratio to maintain quality. We need site liaison/organizers for the likely future venues: southwest Montana, the Tetons, Little Cottonwood Canyon, the Sierras, Colorado, and Alaska. The course has been developed now to the point where qualified educators can teach it in their venues.

We reviewed a white paper by Steve Conger on Level III course guidelines and one by Michael Jackson on mentorship and took three actions based on the recommendations:

1. A subcommittee headed by Bill Glude will review Level I and II courses and develop course outcomes, measures, standards, and revised guidelines.
2. A subcommittee headed by Janet Kellam will work on developing a systematic learning progression out of all the plethora of Level I-III, National School, PAWS, and other courses.
3. A subcommittee headed by Michael Jackson will work on developing mentorship paths and resources for prospective avalanche specialists.

The Board reviewed the procedure for appeals of Certified Avalanche Instructor denial.

Ski Areas Committee, Bill Williamson

Bill will help make sure the ski areas know about the PAWS course.

Search and Rescue Committee, Mark Mueller for Chair Dale Atkins

An updated avalanche SAR dictionary is in the works, and Dale has been working on fitting avalanche responders into the Department of Homeland Security's resource typing classification system and setting up appropriate protocols. We concur with a recommendation from ANENA that beacon manufacturers list useful working range rather than maximum, but note that there needs to be agreement on how range is measured if the figures are to be accurate.

Standards Committee, Craig Sterbenz

CIL Orion is demonstrating their new improved Delta K avalauncher round this spring. It costs more than the old standard rounds and requires a new barrel for the older guns, but its one kilo-gram rounds have a spiraled tail fin for better range and accuracy, arm in flight, and detonate on the surface. CIL Orion donates 3% of their avalanche explosive sales to AAA for education—about $7000 this year.

Continued next page ➡

AAA BOARD MEETING HIGHLIGHTS

continued from previous page

Data Committee, Mark Mueller for Chair Dan Judd

Dan Judd recommends that Randy Trover take over as chair. The data committee has primarily maintained the Web site. We are seeking new programming to make the site easier to maintain and update, and we are planning major Web site upgrades and new programming for data exchange.

Old Business

We discussed the *Backcountry Magazine* avalanche accounts and liability insurance for our Board.

New Business

We will develop a new membership certificate.

The next AAA Board meeting will be all day on the Sunday before ISSW begins, October 1, probably in the Peaks Lodge or maybe one of the ski area meeting rooms. Members are welcome to attend. The annual membership meeting is scheduled for Tuesday evening, October 3, in the conference center. ISSW 2008 is in Vancouver/Whistler.

The need for a dues increase, the first in 10 years, was brought up. We discussed the future need to fund an education coordinator position, do more instructor training, and possibly add an intermediate level of instructor certification. ❄

metamorphism

AAA Celebrates Twenty Years

The AAA will celebrate its 20th anniversary with a party at the ISSW on Wednesday, October 4. We'll have beer and bbq; please come join us from 1700 to 2100 in the Gondola Plaza.

To commemorate 20 years of the AAA, the AAA charter members are printed below. Many of theses names have been central figures in our common history, mentors in our field, and contributors to TAR. Thanks to everyone below for the vision and action back in 1986 which continues to inspire us today.

AAA Charter Members (1986)
Bob Bailey, Portland ME
Michael Benier, Moscow, ID
Hal Boyne, Ft. Collins, CO
Sandy Bryson, Markleeville, CA
Eric Burr, Mazama, WA
Sam Colbeck, Lyme, NH
Jeff Dozier, Mammoth Lakes, CA
Kelly Elder, Ft. Collins, CO
Randy Elliot, Bozeman, MT
Rob Faisant, Palo Alto, CA
Sue Ferguson, deceased
Liam Fitzgerald, Salt Lake City, UT
Dale Gallagher, deceased
Steve Hackett, Homer, AK
Denny Hogan, Silverton, CO
Michael Jenkins, Logan, UT
Patrick McKenna, Lima, MT
John Montagne, Bozeman, MT
Mark Moore, Kenmore, WA
Rod Newcomb, Wilson, WY
Michael Trotter, Sitka, AK
Walter Walker, Durango, CO
Norm Wilson, deceased

Halsted Morris and **Dale Atkins** have both retired from the CAIC. Dale is working for Recco, and he and Halstead just finished an experiment for BCA on digging out avalanche victims. Dale promises *The Avalanche Review* that he is in the process of updating *The Snowy Torrents*. Ask for details when you see him.

The Sierra Avalanche Center wants to call your attention to their ad for a forecaster elsewhere in this issue of TAR. Check the employment section of Avalanche.org for details or write Bob Moore at rhmoore@fs.fed.us

Subcommittees of the AAA Education Committee have undertaken projects to review Level 1, 2, and 3 course outcomes and progressions. These updates are vital and you are requested to contact Bill Glude or Janet Kellam with your timely input.

Congratulations and welcome to the following AAA members on their new status within the AAA as of the Spring Board Meeting:

New Certified Instructors
Kirk Bachman, Stanley, ID
Matt Hill, Mt. Shasta, CA
Tom Kimbrough, Salt Lake City, UT
Doug Richmond, Butte, MT
Rick Wyatt, Salt Lake City, UT

New Professional Members
Tom Waclo, Olympic Valley, CA
Damian Jackson, Alta, UT
Brian Lazar, Boulder, CO
Mark Yancey, Sandpoint, ID
Jay Frisque, Bozeman, MT
Nick Caselli, Durango, CO
Keith Renke, Ophir, CO
Adam Brown, Leadville, CO
William Jaskar, Gardnerville, NV
Dave Alley, Kellogg, ID
Anthony Cammarato, Dillon, CO
Michelle Smallman, Mazama, WA
Pat Barill, Basalt, CO
Randy Trover, Salt Lake City, UT
Ben Pritchett, Crested Butte, CO
Billy Rankin, Crested Butte, CO
Ann Mellick, Bishop, CA
BK Braun, El Prado, NM
Kevin Devine, Durango, CO
Jason Rogers, Ophir, CO
Kevin Cahalane, Ophir, CO
Jamie Pierce, Colorado Springs, CO
Rod Gee, Terrace, BC
Bill Nalli, Salt Lake City, UT
Scott Quirsfeld, Mammoth Lakes, CA
Bill Seline, Truckee, CA
Kip Melling, Eagle River, AK
Steven Banks, Crested Butte, CO
Steve Wiseman, Leadville, CO

New Member Affiliates
Stan Gale, Golden, CO
Ed Rotthoff, Silverthorne, CO
Rick Knowles, Bonney Lake, WA
Rick Meyer, Berkeley, CA
Seth Green, Berkeley, CA
Andrew Slaughter, Bozeman, MT
Jeremy Rubingh, Aspen, CO
Craig Patterson, Salt Lake City, UT
Nicholas Armitage, Big Sky, MT ❄

How I almost blew up the Snowcat with a 50 lb bag of Anfo, or MENTORSHIP: helping others while helping yourself

Story by Michael Jackson

How many of you started out in the Avalanche Industry with a focused career plan, a punch list of prerequisites to guide you on your journey, and an established professional in your chosen field to consult with when you had a question?

If you are like most, your career followed a less-than-linear progression, with a few side trips to construction sites or restaurant kitchens to pay the bills. Eventually, over time, you met the right people and worked the right jobs to get you where you wanted to be. It may not have been efficient, but it ended up being effective. How would you like to take your experience and help someone else starting out in the industry to be more efficient in their career progression?

The AAA Education committee is in the process of developing career-path flow charts for aspiring avalanche professionals. Potential careers in the avalanche industry could fall under the headings of Ski Patrolling, Forecasting, Avalanche Education, Highways, and Land Use Planning.

Complementing these flow charts would be a listing of established professionals in each field available as consultants or mentors for any questions aspirants might have. The flow charts and list of mentors would then be listed on the AAA Web site. The goal of this project is to give aspiring avalanche professionals handrails to guide them as they begin their journeys and contacts to keep them on paths that lead towards satisfied workers and employers.

As with any profession, who you know can be just as important as what you know during the job search. This mentorship project provides job and career seekers with the opportunity to make connections that may lead to job opportunities and insight into career paths.

We are also interested in any input individuals might have as possible mentors or as aspirants. Is this a valid direction for us to follow? Is this a potential valuable service?

The AAA Education Committee is currently recruiting individuals interested in being included as a mentor in one of the career paths listed above. As a mentor, aspirants would gain valuable insights from your past experiences, both good and bad. So dust off your old war stories and get ready to tap into the wealth of experience that lies just beneath your hat.

For those interested in mentoring, please contact:

Michael Jackson
powderhino@aim.com

Lynne Wolfe
lwolfe@tetontel.com

Bill Williamson
bwilliamson@schweitzer.com

Andy Gleason
algleason@bresnan.net.

Michael tells of the Snowcat and 50 lb bag of Anfo in his story's title:

"The snowcat story is not mine, but a patroller friend at _____ ski area. He forgot to leave the snowcat running before he capped the bag. After a few agonizing mis-starts he was able to drive a safe distance away. Safety protocols? We don't need no stinking safety protocols…we call that experiential education."

Michael Jackson is the chair of the AAA Education Committee. He thanks his mentors for all their examples, and blames them for none of his bad habits. ❄

Walter Rosenthal: 1947-2006

Story and Photos by Jim Stinson

The afternoon of April 6 will be etched in ours minds forever. It dawned as a bluebird morning, but the sunny spring day was darkened that afternoon by a tragedy that stunned family, friends, and employees of Mammoth Mountain. *(For details, see Eastern Sierra Avalanche Center season summary, p25.)* In no time, the entire eastern Sierra was grieving the untimely death of Walter Rosenthal. The support and sympathy has been immense with e-mails, letters, and phone calls coming in from all over the country. Many of the well-wishers never knew Walter or the other victims, but have been touched by this tragic story of bad luck, desperation, heroism, and courage. The newspaper coverage went national that same afternoon and by the following day, the story spread overseas to Thailand and perhaps beyond.

Charles Walter Rosenthal was born and raised in Burbank, California. He would have been 59 years old on April 26. Walter graduated from UCLA with a degree in Political Science. In college he was involved with the local spelunking club and ended up exploring remote and uncharted caves from Nevada to Mexico. His interests eventually turned to climbing and he subsequently migrated to Yosemite Valley. One of Walter's endeavors was soloing the Zodiac Wall of El Capitan, which took him a week and a half. He climbed only in the mornings while it was cool, then hung out in his hammock and read all afternoon when the sun crept around the corner and started baking the cliff. Walter was a gregarious person, but it often suited him to strike out on adventures alone. When he moved to the eastern Sierra in the early '70s, Rosenthal quietly began to tick off a number of first ski descents: Para-Chute off the east face of Pyramid Peak, Red Slate Mountain, the Checkered Demon, and the couloir down the center of the Sevehah Cliffs of Laurel Mountain. His adventures were pure and without any fanfare. Walter was modest and humble, extremely bright and engaging. He was great fun to be with.

Among Walter's plans was starting a Ph.D. program in the autumn. His research would have changed the current conception of how snow crystals change within the mountain snowpack.

For the many people who knew Walter, words cannot begin to describe the depth of the pain and sorrow of his passing. Walter's toothy smile could light up a room, and his laugh was loud, rolling and infectious. Above all, Walter had an intense love of life and family. His was a kind and sensitive soul, and there was no one more big-hearted. Walter was known to do anything for a friend, which is why he is gone. Walter lost his life trying to help his friends. When Walter died, a part of all of us died. The radiant glow of his smile has been extinguished, and there is emptiness and silence now. What remains are the memories, photographs, and shattered lives. With time, this dark cloud will move on, but we will always miss him.

Walter is survived by his wife, Lori Michelon, and his 14 year-old daughter, Lily. Lori is an instructional aid at Mammoth Middle School and an adjunct teacher of art at Cerro Coso Community College. Lily is a straight-A student at Mammoth High School. Walter made a screensaver for Lily on their home computer which reads, "I love you 'bug-bug.'"

Personal finances, including mortgage payments and college tuition for Lily, are of great concern. There have been memorial funds established at the Union Bank of Mammoth Lakes for all three patrollers: the Walter Rosenthal Memorial Fund, the Scott McAndrews Memorial Fund, and the James Juarez Memorial Fund. Union Bank, PO Box 2729, Mammoth Lakes, CA 93546. ❄

Norman Arthur Wilson

Sent to TAR by Robie Wilson Litchfield

"I had more fun at my work than most people have on their vacations."

These are the words of Norman A. Wilson, aka "Stormin' Norman," shortly after he was diagnosed with ALS (Lou Gehrig's Disease) in April of 2005. Given two to nine months to live at the time, he once again showed those who loved him his will—the type often experienced by his students during wild sideways snowstorms on Sierra ridgelines in search of that perfect weak spot in the snow—by staying with us 14 months instead.

An expert, a professional, an educator, and 55-year resident of the Tahoe-Truckee Region, Norm was known, loved, and respected throughout the ski and snow industry. He began his life on snow in the early '50s at Sugar Bowl, moving to Squaw Valley a few years later to begin his avalanche career under the tutelage of Monte Atwater, and worked on the avalanche crew during the 1960 Olympics. He later took the position of mountain manager at Alpine Meadows, and in 1971 as a full-time "snow consultant" he conducted studies for various clients including mines, highways, and ski areas, and he taught numerous courses.

It is in the area of education that Norm leaves his legacy, whether in his own home-grown classes on Donner Summit or at many other venues, Norm shared his passion and respect for snow in his characteristically informative and sometimes humorous ways, but always with dignity and grace.

Norm maintained that dignity and grace right up to his last peaceful breath on the morning of Wednesday, June 28. With him were his daughters Robie Wilson Litchfield of Truckee, California; and Cari "Chresten" Wilson of Incline Village, Nevada; Norm's "lady friend" Judith Luce of Reno, Nevada; son-in-law Dean Litchfield; and Chresten's devoted companion Candace Lindskog.

A memorial celebration was held on Saturday, July 29 at the home of Robie and Dean Litchfield in Truckee, CA.

In lieu of flowers, the family asks that donations be made to the following: the NAW Avalanche Education Fund through the Truckee Tahoe Community Foundation, ALS of Nevada, St. Mary's Hospice in Reno. ❄

what's new

The Avalanche Handbook, 3rd Edition

David McClung and Peter Schaerer

The unrivaled resource for information on avalanches and snow safety—now completely updated!

- New information on the unique characteristics of alpine snow, snow slab instability, terrain variables, skier triggering of avalanches, and the nature of avalanche motion
- Brand-new chapters on the elements of backcountry avalanche forecasting and the decision-making process
- This is the text used by search-and-rescue professionals, ski patrols, and outdoor education programs

Technical yet accessible, *The Avalanche Handbook* covers the formation, character, effects, and control of avalanches; rescue techniques; and research on understanding and surviving avalanches. Illustrated with nearly 200 updated illustrations, photos and examples, the revised edition offers exhaustive information on contributing weather and climate factors, snowpack analysis, the newest transceiver search techniques, and preventative and protective measures, including avalanche zoning and control.

David McClung is a professor in the Department of Geography and leader of the avalanche research group at the University of British Columbia. He has 35 winters of field experience and has published more than 150 technical articles on alpine snow and avalanches. With more than 40 years experience studying avalanches, Peter Schaerer spent most of his career as a senior research officer and head of the Avalanche Research Center of the National Research Council of Canada. He was instrumental in forming the Canadian Avalanche Association and in setting up professional avalanche training programs in western Canada.

—$19.95 (AAC members get 20% off Mountaineers Books) Available in October. ❄

Hypothermia Frostbite and other Cold Injuries

Prevention, Survival, Rescue, and Treatment

Gordon Giesbrecht, Ph.D.
and James Wilkerson, M.D.

The compact yet comprehensive guide to recognizing, preventing, and treating hypothermia and other cold injuries—now updated with the latest research.

- A vital resource for search and rescue professionals and physicians as well as outdoor enthusiasts
- Adds four new chapters to cover additional cold injuries and strategies for survival

Hikers, skiers, climbers, hunters, fishermen, and lost children all are potentially at risk of hypothermia or other cold injuries including frostbite and trenchfoot. Cold-water immersion is also a major cause of death in boating accidents. Yet as shown in anecdotes from the updated second edition of *Hypothermia Frostbite and Other Cold Injuries*, many people have died unnecessarily, succumbing to cold effects long before hypothermia sets in.

This compact, comprehensive book covers the causes and effects of hypothermia and other cold injuries, and tells how to prevent, recognize, and treat them. The new second edition includes expanded coverage of how the body loses heat and the latest rewarming techniques such as thermal wraps. There are new chapters on cold water drowning and covering additional cold injuries from Raynaud's phenomenon to cold-induced asthma. Other new chapters present strategies for cold-weather survival, safe practices for working on the ice, and ice-water escape and rescue techniques.

Gordon Giesbrecht, Ph.D., is a professor at the University of Manitoba in Winnipeg, where he operates the Laboratory for Exercise and Environmental Medicine. James A. Wilkerson, M.D., an active mountaineer and frequent lecturer on wilderness medicine, is the editor of *Medicine for Mountaineering and Other Wilderness Activities, 5th Edition*.

—$17.95 (AAC members get 20% off Mountaineers Books) Available in October. ❄

Willie is Janet Kellam's new puppy. He can never fully replace Dottie, but he is awfully cute.

Dale Atkins Receives Prestigious Award at Mountain Rescue Association Conference

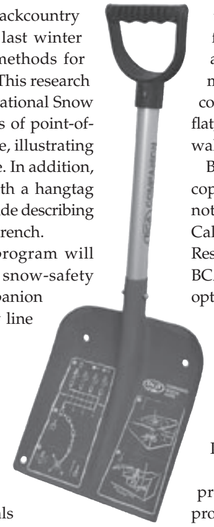
Dale Atkins, long-time avalanche forecaster, rescue mountaineer, ski patroller, and public safety educator, was given a prestigious Outstanding Contribution to Avalanche Education and Safety award at the annual Meeting of the Mountain Rescue Association (MRA) in Marin County, CA on June 17.

30-year veteran of Alpine Rescue Team (Evergreen, CO), Atkins is an internationally renowned lecturer, author, and media spokesperson on the topics of snow science, avalanche safety, and avalanche rescue.

"Dale's accomplishments in the past 30 years are unparalleled," said Dan Hourihan, past president of the MRA and chair of the awards committee. "Not only has he participated as a leader in countless avalanche rescue and recovery operations in Colorado, he has instructed over 14,000 students on the topic, produced books and videos, and represented the United States in many international conferences and symposia. Dale has made remarkable contributions to snow science and avalanche safety."

Co-author of *Avalanche Rescue Fundamentals and The Snowy Torrents Vol. 4*, Atkins also co-authored guidelines for U.S. avalanche-education courses approved by the American Avalanche Association. He also wrote and produced 2 avalanche rescue training videos. ❄

BCA Adds Probing and Shoveling to Education Program



Snow safety equipment manufacturer Backcountry Access (BCA) staff spent an entire week last winter digging holes and researching the best methods for excavating avalanche victims from debris. This research will culminate in a paper at the 2006 International Snow Science Workshop in Telluride and a series of point-of-purchase displays at retail shops worldwide, illustrating proper beacon, shovel, and probe technique. In addition, all BCA products in 2006-07 will come with a hangtag containing a tear-out Companion Rescue Guide describing these techniques in English, German, and French.

The company's expanded education program will be supported with an expanded line of snow-safety products. This includes an updated Companion shovel redesigned for professionals, a new line of fast-assembling Quickie probes, and an affordable snow study kit, field book, and snow saw.

BCA's updated Companion shovel is the best example of the company's focus on education. On the front of the shovel blade, BCA has printed three illustrations from its *Companion Rescue Guide*. These can be used as an educational tool by professionals teaching on-snow courses and as a field reference for recreationists. The blade itself has been enlarged and now measures 25x30cm. These new dimensions make it ideal for performing shovel shear and compression tests. The back of the blade is completely flat, enabling the professional to produce much cleaner walls and columns when working in snowpits.

BCA designed the Companion shovel blade after copious input from avalanche professionals, most notably the research team from the University of Calgary's Center for Applied Snow and Avalanche Research (ASARC). The shovel will continue to feature BCA's innovative oval shaft and accommodates the optional Companion probe. BCA's new Quickie line of probes include depth markings and are available in sizes ranging from 203-300cm. BCA's snow study kit was developed with guidance from members the American Avalanche Association (AAA), Canadian Avalanche Association (CAA), ASARC, and AIARE (American Institute of Avalanche Research and Education).

For more information on BCA's education program, see www.bcaccess.com/education. For pro pricing information, call (800) 670-8735. ❄

AIARE Funds Research

The American Institute for Avalanche Research and Education (AIARE) provides educators with the tools to educate students about how to make decisions in avalanche terrain. In its continued efforts to be a resource to educators and instructors, AIARE will be offering two grants of $500 each for research in the following areas:

1. Research that contributes to the improvement of curriculum and pedagogy in avalanche education.

2. Research that contributes to improved decision-making and human safety in avalanche terrain. This includes knowledge of how avalanches form and release, knowledge of how terrain contributes to snowpack variability and avalanching, and the factors which contribute to improved safety for those who work or recreate in avalanche terrain.

Research project abstracts need to be approved by the AIARE Education Committee. This funding is open to all. Submissions can be sent to info@avtraining.org. Submissions must be received by March 1, 2007. Grant money will be distributed after review and approval by the AIARE Education Committee.

ATTENTION: Women Snow Professionals

If you are coming to the ISSW in Telluride, please plan to attend Ladies Night, Tuesday October 3, from 5-7pm. This event will be a celebration of women in the avalanche field and will be hosted by Babes in the Backcountry and sponsored by the American Avalanche Association. ❄

International Workshop on Snow Avalanches set for Oct 30 - Nov 2 in Vancouver, BC

This workshop on avalanches will take place October 30-November 2, 2006 at the Simon Fraser University Harbour Centre in Vancouver, British Columbia, Canada. The Coastal and Mountain Meteorology Laboratory of the Meteorological Service of Canada and the Centre for Natural Hazard Research at Simon Fraser University invite practitioners, and researchers to attend this event, which will bring together the avalanche research, forecast, and rescue communities to discuss strategies for overcoming knowledge gaps in snow avalanche processes, forecasting and information dissemination.

Snow avalanches are a significant hazard in many mountain areas around the globe, including the Canadian Cordillera. In recent years in Canada there has been an increase in loss of life due to avalanches in British Columbia, Alberta, and elsewhere. This increase is due, in part, to rising winter backcountry use by the public for recreation including commercial and non-commercial backcountry skiing. Accurate forecasting and dissemination of avalanche conditions to recreationalists as well as education will likely reduce the number of search-and-rescue incidents and loss of life. However, accurate forecasting of snow avalanche conditions is complicated by terrain variations, uncertainties in forecasting mountain weather conditions and the complexity of the underlying processes involved in avalanche formation and release. The purpose of this workshop is to build a better understanding of avalanche processes and to examine Canadian and international approaches to avalanche awareness and forecasting.

Presentations and discussions on the following topics will take place:

- Avalanche and mountain weather forecasting
- Public communication of avalanche conditions and safety awareness
- Historical avalanche activity
- Climate change effects on snow avalanche frequency and magnitude
- Snowpack modeling
- Science-based decision-making

More information can be obtained from the workshop Web site at www.sfu.ca/cnhr/avalanche/index.html ❄

crown profiles

Doug Coombs — The Early Days

Story by Bruce Tremper

I was one of the lucky ones. I got to hang with the great master and count him as a good friend—back in the heady days when Doug Coombs and the rest of the Chutski Brothers were inventing the wild new sport of extreme skiing—well before Doug became a skiing legend and America's most famous freeride media star. Back long before he slipped when trying to get to the edge of a cliff to help another skier who had skidded on a patch of ice and tumbled to his death over the same cliff just before him. We all came to believe that the laws of physics no longer applied to him but in the end he tumbled and fell and died just like anyone else. He died in his favorite French mountains like an ordinary mortal instead of the perennially, death-defying legend that we assumed would go on forever.

My particular story begins with Emily Gladstone, the woman who would become Doug's wife and business partner. It must have been sometime in the late '70s. I was riding the chairlift at Bridger Bowl near Bozeman, Montana, when—and this vision is permanently burned into my deep neurons—a beautiful, shapely woman skied by under the lift with her long red hair flying, carving perfect turns on the hard spring ice. All the heads in all the chairs turned in unison. From a lifetime of ski racing, I could instantly tell she was not only an ex-ski racer, but she grew up skiing ice, and she skied with a distinctive East Coast style. She may have been the best female skier I had ever seen at Bridger Bowl and Bozeman is a small town where good skiers do not remain a secret for long. Who IS that woman?

Luckily I was near the top of the lift and I straight-lined it to the bottom where, in my usual style in those days, I introduced myself and made sure I was on the next chair with her. She was painfully shy, inching away to the far side of the chair under my barrage of questions and fake charm. Sure enough, she was an ex-ski racer and she was from the east coast—Boston—and yes, she was new in town. She came to study photography at the University. Photography? Well yes, I happened to be a photographer too. And YES, I was riding the chairlift with her. SCORE!

But despite her head-turning beauty and despite that I was still young, handsome, and eager with a full head of golden hair—now mostly gone—romance was never in the cards for us. She was still reeling from the breakup of some kind of love-gone-wrong, which she had escaped with her move to Bozeman, and no, she was not even remotely interested in starting something new, especially with someone like me. Coincidentally enough, I was in a similar situation.

"Refugees of love." That's how we referred to ourselves over the next few months as we quickly became skiing and photography buddies. It seemed like we did most everything together. A year or two later, we even had adjoining apartments where we usually cooked breakfast or dinner together. Emily was my best bud.

In the beginning, I hung at Emily's house as much as she and her roommates could stand me. Bozeman at the time was in that early magic stage of its transformation from an aggie-school cow-town into the groovy little outdoor-adventuring boomtown we know today. And Emily's house seemed to be the social hub of it all. It is where I became quick friends with the fledgling core of what would become known as the "Chutski Brothers"—Tom Jungst, a racer on the Montana State University ski team; Emil Tanner, an aerobic animal who later raced on the U.S. bicycling team; and Jim Conway, an ex-freestyle skier (yes, an inexcusable lapse in judgment, but he made up for it by racing for a season or two at MSU).

And, of course, there was this scruffy lad by the name of Doug Coombs who arrived on the scene perhaps a year later after racing a couple seasons for an Eastern school, and he transferred to Bozeman to finish his college racing career and a geology degree. I had retired from my own ski-racing career a few years earlier after racing on the national circuit and on the rival ski team at the University of Montana in Missoula, and I had come to Bozeman for graduate school in Geology. United by ski racing, geology, and a passion for outdoor adventures, it was inevitable that Doug would quickly gravitate into our little gang.

When Emily shyly told me one day that she was interested in Doug Coombs, I remember blurting out, "Oh come on, Emily. You can do better than that."

The Doug I knew in those days wore glasses, had long matted hair and a scruffy long beard that grew only below his chin and on his neck. Every time I talked with him, I wanted to grab some scissors and hack off that disgusting beard. He talked in a slurred hipster-speak that matched the rest of his décor.

"But he's a beautiful skier, and he's smart and a really nice guy," Emily protested.

So I promised Emily I would give him a chance. Doug and I slowly got to know each other through long conversations in the Geology Department. Yes, I had to admit that under the repellent exterior there was a no-ego playful energy and—something he seemed to conceal well—he was wickedly smart. He would get good grades seemingly without cracking a book or attending classes. He was hyper-aware, like the perfect sponge, and no piece of information ever snuck past him—something that would serve him well in his career of running slalom through thousands of dangers per day. But, of course, it was the skiing that did the trick. The first time I skied with him I remember just standing back and gasping.

I had raced with all the best skiers in the country at the time: the Maher brothers, Bobby Cochran, and Andy Mill. Doug Coombs was the most beautiful and athletic skier I had ever seen. Doug comes alive whenever he's in motion—any kind of motion: soccer, skiing, mountain biking, climbing. He's one of those astoundingly gifted kinesthetic geniuses. Go watch old reels of Michael Jordan or Pelé and you'll know what I'm talking about. Better yet, just watch the endless parade of skiing films that feature him through the past 20 years. There is absolutely no one else like him.

He skied with his signature style—straight up, fluid, effortlessly powerful and impeccably balanced, like he could nonchalantly ski with a full cup of tea on his head, whether he was jumping cliffs, pounding bumps, or outrunning an avalanche. And he always seemed to be smiling. The photographers and cinematographers loved him because he was tall, slim, and handsome (after he eventually cleaned up his act) and you could never take a bad photo of him either on or off skis.

Then there was the signature Doug Coombs presence. Always smiling, here-and-now and ready for adventure. He seemed to love everything and everyone and the purpose of life was to play. His mind operated on a kinesthetic, 3-D spiritual plane, usually leaving others to attend to the messy details. He always seemed to draw a crowd, like a friendly golden retriever. He was a people person and a natural diplomat, who could flawlessly see deep into someone's core in an instant and all without any judgments.

During Doug's second season on the ski team, he played hooky from the slalom gates with increasing frequency and I would find him nearly every day with his skis over his shoulder, leaving the top of Bridger chair and booting it up onto Bridger Ridge, run after run, exploring every single nook and cranny of all the 100-or-so steep couloirs that make Bridger Bowl famous. His fellow ski team member, Tom Jungst, had already graduated from school and had spent the past couple seasons exploring all the steep chutes along with Emil Tanner and Jim Conway. They all showed Doug how it was done and he took it from there. Suddenly everything jumped to the next level. The ski patrol called them the Chutski Brothers. Once Doug discovered the Ridge, he lost interest in ski racing, and by the end of that second season he had blown off the team altogether.

The Chutski Brothers regularly skied things that had never been skied before—never even considered before. For instance, for chutes that were impossibly narrow and death-defying, they simply triggered a sluff, which they would ride down. As it reached the choke, it welled up and safely floated them through the snaggletoothed gap, like being carried on an ocean wave. After the wave passed the choke, it spread out and as soon as their skis touched solid snow again, they would 45 out of the sluff off to the side and ski hanging patches of snow that had never seen a ski track—ever. They jumped series of cliffs, connecting impossible patches of snow. They learned the intricacies of sluff and slab management. They invented the sport, right there in front of us. Doug has been called a pioneer, and he certainly did his share, but what set him apart was that he did it with a style, athleticism, and beauty that had never been seen before or since. Many tried to emulate it but everyone came up short.

I came along whenever I could, but not often enough to be a certified member of the Chutski Brothers, as I was too often distracted by my duties on the Bridger Bowl Ski Patrol and graduate school. But I was still part of the gang. We hung together not only at Bridger but also doing spring skiing trips to backcountry ranges, camping in the meadows and skiing the corn snow. We played on the soccer team together. We rode mountain bikes (Tom Jungst was a machinist who built bike frames and helped invent the first generation of mountain bikes). We laughed and loved and partied and rambled around in the mountains every chance we got. They were some of the best days of my life.

As for that beard and hair, like most people, Doug eventually had to get a real job to pay for his skiing—as a mud logger on oil rigs. In fact, we worked for the same company one summer. He cut his hair, shaved off his beard, and got contacts. Suddenly this movie-star-handsome man appeared in our midst—who could ski. God, he could ski.

Back in the early days, I was constantly lecturing Doug about avalanches because I could see that his trajectory was taking him on a collision course with the big dragons of the backcountry. And like most resort skiers, he was overly accustomed to the bombed-up and skied-up safety of Bridger Bowl and he had no inkling of the horrors lurking beneath the undisturbed backcountry snowpack. Doug finally saw what I was talking about when he went on a weekend ski trip into the Tobacco Root Mountains and triggered a huge hard slab on depth hoar, which he narrowly escaped with bruises and broken skis. That was it. Doug suddenly got religion and we spent endless hours talking about all the subtleties of depth hoar, surface hoar, and other lurking dragons, which he would need to quickly master if he was going to survive. He took Dr. John Montagne's quarter-long avalanche class and he became a compulsive snowpit digger. Eventually, Doug turned into one of the cagiest avalanche professionals I have ever known.

And the rest of the story is now legend, and others know the story much better than me, as our paths unfortunately diverged more than I would have liked. I followed a career as an avalanche geek while Doug, Emily Tom Jungst, and Jim Conway made their careers in the nascent extreme skiing industry as pro athletes and guides. Emil Tanner raced road bikes on the U.S. team and ended up in Boulder, Colorado. Jim Conway lives in Salt Lake City and we are still close friends. He is our Web site designer and we regularly collaborate on various avalanche projects. I was only able to get together with Doug and Emily every couple of years or so.

But for those that don't know the rest of the story: Doug and Emily moved to Jackson, Wyoming where he once again became the nucleus of a talented team of radical riders who completely transformed the Teton backcountry. Everyone knew that the fledgling Extreme Skiing Championship in Valdez, Alaska was a sham without Doug Coombs. So LifeLink in Jackson bought him a plane ticket and Doug handily won it. He had himself a good look around the place and decided to start the first guided helicopter skiing company in the Chugach. The Canadian helicopter skiing companies told him he was crazy to try to guide in such extreme terrain. He would either go broke, get killed, or both. Nevertheless, Doug, along with a team of the top freeride athletes in the world, pioneered a new sport in a new place and suddenly, ski photos and ski films shot in any other mountain ranges seemed so tame. Everyone flocked to Alaska. For the third time, Doug was at the center of yet another wave of steep skiing innovation. After Doug and Emily sold the business and after the ski patrol

Continued page 28 ➡

snow science

Snowpro Plus+ Tips and Tricks

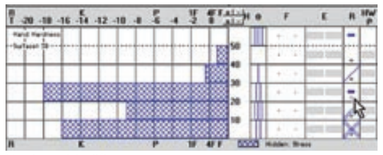
Story by Gary Sims

Snowpro Plus+ has a rich set of tools for constructing snow profiles and usually provides at least two ways to do anything. The follow tips are intended to help you quickly become proficient in using Snowpro Plus+. If you have specific questions or would like a specific topic covered in future tips, contact us at info@gasman.com with your request. You can download a demo version online at www.gasman.com/demorequest.htm.

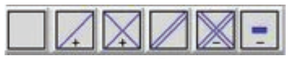
TIP 1: CHANGING RAM HARDNESS MODIFIERS

A new feature of Snowpro Plus+ is plus and minus hand hardness modifiers. This lets you set the hardness to be about either one or two thirds between the standard hardness settings allowing a finer resolution on estimated hand hardness.

The modifiers are shown with a small plus or minus symbol in the center bottom of the hand hardness icon in the snow layer as shown below. The width of the hardness bar in the left side of the graph will also indicate the end position either before or after the hardness scale I, K, P, 1F, 4F, or F.



Hardness Modifiers



Hand Hardness Icons on Toolbar

Note: The Fist modifiers do not include the minus and the Ice modifiers do not include the plus.

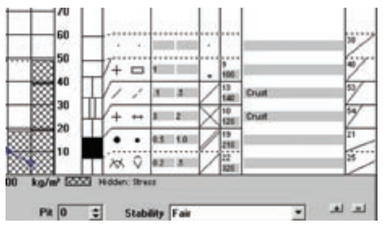
To Set the Hand Hardness Modifier for Layer, Symbol on the Graph, or Toolbar:

1. Position the mouse cursor over the hand hardness layer on the left side of the graph, or over the hardness symbol on right panel of the graph or over the toolbar hardness symbol.
2. Hold the keyboard Ctrl key down and click the left mouse button. The layer width and the hardness icon will change to reflect the current modified hand hardness value.
3. Repeat to toggle modifier between none, plus, or minus.

TIP 2: ALL ABOUT LAYER SLOPES

A little-known feature of Snowpro Plus+ is layer slopes. Layer slopes are a small indicator placed on the very right side of the layer information. This was initially developed to support users in Europe who used this information to visually flag the layer slope at different levels within the snow profile.

Layer slopes allow you to display the slope of the measured snow layer on the graph. The slope is plotted at the slope angle from the lower left of the layer in the slope column upwards to the right. The layer slope can be used in the plot lines for Shear Stress instead of the surface slope. This might give more accurate calculation of these lines and values in some cases. Layer slopes are optional and can be hidden. The numerical value of the slope can also be shown or hidden.



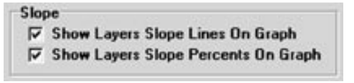
Hardness Modifiers

The surface slope is the same slope as displayed in the Slope field shown in the upper left side of the graph. You can set the surface slope at either location and the other slope will be automatically adjusted.

To Show or Hide All Slope Numerical Values Using Preferences

The layer slope is drawn at the angle specified. You can also show the numerical slope value in the upper left corner of the layer slope field.

1. Click on Preferences, Snow Layers Tab.
   - ▶ To Show: Check Show Layers Slope Percents On Graph checkbox.
   - ▶ To Hide: Clear Show Layers Slope Percents On Graph checkbox.



Enabling Snow Layers Slope Numerical Value in Preferences

To Show or Hide Layer Slopes Using Graph Properties Menu

The menu shown will depend on the current state of the slope lines. If they are not shown the menu will display Show All Layer Slopes. If the layer slopes are visible then the menu will display Hide All Layer Slopes.

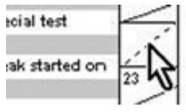
1. Right-Click on the Graph to open up the Graph Properties Menu.
1. To Show: Click on Show All Layers Slopes.
1. To Hide: Click on Hide All Layers Slopes.

Enabling Snow Layers in Graph Menu

Note: When the slope is hidden, the snow layer comments field is widened to display more text and the slope column is removed from the graph.

To Set All Slopes to Same Value:

1. Hold keyboard Shift key down.
2. Place the mouse cursor in the slope column at the desired layer.
3. Drag the mouse cursor up or down until the desired slope is set then release the mouse button. A dashed line will indicate the current slope position.
4. Repeat for each layer slope.



Setting Layer Slope with Mouse

Note: The slope value will be displayed on the status line at the bottom of the graph to assist in accurate setting.

To Set All Slopes to Same Value

1. Set any single slope to the desired value using above technique.
2. Hold keyboard Ctrl key and Click on the slope you want to copy to the remaining layers slope.

Note: The slope value will be displayed on the status line at the bottom of the graph to assist in accurate setting.

To Show or Hide an Individual Slope Numerical Value Using the Mouse

1. Hold keyboard Alt key.
2. Click on the slope you wish to show or hide the actual degrees next to the slope line.
3. Repeat for each layer slope.

To Hide an Individual Slope Line

▶ Set slope value to zero and the line will not display.

TIP 3: LABEL AND LANGUAGE TRANSLATING

Snowpro Plus+ was developed to support other languages than English. There are language translation files for Icelandic (islenka), French (francais), Spanish (català), and more in the works. While we do not directly support non-English languages, we do ship any language translations that users have sent to us to be used by anyone in the user community.

Two files ending in .slt and .sl2 contain every English text label in the software (about 1200). Two templates named trans.slt and trans.sl2 can be used to create a new language translation file set. When you select a translation file set and enable translation, then all English labels are replaced with the translated text.

You can easily change the text on any label by translating it to a different text label. For example, you could change "Air Temperature" to "Outside Temperature" by two different methods.

On method is to copy the two files trans.slt and trans.sl2 to different names such as english1.slt and english1.sl2 then edit the files with a ASCII text editor such as notepad and add the translated text. For the Air Temperature example above you would open file english1.slt and locate the section and label and change it as follows:

▶ [GRA:GRAPHLABEL] (Each section starts like this between square brackets)
▶ Air Temperature=Outside Temperature (left side is original text, right side is translated text)

Save the file, start up Snowpro and enable translation on the Main Menu Translation Menu dialog and select "english1" as your language. Exit the software, restart, and the label will now show as Outside Temperature.

Note: It is important not to put new labels on the right side of the equal sign that match labels already on the left side of the equal sign as you will get incorrect results.

Another method is to enable the translations and turn on the learn mode. The software will then prompt you for each label that is not translated. It is necessary for you to select all Snowpro options and dialogue boxes in order to get all labels translated.

The full details of language translations are detailed in the User Manual in *Appendix B - Language and Label Translation* which is viewable in the Help Menu.

TIP 4: SYSTEM TEXT FILES (The Real Meaning)

Snowpro Plus+ uses a number of text files to contain values which are in the drop down selection boxes. You can modify these using an ASCII text editor such as notepad. The files are located in the folder where you installed the software.

Note: It is important to not add extra or blank lines or change the length of the labels significantly as this may overwrite other text on the profile screen.

FILE NAME	DETAILS
aspect.txt	Profile Aspect (North, South...)
crydesc.txt	Grain Form Labels
crydescv.txt	Grain Form Labels (Flags module only)
handhrd.txt	Hand Hardness Symbols (+F, F…)
handhrdn.txt	Hand Hardness Labels (Fist, Fist+…)
handhrdv.txt	Hand Hardness Symbols (flags module only)
location.txt	Location - Built automatically using entered locations
obs.txt	Observer – Built automatically using entered names
prcrate.txt	Precipitation Rate Labels (Very Light…)
prcrate2.txt	Precipitation Rate Labels (VL <1 cm/hr…)
prctype.txt	Precipitation Type Labels (Snow, Rain…)
prctype2.txt	Precipitation Type Labels (*Snow…)
protype.txt	Profile Type Labels (Full, Test…)
shrcomp.txt	Shear/Compression Values (V - Very Easy…)
shrother.txt	Shear/Other Values (0, 1…)
shrrutsc.txt	Shear/Rutschblock Values (1 - Digging or sawing…)
shrshovl.txt	Shear/Shovel Values (C – Collapse…)
skycond.txt	Sky Condition Labels (Clear/No Clouds…)
surface.txt	Surface Roughness Labels (Smooth, Wavy…)
units.txt	Units Labels (Metres, Feet)
watercon.txt	Water Content Labels (Dry, Moist…)
wnddir.txt	Wind Direction Labels (North, South...)
wndspd.txt	Wind Speed Labels (Calm, Light…)
wndspd2.txt	Wind Speed Values (<1 km/hr…)

Gary Sims has developed computer software for the skiing and snow industries for over 20 years and has worked with the BC Ministry of Transportation to develop weather station and avalanche data collection software.

Jud with primacord and seismograph powder by Malcolm Mellor, originally published in *Avalanches*, Cold Regions Science and Engineering, Part III, p130

ART JUDSON: A Visit with an Avalanche Legend

Story by Tom Ross, reprinted from *Steamboat Pilot & Today*

Some guys name their boat after their spouse. Not Art Judson.

It might not sound romantic, but one of two obvious avalanche courses on the east side of Hahn's Peak is affectionately named "The Milly O" after Milly (Opie) Judson. On the left side of the peak there is a crooked slide path known as the "Dogleg." But the long straight chute on the right is named after Art's wife of nearly 50 years. And when you think about it, it's only fair. For all these years she has put up with a man whose career demanded that he rise in the middle of the night. When he left the house, it was to climb high into the mountains, just to see if he could start an avalanche.

He has been retired from his career as a U.S. Forest Service avalanche researcher for more than two decades. But excitement creeps into Judson's voice when he talks about snow and the laws of physics that can cause it to come crashing down steep mountain bowls and ravines. "I still get pretty wound up about it," Judson confessed. He keeps a weather station in his backyard where he records snowfall statistics and faithfully reports them to the National Oceanic and Atmospheric Administration in Boulder. And from his sunny dining room table, he can monitor avalanche activity through a pair of binoculars.

"See that shady patch on the side of the Sleeping Giant?" he asks a visitor. "It's the most prone to avalanches, probably because more depth hoar (crystalline layers) form there. There can be several a year — sometimes none in a year. But there are 26 avalanche paths on the north, northeast, east, and southeast sides of the Sleeping Giant. The slides just run year after year in the same places."

Youthful adventures

Judson grew up near Tug Hill, N.Y., and the snowy logging camps of the Adirondacks. His father, Oliver, was a contract logger, who moved frequently to be near his work. When he was 18, he followed his father west to continue logging near Ukiah, Calif. It meant he would become the first Judson in several generations who did not matriculate at Yale.

In 1953, he moved to Southern California and enlisted in the Marine Corps, missing the tail end of the Korean War. He began climbing in the San Bernardino Mountains and later joined a buddy from the Corps in Boulder, where the rock climbing became more serious. Art met Milly while both were working with Mountain Rescue. If you ask him, he might admit he fell in love with her because she was a better climber than he was.

He learned humility on South Arapahoe Peak when he misjudged how difficult an icy slope was. "I think I was overconfident because of my ice climbing experience. I didn't think I needed my crampons, and I fell off an avalanche slope wearing a 50-pound Kelty pack," Judson said.

He pursued geology at the University of Colorado, but Judson found he didn't enjoy studying rocks as much as he enjoyed climbing them. In 1957, he left Boulder for Corvallis, Ore., where he studied forestry. He earned his bachelor's degree in 1960.

In Oregon, Judson and his climbing buddies were exposed to the big volcanoes of the Cascade Range. They climbed Mount Hood and Mount Baker and two of the three peaks known in Central Oregon as The Three Sisters. They made a trip to Washington and climbed Rainier. Climbing partner Bert Brown recalled the time Judson introduced him to a four-legged member of the team for an assault on the South Sister. "Jud had a Siberian Husky named Kawatchee. A few minutes out of camp in the forest, the dog collided with a porcupine, and as you can imagine, that was noisy. We used a rope for crevasse safety on the South Sister glacier, and Kawatchee was the 'middleman' on the rope. That was the only time I've done such a climb with a dog."

"Head full of snow"

It was a magazine article that prompted another shift in Judson's career plans. "In my junior year, I read an article in Coronet about snow rangers who were practicing avalanche control in preparation for the 1960 Winter Olympics at Squaw Valley, Calif. I thought, 'That really sounds like what I'd like to do,'" Judson recalled. "That's what turned me on to snow.'"

Judson landed a job as a snow ranger with the Arapaho National Forest and became a protégé of veteran snow ranger Dick Stillman, who was the head avalanche forecaster in the region. From a base in Golden, they conducted extensive research into snow conditions and the behavior of known avalanche zones on Berthoud Pass. They helped to document the history of more than 185 known avalanches on the Front Range. "My whole head was full of snow at all times," Judson recalled. "That's all I thought about." Stillman taught him how to approach known paths of small avalanches with relative safety, and how to set them off with a hard check turn of his skis. "We would get up in the middle of the night in storms and study density trends and the quantity of blowing snow," Judson recalled. "We sometimes worked 20 hours straight. When you work long, long hours, you learn that much more. It was a labor of love."

Most often, the men carried backpacks stuffed with explosives. They used "seismograph sticks," each about 3 feet long and weighing 5 pounds. The sticks contained a mix of dynamite and other compounds and were set off with pull-wire igniters, Judson said. He remembers detonating a seismograph stick and marveling at its effect. "The slope would shatter like a pane of glass," he said.

In his younger years, before Judson met him, Stillman was known for studying avalanche behavior by deliberately inserting himself into a slide. "He actually rode 50 in his first year of work," Judson said. "In the last one he broke his leg." Stillman was wiser and more conservative when Judson attached himself to his mentor, and they had a rule that they wouldn't touch a slope with more than 18 inches of new snow on it.

Still, Judson had his own unpleasant brushes with avalanches. "I got caught in two over a period of 25 years," Judson said. He recalls a time on Berthoud Pass when a safety rope saved him from a dangerous ride. "My partner roped me down about 30 feet to a line of stakes where I wanted to take readings. I heard a sound like a rifle crack," Judson remembered. "This entire slope took off below me. I fell straight down about 7 feet to the bed surface. I was looking at this huge mass of snow. It was like I was in the front seat of a Greyhound bus, looking out the window."

Another time, Judson was buried to his neck in a slide and Stillman dug him out. His children were ages 2, 4, and 5 at the time. "I worked the rest of the day and didn't say anything to Milly for several days," Judson recalled. "It does make you begin to think." Judson's son, Mike, doesn't recall the day his father was caught in the slide. However, his memories of accompanying him to witness the triggering of an avalanche on Berthoud Pass are distinct. "I remember like it was yesterday," Mike Judson said. "We took the chairlift on the west side of the highway, where the avalanche paths were, and skied down toward a run called 'The Roll.' I was maybe 11 or so, but a pretty solid skier from all the time we spent at Mount Werner. We skied down to a certain point where the slope began to get noticeably steeper, and that's where we stopped. My dad and others in his group used a type of explosive to set off avalanches. At a given signal, we all covered our ears. That didn't stop us from hearing the loud 'bang!' As I stood above the hard slab avalanche and looked down the hill, the snow looked like a big, fast-moving river as it roared away. It definitely was an unforgettable day in my youth."

"The highest of honors"

Over the course of his 25-year career with the Forest Service and even in retirement, Judson continued to write research papers about avalanche science. He is credited with founding Colorado's avalanche warning program. The Judsons built their home in Steamboat Springs in 1969 and moved there permanently in 1993, after Art retired from the Forest Service.

Judson is keenly aware that more people than ever are skiing and snowmobiling into the Colorado backcountry and potentially putting themselves in harm's way. "It's a different kind of thinking today," he said. "People have a lot more knowledge (about avalanche conditions) and they don't want to be told you can't really forecast these things accurately." One of the most dangerous qualities of avalanche paths, Judson said, is that a skier or snowmobiler might traverse the same path many times without incident. That experience builds a false sense of security. And then, without warning, one day the slope lets loose. "It might be a matter of micro fractures buried in some layer and when it starts, it propagates at the speed of sound," he said.

Former colleague Ron Perla of Canmore, Alberta, Canada, said for decades, Judson has served as the conscience for the field of avalanche research. Judson always was able to sort through some of the "nonsense" being published in the field and bring it back to science, Perla said.

"When it came time for Noel Gardner, the father of Canadian avalanche studies, to convert his many years of field and theoretical experience into a publication, he chose Art Judson as co-author," Perla said. "Noel could have chosen a co-author from other candidates in Canada, USA, Switzerland...but he chose Art Judson. Noel's endorsement is the highest of honors."

Contact Tom Ross, Steamboat Pilot, at tross@steamboatpilot.com

From: Art Judson
Subject: The World According to Jud
Date: August, 2006
To: Lynne Wolfe <lwolfe@tetontel.com>

Tom Ross of the Steamboat Pilot called me and wanted a story so he came to the house and I just talked to him more or less starting when I was a little boy awed by snow. He picked up what he thought the readers would like and put it together. So "my version" was never on paper except for a couple of short e-mails I sent for clarification, but which weren't included. I think the story is copyrighted so I don't think we could just take it and start changing things. May I suggest running it as is with typo corrections and then use a brief addendum which I could write to balance it on my two years as a snow ranger and 21 as a scientist with the Forest Service Alpine Snow and Avalanche Research Project at the Rocky Mountain Station and highlight a few research and operational accomplishments?

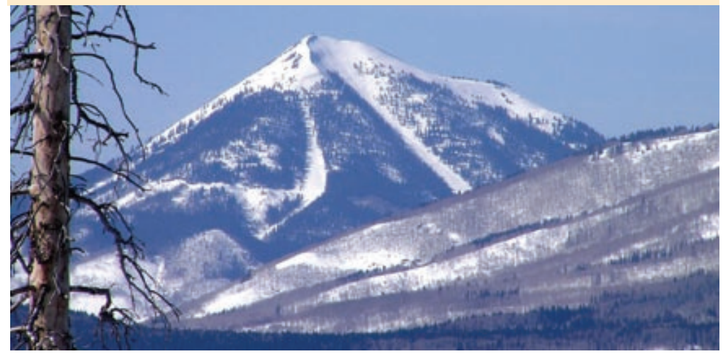
Publications since retirement could be mentioned: "Snow Booklet…" and AMS Bulletin paper "Density of Freshly Fallen Snow in the Central Rocky Mountains." I spent four of my retirement years collecting the density data for two of the many locations analyzed in the AMS paper. One of them was accessible only by skiing into the forest a mile to the site. Still seemingly not getting enough, I worked for three more winters collecting weather, snow, and avalanche data from the Steamboat Zone for CAIC. With it came a twice-daily analysis of snowpack conditions. So there I was working sometimes 16 hours a day at the age of 72. Crazy…

I would like to include a picture of the Milly O. avalanche path I named for my wife. I never told Tom, but 40 years earlier I named paths after my three boys, a dog, and even the cat.

I've also written a book on my career in avalanche work which I've not taken to the publisher. It's just sitting on the shelf in my office. But I must say the snow ranger job was the best I ever had. It didn't pay much (especially 46 years ago), but I was on my own with no administrators in sight. Few things are as much fun as blowing up avalanches at dawn, or failing that, skiing them off by the hundreds.

Jud

Art Judson checks the snow stake behind his home in Steamboat Springs before submitting data to the national Oceanic and Atmosphere Administration in Boulder. The stake is so tall because it was previously stationed in the Elk Range, where the snow really does pile up to 10' deep. *photo by Tom Ross*



Right: Hahn's Peak with Milly O and Dogleg slide paths. Other paths bear the names of Judson's three sons, a dog, and a cat. *photo by Will Carlton*

ART JUDSON:

To this day I ski the Park Range backcountry powder and play with weather, snow, and avalanches. I'm still doing it at 72, yahoo.

photo by Tom Ross

Early Colorado Snow Ranger

Story by Art Judson

With some persistence, I rode luck into the snow business. A Forest Service recreation chief named Johnny Herbert told me that snow ranger jobs were a dead end. There was no career ladder, the work was seasonal, the pay low, and the jobs increasingly hard to find. Furthermore, some Forest Service people didn't think FS personnel should be actively engaged in avalanche work, bless them. There was no work for me on the Wasatch that year or the next. In Denver the Forest Service might have an opening when I graduated from Oregon State. In spring of my senior year I received a letter from the Forest Service regional office in Denver. They offered a snow ranger position for me at A-Basin and Berthoud Pass, if I was willing to work as a recreation planner in summer. I took the job.

My first mentor was Dale Gallagher, the Forest Service district ranger at Dillon on the Arapahoe NF. He was shooting avalanches at A-basin and showed me the ropes. The Palivacinni he said was a dangerous avalanche path. Unpredictable. We'd shoot it and others, open and close slopes to public skiing depending on snow and avalanche conditions and ski. On alternate weekends I shot and skied off avalanches at the Berthoud Pass ski area. Howard McMillan was the snow ranger there and I was all ears. I soon met engineer Whit Borland who came up weekends to dig progressive snowpits and record stratigraphy. Whit had controlled avalanches near Camp Hale as a member of the 10th Mountain Division U.S. Army in 1942. He had written a series of snow and avalanche reports and was an expert. I pestered him with questions and read all the reports more than once. He showed me the layers, taught me about depth hoar, sun and rain crusts, density inversions, blowing snow, the new snow crystals, the ram penetrometer, the Army's steel SIPRE density tubes and the avalanches here there and everywhere across Colorado's Front Range.

Before my second year as snow ranger, Dick Stillman returned to the Arapaho NF from his work as avalanche control chief at the Squaw Valley Olympics. We immediately hit it off, and while we did some recreation planning together in summer we often found our way back to Berthoud Pass to splice cables and get instrumentation ready for the coming avalanche season. Quickly I learned that cables were endangered by bulldozers, marmots, lightning, icing, water, snow creep and glide, and lift operators. It was a constant battle to keep the data we needed for avalanche forecasting readily available. Stillman had 11 years of avalanche experience when we started working together. The following winter we spent long nights in the snow ranger's quarters renovating instruments, keeping records, fixing the esterline recorders, making up fuses with caps, swapping stories, and sometimes sleeping on cases of seismograph powder stuffed under the beds. It was a blast. We'd talk for hours about avalanches, snow deposition, triggers, rain on snow, categories of unstable stratigraphy, and administrators we didn't like. By day we brought down the avalanches and dabbled in research with experimental design help from Ed LaChapelle. There weren't many jobs like this as we were free to run our own schedules. Life may have been too good. Soon word came that the snow studies at the pass would be shut down so I was job searching once more, wondering if ever I would work with snow again.

The new job came in fall 1962 with the Rocky Mountain Research Station in Fort Collins. I managed to get in on the ground floor of the Forest Service's Alpine Snow and Avalanche Research Project headed by Pete Martinelli. Swiss engineer Hans Fruitiger was there, on a year's sabbatical from the Swiss Federal Avalanche Institute for Avalanche Research. He designed structures for avalanche control in the starting zone, while I worked on stability evaluation and would continue to notify the public when dangerous avalanche conditions existed in the Front Range. In a few years, new money found its way to the project courtesy of hard work by Pete and his connections with the Climax Molybdenum Company and the Urad Henderson Mine. With new funds we hired R.A. Schmidt who pioneered models in blowing snow and designed and built snow particle counters for measuring snow transport. R.A. suggested there was a nearly one-on-one relationship between avalanches and blowing snow. He was right. Dick Sommerfeld came aboard later to work with metamorphism and snow deformation in an avalanche-starting zone. Knox Williams started in 1970 and took over my work with the Westwide Avalanche System. By 1973 the avalanche-warning center became operational. Knox would soon run the center with help from Don Bachman. Richard and Betsy Armstrong joined the center as forecasters and researchers soon after. Ron Perla wrote the 1976 *Avalanche Handbook* at the station and worked simultaneously with fracture mechanics. Over the next 22 years the project and cooperators produced more than 170 publications on weather, snow, and avalanches. The station was a good place to work and project members traveled to snowy places from Antarctica to western U.S., Canada, Alaska, Europe, and Japan. Along the way I skied avalanche paths with Dale Gallagher, Whit Borland, Dick Stillman, Hans Frutiger, Ed Henion, Ed LaChapelle, Ron Perla, Norm Wilson, Rudy Somrak, Knox Williams, Will Bassett, Juris Krisjansons, Kenny White, Noel Gardner, John Harmening, Bernie Kingery, Don Huber, Ralph Kimmerly, Bob Lawrence, Mike Dolfay, and others. Stillman set the record for most rides in avalanches while Gardner had the best bear stories and a terrible encounter with one tree-climbing grizzly that bit Noel's thigh to the bone. That was a bit much so he hammered the thing on the nose and down the tree it slid. Noel nearly died a day later in a Banff hospital but soon was back on skis. His facilities at Rogers Pass were as grand as his avalanche paths. Years later I learned that all good things come to a close. The project was cut in 1984 and I managed another year to finish work on an avalanche-forecasting model.

We moved to Steamboat Springs, CO, and to this day ski the Park Range backcountry powder and play with weather, snow, and avalanches. I'm still doing it at 72, yahoo.

You Never Can Tell

Song written and performed by Chuck Berry*
with commentary by Jerry Roberts

Kino Mine is threatened by Grand Turk's wind-loaded east face. *Photo by Mark Rikkers*

Winter of '05/06. The San Juan Mountains had been experiencing a sub-par year for snow especially when compared to the previous above-average season. In a La Niña year, storms generally track north of our southern mountains the first half of the season and arrive the latter part of January through April.

March 8-13. We received a decent storm brought to us on southwest flow. 75" of snow fell at Molas Pass (37% of average on our SNOTEL site) on the south end of Highway 550 and only 24" fell on Red Mountain Pass to the north. New Air Helicopter was called out for a control mission, the first one of the year. It wasn't a big deal; only a few paths gave up their goods and were road hits, but nothing special. The new snow seemed to have locked up because of its weight and warming air temperatures.

A few days later on March 18-19, a small southern storm brought us 13", which lulled me into lowering the highway hazard a notch. Prior to this storm and post-storm there were no indications of instability. There was no natural activity in our forecast area which encompasses many square miles of terrain and several hundred paths that can affect the roads.

The Kino Mine path released at 9:30 on the morning of the 20th as the rising sun covered the east face of Grand Turk and after the path had several 30-lb shots placed in the upper starting zone with negative results during the March 8-18 storm. Maybe this was a situation of destabilizing the snowpack? This precip event was a minor impulse with south winds that averaged in the mid and occasionally high teens and cross-loaded the east face of El Turko. One can never underestimate the power of wind.

Pat Ahern, snow safety director at Silverton Mountain, which is down the road on State Hwy 110 (another of our forecast responsibilities) said to me, "I expected more activity, but when the storm rolled through and we were only getting class-2 slides (artificially triggered), I thought the early weak layers would plague us throughout the whole season. But they weren't, so when the Kino went I was surprised. My boss was wondering why I was busting the budget with no results."

Fortunately no vehicles were in the track of the Kino when it plowed onto the highway from a 2500' descent. In the past it has taken out the guardrail and can continue downward into the Animas River canyon another 800' below the highway (a serious plunging avalanche). Two piles of debris, 7' deep by 175' in length, buried the road. At least once a year, if you're lucky, you'll get surprised by one of the many paths we monitor.

Mike Friedman said to me as we talked about my Kino drama; "It's not if but when something is going to hit the road unexpectedly. You've got to think outside the box, but even so there are limitations of resources such as firepower and timing. When we [Heli-Trax] had the avalanche mitigation contract with CDOT we were fortunate to be able to live by the creed: *It's only time and money.* But for CDOT and you as the forecaster under the gun, there has to be a rationale for every shot. Today's record is tomorrow's quota."

The 1992, CDOT/CAIC forecast agreement stated that CDOT was responsible for the avalanche mitigation and the CAIC forecasters were advisors and would call for control missions. The goal was to call for avalanche-reduction work more than in the past (before 1992); more missions would theoretically mean more triggered avalanches and hopefully those avalanches would be smaller in size with fewer road hits.

The million dollar question: Would the results be different if we had unlimited mitigation resources? I'm not sure, but I don't think saturation bombing of our terrain is possible, nor the party line to be followed, and even if it were, I'm not convinced that we would be any more successful with this schizophrenic snowpack. Burnie Arndt, ancient snow viewer, shared his snow philosophy: "Forecasting the Colorado snowpack is not unlike attending to a very disturbed psychiatric patient. You have to make accurate observations, occasionally poke him in the belly, and then create a list of appropriate questions to ask, or the answers could be very misleading with things that you really don't want to know."

Shooting with the slightest provocation is not forecasting, but we need to shoot when necessary. Pressure to have avalanche debris cross the centerline of the highway should not be **nor do I believe *is*** the driving force of the avalanche-reduction program. Timing is the major ingredient of successful mitigation plus the right amount of explosives added to the equation. Unlimited explosive work doesn't solve the problem of our conditionally unstable pack. The forecasters' goal is similar to the old Chicago joke, "Vote early and often." We want to see more avalanches with less snow on the road by pecking away at the problem with greater frequency and not let the hazard build to an unacceptable level.

Experience is **BIG**. We have an overwhelming amount of terrain, avalanche paths, and great distances of highway in three counties that on a good day will take six hours to drive. This makes it physically impossible to micromanage our forecast area. When a big storm rolls in, it's all hands on deck. The two forecasters are up to their asses in alligators and cannot be everywhere at once. We have to prioritize highways and avalanche paths to be dealt with and slowly work towards the goal of having paths mitigated and roads opened. You have to rely on remote weather stations, SNOTEL sites, snowplow-driver observations (drivers who might under or over state conditions when under the gun) and your own take on the scene. How the storm is developing and what is really happening? **Ground Truthing!** A famous dictator said, "Regard the essential—disregard the nonessential." After going through all of the reasons and excuses, it's usually blamed on pilot error and, really, the snowpack is the final jury on any decision that's made.

The inherent uncertainty of what we do as highway forecasters is just part of the job that you either accept and hope that you are right more than you are wrong or you don't accept and find yourself a new career. With more than 50 miles of highway and about 200 slide paths to think about, you soon realize you get paid to worry! Our avalanche problem isn't like ski areas where you close the gate at five and go have a beer. The highway has a heart of its own that beats 24 hours a day and the mantra is "keep the road open" so it's not an 8-hour shift. You worry full time. Guess it's that simple.

art of wisdom-
slowly learning
to be wrong

I listened to some sage wisdom offered from two people I respect. First, Art Mears said to me, "You know, internationally, explosives are not known to promote stability in structures." Secondly, Ernie Kuhlman, a 20-year CDOT veteran on Red Mountain Pass and a very understated guy, said after the Kino hit, "You never can tell."

**Chuck Berry is an occasional "guest forecaster" at the Silverton Avalanche Forecast Office when he is on tour in southwest Colorado. Jerry Roberts is forecaster for the Colorado Avalanche Information Center-Silverton Office.*

media

Avalanche Acres

By Snow Lips

ACT I: SCENE I

Place.... Just outside Snowfall....

The warm downslope Punta winds wafted sultrily through the deep valley, the dripping sounds of fast melting snow echoing from cabin to cabin. A lone figure trudged slowly through the deep mush, casting concerned glances to the towering snow-covered slopes silver crescent moons and stares, the Ayatollah-like person of Obie Juan Chaparral appeared deep in thought oblivious to the cries of two ladies who had just begun the trek across the long clearing behind him. Suddenly a long crack appeared high on the east flank of Mt. Mortician and a low, rumbling, rushing sound slowly filled the valley.

Do the deep rumblings indicate the work of the Schlitz brothers, the avalanche control specialists from up-valley Codger Pass, or the mind-rending effectiveness of Dan McCloud, whose preference for big explosives has become legendary? Will the imminent slide quiet the happy shouts of the young ladies forever?? Will Obie snap out of his trance and realize the danger??? Will he care???? Tune in next month for the continued saga of Avalanche Acres.

ACT I: SCENE II

As we rejoin our friend Obie Juan Chaparral and his female pursuers, all eyes save Obie's (who remains deep in thought about his recent losses of the snow bunny track), are turned upwards toward the lofty peak of Mt. Mortician as a mighty slab plummets toward Snowfall. As the avalanche reaches the valley floor, its rumbling snaps Obie out of his trance, he whirls about just in time to see the women engulfed as snow fills the clearing and hurtles toward Main Street. Obie's s face becomes a mask of terror as he runs to the debris and begins a hasty search. However, Obie soon relaxes as he realizes the tavern, the Wizard's Roost, has been left unscathed by the avalanche.

Fortunately for our heroines, Obie was not the only person to witness their fate, and soon a large group of locals rush to the scene, including Bic Legweek, who recognized his wife Bitsy and her friend Sofia Borgeson just before they disappeared. As the crowd grows, confusion reigns, made even worse by Bic's barely intelligible sobs about some unpaid insurance premium. Obie, always alert to ways of turning disaster into opportunity, seizes the moment and opens the Wizard's Roost early, serving a special rescuers brunch.

As would-be rescuers stream into Obie's tavern, the local forest service snow ranger, Zeke Tartinelli, puts his government training to work organizing the crowd into study groups to determine the most environmentally acceptable method of rescue. Skeeter McLehrer, known for his work on avalanche impact pressures on hot tubs, is appointed to write the environmental impact statement, while Doc Nilliam's typewriter runs rampant in chronicling this exciting new disaster.

With all of this organization in place the rescue effort quickly became a well-oiled machine. The only sounds in the tavern are the low murmuring of the study groups, the clink of beer steins and the happy jingling of Obie's cash register.

Will the unfortunate women be rescued in time? Will an environmentally sound method of rescue be approved. Will the Forest Service disavow any knowledge of snow? What was the ladies pursuit of Obie? Will Obie's cash flow problem be solved? Tune in next month for the answers to these and many more questions.

Continued next page ➡

CAST OF CHARACTERS IN ACT I
(in order of appearance)

Obie Juan Chaparral— Eccentric town wizard and avalanche soothsayer. Obie's constant chanting and glowing moons have become a local source of petite mal. However, few have knowledge or comprehension of the true extent of his mystical powers.

Sofia Borgeson— Newspaper heiress Sofia owns the local newspaper, *The Whiteout*, and has reputedly been a one-time mistress to an unknown number of miners.

Bjorn Wontson— Outside snow consultant specializing in depth-hoar mining, Bjorn has more than once found amazing wealth in heretofore unsuspected TG growth in shoe soles of the slow-moving local populace.

Nob Dockman— Swarthy local mining kingpin in charge of the Harriet Hoar Mine.

Dan "Shrapnel" McCloud— Brilliant but moody explosives specialist for the local ski area, Snowblaster on lofty Mt. Mortician. Dan's dislike for the "gentler, kinder explosive" is legendary.

"Doc" Nilliams— Previously unemployed since infancy, Doc now chronicles avalanche fatalities in Runout Valley, when he's not out smashing frozen croquet balls on the local miniature pitch 'n putt at the lovely Debris Dunes Country Club.

Chet Frier— Canadian Snow Bracero whose *Avalanche Atlas of Runout Valley* is the center of fierce local debate since its inception. Inspired by an unknown snow demi-God, Chet has compiled some 32,009 atlases depicting potential slide areas on every topographic feature above sea level.

Zeke Tartinelli— Pursued by the Mafia through avalanche terrain in northern Italy, Zeke outwitted his Italian brothers through controlled application of sports blasting and now finds haven in the heretofore peaceful confines of the Forest Service Snowfall Guard Station.

Bitsy and Bic Legweek— United through advances in innovative transceivering, B and B now attain livelihood through speculation and trading of Hoar stocks.

Skeeter McLehrer— Noted snow-science author of *The McLehrer Report on The Effects of High-Mileage Japanese Cars as Avalanche Barriers*; also language translator for the Canadian Snow Braceros, eh?

The Schlitz Brothers— Avalanche-control specialists from Upvalley Codger Pass; strong advocates of Civil War artillery for effective avalanche control.

Bart Beers— Forced into managing a crystal consulting corporation by improbable charges of slush racketeering with Amalgamated Avalanche, Bart also investigates potential criminal avalanche fraud as BART BEERS—AVALANCHE DETECTIVE.

Lars Mudson— Research leader for the Soils Hills Farm and Home Avalanche and Gardening Stations, Lars specializes in "Passive Protection through Creative Poppy Planting."

Huckleberry McThias— Wino turned sharecropper turned FBI informant. Huck is on the track of a hoar embezzler and mail fraud expert whose illegal usage of the postal system for vast mail-order hoar crystals has resulted in repeated flooding of the Los Angeles post office. Huck is also a noted test pilot for the fabled zero-gravity chicken suit.

Nick Sheraton— Former spokesman and CEO of WFA, Inc (Weenies For All), Uncle Bob (as known by close associates) now deals extensively in smuggling "heavy snow" isotopes, such as the highly radioactive and extremely mushy H20235 into Colorado snowpacks. "Helps 'em combat the Hoars, you know..."

Mortimer Marks— Perennially hounded by weather and acts of God, Mortimer has been struck by lightning 17 times, severely affecting his mental stability. Despite these drawbacks, Mortimer has defied logic and runs the infamous Colossal Center for Crust Control (CCCC), whose whimsical Forecasts of Flight and Fancy are oft subject to user derision.

Any resemblance, however slight, to the following persons is purely coincidental, and any resemblance to any other persons, living or dead, is mostly unintentional: Betsy Armstrong, Richard Armstrong, Don Bachman, Sue Ferguson, Liam Fitzgerald, Geoff Freer, Art Judson, Ed LaChapelle, Rich Marriott, Pete Martinelli, Barry Mathias, Dave McClung, Art Mears, Mark Moore, Rod Newcomb, Ron Perla, Andre Roch, Peter Schaerer, Walter Schleiss, Fred Schleiss, Knox Williams, Norm Wilson.

The Genesis of Avalanche Acres

Story by Rich Marriott and Mark Moore

Avalanche Acres was born in 1982 after the ISSW in Bozeman, Montana. The first issue of *The Avalanche Review* was distributed at the Workshop by creator and publisher Sue Ferguson. Sue had the misfortune of being part of the Seattle contingent that traveled in a less-than-straight line from Seattle to Bozeman in a large University of Washington van along with six other people (Ed LaChapelle, Mark Moore, Rich Marriott, Cindy Marriott, Paul Baugher, Pam Speers-Hayes, and Snow Lips). Besides the euphoria of a great ISSW, the happy adventurers were overly stimulated by excessive socializing in the sauna at a local motel, excessive amounts of time in Boiling River in Yellowstone, long loud serenades of Demon Drums (reminiscent of a failing transmission), and the capture and taming of a large inflatable Oscar Meyer wiener. On the return trip to Seattle, there was much discussion about TAR: how to add some fun to it and make it a part of the avalanche community. Snow Lips hit upon a continuing soap opera based on the many personalities in the avalanche business. A shudder swept through the van like an avalanche (actually it was the start of track 3 of Demon Drums) and ideas for story lines and characters cascaded out of the group. The first act of *Avalanche Acres* was fashioned during the next eight hours on (and occasionally off) the road back to Seattle. And the rest is history.

Mark Moore is director and co-founder of the NW Weather and Avalanche Center. His forecasts often issue in rhyme. Rich Marriott is co-founder of the NW Weather and Avalanche Center and secretary of the ISSW Steering Committee. He really does know nothing about inflatable Oscar Meyer wieners.

A long time ago in a galaxy far, far away...

Story by Steve Conger

Somewhere in the empire of snow and learning, possibly in some late-night collegiate discussion of saving the world or just finding the holy grail in a snowpit observation, a small individual walked through the door and entered into conversation (rumor has it bearing an unopened bottle of very old single-malt scotch). That evening, Snow Lips passed on the oral tale of Snowflake. Sue Ferguson, being privy to the tale, carefully chronicled its contents and colons. She shared salient selections with the wider community of amused avalanche addicts through publication in early editions of TAR. The identity of Snow Lips remains clouded in cloudiness and a meta-mystery still today. The original manuscript was found locked in antiquity on a 6" floppy disk, so several secretive snow sprites salaciously scribed the subsequent story from previously printed accompanying archival-quality continuous-feed printer paper. Research is underway by some of the greatest minds in avalanche science to uncover the identity of Snow Lips and any real personality that the entirely fictitious characters in the story have no relation to or resemblance of whatsoever.

The Continuing Saga of Avalanche Acres by Snow Lips is presented here to honor Sue and her brilliant bohemian humor amidst her other great accomplishments.

"Many of the truths that we cling to depend on our point of view."
—Obi-Wan Kenobi

In past lives, Steve Conger has been, among other roles, TAR editor, UDOT forecaster for Little Cottonwood Canyon, and Patagonia product manager. He is currently dividing his time between Vancouver, Roger's Pass, and Golden, BC, as he researches an electronic snow probe.

Avalanche Acres

continued from previous page

ACT I: SCENE III

As we rejoin our hardworking heroes, the rescue study groups are beginning to break up and several facts have come to light. Bitsy and Sofia were apparently carrying an urgent message for Obie Juan Chaparral, one which might affect people in the valley. No one knew for certain the exact contents, but it may have included damaging information, information that certain parsons would do anything to stop, making foul play a possibility. Finally, Doc Nilliams said the unsayable, "Suppose this was not a natural?"

Suddenly a voice with a thick Canadian accent spoke up, "eh!" it was Chet Frier, famous avalanche mapper. "This area is not in my atlas of Runout Valley, eh!"

"What?" Doc shot back. "Can anyone understand old Chet" fortunately, Skeeter McLehrer spoke fluent Canadian and translated, but old Chet fell asleep, exhausted, before retelling his entire story. But enough was heard to cause anxious glances at Chet's sleeping form.

Suddenly a shadowy figure near the back of the study groups moved forward. "Maybe I can help"

"Who are you?" asked doc.

"My card," he replied, thrusting forward a paisley-covered object.

Doc's eyes quickly scanned the card, which seemed to move in his hand, having a life of its own: "BART BEERS-AVALANCHE DETECTIVE."

"Bart Beers! What is a famous avalanche detective doing in Snowfall?"

"I'm here investigating the contractor who snowshedded the miniature golf course. But this seems more important," replied Bart.

Suddenly the grief-stricken Bic Legweek grabbed Bart's arm. "Bart! I don't care how much it costs-your weight in depth hoar if necessary-but you have to get to the bottom of this!"

Bart looked at Bic, his hand resting unconsciously on his wallet. Nodding pensively, he muttered, "yes, this may be much more important."

Does Bart take Mastercharge? Does Bic have clout? What was this message Bitsy and Sofia may have taken to their graves? Will Obie's "rescuer's dinner special" go over big as the meeting continues? Shift your eye back to this spot in next month's Avalanche Review for answers to these and other big questions of life.

ACT I: SCENE IV

As vast plumes of steam stream skyward from the bubbling vats of chili at the Wizard's Roost, it is evident that the crunch is on for the big "debris dinner special." Only Bart and Bic, rapidly exchanging credit references for the upcoming investigation, seem oblivious to the overpowering odor of pickled chilies and tequila, among a host of other "secret sauces," which Obie is lavishly pouring into the splashing inferno.

The remainder of the rescuers, forced outside by flaming nostrils and nausea, have been roughly organized into probe lines by Tartenelli. But they are experiencing severe continuity problems due to the increasingly large cow herd which is descending on the scene of the slide. Skeeter's E.I.S. has already been rewritten three times as gradual browning of the avalanche toe occurs.

Meanwhile, another interesting development is occurring high upon Mt. Mortician in "Munch Gulch" near the big slide fracture. Bjorn Wontson, enjoying some of the finest wet crud skiing in recent years, has skied into a large blast crater just below Auger Alley and lies unmoving in an unpleasant position. Some distance downslope and rapidly disappearing into the trees, a lone figure sporting a large backpack is cursing his luck and lamenting the frustrations of small explosives.

Is the "Munch Gulch" crater a locally produced meteorological phenomenon? Is Bjorn just intensively studying some abstract crystal shape? Will the patrol sweep find him if he isn't just theorizing? What's in the backpack? Too many questions and not enough answers??? How about Bitsy and Sofia?? Their half hour's survival statistic may have lapsed... have they?? Will Obie's chili light a fire under the rescuers?? Will the propane cook stove explode?? Put your mind at ease knowing these and other questions will remain unanswered until next issue.

ACT I: SCENE V

Returning to the rapidly deteriorating scene of once organized rescue, it has become obvious to even old horizontal Chet Frier that perhaps Obie was slightly overzealous in his Herculean efforts to concoct an acceptable chili. A pitiful line of rescuers, interspersed with the ever increasing cow herd, appear throughout the mammoth slide debris, many resting deliriously but comfortably on their probe poles or shovels. Even the avalanche dogs, brought in by Lars Mudson, have succumbed to the combined effects of Obie's noxious concoction and baffling cow odor, and are crazily digging randomly into the chili-soaked snow. As the day wears on, only Bart and Bic seem somewhat removed from the confusion. Bic, pleading with incoherent and downed rescuers to "probe left, probe right, probe center, step forward," has become increasingly agitated as the tottering line falls back and collapses in response to his urging. Bart, calmly surveying the sordid slide situation from a safe vantage high atop the Wizard's Roost lookout, is busy calculating forces, pressures, other slide specifics, and the decreasing probabilities of the ladies' survival as he converses quietly with a semi-sober Doc Nilliams about local eccentricities of some fold around the valley, "you mean Obie never uses Shrapnel's snowpit data for his daily backcountry slide soothsaying?" inquires Bart incredulously

"Well, yes and no... you see... Obie spends so much time trudging in the snow and looking at the sky that other input is just... well...confusing and clouds the crescent moon...." responds a slowly sinking Doc as he drains the remnants of a yellowish bottle. "He... he got his magic cloak on a recent bartering junket to the Colombian Highlands ... and ... and ... claims the crescent moons emblazoned on the cloak speak to him ..."

"What!!! But you can't mean that all he uses to forecast are soothsaying, wizardry and some mystical cape?...I just can't..."but just then the rustling of silken robes at the lookout door and a tumultuous cry from the few still standing rescuers along with bewildered moos breaks the advancing train of deep thought..."hot damn!!!" exclaims Obie as he, Bart and a now staggering Doc lean over the balcony, observing what appears to be a rather sizable collapse and settling of the slide debris which has trapped an uneasy bunch of rescuers with a large bevy of excited cows...."I knew my crescent moons were glowing for a reason!"...Obie's eyes sparkle with delight.

Further upvalley...rapid staccato discussions are occurring near the "big blast" gunmount regarding the earlier round that apparently sailed merrily over the ridgeline toward the south from the newly installed 175 mm "long tom" howitzer ... "Aaachhh himmmmmel ... dubkopf .... I told you zat blind firing doesn't mean mit your eyes closed!!!!"

And back at the Harriett Hoar Mine... Nob Dockman is busily and happily sorting hoar crystals for their refrigerated ride northward to the big city markers. "Now, let's see ... too small ... got to throw it back ... let it grow a little ... now here's a real beauty, 87 facets in ornamented scroll.... oh boy...I'm rich, I'm rich..."but as he gloats over his finds a strange sound interrupts his delirium...a sharp crack followed with a whining sound that quickly fills the glittering confines of the mine.

"Didja hear that, Huck?" he queries his close friend Huckleberry McThias...who has automatically reached for his protective chicken suit.

"Dunnno, Nob, sounded sort of like my beagle arrrrooooooing ... shoulda left that filthy cur at home to buuuugle!"

Still perplexed, Nob carefully stacks his newest find in the quick freeze file for later surface transport via his own "Frozen Flake Truck Lines" and bewildered trudges off down the sparkling tunnel toward the mysterious emanations...closely followed by a much merrier Huck now in gala chicken attire....

Will the cows stampede when they taste the chili? Does Bic's pleading resemble a lovesick bull? Is Obie's moonglow for real? Is Obie for real? Will Doc fall off the balcony? Is Bart's mind piecing the puzzle or just puzzling the pieces? Where's Shrapnel McCloud? Where's that stray round from Codger Pas? How about that noise in the mine? Has Nob gone bananas? Has Huck gone berries? Did Sofia have her Skadi on? Too many moos for you?? Relax, sit back tips up, and think.... am I really reading this when I could be out eighting that lone track in south bowl???? Ahhhhhhh, but wait "til next month when these and other questions become more strange ... knowing that spring is not too far away and maybe Snowfall will just melt.

ACT I: SCENE VI

As the clouds thicken and the sun dims over Snowfall, increasingly alarmed moos ring out over the settling slide debris as irregular probe thrusts from the mostly horizontal rescuers now affect anything that moves. Bic has terminated his urgings of systematic rescue and now is busy imploring a huge bull to dig and paw in a likely burial area. High above the pervasive pandemonium, an increasingly crowded and top-heavy Wizard's Roost lookout is the scene of an animated and heated discussion, surrounded by a host of people seeking refuge from the chili fumes below, Bart is busy nodding and prodding suspects as he jots down notes in a tattered Wrong In The Rain notebook. Finally he stops writing and steps back from the pressing and unruly crowd..."silencio, por favor.... I need time to think!!" he bellows and his piercing eyes, not to mention his wildly swinging snow machete, quiet the crowd. Moments pass with the only remaining sounds being heavy snoring from the still exhausted Chet Frier and tired grunts from Doc Nilliams as he slowly tries to regain the balcony he tottered off earlier.

Then Bart nods to himself and breaks the tension...."several important points have been made and they all add up to the same thing.... that slide out there was not natural!!!!" startled gasps arise from the gathering and Obie's crescent moons seem to gleam more brightly. "Sure the snowpack was becoming more unstable.... but something big and unnatural released that slide!!! ""whaaat's that, ehh?" mouths a suddenly startled Chet as he wakens. "cloud seeding, eh! that's the answer, eh! this was a cloud seeding accident gone crazy!"

The crowd glares uncomprehendingly at a now satisfied Chet, while Bart continues..."Bjorn here tells me that while investigating the snowpack in Munch Gulch, he found wet snow quite a ways down...but apparently not weak enough to release with small explosives, right Dan?"

"Damn right, Bart...didn't have time to hook all these charges together, and ran out of primacord, too. It's weak and gettin' weaker, contrary to Obie's obs, but it sure needed something substantial to get her movin'. Had some small slides in brown bowl, though...where Obie tethers his herd, you know.... that's what brought them beasts this way...."

As the crowd begins to mutter, everyone is startled by three quick choruses of "Demon Drums". Just as the panicked crowd begins to pour over the railing on top of a still struggling Doc, Obie produces his personal portable telephone with the custom demon drums bell. "Bart, it's Codger Pass...one of those Schlitzes sound excited too!"

As Bart works his way toward the phone, a brief smile crosses his lips...while Obie, now deeply in thought, contemplates the appropriate cuisine for a midnight rescuers snack and where a surcharge on entertainment night be appropriate.

Returning to the Harriett Hoar Mine, Nob and Huck have now penetrated deep into an immense, glittering cavern where Scurvy, the beagle, remains bugling at a large snow deposit fallen from the ceiling.

"What's this, Huck, I've never seen anytin' like it? Just then a portion of the pile moves and Scurvy scuttles quickly away down an adjacent tunnel, yipping pitifully, followed closely by Huck who stumbles in his bulky chicken suit and collapses into a mass of writhing feathers and large plastic beak. "Whoa, there Huck, maybe it's only a snow snake!" Nob yells as he steps cautiously forward to investigate, probing; gently with his crystal catcher. to his surprise, and an apparently human hand breaks the surface... followed more slowly by a wiggling arm and leg trying to break through the hardening snow. "Holy Hoar! look at this!!" Nob exclaims, grabbing Huck by the coxcomb just before he could reach warp speed heading out of the mine.

Momentarily, more snow is cleared away by the searching hand and a choking, coughing face appears, clogged by snow. Suddenly Nob notices more movement on the other side of the large snow mound, filling Nob's mind with visions of a hoar junta. Meanwhile, Huck is revving up his chicken suit waiting for the right moment to make a quick exit.

Can you believe it? is Bart a believer? does Bic like bulls? are Dan and Obie as friendly as they seem? does Huck still respect Scurvy? Will Doc regain the balcony? what will the Schlitzes say? is the big slide a post-control classic? what hoar horror is happening at the Harriet? will Huck's chicken get plucked? is Nob's noggin in neverland? what spectacle is issuing from the snow? if you think you know, please send $100 cash and a nude photo to Snow Lips (all replies will be confidential and only viewed and enjoyed by Snowfall locals). otherwise, stay tuned to AVALANCHE ACRES for the final sordid scene next month and hope that spring comes late.

ACT I: SCENE VII

Returning to the increasingly legendary Snowfall, USA, where vast dreams of wealth and powder come and go as quickly as consumers of Obie's famous chili, we find a more tranquil scene where once pandemonium reigned. The cows have mostly meandered back to Brown Bowl, eager to be rid of Bic and his incessant urgings. Back at the Wizard's Roost, the cash register is once again happily jingling and the vats are bubbling as a content and much more fungible Obie busily passes out crème concoctions and sloe-gin slushes in preparation for his post-search extravaganza. Hastily scribbling some final entries in his scruffy notebook, Bart Beers, Avalanche Detective, climbs down to the Roost, trailed by Chet and Doc. Once inside, Bart climbs onto a tottering table, shouts for silence and waves his notebook in the air, "I've finally put all the evidence to together and now we really know what finally happened here in Runout Valley.

A toothy smile spreads across his face as he glances toward a glowing Bic who, embarrassed, disengages from a soulful embrace with an equally abashed Bitsy. Then his gaze shifts toward another equally colored lady, whose table is stacked high with drained libations and a copy of the EXTRA edition of the Whiteout. The huge headline reads: "PUB SOILED, BUT ASSASSINATION FOILED."

"First of all," Bart continues, "kudos are in order for Huck's bugling beagle, Scurvy, whose frenzied pursuit of his chicken-suited master caused enough vibration to collapse the Harriett Hoar mine and drop our buried heroines into Nob's arms...and of course cheers for the ladies, whose continued life has turned remorseful rescue ruminations into a joyful celebration of an improbable outcome." A chorus of hurrahs quickly returns to silence as the crowd ponders their recently delivered bills for Obie's exquisite, if somewhat pricey, cuisine.

"Don't celebrate yet!" warns Bart, the table wobbling beneath him. "I've discovered the hidden contributory factor to this whole mystery!"

"Well, what is it?" asks Bjorn Wontson, jealous skepticism coloring his voice "did the ski patrol do it?"

"Much worse than that," Bart replies, "have you noticed how everybody has been spaced out, disoriented, and acting very peculiar? Have you not wondered how the sharpshooting Schlitzes could overshoot so terribly and cause such a monumental catastrophe on our own Mt. Mortician?"

"Wow!!" "yeah, man!!" "Ain't it th' truth!" a chorus of catcalls and scurrilous remarks fills the air.

Taking a deep breath, Bart shouts out his finding..."Everybody involved in this mystery is a patron of the Wizard's Roost. Everybody has been drinking the rotgut booze and eating the weird food. There is only one possible conclusion: a psycho-active (psychically-active?) substance gas been put into everything served here at the Roost!"

DOG AT LARGE: The ISSW Wiener Story

by Rich Marriott and Mark Moore

photo from Rich Marriott collection

Stopping for gas and a midnight repast in the small hamlet of Thorpe, Washington, on their way home from ISSW 1982, the Seattle group scored a triumph in the small convenience store—cajoling, threatening, and ultimately securing the overhead inflatable Oscar Meyer wiener display for posterity. He became fondly known as "Oscar" and has been an active participant of every ISSW since, always nattily dressed. Sadly, Oscar was stripped of his dapper attire at ISSW 2004 in Jackson Hole and taken hostage by as yet unknown but obviously misdirected assailants. Recent contact from Oscar indicates that HW ["His Wienerness"] has been well treated, possibly adopted by an Amazon in Mexico. But his exact whereabouts remain a mystery. He will soon be appearing as one of the missing wieners on cartons of margarita mix.

MISSING!

HAVE YOU SEEN THIS WIENER?

NAME: "OSCAR" - ALSO ANSWERS TO "HW" OR "HIS WIENERNESS"

COLOR: HOT DOG RED

SEX: YES

HEIGHT: APPROX 36"

GIRTH: 12" (when fully inflated)

DOB: ISSW BOZEMAN 1982

DISTINGUISHING FEATURES: YELLOW BELLY BAND, VERY PLUMP, SLIGHT SAGGINESS FROM REPEATED SQUEEZING, MARKED FONDNESS FOR CHEAP BEER AND HARD LIQUOR

LAST SEEN: ISSW JACKSON HOLE 2004

IF YOU HAVE ANY INFORMATION THAT MAY LEAD TO THE SAFE RETURN OF OSCAR, PLEASE E-MAIL RMARRIOTT2@YAHOO.COM

$5,000 REWARD

Obie's face turns pale and his moons start to fade as the crowd turns to him and an ominous silence falls over the roost, finally broken by Shrapnel McCloud, "fire him out the barrel of an avalauncher, sort of a test round so to speak!"

As the din increases with more creative fates for Obie, we see him slowly turn toward the kitchen, imploring his dimming moons to transport him from the current unpleasantries. Suddenly he spies two lowly figures huddled in the corner around an empty bottle, bearded, bedraggled, and semi-conscious. With a dawn of comprehension the soothsayer points furtively in their direction and shouts, "It's the snake oil! It's them! They sold me a bottle of snow snake oil and I've been using it in the kitchen. They claimed it would improve my business!"

Renewed fervor among the crowd reigns as all eyes shift toward the two scruffy con men. "Yeah, of course, that's Nick Sheraton who tried to sell me a big plastic wiener," says Zeke Tartinelli, "claimed it would improve my status with the Mafia."

"And that other one, that's Mortimer Marks, who threatened to eat my legs if I didn't subscribe to his avalanche warning service," chimes Skeeter McLehrer.

"Hey, where do you suppose they got that snow snake oil?" asks Doc Nilliams. The gleam of his illicit profits suddenly flashing in his eyes.

"Poor fellows," observes Sofia, "that snow snake oil really put them in another dimension."

"P-poor f-f-fellows?!" cries Lars Mudson, silent all this time due to shyness. "why th-those chee-cheesy, chee-chee-cheeky.... th-they nearly k-k-killed you? Th-they d-d-d-destroyed th-the H-h-harriet H-h-hoar Mine! th-they sh-should be sh-sh-sh-shot!"

Sheraton suddenly sits bolt upright, mortal terror written across every feature, "no, no, anything but that, I'll take death first..."and then slumps back down into a stupor.

Anxious to get back on their sloe gin now that they know the secret disaster ingredient which has apparently solved this deepest of mysteries, the crowd readily agrees to become merciful. "ahhhh, just make them eat the chili here at the Roost for a month-eh?" murmurs Chet, busy slurping the bottom of his own slush.

Cries and glugs of approval sweep around the room, muffling the sounds of swishing robes. Only Bart and the sharp eyes of Dan McCloud watch Obie as he slides towards the door.

As the din of the celebration fades, Obie reaches his famous manor "Dark Snow" and with great effort raises the drawbridge behind him, leaving his moat full of man-eating snow flakes to deal with any unwanted snow supplicants or door-to-door crystal hawkers. Exhausted by the labors of the day, largely involving shuttling from the Roost to the bank with new deposits, Obie staggers into his bedchamber. Suddenly he gasps involuntarily, as the mesmerizing energy from two intense, piercing, yellow eyes attached to a black phantomlike figure look upon him from a darkened corner. Frightened, Obie reels backward, falling against the crystalline "Snow God" image his daily meditations focus upon. a deep rumbling voice command, "Ooooobie! Ooooobie Juan Chapparal! It is time!"....

Well, now, is this the end of magical snow management!! Is snowfall destined to be sans soothsayer?? Will a month of Obie's chili put Nick and Mortimer into orbit?? Will Doc Nilliams chronicles of this crisis be creditable?? Will Snowfall survive the long hot summer?? Tune in next fall as AVALANCHE ACRES insults your intelligence once again.

education

Avalanche Judgment & Decision-making Part III
Developing Expertise

Story & Photos by Laura Adams

A group of CMH heli skiers await their turn to ski Brad's Bowl in the southern Selkirks.

Several decades of Naturalistic Decision Making (NDM) research have shown that studying the skills experts use to make decisions in real-world settings can form the critical foundation of highly effective decision skills learning and support programs for less-experienced decision-makers. Using Cognitive Task Analysis and the Critical Decision Method, I studied the most significant decision-making experiences of a group of expert Canadian avalanche professionals.

In Part I of this series (TAR 24.2, December 2005), I discussed the processes and strategies that avalanche experts use to solve the decision problems they face in their profession. In Part II (TAR 24.3, February 2006), I discussed the human factors that negatively influence avalanche experts' ability to make sound judgments and decision actions. In this article, I examine the positive human factors that support sound avalanche decision-making. While human factors have received considerable interest in the avalanche field, most of the focus has been on their negative influence. I argue that human factors also exert positive impacts in avalanche judgment and decision-making. For example, while low levels of motivation to solve decision problems may lead to decision error, high levels frequently lead to decision success. Thus, taking a strength-based approach to enhancing positive human factors is a tremendous tool for decision quality enhancement and support.

PART III HIGHLIGHTS

- Motivation to learn and improve avalanche decision-making is a critical component for the development of expertise, for those who lack motivation will never perform at the level of experts.
- The level of skill and expertise a person attains is directly related to the amount of deliberate practice in which they engage.
- By applying and practicing the key strategies used by avalanche experts in real world settings, decision makers can target their learning to develop the skills that are proven to really work.
- Well-designed scenario-based training approaches can provide more learning value than direct experience.
- High-quality communication enables decision-makers to dramatically enhance their knowledge and expertise.

CHARACTERISTICS OF EXPERT DECISION-MAKERS

I found that expert avalanche decision-makers have specific characteristics that differ from their equally experienced partners. They are motivated to learn, have high levels of personal mastery, approach their profession with an attitude of safety and respect, and are exceptional communicators.

Motivation to Learn

The avalanche experts in my study possessed a deep motivation to learn and to improve their knowledge and decision-making capacities. For example, one expert related, "I'm constantly trying to expand my knowledge base by reading books, taking courses, and spending time with other experienced professionals." Motivation to learn is the most cited condition in the literature for improving decision performance and developing expertise.

Avalanche experts are passionate about their work. They actively seek feedback and opportunities to learn, they read and discuss their experiences with other practitioners, and they reflect upon their experiences frequently. These experts are also highly motivated to solve the decision problems they face. High levels of motivation to reduce situational uncertainty frequently leads towards decision success, while low levels may lead to negative consequences (see Part II). The finding that participants were motivated self-directed learners is an important result of my research, since this suggests that avalanche decision-makers of all levels can significantly improve their judgment and decision-making capacities by engaging in targeted activities and decision-skills training.

Personal Mastery

Highly effective decision-makers are distinguished by their ability to frame the decision problem well. However, as shown in Part II, avalanche judgments and decisions are subject to internal (cognitive, physiological, and psychological) and external (team, client, organizational, and sociopolitical) human-factor influences. I suggest that successful avalanche decision-making requires decision-makers to have a high level of personal mastery and leadership skill. Personal mastery involves making decisions based upon a strong set of core values and principles, continually learning to see the situation more clearly, and having the personal confidence to not be overly influenced by the words and actions of others.

These qualities are key to achieving an accurate perception of the factors influencing the decision problem, to being aware of the biases and assumptions that may be present, and making suitable decisions in light of this awareness. Personal mastery reduces the influence of negative human factors in the judgment and decision process, and incorporates mindfulness (metacognition) and situation awareness (see Part I). Thus personal mastery plays a significant role in the capacities of avalanche decision-makers to make objective and principle-based decisions, and is a fundamental factor in the quality of competence for avalanche-decision expertise.

Attitude and Approach

> "Anticipate the unexpected, prepare for the worst-case scenario, and be prepared to be wrong or fooled."
> —research participant

Knowledge of their limitations and a deep commitment to safety was fundamental to how these avalanche experts approached their practice. All of the experts in my study had experienced close calls during their careers as avalanche professionals. These experiences had increased their respect for the uncertainties associated with avalanche phenomena, for the serious consequences of involvement, and for the imperfect nature of human decision-making. For example, one study participant related, "I recognize I have made errors in the past and will do so in the future." Our ability to take our strengths and limitations into account is a key strategy (metacognition) to successful decision-making.

Experientially created knowledge enabled participants to objectively manage avalanche hazard and risk, and reinforced the importance of including a buffer zone of safety within their decision actions. For example, one expert suggested it was critical to "maintain a margin of safety that is just a hair bigger than what I think I need." The decision actions that resulted included increased mitigation, reducing terrain exposure, or choosing terrain closure or avoidance. These simple tactics require limited cognitive processing, and can be executed by decision-makers of any level of expertise to result in higher levels of safety.

High-Quality Communication

A key characteristic of expertise is the ability to communicate thinking and expertise to others. Additionally, high-quality communication results in high-quality decision-making and team performance. For example, a ski-area forecaster related, "Good communication and discussion is critical to my decision process. We always talk about what we are seeing and thinking before an action is taken."

I found that exceptional avalanche decision-makers were exceptional communicators. They encouraged an atmosphere of open communication, listened carefully, and showed respect and encouragement for different points of view. They also used critical-thinking techniques extensively, such as raising vital questions, analyzing their own and their peers' assumptions to determine whether they were justified, or examining the reasoning process for consistency in interpretation when drawing conclusions.

High-quality communication enables decision-makers to dramatically enhance their knowledge and expertise. Greater levels of communication result in richer mental models, reduced uncertainty, and higher levels of decision confidence. It also reduces subjective biases that may have been present in an individual decision maker. A key recommendation of participants in my study was that communication skills training should be a key focus in team decision-making environments and should include an emphasis on leadership skills for those in supervisory positions.

ENHANCING DECISION-MAKING PERFORMANCE

Avalanche decision-makers of all levels can enhance their decision-making performance by learning from the successes of avalanche experts and engaging in the following targeted activities:

Deliberate Practice

> "Experience, an unconscious feel for the situation, and a commitment to safety overriding all other factors—another day in the life of an avalanche professional."
> —research participant

Avalanche experts have superior knowledge, skills, and information-processing capacities acquired through experience. However, the accumulation of experience as a single factor does not necessarily produce decision expertise. It is what we do with our experiences that make the difference. Engaging in deliberate practice has been found to be the most effective way to improve decision-making performance. Exceptional mental conditioning results from engaging frequently in activities specifically designed to improve decision-making skill. These activities include practicing the key decision processes and strategies used successfully by experts, pursuing professional development and learning activities, seeking out coaching and mentoring, and engaging in critical thinking and reflection. Extensive research in performance acquisition shows the level of skill and expertise a person attains is directly related to the amount of deliberate practice in which they engage.

Mentoring and Coaching

A key recommendation of participants in my research was to implement mentoring and coaching more formally into the avalanche domain. We all need external feedback to provide us with a realistic picture of our effectiveness. No matter how accurate we think we are, we are constantly challenged by the reality that our personal interpretative filters may lead us into distorted ways of thinking. In order to transform our experiences into expertise, we need to actively gather and interpret this feedback from others whom we respect.

Hearing the perceptions of our peers helps us gain a clearer perspective of our thoughts and actions, and alerts us to our judgmental ways of seeing. Sometimes, these conversations may also confirm the correctness of the instincts that we felt privately but doubted for a variety of reasons. Cognitive and process feedback are two techniques to improve high-stakes decision making. Cognitive feedback provides information about the interrelationships between the environment and the decision-maker's perceptions, while process feedback provides information on how decision-makers can make effective adjustments to their decision-making approach.

Critical Thinking and Reflection

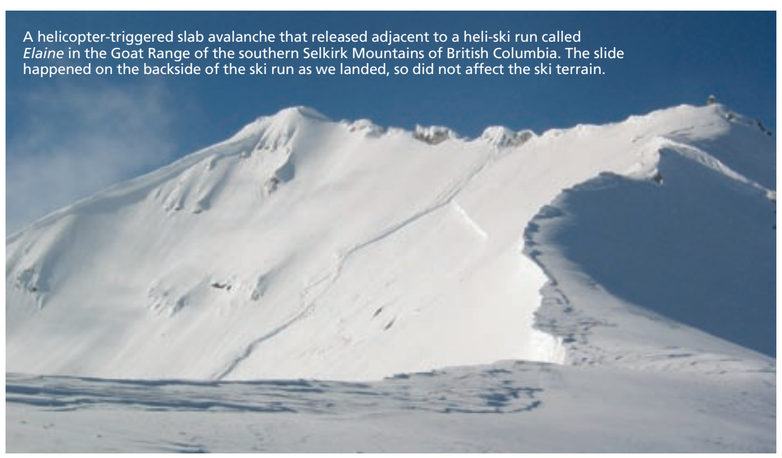
It is widely recognized that learning and performance enhancement cannot occur without questioning and reflective processes. Critical thinking and reflection enables us to derive new insights, richer mental models, and an understanding of the causal influences that may not have been evident at the time. Utilizing questioning instead of answer finding, considering how our assumptions are shaping our viewpoint, and searching for information that opposes our position, as well as supports it, are several examples. Building upon our knowledge and experiences with critical questioning and reflective insight can make the key difference to the quality of our problem solving and to deriving effective solutions.

DECISION SKILLS LEARNING AND TRAINING STRATEGIES

Well-designed decision skills learning and training strategies can help avalanche decision-makers of all levels acquire and enhance critical skills, perceptual cues, and knowledge more quickly. Following are a set of strategies designed to help avalanche decision-makers achieve expertise more quickly.

Experiential and Action Learning

Research in adult education identifies experience as the most valued resource in the learning process. In addition to field experience, exposure to new ideas and practices through well-designed learning strategies has a powerful impact upon our learning. These activities result in improved judgments and a greater capacity to gather, interpret, and communicate relevant information. I suggest the emphasis must be placed on action learning—learning how to learn in realistic situations. In addition, this emphasis must support and enhance the decision processes and strategies actually used in the real world, rather than generic skills that confirm to optimal procedures. These are key principles, since it is only through testing ideas and strategies in practice that we are truly able to know whether they are effective or practical in real-world situations.



A helicopter-triggered slab avalanche that released adjacent to a heli-ski run called *Elaine* in the Goat Range of the southern Selkirk Mountains of British Columbia. The slide happened on the backside of the ski run as we landed, so did not affect the ski terrain.

Build Experience Learning Like an Expert

A widely used strategy to develop decision expertise is to build experience learning like an expert. By applying and practicing the key strategies used by avalanche experts in real-world settings, decision-makers can target their learning to develop the skills proven to really work. Avalanche experts use the decision strategies of pattern recognition to make effective judgments, and mental simulation to analyze if their planned actions will work. They utilize mindfulness (metacognition), situation awareness, and critical thinking to analyze whether their judgments are accurate, and they communicate effectively with others to gain additional insight and perspective to their decision processes (Part I). These strategies are integral to objective and sound decision-making and offer powerful tools to counter the influence of potentially dangerous biases and heuristic traps in the decision process. An awareness and understanding of these key strategies can enhance our capacities to strategically apply them with greater accuracy and success.

However, it is important that decision-makers utilize the appropriate decision-making processes for their level of knowledge and skill. As explained in Part I, avalanche decision-makers evolve through a cognitive hierarchy of decision processes from rule-based to integral systems thinking. Thus, the use of higher-level processes such as intuition should not be encouraged in novice decision-makers. While our intuitions can be valuable, we need to use them accurately, and make our decisions based upon informed gut feelings. Novices lack the rich experience base and mental models essential to perform at this level of cognitive function and to accurately recognize and interpret complex patterns in a set of information or high-stakes decision. As a result, their intuitions may be strongly based in the affective (feeling and emotion) domain, which may result in potentially dangerous biases in their judgment and decision processes. Thus, decision learning and training strategies should emphasize decision processes and strategies that are appropriate and effective for specific levels of knowledge and experience. For a further discussion on the hierarchy of avalanche decision modes and decision strategies, see Part I of this series.

Encourage Pre-Decision Making

Pre-decision making is a fundamental part of the systems approach to decision-making used by the avalanche experts in my study. Pre-decision involves anticipating and identifying critical decision conditions or points, and then planning strategies and options for associated decision actions prior to their occurrence. Pre-decision making is an extension of mental simulation. Examples include planning route options, making determinations about specific terrain use, and logistical planning. The run list is a typical example in the ski guiding industry.

This strategy serves a critical function in reducing cognitive workload in field situations, and reduces the influence of human factors that inhere in the avalanche decision process. Prior research suggests the more preparations and information analysis that decision-makers engage in before entering stressful situations, the less anxiety they experience. Since anxiety levels correlate directly with performance levels, pre-decision making is an important tool for sound avalanche decision-making.

Continued next page ➡

DECISION-MAKING

continued from previous page

Increase Situation Awareness and Perceptual Capacities

The key to effective avalanche judgment and decision-making rests in an ongoing accurate perception of the conditions in the human, physical (terrain), and environmental (weather and snowpack) systems. Situation awareness, rich mental models, and metacognition (mindfulness) are the primary input into decision processes and are the fundamental components that guide our selection of decision actions. Thus, increasing these capacities should be a key focus for avalanche decision-makers and for decision skills training strategies.

Focus on Scenario-Based Approaches

Lack of experience is often discussed as a fundamental barrier in enabling decision skill. However, we do not learn only through direct experience. Recent NDM research has shown that well-designed scenario-based approaches can provide more learning value than direct experience. I recommend case studies and simulations as two key methods to build avalanche decision skills and to enhance leadership capacities and team communication:

Case studies, combined with effective coaching, enhance the learner's vicarious experience base and enriches their mental models through a process of studying and reflecting upon how decisions were made under specific circumstances. Creatively designed case studies enable judgments and decisions to be examined and learned in the context within which they naturally occurred. They also encourage learners to identify key vulnerabilities and human-factor influences. They are an excellent method to develop perceptual expertise since decision-makers can see how the cues appear within the context of a realistic situation and receive valuable coaching from the facilitator.

By engaging in realistic and detailed simulations, decision-makers have the opportunity to critically assess situations and build a sense of characteristic cues and common patterns (mental models) essential to intuition. Simulations are designed to capture the essence of difficult and uncertain situations and challenge decision-makers to utilize proven decision strategies to decide upon an effective course of action. Learners are encouraged to develop alternative explanations, identify conflicting evidence, and describe the actions they would take at specific points during the simulation. Simulations also provide insight into how different decision-makers perceive the same situation and provide learners with the opportunity to practice their skills for communicating essential information and working effectively in team environments.

Integrate Human Factor Training

Recognition processes are a key strategy used by avalanche decision-makers (Part I). Integrating human-factor training into professional and recreational learning curricula will bring a critical awareness of the influence of positive and negative human factors in the avalanche judgment and decision process. Thus, avalanche decision-makers can strategically increase their capacities to recognize and manage their presence with greater accuracy and success. This strategy is of critical importance, since the more negative human factors present in a situation, the harder it is to apply good judgment and decision-making.

Enhance Team-Decision Making

Team decision-making can be enhanced through effective management of information resources and workload, coordination of actions, and more effective communication. Communication enhances predictability, which helps team members and stakeholders to set expectations, plan for future contingencies, share a common mental model, reduce ambiguities, and decrease stress levels. Improving communication is a primary strategy for improving individual and team decision-making performance and reducing human error.

DECISION SUPPORT INTERVENTIONS

As I have shown throughout this series, avalanche decision-makers use uniquely individual processes of decision-making. Thus, interventions to support decision-making and enhance decision performance need to be designed with flexibility and focus on methods that naturally lead to supporting appropriate choices. I offer four focused interventions for effective decision support.

Capture Avalanche Domain Knowledge and Experience

Knowledge is now being recognized as being the single, greatest asset of individuals, teams, and organizations. Recent research indicates that knowledge doubles every three to four years; therefore a focus on the acquisition, creation, storage, transfer, and utilization of knowledge (mentofacturing) is fundamental to support effective decision-making. Capturing key knowledge and information that describes historical and current avalanche system dynamics (human, physical, and environmental) provides a virtual mental model to support decision making, individual, team and organizational learning, and future systems design. Knowledge banks are key learning tools as they direct decision-makers' attention to critical aspects of the decision problem, and illustrate mental models of the avalanche domain. GIS is a particularly useful application enabling key information to be displayed spatially using visual displays that are easily understandable for users of varying levels of expertise.

Identify the Architecture of Good Decisions

Avalanche decision-making has a heavy reliance on tacit knowledge—knowledge that is not easily verbalized. Deliberating upon and deconstructing good decisions is necessary to expose this tacit knowledge and to understand the underlying architecture of good decision-making. In addition, defining the qualities of good avalanche decision-making is necessary for constructing the models from which decision-skills learning programs can be effectively designed. Debriefing exceptional decisions takes a strength-based approach to decision-capacity enhancement and is a tremendous learning tool for individuals, teams, and organizations.

Record Human Factor Influences

In Part II, I identified the human factors that negatively influenced the judgment and decision actions within my research participants. However, limited research exists in this area. In order to gain a deeper understanding of these influences, descriptive empirical data is needed. I suggest that defining criteria for the recording of human-factor influences in avalanche accident and near-miss records and implementing the capture of this information will offer critical insight into avalanche-risk assessment, decision-skills learning initiatives, hazard communication, and decision support.

Ensure Learning Initiatives are Accessible

Learning is not only undertaken by individual decision-makers, it must also be encouraged and supported by organizations that are committed to foster individual, team, and societal learning through sharing information, creating a sense of community, and fostering creative and accessible learning initiatives.

As I have emphasized, decision-makers need to have the motivation to pursue them. I suspect the benefits clearly outweigh the costs for professional avalanche decision-makers. However, it is unclear whether recreationists would be willing to devote the time, money, and effort required to engage in these activities. Creative avalanche decision skills learning programs are a critical tool to enhance recreational decision-making and one that I suggest would be most effective in reducing avalanche involvements. Thus, ensuring these programs are accessible to the public by securing funding from industry sponsors and granting agencies should be a primary focus for decision-support initiatives.

CONCLUDING REMARKS

Developing expertise in avalanche judgment and decision-making takes time and energy. However, we can train decision-makers of all levels to achieve expertise more quickly by learning from the successes of avalanche experts, and by engaging in targeted activities and decision-skills training. Motivation to learn and improve avalanche decision-making is a critical component for this development, for those who lack motivation will never perform at the level of experts.

Effective and successful decision-making is critically dependent upon attaining a good understanding of the situation. Thus, building strong mental models and developing accurate situation awareness through scenario-based approaches should be a key focus of avalanche decision skills learning strategies. Well-designed learning strategies can be more effective in developing good knowledge and skills than direct experience, since repeated experiences of poor decision-making or false-positive events can result in dysfunctional strategies for future decision-making.

The learning methods I recommend take a strength-based approach to facilitating the development of key decision skills and learning strategies used effectively by expert avalanche decision-makers in real world settings. These methods offer a meaningful opportunity to enhance individual, team, and organizational learning, and to infuse avalanche training programs and decision support interventions with vital tools to support and enhance avalanche judgment and decision-making.

ACKNOWLEDGEMENTS

Yet again, I offer my thanks to the Canadian avalanche professionals who participated in this research so we can all learn from their wisdom. I must recognize the impact of Gary Klein on the naturalistic decision-making approach I have taken and the interest and support that I received for my research from Buzz Reed at Klein Associates. Additionally, I thank the Canadian Avalanche Foundation, Selkirk College, and the Social Sciences and Research Council of Canada for providing financial support.

FURTHER READING

Chi, M. T. H., Glaser, R. E., & Rees, (1982). Expertise in problem solving. R. S. Sternberg (Ed.) *Advances in the psychology of human intelligence*, 1. (pp. 1-75). Hillsdale, NJ: Erlbaum.

Endsley, M., (1997). The role of situation awareness in naturalistic decision-making. C. Zsambok, & G. Klein (Eds.). *Naturalistic decision-making*. (pp. 269 – 284). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Klein, G. (1998). *Sources of power: How people make decisions*. Cambridge, USA: The Massachusetts Institute of Technology Press.

Klein, G. (2003). *The power of intuition*. New York: Currency Books.

Orasanu, J., & Salas, E. (1993). Team decision-making in complex environments. G. Klein, J. Orasanu, R. Calderwood, & C. Zsambok, (Eds.). *Decision making in action: models and methods*. (pp. 327-345). New Jersey: Ablex Publishing.

Sexton, J.B. (Ed.). (2004). *The better the team, the safer the world: Golden rules of group interaction in high risk environments*. Ladenburg: Gottlieb Daimler and Karl Benz Foundation, & Swiss Re Centre for Global Dialogue.

Laura Adams instructs mountain safety, risk management, and leadership at Selkirk College in Castlegar, BC, and coordinates the avalanche program at the Selkirk Geospatial Research Centre. Laura has a master's degree in leadership and training from Royal Roads University, a teaching certificate in adult education, and an honors diploma in business administration. She is a professional member of the Canadian Avalanche Association and the Association of Canadian Mountain Guides. Laura utilizes a systems thinking and naturalistic decision-making approach to her research in avalanche risk management and high-stakes judgment and decision-making. Her research studies experts in real-world situations and aims to define avalanche decision skills, to identify the human factors that influence decision processes, and to design innovative strategies for decision skills learning and decision support. She will be at Selkirk until the end of September and then is taking a sabbatical until January 2008. She has accepted the position of CEO of Outdoors New Zealand and will be commencing that assignment on October 1.

—This article first appeared in the *Canadian Avalanche News*, Vol. 77, Summer 2006.

Mt Troy fieldwork, Hilda Meadows surface hoar. *Photo by Bill Glude*

NAC 2005/06 season roundup

Utah Avalanche Center

The winter of 2005/06 will go down in history as perhaps the best season in memory due to a delightful combination of great riding conditions and a very stable snowpack. The storms rolled through with the regularity of marbles descending a spiral chute in a Rube Goldberg contraption. There were only three brief periods during the winter where it failed to snow for nine or 10 days at a time. In other words, in a desert state usually characterized by big powder storms scattered throughout long spans of sunny days, it snowed 57% of the time on nearly 100 out of 173 days of our operational season from just before Halloween through mid-April. Also, despite a few early season speed bumps, warm temperatures and prodigious snowfall produced a mostly stable "coastal" snowpack. As one forecaster put it, "The overall stability looked like an EKG monitor, with the avalanche problems spiking with the storms and then rapidly fading away."

The Pacific storms rolled south one by one out of the Gulf of Alaska, moving inland over the central or northern Pacific coast, which allowed the Cottonwoods to record over 600" of snow. Somewhat typical of a weak La Niña winter, one could almost trace the Maginot line that kept the southern mountains bone dry while their cousins to the north enjoyed a continual blanket of snow. By March however, the Maginot Line moved south and southern Utah doubled their snowpack after an early season famine. While this season did not have the same amount of blockbuster storms as 2004/05, the snowfall was thankfully much more consistent. Because of the very stable snowpack, we suffered only three avalanche-related fatalities, which is less than the 10-year average of 4.1. While we typically see a seasonal average of over 100 unintentional human-triggered avalanches in the backcountry, we experienced only 76 incidents in which 45 were caught and carried resulting in 17 partial burials, 8 injuries, and three deaths. What a big relief after last season's record-setting eight fatalities.

Early Season— October recorded 27.5" snow/3.34" snow-water equivalent and just like the storms, our avalanche advisories were intermittent through the end of the month and the beginning of November.

November recorded 67" snow/7.3" snow-water equivalent. Two periods of high pressure resulted in some formation of weak layers that hounded us through December. Most people stayed on rock skis or boards and early indications were for a thin winter. Dense snow and two rain/rime events left even the most optimistic people reaching for long novels by the great Russian authors.

December— Winter finally arrived in December when snowfall more than doubled the pre-existing snowpack, providing 151" snow/14.87" snow-water equivalent. With limited snowfall in the early season, the snowpack, particularly outside of the tri-canyons, had begun to deteriorate into weak, faceted snow. On the 3rd, a party of four experienced backcountry skiers suffered a very close call along with a few injuries warranting an assist by the Summit Country Search and Rescue team. The party decided to ski a slope called "No-Name bowl," a steep northeast-facing slope off the Park City ridge line. One at a time, the party lapped the bowl twice. On the third lap, the fourth skier triggered the entire bowl to the ground, engulfing him and his three friends waiting for him down below. While no one was completely buried, two were reportedly unable to dig themselves out.

Just after Christmas, the storms began in earnest. We suffered our first fatality of the season in upper Aspen Grove on Timpanogos in the Provo area, not far from the accident site that claimed three young victims the day after Christmas in 2003. Two fit snowshoers hiked up high into Primrose Cirque on a windy stormy day. Both likely triggered the avalanche, which buried one and kept one on top of the debris. Neither had any rescue gear and the survivor immediately called 911 for help. Worsening weather and avalanche conditions combined with a very dangerous location precluded an extended search for the victim, and as of this early summer writing, the body is still not recovered.

January— January followed in the snow footsteps of December. Totals were 121" snow/10.34" snow-water equivalent. All but nine days of the month had measurable precipitation, and we never saw the DJI (dreaded January inversion), so common in most years. By the end of the month, season totals exceeded 350" and it began feeling like a real Wasatch winter. Still emblematic of a maritime snowpack, weak layer formation was minimized due to the warm temperatures and continued snowfall.

February— February provided a let-down, bringing *just* 68" snow/6.52" snow-water equivalent. The initial heavy snowfall overloaded a thinly buried weak layer that provided some close calls in areas of radical terrain around the turn of the month. One incident occurred just below the Monte Cristo/Superior ridge line as a UDOT avalanche forecaster was inspecting the crown of a recent avalanche. An unsuspecting party triggered a cornice from above, bowling the forecaster over, which resulted in a slide-for-life situation. He fortunately arrested on the bed surface while his gear continued down into the choke and over some cliff-bands a couple thousand feet below. Another incident just off the summit of Box Elder involved a skier who triggered a new wind drift on a bed of weak snow, carrying him nearly 2000' down to the flats. Miraculously, he walked out of it unscathed. The same day, just off the north side of Little Superior, a party of four collapsed a buried weak layer, triggering a hard-slab avalanche. The avalanche immediately engulfed the four, carrying them a few hundred feet, leaving them all partially buried.

March— The hose turned on again in March with the upper Cottonwoods recording 157" snow/10.46" snow-water equivalent. 21 of 31 days had measurable precipitation, making it one of the snowier Marches in years. In what has now become a rule rather than an exception, Utah suffered another fatality from someone accessing the backcountry from Snowbasin ski resort. On the 11th, a 34-year-old man perished after triggering a fresh wind drift on a steep northwest-facing slope near Taylor Canyon, which is just east of Snowbasin and overlooks the town of Ogden. Significant snowfall and winds toward the end of the month led to a build-up of massive cornices, resulting in three near misses in the last week.

April— Continued heavy snowfall and winds caused avalanche problems early in the month. The upper elevations recorded 64" of snow/6.8" snow-water equivalent. Again, the activity would spike during and just after the storms, and typically settle out a day or two afterwards. On the 3rd, a man in his 20s died while traversing along a corniced ridge in the backcountry adjacent to Brighton resort. While following footsteps along the lip of the cornice, the cornice apparently broke behind him, dropping him onto the steep rocky slope below. The impact pulled out another 2'-deep slab avalanche, burying him with a hand sticking out of the snow. The young man accounted for Utah's third fatality of the season. In all three fatalities, the avalanche advisories very accurately described the conditions that caused the accident.

In mid-April, the last major storm offered nearly 2' of cold fresh powder for the last fling of a very memorable season. After that, the weather blessed us with a slow warm up and the season died with a thankful whimper. —*Bruce Tremper, director*

Southeast Alaska Avalanche Center

We had the warmest, least-snowy winter ever recorded in our region. Until late January, a Pineapple Express weather pattern steadily channeled tropical storms straight across the Pacific to Alaska, bringing nearly continuous warm temperatures and heavy rains to at least 2,500 meters, which melted most of the snowpack.

In late January, the pattern began to shift. February through mid-April brought alternating periods of moderate dry snowfall and cold clear weather. Snow quality was good, but snowpack thickness—even in the high mountains—remained a very thin 1.5-2m. Well-developed facets and depth hoar mixed incongruously with icy masses and rime nodules from the early season warm and wet weather. Despite the weak snowpack, snowfall came in small increments so avalanche activity was minimal.

The first heavy loading arrived in mid-April. Our spring then turned cold and snowy, with powder skiing down to 600m in early May. Snowpack depth finally reached 2-3m. The largest avalanche cycles of the season came very late from mid-April through the third week of May.

Continued next page ➡

NAC ROUNDUP

continued from previous page

Avalanche Accidents— We had no deaths in our region this season, but we had a number of close calls. The most spectacular of these included one skier buried to the nose, two slides that left terrified snowboarders teetering on tiny islands of safety as entire faces ripped out 1-2m deep around them, and a cornice-triggered slab on a 20°C day in late May that covered 100m of track on the White Pass and Yukon Railroad with up to 20m of debris.

SAAC Events— We taught 188 people in four Level I courses, offered four awareness presentations, and provided one custom crew training. This brings our total since 1995 to 6217 people with 19% in field courses and 81% in classroom-only sessions. We fielded the usual numerous media contacts for sound bytes, interviews, and background information.

Advisories— We issued 46 advisories this winter between November 8 and May 23, posting on our Web site three days a week when we were in town. We dropped the frequency during the early season warm spell because there was so little snow. Almost all advisories met the goal of being posted online the same day the observations were made.

Our advisory format is a short-text summary followed by scanned fieldbook pages and captioned photos. We try to make each advisory a mini-tutorial on snow and avalanches. We do not include an avalanche danger level because we feel we have not had enough field presence to do so accurately.

Our lone staffer put in some 30 hours a week and field volunteers added some 20 hours, totaling 1400 program hours of donated labor this season.

Research Projects— The AK Block studies are nearly done for presentation at ISSW 2006. We also got a digital SLR camera with a lens and flash system for photographing snow grains in the field as part of an ongoing study on melt-layer recrystallization and faceted melt-freeze grains.

DOT&PF Forecasting— We continued to provide a limited avalanche forecasting program for the Alaska Department of Transportation and Public Facilities on Thane Road in Juneau.

Budget— We survived one more season without a real operating budget. We used approximately $17,000 income and over $59,000 worth of donated volunteer time to run a program that could realistically use over $110,000 to maintain itself. The funding we received came from the DOT&PF forecasting, a few small private and nonprofit grants, course fees, and drawing down our balance from previous years. The greatest budget component in the last two years has been volunteer time.

At the end of the season, we had just announced the discontinuance of courses and advisories for next year due to lack of funding when we received money and in-kind support from the city and borough of Juneau. This funding is earmarked for a five to 10 week urban avalanche forecasting demonstration program next winter. We are negotiating with state and federal agencies for additional funding and in-kind support that could extend the demonstration program and potentially restore our education program as well. *—Bill Glude, director*

Research lab with a view: Sheep Mountain fieldwork, Juneau area, April 19. *Photo by Bill Glude*

Idaho Panhandle National Forest Avalanche Center

This season began with early snowfall in late October and the first of November, and ran until mid-April. The Idaho Panhandle NF Avalanche Center issued the first pre-season update on November 18. Cold weather in December was associated with some snowfall, but a persistent high-pressure system kept the weather cool and clear. Some stability issues were mentioned in the advisories. January continued to be mild with relatively no snowfall until the second week when weather patterns favored a westerly flow over the Pacific Northwest. Snowfall was consistent toward the end of January and into February. Typical high-pressure weather patterns did not occur and the Idaho Panhandle caught up with the seasonal average snowpack amounts. The weather brought some high avalanche danger during storms but persistent weak layers did not develop and linger in the pack. In one incident, two snowmobilers were caught and buried in early February. The incident occurred on the Selkirk Crest near Jeru Peak in the Hellroaring drainage. The riding partners had all of their rescue equipment, worked effectively, and both victims of the avalanche walked away with only minor injuries.

Significant snowfall accumulation continued into March, but by mid-month the weather pattern shifted to drier and warmer airflow. As a result snowfall events decreased with only minor accumulations accompanying any given storm. The season ended with many of our Snotel sites above average snow-water equivalent and the rest of the sites reporting near-average amounts.

This year we had two forecasters reporting weekly from the St Regis Basin near the Lookout Pass ski area. Two forecasters based out of Avery reported from the St Joe Mountain region south of Wallace. We are looking at picking up and training one or two new forecasters to report from this region to assist Ed Odegaard next year. To the north, John Olson and I covered the Selkirk and Cabinet Mountains. This year was the first season without our former director, Bob Kasun, as he retired. Now there is a hole in our ability to cover education in the Coeur d' Alene region. We continue to work on getting our forecasters in that area comfortable with teaching avalanche-awareness classes.

Overall, the season was active with many opportunities for educational programs. Our media contacts helped to produce a television interview on avalanche safety, local television avalanche danger updates, and an IPNFAC display at the Banff Film Festival. IPNFAC partnered with Sandpoint Parks and Recreation again this year to reach many backcountry users over the course of three free classes. A regular program is being established with Steve Tomson, a law enforcement officer in Spokane who directs the Mountain Safety School. This school trains new Conservation, Border Patrol, Law Enforcement, and Forest Service officers on wilderness survival and outdoor technical skills, one of which is avalanche safety. I would like to advance my own training to be an available instructor for groups seeking a AAA Level 1 course.

Schweitzer Ski Patrol assisted the avalanche center numerous times with weather and avalanche observations and have been very supportive of our program. Silver Mountain Ski Patrol also sent us pit data from their snow-safety director. We are working with Lookout Pass ski area on an avalanche-awareness display and Phil Edholm, the director of the ski area, expressed interest in assisting with our avalanche program next year. We also take every opportunity we can to work with and educate the local snowmobile clubs. The local clubs will be helping us to find some new snowmobiles and a trailer for next season. *—Kevin Davis, director*

West Central Montana Avalanche Center

News— Gene Thompson transitioned oversight of the West Central Montana Avalanche Center to Steve Karkanen in early December. Steve's full-time job is in Fire Management as the Lolo Hotshot Crew Superintendent. His background in snow safety is nearly as long as his fire background, with 21 years of experience as a professional ski patrolman. Steve developed the original Web site for the advisory program in 1999, has been assisting Gene with the weekend advisory for several years, and helped found the non-profit West Central Montana Avalanche Foundation (WCMAF) in 2001.

This winter, the Foundation contracted with a local internet service provider to overhaul our Web site, which is now posted. The new site will allow better interaction with our users and field observers as well as provide for more reliable IT support. WMCAC continued a strong working relationship with the University of Montana, who contributed the time of one of their employees, Dudley Improta, Assistant Director of UM Campus Recreation. Dudley helped collect snow profile data and assisted in posting weekend advisories. WCMAC, WCMAF, and the University of Montana also collaborated on several community avalanche education programs.

Advisories and Weather— WCMAC issued 17 weekend avalanche advisories this season and no special avalanche warnings for periods of high avalanche danger. There were no significant incidents or close calls reported to us this winter, mainly due to the stability caused by the high moisture content in the snowfall throughout the winter. We also experienced several warm-weather events early in the season, which provided further snowpack stabilization. The Missoula area broke a previous record of above-normal temperatures from mid-December into February with 56 days. Elevations below 5000' were wet with rain, but the higher elevations received a steady dose of high-moisture-content snow through the course of the winter. Snow and snow-water equivalent amounts were above normal at most SNOTEL sites within our advisory area for the entire winter.

Education— Education efforts continued to reach a large cross-section of the local communities within the advisory area. With assistance from an education grant from Montana Fish, Wildlife and Parks Department, we sponsored 37 avalanche-education programs in the Missoula, Bitterroot, and Lower Clark Fork valleys. 1747 individuals attended the sessions. Much of this education took place in local area schools under a partnership with the Montana Natural History Center. Nearly 900 middle and high school students were introduced to basic avalanche awareness in 30 classes. The other 36 education programs ranged from one-hour introductory sessions to multi-day classroom/field workshops. 847 individuals attended these sessions this year. We also sponsored four three-hour avalanche transceiver workshops attended by 92 individuals. The *Know Before You Go* DVD and PowerPoint programs were used for the second year in many of these sessions and were very popular with students of all ages. *—Steve Karkanen, director*

Northwest Weather and Avalanche Center

A highlight of our season was having Knox Williams as a part-time forecaster from October to April. We were able to do this by have Garth and Knox share Garth's full-time position. Our original idea was to see if an additional forecaster via a job share increased the flexibility in our planning and schedules. When Knox indicated his interest, we knew it was an opportunity not to be missed. Knox and

Knox enjoying that darned Cascade 10% pow. *Photo by Garth Ferber*

Suz rented a house not far from the NWAC office, which worked out great.

Overall this arrangement worked well and was fun for many people here in the Northwest. Knox brought a fresh outlook to our office, gave us specific suggestions on how to approach some old and new tasks, and made the forecast schedule a little easier for all of us. A couple of drawbacks were that it was difficult at times for each to do all the usual tasks that the position demanded (such as administrative tasks) while working half time, and the resulting salary decrease (50% of usual) is not sustainable for most people here in Seattle unless one has another source of income.

The Northwest had a great season for snowfall, in contrast to 2004/05. We had a couple of very early storm cycles in November, which provoked an early start to the forecasting season. Much of December was a bust. Then Momma Nature really turned on the snowmaker and gave us major storm cycles in January. Many sites averaged near or over a foot of snow a day for several days in each of these cycles. We had another dry cool spell the first half of February and then some more good storms through mid-April. Total snow depths at some sites, such as Mt Baker, peaked in mid-April.

Location Snowfall for January storm cycles

Mt Baker	368"	Paradise	339"
Stevens	241"	White Pass	175"
Snoqualmie	215"	Mt Hood Meadows	258"
Crystal	191"		

Avalanche Accidents— We had two avalanche fatalities in Washington this season: one a skier on Mt Herman near Mt Baker and the other a snowmobiler near Tiffany Mountain in the northeast Cascades. For details see the Accident Data link at www.nwac.us.

Mt Herman 3.5' slab-avalanche crown. *Photo by Tony Totorelli*

Tree Well Accidents— An unusual, tragic series of tree-well accidents occurred during the heavy snowstorms of January. There were two fatalities at Mt Baker Ski Area and one at Stevens Pass Ski Area. In each of these accidents a skier or snow boarder, by themselves or separated from their partners, fell into an air space near the base of a tree due to the heavy snowfall and tree boughs above. In another very close call a ski patroller at Crystal Mountain Ski Area barely found his wife in time to rescue her from the same situation.

30th Anniversary Of The NWAC— This season marks the 30th anniversary of forecasting by the Northwest Weather and Avalanche Center. The center is directed by one of the original forecasters: Mark Moore. For details see the press release issued by the Mt Baker Snoqualmie National Forest at www.fs.fed.us/r6/mbs/news/2005/nr-nwac-anniversary-120205.shtml

NWAC Poetry Slam

Here I am at the office, and to my increasing surprise,
The seasons are changing before my startled eyes.
What last week was winter-like, windy, and cold,
Has become almost summery with a ridge so bold.

The once dominant trough along the West Coast,
Has become a strong high, bringing warming to most.
And the old upper low is no longer splitting,
It's moved some other place where it's happily sitting.

The snow may have stopped but it hasn't departed,
So continue awareness from wherever you started.
For most steeper snowpacks, its preferred resting place,
Is way down in the valleys where it can settle in place.

High freezing levels, sunshine, or warm spring rain,
High clouds that amplify radiational gain:
The snowpack doesn't care why it's weak or unstable,
Or if travelers are careless when they could be more able.

Just remember in Northwest mountains in spring,
Safety is truly a relative thing.
For until snow melts into lupine and clover,
It ain't over 'til it's over.

—by Mark Moore, last forecast for the season on April 23, 2006

Budgets, Forest Service Plans And Other Woes— I don't like to end this report on a dour note, but we are still experiencing budget difficulties and current Mt Baker Snoqualmie National Forest plans do not include the NWAC beginning in October 2008. So we may be looking for a new home. Do you have any space in your garage? *—Garth Ferber*

Sawtooth National Forest Avalanche Center

In the winter of 2005/06, the drought ended. It was a banner year for snow conditions and snowpack stability. SNOTEL sites showed 120-145% of average in early April, with an ongoing wet southwest weather pattern. Mid-winter, people safely accessed large high mountain slopes to hit epic powder and steep lines. In most years, this is simply impossible or dangerous until spring conditions arrive.

Storms in the first half of November laid down a dense base. A two-week dry spell followed, but warm temperatures and a dense snowpack prevented all but the snow surface from faceting. Storms in late November and early December caused some concern with new snow loading on the old, weak snow surface, but little avalanche activity occurred.

A second extended dry spell ensued during the middle of December. Warm temperatures in the upper elevations prevented extensive faceting, while frigid valley temperatures rotted out the thin lower elevation snowpack. Just before Christmas, one to two feet of new snow brought the snowpack close to the tipping point, but natural avalanching was limited to remote terrain not typically accessed by backcountry recreationalists. This storm dropped rain at lower elevations, saturating a depth hoar snowpack that eventually froze into an ice-matrix mess.

Christmas through early February brought a period of almost continuous snowfall uncommon to the Sun Valley region. For the most part, instability was limited to direct activity following storms or wind events, but a few buried weak layers persisted. On January 5, a snowmobiler triggered a large avalanche near Baker Lake that ran on facets above an ice crust.

The last three weeks of February brought the longest dry spell of the winter, leading many of us to believe our epic

Continued next page ➡

NAC ROUNDUP

continued from previous page

winter had ended as quickly as it had started. Several clear nights resulted in an extremely faceted snow surface, and Sun Valley Heli-Ski guides were taking bets as to whether four or six inches of new snow would trigger the next avalanche cycle. No guessing was necessary when a warm Pacific storm delivered over two inches of snow-water equivalent accompanied by strong southerly winds on February 27-28. An avalanche warning was issued on February 28 as widespread avalanche danger jumped to High. At lower elevations, the precipitation fell almost entirely as rain, saturating an already weak snowpack. Countless wet sluffs occurred, many scouring down to the dirt. In the mid and upper elevations, a widespread slab avalanche cycle took place with most activity occurring in the south and central Wood River Valley. Unfortunately, the first fatality of the season occurred right after this storm when a snowmobiler triggered a wind slab while highmarking in the Pioneer Mountains northeast of Carey.

As the February facets began to heal, new weak surface layers formed. These became a concern when loaded in mid-March. As the avalanche center began winding down its operations in late March, a winter-like snowpack lingered throughout our region. It became clear that backcountry skiers and sledders would tire before old man winter did.

The California storms kept rolling into our area. The first week in April saw a water gain of 3-4" with rain in the lower elevations. A snowmobiler was fully buried and killed northwest of Fairfield in the Trinity Lakes area in the Boise Forest on April 8 when a cornice broke and dropped him onto the slope below to trigger a slide. He was the second fatality of the winter.

Chris Lundy returned for his second season as lead forecaster and played a key role in upgrading the Web site and forecast standards. Matthew Lutz, a long-time avalanche worker, brought his skills and experience to the part-time forecasting and teaching position. Matt's background includes working as a Canadian and American heli-ski guide and with Snowbird ski patrol. Janet Kellam returned as director for her tenth winter with the avalanche center.

A total of 113 advisories were posted until early April when funding ran out and user interest decreased. User numbers increased dramatically this year, with over 88,000 advisory accesses and 1070 avalanche-program participants. We hosted an Avalanche Awareness Week with special programs; the week culminated with the Friends annual fundraiser. A new advisory format with enhanced graphics, a pop-up glossary, improved weather station displays, digital audio forecasts on the Web, a direct e-mail link for sending in observations, and an interactive forecast area map were among the improvements this season. A daily 60-second avalanche spot on KECH radio and numerous newspaper articles brought avalanche awareness and information to the forefront of the local community. One of the great additions this season was an Easy Searcher Avalanche Rescue Training Park.

Due to funding limitations, Monday and Tuesday advisories were combined on Mondays. This arrangement is workable, but it seemed as if most surprise storms occurred early Tuesday mornings! We hope to gain additional sponsorship to provide advisories seven days a week next winter. A new advisory sponsor for 2005/06 was the Bureau of Land Management, who manages a portion of the public lands in our forecast region.

Countless local individuals have contributed to the Friends of the Sawtooth Avalanche Center with financial donations, hours of promotional and educational work, and endless enthusiasm. We are proud to be a community-based service that is so warmly received and supported. The SNFAC has become a first-class operation. We've achieved so many project and program goals and the value of the operation is being recognized. Our key goal now is to gain better financial stability. We are able to pay off the bills each season, but a bit more guaranteed funding through partnerships, grants, and donations would make a world of difference.

—Janet Kellam, director and Chris Lundy, lead forecaster

The Mt Shasta weather station on its way to full burial. *Photo by Matt Hill*

USFS Mt Shasta Avalanche Center

The 2005/06 season was our eighth year as a Type II Regional Avalanche Center. The Mt Shasta Avalanche Center encompasses three distinct recreational areas: Mt Shasta, with elevations ranging from 3500-14,162', The Eddies at 3,500-9,000', and Castle Crags to the Trinity Divide which lies between 2,500-6,500'. We generally break our forecast down into elevation zones. The total area encompasses approximately 1000 square kilometers.

Climbing advisories are issued year-round, and avalanche advisories last from November through late April depending on the snowpack. We issued over 150 avalanche advisories this last year. The MSAC Web page has been on-line since December 1998 with over 67,625 hits for 2005/06. Over 30,000 advisories went out via e-mail. We don't have a counter on our phone recorder, but we guesstimated that we had about 20,000 people call our hotline. 900 advisory faxes were sent out to various agencies and businesses.

The 2005/06 winter provided well-above-normal precipitation at around 168% of normal. The season began in a neutral El Niño climate with warm and wet weather. By February, the climate was influenced by a change to La Niña conditions with cooler temperatures and above-normal precipitation. This continued toward the end of our forecast season where the climate returned to a neutral El Niño condition. The Madden Julian Oscillation remained fairly weak through most of the season. The most noticeable weather event of the season was a long wave pattern over the north Pacific during late February through the middle of April. This brought a nearly continuous line of low-pressure systems and measurable snowfall 42 out of 50 days with 252" of snow and 24.1" of water. The coldest temperatures of the year were also recorded during this time and March 2006 remains one of the coldest in Mt Shasta weather history. Several of our weather stations were buried in late March and early April and manual measurements had to be taken. The deepest snowpack measured at our Ski Bowl weather station was 284" on April 12. The Cooperative Snow Survey measured the second deepest snowpack for May in 76 years at Horse Camp on Mt Shasta. The study plot averaged 215".

The March lineup brought storms from the Gulf of Alaska with snowfall throughout the month. Most storms were on the light side, but 135" of snow and 12.23" of water were measured for March. We measured the coldest temperatures in the 5-year history of the Ski Bowl weather station. Minimum temperatures of 2°F persisted for several days and the lowest maximum temperature of the season was also recorded (14°F). Winds were light to moderate during March and varied from southeast to west/northwest.

In April, above-normal precipitation and below-normal temperatures continued into the middle of April. The second half of the month was dry and warm. 85" of snow and 8.7" of water fell, all in the first half of the month. Winds were fairly light to moderate and were mostly south and west during the first half of April, becoming variable during the second half of the month. Of note in April was one of the deepest snowpacks in recorded history for our area, including our lower elevation weather stations: Castle Lake at 5900' reached 190", Mt. Eddy at 6800' reached 168", Sand Flat at 6800' reached 189" and Ski Bowl at 7600' reached 284".

We were fortunate to get a new weather station at on the east side of Mt. Eddy at 6509' this year, courtesy of the Friends group and Snow Dog Engineering. This station provided critical weather data for an area seeing increasing backcountry use. Long-needed maintenance and repair was performed on our other weather stations on Mt Shasta, including the snow-depth sensor and heated tipping bucket at the Old Ski Bowl.

Bob Noyes from the Friends group made three beautiful GIS maps of our forecast area that highlight the slope steepness. These can be viewed and printed from our Web page. The friends also did a great job in receiving a grant from REI, which provided for a rescue cache in the forecast area along with other supplies.

The Crystal Ball— In the future we would like to continue to expand our program in education, weather information, and the forecast area. We look forward to having the Friends of MSAC members help teach the avalanche-awareness classes next year. Fundraising efforts were successful again and FMSAC is looking to sponsor the move of a current weather station in the Old Ski Bowl. They have also considered purchasing a PowerPoint projector and laptop computer for educational purposes.

As forecasters, we would like to continue to receive more education pertaining to the unique weather that occurs on Mt Shasta. Discussions have occurred regarding wind modeling to more accurately forecast the complex and strong winds Mt Shasta receives. Another goal is to expand our snowmobiler-educational programs. We look forward to the winter ahead and continuing to provide a professional and quality product for the public.

We want to give a BIG THANKS— We feel very fortunate to have such great support from the Friends of the Mt. Shasta Avalanche Center. They threw another incredible fundraiser called The Snowball that produced over $7000 to be used for more weather telemetry. Many businesses donated prizes, beverages, and food. We would also like to give a big thanks to Tuli and Keith Potts for filling in during our busy educational year. You two are invaluable to the program.

We would also like to thank Scott Schmidt for installing another working weather station on Mt. Eddy. Great work Schmidty! Thanks to the National Avalanche Center for their support and guidance. All the observers deserve a huge pat on the back for their invaluable information. Medford NWS did a good job of providing us with weather information. Brenda Graham from the USFS Fire Weather Forecast Center in Redding, CA gave us invaluable guidance and meteorological education. Dept of Water Resources provided access to excellent weather telemetry. Dave Trevisan and Mike Hupp deserve many thanks for their continued support and faith in the avalanche center. Last but not least, great thanks to our patient families for putting up with early mornings and of course to our Avalanche Search Dog, Kenai.

—Matt Hill, director and Eric White, forecaster

Payette National Forest Avalanche Center

Seasonal snowfall was 121-126% above average for the mountains surrounding the McCall area, with February being the driest month of the winter. Average cumulative snowfall as of mid-April was over 400". In general, the McCall area had a relatively stable snowpack compared to 2004/05. Storms flowed predominantly from the south and southwest, beginning with cold temperatures and ending warm. In spite of these inverted storms, instabilities subsided within a couple of days. Strong winds accompanied most storms and created an ongoing wind-slab concern throughout the season. Other than a small cycle early in December, no major avalanche cycles occurred.

A total of seven avalanche-related accidents were reported to the center, none fatal. Out-of-bounds skiers within our southernmost forecast area around Tamarack Resort caused four of these accidents. These incidents were likely due to wind loading. The remaining three accidents involved snowmobilers in the backcountry. Of all seven incidents, none resulted in a full burial. Most were partial burials, or the victims were flushed to the side or top of the snowpack as the slide slowed to a stop.

Staff this season consisted of Randy Skinner as the lead forecaster, Jim Fitzgerald and John Groom as co-directors and forecasters, and Tiff Meheen as a forecaster.

Funding for the season came from three sources: totaling $26,000. The National Avalanche Center/Region 4 provided $15,000; Payette National Forest another $8000; and Idaho Department of Parks and Recreation provided $3000 from the state snowmobile license-plate program. The center posted a total of 36 advisories from December to mid-April on a bi-weekly basis on Wednesdays and Saturdays via Web page, phone recorder, and subscriber e-mail.

The center hosted one basic avalanche class and eight awareness classes at local schools. These awareness classes reached approximately 350 youths and consisted of short film pieces, PowerPoint presentations, question-and-answer time, and hands-on beacon searches. Other community avalanche education included two Level 1 avalanche classes put on by the Friends of the Payette Center and four free beacon clinics and a beacon competition hosted by the local retailer, Gravity Sports.

For 2006/07, the Payette NF Avalanche Center anticipates a partnership with the Boise National Forest. This will facilitate an expansion of forecast days and forecast area to include Cascade, south of McCall. We welcome back Jeff Haligan who will be forecasting for the Cascade area. We've also designed a new advisory template for 2006/07 that has less straight text and is more user-friendly.

—John Groom, co-director

Bridger-Teton National Forest Avalanche Center

The 2005/06 season will be remembered for above-average snowfall. Snowfall amounts were well-above average in December and January, below normal in February, and back above average in March. From October 1 to April 15, over 500" of snow fell at 9,000' in the southern Teton Range. Snow depths in mid-April ended up at 115% of normal.

Wyoming had two avalanche fatalities. They occurred at the beginning and the end of a late December/early January storm cycle that brought over 80" of new snow to the mountains. On December 27, a young man on a snowmobile died in a terrain trap near Togwotee Pass. The lack of a transceiver, obscure location, and escalating storm delayed the recovery of this victim for several days. The second incident occurred on January 5 on the first clear day at the end of this storm cycle. Laurel Dana, a well-known local skier, died on a steep, active avalanche path off the southeast ridge of Mount Taylor. In addition, several other backcountry users were caught and partially buried during the later portion of this storm cycle.

The Western Wyoming Avalanche Advisory, a new product offered by the Bridger-Teton National Forest Avalanche Center, was well received. This daily afternoon bulletin provided a synopsis of snow and weather conditions, an avalanche forecast for the next day, and snowpack and weather trends for the second and third days out. This new afternoon regional advisory was supplemented by our traditional morning bulletins for the Teton, Togwotee Pass, and Greys River areas. With four forecasts a day, the center issued a season total of around 680 advisories. Bulletin queries increased to over 500,000 for the season.

In addition to hosting a field session of the National Avalanche School, BTNF avalanche center instructors offered avalanche-education programs to the Green River Snowmobile Club, Jackson Community School, licensed snowmachine guides, Prescott College, the Boy Scouts, the Avalanche Center Support Organization, local backcountry skiers, and the American Avalanche Association.

Slide path on the north side of the southeast ridge of Mt Taylor, site of the accident of January 5, 2006, with positions of the principals marked. *Photo by Eddie Horney*

For a fourth season, the BTNFAC provided assistance to Intermountain Laboratories (IML) of Sheridan, Wyoming, in their infrasonic research project funded by the National Science Foundation. Huge advances in signal-processing applications with respect to distributed arrays of sensors have advanced this project from the research phase towards the commercial development of this technology.
Bob Comey of the BTNFAC participated in the National Avalanche Center forecasters exchange with the Swiss Federal Institute for Snow and Avalanche Research (SLF) in Davos, Switzerland. During the four weeks of the exchange, Bob observed the Swiss operation, gave a presentation on the procedures of the BTNFAC, and attended a workshop on wet-snow avalanches hosted by the SLF. Ernie Scott of IML also traveled to Davos and gave a well-received presentation on the results of his infrasonic research efforts. Bob will be giving a presentation on this exchange and the wet-snow workshop at the National Avalanche Center forecaster's meeting next fall.

—Bob Comey, director

Mount Washington Avalanche Center

For the Mount Washington Avalanche Center. the 2005/06 season was especially "New England-like." Early on, while two of the four forecasters were enjoying some quality time with Western sandstone, a mid-October storm rolled through the Northeast and provided a solid base with 34" (86cm) of heavy snow, ice pellets, and graupel. The storm officially kicked off the forecasting season and a general advisory was posted on October 18. The first advisory using the U.S. 5-scale danger-rating system was issued a week later. The latter half of October was clouded with constant snowfall and we ended the month with 72.2" (183cm) of snow making it the snowiest October on record for the Mt Washington Observatory. Most of the snow that went into that record was perfect for establishing a long-lasting base and helped smash the record for the wettest month on record with a whopping 26.8" (68cm) of water.

The snow we had accumulated by mid-winter took a serious beating with our January thaw. Local stores seemed to sell out of sunscreen and Hawaiian shirts while the hockey skates and snowblowers sat forlorn upon the shelves. Rather than skiing and ice climbing, the Snow Rangers spent their January days off pursuing activities like rock climbing and pedaling bikes over bare ground. The two high points of the month ended up being the chance to observe the elusive thundersnow and the opportunity to employ some of our technical rescue skills in extremely boney conditions! When all was said and done we ended up with the warmest January on record, breaking a mark that was set back in 1954.

Just when we thought the weather couldn't get any crazier, we hit mid-February. As the unpredictable continued to occur on a seemingly regular basis we witnessed the mother of all extremes. Friday, February 17 was a balmy 34°F (1°C) and the weather observers enjoyed short sleeves and light winds at the summit of Mt Washington. Late in the afternoon, a cold front moved in and it seemed especially apocalyptic as strong thunder and lightning rocked the mountain. Winds ramped up with gusts over 135mph (216kph) and what little heat remained was soon sent south with its tail between its legs. Approximately 24 hours after smashing the record high, the Summit's temperature had dropped down low enough to set a new daily record low at -29°F (-34°C) and a fresh record for biggest 24-hour temperature swing! Despite the seemingly malicious weather, Mt Washington attracted its normal weekend crowds and we felt kind of soft trying to talk the sneakers-and-jeans-clad visitors out of their summit bid while we shivered in our insulated one-piece suits.

Continued next page ➡

NAC ROUNDUP

continued from previous page

Much of the remainder of the season was dominated by an abusive pattern of copious rain followed by a deep freeze. By late winter there was little differentiation between the myriad ice crusts, and the entire snowpack had turned into a solid mass of jackhammer hardness. As much as we tried, we couldn't seem to lure our Western friends out for some good old New England packed-powder skiing. The daily presence of an icy surface contributed to an increase in sliding injuries, most involving crampons. Whether they were glissading on purpose or just slipped and didn't stop, a number of folks took some high-speed slides into areas with extremely poor runouts. Luckily the snow that was horrible for skiing was great for snow pickets and our local SAR teams assisted with a handful of technical rescues. On one single day in April, the Mt Washington Volunteer Ski Patrol helped us deal with 10 skiers and riders whose edges lost the battle with the hardpack.

Though there were a few human-triggered avalanches this season, there were no major avalanche-related accidents. The only significant incidents we recorded were two naturally triggered slides. One was a partial burial (up to the waist) of a skier and the other was a medium-sized wet sluff that buried a bunch of gear stashed by skiers. We had recorded 60+ natural events by the end of February when the cycles seemed to fizzle. The rains got progressively heavier with each passing system, and eventually our well-drained snowpack built up a heck of a tolerance to monsoon weather. Our yellow lab, Cutler, continued his service with the program and we tried to keep his scenarios interesting by throwing in challenges like night-time searches. The lack of snow often made things difficult, but there are few limitations when you're jacked on coffee and plagued by cabin fever.

The number of avalanche courses offered in the area continued to grow this year and the forecasters took part in most courses. A number of other avalanche education programs were presented including two at the 13th Annual Mount Washington Valley Ice Festival of which the Mt Washington Avalanche Center was a sponsor. The avalanche advisory continued to be our most accessed educational tool, with Web site visits climbing steadily. During the forecast season we averaged 38,000 hits per day and tallied more than 10-million hits since the end of last season. One contributing factor might be the increased length of our season. When the last advisory was issued on May 28, the season's total had reached 215 advisories for the year, breaking our old record by 15. What we lacked in snow quantity and quality we most definitely made up for in duration! Now if we can only have the 8-month winter where it actually snows all the time… *—Chris Joosen, director*

Debris from a huge slide in Pine Canyon, Wellsville Range near Logan, Utah. *Photo by Toby Weed*

Logan, Utah • Bear River Avalanche Information Center

Powder connoisseurs lucky enough to taste the regional backcountry offerings will look back on this season as a first rate vintage—that is, with fond memories and insuppressible grins. Strong high-pressure systems did not develop over the area, and the city of Logan was completely spared from the hated winter temperature inversions that often afflict Cache Valley with stagnant and smoggy air for weeks at a time. Snow fell every few days like clockwork, and it piled up deeply in most avalanche starting zones, insulating the basal layers and preventing depth hoar development. Our snowpack remained mostly stable throughout the season, with only a few exceptions. As I write this in late April, the Tony Grove Snotel site at 8400' reports over 9' of total snow on the ground containing almost 56" of water equivalency weight. This puts us at 155% of the average for the date.

Snow began to pile up at higher elevations in early November, and I put out an early season advisory on November 6. On November 13, after a particularly productive snowstorm, a lucky snowboarder without proper backcountry equipment or avalanche knowledge dropped into a 42˚ chute atop a steep bowl called Ski Hill, triggering a 350' wide by 1-2' deep new-snow avalanche and taking a short ride.

By December 1, warmth had solidified the base layer of the snowpack, with the Tony Grove Snotel reporting only 7" of total snow containing 6" of SWE (snow-water equivalent). The Friends of the Utah Avalanche Center - Logan held their second annual fundraiser bash on December 4, and it was once again a big success, raising community support and some much-needed cash. We observed spotty natural avalanches associated with regular snowstorms on December 4, 20, and 27. On New Year's Eve, part-time forecaster Dave Kikkert tied into a rope, sawed through a big cornice, and triggered a 30' wide and 1-2' deep soft slab in the Hell's Kitchen running on faceted snow. Shortly afterward, a backcountry skier on a nearby slope, unaware of Dave's successful slope-test, unintentionally triggered a similar slide and barely managed to escape taking a ride.

On the first day of 2006, we noted 89" of snow on the ground at Tony Grove with 23" of SWE. On the third, after heavy snowfall and strong westerly winds, widespread natural hard and soft slab avalanches occurred in the region. On January 4, I examined the aftermath of one the most impressive avalanches I have ever seen in Pine Canyon in the Wellsville Range. The huge, full-width hard slab pulled out right at the ridge line and careened 3000 vertical feet down the twisting canyon bottom, toppling huge pine trees and forming half-mile-long serpentine rock-and-tree-embedded ice walls en route to its terminus. In January we documented a total of 14 days with avalanches occurring. We knew of four unintentionally human-triggered slides. These were fairly evenly divided between user groups: two snowmobilers, a snowboarder, and a skier.

On February 1, the Tony Grove Snotel site reported almost 12' of snow on the ground containing nearly 39" of water equivalent. In the first week of February we documented large natural hard-slab avalanches in Pine Canyon and Castle Rock (near Naomi Peak), which were repeaters of previous slides in these same paths. Avalanches occurred on eight days in the month, and four slides were listed as unintentionally triggered: two triggered by skiers and two by snowmobilers. On February 28, heavy rain fell even at high elevations, and large natural wet loose avalanches ensued. One hit Highway 89 in Logan Canyon at around mid-day, crossing both lanes of the busy road and forcing a couple-hour closure. The rain created an easy-to-identify crust layer across the region. In the Wellsville Range, this layer and associated facets became a persistent weakness and sliding surface for several big springtime natural avalanches.

122" of snow with 47" of water sat on the ground at Tony Grove on March 1. Regional avalanches occurred on 12 days in March, with a couple dangerous human-triggered avalanche situations. On March 3, a snowmobiler triggered a sizable hard slab on the north face of Providence Peak. The incident wasn't reported, but tracks leading into and out of the large debris pile told the amazing escape story. In the Wellsville Range, large natural hard-slab avalanches running on the February 28 rain crust occurred on February 19 or 20 in Shumway Canyon and on February 29 in Gibson Canyon.

March 21 was another of the "all-time best-ever powder days" in the region, and I was enjoying the fine conditions in the rare company of my only brother and a favorite backcountry partner. High above the upper reaches of White Pine Canyon, the crown jewel of the Bear River Range, a wily old mountain goat fell prey to a momentary lapse of good decision-making on the steep and craggy east face of Mount Gog. I'd rated the avalanche danger as Moderate, with slab avalanches possible on steep upper-elevation slopes, just like the one we were on. But, as the third skier to descend the steep entry gully on the main part of the face, I didn't expect to actually trigger a slide. As I popped through the narrow neck of the chute and onto the steep slope below I noticed, in the very limits of my peripheral vision, the slab breaking apart across the slope above and to my left. Instinctively and without a thought, I skied off the moving mass while yelling, "AVALANCHE!" I watched, overcome by an indescribable helpless terror, as the slide ran within feet of my nervous partners who were waiting below on a tiny dividing rib above a 100' cliff, holding desperately to the flagged lower branches of precariously perched Douglas firs.

On April Fools Day, the Tony Grove Snotel reported an incredible 13' (132") of total snow with 56" of SWE. On April 6, after a productive and windy storm a very wide hard-slab avalanche spontaneously released below a cliff band just north of Naomi Peak. The 1200'-wide avalanche piled chunky debris on a bench after running a maximum of 250 vertical feet. On the same day in the Wellsville Range in Old Logway Canyon, cornice fall triggered a large hard slab running on the now familiar February 28 rain crust. After a string of warm nights, strong southwesterly winds, and some rainfall at upper elevations, a large cornice fall on February 16 triggered a deep wet slab in the upper North Fork of Shumway Canyon. I posted our last regular advisory on April 16.

We documented 43 days with avalanche occurrences and 22 human-triggered avalanches. Of these, we consider 11 unintentionally triggered. Thankfully, no one was buried, injured, or killed and no reported property damage occurred. This season set the standard for fine powder conditions in the regional backcountry, and it will be a hard one to top. *—Toby Weed, director*

Northwest Montana & Glacier Country Avalanche Centers

The 2005/06 winter summary for Northwestern Montana is one of near norms for snowpack accumulation. Precipitation was normal in October and November, lagged a bit in December, but picked right up again in January. Mid-March, typically a time for late-season storms, snowfall accumulation declined. Overall the region fell slightly below the 30-year snowpack average. Temperatures during the winter were on the warm side at all elevations, especially below 5000' where most precipitation was in the form of rain.

Two noteworthy incidents occurred this year. The first was a large natural release in January. This avalanche caught three snowmobilers who had stopped in what normally would have been regarded as a safe area beside Red Meadow Lake. The avalanche created a mini-tsunami as it broke through the lake's ice. Water, ice, and snow surged out of the far side of the lake, hitting the three snowmobilers. One was rescued and two perished. The second incident happened in March, when a single skier triggered a slide while skiing down into a terrain trap. Partners rescued the victim, who sustained a crushed pelvis and soft organ injuries.

The local Friends group, Glacier Country Avalanche Center (GCAC), continues to be a strong partner with the Forest Service. The partnership provides quality education opportunities, a highly visited Web site and a group of very dedicated volunteers. The Forest Service also received another substantial Montana Department of Fish, Wildlife & Parks trails grant for avalanche education.

Our GCAC partnership is looking ahead to even better ways of reaching winter recreationists for next year. GCAC reports hosting 250 educational participants. "Avy Savvy" clinics, an observer's course, on-snow transceiver clinics, Avalanche Awareness Days and a well-attended Level 1 course were among the programs offered. Some challenges for the non-profit educational programs have been the skyrocketing costs of avalanche-course insurance and handling instructors as employees of a non-profit. These escalating costs are leading towards the shifting of

programs and oversight to help fund a Forest Service employee hired specifically for avalanche-education programs. *—Tony Willits, USFS, & Lisa Steiner, GCAC*

Eastern Sierra Avalanche Center

The inaugural season of the Eastern Sierra Avalanche Center got off to a slow start. An early November storm dropped nearly a foot of snow which promptly turned into depth hoar. Rain before and on Thanksgiving Day left two knife-hard ice lenses that persisted into the end of February and beyond. By the end of November, Mammoth Mountain's study plot only had 5" of snow.

December Doldrums— On December 2, the season's first avalanche warning was issued. A Pacific storm dropped 3' of dense (15-19%) snow above 8500'. 48 hours of sustained 70mph winds led to an extensive avalanche cycle. Many full-depth natural avalanches ran at the Mammoth Mountain ski area and in the backcountry, including previously bare slopes avalanching back down to the ground. A period of high pressure with dry and unseasonably mild weather followed for two weeks.

Noah's Ark— Our second extreme-danger rating and avalanche warning was issued December 20, when a cold dry storm dropped 2-3' of snow followed by warming temperatures and rain. 5" of water was added to the snowpack in a 24-hour period. A violent rainstorm on December 22-23 created another ice lens in the pack. This lens persisted through the winter until early March, when these ice layers were buried under more than 3m of snow.

During the last week in December, Reno National Weather Service called for the jet stream to bring very moist subtropical air to the region. Whether we would receive rain or snow was the big question. By December 29, 18" of rain and snow had fallen with 3-4" of water content. In Tuolumne Meadows, 40" of snow fell and the snowpack settled a remarkable 39". Wildly fluctuating temperatures during the storm had rain-snow levels ranging from 8,000-11,000'. Mammoth Mountain ski patrol reported avalanches running on the ice lens of the December 27-28 storm or on a layer 30-80cm down that consisted of columns, facets, and sector plates.

Finally, SNOW! The most potent storm system of the series moved into the region on December 30. An enormous amount of subtropical moisture from the Philippines and Indonesia accompanied this system. On January 2, holiday visitors and local officials woke up to over 3' of new snow arriving in an 18-hour period. Interstate highways closed and avalanche warnings were issued. Another 3' of snow fell in the next 24 hours, and holiday travel in the eastern Sierra ceased. By that time, the eastern Sierra's seasonal precipitation values were close to April 1 peak values. During the first three days of 2006, 74" of new snow was recorded at the ski patrol study plot. Backcountry locations received 48-60" of new snow and up to 10" of water. Many class-4 and 5 avalanches were observed on Mammoth Mountain and in the backcountry.

Tragedy— At the end of January, a party of three off-duty Mammoth Mountain ski patrollers were west of Bridgeport, skinning up a 40˚ east-facing backcountry slope. The aspect changed to northeast and a short 150-200' wind-loaded slope had to be traversed. While two skiers waited in a scattered glade of small white bark pines, the other skier began to traverse the slope. An 18" fracture line broke across and above the group. Two were carried and partially buried in the slide. One patroller managed to hang onto a white bark pine while the avalanche flowed past him. The female skier died as the result of traumatic injuries received when she was taken through the stand of timber. The other skier was partially buried and found not breathing, but quickly revived once his airway was cleared. The avalanche danger was rated moderate on wind-loaded slopes in the morning's avalanche advisory.

This was the third avalanche fatality in the eastern Sierra in two seasons. Ski patrol and many friends in Mammoth mourned the loss of a vibrant, well-respected and capable skier and patroller. Others were beginning to question the so-called "bomber" Sierra snowpack.

February, Business as Usual— February, typically a snowy month in the eastern Sierra, was lean. Only 48" of snow fell in two storms. The first half of the month was characterized by alternating cold and warm days, creating a variety of sun crusts, hard wind slab, faceting below crusts and slabs, and near-surface faceting. Two ice layers from the December rain storms were evident in most snowpits. Stability tests failed consistently on facet layers above and below ice layers approximately 50cm deep. Snowpack depths ranged from 90-120", and I decided digging snowpits to the ground in a search for more deeply buried ice lenses was good for snow hydrology, but not the best use of an avalanche forecaster's field time.

March Madness— Late February, Weather Service forecasters warned of a large influx of subtropical moisture with 3-5" of water and high winds. Heavy precipitation rates and strong (100mph+) winds resulted in a large, destructive avalanche cycle. I saw a few backcountry lakes that were hit with debris that pushed huge waves of lake ice and water onto the opposite shore.

From the end of February through April 6, a quasi-stationary longwave trough parked over the West Coast spewed an endless supply of shortwave storms. Snow was recorded for 22 out of 31 days in March. Mammoth Mountain received 166" of snow with 17" of water. High-elevation snow sensors (10,700-11,200') picked up 22" of snow-water equivalent.

March was also the coldest month of the season based on the temperature record at MMSP and backcountry sensor locations. With snow steadily accumulating on top of the buried ice layers, the potential for deeper instability was a concern. However, the March storms came with extremely high winds and most avalanche activity was limited to 15-40cm wind slabs that failed on thin low-density layers.

Cornices were unusually large and becoming increasingly unstable with new snow. One person learned the cornice lesson the hard way. He broke through an overhanging cornice, landed 20' below, triggered a soft slab and slid face-first down

This wet avalanche on McGee Mountain started as a slab near 10,500' (not the class-3 slab visible on the NE aspect above the main track). The path is called Trailer Park Gully after the 30-space mobile-home park located near the end of the historic runout zone. This slide occurred early in the morning of April 6 during the storm that resulted in Walter Rosenthal's death. *Photo by Sue Burak*

one of the steep 50˚ chutes above Ellery Lake near Tioga Pass. As the avalanche slowed down, he surfaced and ended his ride on top of the avalanche debris.

April Snowfall and Tragedy— March snowfall at Mammoth Mountain totaled 164" of snow and 17" of water. Backcountry locations received 10-15" of water for the month and seasonal precipitation exceeded 145% of the 50-year average. On April 1, the ski patrol study plot recorded 189" of snow depth.

A prolonged storm period April 2-6 brought another 79" of snow and 8.9" of water to Mammoth Mountain. The morning of April 6, two patrollers were resetting a fence around the opening to a fumarole—a volcanic vent that emits steam and the gases CO2, SO2, and H2S. Unaware that heat from the fumarole had created a cavern under the snow, the two fell 20' to the hot ground and into excessively high concentrations of toxic gases. Two other patrollers went into the hole with oxygen in a vain attempt to rescue their comrades. Both patrollers and one of the rescuers died from asphyxiation due to the high levels of CO2 gas trapped by the snowpack.

Walter Rosenthal, the rescuer who did not survive, will be remembered as a friend, mentor, snow scientist, and the driving force behind formation of the Eastern Sierra Avalanche Center. The community of Mammoth Lakes was stunned by this tragic accident and the events of the winter. *(see Walter's obituary, pg2)*

Spring Arrives with More Snow— Moderate snowfall and spring-like temperatures began the spring-summer transition of the Sierra snowpack. The last few days of April saw elevations above 10,000' with high temperatures in the upper 50s to 60°F and lows in the upper 30s. Many skier-triggered avalanches and large class 4 and 5 naturals ran in the backcountry. Entire basins avalanched to the ground.

The final advisory was posted on May 26, with many of us still enjoying fine spring descents in mid-June. Despite great concern about deep spring avalanche releases on buried ice layers, there were only a few deep wet slab releases.

Our first season was marked by the highs of great skiing, mind-numbing long periods of heavy snowfall and two heartbreaking tragedies. We look forward to avoiding the latter in our next season of operation, using lessons learned from this year, and developing a more extensive operation. *—Sue Burak, lead forecaster*

Gallatin National Forest Avalanche Center

The Montana winter started in early October when the first storm deposited 15-24" of heavy wet snow in the mountains. This provided a well-bonded base layer for one of the more stable snowpacks we'd seen in several years. The remainder of October was cool and dry. As a result, snow stayed on the ground and weak crystals formed on the surface.

During the first week of November, 2-4' of snow fell in most mountain ranges, with over 6' falling in the mountains around Cooke City. Strong winds accompanied this storm cycle and so did the first avalanche burial of the season. Fortunately, the buried person and his dog were okay. Warm weather dominated until after Thanksgiving. Then a three-day storm deposited 4' of snow in the northern mountains and 1-2' in the south, prompting daily advisories to begin on November 28. The new snow from this system bonded well and didn't produce a significant avalanche cycle.

Snow continued through the first week of December, adding 4' onto a stable snowpack in the Bridger and northern Gallatin Ranges. 1-2' of snow fell on well-developed surface hoar in the southern ranges. Cold clear weather during the middle of the month formed a second surface-hoar layer in the southern Gallatin and Madison Ranges and produced near-surface facets in the mountains around Cooke City. Weather patterns shifted from a northwest to southwest flow near the end of December, and a series of storms brought several feet of snow to the southern mountains. A significant avalanche cycle occurred on the uppermost surface hoar layer, and avalanche warnings were issued for the southern ranges from December 29 through January 2.

Measurable snow fell 25 out of 31 days in January, depositing 60-80" of snow in the southern Gallatin and Madison Ranges and 120" in the mountains around Cooke City. Heavy snowfall the first week of January produced unstable conditions in the

Continued next page ➡

NAC ROUNDUP

continued from previous page

mountains outside of Cooke City, leading to two back-to-back avalanche fatalities on January 5 and 6. Both avalanches ran on near-surface facets that formed in mid-December. The northern mountains received 24-48" of snow during January and, unlike our other areas, had no significant instabilities.

February was cold and dry with several periods of below-zero temperatures. Weak surface crystals formed and were subsequently buried in all mountain ranges. A storm system near the middle of the month produced the only significant snow, 15-20" in most ranges and 30" in the mountains north of Cooke City. This snow was deposited on near-surface facets and produced avalanches in all mountains of our advisory area.

March seemed determined to make up for February's poor performance. Over the course of the month, 60" of snow accumulated in all ranges. The avalanche cycle of mid-February cleaned out many paths. On slopes that hadn't avalanched, the buried weak layer gained enough strength to support the added snow load. As a result, the snowpack was generally stable during most of the month. Warm wet storms near the end of the month produced several human-triggered avalanches, but these storm-related instabilities were short-lived, usually subsiding within 24 hours of the snowfall. Wet weather has continued into April. Unfortunately the storm systems were warm, resulting mostly in rain.

The overall good stability of the snowpack this season is illustrated by the lack of avalanche incidents. Only 22 human-triggered avalanches were reported in our area, with four partial burials and four full burials resulting in two fatalities.

Regular advisories started November 28. 134 advisories supported by 114 field days were issued by the close of business on April 9. The popularity of the advisories continues to increase, with advisories access counts tallying 2052 daily for an 18% increase over last season.

We provided avalanche education to 2891 people through a combination of 47 talks, seminars, or field sessions. This is an increase of 30% over last season. This increase has been made possible by monetary support from the Hans Saari Memorial Fund. We hired Jay Pape and Dale Gullet to teach classes to students we would otherwise have had to turn away due to time constraints.

We are proud to announce that Yamaha sponsored the GNFAC this season by generously donating two sleds for our use. This sponsorship was the result of the strong support we continue to receive from Team Bozeman, a local snowmobile shop. We are very grateful for the use of these machines; without them, our snowmobile avalanche-education program would suffer greatly. It's pretty hard to keep up with the class when you're riding two-up on a wide track.

Thanks to everyone who has made this another successful season for the GNFAC. Have a great summer and we'll see you next fall. *—Scott Schmidt, forecaster*

Chugach National Forest Avalanche Information Center

The Chugach National Forest Avalanche Information Center (CNFAIC) entered its fifth season with the first advisory posted on October 31, 2005. Full-time advisories started November 23. The weather station on Seattle Ridge was reconstructed after snow creep destroyed the tower in the spring of 2005. A more robust Rohn tower, additional solar power, and a larger battery bank were introduced to the site. This was a joint project between the CNFAIC, the Friends Group, and AK DOT. This site also acts as a repeater for a DOT roadside camera.

The 2005/06 season was staffed by Lisa Portune, Matt Murphy, and Carl Skustad. Tim Charnon and Dan Keeler provided critical help by filling in when a partner was needed for field observations. This season the CNFAIC staff cross-trained as snow removal, outhouse, and sign technicians. Winter trailhead and snowmachine trail maintenance along with avalanche education filled up the remainder of the schedule. It is estimated that 75% of the staff's time is directly related to avalanche education, observations, and writing advisories. The remaining 25% is filled with the other activities mentioned.

105 avalanche advisories were posted this season, posted by 0800 Wednesday through Sunday. The Web site received on average 104 hits per day with the most active day reaching 597 users. Web users logged on 7695 times in January alone.

Avalanche awareness continues to be a large focus of the CNFAIC. We started the season with the annual Fireside Chats, with the best turnouts yet. 177 participants attended over the five evening sessions. We also spoke to the following groups: Anchorage snowmachine club (75 attendees), Conoco Philips (30), AK Pacific University (22), Anchorage Parks and Rec (70), APLIC (10), AK Safety Council (12), BLM Winter Trails Day (50), and AK Fish and Game (30).

Getting good volunteer snow and weather observations from the field is always a challenge. With the assistance of the Friends Group, we contracted AK Avalanche School to train 12 volunteer observers. A prerequisite for candidates was Level I avalanche training. This four-day course was free to participants. We also gave them snow-study kits and palm pilots to record their observations. In return, observers would voluntarily send snow observations to the center. Observations could be recorded on palm pilots or PCs, then sent to an on-line database residing at snowpilot.org. The center would then view the snow assessments on-line. The program successfully trained 12 observers and had approximately 50% success in receiving snow observations from participants. We plan on continuing the program next season with the participants from this season. Additional observations came from numerous other outdoor enthusiasts. All these observations assist us in producing a more accurate advisory.

Thanks to a great network of weather stations we were able to keep a pretty close eye on this winter's weather. A flurry of weather stations exists in the Turnagain Arm area thanks to a group of dedicated people. AK DOT, AKRR, Alyeska, NRCS, and the Friends of the CNFAIC make this network possible.

November marked the start of our winter season along with a motorized-use opening date of December 1. A very cold and shallow snowpack existed for most of December, becoming very faceted. During the holiday season, snowmachining on the Chugach Forest was closed due to significant rain. Rains reached up to 3000' and the snowpack above 3000' remained cold and faceted. Common in the colder mountain environments in Alaska, faceted snow is not seen as often in our warmer coastal snowpack. This weak faceted snow was responsible for AK's first avalanche fatality on January 3. This avalanche occurred in the center's advisory area on Raggedtop Mt above Girdwood. One ski mountaineer was buried and killed. January provided only 38" of snow but sunny cold weather made great mountain travel. These cold temperatures allowed the weak faceted snowpack to persist above 3000'.

Snowmachining was unable to reopen until February 2. This date also marked the beginning of the largest avalanche cycle of the year. 62" of snow and 11.6" of water equivalent fell in one week. Large class-4 avalanches closed the Seward Highway and destroyed power lines during these storms. More sunny skies closed out February.

March offered up two smaller avalanche cycles with 43" of snow and 4.3" of water equivalent. Spring had a hard time pushing back the Chugach snow this season. Two good April storms dropped nearly 2' each on the mountains above 1,500'. April came in a close second for the snowiest month of the season with 54" of snow and 11.6" of water equivalent. Snow totals for Alyeska Resort ski area came in above average at all elevations of the mountain, with 710" of snow falling on the upper mountain by closing time in the spring.

Alaska had four avalanche fatalities during the 2005/06 season. A skier was killed on Raggedtop Mountain in the Chugach Range on January 3, a snowshoer was killed on Flattop Mountain above Anchorage on February 8, a snowmachiner breaking trail for the Iditarod Sled Dog Race was killed at Rainey Pass in the Alaska Range on February 14, and a snowboarder was killed in Hatcher Pass on Marmot Mountain on February 28.

On May 1, all areas of the Chugach NF were closed to snowmachines, except Turnagain Pass, which stayed open until May 16. Our spring avalanche cycle started on May 13 when overnight temperatures stayed above the freezing point.

—Carl Skustad, director

Sierra Tahoe Avalanche Center

The 2005/06 snow season got off to a late start in the central Sierra Nevada. We issued our first avalanche advisory November 28, and issued our last advisory on May 2. We were plagued with above-average temperatures this winter, as well as many rain events occurring within the forecast area during November, late December, and the month of January. The first half of February brought spring conditions with true corn-snow development. Seasonal temperatures finally arrived in late February. One storm after another rolled through the forecast area from mid-February through mid-April. March 2006 was a record snowfall month for most of the forecast area. Alpine Meadows ski area set a new record of 200" of snow at their base area, located at 6,700'. Snow was recorded 24 of the 31 days.

The Sierra Avalanche Center provided avalanche forecasts and advisories covering roughly 1700 square miles between Highway 49 - Yuba Pass on the north and Highway 108 - Sonora Pass on the south. We issued 124 avalanche advisories between November 28 and April 18, all prior to 7am. The number of advisories issued at each danger level were the following: 26 Low, 44 Moderate, 29 Considerable, 25 High, and zero Extreme.

Formal information-sharing was established between Alpine Meadows, Bear Valley, Kirkwood, Mt Rose, and Sugar Bowl ski areas. Snowpack, weather, and avalanche observations from the ski areas were submitted to the center between 0500 and 0645 on mornings when avalanche-control work was performed. Afternoon updates were often submitted by the ski areas during storm cycles. Additionally, a significant increase in the number of snowpack, weather, and avalanche observations were submitted to the center from both the UC Berkeley Snow Laboratory on Donner Summit and the general public.

The center welcomed the first full-time, paid avalanche forecaster this winter. Full-time volunteer forecasting occurred during the 2004/05 season. The Truckee Ranger District of the U.S. Forest Service provided office space, a computer, phone, radios, a vehicle, fuel, and covered most indirect costs. The "Friends of" program for the center successfully raised $18,000 in private funds to support the center. Funds were raised through sales of donated ski-area lift tickets at Kirkwood, Sugar Bowl, and Homewood ski areas, raffles and silent auctions at fundraiser events, t-shirt sales, and cash donations.

The Sierra Avalanche Center made great strides to establish itself for long-term existence during the course of this past winter. We are currently working in partnership with the Eastern Sierra Avalanche Center on a joint proposal for significant federal funding from the Tahoe and Inyo National Forests. If this money is received, each avalanche center could employ two forecasters. *—Brandon Schwartz, forecaster*

Colorado Avalanche Information Center

October and November— Avalanche activity began as soon as October's snows started. The first reported avalanche ran on October 28 near Schofield Pass, catching and partially burying one backcountry skier. On October 30, an avalanche on Mount Baldy near Crested Butte caught two skiers, burying one to his waist and the other to his chin.

Our season did not slow down in November. On the 2nd, two backcountry skiers triggered a soft-slab avalanche on Purple Ridge near Crested Butte. Later that day, a lone backcountry skier passed this same slide before entering a slope of similar aspect and triggering another slide. The avalanche ran an estimated 2,200 vertical feet, carrying the skier most of this distance. Fortunately the man and some of the debris stopped at a bench, while the rest of the snow continued over a very large cliff and tumbled down to the valley floor. His injuries included a separated shoulder and numerous cuts and bruises.

A weak frontal system brought 7-9" of snow and strong winds to the Northern Mountains on November 5. This combination formed hard slabs near and above treeline. A snowboarder triggered one of these hard slabs on Mines Peak near Berthoud Pass and was buried under about 3' of snow. Unfortunately he had left his beacon in the car that morning. Rescuers with probe poles recovered his body about 2 hours after the accident. One dog was also killed in this accident.

Two quick storms in mid-November opened the door for more avalanche activity. On November 16, a skier triggered a shallow slide near Trico Peak in the San Juan Mountains. The skiers escaped unscathed but their canine companion was killed. On November 17, three ski patrollers at Telluride Ski Resort doing early season boot packing triggered a soft-slab avalanche. They were all caught in the slide and one suffered several broken ribs. November ended on a snowy note with the last four days of the month bringing a very pleasant 43" of new snow to the Steamboat area and 15" to Aspen. Observers reported 89 slides from October and November in the Northern Mountains, 34 in the Central Mountains, and 9 in the Southern Mountains. There were four avalanche incidents involving six people, burying two and killing one person and two dogs.

December— Heavy snows and strong wind brought Colorado its first avalanche warning of the season on December 3. 40 avalanches were triggered by control crews on the first day of the warning. Snowfall amounts from this first December storm ranged from 2-4' with winds between 50-60 mph. During the first four days of December, nine people were caught in avalanches. These winds built numerous slabs across the Front Range. On December 22, two high school students from Colorado Springs were attempting a winter climb of Torreys Peak when foul weather forced a retreat. A large natural avalanche from well above their route caught both of them and buried one 5' deep. The survivor had no rescue gear and was forced to hike out for help. An avalanche dog and handler from Breckenridge ski area flew through horrendous winds to the site and found the victim's body after an estimated three-hour burial. In the Northern Mountains, 264 avalanches were reported in December, 158 from the Central Mountains, and 100 in the Southern Mountains. There were nine avalanche incidents which caught 12 people. Three people were totally buried and one was killed.

January— New Year's Day was grim. A group of 12 snowmobilers stopped below an avalanche path near Cameron Pass. While highmarking on the slope, they triggered an avalanche that caught seven of them. Five were partly buried, and two were completely buried and killed. Fortunately, this was the last serious accident for the 2005/06 forecast season. Typically there are several avalanche accidents in Colorado during the second half of the winter and in the spring.

A high-pressure system brought calm weather to Colorado during the first week of January, but eventually gave way to a series of weak Pacific systems. Colorado remained under persistent northwesterly wind flow through the end of the month. This weather pattern brought constant snowfall to the Northern Mountains. Although the weather models kept hinting the Southern Mountains would get some snow, storms invariably tracked further north leaving the southern third of the state high and dry. With steady snowfall, Colorado's usual deep-slab instability problem was quietly slipping away. Four avalanche incidents for the month caught 10 people, killing two. There were 86 avalanches reported in the Northern Mountains, 66 in the Central Mountains, and 197 in the Southern Mountains.

February— February proved to be an interesting month for weather, but tame for avalanches. It started as a strong Pacific storm with west-northwest flow pummeling the state. On February 2, Copper Mountain, Vail, Breckenridge, and even the usually skunked Lake City area reported over a foot of snow. Sites across the state received 2-3' of snow in three days. A strong high-pressure system then planted itself over the state for the next nine days.

One of the more interesting weather events of the season arrived on Valentine's Day. A dust storm crept into the San Juan Mountains and moved into the Northern and Central Mountains. A strong jet stream across the desert southwest picked up enormous amounts of dust and spread it across Colorado. This system also dropped several inches of new snow throughout the mountains of Colorado. Weather stations from the San Juan Mountains to the Front Range measured average wind speeds in the 40mph range with gusts into the 80s. By the afternoon of the 15th, winds would peg over 100mph near Red Mountain Pass. These winds combined with the new snow and dust gave the snow surface a "Pintoed" look. After the storm, high pressure gradually built over Colorado. A dramatic spike in the warming trend on the 27th and 28th produced a cycle of wet slides and roof avalanches. One roof slide caught and buried a three-year-old boy walking behind his mother and father outside a school in Steamboat Springs. The boy, buried for less than 10 minutes, was recovered alive with cuts and bruises. The warm temperatures helped spur an active wet-slide cycle, wreaking havoc on

Continued next page ➡

DOUG COOMBS
continued from page 8

banished Doug from Teton Village for too many boundary violations, he went to Europe and similarly made a name for himself in Verbier and La Grave. He and Emily ran their Steep Camps there where the rules are loose, the mountains are big, and the access is unmatched.

When you live your life as a pioneer out on the naked edge of possibilities, you are bound to have some close calls, and Doug certainly had his share. Doug developed a reputation for having nine lives, but by my count, he had more like 18. I remember those early days when he was just learning, nearly every day I would expect to hear about his death. But through his impeccable sixth sense and calculating intelligence, he cheated death time after time, year after year. He eventually acquired the reputation of being cautious and careful—something that naturally follows from many close calls. And just like Alex Lowe, another mountain legend who I can luckily count as a friend and a co-worker, he seemed to escape the fate of mere mortals. Both Doug and Alex lived comfortably into middle age, complete with children and after awhile I stopped worrying about them. The laws of physics obviously did not apply to living legends, at least the ones that I knew. I even quit worrying about my other legendary friends Mugs Stump and Seth Shaw. Dead. They are all dead now. Killed in the mountains. They died not doing the things that made them famous, but on moderate routes making silly little mistakes or simply being in the wrong place at the wrong time.

In the end, there's no way to escape the fact that mountains are inherently dangerous places. All of us who play in the mountains know that mistakes or bad luck are often fatal, so our only escape is to shave our odds down to impossibly low probabilities. If we spend half our days out there on the edge, then 99% safe is not good enough. It means that, on average, we will get killed once per year. 99.9% means we get killed once every 10 years. Through some combination of skill and luck, we need to be safe 99.99% of the time to enjoy a reasonably long career. Do you know anyone who is 99.99% perfect?

In the end, it's just like the Zen koan of Isan's buffalo, who passes through the window and the Zen master asks, "Why can't the tail go through?" We can never, ever, shave off those final percentage points. We are humans, after all, and even the Buddhas, Bodhisattvas, and legends of the mountains always have a tail that remains in the world and is also subject to the foibles of mortals. Sometimes death stands over our shoulder and we tell death, "Hey what are you doing here? I always operate with two nines after the decimal point." And death says, "Sorry, today you need three." Game over.

I miss all my friends who are not in the world any more, but I don't want to follow them yet. I will continue to go into the mountains because it not only seems to be my lot in life but my source of life. But I will shave more and more points off of the probabilities. Play it even safer. Take yet another giant step back from the edge. I want to die as an old man. I hope it works.

Bruce Tremper is the director of the Utah Avalanche Center and the author of "Staying Alive in Avalanche Terrain."

NAC ROUNDUP
continued from previous page

numerous Colorado roads. Colorado Highways 6, 40, 50, 91, and I-70 were all closed for short periods with avalanches crossing at least one lane. There were only three avalanche incidents in February burying three people, including the three-year-old. He was the only person injured (head laceration) during what is usually one of the busiest avalanche months in Colorado.

March— A deep closed low over the Gulf of Alaska and strong high pressure over the Great Basin teased Colorado with an early taste of spring during the first week of March. On March 7, the weather pattern and the winter suddenly did a 90° turn. A dramatic shift from northwest to southwest flow gave plow operators on Coal Bank and Wolf Creek Passes a chance to earn their money. A series of strong storms battered areas favored by southwest flow. Over the next week Coal Bank Pass had a whopping 75" of snow. With the snow came strong winds. Gusts over 90mph were reported from Red Mountain Pass northward to Summit County. Given the strong winds, the old snowpack structure, and the new snow, we issued an avalanche warning for the San Juan Mountains on the 10th. A brief lull in the action lasted only 24 hours after the warning was dropped on the 13th. A series of quick-moving convective storms brought heavy snow to scattered locations through March 23. At Wolf Creek Pass, more snow fell in March than in the previous four months combined. Even with all the snow and wind, only 265 avalanches were reported in March. In the Northern Mountains, 118 avalanches were reported, 55 in the Central Mountains, and 92 in the Southern Mountains. Five incidents caught four people (one person was caught twice in the same day) and one person was partly buried.

April— April turned out to be a dry month with less-than-average precipitation reported across the state. There was also very little avalanche activity. Warm temperatures on the 4th in Summit County set off a rash of small wet avalanches. More than 20 slides were reported around the I-70 corridor through Tenmile Canyon. Wind gusts exceeded 100mph for four straight hours on the 5th, maxing out at 124mph at the Eagle weather station near Red Mountain Pass. These winds ushered in the biggest storm of the month with 19.5" of storm snow recorded at Coal Bank Pass. A big warmup on the 12th and 13th meant high temperatures hit the lower 50s near treeline across the state. As expected, a number of wet slides ran throughout the San Juan Mountains with crown depths up to 3' deep. After the 17th, the mercury plummeted to lows in the single digits for winter's last hurrah. Spring-like weather ended our daily forecasts on April 23. There were no reported avalanche incidents for the month. Of the 115 reported slides, 75 were in the Northern Mountains. Southern Mountain observers reported 28 slides and 12 avalanches in the Central Mountains. —*Scott Toepfer, forecaster*