

VOLUME 26, NO. 1 • OCTOBER 2007

THE

www.AmericanAvalancheAssociation.org

2006/07 season roundup

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This very large spontaneous avalanche occurred in Bonneval-sur-Arc (France) on April 4, 2007. The snow from at least two successive storms was included, and the crown was more than two meters thick. The danger rating at the time was 3 on a 5 scale, but this was the largest slide on this path for the last 10 years, and it was the only big avalanche in the whole range during this period. See story on page 14.

> photo by Alain Duclos www.data-avalanche.com

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Just as we were about to dismantle the instruments at our snow plots, April struck, and we were sent to the store for more Dramamine[®].

—Jason Preisendorfer, Mount Washington Avalanche Center 2006/07 Season Roundup, p17

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The mission of the AAA is:

from the president

I am writing this note in late July, while much of the Intermountain region is inundated with smoke, widespread wildfire, and record dry conditions. Who knows what the rest of the summer and fall will bring? I've almost forgotten how the past winter brought strange weather to many of the regions A3 members work in. Now, as we enter the coming winter season, the National Avalanche Center season summaries (beginning on page 16) bring those conditions back to life.

I'd like to give you an update on what the American Avalanche Association has been able to accomplish between snowmelt and snowfall. Thank you everyone for your help on these programs. A3 would not be what it is but for its members.

A number of avalanche professionals deserve recognition for contributing time and expertise this summer. Check Doug Richmond's article about OSHA's proposed changes for explosives handling and the A3 members who analyzed volumes of text and even traveled to Washington, D.C., to educate lawmakers. These A3 members helped to format input with NSAA and developed recommendations for OSHA regarding changes that could dramatically affect how many of us work in snow-safety operations.

Education programs by and for A3 members have been at the forefront the past year. The PAWS course (renamed AVPRO to avoid confusion with dog-training programs) is scheduled for Little Cottonwood Canyon December 1-9, 2007. With top instructors in one of the best snow and avalanche study areas in the world, it will be an impressive and rewarding upper-level program for

professionals or aspiring professionals. Sarah Carpenter has been the key coordinator for the AVPRO, and we are fortunate to have her step in to assist Michael Jackson as co-chair of the Education Committee. Education Guidelines have been revisited and revised to include entry level programs, recommended content and formats, and to more clearly identify objectives and outcomes for the different levels.

Most members express the desire for professional development and continuing education programs. Our summer membership mailing highlighted and alerted members to the biannual professional ed. seminar just held in Jackson Hole. For this, A3 and the National Avalanche Center partnered on a one-day series of presentations and discussions based on contemporary avalanche topics. Watch for more of these seminars. Perhaps you can help create one in your region. Michael Jackson is facilitating one for the Pacific Northwest; Kyle Tyler in the Eastern region and the annual fall CSAW is well recognized in the Colorado region. And special thanks go to High Angle Construction (GASEX) for their scholarship program to the National Avalanche School 2007 and to ISSW 2006 for their scholarship program to AVPRO 2007.

Lastly but certainly not least, the Web pages continue to be updated with material such as current content, online membership, TAR renewals, mentorship project files, business supporters, and past years' TAR archives in PDF format.

It's not very far off; here's to a great season and plenty of snow. —Janet Kellam, president 💥



Lynne Wolfe, Janet Kellam, and Willie the-pretty-good-dog wish you a wonderful winter.

photo by Don Bachman, taken after the AAA spring board meeting

from the edit

September 24, 2007: Welcome to the first issue of volume 26 of The Avalanche Review. That means 26 years of the best the American Avalanche Association can offer in news, features, research, photos, and personalities of the avalanche world. What's kept the publication vibrant through those years is the strong impetus our contributors feel to share their worlds. Sincere thanks to each past contributor and heartfelt encouragement to those of you who procrastinate writing your story or sending your news. There's snow on the mountain passes this morning; gold, orange, and red on the hillsides; and a fire in my woodstove as I work on the final proof of 26/1. I'm not quite ready to trade tank tops, barbeques, and parades of zucchini in the garden and Winnebagos on the roads for long pants, studded tires, and deep powder. Well, on second thought ... I am, however, looking forward to the upcoming avalanche-focused weekend in Jackson, Wyoming, on October 4, 5, and 6. It includes an AAA board meeting, the NAC meeting, an AAA membership meeting (complete with free beer!), and the Professional Development Seminar that Rod Newcomb, Karl Birkeland, and I have been working on for almost two years. We hope you can join us on Saturday, October 6, 8am at the National Museum of Wildlife Art for an ISSW-style jump start to our winter. We'll have a full morning of wet-snow investigations, then after lunch take a look at fracture propagation, deep

slab instability, and revisit "To Swim or Not to Swim." The day is free to AAA members and TAR subscribers; it's \$20 otherwise. Get there early for a seat – we expect a full house. And if you can't make it, you'll be seeing bits and pieces of the presentations throughout the TAR season. I also plan to put together a CD with some or all of the speakers' presentations; please contact me if you'd like a copy. In addition to the formal agendas above, I'm really looking forward to seeing many of you, my snow and avalanche co-workers, in Jackson in October; to sharing stories, planning trips, and trading encouragement and inspiration with other educators, forecasters, and scientists whose opinions and ideas I value.

- 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.

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Finally, as Garrison Keillor says, "Stay well, do good work, and keep in touch." —Lynne Wolfe, editor 💥

corrections

From Ladies Night Honorees: ISSW 2006, 25/4, April 2007:

Evelyn Lees wants to clarify that, although she has climbed all over the world, she has never attempted or summited Mt.Everest.

Janet Kellam clarifed that she studies wolves in the Arctic; there are no wolves in Antarctica. ***

lanche

Bellet

The Avalanche Rev RO, Box 2821

submissions

- Seen any good avalanches lately?
- Got some gossip for the other snow nerds?
- Developing new tools or ideas?
- Learn something from an accident investigation?
- Send photos of a crown, of avalanche workers plowing roads, 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: articles, stories, queries, papers, photos. Submissions guidelines available upon request.

SUBMISSION DEADLINES

Vol. 26,	Issue	2	10/15/07
Vol. 26,	lssue	3	12/15/07
Vol. 26,	lssue	4	02/15/08
Vol. 27,	Issue	1	08/01/08

Lynne Wolfe, TAR editor PO Box 1135 Driggs, Idaho 83422 Iwolfe@tetontel.com (208) 709-4073

mailbag

To the Editor: From: John Brennan Re: David Sly's Avalauncher piece in TAR 25/4

While researching the *Evolution of the Avalauncher* article that was printed in your journal, I came away with a great deal of knowledge on the subject. As a result, I was quite disappointed to read Dave Sly's recent piece and find numerous occasions where he misleads the reader. While I applaud CIL/Orion's dedication to the avalanche community, I felt compelled to forward some hard facts.

When Dave tells the reader, "CIL/Orion and the Austin Powder Company make and design all parts of the Stubby, allowing for quality control that was lacking in the past," the reader is obviously unaware that Dave is referring to only the plastic body and tail fin of their projectile system. It misleads the reader because the: arming disk, arming disk clip, spacer washer, rivet, arming wire, magnet, magnet anvil, striker, flight safety pin, ejector spring, ejector spring washer, transport safety pin, pull ring, primer ferrule, and the nose cone of the Stubby assembly are all items that Pete Peters of Avalanche Control Systems orders and prepares himself.

Additionally, despite Dave's derogatory connotations to anything "homemade," the previously mentioned componentry of the Stubby are assembled in the home of Pete Peters. Over 1000 of the white Stubby tail assemblies have been prepared there to date. Additionally, the parts used on the Stubby aren't unique to that tail assembly. Rather, they are used on a variety of different tail fin models. Dave feels that "The entire USA market appears ready to switch from homemade fuse assemblies to a reliable factory-made fuse assembly." And, separately, "The Mildet has been used exclusively in Canada for the past six years." First off, portions of the USA market and the entire Canadian avalanche community have been using factory-made cap fuse assemblies prior to the CIL/Orion Mildet – such as the Tec Harsiem and Cobra assemblies. Secondly, to condescendingly call the cap-fuse assemblies that are manufactured by portions of the avalanche specialists in the USA "homemade" is to undermine our training and experience in this work.





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When Dave relates that while using the Avalanche Pipe at the Aspen Highlands that "The large explosions emptied the large bowl of any dangerous new deposits," most readers would assume that avalanching had occurred. The fact of the matter is that the 30 cm low-density storm snow, deposited without wind, had no dangerous deposits and that no avalanching whatsoever occurred – not even a sluff.

I have to comment on Dave's assertion that "Fluctuations in temperature play a large role in the diameter of an aluminum barrel; our Stubby procedures address these barrel issues." I had a recent conversation with a Metallurgical Engineer, and by using the coefficient of thermal expansion for the type of aluminum used for Avalauncher barrels it can be stated that from minus 20 degrees F to plus 40 degrees F a barrel's diameter changes by just .00275 inches – less than the thickness of most human hairs. I contend that the incredible heat passed from molten cast explosive to the plastic Stubby bodies during the pouring process plays the major role in whether the full-bore Stubby projectile will fit the barrel properly and that the vagaries of molding plastic parts to tight tolerances is a very minor factor.

Additionally, Dave sells extruded barrels that, according to him, go through a post-production machining process. Avalanche Control Systems, Avalanche Mitigation Services and the defunct Launcher Company all use/used drawn barrels, which come from the manufacturer as stronger, straighter units than the extruded version.

For further discussion, contact me at jb@avalanchemitigationservices.com — John Brennan



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JERRY NUNN'S AVALAUNCHER— For more about Jerry Nunn and her avalaunchers, see *The Lady and the Avalauncher* in TAR 25/3, February 2007.

Dear Mark [Mueller],

As I told you on the phone the other day, Jerry and I want to thank you, Janet Kellam, John Brennan, and all the other AAA members who found the old Avalauncher for our Arizona Ski Museum. When Janet visited our museum and met Jerry a couple months ago, we were talking about the old drawings, photos, and dummy projectiles we had on display in the museum and how we would love to have one of the old avalaunchers for our collection and for the visitors to see.

Janet said she would pass the word around to the AAA members and see what she could do. On 5-28-07, John Brennan phoned to say they found one at Steven's Pass Ski Area in Washington and they were at work on how to get it to us. On 6-04-07, John called to say they raised the money to box it up and ship it to us: "It's on the way." On 6-06-07, a big truck pulled up to our house with a big box – 365 pounds and the 10 foot 8 inch barrel – for our ski museum. After unpacking and assembling the avalauncher, it was time for photos and thank you letters.

Enclosed are photos to use in your publication so that we can thank all of the AAA members who had anything to do with getting Jerry her own Avalauncher. We particularly want to thank the Steven's Pass Ski Area and Jon Andrews for giving Jerry the old gun in the first place.

Hope to see you next winter in Pagosa Springs with lots of snow at Wolf Creek Pass. – Yours truly, Jimmie & Jerry Nunn

metamorphism

NEW CERTIFIED INSTRUCTORS Nancy Pfeiffer, Palmer, AK Gary Murphy, Truckee, CA Scott Toepfer, Breckenridge, CO Michael Jackson, Bellingham, WA Brad Sawtell, Breckenridge, CO Toby Weed, Logan, UT Blaine Smith, Eagle River, AK

NEW PROFESSIONAL MEMBERS

(approved at the Spring board meeting) John Humphries, Telluride, CO Doug Wewer, Eden, UT John Mortimer, Silverton, CO Skippie Zeller, Durango, CO Howie Schwartz, Big Pine, CA Matt Dayer, Durango, CO Rob Hammel, Girdwood, AK Michael Hatch, Stanley, ID Corey Rubenfeld, Skykomish, WA Jack Soukop, Leavenworth, WA Patrick Stanton, Kirkland, WA Andy Anderson, Truckee, CA Tim Farrar, Reno, NV Eric Tanguay, Norwood, CO Paulette Schneider, Sparks, NV Eric Peitzsch, Bozeman, MT Mason Stafford, Bellingham, WA Steve Brigham, Del Norte, CO Jeremy Allyn, Bellingham, WA Stuart Schaefer, Leadville, CO John Snook, Nederland, CO Trevor Pollock, Brian Head, UT Chelan Babineau-Z, Bozeman, MT

Christine Pielmeier, Davos Monstein, Switzerland John Fitzgerald, Driggs, ID Erik Hestnes, Oslo, Norway Travis Feist, South Lake Tahoe, CA Mike Ruth, Park City, UT Douglas Krause, Silverton, CO Jason Bright, Auburn, WA Angela Hawse, Ridgway, CO Ryan Evanczyk, Dillon, CO J. Scott Scharin, Aspen, CO Andrew Nichols, Boulder, CO Michael Morris, Salt Lake City, UT C. Michael Ditolla, Salt Lake City, UT

NEW MEMBER AFFILIATES

Hank Thomas, Littleton, CO Nick DiGiacomo, Telluride, CO Dr. Jon J. Major, Vancouver, WA Jeff Levison, Fairbanks, AK Joseph Eisholz, Mukilteo, WA Mark Staples, Bozeman, MT Don Roth, Boulder, CO Jonathon Shefftz, Amherst, MA Taylor Brown, Breckenridge, CO Brandon Woolley, Silverthorne, CO Michael Janes, Juneau, AK Ray Leggett, Estes Park, CO Brian York, Dillon, CO Zahan Billimoria, Driggs, ID Michael Walter, Aspen, CO Ed Crothers, Fort Collins, CO Ron Simenhois, Silverthorne, CO





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From Mike Bartholow—

My wife Kristen Chamberlain and our son Owen and I have moved from Juneau, AK, to Minturn, CO, where I am now working on the White River National Forest as the Lead Backcountry Ranger for the Vail Pass Winter Recreation Area. It's been pretty exciting getting to know a new area and a new snowpack. Last year we started a program of submitting snow, weather, and avalanche observations to the CAIC and this year will be doing daily observations. We are hoping to install a BCA Beacon Basin and beacon checker at Vail Pass for the coming winter season. We are working to expand our outreach to "hybrid" skiers and snowboarders who are accessing the Vail Pass backcountry with snowmobiles.

The Telluride Watch Society Page: VOWS EXHANGED: Issenberg-Roberts

Story by Peter Shelton

TUESDAY, JUNE 26, 2007, 7:17 AM MDT— Lisa "the Welder" Issenberg and Jerry "Snowviewer" Roberts at the Historic Western Hotel and Saloon in Ouray, Saturday night, June 23, 2007.

The bride wore a gown by...well, it wasn't a gown really, more of a slinky, clingy orange thing that showed off all of Ms. Issenberg's curves. While the groom wore (we took bets on this on the drive up the valley, and I won) short-sleeve pants and flip flops.

The mother of the bride, who is, if I may say so, a real pistol and looks barely old enough to be the mother of the bride, wore butterscotch leather pants and a slinky lacey top.

Presiding was...um, well, no one was presiding, because Ms. Issenberg and Mr. Roberts actually ran off to the desert back in February and married themselves without telling anybody first. They set a camera on a rock and took pictures to prove that they were there – hugging. And Mr. Roberts dreamed up a haiku for the occasion:

under blue New Mexican sky two share same Ghost Ranch path O'Keefe as witness

Ms. Issenberg, a well-known mixed-media artist, converted those same elements (plus a fridge magnet version of the hugging picture) into the invitation for Saturday's event. A-list guests from as far away as Vancouver and Portillo, Ridgway and Ophir filled the authentically aged hotel to sidewalk overflow. In support of Mr. Roberts, a long-time skier and avalanche forecaster, came a veritable Who's Who of the North American snow-science world, including Richard and Betsy "Avalanche Hazard in Ouray County 1877-1976" Armstrong, Knox "Be careful out there" Williams, Silverton Mountain's Pat "Sarajevo" Ahern, heli-skiing pioneers Mike "Friegele" Friedman, Brian "Speed" Miller, Tim "the Buddhist" Kudo, Mark "Frankie" Frankmann, and Bob "the Human" Newman.

On the art side, Ms. Issenberg invited watercolorist Susie Billings, late of Norwood; master carpenter Scott Rikkers and his wife Jill, herself a fabricator of fanciful ironworks; the renowned colorist Julie Ahern; potter Ann Mellick; author Corinne Platt-Rikkers; Ophirian sculptor Gerald Oyama; the writer/ painter/surfer duo Rhonda Claridge and Sean McNamara; and fabric genius



Bride Lisa Issenberg and groom Jerry Roberts (in signature Hawaiian shirt) celebrate their recent nuptials in Ouray, CO, June 2007. The wedding guests included a veritable Who's Who of the North American snow-science world. *photo courtesy Jerry Roberts*

Phoebe Sophocles of Busted Boiler Draw.

In addition, the throng pulsed with assorted climbers, cyclists, interns, dirtbags, former interns, philanthropists, and Outward Bound alumni from near and far. The groom mixed batches of his proprietary pisco sours while the band, the New Orleans Western swing quintet Gal Holiday and the Honky Tonk Revue warmed up in the hotel's miniscule parlor.

Heartfelt toasts from family and friends ended with a hopeful pronouncement

from Mr. Roberts' friend Dennis McCoy, who allowed as how Ms. Issenberg was the first woman in Mr. Roberts' life that he did not refer to as "my future former girlfriend."

Peter Shelton lives in and writes about the San Juans. He sends TAR a recent photo from his 40th high school reunion in Corona del Mar, California. Story reprinted courtesy of Peter Shelton.



aaa news

Rick Grubin: New Member Affiliate Representative

Summer is in full bloom, and there are still whitewater waves to be farmed, yet I am thinking in earnest about the upcoming ski season and, by direct association, the avalanche season.

My name is Rick Grubin and I am the new Member Affiliate Representative to the Governing Board of the American Avalanche Association. Halsted Morris held this position for 10 years prior to becoming a Professional Member and subsequently the Chair of the Awards Committee.

This past summer, an off-year in the AAA election cycle, Halsted kindly nominated me to take his place, and I was voted into office by the governing board. Given the august membership of the governing board, this is qualified instructor. My avocations revolve around water in various forms: skiing in the winter and rafting, kayaking, and canoeing in the summer.

Professionally, I work at the National Center for Atmospheric Research in Boulder, Colorado, where I create and enhance tools for the ingest, interpretation, and visualization of all sorts of geophysical data. Working at NCAR, it's impossible to ignore weather in any of its many forms, and weather as it relates to avalanches is very much of interest to me.

I view the position of Member Affiliate Representative as one which, while supporting all the components of the AAA's mission, should focus on these points: to provide information about snow and avalanches, to exchange technical information and maintain communications among persons engaged in avalanche activities, and to promote and act as a resource base for public awareness programs about avalanche hazards and safety measures. To me, these mission components point toward one thing: furthering our individual and collective avalanche knowledge and passing that on to others. Seek out and learn from mentors (thanks Lin Ballard, Tom Murphy, Mike Scott, Dale Atkins, and Halsted!); there are a great many resources available within the AAA. Share what you've learned with colleagues - professional development is vital to renewing and updating our knowledge of avalanche phenomena, leading to new understanding. Share what you know with the public – education is key to saving lives.



a position with responsibility not to be taken lightly. To do as good a job as Halsted did will be a tall task.

The American Avalanche Association's membership class Member Affiliate is "open to persons...with less experience and/or education required for Professional Membership. Member Affiliates are typically entry-level professional patrollers or assistant guides, volunteer patrollers in avalanche-prone areas...SAR specialists..."

As the Member Affiliate description suggests, I am a volunteer patroller in an avalancheprone area: the Loveland Ski Area in Colorado. The Loveland Ski Area contains numerous inbounds avalanche paths and is classified as a "class A" avalanche ski area (to say nothing of the surrounding mountains).

I also have a background in outdoor education, which manifests itself in the form of interest in avalanche education. I'm a NSP avalanche instructor as well as an AIARE-

Some Member Affiliates strive toward Professional Member status as they further their avalanche experience and education, while others will remain Member Affiliates, choosing to continue to work as a volunteer. As the Member Affiliates Representative, I will strive to do what I can to help each Member Affiliate achieve their goals within the AAA. To that end, I ask that each Member Affiliate please contact me and tell me what you want, expect, or otherwise require from your representative on the AAA Governing Board. I look forward to serving, and working with, all of you. Rick Grubin can be reached at Rick.Grubin@Colorado.EDU

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American Avalanche Association Spring Board Meeting Highlights

The American Avalanche Association (AAA) Board spring board meeting was held in Alpine Meadows, California on April 21, 2007, with 15 people attending.

Treasurer's Report, Bill Glude

We are at our usual seasonal financial low now but we are in good shape financially, we are doing a little better every year, and we do not need a dues increase at this time.

We decided to continue to put income from the National Avalanche Center account into our general operations fund and use it for our purpose of advancing avalanche issues in the US.

The budget breakdown shows our major income categories in round figures as dues at \$20,500; *The Avalanche Review* (TAR) advertising \$15,000; donations \$10,000; Professional Avalanche Workers School (PAWS) \$8,000; "SWAG" observations guidelines \$7,500; and merchandise \$4,500. All other categories of income are less than \$2,000 each.

Our major expenses in round figures are \$13,500 for our executive director; \$15,500 for TAR staff; \$1,000 for instructor certification; \$2,000 for web page design; and \$1,500 for accounting and tax preparation. PAWS staff cost \$9,500 and insurance and other miscellaneous PAWS expenses came to \$3,500.

Publications cost us about \$2,000 for the membership directory; \$3,500 for SWAG production; and \$3,000 for TAR printing and mailing.

Web site design cost us \$2,000 and the other expense categories were all under \$2,000 each.

Executive Director's Report, Mark Mueller

We are a far-flung organization with our membership spread over a wide geographic area, but we are able to get a lot done with minimal overhead because most jobs are done by volunteers. The Board tends to drive programs, we do not have a great call from members for expanded services. TAR is a central benefit and networking tool, essential for such a geographically wide-spread membership.

Membership at 923 is growing slightly, with an upturn in all categories including subscribers and applications for member affiliate and professional membership.

The Avalanche Review (TAR), Lynne Wolfe

If memberships from subscribers are factored in, TAR breaks even. All issues this year were 28 pages, full size. Production costs have been a little higher than in the past, but quality has been high. Support is good, and we have more material than we can print.

Marcia is retiring from the TAR advertising sales position and replacement Jazz Russell is enthusiastic about stepping into it.

We and the Canadian Avalanche Association (CAA) are encouraging our members to subscribe to each others' publications. To subscribe to avalanche.ca, give the CAA a call at 250-837-2435.

We discussed our online policy of posting cover stories for the current year and entire issues for previous years. We need a graduate student or intern to help process back issues and add them to the Moonstone Library on avalanche.org.

We would also like to make a resource CD of key educational articles for avalanche instructors.

Membership, Stuart Thompson

The guidelines we put into place last year are working well for guides and instructors and continuing to work well for patrollers and others, as intended. Applicants need to be sure to submit complete applications and double check to be sure they include everything required.

We approved 36 Professional member applicants, listed in Metamorphism. Professional membership applications go to the Executive Director, a tally is forwarded to Governing Board, review and approval are at the spring and fall Board meetings. The Membership chair tracks the status of applicants through the review process and communicates their status back to the Executive Director.

Awards, Mark Mueller for Denny Hogan

COURSE INSTRUCTORS: Jim Woodmencey: MountainWeather™ Lead Meteorologist Jamie Yount: WYDOT Avalanche Forecaster and Meteorologist

INFORMATION: http://www.avalanchecourse.com/wwfc.pdf

ENROLL: Don Sharaf 208-709-5208 | don@tetonavalanche.us



Denny had to resign; Halsted Morris is approved as the new Awards chair.

Research Grants, Mark Mueller for HP Marshall

We funded our one practitioner applicant for a comparison of the extended column test with Gauthier and Jamieson's fracture propagation test by Ron Simenhois. Chair HP Marshall will work with the applicant on methodology, the \$1,000 will go to digital video for high-speed recording of fracture propagation.

Education, Michel Jackson

We approved a proposal that we have a certified avalanche instructor representative on the Governing Board, then appointed Dean Cardinale of Snowbird to the position. We referred professional course instructor training to Education Committee discussion.

We decided to change the name of the professional course to AVPRO to avoid confusion of PAWS with rescue-dog training. We will keep the tuition at \$875 for members and \$975 for non-members, and we will keep the course content general so it is applicable to all subdisciplines. We decided to wait until later for an independent audit of the course. We discussed having the American Institute for Avalanche Research and Education (AIARE) handle course administration, but took no action.

We discussed the need for continuing education for avalanche instructors and the possibility of several levels of certification that would bring instructors along

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to higher levels of proficiency. The topic was referred to the Education Committee. Lynne Wolfe reported on mentorship efforts, noting that we have identified some career paths but need more.

Janet Kellam reported on the project of updating and clarifying the guidelines for US avalanche education through Level III. We did not actually get Level III done but did a thorough job on the lower levels. The next step is wide circulation of the proposal for discussion and feedback, including soliciting comment in a variety of snowsports and outdoor publications.

Search and Rescue, Halsted Morris for Dale Atkins

Dale attended the June International Mountain Rescue Association meetings in San Francisco and the October ICAR alpine rescue committee meetings in Kranskja Gora, Slovenia. They are working on an international search and rescue glossary, a recommendation that advertised transceiver range be useful working search strip width rather than maximum under optimum conditions, recommendation on minimum standards for new search systems, and a statement on avalanche safety systems.

Dale is monitoring classification and integration of Homeland Security's National Incident Management System (NIMS) for avalanche rescue. NIMS ICS information can be found at www.fema.gov/nims/

We approved compilation of avalanche-transceiver service and warranty information to be issued to our members at the fall meeting.

New Business

- Russ Johnson reported on planning for ISSW 2010 at Squaw Valley. Since ISSW has no formal organizational status, the accounting will be organized through AAA. We approve \$5,000 to open an ISSW 2010 account. The issw.org domain is paid through 2012 and set up through AAA on avalanche.org, ready to use. We will provide two partial AVPRO course scholarships from the money donated to us from ISSW 2006, according to criteria to be developed by sub-committee.
- The new federal House avalanche bill (HR 1703) has been reviewed favorably by all who had concerns with last version; we pass a resolution in support.
- Janet Kellam will set up appropriate categories of business membership.
- We will collaborate with the National Avalanche Center (NAC) on our fall continuing education seminar, scheduled for October 6 in Jackson Hole, Wyoming, at the National Museum of Wildlife Art. It will be free for AAA and NAC members. The AAA Board meeting will be on Thursday the 4th, and the AAA membership meeting will be on the evening of Friday the 5th, locations to be announced.
- Evan Salke will chair a new Web committee and oversee the Web site overhaul.
- Lel Tone will research better methods for instant and consistent AAA merchandise order fulfillment. ***

AVPRO: AAA Avalanche **Professionals Course**

The AAA is pleased to announce the 3rd AVPro (formerly PAWS) course will be run this winter in Little Cottonwood Canyon, December 1-9, 2007

What is the AVPRO course?

The AVPRO is a comprehensive professional course aimed at all levels of avalanche workers. It introduces the Snow, Weather, and Avalanche Guidelines of the American Avalanche Association (2004) and sets a proficiency standard of education for the US avalanche community. Sixty percent of the course will be conducted in the field with the remaining 40% of the course in the classroom. The course is intensive: eight days long (plus a day off in the middle), and each day consists of between nine and 11 hours of instruction.

This course will provide expert instruction designed to provide participants the opportunity to become accurate and efficient in snowpack observation. The course will solidify the participants' understanding of snowpack physics and avalanche formation and give them tools to apply that knowledge to the assessment of avalanches and avalanche potential. Terrain assessment, route finding, group management, and decision-making will be examined and practiced daily. Avalanche rescue and beacon use will be extensively practiced, and participants will be brought to a higher level and expected to meet a standard.

Additionally, the course will provide an overview into highly organized avalanche-control programs (both at ski areas and highways) and provide industry-norm instruction into avalanche-control practices. This course will benefit a large audience, including: forecast center avalanche observers, ski patrollers, ski guides, search and rescue coordinators/trainers, highway technicians, and experienced recreationists who want to pursue a career in the avalanche realm.

Prerequisites:

It is required that participants have taken one of the following: a 3-day Level 2 avalanche course, both phases of the National Avalanche School, or the equivalent of in-house training and experience. Participants will need to be proficient in beacon recovery and will be tested on single-burial recovery at course commencement. Participants will need their own skis or splitboard, boots, and skins and be proficient in their use. Skiing or riding skills need to be at least at the intermediate level in most snow conditions. Participants should be in good enough physical condition to comfortably climb 3000' vertical over the course of a day.

Need more information?

Check out the AAA Web site at www.americanava lancheassociation.org or contact Sarah Carpenter at sarahlovessnow@yahoo.com or at (208) 787-4235 **** ****

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AAA Offers AVPRO what's new **Course Scholarship**

This scholarship, funded by ISSW 2006 in cooperation with American Avalanche Association, is a great opportunity for a working or aspiring snow and avalanche professional to advance his/her career. AAA is proud to offer two scholarships per course for up to \$500 applied toward the tuition of the AVPro course.

Criteria for application:

The purpose of this scholarship is to provide assistance funding the continuing education of a qualified professional or aspiring professional in the snow and avalanche field. The successful applicant is one who:

- is a current AAA professional or affiliate member in good standing.
- pursues (or strives to pursue) snow and avalanche work as a profession.
- seeks to better his/her skills through educational courses.
- provides a written report on the use of the scholarship within one month of completing the course.

Following participation in the AVPRO course, a scholarship recipient agrees to become increasingly involved in the AAA by doing one or more of the following:

- joining a committee
- assisting/volunteering to help with a regional continuing education seminar
- writing an article for *The Avalanche* Review
- assisting in cataloguing articles published in The Avalanche Review
- doing a paper or poster for ISSW
- offering housing for an AVPRo attendee if they are a local

Applications are available at www.amer icanavalancheassociation.org. Deadline for application: October 31, 2007. **** ****



Participants at last year's course digest information provided by course instructor lan McCammon. photo by Sarah Carpenter

AIARE Instructor Training Courses

AIARE invites all outdoor educators with an interest in avalanche education to join fellow instructors for three days of information sharing and professional development. Courses focus on both indoor and outdoor teaching techniques, risk management concerns for avalanche courses, and new research in education and avalanche science.

If you're interested in sharing ideas and concepts in avalanche education, the instructor training courses offer a forum for discussion and feedback. Participants take part in "peer presentations" in an effort to hone their skills while contributing to the course. Training occurs indoors and outdoors.

Guest speakers are always invited. Past guest speakers have included Ethan Greene, Mark Moore, Russ Johnson, Sandy Kobrock, Jean Pavillard, Mark Mueller, Ian McCammon, Allen O'Bannon, Martin Volkan, Colin Zacharias, and Karl Klassen.

Who should consider attending an AIARE ITC:

- Outdoor educators interested in sharing ideas and concepts in avalanche training for the public.
- Current and aspirant avalanche instructors.
- Anyone training the public in avalanche awareness and decision-making in avalanche terrain.
- Those looking for continued professional development.
- Those interested in the AIARE avalanche training program/ progression.

COURSES WILL BE HELD IN:

Winter Park/Berthoud Pass, Colorado: November 30 -December 2, 2007

Washington Cascades: December 7-9, 2007

Mammoth, California: November 30 – December 2, 2007

Snowbasin, Utah – L1 ITC: January 6-8, 2008

Snowbasin, Utah – L2 ITC: January 9-11, 2008

All dates subject to change.

More information can be found at www.avtraining.org, info@avtraining.org, or by calling 970-209-0486. ****

AIARE Announces Level 3 Dates

The Level 3 course is an advanced course for experienced and professional avalanche practitioners, professional patrollers, guides, and advanced recreational backcountry travelers. The course is 6 days long and completes the avalanche course stream of the Level 2 and 3. (10 days together). Individuals who receive a passing grade and successfully complete the course receive a certificate provided by the AIARE administration.

AIARE LEVEL 3 AVALANCHE	COURSE SCHEDULE FOR WINTER 2007/08
January 20-25, 2008	Eastern Sierra, June Lake, California
February 17-22, 2008	.Snowbasin Ski Resort, Utah
February 25 - March 1, 2008	.Red Mountain Pass/Silverton, Colorado

The Level 3 course provides course participants with an industry-based framework to make decisions in avalanche terrain and to manage avalanche hazards common to avalanche control operations and winter guiding scenarios. Participants are required to form opinions, to take on leadership roles, and to utilized team member's skills to assist in the process of forecasting avalanche hazard and snow stability and making appropriate terrain choices. Course goals also include evaluating each participant to the AIARE Level 3 standard.

The Level 3 course builds on the concepts introduced in the prerequisite Level 2. These include standardizing snow and weather observations and techniques to the Snow, Weather, and Avalanche Guidelines of the American Avalanche Association (2004). The Level 3 takes the "trained observer and technician" and begins the process *** of making the information relevant to the complexities, variability, and influences of terrain.

Barryvox HelpPoint Provides Support and Answers FAQ

The new Barryvox HelpPoint answers frequently asked questions relating to all types of Barryvox avalanche transceivers and offers support for solving problems.

Barryvox avalanche transceivers are used by many backcountry skiers and rescue organizations. Currently there are seven different models of Barryvox transceivers that are substantially different in terms of their features and use. Often the devices are used rather rarely, but are expected to be fully functional at the time of use. In any case, the user expects 100% reliability. Therefore, proper maintenance of the Barryvox devices is very important. We recommend a preventive checkup at least once every three years, and for older or frequently used devices, once per year. Our team of specialists has over 20 years of experience in the development, production, and repair of Barryvox devices. We do know every detail of the Barryvox devices and of their use in the field. With the new Barryvox HelpPoint, we want to provide answers to frequently asked questions and solutions to problems. We also cover general avalanche-transceiver issues that apply to all brands.

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The Barryvox HelpPoint is accessible via www. girsberger-elektronik.ch or directly at www.barryvoxhelppoint.com. It is continuously updated. We will be happy to answer new questions posted via e-mail.

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Late-breaking news from BCA:

Latest AVALANCHE JAM a resounding success: read the full story in upcoming December issue of The Avalanche Review



I-r: Dave Sly (CIL/Orion Canada), Craig Sterbenz (Telluride), Jesse Perceval (Mount Washington), Jenner Richards (U-Vic), Jorge Ducla (CIL/Orion Mexico), Deedee Sterbenz, Brendan (U-Vic), Ross (Mount Washington), Jon Andrews (Stevens Pass), and Ignacio Rigou (CIL/Orion Argentina). Photo at right frames an avalauncher's view of the slope at Mount Washington Alpine Resort on Vancouver Island where Stubby rounds were tested this last summer.

INDUSTRY UPDATE: Canadian Avalauncher Projectile Improvements

Last spring the Canadian Avalanche Association celebrated its 25th Anniversary at its Annual General Membership (AGM) meeting in Penticton, B.C., during the second week of May. The Okanagan Valley is very pleasant that time of year, and the AGM meeting was well attended. The AGM offers a number of workshops, presentations, awards, and commercial exhibits. It also provides the opportunity for the membership to see old friends and do a little "networking" over a pint of ale.

During the AGM meeting there was a special workshop held by CIL/Orion for the Canadian avalauncher users group. The purpose of this workshop was to discuss the various problems users encountered last winter with the newly introduced Stubby and Delta-K avalauncher projectiles. These new rounds were purported to improve range, accuracy, and reliability. However, many of the avalauncher users at the meeting were reporting very high misfire rates and very low percentages of actual "payload-to-target." It was generally agreed that the old classic avalauncher rounds always had similar problems, yet they had remained basically unchanged for many

years. However, at today's prices and in today's regulatory environment, it is unacceptable to have such a high misfire rate. Most users felt that the new rounds showed promise for increased accuracy and were worth pursing development.

From the ensuing discussion, a number of potential problems were identified and possible solutions were proposed. One of the big problems reported with the new rounds was "separation in flight," especially with higher-pressure shots. It seemed that high-pressure propulsion gases might be forcing the tailfin-to-forebody connection to come apart. Whether threaded or snap-fit, these connections needed to be redesigned to provide a truly positive locking mechanism that would make them nearly impossible to take apart (like child-proof medicine bottles).

Another problem with the Stubby was inconsistent and possibly erratic flight, with some of the rounds reportedly landing sideways. It was suggested by one user that this might be the result of incomplete or partial release of the pressure-plate arming mechanism. Possibly too much spring tension on the cross pin or, more likely, a

Story and photos by Craig Sterbenz



Stubby test slope at Mount Washington, Vancouver Island

at the meeting that if they couldn't make the necessary improvements before next season, they would make the classic rounds available as a backup.

On June 26, avalanche workers from Canada and the US joined with engineers from the University of Victoria and representatives from CIL/Orion for the first round of testing the new components. Mount Washington Alpine Resort on Vancouver Island in British Columbia was chosen for the field-tests. Not all of the proposed changes had been incorporated into the rounds at that time. The new forebody sections were not yet available. The original tail-fin mold had been modified, and the flair or lip at the back end had been removed to allow cleaner release of the pressure plate.

A total of 25 inert rounds were fired from Mount Washington's SEAR avalauncher using pressures that ranged from 100-200 psi. These rounds were equipped with more sensitive firing-train components as well as a couple of different types of nose cones on the forebodies. The engineers from "U-Vic" filmed firing of the rounds with a high-speed camera.

Twenty four of the rounds were then recovered from the slope and analyzed to confirm detonation of the tail-fin components. Detonators were not used, but analysis confirmed that 23 of the 24 rounds recovered had successfully detonated the shotgun primers. The one misfire showed evidence off an off-center strike on the shot primer. The 25th shot did fire but could not be located at that time. Using the data and video collected from this test firing, it was back to drawing board again before the next test firing scheduled for July 31.

Mount Washington was again chosen as the site to conduct the test firing of 20-50 inert Stubby rounds with live detonators and all of the new firingtrain components, as well as the newly molded nose pieces, forebodies, and tail-fin assemblies. The pressure plate and cross-pin assemblies were the only parts that remained unchanged from the previous design. The first 20 rounds all detonated and provided the test team with enough information that the other 30 rounds weren't needed. The new thread locks and firing mechanism

small lip on the end of the tail fin might cause the pressure plate to hang up and not release properly. The stubby tail-fin mold needed to have this lip removed, and some florescent dye added to the translucent tail fin to make it easier to see.

The erratic flights and sideways landings might also result from the shape of the round itself. The new rounds were designed to improve accuracy by being "front-wheel drive" rather than "rear-wheel drive," being pulled out of the barrel by the forebody rather than pushed out of the barrel by the pressure plate. However, without spiral rotation, the Stubby's shorter length and football shape seemed to make it fly a bit like a knuckle ball. It was suggested that adding a spiral or simply more length to the tail-fin assembly would improve flight characteristics and accuracy.

Quality control during production as well as during shipping and handling was also discussed. There were a few problems reported with Stubby rounds that were possibly "out-of-round" and wouldn't fit down the barrel. Decreasing tolerances between round and barrel dimensions should compensate for possible variations in round or barrel diameters. Many of the other misfire problems may have been attributable to quality control, consistency, and sensitivity of the many small components of the firing train. Of particular concern was the possibility of improper storage or handling which might result in moisture getting into the firing-train components.

At the conclusion of the Penticton meeting, CIL/Orion agreed to go back to the drawing board, make some changes, and have the improved product field-tested, on snow if possible, before next season. They also assured the avalauncher users

seemed to be performing well. However, there was still no provision for introducing spiral rotation or increasing the length of the tail-fin assembly to improve flight stability.

Video from the first test firing and careful observation during the second mission confirmed the need to extend the length of the round in order to improve flight characteristics. Anticipating this outcome, two special extended-length rounds were prepared for testing during this second mission. Initial success with these longer rounds was very positive. It appears that the extended-length round will not only stabilize the projectile in flight, it will also permit the use of a closed-end shock tube detonator instead of the open-ended #8 blasting cap currently in use. This should help eliminate another big potential for misfires.

CIL/Orion intendeds to proceed with development of this new extended-length projectile, the Stubby Tornado. It should be ready for field-testing before this issue of TAR hits your mailbox and if all goes well it will become the only avalauncher projectile CIL/Orion produces.

Craig Sterbenz, aka Sterbie, tells TAR that he is an A3 Pro member; A3 Standards Awareness Chair; A3 Certified instructor; previous TAR contributor; bald, fat, old & crippled Snow Safety Director, Telluride Ski Patrol. "The Telluride Ski Patrol uses a large quantity of specialty explosives, including avalauncher rounds, which are manufactured by CIL/Orion and as a major US client I was invited to attend the tests conducted at Mount Washington."

THE AVALANCHE REVIEW

UPDATE: Avalanche Legislation

from Don Bachman

This avalanche legislation (next page) was initially introduced in April 2003 and has gone through several iterations and reintroductions to the present. Dave Hamre and Don Bachman continue to actively work for its passage. The supporting resolution by AAA (below), considered at the Spring Meeting, was carried by Bachman back to Washington, DC, and delivered to the staffs of co-sponsors Don Young of Alaska and Mark Udall of Colorado. Currently the bill is awaiting scheduling for a hearing later this fall.



AMERICAN AVALANCHE ASSOCIATION **Board of Directors**

Resolution 2007-1

A RESOLUTION OF THE BOARD OF DIRECTORS FOR THE AMERICAN AVALANCHE ASSOCIATION FOR THE PURPOSE OF SUPPORTING A BILL TO BE BROUGHT BEFORE THE UNITED STATES HOUSE OF REPRESENTATIVES IN THE 1ST SESSION OF THE 110TH CONGRESS, TITLED: "FEDERAL LAND AVALANCHE PROTECTION ACT OF 2007".

WHEREAS, The American Avalanche Association, at their spring board of directors meeting at the Alpine Meadow Ski Area, California on April 21, 2007 finds that:

- 1. Snow avalanches present a growing risk to users of Federal Lands, rising from an average of 13 fatalities per winter season for the period 1981 to 1991, and 25 fatalities winter season from 1991 to 2001 and 30 per winter season from 2001 through 2006;
- 2. Virtually all of these fatalities and total incidents occur to back country snowmobilers skiers and snowboarders;
- 3. Avalanche incidents result in the greatest number of deaths attributed to a single factor on Federal Lands;
- 4. Developed ski areas on public lands conduct active mitigation programs which have prevented all but a handful of incidents over the same period;
- 5. Vital transportation corridors such as the Alaska Railroad and Seward Highway in Alaska, Interstate Highways in Colorado and Washington and other mountain highways passing through Federal Lands in western states have active avalanche mitigation programs, including the use of artillery and other explosive devices;
- 6. These programs in conjunction with corridor closure prevent avalanche incidents, thereby protecting hundreds of thousands of travelers and commercial carriers each winter.
- 7. Developed areas in some western mountain regions and communities are threatened by avalanches originating on public lands which will inevitably cause death, injury and property damage;
- 8. Inevitable growth will exacerbate the potential for hazards from interaction with avalanches;
- Avalanche risk on back country federal lands can be mitigated through education of back country snowmobilers, skiers, and other users, and 9. forecasting programs advising of adverse conditions;
- 10. Avalanche risk in developed ski areas can be mitigated through active control by explosives including, where appropriate (in eight ski areas) military artillery and through passive control including closure of known avalanche threatened terrain;
- 11. Avalanche risk on transportation corridors can be mitigated through active control by explosives including, where appropriate, military artillery and through passive control including closure and in some cases: road relocation, construction of snowsheds and structural control in avalanche paths;
- 12. Avalanche risk to developed areas and utility corridors can be mitigated through passive control including zoning, structural control, forecasting, and education;
- 13. Knowledge of avalanche condition development including weather forecasting, snowpack characteristics, and release mechanisms, require additional research, evaluative refinement and technology transfer resources
- 14. Avalanche forecasting programs, public education, and development of communication resources require adequate funding commitment;
- 15. Artillery weapons, ammunition and parts referred to as ordnance, utilized in avalanche control programs, are no longer manufactured and a known and reliable supply of this ordnance must be maintained to insure program effectiveness and continuity;
- 16. Military ordnance will inevitably be phased out due to supply shortage and age and will not be replaced due to issues of suitability for avalanche control work,
- 17. Research into suitable explosive delivery systems and alternative control devices is necessary to maintain future program effectiveness and continuity.
- 18. The National Research Council Report of 1990 stated: "...the federal government should establish a mechanism for program initiation and coordination among federal agencies having responsibilities related to slope failure (avalanche), snow research, administration of federal lands containing avalanche hazards, and administration of forecasting centers."

NOW THEREFORE IT IS HEREBY RESOLVED THAT THE BOARD OF DIRECTORS, ON BEHALF OF THE 400 PROFESSIONAL MEMBERS AND 300 ADDITIONAL AFFILIATED AND SUBSCRIBING MEMBERS OF THE AMERICAN AVALANCHE ASSOCIATION SUPPORTS THE "FEDERAL LAND AVALANCHE PROTECTION ACT OF 2007" AND NOTES THAT:

- 1. This bill directing the Secretary of Agriculture to establish a coordinated avalanche protection program, and for other purposes has been drafted through the coordinated efforts of the offices of Representative Young (AK) and Representative Udall (CO) who are commended for their efforts.
- 2. This bill language and its implementation acknowledges the National Research Council Report conclusion that: "Reduction of avalanche hazards should be viewed as a national goal, requiring national leadership."
- 3. By establishing the advisory committee this legislation recognizes that the development and implementation of the program will be in the capable hands of those who have the experience and expertise in dealing with avalanche risk, and the agencies most capable of providing resources to fulfill the purpose of the coordinated avalanche protection program, and
- 4. This legislation is in the public interest which compels the American Avalanche Association to urge passage and funding as is proposed for authorization.

PASSED, ADOPTED, AND APPROVED THIS 21ST DAY OF APRIL, 2007 BOARD OF DIRECTORS AMERICAN AVALANCHE ASSOCIATION

anet Vellan

President

ATTEST:

Bill stude

Treasurer, Acting Secretary

Vice President

Federal Land Avalanche Protection Act of 2007 (Introduced in House) HR 1751 IH 110th CONGRESS

1st Session H. R. 1751

To establish a coordinated avalanche protection program, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

March 28, 2007

Mr. YOUNG of Alaska (for himself and Mr. UDALL of Colorado) introduced the following bill; which was referred to the Committee on Natural Resources, and in addition to the Committees on Agriculture and Oversight and Government Reform, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned

A BILL

To establish a coordinated avalanche protection program, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the `Federal Land Avalanche Protection Act of 2007'.

SEC. 2. DEFINITIONS.

In this Act:

(1) PROGRAM- The term `program' means the avalanche protection program established under section 3(a). (2) SECRETARY- The term `Secretary' means the Secretary of Agriculture.

SEC. 3. AVALANCHE PROTECTION PROGRAM.

(a) Establishment- The Secretary, acting through the Chief of the Forest Service, shall establish a coordinated avalanche protection program to--

(1) identify the potential for avalanches on Federal lands and inform the public, including users of those lands and other potentially affected parties, about the probability of such avalanches and their potential adverse effects on neighboring communities and on transportation and utility corridors; (2) carry out ongoing research regarding the causes of avalanche development, so as

to improve forecasting of avalanche events; and

(3) reduce the risks of avalanches on Federal lands and mitigate their effects on users of those lands, neighboring communities, and transportation and utility corridors.

(b) Coordination-

(1) IN GENERAL- In developing and implementing the program, the Secretary shall consult with the Secretary of the Interior, and coordinate the program to ensure adequate levels of protection for recreational users of public land under the jurisdiction of such Secretary. (2) RESOURCES- In carrying out this section, the Secretary--

(A) shall, to the maximum extent practicable, use the resources of the National Avalanche Center of the Forest Service; and (B) may use such other resources as the Secretary has available in the

development and implementation of the program.

(c) Advisory Committee-

(1) IN GENERAL- The Secretary shall establish an advisory committee of 15 members, appointed by the Secretary, to assist in the development and implementation of the

program. (2) MEMBERSHIP- The membership of the advisory committee established pursuant to paragraph (1) shall include representatives of-

(A) Federal land management agencies and concessionaires or permittees that are exposed to the threat of avalanches;

(B) State departments of transportation that have experience in dealing with the effects of avalanches;

(C) the Alaska railroad;

(D) the United States Geological Survey;

(E) the National Oceanic and Atmospheric Administration; (F) the National Weather Service;

(G) entities with interest in the program that the Secretary considers appropriate

for representation on the board; (H) authorized users of artillery, other military weapons, or weapons alternatives used for avalanche control; and

(I) such other members as the Secretary considers appropriate.(d) Central Depository- The Secretary, the Secretary of Transportation, and the Secretary of the Army shall establish a central depository for weapons, ammunition, and parts for avalanche control purposes, including an inventory that can be made available to Federal and non-Federal entities for avalanche control purposes under the program. (e) Grants-

(1) IN GENERAL- The Secretary may make grants to carry out projects and activities under the program-

(A) to assist in the prevention, forecasting, detection, and mitigation of avalanches for the safety and protection of persons, property, and at-risk communities; (B) to maintain essential transportation, utilities, and communications affected or potentially affected by avalanches;

(C) to assist avalanche artillery users to ensure the availability of adequate supplies of artillery and other unique explosives required for avalanche control in or affecting--

International Symposium on Mitigative Measures against Snow Avalanches

Egilsstadir, Iceland • March 11-15, 2008

Mitigative measures against snow avalanches have been built for many decades and even centuries in various places of the world. Improved knowledge and better equipment have, in recent times, made it possible to build considerably larger and more complicated structures. Their aim is to protect human lives and/or infrastructure such as roads and communication lines, but they affect humans in many other ways. Large structures usually have a significant impact on the environment, either at the starting zone of avalanches or in the runout zone. In many cases, the runout zone structures have to be built close to dense settlements – they can even affect the local climate as well as snow accumulation close to the structures.

Relocation of settlements implies many hard decisions when people are forced to evacuate their old homes to move to a new area. A question that needs to be answered in this connection is why to destroy an already built-up area rather than protect it? The value of endangered buildings is also often questioned. How do protective measures affect the daily life of people? Do people believe in the measures, and do they feel safe living close to them? What effect do protective measures have on the value of protected buildings, and what effect will they have on the future development of the area?

Does bad avalanche reputation have an effect on society and future development of the settlement? Travel has increased enormously in the last years, and the demand for safe transport has been put at the top of the priority list all over the world. Avalanches pose a serious threat to highways and rail traffic in mountainous areas, and many travelers are killed in avalanche accidents every year. Traffic delays and detours also cause large financial losses every year.

Electricity is becoming more and more important in modern society, and any disturbance has a large effect on the daily life of people. The end user of a power plant can be an aluminium smelter, which uses an enormous amount of electricity compared with a family home. The effect of an electrical disturbance can be very different for different customers; a disturbance may have unforeseen consequences for the smelter but minor consequences for the small home. Transmission lines are not easily repaired during avalanche cycles!

The aim of this symposium is to connect three different themes: Snow-engineering, Environment, and Society. The goal is to get a glimpse of the future, to facilitate exchange of experience and ideas, and to find ways to cooperate so that we can improve living in areas threatened by avalanches.

This symposium is organized by the Association of Chartered Engineers in Iceland in cooperation with many local and foreign organizations and institutions. It will be held in Egilsstadir in eastern Iceland, which is in the vicinity of several avalanche-prone villages, power lines, and highways. Registration and general information can be found at the symposium Web site: www.orion.is/snow2008.

—Árni Jónsson, organizing committee chair 💥

Federal land used for recreation purposes; and

(ii) adjacent communities, and essential transportation corridors, that are at risk of avalanches; and

(D) to assist public or private persons and entities in public education regarding avalanches and in conducting research and development activities for costeffective and reliable alternatives to minimize reliance on military weapons for avalanche control.

(2) PRIORITY- For each fiscal year for which funds are made available under section 4, the Secretary shall give priority to projects and activities carried out in avalanche zones-

(A) with a high frequency or severity of avalanches; or

(B) in which deaths or serious injuries to individuals, or loss or damage to public facilities and communities, have occurred or are likely to occur. (f) Surplus Ordinance- Section 549(c)(3) of title 40, United States Code, is amended--

(1) in subparagraph (A), by striking `or' after the semicolon at the end;
(2) in subparagraph (B), by striking the period at the end and inserting `; or'; and
(3) by adding at the end the following:

(C) in the case of surplus artillery ordinance that is suitable for avalanche control purposes, to a user of such ordinance.'.

SEC. 4. AUTHORIZATION OF APPROPRIATIONS.

There is authorized to be appropriated to carry out this Act \$4,000,000 for each of fiscal years 2008 through 2012.

SEC. 5. LIMITATION.

Nothing in this Act shall be construed to require use of artillery or any other avalanche-related actions affecting any unit of the National Park System or any other Federal lands or to limit the applicability of any Federal law or regulation with respect to any such actions on such lands.

Yöstmark Responds to New AAA Guidelines

This upcoming winter, Yöstmark Backcountry Tours of Driggs, Idaho, is expanding its avalanche course offerings in response to the new AAA avalanche course guidelines. As detailed in TAR 25/4, the new guidelines outline updated Level 1 and 2 course progressions and expand the scope of recommended courses to include rescue clinics and avalanche-awareness presentations.

Yöstmark will now offer "Backcountry 101" and halfday rescue seminars in addition to running its standard Level 1 and 2 avalanche courses. Backcountry 101 will serve as a primer for those new to the backcountry (pre-Level 1 avalanche course) and will highlight basic backcountry knowledge and skills: what gear to carry in one's pack, how to care for skins, etc. The half-day rescue seminars, which are designed to provide structured transceiver and rescue practice with expert instruction and coaching, will be free and open to public of all experience levels. For more information please call 208-354-2828 or e-mail info@yostmark.com. **** ****

Hans Saari Memorial Fund Launches Ski Scholarship Program

Story by Drew Seesel • Photos courtesy Bean Bowers

On June 12, 2007, three teenagers from Bozeman, Montana, emerged from the Tetons having completed a 5-day ski course made possible by education scholarships provided by the Hans Saari Memorial Fund. The scholarships were the first given under the Fund's new Ski Education Scholarship Program, an initiative designed to provide skiers young and old, experienced and inexperienced, with the opportunity to advance their backcountry ski and avalanche skills. The trip was led by Bean Bowers and Hans Johnstone, seasoned professionals from Exum Mountain Guides and would not have been possible without their generous assistance.

Michael Asay, Nina Hance, and Kate Siberell are not your average 15-year-old skiers. With a combined 10 years experience on Bridger Ski School's Team Extreme and a wealth of in-bounds and out-ofbounds skiing experience from Montana to Alaska, they were looking to advance their ski mountaineering skills in a controlled environment.

Through its Education Scholarship Program, the Hans Saari Memorial Fund was able to provide funding for tuition, assist with equipment, and coordinate with Exum Mountain Guides to make the Teton trip a reality. The course began with introductory skill sessions at Jackson Hole Ski Area where the students worked on snow and terrain evaluation as well as mountaineering skills required for technical ski descents. After getting comfortable with the ski conditions at Jackson Hole while practicing anchor construction, self-arrest technique, and belaying, the team headed into the mountains. The threeday backcountry camp culminated in a steep 50-degree descent from just beneath the summit of the Middle Teton that allowed Mike, Nina, and Kate to use all the skills they had learned in the previous four days.

"We are extremely pleased with the results of this first effort," said Drew Seessel, president of the Hans Saari

Fund. "Hans and Bean gave the group the chance to learn new skills and push themselves both mentally and physically. We started the scholarship program to encourage skiers to develop their skills and to improve their ability to make thoughtful decisions in the backcountry. With this first group of awardees, we are off to a great start. We look forward to continuing to help skiers become better, smarter backcountry travels."

Drew Seesel is a long-time backcountry skier and avalanche educator. He is president of the Hans Saari Memorial Fund Board of Directors and lives in Bozeman where he is married and has two daughters who also love to ski.







All three photos on this page from June 2007 Teton ski mountaineering camp.

The Hans Saari Memorial Fund

The fund's mission is to foster an appreciation for skiing by promoting ski exploration and education. Through its operations, the fund seeks to raise the level of awareness and expertise among those traveling in avalanche terrain. The fund will contribute to the ski community by sponsoring and encouraging innovative ski expeditions and education programs. The implementation of the fund's strategy, the success of sponsored expeditions, and the focus on education programs will create a legacy to Hans Saari. Contact drew@hansfund.org or visit www. hansfund.org for more info.

EXPLOSIVES UPDATE: Summer 2007

Story by Bill Williamson

E arly this past summer, we received a headsup from Larry Heywood, who was working on the new proposed Cal OSHA vertical standards concerning avalanche control work, that Fed OSHA was updating its 25-year-old regulations for using explosives. There were several issues (storage, transportation, deployment, retrieval, and

reminded us to get our comments in by the July 12 deadline, which Geraldine did.

While we were in Washington (for approximately 20 hours) Geraldine, on incredibly short notice, made appointments with the offices of Senator Larry Craig (ID) and Senator Orrin Hatch (UT). Both sit on committees overseeing OSHA, and we were able to present our concerns about the rule changes. We again had encouraging meetings and left feeling we had the support and backing of at least Senator Craig's office, if not both. With all that said, our efforts may have been somewhat moot since another organization, the National Rifle Association (NRA), also had concerns about the regulations as they relate to the storage of black powder. They were able to throw their considerable lobbying power behind another revision of the proposed regulations, and we have recently been notified that OSHA withdrew their proposal. They have made a very brief statement in the Federal Register stating that they intended to re-propose the rule and clarify its intent, and there is no time frame for issuing a new proposal. OSHA contacted NSAA this week indicating that NSAA's written comments were helpful and that they are hoping to incorporate them into the rule in the future.

probably was the deciding force here, we owe thanks to the folks in our industry who put quite a bit of time and effort into following this, providing constructive insight and personal time. Doug Richmond, Craig Sterbenz, Geraldine Link, Larry Heywood, and Gus Gilman were a few: "Thank you."

On a somewhat related topic, in discussions with

numerous others) in the proposed standards that would conflict dramatically with the way most of us use explosives for hazard mitigation.

NSAA's Geraldine Link, along with input from several Ski Area and Transportation Department representatives, read the proposed regulations and outlined the issues that would make explosive use in avalanche control more unsafe or difficult. Geraldine was able to secure an appointment with the OSHA standards committee that was overseeing these changes in order to present our concerns to them in person. With the generosity of our managements, Geraldine, Gus Gillman from Alta, and myself from Schweitzer traveled to Washington, DC, and met with the team at OSHA. They gave us an extended two-hour meeting that was very well received. We covered a brief history of AC (with an emphasis on our safety record), how we actually perform avalanche-control work, and a list with explanations of our concerns. We explained the conditions we work under and the reasons why these regulations would not enhance the safety of employees and guests at our ski areas. They

NSAA may meet with OSHA representatives again this fall, and NSAA intends to file comments on the re-proposed rule upon publication. Although the NRA OSHA and other explosive-related groups, we often report usage numbers, demographics of the "handlers," safety stats, and so on. These numbers are derived from a survey that the AAA Ski Area committee put out in the 1992 *Ski Area Avalanche Control Methods, Procedures, and Manpower.*

A group has been working on a new survey to provide more current info and stats, which will be available for forecasters and patrol directors to fill out this fall. The current survey is for ski areas in particular, but we will probably expand to other user groups in the future. It will be administered through the Survey Monkey Web site, and if we stay on schedule, we should have most of our results in the spring. The results will be shared with all participants, and the specifics of any particular area will be anonymous. We will be trying to contact areas to give more details in November. In the meantime, "Keep your powder dry."

Bill Williamson is the Ski Area Representative to the AAA Board. He invites everyone to come Ski Schweitzer this winter.

media ·

Mt Shasta 1995 Avalanche Interpretive Site Now In Place

Story by Roland Emetaz • Photos by Eric White

Avalanche Marks History – Broken Trees Reveal 300-year Tale on Mt Shasta

This was the headline in a February 1995 edition of the *Mt Shasta News*. Record snowfall, followed by several days of heavy rain, caused the release of a massive snow avalanche on the south side of Mt Shasta sometime between January 9 and January 13, 1995. It was estimated that the event originated at about the 3353m (11,000') level on Mt Shasta's Sargent's Ridge and tumbled across the popular Everitt Memorial Highway before running out of steam at 2072m (6,800') elevation near the Panther Meadow campground. The force of the event snapped off and uprooted 300-year-old Shasta red fir trees with diameters exceeding 152cm (60") and piled them 4.2m (14') to 7.6m (25') deep in the runout zone.

Several months later on August 3, 1995, Don Bachman, then secretary of the American Avalanche Association (AAA), was passing through Shasta City, California, and stopped at the Mt Shasta Ranger Station for information. It was then that he found out about the past winter's avalanche event. As would be expected, he was interested and immediately went to the site to take a look. After viewing it, Bachman wrote, "It is known that avalanches on some paths, especially in maritime climates on big mountains, under certain conditions may attain maximum runout distances on the order of 300-500 years. This extraordinary Panther Meadow avalanche on Mt Shasta is that kind of rare event." This observation led Bachman to conclude that there was an excellent opportunity to preserve, study, and interpret the dynamic forces of nature.

After some discussion, the Forest Service and the AAA agreed to form a partnership to establish some level of visitor interpretation at the site. A small team was formed involving Forest Service staff, members of the AAA, and a volunteer or two. Interpretive methods were evaluated, and the team determined that a short interpretive trail and viewpoint would be most effective in conveying the message. For a detailed explanation of the interpretive methods used, see *On-Site Interpretation*—*A Tool for Increasing Avalanche Awareness*, ISSW '98 Proceedings.

Special thanks to the people who made it happen: Matt Hill, Dan Towner, and Eric White of the Shasta Ranger District; the Shasta-Trinity National Forest; Art Mears and Steve Deal of the American Avalanche Association; and, of course, Don Bachman.

The interpretive site is located within the avalanche path, just off the Everitt Memorial Highway, approximately 12 miles up the highway from the Shasta City limits. For obvious reasons, the interpretive panels pictured in this story are removed in the autumn and put back in place once the snow melts. So if traveling along Interstate 5 in northern California by Mt Shasta, stop by and take a look (calling ahead may be advisable). Mt Shasta Ranger District, 530-926-4511.



snow science

Revisiting Multiple Burial Statistics: U.S. Avalanche Incidents 1995-2007

Story by Bruce Edgerly and Jon Mullen

Unifortunate headlines like this one (above) are printed all too often in North America. A single avalanche fatality is unfortunate enough; multiple fatalities are even more tragic. But as tragic as these incidents are, they can also be sensationalized by the media, manufacturers, and even avalanche educators. While epic multiple-burial scenarios like this have occurred in guided parties in various alpine countries, how prevalent are multiple burials in the US, especially in a typical recreational setting? How much time and effort should educators devote to teaching special techniques and technologies for performing complex multiple-victim transceiver rescues?

These are important questions for educators who need to efficiently allocate their time when teaching courses. It's an important issue also for manufacturers and consumers who must prioritize important features when designing and purchasing equipment, respectively. We must also address a basic issue of terminology. When teaching transceiver rescue, should a "multiple burial" really be called a "multiple burial" if the technique used to solve the burial is no different than the technique used for a single burial?

In an effort to better define the significance of multiple burials in the US, we analyzed 12 years of incidents, from December 1997 through March 2007, listed on the database of the American Avalanche Association (www. avalanche.org). In some cases, this was supplemented with further research and witness interviews. The goal was to answer the questions above by determining:

- a) How many incidents truly involve completely buried multiple victims using transceivers?b) Of these, how many are "special-case" multiple
- burials that lend themselves to a special search technique or technology?

Our findings show that it is more valuable for avalanche educators to get their students to own beacons, to master single burials, and to learn strategic shoveling than it is to invest time on special cases.

DEFINING MULTIPLE BURIALS

"More than 50% of avalanche accidents involve multiple victims." This is a popular statement commonly heard in the snow-safety industry. While this is a valid statistic on the surface, it can be very misleading, depending on how you define a "victim." The US statistics show that several people are often "involved" in an avalanche, but the number who are completely buried is much smaller. Of 366 incidents reported from 1995 to 2007, 48% were reported to involve multiple victims. But these victims often escape

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crown profiles



French Avalanche Analysis 2006/07

Story by David George Photos by Alain Duclos www.data-avalanche.com During the previous winter, 2005/06, France was buried under a veritable avalanche of hyperbole as the mainstream press blamed out-of-control freeriders for the worst season of avalanche fatalities since 1970. What a difference 12 months makes. To date (August 30, 2007), 20 people have been killed by avalanches; this is the lowest figure since 1989, and the press has moved on to speculate about other topics.

Weather Conditions

The prime suspect for fatalities and avalanche accidents during the record 2005/06 season was a thin snowpack with an unstable layer of depth hoar. Last winter saw record-breaking weather conditions of another type. The mountains were 2° to 3°C warmer than average. The result was a late start to the season with little snow below 1800m.

The first skiable snows came in the first week of December with a storm blowing up from the Mediterranean. The rest of the month was dry and relatively warm. A layer of depth hoar formed above 2200m on colder slopes. Snow followed at the start of January, but the first three weeks of the month when he was buried under 1m of snow. He didn't have an avalanche beacon and was only found by a probe line after 40 minutes of searching. The most serious incident involved two ski tourers in the Hautes-Alpes buried by a large avalanche. Both men were experienced and properly equipped with rescue gear. One of the men was located by a police helicopter equipped with a transceiver. His colleague was found later by a Search & Rescue dog.

Incidents continued through the 7th, when a snowboarder was seriously injured at l'Alpe d'Huez. There were some lucky escapes, with a skier buried under 4m of snow at Val d'Isere and another buried for over an hour in the notorious Cote Brune sector at Meribel. On the 5th, two off-duty ski patrollers

saw temperatures 9°C above norm. During this time, it rained to 2700m, rendering many north-facing slopes unskiable and covered in a thick layer of ice. The rain and freeze-thaw cycle had the effect of stabilizing the snowpack below 2500m and skiers experienced spring-skiing conditions in the middle of winter. Cold weather finally arrived on January 23, when the maximum temperature fell from 5.3° C to -8.4° C over a 24-hour period at Pralognan (1420m) near Courchevel. This was accompanied by some fresh snow. March continued with unstable weather and additional small snowfalls into the first week of April. Winter finished abruptly with a three-week thaw followed by a return to colder, unsettled weather in May and June.

Avalanche Incidents

Sixteen of the 20 avalanche fatalities, including the single fatality in the Pyrenees range, were clustered into four groups. Fourteen of the fatalities occurred in the neighboring regions of the Savoie and Hautes-Alpes, with four of the others in Chamonix. The first fatal accidents took place in early January, involving off-piste skiers. On January 2, a young skier was killed by an avalanche off-piste in les Arcs. Tired, he had left a group of friends and was returning to the resort alone. He wasn't equipped with a beacon. The avalanche-hazard rating that day was considerable.

The following day, with the avalanche hazard now at high across the Alps, a resident of Chamonix was off-piste skiing in the Grands Montets sector

were caught at Tignes. One escaped with relatively minor injuries, while the other patroller was not so lucky and at the time of writing is still in a coma.

On the January 27, the avalanche hazard in the Alps was considerable, and there was a strong wind blowing from the north to northeast. 30cm to 50cm of fresh snow had formed new slabs that were poorly bonded to a crust or facets below. An Italian ski tourer died in the Pelvoux despite being swiftly rescued by friends. In the Arêches, two local instructors were killed while ski touring together. A search was only started when they failed to return in the afternoon. In the Pyrenean resort of Porte Puymorens, a climber died after being swept 200m down a rocky couloir.

Five fatalities and a number of other incidents followed in February. On the 13th, a skier crossing between open ski runs at Tignes was buried and killed by a small avalanche into a terrain trap. At la Plagne, the body of another lone skier was located just meters away from an open slope, buried in a terrain trap with his legs visible. A lone monoskier was also killed off-piste at le Corbier. None of these victims had avalanche beacons, and there were long delays before they were reported missing. The avalanche hazard was high above 1800m.

On the 15th, a ski tourer was killed in the resort of Crevoux in the Hautes Alpes. Climbing with a friend from the top of the lifts, the victim was caught by a large avalanche and a terrain trap. He was not equipped with a beacon. The hazard was high and the bulletin advised that the snowpack was very





unstable at altitude. The cycle ended on the 18th when another ski tourer triggered a slide in the Hautes-Alpes. The man was found by members of his group using beacons after 40 minutes but could not be revived.

There had been close to a meter of fresh snow on March 4 in the northern Alps. A group of relatively experienced and properly equipped skiers from Lyon University's Mountaineering Club decided on a ski tour close to Valloire in the south of the region. The avalanche bulletin rated the hazard as considerable, increasing to high during the day, with the snowpack described as only weakly stabilized for the first 60-120cm with a weak layer of graupel. One of the group recalled how they had skied 150m of powder on a north aspect, descending one at a time. While climbing back up, they noticed the weak layer in the snowpack, but they felt more confident in the stability having already skied the slope. Following a line of rocks in the hope these would provide anchors, the group triggered an avalanche that was at least 1m deep and took most of the face, some 1000m, ultimately killing two of the skiers. This was one of the biggest slides of the season. There had been several minor incidents in the area in the days prior to this slide.

On March 6, a group of eight ski tourers from the French Alpine Club were caught by an avalanche in the Ubaye, close to the border with Italy. The group had originally scheduled a week-long ski tour in the Vanoise in the northern French Alps, but changed their plans after consulting the avalanche bulletins. After lunch on the second day of touring, the group skied a short northeastto-east slope at 2700m. The group leader didn't think there was much risk of a slide on what he estimated was a 25-degree slope. After skiing the slope without incident, three other members were caught by a slide, and one of them was completely buried. They had difficulty in localizing the victim due to the burial depth. The group worked in relays to dig a hole, rechecking with probes and beacons as they dug. They finally uncovered the face of their friend after 25 minutes. He was unconscious and failed to respond to over an hour of resuscitation. On April 8, a talented international female climber was killed ski touring in the Hautes-Alpes. She was buried for 30 minutes before being located with a transceiver. The avalanche hazard was moderate, but strong winds had formed localized slabs. The last incidents of the season were at high altitude on Mont-Blanc. At the end of May, a Finnish ski mountaineer was caught on the north face and swept into a terrain trap. On June 17, two Swiss climbers, one a highmountain guide, were also killed after being buried in a terrain trap.

to five off-piste skiers and no snowboarders. The other three fatalities were climbers. There were no fatalities amongst guided groups.

The average number of fatalities over the last 18 seasons is 30.8. However from the year 2000 (with the exception of 2005/06), the average has been 27 – even with off-piste skiing and ski touring gaining popularity. Set in this context, last season's figures are still good.

What can account for this relative success? Using the Camp2Camp.com database of ski tours, we plotted all the trips for the northern Alps with a 14-day moving average for the last six years. This data shows that this season started three weeks later and only reached average, with the good conditions from mid-March to April, followed by a rapid end. Apart from the Pyrenees, there was practically no ski season in the French mountain ranges off of slopes covered by artificial snow. There were, quite simply, less people out in the mountains. A similar database maintained by Skitour.fr showed that for its 500 members, the average number of trips dropped 6.2% to 5.46 compared to 2006, and the vertical of each trip increased 4.1% to 1356m. This increase suggests that skiers were searching for snow on longer high-mountain routes. This statistic might account for the larger number of ski tourers in last season's figures, as these higher routes are more dangerous, even in good winters.

A large proportion of the ski-touring fatalities were part of experienced and/or well-equipped groups. It is possible that these skiers were the ones motivated, informed, and experienced enough to find snow in a difficult season.

The ratio of victims per fatal avalanche, as well as the overall number of avalanches reported versus fatalities, doesn't suggest that skiers in 2007 were luckier than normal or that accidents were less severe. What is true is that

Conclusions

Over the last few years, there has been an increase in the number of fatalities involving off-piste skiers and snowboarders compared to ski tourers. The first group now constitutes over 50% of all victims. This trend can be attributed to the growth in popularity of lift-served off-piste skiing and snowboarding, aided by the introduction of better equipment and the increasing safety awareness of ski tourers. Last season, all but one of the ski touring fatalities carried a beacon, whereas none of the off-piste fatalities were equipped. Last season saw a reversal of recent trends, with 12 ski tourers killed compared

for the most part, avalanches occurred during four clearly defined cycles and were largely limited to an area on the French-Italian border stretching from Chamonix to the Ubaye. The weather clearly played a role with rain to high altitude and a freeze-thaw cycle in January. Avalanches generally occurred at a slightly higher altitude – perhaps putting some dangerous terrain out of the reach of ski lifts. The French Ski Lift Operators Association (SNTF.org) reported a 12% drop in skier days last season compared to the previous year (an 8% drop when compared to the period 2002-2007). At the big high-altitude resorts, this drop was just 6%.

2006/07 will be remembered as an unusual winter. The stable snow conditions and poor snow cover were the principal reasons for the improved accident figures. The increase in the number of ski touring fatalities amongst experienced skiers worries us.

References

Snowfall data from Meteo France ANENA articles http://www.data-avalanche.com/alea_avalanches/

Every year David George dependably reports upon France's previous winter's conditions for The Avalanche Review. He runs the French backcountry skiing Web site www.pistehors. com. More photos and information are also available at www.data-avalanche.com

NAC 2006/07 season roundup

Sierra Tahoe forecaster Andy Anderson performs a crown profile on Mount Judah. photo courtesy Sierra Tahoe Avalanche Center

Sierra Avalanche Center - Tahoe National Forest

During the 2005/06 season, the Sierra Avalanche Center was an organization held together by the determination and hard work of a few individuals and a healthy dose of good luck. Backcountry use in the Tahoe area was already at an incredible level. As it continued to grow, so did the need for a comprehensive avalanche advisory. Unfortunately, the center lacked any cash funding from the Forest Service, and the innovative fundraising events hosted by the Friends of the Sierra Avalanche Center fell well below financial expectations. Brandon Schwartz (the center's one full-time forecaster) spent most of the winter living off peanut butter and jelly sandwiches while hoping that funding would materialize. At the end of the season, the last fundraiser was a huge success, and the center paid debts that it had accrued during the season. Brandon finally received a check for months of unpaid work and ate a real meal.

Flush with this success, the Sierra Avalanche Center and the Friends group decided that it was time to take an ambitious gamble: the avalanche center needed to hire a second full-time forecaster to continue to meet the needs of the public. The goal would be to have two forecasters that would issue daily advisories throughout the winter of 2006/07. The Sierra Avalanche Center and the Friends group thought that by using some of the new fundraising and marketing techniques learned during the 2005/06 season, they could make this goal a reality.



The plan was simple. Take the risk and hire the second forecaster. Then raise enough money over the winter to pay forecaster salaries and cover operating costs.

Bob Moore successfully lobbied Tahoe National Forest to increase its donated infrastructure support (computers, truck, gas, office, etc) to \$12,110 and to give the Avalanche Center \$16,500 in cash funding. The Friends group rallied and raised more than double the amount that it had in 2005/06 during the 2006/07 winter.

The primary fundraising events that the Friends of the Sierra Avalanche Center rely on are "Ski Days." The Board of Directors of the Friends of the Sierra Avalanche Center have used their connections in the Tahoe ski industry to get four ski resorts to participate in these Ski Days. Each resort gives the Sierra Avalanche Center between 250 and 500 lift tickets for a specific day. The Sierra Avalanche Center sets a fixed public donation amount necessary to receive a lift ticket for the Ski Day as a thank you gift. By setting the lift-ticket price well below retail, these tickets become a screaming deal for anyone who buys them and a great income source for the Sierra Avalanche Center.

In 2005/06 very few people knew about the Ski Days. Only one of them was a significant financial success. Learning from that experience, the Friends of the Sierra Avalanche Center enlisted the help of an internet e-lift-ticket marketing company called SnowBomb.com. SnowBomb volunteered to donate its services as an e-lift-ticket provider and to help market the Ski Days. This service allows the public to purchase and print the Sierra Avalanche Center Ski Day ticket from any computer with an internet connection and a printer. The Sierra Avalanche Center receives 97% of the proceeds with 3% given to SnowBomb for credit-card processing.

The Sierra Avalanche Center also raises money through private donations.

Sierra Tahoe Avalanche Center forecaster Andy Anderson updating the hotline. photo by Brandon Schwartz

Near the end of the 2005/06 season the Sierra Avalanche Center set up a PayPal donation button on its Web site that proved to be an excellent way to encourage public donations. In 2006/07 the public donations garnered through the Web site and by mail increased. The Sierra Avalanche Center kept the public informed of its current financial situation by posting the specific dollar amounts raised and needed throughout the season on the Web site.

Through these efforts, the Friends group was able to raise a total of \$56,700 in cash funding to directly support the avalanche center in the 2006/07 season. Of this funding, \$31,440 was raised through the sale of 1044 donated lift tickets from Homewood, Kirkwood, Mt Rose, and Sugar Bowl ski areas. SnowBomb. com made online sales of these lift tickets possible. \$25,260 was raised through grants, cash donations from local groups, and cash donations from individual users of the avalanche advisory. Major cash contributions from local organizations included \$5000 from The WARI Institute, \$4500 from the Heavenly Professional Ski Patrol, \$2500 from the Norm A. Wilson Avalanche Education Fund at Truckee Tahoe Community Foundation, and \$1000 from Tahoe Nordic Search and Rescue. Smaller cash donations averaging around \$80 per person were made by 177 other groups and individuals.

This incredible fundraising effort made the move from one full-time forecaster to two full-time forecasters a success. The Sierra Avalanche Center took another step forward by contracting with a professional observer on a per diem basis from mid-January through the end of the season.

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Despite 40% of average snowfall amounts for the Sierra Nevada Mountains, the Sierra Avalanche Center also made great strides in improving the products that it provides to the public. Between November 25 and April 27, we issued 137 daily avalanche advisories, sevem early-season condition reports, and four late season condition reports. We issued 68 Low, 52 Moderate, 14 Considerable, 3 High, and 0 Extreme danger ratings. Small storms and long periods of high pressure kept snowfall amounts well below seasonal averages. Only one typical Sierra storm dropping 6' of new snow in a single storm event occurred this past winter. This was a significant change from the 2005/06 season during which 29 Considerable and 25 High danger advisories were issued, and snowfall records were broken for the month of March.

Our formal program of avalanche, snowpack, and weather information sharing was improved this season by adding a password-protected online submittal form to our Web site and establishing more personal contacts with local avalanche professionals. Observations from Alpine Meadows, Central Sierra Snow Laboratory, Heavenly, Kirkwood, Mt Rose, Squaw Valley, and Sugar Bowl were submitted to the avalanche center on storm mornings with afternoon updates often submitted. This information, combined with observations submitted by the public, was an important supplement to the information gathered by forecasters Brandon Schwartz and Andy Anderson, as well as professional observer Steve Reynaud.

Doug Abromeit, Director of the USFS National Avalanche Center, visited the Sierra Avalanche Center during the middle of March. This was an excellent opportunity for forecasters Andy and Brandon to compare operations and discuss the issues facing continued operations of the Avalanche Center. We appreciate the support extended to us from the USFS National Avalanche Center.

For the 2007/08 season, we plan to continue to expand operations by contracting additional professional observers. Our Friends group is working to secure additional grants and is arranging more Ski Days for next winter. Additionally, they are working on acquiring two snowmobiles to aid in accessing some of the more remote avalanche terrain within the forecast area that receives significant snowmobile traffic.

We attribute this season's success to a proactive Friends group, the Board of Directors professional and community contacts, online ticket sales through SnowBomb.com, and positive support from the Tahoe National Forest. The Sierra Avalanche Center is very grateful to all of the individuals who have made our growth possible. The forecasters now have lunch options beyond peanut butter and jelly sandwiches.

—Brandon Schwartz and Andy Anderson, avalanche forecasters

Forest Service National Avalanche Center

The Forest Service National Avalanche Center deals with many issues ranging from military artillery to snow research, and one of the most gratifying and important of these issues is working with local backcountry avalanche centers.

There are 19 variously shaped and sized backcountry avalanche centers scattered across Alaska, Washington, California, the Intermountain West, and New Hampshire; 16 of these centers are managed by National Forests, one by the state of Colorado, and two by non-profit groups. A couple of the centers focus exclusively on avalanche education and do not issue avalanche advisories, others only issue one or two advisories per week, and still others issue two advisories per day. A few of the centers only have one part-time employee; others have 10 full-time employees. While centers differ widely in size and scope, they have two things in common: they all deliver great products and they all depend upon outside funding to keep them financially afloat.

The centers deliver great products because the staffs are talented consummate professionals and because they cooperate well with one another. This cooperation includes maintaining an effective electronic information exchange throughout the year and meeting at the annual National Avalanche Center Workshop.

The US backcountry avalanche warning system is a confederation of diverse, autonomous, and locally funded centers rather than a homogeneous, centralized, and singly funded center typical of most other systems in the world. Naturally, since the centers are both diverse and autonomous, there is always the danger of diverging into something like a herd of cats. However, to date, the centers have been amazingly successful at sharing technology and maintaining consensus, both of which help assure consistently high quality products.

We feel that the annual NAC Workshop has helped achieve that end. The workshop includes a technology transfer day that features cutting-edge avalanche-



In April 2007 a natural avalanche cycle in Tuckerman's Ravine produced this large runner for the bowl; crown line is visible at the upper right. *Photo courtesy Mount Washington AC*

Mount Washington Avalanche Center

If the Mount Washington Avalanche Center could pick a title sponsor for the 2006/07 season, we'd probably choose Dramamine[®]. Our season kicked off during the month of October with 17 of the 31 days seeing snowfall. Although the mountain only saw 64% of its average monthly liquid equivalent, we piled up three times the normal snowfall. The locals were restless, and many made long descents in areas usually out of shape until mid-winter. Thus began the first uphill climb on our New England roller coaster.

November was a rude slap in the face as our snow-induced high quickly wore off. Summit temperatures for the month were 9.2°F above average, sending our great October base layer out to the Atlantic. Additionally, the summit recorded only 18% of their average snowfall as they witnessed the second least snowy November on record. December continued the warm trend, yet somehow the Observatory managed to record snowfall on 24 of the month's 31 days, and snowfall was down only 25%. Above average temperatures persisted through January and only 53% of the expected snowfall was recorded for the month.

By the beginning of February our new forecaster, Jeff Lane, was wondering just what he had signed up for. The troops were in need of a morale boost, and my return from the disabled list (post-ISSW broken ankle) seemed to be accompanied by deep cold and big snow. A Valentine's Day blizzard made snow enthusiasts reconnect with their true love, and my co-workers thanked me for returning as storms lined up back to back. Unfortunately my magical powers fizzled, and before we knew it we were back to a waning snowpack. Here's where you'd start to up your dosage of Dramamine if you were a snow lover stuck in New England.

March came in like a lion though unfortunately this cat was the king of devastation, and the snows of February seemed to melt before our eyes. By the end of the month most of us gave in to our pessimistic side. The Summit tallied a mere 53% of their average March precipitation which accounted for the seventh straight month of below-average liquid equivalent. Our snowmobiles got put away, the shorts came out, and when we spoke of snow it was usually in reference to the next season. Just as we were about to dismantle the instruments at our snow plots, April struck, and we were sent to the store for more Dramamine. The ensuing storms pummeled the mountain with a vengeance, and our constituents had to locate their boards which had sat neglected for weeks. The most exciting storm of the bunch was a nor'easter that dumped 35" (89cm) of snow with an average density of 206kg/m! To top it off we had sustained winds over 100mph (161kph) that plastered the snow into every nook, cranny, and vertical face inbetween. Skiers and riders who visited were treated to excellent coverage in areas that rarely hold snow. As

related presentations and a business forum day to discuss germane topics, including standard operating and business procedures, as well as mutually beneficial projects. These projects include the recent *Snow, Weather, and Avalanches: Observational Guidelines for Avalanche Programs in the U.S.* (SWAG); advisory graphics; *Know Before You Go* avalanche awareness video; short avalanche-awareness instructional videos that can be downloaded; Snow Pilot data storage; an avalanche encyclopedia; informational brochures; the current considerable effort to revisit and perhaps revise the danger scale; and many others.

While all the avalanche centers depend upon mutual cooperation to deliver the best possible products to the public, they also all rely upon outside funding to keep their doors open and their advisories flowing. To illustrate, National Forests that manage avalanche centers typically provide between 30% and 70% of the funding for their individual center, with the remainder of the funding coming from outside sources including community Friends Groups. The Friends Groups are comprised of dedicated people who volunteer literally thousands of hours, hosting a plethora of events from film festivals to ski mountaineering races that help fund the centers. The NAC salutes the outstanding and invaluable behind-the-scenes help provided by Friends Groups.

Much of the rest of this issue of *The Avalanche Review* is dedicated to showcasing the accomplishments of the various avalanche centers. We hope you enjoy hearing about them as much as we do!

—Karl Birkeland & Doug Abromeit, directors

Chris Fithian, the caretaker of the AMC Hermit Lake shelter, in debris from a small slab on Hillman's Highway. This was also the site of a human-triggered avalanche around that time in which no one was caught, but there were at least six people in the gully area. MWAC did a full rescue scenario with dogs, probe lines, and Recco to make sure there were no victims. Photo courtesy Mount Washington Avalanche Center

THE AVALANCHE REVIEW

continued from previous page

Snow Ranger Jeff Lane checking snow stability out in The Sluice on a very cold winter day. Photo courtesy Mount Washington Avalanche Center

the month wound to a close, the snow seemed to go as fast as it came, and we were back to a below-average snowpack despite an April that saw 50% more snow than normal.

Now it's late May, and we're still forecasting for the stubborn New Englanders who continue to come up for the late-season corn and occasional freshies. To date, 170 advisories have been issued for the season with the first advisory coming on October 27. In addition to daily advisories, we also began producing a "Weekend Update" on Friday evenings and have gotten great feedback from those starting their weekend pilgrimage before the Saturday advisory comes out.

As the lead agency for search and rescue operations, we managed 16 incidents ranging from ice-climbing accidents to lost skiers. Two avalanche incidents stand out as worthy of mention. The first was a guided party of five that was overcome by a small slide while preparing to descend from a day of mountaineering. The group had been using the runout of a prominent gully for snow anchors, self arrest, etc. when what is believed to have been a large slough caught three of the five climbers, breaking one person's leg. A number of pieces of bull's-eye data were present, including new snow, moderate winds providing direct transport, low visibility, and climbers in the gully above.

The second incident occurred when a skier triggered a slide (D2R3) while ascending a skin track created by his partner. The victim was carried approximately 750' (230m) through small trees, and though injured was able to free himself from a partial burial. Nearly 100 people witnessed the avalanche, and the response was quick. An avalanche (D3R3) was triggered by skiers in an adjacent gully while we were removing the victim for further medical care and were searching the debris for other victims (a number of other skiers and riders were in the general area at the time of the slide). Six skiers were in the gully at the time of the slide and rescue personnel were located on a rib separating the two paths. We conducted beacon, dog, and Recco searches on the debris pile before terminating the search due to a high degree of confidence in a lack of additional victims and the presence of hang fire with continual loading.

Of the large number of people in the general area during the slides, only two were wearing beacons.

This season also brought some changes to the Snow Ranger family. After more than a dozen seasons, Marianne Leberman left the program though she continues to provide logistical support. Jeff Lane was chosen to fill the vacancy and brings to the program unique strengths in education, risk management, Web design, and grammatical correctness. As always, the Mount Washington Volunteer Ski Patrol played a huge role in the success of our season, as did our volunteer search and rescue groups and the local guide services that provided more than two-dozen avalanche courses. Thanks to all!

Sawtooth National Forest Avalanche Center

This may be one of the least eventful snowpack summaries in recent memory. It was a very low snow year (60-80% of average in late March). A lack of big storms prevented the avalanche danger from reaching High and no warnings were issued. Still, unstable conditions did exist at times, and we had a few close calls. A dry start to December created depth-hoar conditions in areas with a thin snow cover and created a near-surface facet layer where the snowpack was deeper. Mid to late December brought the heaviest snowfall of the season, resulting in periods of Considerable avalanche danger. During that time, forecasters Chris Lundy and Matt Lutz purposely and remotely triggered a class D3+ slide on a popular backcountry ski run on Durrance peak. We figured we had better get there before someone else did, as a number of local skiers had become "too familiar feeling" about Durrance. This was verified with a number of on-the-street comments coming back to us like, "I never thought Durrance had slides."

Early January began a month-long dry spell, testing the forecasters' ability to say the same thing in different ways. Where the snowpack was deeper, a highly variable surface mix of facets and wind-blasted snow developed. The south and central valleys turned to bottomless depth hoar.

By the second week in February, snowfall resumed but at a slow and nervewracking pace. With a slab slowly building atop a very weak and highly variable snowpack, it was hard to predict when the breaking point would be reached. Ultimately, the snowfall never tipped the scales, and the avalanche danger stayed at Considerable. The biggest stress to the January facets turned out to be warming temperatures in early March. Several natural avalanches occurred, and a snowmobiler had a close call when he triggered a class D2 slide in Apollo Creek northwest of Ketchum. A week of warm temperatures strengthened the snowpack, and stability tests produced hard or no results. Illustrating that snowpack structure is equally as important as strength and energy, a snowmobiler triggered two D2.5 avalanches in steep, rocky northfacing terrain on March 10. The second completely buried him, but he was quickly located and recovered by his partners using beacons. He was evacuated by Life Flight and underwent successful surgery for a fractured spine.

March continued to be dry and very warm, leading to wet-snow avalanche concerns. Numerous wet slides - sluffs and slabs - occurred during this period. An extended melt-freeze cycle helped consolidate the wet pack later in March and brought very good spring conditions. Rapidly melting snow around town and widespread spring fever led to decreasing backcountry interest and the last daily avalanche advisory on March 18. We provided general snow and weather information into early April as conditions warranted.

Part-time forecaster Matt Lutz took a temporary leave of absence in early January to start paramedic school, and the Avalanche Center was shortstaffed for the majority of the season. As a result, we did not issue regular morning avalanche advisories on Tuesdays and Thursdays. If conditions warranted, we provided an update on Monday and Wednesday afternoons to cover the following day. We look forward to Matt returning next season and plan to resume the full daily advisory schedule with Chris and Janet also returning.

Sixty-second avalanche information spots weekday mornings on local KECH radio proved very successful. With a possible audience of up to 15,000 valley residents, this radio spot undoubtedly reaches several thousand people each morning. To keep up with the changing ways that the public accesses online information, we added RSS feeds and podcasts. Sunvalleyonline.com, a popular local news Web site, used the RSS feed on a daily basis to display the avalanche advisory to their viewers. All the new approaches make it difficult to accurately calculate the number of times the public accesses avalanche information, and we believe our numbers underestimate the total number of advisory uses.

We continued to refine the graphical advisory layout this season and helped other avalanche centers adopt similar formats. New mouse-overs for the danger ratings and avalanche concerns give viewers quick access to definitions for those important terms. We also dabbled with the use of streaming video clips and find these to be a promising tool for getting our message across to the public.

With Matt gone for much of the season, we reduced the number of educational programs. Core local classes and Avalanche Awareness Week programs were

Forecaster Justin Preisendorfer edging out onto steep terrain on Tuckerman's headwall. Photo courtesy Mount Washington AC

—Justin Preisendorfer, forecaster

If the Mount Washington Avalanche Center could pick a title sponsor for the 2006/07 season, we'd probably choose Dramamine[®].

offered, but we cut back on travel and outreach programs. We taught an advanced avalanche rescue course for Idaho Power, which included a fivefoot burial of a 180-pound mannequin.

New this season was a two-hour Avalanche Basics class taught for Wood River Valley emergency services personnel. The Avalanche Rescue Training Park was improved this season with the number of buried targets doubled from four to eight. Public awareness of the facility became more widespread, and use increased substantially. Our work with the media led to a number of news programs and articles about avalanche conditions and basic safety.

Partnership grants from the Wattis Dumke Foundation led to a new avalancheawareness brochure covering the most essential components of avalanche safety. A unique, eye-catching design utilizes a "Red Flag" approach to help recreationalists identify unstable conditions. It appears that other avalanche centers will adopt the brochure and that it will receive wide circulation in the future.

In March, Chris and Janet met with Idaho Department of Parks and Recreation to brainstorm how to reach more of Idaho's winter backcountry users, and even how to partner and reach snowmobilers nationwide. IDPR is interested in providing additional support for Idaho's three avalanche centers: the Panhandle, the Payette, and the Sawtooth. So, in spite of a dry season, we seemed to always be busy and ran a successful and well-received program. —Janet Kellam, director

The Nisqually road and site of the former Sunshine Point campground: November, 2006.

Northwest Weather and Avalanche Center

And then there were three... again!

The NWAC entered the 2006/07 season trying to lure Knox Williams to make a Michael Jordenesque move, returning one more time from retirement to bring his unmatchable talents back to the Pacific Northwest, but it was not to be. After a wonderful season in 2005/06, featuring Knox Williams sharing a position with Garth Ferber, long-time director Mark Moore was left with one less minion to help shoulder the load. Garth once again returned to his full-time position along with Kenny Kramer to round out the trio of forecasters for the NWAC 2006/07 season.

With a moderate and strengthening El Niño brewing in the Pacific, the season began under the uneasy feelings of a possible dour snow year unfolding in the region. Well, regardless of the conditions in the Pacific, the weather encountered in the Pacific Northwest was anything but uninteresting and most of the time was truly dramatic! It began with record flooding in early November when the NWAC precipitation gage at Paradise on Mt Rainer recorded over 14" in a 36-hour period and nearly 22" of rain over a four-day period! This flooding proved to be catastrophic in many areas of the Northwest, but particularly for Mt Rainier National Park, typically a very popular backcountry skiing destination that, at this writing, remains closed to the public – nearly six months after the flooding.

The flooding was the most extensive in the park's 108-year history with damages estimated to exceed \$36 million. The damage to Highway 123 along the eastern border of Mt Rainer was so extensive that a closure for that highway is expected through the entire summer of 2007.

the remainder of winter. The 2006/07 season began more optimistically than these trends with well-above-normal averages. However, a strong and wellestablished ridge of high pressure moved over the region from mid-January and lasted through mid-February. This pattern produced little if any snowfall in the later half of January into early February and was accompanied by relatively high freezing levels and mild temperatures. A recapitulation of the early season returned for the later half of February, with heavy snowfalls. For example, Mt Baker received 7' of snow in last two weeks of February! It was during this storm cycle that the only avalanche-related fatality occurred in the Northwest. On February 24, a skier at Crystal Mountain left the area with his partner and descended into Mt Rainier National Park that borders the ski area. There, he triggered a 3' slab that carried him some 1500 vertical feet down the mountain. The NWAC had issued an avalanche watch the previous morning to highlight the expected danger increase and issued an avalanche warning the morning of February 24, but apparently neither member of the party was aware of the backcountry conditions.

depths occurred that lasted through

From early March through the remainder of the season, the snow-depth curves began to follow the pattern of previous El Niño winters, eventually dipping below climate averages by late March and early April of 2007. A generally cool and unsettled weather pattern developed from mid-spring onward. Lacking any extended warm periods, the snowpack thus far has been allowed a relatively slow and peaceful transition to typical isothermal spring-like conditions.

As is the case with so many of the avalanche centers in the country, especially the long-established ones, the efforts and support by the Friends groups remain a vital part of who we are and what we are able to accomplish. This certainly is the case for the NWAC that has an active group of volunteers who work tirelessly to help us in so many ways. The Friends of the NW Weather and Avalanche Center (FOAC) threw a memorable "Snowbash" fundraiser in early November to kick off the season. The live and silent auction, live music, and locally crafted libationinfused evening added up to a stomping success and a lot of fun!

Administrative changes afoot for the NWAC...?

Renewed efforts to ensure NWAC's future existence were precipitated following the recent announcement by the USDA Forest Service that they would no longer be administering the NWAC beyond the 2007/08 season. In response to this news, the FOAC proved instrumental in drafting and getting a bill of legislation introduced in Olympia (Washington's state capitol, for those who skipped class that day) to ensure the long-term viability of the NWAC in the Pacific Northwest. After much effort, a bill revision, and several visits to the state capitol to testify in support of

Continued on next page **—**

The flooding in November also cut off access to areas of Mt Hood. This proved especially devastating for Mt Hood Meadows ski area, where substantial early season snowfall following the torrential rains lay mostly untracked on the inaccessible mountain while other areas quickly opened amid deep new snow. The rains of November quickly changed to heavy snowfalls that lasted into early January, thus building a substantial early season snowpack with many area snow depths eclipsing 200% of normal by December 1, 2006.

Looking at the snow-depth trends in the Pacific Northwest during previous weak-to-moderate El Niño episodes, a fairly distinct pattern emerged. Generally, the seasons began tracking with the climate average, until about mid-January, when a precipitous decline to well-below-average snow

White River bridge near Mt Hood, OR, 11-07-06.

Photo by Doug Jones, USFS from the Hood River RD on the Mt Hood NF

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NAC 2006/07 ROUNDUP

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the bill, the revised bill passed unanimously out of both House and Senate and was signed into law this spring by the Governor of Washington. While the current bill may not initially make any sweeping changes, it does establish the means and timeframe to develop a plan and create the lasting partners that will oversee and fund the NWAC, hopefully well into the future. This may eventually lead to the NWAC coming under the wing of the state of Washington rather than the Federal Government; however the details of this transition and its ramifications are still in their infancy.

-Kenny Kramer, forecaster

Colorado Avalanche Information Center

The best word to describe the 2006/07 operating season for the Colorado Avalanche Information Center is change. Nick Logan followed Knox into retirement, of a sort. He actually worked a couple days a week out of our CAIC-Summit County office, and we were all happy not to lose him completely. The CAIC brought on two new forecasters in the Boulder office: John Snook and Ann Mellick. We opened a second satellite office to cover the northern San Juan Mountains. Mark Rikkers moved from the CAIC-Silverton office to become the first, and currently only, forecaster in this office. Susan Hale moved into the CAIC-Silverton office. After seven seasons as the CAIC's Education Coordinator, Halsted Morris decided he wanted to put less than 15,000 miles on his car. Ben Pritchett became the second education specialist in CAIC history and did a fantastic job during his first season. The first couple months of our season were spent training Ann and John, launching a new Web site, and pushing Ethan to finish his PhD. There are some people on our staff who would say it was a busy 2006/07. If you want more info, pull one of us over for details, but it would help to converse over cold brews, or we might start twitching and quivering. The good news is that we survived, and we are all still talking to each other!

NOVEMBER— Good early-season snows with plenty of cold clear nights developed the typical faceted Colorado snowpack. In general, storm cycles for the rest of the year brought the snowpack to the brink of large avalanche cycles, but would end just as we reached the cusp of avalanche-warning status. The first avalanche incident of the year on September 24 ran off a metal roof south of Breckenridge after a three-day storm cycle that dropped over 18" of new snow. This slide left one man with severe head lacerations. A second incident in late October happened after more than a foot of new snow fell and left one man shaken but unhurt after taking a 1,000' ride near Loveland Pass.

The CAIC opens for business by providing a weather forecast for the six CDOT avalanche forecasters on November 1 each year; public forecasting generally begins mid-November. By the 5th, a decent-size avalanche caught one skier on a local favorite backcountry run known as "The Corkscrew" just east of Montezuma in Summit County. He took a short ride and sustained only minor injuries.

The CAIC opened on November 12, not a moment too soon as the next reported human-triggered avalanche ran on the 15th near Red Mountain Pass. Some 12-16" of new snow associated with strong winds fell from the 12th to the 13th, loading slabs onto either very weak faceted snow or hard, glazed sun crusts. A skier triggered one soft slab plus two nearby paths while on a 600' vertical ride. Three climax avalanches were explosive-triggered on the same day from Telluride and Silverton. The next big November storm dropped nearly two feet onto a highly variable and often very weak snowpack in the Central mountains on the 27th and 28th. One skier triggered, was caught, and partially buried in an avalanche near Aspen due to these conditions. For November, five people had been caught in the 141 reported avalanches, and two people had been injured.

DECEMBER— Three periods of activity marked the month of December. Strong winds and a little bit of new snow deposited fresh slabs onto a hodgepodge of depth hoar, near surface facets, surface hoar, and melt-freeze crust layers. Natural, skier, and explosive-triggered slides were reported from around the state through the 5th. Crowns ran to 900' wide near Wolf Creek Pass, and verticals of a couple thousand feet came in from the northern San Juans. A ski patroller at Crested Butte was caught in a post-control release on December 2 and was buried to his neck. The next day, a snowmobiler triggered a slab near Jones Pass and was partially buried. Strong winds and the next snow cycle spiced up the backcountry by the 15th. The first incident of the second avalanche cycle of the month involved an ice climber caught and injured while climbing "The Ribbon" near Camp Bird Mine. The second post-control event of the month happened on the 16th, when a snowboarder triggered and was carried by a small soft slab on Gold Hill at Telluride. Also on the 16th, a backcountry skier near Cameron Pass lost his gear after being swept up in a slide on Diamond Peak. The last avalanche cycle closed out the last week of 2006. Three skiers were caught in three separate incidents, unfortunately resulting in the first avalanche fatality of the year. An up-and-coming freeskier launched a cliff on a closed run at Snowmass ski area, triggering a SS-AS-R3D2-O. He was buried and died before he could be evacuated. One of the luckier incidents of the season involved a father and son team that attempted to climb 13,427' Grizzly Peak near Loveland Pass. After bailing on the summit, they decided to take a shortcut which took them between two recent large soft slabs. As you may have guessed, they triggered a large soft slab, burying both the father and son. The father managed to dig himself out, then was able to hear his son shouting for help and dig him out without beacons, probes, or shovels. (see photo above)

A father-son team was caught in an avalanche while down-climbing Grizzly Peak near Loveland Pass during the last week of December. After digging himself free, the father heard his son's calls for help and proceeded to dig him out. Neither man was equipped with an avalanche transceiver, probe, or shovel. photo by Nick Logan

JANUARY— During the first week of January only four incidents were reported but 12 people were caught. January 6 was the busiest day of the month. Two skiers were caught near Wolf Creek Pass but were unhurt. In the second incident, two cars carrying a total of eight people were hit by an HS-N-R3D3 on US 40 over Berthoud Pass. The Stanley avalanche path ran naturally about 1000' wide, an estimated 2-10' deep, and swept the two cars off the highway, slightly injuring all passengers. 299 reported avalanches for the month of January.

FEBRUARY— Wind, bitter cold, and snow ushered in February. The first avalanche cycle of the month came with it, with our second fatality of the year on the 4th. A snowmobiler was caught, buried, and killed while high-marking an open bowl east of Wolf Creek Pass. On the same day, an ice climber was caught and buried to his waist on "The Pumphouse" in East Vail. Two other snowmobilers were caught in February: one buried to his neck on the 18th in the Flattops and the other completely buried for about five minutes on the 23rd near Granby. The rest of February was split with cold temperatures and quick-moving short waves. Instabilities that developed between short waves, plus a depth-hoar layer, dominated the snowpack. Five skiers were caught in four separate incidents during and just following a storm cycle that ran from the 12th through the 17th. None of these was serious. One more storm cycle beginning on the 22nd contributed to the last two incidents of the month, including the close-call burial of the snowmobiler near Granby. For the month

For December, 268 avalanches were logged at the CAIC.

of February, 13 people were caught in 12 separate incidents. 626 avalanches were reported – by far the most active month of the year for slides.

MARCH— March came in like a tame lion with snow and some cold temperatures, but nothing to quiver from. Unfortunately, the next fatality of the season happened when a man on snowshoes slipped down an east-facing avalanche slope near 14,264' Mt Evans in Colorado's Front Range on March 3. In the process of scrambling back uphill, he triggered the slab that caught and killed him.

The 13th proved lucky for one backcountry skier near Clark Peak in the Front Range. He was buried an estimated six feet but was quickly dug out with no injuries. Unfortunately, the 13th did not prove as lucky for two backcountry split-boarders caught while ascending Mt. Shimer near Aspen. Out of three people caught, two were buried and killed. This brought the total number of fatalities in Colorado to five for the season. During the month of March, 10 people were caught in slides with three killed and one injured. 510 slides were reported by observers.

APRIL— The month of April started cold and snowy. Public forecasting was scheduled to last until April 22 and CDOT forecasting until the last day of the month. As of April 11, 81 slides had been reported.

—Scott Toepfer, forecaster

THE AVALANCHE REVIEW

Northwest Montana – Glacier Country Avalanche Center

The precipitation trend this year started a little below normal, picked up in January, only to fall off in March with a slight surge in April. Temperatures were on the warm side at all elevations, but especially below 5000' where most precipitation was in the form of rain. November's weather pattern started with a large rain and wind event that left widespread flooding and many trees blown down. January and February proved to be the normal part of our winter. Snow instabilities were not particularly pronounced at any one time, and even the Middle Fork Corridor was fairly uneventful. After the first week of March, snowfall accumulations declined, normally a time to accumulate late-season snowpack. April had some brief surges but was a little too late. In the end, snowpack accumulation ranged from 20 to 25% below normal.

Fortunately, this year we had no avalanche-related deaths, but several incidents did lead to injuries. A skier was injured and his dog was killed in one of the side drainages of the Middle Fork. The two skiers ignored some significant warning signs. A more dramatic incident occurred when a snowmobiler triggered a small slide that resulted in his burial. This individual was wearing a snowcat helmet and a heated waist wrap that may have enhanced his survival, since he did not have a transceiver. His snowmobile partners performed an initial search but were frustrated by the absence of a signal they assumed was on their partner. The secondary search was successful with probing, after nearly eight hours of burial!

Reported accidents within the region involved two snowmobile groups and three skier groups.

The Flathead Forest expanded education programs with the addition of a seasonal employee. The program was very successful thanks to the funding and support of the Glacier Country Avalanche Center. An additional grant was received from the Montana Department of Fish, Wildlife and Parks trails funds, targeting avalanche education. Numerous transceiver, avalanche-awareness and school programs were offered and attended by over 600 people! The twice-weekly avalanche advisories were posted on the GCAC Web page and also available via email and phone voice mail. The Web page not only provides access to our advisories, but also offers a forum for backcountry observation reports.

Plans for next season involve maintaining existing programs, with a more focused attempt to reach additional backcountry users. One of these attempts will be a new Level I class directly tailored to snowmobilers.

—Tony Willits, forecaster

Southeast Alaska Avalanche Center URBAN AVALANCHES

This year we met two of the main goals for which our Center was founded 11 years ago: we began issuing daily urban avalanche advisories, and the city and borough of Juneau began buying out properties in the urban avalanche zones.

With 62 houses, one hotel, two sections of expressway, two sections of state highway, eight residential streets, and a boat harbor in the avalanche zones, Juneau's urban avalanche problem has been well-described as the largest potential avalanche disaster in North America. These steps, in addition to the avalancheresponse plan adopted several years ago, move the city well along toward a long-term solution.

The urban-avalanche advisories were only funded this year as a nine-week demonstration program, but we issued 80 forecasts over a 63-day period between February 15 and April 18, and the city has committed to an ongoing program, though funding for it is still uncertain. The advisories featured four "speedometer" gauge icons to indicate danger level, trend, size, and probability, followed by a short non-technical text discussion and an avalanche tip of the day.

The forecasts were very well received and garnered international media attention when the largest avalanche cycle of the season hit just after we had taken several reporters on a helicopter field day on Mt. Juneau. We had the urban danger level on Extreme for several days running just as we reached an all-time snowfall record. During this cycle, a spectacular video of a slide released by the Department of Transportation and Public Facilities' 105mm howitzer above Thane Road circulated widely on the Web, completing the perfect media moment.

WEATHER AND AVALANCHES

We had the heaviest snowfall on record in Juneau, both at sea level and at our

Winter arrived early, bringing two meters of dry bottomless powder to the midelevation mountains by mid-November, and midwinter thaws to the ridges were notably absent – the only one being a warm rainless week in January. Snowfall was steady all winter with only a few brief cold, clear breaks, and spring came late and cool. As of mid-May, we still have over two meters of snow at a mid-elevation 800m.

We had one medium-sized dry slab avalanche on the Behrends Avenue path in January that put 10 meters of wet debris within 45 meters of a house alongside the path, but our largest cycles came in March. One fast-moving dry slab on the Bathe Creek path ran beyond known historical limits through the forest and left 3 meters of debris within 50m of two houses. It heavily dusted another house across a street with no known avalanche history. Other large dry slab avalanches throughout the region took out stands of 50-year-old trees, dammed creeks, and left the largest debris piles of the last 20 to 30 years.

AVALANCHE ACCIDENTS

Despite many near-misses, including a number of rides taken by backcountry skiers and snowboarders and a two-meter-deep heliskiing burial and injury-free recovery, there were no avalanche deaths in southeast Alaska this year. See the Chugach NFAC report (*page 22*) for Alaskan fatalities.

COURSES

We solved the problem of prohibitive insurance costs and permitting hassles by doing all our courses this year through the University of Alaska Southeast, Alaska Heliskiing, and other entities. We taught three Level I courses, including one with the Juneau Ski Patrol and one for heli guides, and one Level II course. In addition, we did two urban-avalanche rescue training sessions for the Capital City Fire and Rescue crews. We were unable to do more than two awareness presentations this year due to lack of our usual Department of Public Safety funding.

OTHER PROJECTS

Our staff did private consulting work to make ends meet whenever we were not on Avalanche Center business and found that we were so busy that we had no time to work on our ongoing research or other projects.

BUDGET

The urban avalanche advisory program was funded with \$45,000 from the city and borough of Juneau, including \$15,000 from their federal timber receipts program. We covered office and field equipment needs and travel to ISSW and AAA meetings with about \$12,000 from a state legislative capital grant.

Funding for next season is still a cliffhanger at press time. The city and borough of Juneau has approved funding, but at \$60,000 it is still \$96,096 below the minimum we need to set up an ongoing program. They have committed to using their resources over the summer to help us get the state and federal governments to contribute their shares, and we are hoping for swift passage of Rep. Don Young's federal avalanche bill, H.R. 1703.

-Bill Glude, director

West Central Montana Avalanche Center

The 2006/07 winter was characterized by snowpack amounts that were near normal until mid-March, when warm weather ushered in an early spring. There were no avalanche accidents in West Central Montana and only a couple of minor snow incidents reported to us. We issued no special avalanche warnings for high avalanche danger, but did have a period when conditions were rated as Considerable on wind-loaded terrain, mostly due to faceted layers that formed in December and early January. There were also weaknesses associated with several melt-freeze crusts that formed in February, but these conditions were short-lived, and we enjoyed mostly stable conditions this winter.

ADVISORIES AND BACKCOUNTRY WEATHER FORECAST— The Center issued 19 total avalanche advisories this season with 15 regular weekend and 4 informational posts. The regular season started December 15, 2006, and ended March 27, 2007. The Missoula Office of NOAA Weather issued a daily Backcountry Weather Forecast posted by 1400 each day for the entire period ending April 8, 2007.

WEB SITE— Our new Web site and domain – missoulaavalanche.org – was a

Eaglecrest ski area. This is unusual, because the heaviest snowfall years in our high-latitude maritime mountains are usually the warm wet winters when rain is more common than snow at sea level, while the heaviest snowfall years at sea level are usually cold and dry winters when most of the sea-level precipitation comes as snow, but the snowfall at elevation is only moderate.

With 62 houses, one hotel, two sections of expressway, two sections of state highway, eight residential streets, and a boat harbor in the avalanche zones, Juneau's urban avalanche problem has been well described as the largest potential avalanche disaster in North America. significant improvement over the site hosted on the Forest Service server. Total hits counted during the November-April season exceeded 196,000. An average of 100 unique users visited the site each day this winter. This is far beyond any previous count, and we received many positive comments about the new site.

EDUCATION— We sponsored 36 individual classes in the Missoula, Bitterroot, and Clark Fork Valley areas. These ranged from introductory one-hour avalanche-awareness lectures and avalanche-transceiver workshops, to a three-day Level 1 avalanche class. 720 students attended these classes. Fifteen individual classes were taught to the 7th-12th grade levels in Missoula, Darby, Alberton, Florence, and Seeley Lake area schools. 246 students attended these classes.

We again have strong partnerships with our Friends group, the West Central Montana Avalanche Foundation, a 501(C)(3) non-profit, and the University of Montana, who again contributed 16 days for field assessments and backup advisory posting. Other partners include the Clearwater, Bitterroot and Lolo National Forests, that contributed several days each week to field assessments; NOAA Weather – Missoula office that contributed a daily backcountry weather forecast; Montana Dept. Fish, Wildlife and Parks; Missoula Parks and Recreation; and many local businesses.

-Steve Karkanen, co-director & forecaster

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Chugach National Forest Avalanche Center

The 2006/07 winter on the Chugach National Forest treated us with great abundance: lots of snow, lots of cold, and lots of stability! The avalanche center returned with the same staff and the same schedule. Matt Murphy, Lisa Portune, and Carl Skustad released 98 advisories and taught over 500 students. The Fireside Chat lecture series continued to be the most popular venue for avalanche education. This is a series of evening avalanche talks held at the Glacier Ranger District. Avalanche Center staff and guest speakers present topics that mimic those you would find in an Level I avalanche workshop. They serve as great introductions to new backcountry travelers or as a review for seasoned veterans. Partnering with the Municipality of Anchorage, the Center also reached an increased number of backcountry travelers living in Anchorage and the Matanuska Valley.

The weather allowed another great season of snowmachining, skiing, and snowboarding in the Chugach backcountry. Early snow and cold temperatures had us worried that a layer of faceted snow would haunt us all year, but heavy snows in December and January negated the threat. Record-breaking snowfall for the month of December fell at Alyeska Resort ski area, in the heart of the forecast area. Large storms pushing through Prince William Sound parked over the area, dropping 283" in December, with four 30"-plus storms. January offered little chance to dig out, as another 200" fell. The avalanche center staff felt more like snow shovelers and plowers than avalanche forecasters during these white months. With constant snow and little wind, the snowpack became very homogenous, and life at the center was pretty straightforward. After early-season aboveaverage snowfall, the remaining season was actually below average. February to April brought cold temperatures and approximately 100 more inches of snow. Amazingly, there was no rain recorded from December through mid-May. This is very unusual for the area.

The Friends of the Avalanche Center continued to be a great support. They purchased and installed another remote weather station on Sunburst Mountain in Turnagain Pass and repaired the one on Seattle Ridge. The site at Seattle Ridge has been a test of extremes. Extreme creep and glide have us planning to move the site to the ridgetop and abandoning the snow sensor. The group also purchased and (with Alyeska Resort's assistance) got a net radiometer online to assist with the NAC's wet-slab study.

There were no avalanche fatalities recorded this season in Alaska, other than the early-season caribou fatality reported by Reid Bahnson. One broken back and one burial and recovery were reported in the forecasting area. Many human- and naturally triggered avalanches in March without incident have us hoping our jobs are making a difference.

-Carl Skustad, director

Utah Avalanche Center - Logan

We'll remember the winter of 2006/07 as a particularly lean snow year in the Logan area. A series of windy storms in mid-December led to dangerous avalanche conditions and several very large human-triggered avalanches in the backcountry. In January, an extended high-pressure system trapped us in the doldrums of smoggy, weak snow-producing weather. A series of storms built a slab layer on the resultant faceted snow in February, leading to an extended period of unstable snow conditions and widespread natural avalanches.

Knowing accidents were imminent, we issued avalanche warnings and watches through the National Weather Service and pre-weekend press releases aimed at all modes of popular media. The media blitz was successful in northern Utah. The word got out, and many normally popular slopes in the Logan Area remained untracked during this dangerous time. Countless tragedies were thus avoided, and unknown numbers of lives were saved.

An unseasonably warm March essentially put the sorry powder season out of its misery. Many normally popular backcountry access points in the region remained unused all season due to lack of snow at lower elevations.

Below normal snowfall in November limited access to upper elevations in the Bear River Range, and on December 1, only 29" of snow containing 8" of water equivalent had accumulated at the Tony Grove Snotel. High pressure in the first week of December caused the development of surface hoar and near-surface facets on upper-elevation slopes. It started snowing on the 12th, and by Thursday the 14th, a couple feet of heavy snow containing over 3" of water accumulated, forming a heavy slab over the sugary weak layers. On a trip to Tony Grove on the 15th, haunted by heart-stopping audible collapses, I observed several natural avalanches that had run well out onto the lake, and I met a party on Chicken Hill

who had just triggered a "larger than expected" hard slab with a cornice drop. The scene was set for a dangerous weekend in the backcountry, with a considerable danger and numerous powder-starved and high-revved triggers set to overwhelm the region. Six more inches of fluffy snow fell on Saturday, and then the winds shifted, coming around from the northeast at a sustained 30mph with gusts in the 50s on Logan Peak. I was breathing a sigh of relief upon not hearing of any fatalities in the region over the weekend, when I rode up the gully approaching Naomi Peak on the 18th and spied evidence of a huge human-triggered slab, 2-4' deep, and encompassing the entire Castle Rock Cirque. Snowmobile tracks in and near the crown and the eastern flank of the very broad avalanche and those on the bed surface of a similarly large slide in the nearby Upper White Pine Canyon told amazing survival stories that I have yet to hear in person.

As the New Year began, the Tony Grove Snotel reported 44" of snow on the ground containing a bit less than 13" of water. On the 9th, a freezing rain or rime event (depending on location) laid down a half-inch-thick brittle crust on the snow surface across upper elevations of the central Bear River mountains. A strange mid-season snow drought and an extended high-pressure system in January led to widespread development of depth hoar, and the shallow snowpack in many areas turned into a rotten mess made up of little else than large faceted crystals.

On the 19th, our Friends group held their third annual fundraiser. Although attended by fewer people than in past years and slightly marred by the ongoing skier-snowmobiler land-use debate, it was a successful event. The focus on attracting snowmobilers was effective, and a fair number came to the event, but at the sacrifice of many hard-core skiers who had attended in the past. What the Friends billed as an opportunity for the community to share a bit of common ground – avalanche knowledge and safety – became a venue for subtle political discussion. Behind the scenes, polarization over access issues cast a negative vibe. Snowmobilers sat together in a group on one side of the room, some wearing politically charged t-shirts. Skiers grouped up around the gear table, a few donning leather Yamaha riding jackets while imitating engine noises in jest. Besides me and the Friends, the only minglers between the two groups were mixed users (snowmobile-riding skiers and boarders): our hope for finding common ground.

There was only 49" of snow with 14.7" of water on February 1. Conditions were ripe for avalanches when snow finally started to accumulate again in mid-February. As the slab layer began to build on exceptionally weak underlying snow, people began triggering dangerous avalanches in the backcountry. With persistently unstable conditions present and the most popular backcountry weekends of the year looming, the Utah Avalanche Center made a concerted and successful effort to warn the public. In the Logan Area, *The Herald Journal* published a handful of articles noting local conditions, and I appeared on local TV and on Talk Radio (right after Rush Limbaugh). Undoubtedly, well-publicized fatalities in and around Utah helped get the word out, and many suspect slopes and historic avalanche paths remained untracked through the worst of the cycle. Continued storminess tipped the scales on many slopes, and large and long-running natural hard slab avalanches afflicted the central Bear River and Wellsville Ranges during the last week of February.

With 85" of snow containing 19.4" of water at Tony Grove, things came to a head in the beginning of March. Early in the morning on March 2, clearing revealed evidence of several very large and destructive natural hard-slab avalanches visible with the naked eye from downtown Logan City. Not surprisingly, the largest of these occurred in the Wellsville Range, with very broad avalanches packing explosive air blasts releasing on depth hoar near the ground and running full path (~2500 vrt'). Of substantially more interest to local backcountry users were several large naturals in the Logan Peak area, particularly those in the very popular Providence Canyon. Among these, two large avalanches traveled nearly 3000' from near the summit of Big Baldy Mountain to the snow-free canyon floor, slamming the welltraveled but seasonally unmaintained Providence Canyon Road.

Drought conditions resumed in March, accompanied by exceptionally warm temperatures, and the snow quickly disappeared at lower elevations and on southfacing slopes. A couple large wet-slab avalanches ran in the Mill Hollow area on the 18th after several consecutive warm days and nights.

On April 1, the Tony Grove site was one of the few in the state with just more than 50% of average water contained in the snow. There were 56" inches on the ground, with 24" of water equivalent. We found good access to upper elevations via the big avalanche paths in the Wellsville Range that had run in late February or early March. Like straight 2000' groomed runs, a dozen or so paths led directly from greening maple stands to generally stable spring snow in the Wellsville Mountain Wilderness. In the first week of April, a party reported a sizable natural wet slab, probably released by cornice fall, in the High Creek Lake area. In the same area on the 20th, the day after our largest storm in April dropped about 15" at the Tony Grove Snotel site, I saw evidence of a very broad natural wind slab (1-3' deep by >800' wide). I noted 14 unintentional human-triggered avalanches this season in the Logan area, amazingly with no known injuries, fatalities, or property damage. Twelve of these avalanches were snowmobiler-triggered and two triggered by skiers. All but three of these avalanches were observed and unreported.

Snowmobile tracks in and near the crown and eastern flank of the very broad avalanche and those on the bed surface of a similarly large slide in the nearby Upper White Pine Canyon told amazing survival stories that I have yet to hear in person.

-*Toby Weed, director*

Utah Avalanche Center – Wasatch

Utah experienced a very dry winter – the driest winter since 1977 and the fourth driest winter in 62 years of record keeping at the Alta guard station, where 356" of snow fell compared to the average of 500".

A thin snowpack means a weak snowpack. In this case, it was extremely weak, bottomless depth hoar. So when it finally started snowing in February, we experienced an extremely dangerous avalanche cycle with very large avalanches breaking to the ground. The dangerous conditions lasted for most of the month. And when the snowpack warmed up in spring, we experienced a similar cycle of very

A huge, natural, wet-slab avalanche released late in the afternoon of March 13, 2007 on the northwest face of Gobbler's Knob in the upper left of the photo. The wet debris gouged out a 40-foot-deep trough and filled it with dense, wet, avalanche debris. The debris flows well out out of the frame to the right. *Photo* © 2007 Bruce Tremper, www.brucetremper.com

large wet slab avalanches. Only the old-timers had ever experienced these conditions before, and it was a great learning experience for the less experienced.

Because of the dry winter, Utah experienced fewer unintentional human-triggered avalanches in the backcountry than usual: 88 compared to the usual average of around 100. Unfortunately, we still experienced our average number of avalanche fatalities per season of four. One of these fatalities was in central Utah near Richfield, which is outside our forecast area. The others include two skiers and a snowmobiler. In total there was 88 unintentional human-triggered avalanches in the backcountry, 43 people were caught, 17 were partially or totally buried, nine were injured, and four were killed. In addition, four other Utah residents died in avalanches out of state: two snowmobilers in Idaho and Montana and two climbers in Alaska during the spring mountaineering season on Mt. McKinley.

We received 2.5 million hits to our Web site, making the UAC the most heavily used avalanche center in North America. The internet is by far the most popular way to get avalanche information, as only 4% of the people who access the advisory do so over the telephone.

The Know Before You Go program, which is directed toward young adults, is administered by UAC staff member Craig Gordon. Instructors include Craig Gordon and a cadre of trained local avalanche professionals. The program taught an incredible 119 presentations, which directly reached over 22,000 people. In addition, the UAC staff taught 33 avalanche classes this season, which directly reached over 3000 students.

We produced 30-second, eye-catching, public-service anouncements last summer, and they played in local theaters and on television. The PSAs were seen by over a million people in local theaters before movies started and seen by at least a half million people on television.

We created a number of Are You Beeping signs for trailheads and ski-area access gates. These signs feature an electronic device that emits both a visual and audible signal when someone passes to indicate whether or not they have a transmitting beacon. They were installed at a number of different ski-area access gates and backcountry-access points.

Because of the dry winter, national and international media contacts were much fewer than normal, although local contacts remained about the same. For the first season in many years, we did not do any interviews for national or international television. We did interviews and/or were quoted by seven national publications including *The New York Times, The Wall Street Journal* and the *Boston Herald*. We were interviewed 19 times by local television stations, seven times by local radio, and nine times by local print media.

The Utah Legislature voted for an additional \$122,000 in one-time funding to the Utah Avalanche Center for next winter, which would come through the Utah Division of State Parks and Recreation. Unfortunately, State Parks also decided to cancel their usual \$82,000 contribution to the Utah Avalanche Center for next winter, which comes from diminishing snowmobile registration fees. Instead, they want us to apply for the same money through the Recreation Trails Program grant program. Because the grant money is not guaranteed, and it does not arrive until too late in the season, we would not be able to use the funds for the 2007/08 season. So combined with an estimated \$40,000 shortfall from rising costs, it appears that we will have the same amount of money next season as this season.

-Drew Hardesty, forecaster

Eastern Sierra Avalanche Center

Today is May 2, 2007, and a winter storm is moving into the eastern Sierra. On north aspects above 10,500', the snowpack is cold and dry. No use wishing this series of storms had fallen during the winter: been there and done that from December to March. Mammoth Mountain recorded a meager 215" total season

A large, wet-slab avalanche triggered by explosives in Scott's Bowl at Park City Mountain Resort on March 18, 2007. The slope has been heavily skied all season, but did not see much traffic early in the season when the weak layer of depth hoar was originally formed. Park City was able to trigger two other similar avalanches on other slopes the same day.

Photo © 2007 Bruce Tremper, www.brucetremper.com

snowfall, the seventh driest season for the ski area in 30 years.

Low snow depths and cold temperatures resulted in an exceptionally weak and faceted snowpack this season. Total January snowfall was 12.5" at the study plot on Mammoth Mountain. The weak and shallow snowpack could have led to numerous close calls, given the brazen attitude of many backcountry users here, but even with a faceted snowpack with 10-15cm of mature depth hoar at the base, there were few reported skier- or rider-triggered avalanches during the winter. An abundance of exposed rocks provided enough anchors to prevent continuous slabs from forming. In addition, general apathy towards skiing and riding in the backcountry prevailed until the end of March and April, when conditions became more stable. Out-of-area folks from telemarktips. com and splitboard.com encouraged people to meet and ski and ride in the great spring corn snow.

Adding insult to the meager snowpack, north and northeast winds were the other defining theme of the season. Post-frontal northeast winds were stronger this year because cold air trapped in the Great Basin added to the thermal gradient after storms moved to the east and north. Within hours after the end of a storm, the wind began to howl from the north and northeast and stripped the upper third of north-facing slopes to the ground. Ski lifts closed and people became despondent as we watched precious snow sublimate back to the atmosphere.

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Snowfall did not come to the Mammoth area until December 10. Undeterred by the late snowfall, the press and outdoor industry hyped the 2006/07 snow season as being another big snow year due to El Niño conditions in the central Pacific. However, the 2006/07 El Niño was weak and involved significantly less ocean surface area than moderate to strong El Niños of the past. As a result, anomalous precipitation patterns dumped records snows in the Pacific Northwest and in the mountains of New Mexico, while southern and central California were very dry. For most of the winter, the jet stream was north of the California/Oregon border.

December snowfall totals at Mammoth Mountain measured 54.5" with 6" of water compared to 104" and 18" of water in December 2005. Snow on the ground at the end of the month ranged from 29" at the ski patrol study plot on Mammoth Mountain, 22" at 10,000' on Tioga Pass, and 16-28" in the southern Sierra. Meanwhile, the Pacific Northwest experienced a violent storm in the middle of the month, stalling efforts to rescue three climbers on Mt. Hood.

January was cold and dry and depressing. Strong winter storms approached the West Coast only to split with the main energy reaching Oregon and Washington where they didn't need or want any more snow. Interest in skiing the backcountry steadily waned as facets grew and backcountry travel become a wallow-fest in sugar snow. As the number of calls made to the recorded message phone dropped, frustration increased as snowplow drivers, outdoor mountain shops, and local skiers and riders wondered what happened to snowfalls measured in feet rather than inches. Forecasters in the Reno office of the National Weather Service echoed the feeling of the local avalanche forecaster "as the incredibly boring winter continues."

About half of the season's snow fell in February. Close to a meter of snow and 5" of water fell in the second week of February, doubling the snowpack in three days. During the storm, ski patrol reported 12-16" crowns on wind-loaded slopes. In the trees there was cracking, but one patroller wrote it was like "skiing half-set-up cement; it just kind of glops and settles."

After the clouds lifted, we were surprised by the lack of natural avalanche activity. Control results on Mammoth Mountain showed nothing of significance. Even with a meter-deep snowpack, rocks, ridges, and subalpine trees were too numerous and large and prevented the propagation of slabs. Now there was a well-developed facet and depth-hoar layer under a meter-deep slab of dense snow. Experienced avalanche-savvy skiers and professionals were looking over their shoulder after this storm.

The main avalanche activity of the season came at the last week of February. 15" of snow and 1.5" of water fell early in the week, followed by three days of 45mph west and southwest winds. Over the next few days, the wind continued unabated, along with 38" of snow and 3.5" of water. There were several natural full-depth avalanches that released on northeast aspects above tree line in the Mammoth and Tioga Pass area. The howitzer at Mammoth Mountain released a large class-5 avalanche on Scotty's Run, the biggest avalanche event on Mammoth for the season. Several dramatic full-depth avalanches in the backcountry were observed with crown sizes ranging from 4-6'.

March was another dry month with only 13" of new snow falling at Mammoth and in the backcountry. Temperature swings of 30°F in a couple of days was the norm for March. The snowpack began to melt on west and southern aspects below 9,000', but north and eastern slopes still had good settled powder-skiing conditions.

April was cool with twice as much snowfall as March: a meager 26". Skiers and riders returned to the backcountry. With great skiing and riding conditions up high, hiking and carrying skis or split boards for a few miles was worth the effort. A few hard-core folks skied through May. The final advisory of the season was posted on May 4, 2007. — Sue Burak, director

This image shows the crowns and skier paths associated with a skier-triggered avalanche that occurred on March 4, 2007, above the Green River Traverse in Upper Rocks Springs drainage south of the boundary of Jackson Hole Mountain Resort. In this event one skier was caught, carried, and partially buried but uninjured. Also shown on this image is the location of a party of three skiers who were caught in a slab avalanche they triggered on January 5. Unfortunately one of these skiers died from trauma during this event. *Photo courtesy BTNFAC*

Bridger-Teton Avalanche Center

The 2006/07 season was rather lackluster with respect to snowfall in western Wyoming. December provided below-average snowfall. January had well-below-average snowfall and a persistent thermal inversion that keep the lower elevations cold while the upper elevations witnessed an extended period of spring-like conditions. February began dry and then the month's average snowfall fell in the second half of the month. March had a near-record-low snowfall and was very warm. The total snowfall for the season (through mid-April) was 338" at 9300', 249" at 8200', and only 84" at 6300'.

Daily avalanche bulletins began in early November and ended in mid-April. Even though new snow was scarce, contacts to our bulletins increased. The center continued the format established last season of issuing afternoon forecasts and morning nowcasts. New this season were weekly summaries that documented the development of the snowpack.

Other additions to the center's resources included a new automated remote weather station in Rendezvous Bowl, a new precipitation gauge at the Raymer Snow Study site, and a new enclosed trailer for the center's snowmobiles.

The BTNFAC purchased this enclosed snowmachine trailer with grant money obtained from the Recreational Trails Program in partnership with the Wyoming State Trails program.

Stuart Wilkinson of the USGS climbs up the backside of Mammoth Mountain after perfect corn changed to connect-the-snowpatches. Photo by Sue Burak

Significant avalanche cycles occurred in mid-December and on Presidents' Weekend in February. On February 17, five snowmobilers died in avalanches in the Intermountain West (in Montana, Utah, and eight miles southwest of Teton Pass in Idaho). In our area, strong winds on the previous day formed dangerous new slabs on an unstable faceted snowpack. This instability corresponded with one of the most popular snowmobiling weekends of the season.

Thirty-two people were caught in avalanches this season. Of these people, four died, one was seriously injured, and two were mildly injured. Two of the fatalities were snowmobilers lacking avalanche-rescue gear who were highmarking steep wind-loaded avalanche tracks during unstable conditions. Both snowmobilers were reported to have either already triggered a large avalanche or crossed numerous fresh debris piles before they were caught and buried. This season's other two fatalities were skiers who ventured onto unstable slabs in steep avalanche starting zones.

There were three full burials with successful recoveries, 10 partial burials, and 15 who were caught but not buried. Two of the three persons who were fully buried and recovered alive did not have transceivers, and their companions were not equipped with shovels or probes. Both were rescued from significant depths by nearby parties that responded with probe poles and shovels.

New avalanche-education efforts included presentations to the Iowa State Snowmobile Association, Jackson Hole Snow Devils, the Star Valley Search & Rescue Responders, and several college and school groups. Avalanche courses were provided to dogsledders and snowmobile guides permitted to operate in the forest.

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THE AVALANCHE REVIEW

Over the summer the center will use funds obtained from a new Recreational Trails Program grant to purchase two new mountain sleds. These funds were obtained in partnership with the Wyoming State Trails Program. Funds raised by the community will be used to create a professional observation network, improve our capabilities to analyze our historical database, and further our abilities to use GIS technology to display avalanche events via our Web site.

-Bob Comey, director

Mt Shasta Avalanche Center teaches probe line technique during an avalanche-rescue training seminar. Photo by Eric White

Mt Shasta Avalanche Center

The 2006/07 winter was Mt Shasta's ninth season as a Type 2 Regional Avalanche Center. The season can be summed up as dry, windy, and relatively safe, with no fatalities or serious injuries caused by avalanches in or around the Mt Shasta region. The biggest event this season was the decision by lead forecaster, Matt Hill, to leave the Forest Service in June 2007.

Matt Hill was the driving force in founding the Mt Shasta Avalanche Center in 1998. Matt had also worked as a climbing ranger on Mt Shasta since 1992. His passion for avalanche and climbing safety and education, along with his vision for the avalanche center, helped to create one of the top recreation programs in the Forest Service. We will miss working with Matt, but look forward to his continued involvement in the avalanche community.

Similar to many areas of the western United States, Mt Shasta had a dry winter in 2006/07. Our precipitation was around 65% of normal during our forecast season: November through April. Our snowpack below tree line was around 60% of normal and even less above tree line. Our weather pattern consisted of weak storms followed by very strong winds, creating a relatively shallow snowpack through much of the winter.

From November through April, we measured a total of 279" of snowfall and 29.73" of water. Normally, Mt Shasta receives around 400-450" of snow and 40-45" of water. February was our wettest month with 109" of snowfall. January was our driest and coldest month with only 15" of snowfall. Every month experienced at least one postfrontal wind event of hurricane speed or greater winds at tree line (8000').

During January, our thin snowpack and cold temperatures created a lot of faceting in the snowpack. However, before any significant storms arrived, warming temperatures mitigated the potential for widespread avalanche activity. Most of the natural avalanches which occurred this season can be attributed to the strong wind events and were mostly hard-slab avalanches.

While there were no avalanche fatalities or serious injuries in our area attributed to avalanches during the 2006/07 season, there were several human-triggered slides. These occurred during two specific times. The first was during our biggest storm cycle in February, when heavy snowfall and wind loading stressed the snowpack. The second time period of human-triggered slides occurred in April, when warm temperatures made wind slabs vulnerable to triggering.

Our outreach program provided avalanche education and presentations to 471 people during the 2006/07 season. We continue to see increasing numbers of attendees at our evening avalanche-awareness presentations and weekend avalanche-transceiver clinics. We have continued our partnerships in these events with the Friends of the Mt Shasta Avalanche Center (FMSAC), Shasta Mountain Guides, Sierra Wilderness Seminars, and The Fifth Season. This season we were able to work more closely with the Medford National Weather Service forecasting office, including meeting with and field trips for some of their forecasters. Our Friends group continues to improve its membership and fundraising efforts and provides a critical connection between the local community and the Forest Service. FMSAC provided funding to improve our remote weather stations and educational program. Additionally, two of the FMSAC members have been trained to assist and cover our daily avalanche advisories when needed.

MATT HILL Thank You & Good Luck

Story and photo by Eric White

All of the avalanche centers would like to honor Matt Hill, who has moved on to a new career. Matt was the lead climbing ranger on Mt Shasta and lead avalanche specialist at the Mt Shasta Avalanche Center, working on Mt Shasta and in the Castle Crags Wilderness for the past 15 years.

Matt was pivotal in developing the Mt Shasta Climbing Ranger program and the Mt Shasta Avalanche Center, both becoming among the top recreational programs within the Forest Service. Matt cared for the land by doing a complete climbing-bolt inventory in the Castle Crags and (with Dan Towner) developing a nationally respected human-waste solution for Mt. Shasta. Matt served the people with his passion for wilderness, his pro-active approach to informing and educating climbers (which has resulted in decreased climbing accidents), and his effort toward the education of thousands of children and adults about avalanche safety and wilderness ethics. He also developed a whole new level of helicopter safety for interagency search and rescue missions on the mountain. Matt gave 150% to the district, the regional forest, to the avalanche center, and to the public. We will miss his passion and vision and wish him well in his new career!

Mt Shasta is fortunate to have Eric White, Matt's dedicated and equally qualified work partner, stepping in to carry on the programs. Best of luck Eric. We'll see you at the fall meetings.

When does a strong, light shovel matter most?

—Matt Hill and Eric White, forecasters

Idaho Panhandle Avalanche Center

This season began with snowfall in late October and early November. We issued our first preseason update on November 23, and our first avalanche advisory was issued on December 8, when mountain snowpack depths were averaging 3-4'. Early instability issues involved persistent weak layers of surface hoar, near-surface facets, and new storm snow. Snow depths across our forecast region were just about average while total precipitation amounts were above average, thanks to heavy rains in early November. Snowfall was sparse through the end of January and most of February. The month of March was good for snowfall and numerous

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When it's your partner's shovel. And you're praying it can take the punishment.

Traverse EXT shovel Oval shaft. 6061 aluminum. Extendable. Weight: 21oz/598g

For our latest research on avalanche statistics and rescue techniques, see www.backcountryaccess.com/research.

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NAC 2006/07 ROUNDUP

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storms brought the average annual snowpack back up to average amounts. During a two-week period we received several feet of very low-density snow - 5-7% - and northern Idaho got a taste of Utah Champagne instead of Selkirk cement, which does not happen often. Winter lingered in the high country, with average snow depths and stable conditions for spring touring.

No reports of near misses or avalanche-related injuries were reported to the IPNFAC this year. An average winter snowpack, 10-12', tends to narrow the window of instability, and we were not plagued by lingering layers of surface hoar or facets. Much of the Selkirk Range in Idaho was under a closure for Woodland Caribou, which restricted snowmobiling in the Selkirk Crest, a popular riding area. In the Cabinet Mountains to the east, on the Idaho/Montana border, a large flood wiped out miles of roads that access this popular riding area. So these two large areas were off-limits to many backcountry users this winter.

We continue to add to our mailing list, currently 110 e-mail addresses of FS employees and interested public to whom we mail the avalanche advisory every Friday morning. The IPNFAC cooperated with Lookout Pass Ski Area to develop an informative avalanche display for their common area to expose recreationists to avalanche awareness, resources provided by the IPNFAC, and additional information. We hope to add to that display and expand its use in following years.

Ed Odegaard attended the International Snow Science Workshop (ISSW) in Telluride last fall. Sidnee Ditman and Tracy Gravelle attended a Level I avalanche program in December with Peak Adventures based in Cataldo, Idaho. Sidnee and Tracy worked with Ed to collect snow-stability information and send data for the weekly avalanche advisory. We had two new regular observers in the Lookout Pass area on the Idaho/Montana border who contributed pit data and general observations on snowpack stability on a weekly basis. We also received pit data from the ski patrols at Silver Mountain near Kellogg, Idaho, and at Schweitzer Mountain near Sandpoint, Idaho.

This season was active for the IPNFAC, as we reached out to a number of individuals and a good variety of age groups and user groups. Carole Johnson really deserves a lot of credit and recognition for her effort in putting out great workshops and making herself available. In Sandpoint we continued to offer free avalanche-awareness workshops in December, January, and February with good attendance and feedback. We have continued to pursue relations with local snowmobile clubs. The Sandpoint Winter Riders have expressed interest in a snowmobile workshop for their club next year. The new President is eager to increase avalanche awareness in the club. We also discussed the possibility of the Winter Riders serving as a 501(c)3 for the IPNFAC.

Overall, the season was a good one for the IPNFAC. We provided avalanche awareness to more public and various agencies than ever before, and we increased our availability and visibility with public displays, more personnel, and increased agency and business contacts. Our weekly avalanche advisory mailing list to agencies and individuals has increased to over 100. Additionally, the response from the public is positive and our opportunities for cooperation and education continually expand. -Kevin Davis, director

The season felt promising. El Niño was forecasted with equal chance of feast or famine, but an unfortunate equation was realized: perception minus reality equals frustration.

Utah Avalanche Center – Manti-La Sal

This year, the Manti-La Sal Avalanche Center opened its doors in mid-November. The La Sal Mountains had snow on them from a large precipitation event in early October, which set up the snowpack with a rotten layer. November was dry as a bone until the 27th, when 11" of fresh blanketed the mountains. 16" of snow fell on the Manti-Skyline during the same time period. The first avalanche advisories for the season were posted on November 28. A tour in the La Sals on the 29th showed a very sensitive snowpack. R2D2 avalanches were being triggered from ridgelines on the up-track. Ski touring on the Skyline was limited due to poor snow coverage. The season felt promising. El Niño was forecasted with equal chances of feast or famine, but an unfortunate equation was realized: perception minus reality equals frustration. The 2006/07 season went down as the worst year of snowfall since the inception of the Avalanche Center in 1989.

Closed lows are not friendly to central and southeast Utah. Gearing up in the Gulf of Alaska, snow fell constantly in the interior of BC and the NW coast before heading south down the California coast. These systems would close off in Arizona, New Mexico, or Mexico, bypass our three mountain ranges, hit the San Juans, and then wrap around and decimate the front range of Colorado.

Our snowmobile fleet let us down as well. One snowmobile was in the shop on four different occasions, breaking down in the field three times. Tire chains broke brake lines, water lines flooded homes, rocks shredded bases.

Small precipitation events in December and January did not help with stability. A rotten continental snowpack was found anywhere there was snow, with some south and west aspects remaining bare. During a tour on January 11 on the Skyline, Dave Medara triggered a HS-AS-R5D2-G on the Little Meadow "test" slope. It broke on a 22-degree slope from the grass and took his up-track out. With our tails tucked, we wished for a consistent snowfall which never came.

We stayed busy, diverting our attention elsewhere. The Manti-La Sal Avalanche Center taught 14 classes in seven towns to a total of 470 students. We taught a two-day avalanche course for snowmobilers on the Skyline. The MLSAC went to Richfield, UT, to teach a basic avalanche-awareness class after an avalanche mortally wounded a member of the community. We trained volunteers to groom 18k of Nordic and skate-skiing trails in the La Sal Mountains. We incorporated Special Avalanche Statements into our Manti-Skyline advisories six times. During times of high-use and greater-than-considerable avalanche danger, we issued Special Avalanche Statements to provide information about the human factor in advisories, hand-outs, and radio

Ron Johnson investigates a slide near Cooke City, Montana, that claimed the life of a snowmobiler on December 16.

Photo here and next page courtesy Gallatin National Forest AC

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interviews. There were a few close calls, but no avalanche fatalities on our forest this season.

We posted 61 advisories for the La Sal Mountains this year: 36 advisories had a moderate danger, 21 considerable, and four high. The MLSAC posted 44 advisories for the Manti-Skyline this year, the largest amount yet: eight with a low danger rating, 21 moderate, 14 considerable, and one high. The extreme danger rating was not used this year. The final avalanche advisory was issued on April 11 for the La Sals.

By the time mid-March came around, not only was all the snow melting at an alarming rate, our budget was dwindling. Both Dave Medara and Max Forgensi had to go to part-time status.

As spring snows continue to whiten the peaks of the La Sals, we hope next year will be a big one. Next year, we hope to install a BCA Beacon Basin at one of the high-use snowmobile trailheads on the Manti-Skyline.

—Max Forgensi, director

Doug Chabot investigates the crown of an avalanche that killed a skier near Big Sky, Montana, on March 3.

Gallatin National Forest Avalanche Center

The Montana winter started in mid-October when a series of storms deposited 15-36" of heavy, wet snow in the mountains. Snow continued through the remainder of the month, sparking speculation in the local backcountry community that this would be one of the best seasons in years. The first reported avalanche caught a skier on October 23.

Fantasies of a great powder season came to an abrupt end in November. Temperatures dropped well below zero°F several times, and snowfall was almost nonexistent. The result was weak faceted snow sitting on top of the hard ice crust from October's wet snowfall. 12-15" of snow at the end of November buried this layer of facets and set the stage for one of the most deadly avalanche seasons in GNFAC history.

Due to widespread rain on December 6, a razorthin ice crust formed on the snow surface across the northern part of the advisory area. This crust was subsequently capped by a few inches of snow. A period of cold, clear weather faceted the snow on top of the crust, which was then buried by 6-12" of snow over a period of four days. A well-developed layer of surface hoar was buried in the southern part of the area during this same period. Humantriggered avalanches were reported on wind-loaded slopes starting December 12. The first fatality in southwest Montana occurred in the mountains outside of Cooke City on December 16 after a storm deposited 12-18" of snow in the area. A snowmobiler attempting to free his struck sled mid-slope was caught and killed in a slide as another sledder rode above him. He was located with a transceiver, but fatally buried 7' deep (see photo at left). A storm cycle on December 24-29 spurred another round of human-triggered avalanches with the second fatality happening in the Lionhead area near West Yellowstone on December 28. In this instance, a 19year-old man was third in a line of seven snowmobilers traversing low-angled terrain at the bottom of a 1000' slope when it released. He was uncovered within five minutes, but resuscitation efforts failed. A third fatality occurred in the Centennial Mountains just outside our advisory area on January 2 from two snowmobilers highmarking a tight, steep gully.

MULTIPLE BURIALS

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the slide or are only partially buried. Only 7.7% of the reported incidents involved completely buried multiple victims. Less than half of these were using transceivers. Of these, only a few, if any, would have benefited from using a special transceiver search technique.

In our analysis, we draw clear distinctions between cases involving "multiple victims," cases involving legitimate multiple-victim beacon searches, and cases in which a special multiple-burial technique or technology could be applied. Legitimate multiple-victim beacon searches require the following conditions:

- More than one victim must be completely buried with no visual clues above the surface.
- More than one completely buried victim must be carrying a working transceiver.
- At least one searcher with a transceiver and shovel must be on scene within 15 minutes.

Even when the above conditions are met, all victims will be found by the traditional practice of locating and excavating the nearest victim, turning off his or her beacon, then proceeding to search for the next closest victim. Additional factors must be present to make use of a special technique or technology:

- If the rescuer is alone, he or she cannot turn off the first victim's beacon once the airway has been established, either because the beacon is too difficult to access or the victim is too deep to excavate within the window of survivability. (This brings up the difficult issue of multiple-victim "triage" – a separate subject that introduces a challenging ethical debate – and should only be considered by experienced professionals.)
- If a second rescuer is available, then one can begin excavating while the other begins searching for the next victim.
- The victims must be buried close enough together so both of their signals are captured at once, and both searchers are led to the same victim. If they are located farther apart, then each searcher can simply isolate and excavate a separate victim as if it were a single burial.

For purposes of clear terminology, we call any case meeting all of the above criteria a "special-case multiple burial."

RESULTS

To classify and analyze the U.S. incidents, we hired a computer scientist to develop a database, flow chart, and algorithm to sort the data. He then appointed assistants to pull information from the avalanche incident databases. This was done not only for US incidents, but for incidents in Canada and Tyrol,

Austria (Tyrolean study results can be found at www. backcountryaccess.com/research). The US results are shown in the pie charts (*bottom of page*).

In numerous cases, when incident reports and further research did not provide enough information to classify the incident, it was classified as having "insufficient data." These cases were always removed from the numerator and denominator when calculating proportions. The analysis resulted in the following observations:

- 1) Transceivers are still not considered essential equipment in the US, Canada, or Austria. Only 36% of completely buried victims in the US were wearing transceivers. This was significantly lower than in Canada (56%) and Tyrol/Austria (58%).
- 2) Of 366 reported US incidents, just 1.4% (5 cases) involved multiple victims that were completely buried, and a transceiver-equipped rescuer was available.
- 3) Multiple burials are lowest in the US, but also extremely low in Tyrol (3.7%) and Canada (7.8%). In Canada, these are mainly found in guided groups. When non-guided groups are removed from the analysis, then the results are similar to those in the US.
- 4) Special-case multiple burials are an even smaller subset, comprising less than 1% of reported US avalanche incidents.
- 5) When performing further research on the incidents, there was a clear message from witnesses that beacon searching was the "easy part." The most difficult and time-consuming aspect of the rescue is invariably the excavation phase, which was described as "hell" on more than one occasion. This is consistent with previous research (see *Strategic Shoveling* and *The Big Dig* at www. backcountryaccess.com/research).

CONCLUSION

The most recent 12 years of US avalanche statistics show that incidents involving multiple victims with transceivers are extremely rare. Special cases where a special technique or technology could come into play are even less common, comprising less than 1% of reported US incidents. The greater issue is that not enough backcountry users own avalanche beacons, and not enough emphasis is placed on excavation strategy. These fundamentals should be mastered and reinforced in recreational avalanche courses. Specialcase multiple burials should be addressed only at the professional level.

The author would like to thank consulting computer scientist Jon Mullen for his work in collecting and analyzing the data.

Bruce Edgerly is vice president and co-founder of Backcountry Access, Inc. (BCA), a Colorado-based manufacturer and distributor of snow-safety equipment, including Tracker rescue transceivers.

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NAC 2006/07 ROUNDUP

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A storm system January 4-9 produced the only significant snowfall of the month. After that storm, the mountains of southwest Montana only received 4-6" of snow until the first of February.

Measurable snow fell 23 out of 28 days in February, with all Snotel sites reporting 110-140% precipitation compared to the 30-year average for the month. This snow was deposited on an extremely weak snowpack and produced a significant avalanche cycle across our advisory area. Thirteen human-triggered avalanches were reported, resulting in two fatalities and one injury. Most of the avalanches released on either the buried facets above the rain crust or on the surface hoar. Very few stepped down into the facets near the ground.

Snow continued for the first two days in March. Strong north winds during this period loaded south-facing slopes and resulted in a fatality on March 3. This was the third fatality in our advisory area and the sixth that we investigated this season. The weather turned dry for the rest of the month. Snotel sites across our area reported 30-50% of the 30-year average snowfall in March. The big avalanche cycle in February had cleaned out most paths, and the snowpack was generally stable. Only one skier-triggered avalanche was reported after the fatality on March 3. This avalanche occurred on April 2 and released in the faceted snow sitting on October's hard ice. Fortunately

the skier was spit out on top of the debris after being carried over 1000'.

Twenty-six human-triggered avalanches were reported in southwest Montana this season (12 snowmobilers and 14 skier/snowboarders). These involved 10 people being caught (three snowmobilers and seven skiers), with two partially buried (both skiers) and seven fully buried, resulting in six fatalities (five snowmobilers and one skier). Two of the avalanches resulted in serious injury.

Regular advisories started December 14. By the close of business on April 8, 128 advisories had been issued. The advisories were distributed to 2408 individuals daily, which is a 17% increase over last season.

The biggest accomplishment at the GNFAC this season came in the education department. Jay Pape took on the job of education coordinator for the Friends expanded education program. Under Jay's direction, the Friends purchased a computer and projector and increased the number of instructors in their program. Between the courses provided by this hard-working group and the class that we at GNFAC taught, 4598 people received avalanche education through 73 talks, seminars, and field sessions. This is a 59% increase over last year. We at the GNFAC would like to thank Jay for the dedication and hard work he has put into this program. In addition we would like to say thank you to Dale Gullet, Jeff Watt, Angela Patnode, and Mark Staples for all the effort they put into teaching the various classes. You folks are awesome! The money to support this education program comes from funds raised at the King and Queen of the Ridge competition hosted by Bridger Bowl ski area. Thanks to Brian Grossenbacher and the rest of

This slide killed two snowmobilers on February 17 while their party of three was highmarking the slope. Photo courtesy Gallatin National Forest Avalanche Center

the Events Department at Bridger Bowl for all the work that goes into making this event happen.

Yamaha sponsored the GNFAC again this season by generously donating two sleds for our use. This sponsorship is the result of the strong support we continue to receive from Cliff Gullet, owner of Team Bozeman Motorsports. We are very grateful for the use of these machines. Without them, our snowmobile avalancheeducation program would suffer greatly.

Last, but not least, thanks to all the people who provided the information that helps make the daily advisories possible. We really appreciate all the observations sent in by the backcountry users in our area and would like to extend a special thanks to the local ski areas for their daily observations. 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