Gallatin National Forest
AVALANCHE CENTER

2008-2009 Annual Report

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ACKNOWLEDGEMENTS

FRIENDS OF THE AVALANCHE CENTER

ISLAND PARK ADVENTURES AND YAMAHA

BRIDGER BOWL

SWEET PEA'S NURSERY

MONTANA FISH, WILDLIFE AND PARKS

On Site Management
Northern Lights Trading Company
Hans Saari Memorial Fund
Pinhead Classic
Gallatin County Search and Rescue
ProLite Gear
Community Food Co-Op
Jeff King at Edward Jones Investments
Barrel Mountaineering
The Yellowstone Club
Big Sky Ski Patrol
Gallatin Valley Snowmobile Association
Danhof Chevrolet
Moonlight Basin Ski Patrol
Montana Mountaineering Association
Spark R&D
Montana Ale Works
Sam Lowe-Anker of Mullethead Productions
NRCS
National Weather Service-Billings

Cover: 15' deep avalanche on Crown Butte which claimed the life of Travis Engstrom.

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From the Director: Our 19th Year of Operation

Greetings!

The Avalanche Center just finished its 19th year of operation. This winter was a good one for snow, which also meant a good one for avalanches. We began issuing daily advisories December 10th and continued until April 10th for a total of 116 posts. During the New Year holiday large snowstorms kicked off our longest running Avalanche Warning—seven days of HIGH avalanche danger in the southern mountains. Unfortunately, the instabilities and avalanche danger only slightly abated in the following weeks. Saturday, January 17th dawned sunny; a first in almost a month. Folks were out in droves and before the sun set southwest Montana had three separate snowmobiler avalanche fatalities: Crown Butte in Cooke City, the Gravelly Range and Mt Jefferson in the Centennials. Although only Cooke City lies within our official forecast area, the conditions were similar throughout the region and local communities reeled from the tragedies.

Our daily avalanche advisories continue to be the focus of our efforts. This year more people than ever received them. But even with our daily outreach people still got into trouble. Out of 45 avalanche incidents reported there were twelve partial burials and four full burials resulting in three deaths. Most of the western US was plagued by a weak snowpack similar to Montana's. Nationally, there have been 26 avalanche fatalities, on par with the 10-year average.

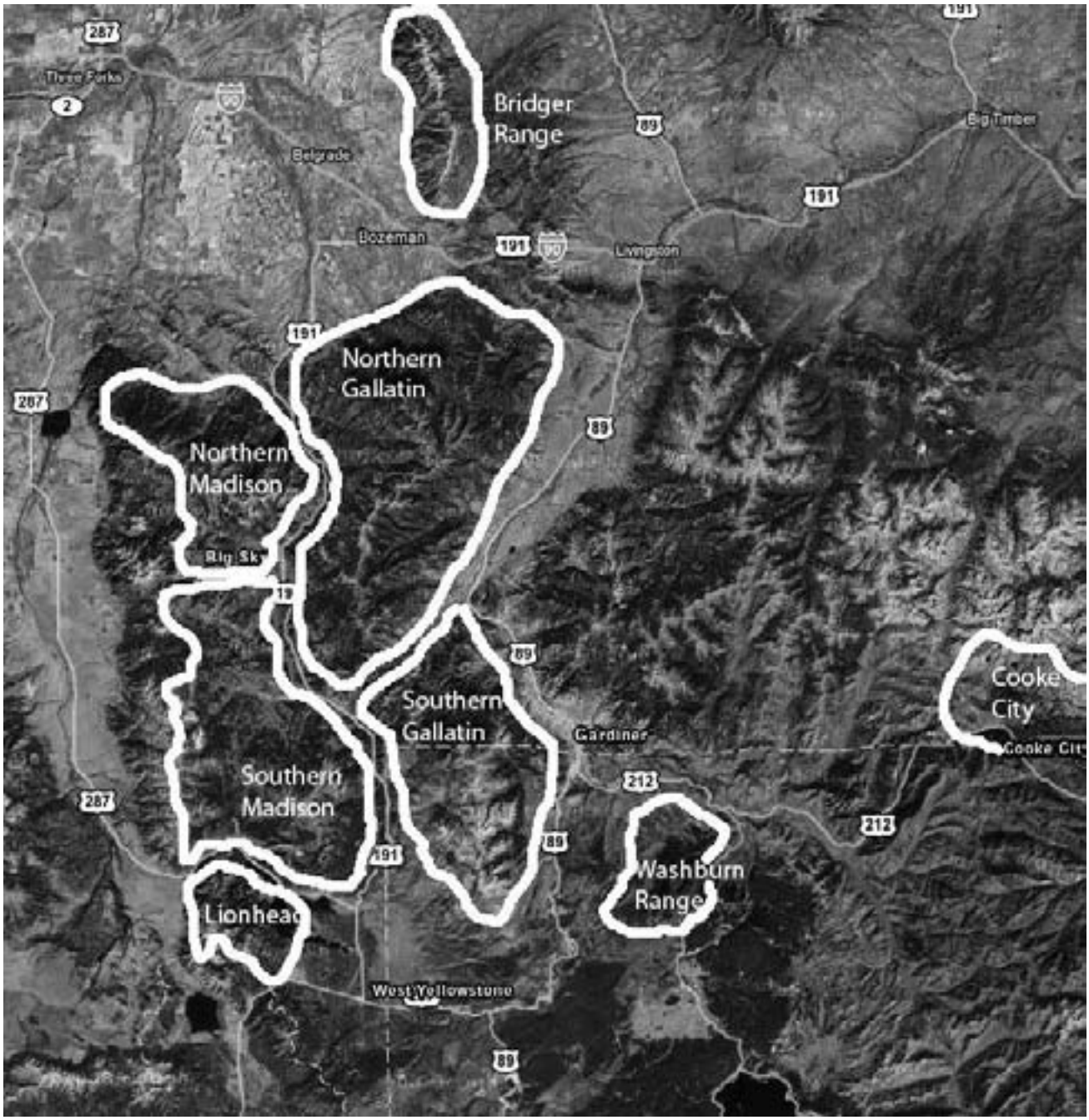
Some highlights of the season include:

- The number of people accessing our daily advisories increased 20% this season. On average, 3,239 folks read/heard the advisory every day.
- Avalanche Education is one of our top priorities. With help from the Friends of the Avalanche Center we gave 62 lectures, seminars and field sessions to over 4,300 people.
- Working with Island Park Adventures and the Friends of the Avalanche Center, Yamaha loaned us two Nytro four-stroke snowmobiles for our field use. We rode over 1,200 miles on each one.
- Our YouTube videos fill two niches: part avalanche advisory and part avalanche education. This season we made 18 clips which were viewed 23,300 times.
- We worked with Sam Lowe-Anker to make a 10-minute film, Stay Alive, on skiing the sidecountry of Bridger Bowl. Five thousand DVDs were handed out to season pass holders with an additional 3,800 views on YouTube.

Along with funding from the Gallatin National Forest we also get substantial money through MT Fish, Wildlife and Parks through their Recreational Trails Program. But even these two sources are not enough. We could not run our program without the financial support of the local community. The Friends of the Avalanche Center helped our budget shortfalls through contributions and fund raisers. The annual Powder Blast, a Spark R&D sponsored movie No Correct Way, Montana Ale Works dinner, Bridger Bowl's King and Queen and Pinhead Classic all raised money totaling thousands of dollars. Our supporters are too numerous to name, but we completely appreciate the money, resources, time and effort that everyone puts into making the GNFAC the best it can be.

Doug Chabot

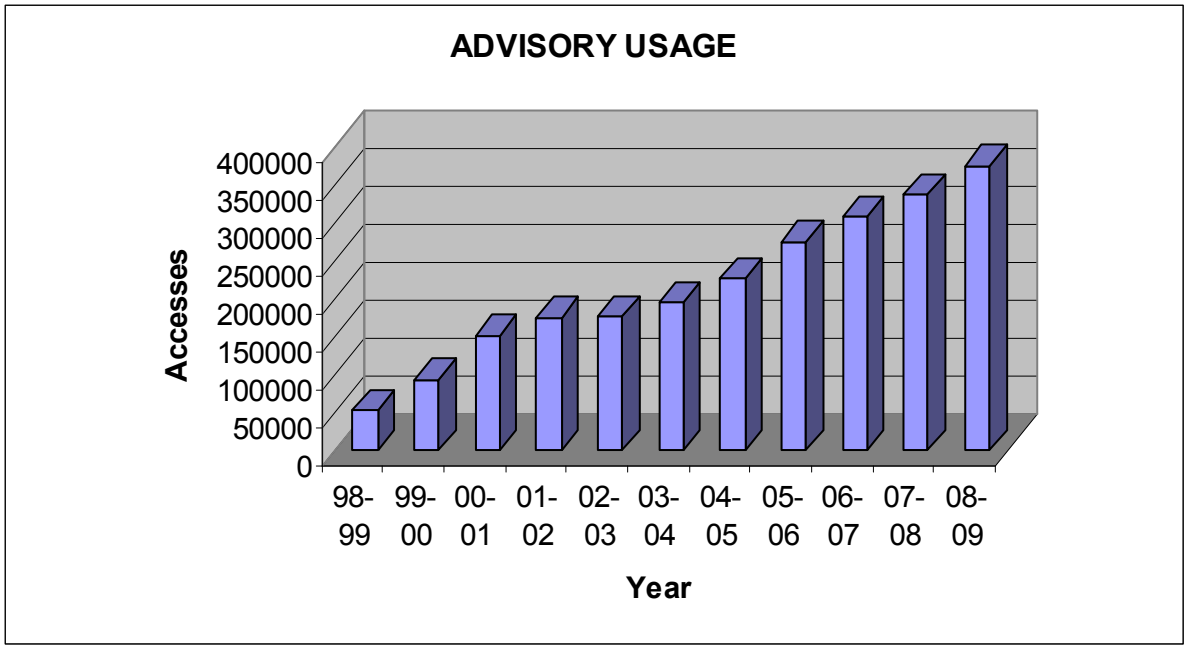
ADVISORY AREA



The GNFAC covers over 6,600 square miles.

AVALANCHE ADVISORIES

A forecaster arrives at the office by 4 a.m. every day to write the daily avalanche advisory. Our goal is to have it done by 7:30 so folks can make an informed decision about their back-country travels. As you can see in the chart, advisory usage increases every year. It's a little easier getting out of bed at 3 a.m. knowing that thousands of people are going to use this information. This season we put out 116 advisories which averaged 3,239 accesses a day—*a 20% increase* over last year. The bulk of these were through emails (2,185/day) and the web (933/day) with a few faxes and 95 calls/day rounding out the count.



YOU TUBE

For the third year in a row we've posted YouTube videos of our field work. These are made with a point and shoot camera—nothing professional, but the clips get the message across. Our aim is to make them informative about the current conditions as well as educational. Because of these clips, people now send in observations that include the Extended Column Test and Shear Quality data. This year we made 18 videos that were viewed 24,500 times.

AVALANCHE EDUCATION

Besides the daily advisories, avalanche education is another focus of the GNFAC. Unlike my retirement fund, our education programs grow every year. Our lectures get updated regularly and we tailor our classes to different user groups. This season we taught courses in Bozeman, Livingston, Cooke City, West Yellowstone, Ennis, Big Timber and Big Sky. Many backcountry recreationalists live outside our forecast area, but travel on weekends to the Gallatin NF. We've stepped up our efforts to educate these visiting skiers and sledders with classes in Butte, Anaconda, Helena, Great Falls, Billings and Cody, WY.

The Friends of the Avalanche Center help the education program in a few ways. First, they fundraise specifically for avalanche education. Second, the Friends employ a group of qualified instructors to help alleviate our teaching burden. The Friends book most of the classes and teach over half of them. Because of their hard work we've rarely had to decline an avalanche education request.

Jay Pape is the Friends education coordinator. Along with Angela Patnode, Dale Gullett, Tim Campbell, Jeff Watt and Scott Savage we all taught 62 classes to 4,305 people.

Students gathering at Bridger Bowl for an Avalanche Awareness class.

AVALANCHE EDUCATION

DATE	GROUP/TOPIC	COURSE	#
8-Oct	NWS	Ava. Awareness	60
11-Oct	"Stay Alive" Movie	Bridger Access	800
21-Oct	Nat Ava Meeting/"Stay Alive"	Bridger Access	30
14-Nov	GCSAR	Accident Review	30
12-Nov	Sleeping Giant Middle School	Ava. Awareness	222
13-Nov	*Helena Basecamp*	*Ava. Awareness*	*70*
17-Nov	**GCSAR - Snowmobilers**	**Ava. Awareness**	**50**
18-Nov	*MOSS @ Bozeman Public Library*	*Ava. Awareness*	*90*
19-Nov	*Grizzly Outfitters, Big Sky*	*Ava. Awareness*	*40*
19-Nov	Bozeman Chamber of Commerce	Ava. Awareness	30
20-Nov	NLTC	Ava. Awareness	50
20-Nov	*Sleeping Giant Middle School*	*Rescue*	*15*
21-Nov	Ski Patrols/"Stay Alive" Movie	Bridger Access	130
25-Nov	MSU Mountain Geography	Ava. Awareness	19
26-Nov	*West Yellowstone Ski Fest*	*Dzn More Turns*	*45*
3-Dec	***Red Line Sports, Butte***	***Ava. Awareness***	***12***
3-Dec	ASMSU Basic Avalanche Seminar	Ava. Awareness	214
4-Dec	ASMSU Basic Avalanche Seminar	Ava. Awareness	210
5-Dec	*Seventh Graders at CJMS*	*Ava. Awareness*	*185*
6-Dec	ASMSU Basic Avalanche Seminar	Field Session	150
6-Dec	***1 hr for Groomers, Helena***	***Ava. Awareness***	***88***
7-Dec	"Stay Alive" movie/ Library	Bridger Access	12
10-Dec	**BNSF**	**Ava. Awareness**	**25**
10-Dec	**Team Bozeman Avalanche Seminar**	**Ava. Awareness**	**39**
11-Dec	**Team Bozeman Avalanche Seminar**	**Ava. Awareness**	**39**
13-Dec	**Great Falls**	**Ava. Awareness**	**78**
14-Dec	**Team Bozeman Avalanche Seminar**	**Field Session**	**14**
16-Dec	MOSS @ Bozeman Library	Ava. Awareness	50
16-Dec	***Cooke City SAR***	***Ava. Awareness***	***25***
17-Dec	***Cooke City SAR***	***Field Sesson***	***14***
18-Dec	**West Yellowstone - Snowmobilers**	**Ava. Awareness**	**25**
19-Dec	**West Yellowstone - Snowmobilers**	**Ava. Awareness**	**22**
2-Jan	**Yellowstone National Park**	**Level 1**	**12**
3-Jan	**West Yellowstone - Snowmobilers**	**Ava. Awareness**	**7**
4-Jan	**West Yellowstone - Snowmobilers**	**Ava. Awareness**	**2**
10-Jan	***Helena Snowdrifters***	***Ava. Awareness***	***37***
13-Jan	*Big Timber (Sweetgrass) High School*	*Ava. Awareness*	*28*
14-Jan	***Livingston Snowriders Club***	***Ava. Awareness***	***35***
15-Jan	*Exploration Works, Helena*	*Ava. Awareness*	*38*
17-Jan	**Livingston Snowriders Club**	**Field Session**	**12**

AVALANCHE EDUCATION Cont'd

1/16-1/19	*MOSS*	*Level 1*	*12*
22-Jan	MMA Teen Avalanche Lecture	Ava. Awareness	30
1/22-1/25	*MOSS*	*Level 1*	*12*
24-Jan	*MMA Teen Avalanche*	*Field Session*	*30*
26-Jan	*Twin Bridges HS*	*Ava. Awareness*	*210*
27-Jan	**GVSA**	**Ava. Awareness**	**25**
28-Jan	ASMSU Avalanche Awareness	Ava. Awareness	187
29-Jan	ASMSU Avalanche Awareness	Ava. Awareness	180
31-Jan	ASMSU	Field Sesson	150
3-Feb	***Anaconda Snowmobile Club***	***Ava. Awareness***	***36***
9-Feb	*West Yellowstone HS*	*Ava. Awareness*	*100*
12-Feb	*Bob Wards*	*Ava. Awareness*	*10*
14-Feb	***Cooke City***	***Ava. Awareness***	***25***
19-Feb	*Livingston HS*	*Ava. Awareness*	*28*
24-Feb	***Valley Motor Sports, Cody, WY***	***Ava. Awareness***	***49***
28-Feb	***Broadwater County SAR***	***Ava. Awareness***	***12***
	West Yellowstone Series #1	***Ava. Awareness***	***11***
	West Yellowstone Series #2	***Ava. Awareness***	***25***
10-Mar	*Rotary Club*	*Ava. Awareness*	*75*
14-Mar	***Mt Jefferson***	***Field Sesson***	***23***
16-Mar	*Moonlight*	*Level 1*	*12*
8-Apr	*Steadman Clinic, Vail, CO*	*Ava. Awareness*	*21*

TOTAL = 62 Talks/Seminars/Field Sessions to 4,305 People

The Friends of the Avalanche Center taught 32 classes. These are in *italics*.

Snowmobilers comprised a large number of our classes. All of these are in **bold**.

Mark Staples investigates a snowmobiler triggered slide in Sunlight Basin.

AVALANCHE INCIDENTS

This winter was deadly. We had three separate avalanche fatalities in southwest Montana, all on January 17th. Over the winter 45 avalanche incidents were reported to us, the same number as last year, although this year we had more injuries and fatalities. Included in these numbers are 12 partial burials (defined as any part of a person's body sticking out of the snow). There was also a full burial on Buck Ridge when a rider was buried six-feet deep, but luckily dug up by his partners uninjured.

The table on pages 12-13 outline this years avalanche incidents. We only hear about a handful of the avalanches triggered, but in incidents involving injury or death we're usually notified quickly.

As of April 20 there were 27 avalanche fatalities in the US. The breakdown by state is: WY-5; UT-4; CO-4; MT-3; CA-3; WA-3; ID-3; AK-2; OR-1. Additionally, there were 25 avalanche fatalities in Canada.

Looking at the numbers

By Doug Chabot

Published in *Carve*, January 2009

Saturday, January 17th, was a rare beautiful day with plenty of sun, warmth and calm blue skies in the mountains of southwest Montana where it has snowed 30 out of the last 37 days. Like wilting plants stretching for sunshine, skiers, snowmobilers, hikers and climbers headed out to soak up rays and reinvigorate souls. Not only was the weather going to hold, it was a long holiday weekend that we could all enjoy. Unfortunately, three separate avalanches killed three people.

Nick Bilton carving in Taylor Fork.

This winter has been dangerous. Early season snow metamorphosed into granular, faceted grains which do not bond together, do not hold much weight before avalanching and is an unstable foundation. When it snowed over Christmas and New Year's Holiday the GNFAC issued Avalanche Warnings because the danger was acute and obvious. Avalanche danger is defined as the potential for avalanches to cause injury or death and is rated on a 5 tiered scale of Low, Moderate, Considerable, High and Extreme. The danger during the Holiday Warning period was High

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on all slopes in the backcountry.

Looking for a buried snowmobiler at Crown Butte.

The Avalanche Warning was broadcast far and wide through newspapers, radio, television and the National Weather Service. People were nervous and cautious. It was snowing so much and so hard that backcountry travel was limited. Trail breaking on skis was slow. The snow was so deep and unconsolidated that snowmobiling off trail was more getting unstuck than moving. In time the snow settled, travel became easier, avalanches and other signs of instability were in decline and the danger rating settled in at Moderate over most of our area. Moderate means natural avalanches are unlikely but human triggered avalanches are possible. The danger doesn't need to be High or Considerable in order to trigger a slide and die.

The unstable snow at the ground had gained strength since the termination of the Warning on January 3rd. The snow was supportable and skiers and snowmobilers ventured further and higher. People got onto big slopes with no consequences. But that was not the whole story. The snow was *not* getting stronger uniformly. Many slopes were safe, but others were just waiting for a trigger to avalanche. These slopes were isolated, but in no way small.

On January 17th there was phenomenal weather, a holiday weekend and folks hungry for powder.

In perfect weather we tend to think the snow is perfect too. It's human nature to infer one from the other. On Friday and Saturday of that week everyone was pushing and tickling the slopes. Highmarks marched across bowls as folks devoured the untracked powder. It was a holiday weekend and many, many more backcountry users than normal were present. People drove in from other states. Hotels were booked and trailheads packed. The sheer volume of people almost guaranteed that if only one out of 100 slopes were unstable someone was going to find it. People are triggers. An individual did not have increased odds of triggering a slide—the danger was Moderate ---but collectively the odds spiked that *someone* would get caught in an avalanche. And they did.

Many slopes were safe, but others were just waiting for a trigger to avalanche.

Two of the three avalanche fatalities occurred outside our advisory area, but the snowpack and situation were similar to ours; a weak snowpack structure, no obvious signs of instability and a crowd of potential triggers. Even though the snowpack has been gaining strength and people are skiing steep lines and hammering slopes with their sleds, folks still die in avalanches when the danger is only rated Moderate. And that's why it's still a numbers game.

Local Avalanche Incidents

DATE	LOCATION	DETAILS
23-Nov	Bridger Range	1 skier triggered
6-Dec	Bridger Range	1 skier triggered
7-Dec	N. Madison Range	1 skier triggered, caught
13-Dec	Cooke City	1 skier triggered
16-Dec	Cooke City	1 snowmobiler triggered
19-Dec	Cooke City	1 snowmobiler triggered
20-Dec	N. Madison Range	1 skier triggered
20-Dec	Cooke City	4 snowmobiler triggered, caught, partially buried
21-Dec	Cooke City	1 snowmobiler triggered
21-Dec	Cooke City	1 snowmobiler triggered
26-Dec	N. Madison Range	1 skier triggered, caught
26-Dec	S. Madison Range	1 snowmobiler triggered
27-Dec	Henry's Lake Mtns	1 skier triggered
28-Dec	N. Gallatin Range	1 snowmobiler triggered
28-Dec	Cooke City	1 skier triggered
30-Dec	Cooke City	1 snowmobiler triggered, caught, partially buried
30-Dec	N. Madison Range	1 skier triggered, caught
30-Dec	Pilot Creek	1 skier triggered
2-Jan	N. Madison Range	1 snowboarder triggered
8-Jan	Bridger Range	1 snowmobiler triggered
9-Jan	N. Madison Range	1 snowmobile triggered
9-Jan	N. Madison Range	4 snowmobiler triggered
10-Jan	N. Madison Range	1 snowmobile triggered, 2 caught, 1 partial burial, 1 full burial
10-Jan	Bridger Range	1 snowmobile triggered
10-Jan	Bridger Range	1 skier triggered
11-Jan	N. Gallatin Range	2 skiers triggered, caught, partially buried
16-Jan	S. Madison Range	1 snowmobiler triggered
17-Jan	Cooke City	1 snowmobile triggered, caught, buried, killed
17-Jan	Gravelly Range	1 snowmobile triggered, caught, buried, killed
17-Jan	Centennial Range	1 snowmobile triggered, caught, buried, killed
3-Feb	Cooke City	1 skier triggered
8-Feb	Absaroka Range	1 skier triggered
11-Feb	Two Top	1 snowmobiler triggered, caught, partially buried, injured
28-Feb	Cooke City	1 snowmobiler triggered, caught
5-Mar	N. Madison Range	1 snowmobiler and cornice triggered, caught, partially buried
5-Mar	Bridger Range	1 snowboarder triggered, not caught
7-Mar	Bridger Range	2 skier triggered, caught, partially buried

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8-Mar	Bridger Range	1 skier triggered
11-Mar	Bridger Range	1 snowboarder triggered
17-Mar	S. Madison Range	1 snowmobile triggered
18-Mar	Bridger Range	1 skier triggered, caught, not buried, injured
18-Mar	S. Madison Range	1 snowmobile triggered
23-Mar	N. Gallatin Range	1 skier triggered, caught, injured
4-Apr	N. Madison Range	1 skier triggered
5-Apr	Bridger Range	1 skier triggered

45 Incidents resulting in

- **12 partial burials**
- **4 full burials**
- **3 injuries**
- **3 deaths**

Mark Staples next to a huge crown on a wind-loaded slope in Sunlight Basin.

2008-09 US Avalanche Fatalities

Activity	Fatalities
Skier	4
Snowboarder	1
Snowmobiler	16
Snowshoer/Climber/ Hiker	1
In bounds skier/boarder	3
Other	2

Date	Location	State	Description
4/18	Thompson Pass	AK	1 snowmobiler buried and killed
3/25	Baker Creek, northwest of Ketchum	ID	1 snowmobiler buried and killed
3/25	Johnson Pass, Kenai Peninsula	AK	1 snowmobiler buried and killed
3/07	Aneroid Basin, Eagle Cap Wilderness	OR	3 skiers caught, 1 partially buried, one buried, one buried and killed
3/06	Gladiator Ridge, north of Sun Valley	ID	1 skier caught, buried, and killed, 1 seriously injured
3/03	Squaw Valley	CA	1 ski patroller caught and killed on a control route
2/27	North of Priest Lake	ID	1 snowmobiler caught, buried, and killed
2/27	Indian Peak area, Sanke River Range	WY	4 snowmobilers caught, 3 buried and killed, 1 partially buried and self-rescued
2/21	Maggies Peaks	CA	1 skier caught, buried, and killed
1/17	Mount Jefferson	MT	1 snowmobiler caught, buried, and killed
1/17	Crown Butte	MT	1 snowmobiler caught, buried, and killed
1/17	Gravelly Range	MT	1 snowmobiler caught, buried, and killed

Cont'd

1/2	Near Cody	WY	1 ice climber caught, died from trauma
12/30	Rockford	WA	1 resident buried and killed in roof avalanche
12/29	Yamaha Hill, western Uintas	UT	1 snowmobiler caught, buried and killed
12/28	Tatie Peak, near Harts Pass	WA	1 snowmobiler caught, buried and killed
12/27	Gravel Mountain, north of Granby	CO	3 snowmobilers caught, 1 partially buried, 2 buried and killed
12/27	Jackson Hole	WY	2 inbounds skiers caught, 1 buried and killed
12/25	Squaw Valley	CA	1 inbounds skier caught, buried, and killed
12/24	Logan Peak	UT	2 snowmobilers caught, buried, and killed
12/17	Northwest of Crested Butte	CO	1 snowboarder caught, buried, and killed
12/14	Near Aspen Ski Area	CO	1 skier caught, buried, and killed
12/14	Snowbird Ski Area	UT	1 inbounds skier caught, buried, and killed

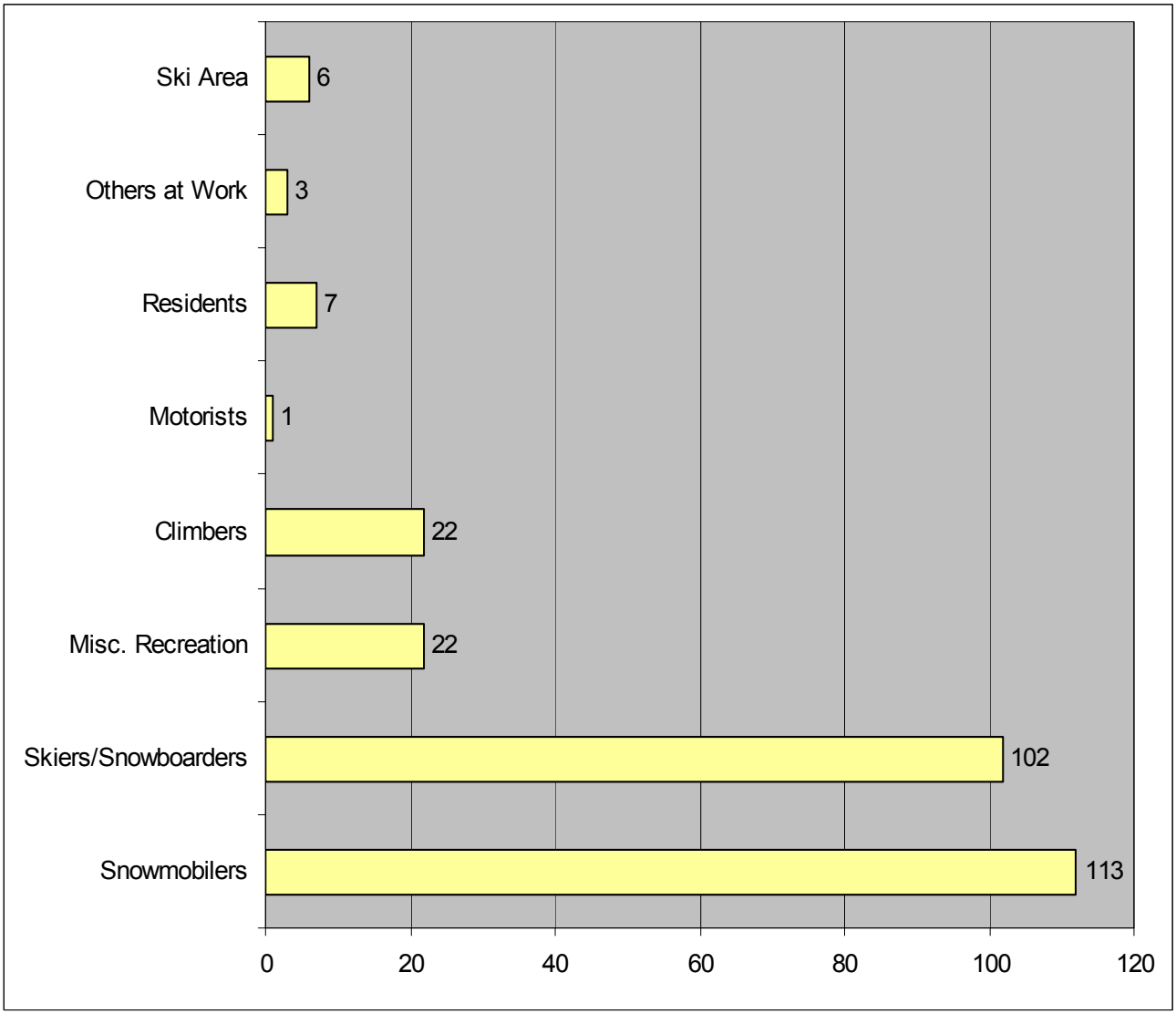
Total: 27 Fatalities in the US

Table of US Fatalities by Activity: 10 Years

ACTIVITY	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	10-winter totals
climbers	0	2	3	5	4	5	0	0	2	1	22
skiers/snowboarders	14	12	11	11	6	15	8	9	11	5	102
in-area skiers/riders	0	0	0	0	0	2	0	0	1	3	6
snowmobilers	5	15	18	14	6	4	12	10	13	16	113
misc. recreation	1	4	3	0	4	2	3	1	4	0	22
motorists/highway workers	1	0	0	0	0	0	0	0	0	0	1
residents	1	0	0	0	3	0	0	0	2	1	7
others @ work	0	0	0	0	1	1	0	0	0	1	3
Total	22	33	35	30	24	29	23	20	33	27	**276**

Rescuing an injured skier on the west side of Saddle Peak. Photo: M. David Johnson

Graph of US Fatalities by Activity: 10 Years



It's interesting to note the difference between motorized (snowmobilers) and non-motorized (skiers/snowboarders). The totals are very similar with only <10% difference in fatalities. The media would have us believe that snowmobilers are reckless and dying at much higher rate. But when we look at the 10-year total we see a different story. Motorized recreationists are no more careless than skiers or boarders. No one user group has the crown of being the safest, or most dangerous. Playing in avalanche terrain is serious business whether you're on skis or riding a sled.

FINANCES AND FUNDRAISING

The Avalanches Center's largest source of financial backing comes from the Gallatin National Forest. The Forest spent over $80,000 for salaries, benefits, travel, office, vehicles, and computer support. However, as we expand our programs we rely more on community support, grants and donations to cover our shortfall. The rest of our monies came from the following groups, agencies and businesses.

THE FRIENDS OF THE AVALANCHE CENTER

The Friends of the Avalanche Center have supported us since their inception in 1992. Page 19-21 details their contributions and fundraising efforts. The Friends cover all our administrative, snowmobile and avalanche education expenses. This season their donation totaled $19,012.

MONTANA FISH, WILDLIFE AND PARKS, RECREATION TRAILS GRANT

MT Fish, Wildlife and Parks continues to be a strong advocate of our avalanche program. This winter we were awarded $35,000, the maximum amount, for use at the GNFAC. This is the 10th year they've awarded us a Recreation Trails grant. Parts of these monies were used this year with the rest earmarked for next season. This is the single largest outside donation we have ever received. A huge thanks goes to Steve Gilbert at FW&P for his continued support.

GALLATIN COUNTY SEARCH AND RESCUE

Gallatin County SAR has been the Avalanche Center's partner since our start 19 years ago. They donate $4,000 annually to our operation. We work very closely with GCSAR since they perform backcountry rescue in our region. Sgt. Jason Jarrett and Sheriff Jim Cashell run an exceptional crew of dedicated and well trained volunteers.

MONTANA FISH WILDLIFE AND PARKS SNOWMOBILE SAFETY FUND

Ray Paige of FW&P donates $3,000 every year to our program. We've worked closely with Ray on our avalanche education outreach. He's come up with monies for stickers, brochures and general funds to help us run the Avalanche Center since I started work as director in 2000.

FRIENDS OF THE AVALANCHE CENTER

The Friends of the Avalanche Center is a non-profit 501(c)(3) organization. They provide a means for individuals and organizations to financially support the work we do. In order to operate the Center at our current level we need outside funds.

The Friends were founded in 1992. Since then, they've donated over $150,000 to the GNFAC. Most of the monies came from local businesses and individuals in southwest Montana. The Friends are a lean, grassroots group with very little overhead or administrative costs.

The Board of Directors represent a varied slice of the community and they all work together to help make the Avalanche Center a successful organization. The Board of Directors include: *Jeannie Wall (President), Jay Pape (Treasurer), Greg Caracciolo, Laura Ryan, Dale Sexton, Mike Harrelson, Lance Riek, Alan Oram, Leah Knickerbocker, Ben Zavora, Adam Knoff and Scott Savage.*

The Friends have donated over $150,000 to the GNFAC since 1992.

WHERE THE MONEY GOT SPENT:

AVALANCHE EDUCATION PROGRAM

Most of our education efforts are coordinated through the Friends. For the third year in a row they've employed Jay Pape to organize and teach avalanche education programs. All the programs are outlined on pages 8-9. The Friends taught 32 of 62 avalanche classes costing $11,404 ($10,040 in payroll/mileage/lodging + $1,364 in hardware/software/DVDs), yet *all of our programs are free to the public*. Funding for this program comes from the Hans Saari Memorial Fund, Bridger Bowl's King and Queen of the Ridge and donations from the classes.

GNFAC SUPPORT

The Friends give us direct financial assistance every year. These fall into two categories:

- Administrative. The Friends pay for many things outside our normal operations. This year that included buying a new DLP, paying Dick Dorworth for his editing services, costs of our email service, weather station maintenance, web work, and fees to professional workshops. This totaled $4,439.
- Snowmobile. Yamaha partnered with Island Park Adventures to loan us snowmobiles for the third year in a row. This season we rode two Nytro four-stroke sleds. The Friends paid for maintenance, insurance, and repairs which totaled $3,169.

ISSW SCHOLARSHIPS

The International Snow Science Workshop (ISSW) is held every 2 years. It's a symposium for avalanche professionals and last September it was held at Whistler, BC. Over 700 folks from around the world attended. The Friends are committed to professional development in the community and for the second time in a row they paid the registration fees for an MSU graduate student and two ski patrollers from each ski area to attend: Bridger Bowl, Big Sky, Moonlight Basin and Yellowstone Club. The Friends also helped pay for Big Sky's Ophir School 5th-grade class give a presentation on Science Curriculum. The total ISSW 2008 scholarships totaled $1,610.

FRIENDS Cont'd

WHERE THE MONEY COMES FROM:

POWDER BLAST

On October 24th we had our 10th Annual Powder Blast at the Emerson Cultural Center. For a $30 admission folks got dinner, music, drinks and tables of silent auction items. We sold 250 ticket and raised $14,548 . Sweet Pea's Nursery owned by Ben and Elissa Zavora were the title sponsors again.

BRIDGER BOWL: KING AND QUEEN OF THE RIDGE

Bridger Bowl hosted the 6th King and Queen of the Ridge event February 14th. Individuals and families hiked laps to the ridge for pledges. All proceeds went to our avalanche education program. This year 41 competitors raised $5,266 for the Friends which will be used for next years classes.

Out of the 41 competitors, six were under the age of 12. Folks hiked for five hours straight and when the clock stopped at 2:30 p.m., Erich Peitzsch reigned King with 26 laps and Sarah Williams was Queen with 21!

Thanks to everyone who competed and pledged. The racers were: The Bridger Bowl Events Crew, Conrad Anker, Fritz Arnold, Andrew Barefield, Kelsey Birkeland, Matthew Burke, Jim Carter, Dan Clem, Stephen Craig, Colter Delin, Paul Gannon, Lance Griffin, Marcie Hahn, Clyde, Mike and Cindy Harrelson, Heidi Hersant, Niko Hinz, Mitchel Johnson, Dan Jupka, Chris Kraus, Jane Kudrna, Isaac, Jennifer and Sam Lowe-Anker, William Moore, Ben Nobel, John Parker Angela Patnode, Erich Peitzsch, Gunnar and Katrina Perkins, Scott Schmidt, Gregg Smith, Mark Staples, Cody Stevens, Wendi Urie, Sarah Williams, Dawn Wilson Brown, Michael Wolf and Ben Zavora.

A long line of sidecountry skiers hiking to Saddle Peak.

BRIDGER BOWL "STAY ALIVE" MOVIE PREMIERE

Stay Alive, Sam Lowe's 10-minute movie about the new sidecountry access at Bridger Bowl, was shown at the Emerson Cultural Center to sell out crowds. Bridger Bowl hosted the evening event and donated the proceeds to the Friends. Over $2,100 was raised.

HANS SAARI MEMORIAL FUND

For the second year in a row the Hans Saari Memorial Fund awarded the Friends a $5,000 grant for their education programs. Hans was a local skier, writer and friend who died in 2000. His name and spirit live on through the fund.

FRIENDS Cont'd

PINHEAD CLASSIC

This year Paul Neubauer and Warren Bauder organized the 28th Pinhead Classic telemark festival and raised $1,000 for the Friends. It was a great party with an Olympic theme and Pinheads from all over the region descended on Bridger Bowl for a wild day of not-so-serious racing, crashing and laughing. Dinner, music and a live auction rounded out the event. Over the years the Pinhead Classic has raised $12,500 for the Friends!

DREAMCATCHER ENDOWMENT

The Dreamcatcher Endowment is run by folks at the Yellowstone Club. Tom Leonard, ski patrol director, has helped us successfully compete for monies. For the third year in a row they awarded the Friends an unrestricted gift of $3,000.

MONTANA ALE WORKS

A local watering hole and eatery, Montana Ale Works, hosted a fundraising dinner for the Friends on February 9th. It was a sell-out evening of a seven course meal paired with great wine and beer. Forty folks indulged themselves and the restaurant donated their proceeds of $2,300. Albert McDonald, the General Manager, made this evening a huge success.

Doug Chabot taking snowpit notes in a blizzard. Photo: Ross Lynn

SPARK R&D, BYEP AND THE POUR HOUSE

Will Ritter at Spark R&D and Dave Granger with Bridger Youth Empowerment Project organized a snowboarding movie, No Correct Way at the Pour House on January 7th. By the end of the evening they netted $1,022 to help support our operation.

OTHER DONATIONS

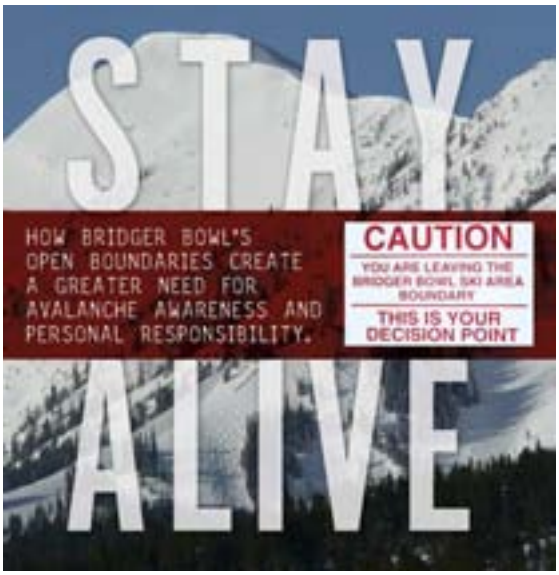
Many people contribute to the Friends of the Avalanche Center. The Stetson family donated $1,000 in memory of their son Tyler who died in avalanche last year. We also got an anonymous $1,000 gift. Moonlight Basin gave us $707 from the proceeds of their avalanche courses. The Big Sky Ski Patrol sent us $600 from their Dirt Bag Ball profits. The Gallatin Valley Snowmobile Association wrote a check for $600. Cold Smoke Awards presented us with a $700 check and the Upper Yellowstone Snowmobile club in Cooke City gave us a $200 donation. Over $4,500 was raised from avalanche class donations and businesses (American Avalanche Institute and Montana Mountaineering Association) who voluntarily reimbursed the Friends for instructor salaries.

STAY ALIVE

A Look At Bridger Bowl's New Backcountry Access
By: Doug Chabot

Published in *Carve*, November 2008

All skiers will be happy about two new developments in the Bridger Range. First, Bridger Bowl added 311 acres of expert terrain, the first expansion in 30 years. Second, backcountry access from the ski area will be a lot easier starting in December. Skiers will be able to ski the west side of the Ridge from Northwest Passage to Z-Chute as well as Saddle Peak from the new Schlasman's chair lift. Like every local backcountry skier, I'm really excited about the open boundaries.



I'm also worried.

I'm worried because increased access means increased personal responsibility, including getting avalanche education, investing in good rescue gear, finding a solid partner, calling the avalanche advisory, and creating a flexible, safe travel plan. I've investigated all too many avalanche accidents, and time and time again I find adults generally do a poor job of being personally responsible. Adults!! Teenagers, as a whole, are even worse. They have more accidents, take bigger risks and are more likely to be influenced by peer pressure.

The boundaries of Bridger Bowl are now open. Any one---adult or teenager, at any level or lack of personal responsibility---at any time has the freedom to exit the controlled ski area into the uncontrolled, wild, potentially deadly backcountry. Like trailheads everywhere, access is free and open and does not discriminate by age or skill. You are free to recreate and free to die—it's the American way.

Adults are the role models for kids, and adults get into trouble in the backcountry. And now kids are heading into the backcountry. This is a huge concern for the Avalanche Center and Bridger Bowl. Many young adults already have avalanche gear and ski the Ridge. By crossing the boundary they are literally just a few steps away from heading into avalanche terrain. Picture this grim scenario: Mom drops off her 14 year old son at the base area. As she drives towards Bozeman he starts up Saddle Peak, a backcountry area prone to avalanching. He's a talented skier who's been on the Ridge before and has his required avalanche transceiver, a Christmas gift worn like a badge. Unfortunately, he's clueless about backcountry avalanche danger. Since avalanches are all about timing, maybe he's fine. And maybe he's not. Maybe he gets caught in a slide and dies. Mom doesn't know about avalanche terrain or that open boundaries require serious decision making skills. She certainly didn't know her son could easily slip out of bounds into the uncontrolled backcountry and die.

"You mean 14 year olds can just head outside Bridger Bowl into dangerous terrain?" she asks. (Or should have asked.)

"Yup."

"There's no one to stop them?"

"Nope. They're on their own."

Instead of just worrying about the situation, the Avalanche Center partnered with Bridger Bowl to warn all backcountry users, especially parents and their kids, about the dangers of avalanches immediately outside the ski area. Together we made a 10-minute movie titled *Stay Alive*. The Friends of the Avalanche Center hired 16 year old Sam Lowe-Anker to film it, while Bridger Bowl made 5,000 DVDs to hand out to every season pass holder. The movie, shot by a teen for his peers and parents, is an entertaining warning on the differences and dangers between the ski area and the backcountry. It's free, and you can view it online on our website too. I strongly urge every parent of kids who ski to watch "Stay Alive" and take responsibility for setting guidelines with their kids instead of blindly letting them ride the bus, or dropping them off at the ski area with insufficient backcountry education and without any worries. PARENTS: I give the terrain outside Bridger Bowls boundaries an R rating, definitely not PG-13.

Stay Alive was given out to 5,000 pass holders and had 3,800 views on YouTube.

Out of bounds access at Bridger Bowl will be gained from the ridge, new lift, or backcountry gates. Every skier and boarder is required to have an avalanche transceiver in order to gain the ridge or to ride Schlasman's, and Bridger will enforce this requirement. The ski patrol also strongly recommends that everyone ski with a partner and shovel; the bare bones minimum for anyone recreating in the backcountry.

The two major backcountry areas opened by the Schlasman's lift are Truman Gulch on the west side of the range and Saddle Peak. Each poses different challenges and dangers. Dropping off the backside of Bridger Bowl leads to Truman, a drainage fed by many long, open slopes with steep, serious avalanche terrain. Touring gear is needed to climb back out since Truman Gulch leads to the creek on the opposite side of the ski area. More importantly, the snowpack on the west faces are usually thinner, weaker and in many years more unstable than the snow on the east side. It is a mistake to assume that conditions are the same throughout the range.

Saddle Peak has a different set of dangers. First, it will be possible to glide back to the new lift from the summit. No skis or touring gear required. Anytime an activity gets easier or more convenient people tend to think it's safer, but this is definitely not the case here. The entire east face of Saddle Peak is prone to avalanche. And if that's not bad enough, the slopes end in large cliffs which are deadly if you don't know where you're going or get swept off your feet and over one.

Whenever you head out of bounds use basic backcountry precautions. Travel with a partner. Carry avalanche rescue gear. Know where you're going. And know the avalanche danger. Most important, take an avalanche class. Make sure your partner takes one as well. If you get injured or buried in a slide it's going to be up to your partner to save you since rescue is, at best, hours away.

DONATED LABOR AND EQUIPMENT

It would be impossible for the GNFAC to operate at its current level without the local community donating time, expertise and equipment. When it's added up, their work totals $39,500. These donations reflect a dollar estimate of what it would cost to hire people or buy/rent equipment.

ISLAND PARK ADVENTURE AND YAMAHA

Craig Gagne, the Yamaha Rep, is an advocate of the GNFAC and works diligently to get us loaner sleds every year. He secured two Nytro four-stroke sleds this winter which we rode hard. We partnered with Ken and Rena Hymas at Island Park Adventures to get these delivered at the beginning of the season.

NORTHERN LIGHTS TRADING COMPANY

Jay Allen, owner of Northern Lights Trading Company, continues to support the Avalanche Center—something they've done since we started in 1990. They loan us skis and boots plus offer discounted equipment.

FIELD VOLUNTEERS/OBSERVERS

In order to put out our daily advisory we rely on a dedicated group of volunteers. Over 60 individuals give us their snow and avalanche observations on a regular basis. Beau Fredlund in Silver Gate saved us days of work with his accurate and frequent assessments of the Cooke City area. We are also thankful for the combined efforts of Bridger Bowl, Big Sky, Moonlight Basin and Yellowstone Club Ski Patrols.

The National Weather Service, NRCS, Yellowstone NP and the USFS Snow Rangers also provided us with valuable observations and data. On most days of the week one of us is outside gathering data for the next day's advisory. We can not always team up with each another so we rely on a pool of volunteers to accompany us in the field. This year our partners were Genevieve Chabot, Amy Staples, Dale Gullett, Tim Campbell, Paige Leddy, Nick Bilton, Chris Robinson, Matt Borish, Mike Cimonetti, Marty Faulkner, Ross Lynn, Erich Peitzsch, Teri Dudzinski, Adam Knoff, Eric Knoff, Conrad Anker, John Yarrington, Jay Pape, Blaine Smith, Alan Oram, Dave Brown, Dawn Brown, Kevin Diffendaffer, Paul Neubauer, Brad Carpenter, Ginger Birkeland, Jim Purdy, Ellie Martin, Jordy Hendricks, Peter Carse.

Doug Chabot standing next to a crown outside Cooke City. Photo: Ross Lynn

Dollar Value of Donated Hours and Gear

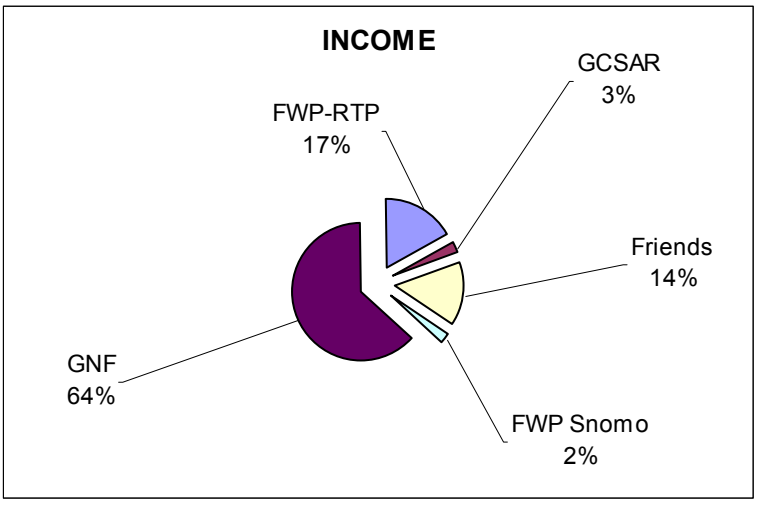
Equipment:	
Island Park Adventures/Yamaha	$8,000
Northern Lights Trading Company	$2,000
Labor:	
Big Sky Ski Area	$3,000
Bridger Bowl Ski Area	$2,000
Yellowstone Club	$2,000
Moonlight Basin	$2,000
National Weather Service	$2,000
National Park Service	$1,500
Volunteer observers and office help	$7,000
Field volunteers (600+ hours)	$10,000
TOTAL	$39,500

BUDGET

INCOME

Montana FW&P Rec. Trails Program	$22,480
Gallatin County Search and Rescue	$4,000
Friends of the Avalanche Center	
• Avalanche Education Program	$11,404
• Administrative Support	$4,439
• Snowmobile expenses	$3,169
Montana FW&P Snowmobile Safety	$3,000

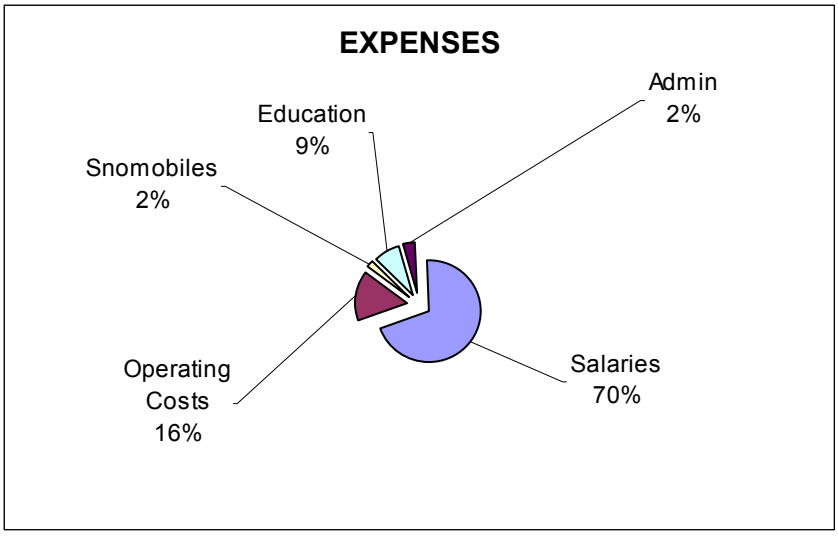
TOTAL CASH CONTRIBUTIONS	$48,492
TOTAL GALLATIN NATIONAL FOREST CONTRIBUTION	$83,950
TOTAL INCOME	$132,442



Cont'd

EXPENSES

Salaries	$88,430
GNF operating costs	$20,000
Travel/OT/benefits	$5,000
Snowmobiles equip/maintenance	$3,169
Education	$11,404
Administrative costs	$4,439
	_____
TOTAL EXPENSES	<$132,442>



SEASON SUMMARY

By Mark Staples

This fall Southwest Montana received the "snow bailout package" denied to other areas. We were hopeful it would provide a solid base for the winter's snowpack. Everything looked good with 3' of strong, supportable snow on the ground when daily advisories began December 10. A few days later temperatures dropped to -20 F forming an ice crust surrounded by facets. Increasing snowfall placed a heavy load on this weak layer prompting us to issue a warning on December 26 lasting seven out of the next nine days. People triggered many avalanches during this time and luckily no one was seriously injured or killed. One notable avalanche involved a snowmobiler buried over 6' deep and recovered alive by his partners. In mid-January snowfall finally stopped and the sun came out for the first time in over a month.

Three people died in separate avalanches on Saturday, January 17. An experienced rider from Bozeman died near Cooke City on a slope covered with snowmobile tracks when he got stuck near the apex of his climb. While attempting to free his sled it started tumbling downhill and hit an exposed rock causing the slope to fracture 15' deep. His wife and his partners began an immediate search but could not find him because he forgot to turn on his beacon. He was found the following day by an avalanche dog. Another experienced rider from Bozeman died just outside the advisory area when he momentarily rode away from a group of 13. Once his partners noticed he was missing, they followed his tracks leading into avalanche debris on a small slope. They conducted an immediate beacon search and quickly dug him out, but it was too late. The third victim died on Mt. Jefferson. His partners could not find him as they attempted an unorganized search. A student from two GNFAC snowmobile avalanche classes witnessed the avalanche and arrived 8 minutes later. He took command of the scene, instructed everyone to turn off their beacons, located the victim's signal and organized shoveling efforts. He was the victim's best chance for survival. Unfortunately, this rider was buried for 20 minutes under 6' of debris.

Mark Staples in Taylor Fork wondering why he brought his skis.

Human triggered avalanches occurred sporadically during a period of cold, dry weather lasting through mid-February. During this time the mountains were occasionally dusted with an inch or two of low density snow in which several faceted layers formed. These were buried when significant snowfall returned on February 15. On many other slopes the entire snowpack faceted during this dry spell and it seemed like we had returned to an early season snowpack. By early March numerous people experienced close calls as avalanche activity predictably increased with each storm. In one case we spotted four snowmobilers climbing a slope at the same time. As we captured this poor behavior on film they triggered an avalanche. Luck-

ily no one was caught. Near the end of March rain and very warm temperatures triggered even more avalanches. A lone skier was caught doing a ski cut and carried into dense timber where he broke his femur. Hearing his cries for help, another lone skier placed a call for Search and Rescue on his cell phone. The ceiling was just high enough for Gallatin County SAR to use a helicopter and short haul the victim to a waiting ambulance.

Following this accident, 3" of snow water fell with very cold temperatures. On many slopes the wet snowpack refroze and was able to support this load. Other slopes had a deep and strong snowpack, yet we continued to find a few slopes with facets from the mid-winter dry period that were still reactive in stability tests.

On April 10 we put out our last advisory and quietly closed our doors.

Skiing one of the many days of Cold Smoke powder!

SUPPORT EMAILS AND LETTERS

Hi Karl-
I am sure you have received several of these emails, so I will make this short and sweet. I really appreciated last week's basic avalanche course. I thought it was perfectly laid out with a great mixture of information. I do not spend an incredible amount of time in the back-country, but being the Information Assistant at the Bozeman District I field many calls dealing with winter snow information (anything avalanche related I usually pass directly to you guys). Thanks for the class!
Great Job!
Holly

Dear Doug,
My name is Glade and i am from Cody, Wy. I attended school in bozeman and am an avid backcountry skier and snowmobiler. I now reside in Cody and ski around Cooke city every chance i get. I saw the picture of the slide on Mt. Henderson happen on Saturday, March 7th while i was snowmobiling. I watched it from across the drainage about an hour after i climbed through the gulley at the bottom of that slide area. I really appreciate the way you guys at the avalanche center keep up on weather and slide activity in the area and thought you might want to know when that slide actually took place. I almost sent you a picture of the slide saturday night, sorry i did not, next time i will. Any ways, thank you guys so much for the information that you give on the website. It keeps my friends and i safe on a daily basis. Thanks for all the hard work we really appreciate it.
Glade
Cody, WY

Kimberly,
Just wanted you to know what a great job Karl did the last two nights up at MSU in a packed ballroom. I sat in both nights, along with a couple hundred enthusiastic skiers, snowboarders and I am sure some snowmobilers, and all thoroughly enjoyed Karl's presentation. It truly had the right elements of information, humor, science, and sobering seriousness that added up to a powerful course that was really well received. I now have a much better understanding of what is occuring in the backcountry and why, and certainly additional appreciation for the work that the Avalanche guys are doing and the importance of their ongoing education for public safety.
MD

Doug, good work to you and your crew this season. We had a very safe year considering all the potential, I truly believe the Avalanche Center is a major component in "engineering" safety and getting the message out to employees and the public. I also appreciate your work this season in making the Slushmans expansion a success. Have a great spring & summer.
Gracias!

Thanks for the work you do. I look forward to a good summer and another good winter next season. Jay

All of you do amazing work; created by a large amount of effort. Please know we appreciate all which you do and support the GNFAC fully. Congrats on reaching such a large number of individuals as well as the amount of volume of people the GNFAC worked to educate this winter. Many thanks, Best, C.

Doug and Crew,
Thanks for the 116 great emails, 18 quality Youtube clips, and the countless hours spent putting them together this winter.
Sam

Hey Doug,
I think you guys do an amazing job and I hope you keep it up for years to come. I know that not many avalanche centers are on par with the stuff you guys are doing. I relocated to Washington this winter and noticed a significant drop in the quality of avalanche reports over here.

Thanks to you & your staff for helping us have a safe snow season at our Idaho getaway. The service you provide is very much appreciated.
Mark Lindy

Great job this year. I read your report almost every day of the week, even when I couldn't go sledding. I have learned a great deal about avalanches and was even inspired by your avalanche advisory newsletter to go to a class held by the local snowmobile club. While I don't typically ride in the area you cover, I found your information very useful! I have changed the way I ride and I am teaching my adult sons what I have learned from you. Thanks!! I look forward to next season's advisories.
Kathy
East Helena

Thanks for another year of great advisories...appreciate the work you guys do! Jim

WooHoo! Thanks for all your excellent work. You've no doubt saved lives.

HEY. Thanks guys for all your dedication and information.. We (My hubby & I) listen to this report EVERYDAY of the season as we sled, about 2-3 days a week.. Again,, Loren & Sheryl

Thank you, guys, for an informative and often entertaining season of reports. Your expertise and wisdom have been very useful as I've begun to explore the backcountry again. Enjoy your off season.

Thank you all for the valuable info----your education on and knowlege of avalanches and conditions, are key to all of us winter outdoor enthusiasts. Kudos!!!
Cory
West Yellowstone

HEY, GOOD JOB THIS YEAR GUYS!!!!!!!! Stacy

Thanks for all of the effort that you put in during the year. I only travel out west once a year, (for now), but still enjoy the reports that I receive each day. It is also great to have a heads up as to what the conditions are like when we do make it out that way. Thanks, Gary
Thank You Everyone for your daily "professional" updates and safety conscious warnings. They make everyday more enjoyable in the back country. Even when not out snowmobiling it's been a pleasure to read the updates for the areas I enjoy going to. Thanks and have a safe summer!
Mark

You guys do a great job--go relax and get ready to cut the grass for the summer.
John

Gentlemen,
I just wanted to say thank you for the work that you do. Many of the decisions that I make in the backcountry are much easier due to something I've read in your report. I am not a big mountain skier. I don't hike for hours to ski a peak. I generally take the shortest hike possible to get to powder skiing. This generally puts me on a slope between 34-40 degrees, which as you know, is the prime range for an avalanche. Reading your report everyday, gives me a great overview of what's going all around me. thank you again.
bart

To Montana Crew,
I just wanted to write you all and say thank you for doing such a great job. I check your report everyday and appreciate your hard work. We live down in Island Park, Idaho and are just out of range except for (lionhead area), so I check both jhavalanche and your report. jhavalanche does a good job also, but you all do a great job.
Again, thank you and keep up the great work.
Dan

Dear Doug, Karl, Mark, USFS and all of you who work so hard,
I just wanted to say thanks to all of you for all your before-dawn awakenings, and your amazing dedication to this emerging science. I've got 4 friends who barely escaped after a 100-yard slide on Mt. Ellis this weekend. Your wisdom has influenced my 18-year-old son greatly - he's one of your targeted young adults who tends to push all limits, and who's so impressed with your work that he now wants to study snow science. It's time to tell all of you thank you for your dedication to keeping my dear ones ---and all of us who love to play in the snow --- informed and alive.
Sunny

Hi.
I attended your Avalanche Awareness Class last night in BT. I wanted to thank you for such an interesting class. I have to say that I have never been in the back country in winter, on skis, or a snowmobile or snowboard and probably never will. My idea of fun on a cold snowy day is sitting with my woodstove and a good book. But, saying that, I am now at a job where I hear about these things and as the Info Receptionist, I am expected to know something about it. I signed up for your daily email this fall and, truthfully, didn't understand a word. This morning I read the Advisory and understood it! I am very grateful that you take the time to have these classes and the next time you have one in town I will not need my boss to tell me to go. The only downside to this class (and I say this as a mother, you understand) is just this past Sunday my daughter in Portland Oregon called and announced she is going to learn how to snowboard this coming weekend. Now I have to call her back and ask all these mom questions like "do you have a beacon, shovel, probe?" "Did you check the Avalanche Advisory for wherever it is your going?" "Are you going with other people?" Yada yada, you know how mothers are..."
Thanks very much and I look forward now to your email every morning and I won't be deleting them or just putting them into the folder without reading them (and I am going to find out skiing in Oregon). Please continue your good work and who knows, someday, somewhere, someone just might get me away from the stove and out into that beautiful country you showed us - but not without checking your website first.
Thanks again, Judy

I have unsubscribed to nearly every e-letter or email list of virtually all kinds. I continue to enjoy your work not only because I spend a good deal of time in the backcountry (snowmobiling) but because your info is timely, accurate and has just the right amount of information. Thanks for the effort. Sincerely, John

Hey Mark,
Without wasting too much of your time, i just wanted to give you a little positive feedback. I actually have taken a couple of your classes some years back as well as several others in different areas. Without comparing apples and oranges, i would like to say that what set yours apart was the fact that your info was delivered more clearly and was more useful to the people attending. I think this was because it was clear the entire time that the goal (for you and us) was to find a safe/fun way up and DOWN!! You'd be amazed at how many people forget something so simple as the the reason for taking a class such as that. Not that every time results in your intended goal, but a lot of other instructors might do better to remember what that goal might be. In my opinion.
Thank you for doing such a great job, and making it look like fun!
conall

Doug, Great job on the DVD about avalanche awareness that accompanied the Bridger Ski Pass. Jay and I are already set up for a full day of Avalanche Safety and an afternoon Beacon Search session at the Middle School in Livingston. You guys rock. Matthew

P.O. Box 160673
Big Sky, MT 59716
October 7, 2008

Friends of the Avalanche Center
P.O. Box 6799
Bozeman, MT 59771

Dear Friends of the Avalanche Center,

The International Snow Science Workshop was one of the best experiences I've ever had in my life. We got to climb a glacier with crampons and ice axes. There could be an avalanche but there was so little snow on the glacier you could barely boot ski on it. But enough side tracking the real fun was in the workshop. Isabella and I presented our poster in a big room with hundreds of people browsing around looking at all the stations, especially ours. We sometimes had seven people looking at our poster and asking questions, testing us on what we learned. I always seemed to be the one talking to four people at once when Isabella got two. One guy even asked, "What did you learn?" I replied simply "about snow." He cracked up as Isabella said "avalanches." After that we told him about our poster.

It was really fun to meet Sam from the movie "A Dozen More Turns: An Avalanche on MT. Nemesis" when he came and visited us at our poster. All in all the conference was a great learning experience. Who knows one day I might be a snow scientist and dig snow pits for a living.

Thank you for help making this trip possible.

Sincerely,
Micah

Micah Robin

B.W.A.G.s
Bozeman, Montana

B.W.A.G.s
c/o Patti Steinmuller
14665 Spanish Breaks Trail
Gallatin Gateway, MT 59730

December 15, 2008

Gallatin National Forest Avalanche Center
10 E Babcock Street
Bozeman, MT 59715

Dear Gallatin National Forest Avalanche Center:

Enclosed is a check for $75.00 as a donation to the Gallatin National Forest Avalanche Ce
from the Bozeman Womens' Activities Groups (B.W.A.G.s). Thank you for your service to c
community. Thanks for the avalanche reports.

Sincerely,

Patti Steinmuller
B.W.A.G.s Treasurer

Enclosure

To the Friends of the Gallatin National Forest Avalanche Center,

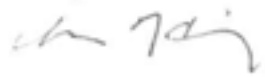
I am extremely appreciative of the opportunity you provided me by supporting me in going to the ISSW in Whistler. The experience was excellent; I learned a lot of useful information about recent research in the snow science field. I also was able to meet a lot of amazing people who truly made the ISSW a unique, valuable experience. I learned a lot from the presentations, and also learned at least as much from all the friendships I formed. As you may know, the Yellowstone Club Ski Patrol (which I am part of), presented our findings about the occurrence of radiation recrystallization in the Southwest Montana snowpack. It was extremely exciting to be involved in one of the papers, especially one in which we heard whispered behind us as Henry finished presenting, "Wow, that was really cool!" We hadn't heard that all week! In addition to the paper I helped author, I was also listed on MSU's sister paper on their corresponding cold lab experiments and also assisted Jordy Hendrikx in his field work for his study on spatial variability, in both Montana and New Zealand. After having put a lot of effort into those different projects, it was great to be able to see the final product.

It is actually quite amazing that I managed to make it to Whistler; I had been in New Zealand all summer, getting some first-hand experience in a maritime climate, and was planning to return in November. However, I decided it would be extremely worth it to be able to make it to the ISSW. So after numerous calls to the airline, and after almost getting charged a hefty fee for attempting to change my schedule, I managed to get a flight so that I made it back 2 days before the ISSW. I think I even managed to travel 4 days over 3 days in the process (I had two Thursday the 18ths).

And it was worth it; I heard the story of a patroller who went down to Chile to forecast for a mine, where the inhabitants had no concept whatsoever that avalanches even existed. They proceeded to ignore him until they ended up in a huge cycle and ran back to their unsafe dorms with their tails between their legs. There were some impressive presentations about first-hand accounts with avalanches, and also many interesting presentations that were more theory based. It truly lived up to the ISSW's standards of 'A Merging of Theory and Practice".

Once again, I thank you for helping me to enjoy and learn from this experience. I look forward to returning to it in two years time.

Sincerely,



Irene Henninger

January, 10 2009

Dear Friends of the Avalanche Center,

We would sincerely like to thank you for the generous support given to us in order to cover the registration costs for the 2008 Whistler ISSW conference this past fall. As professional ski patrollers at Big Sky we both receive a significant amount of practical experience in and on snow but sometimes lack the time and opportunity to explore the academic and theoretical aspect of the discipline. The conference and its dedication to "a merging of theory and practice" was an informative, inspiring and engaging opportunity to broaden our knowledge and involvement in the industry of snow science and snow safety. We are both excited to bring back what we learned this fall to our local operation and the avalanche community of southwest Montana as a whole. We once again thank you for this opportunity and hope that you are able to continue supporting local snow professionals in this manner in the future. Sincerely,

Chelan Babineau-Z
Ross Titillah

the Base Camp
Gear for the Great Outdoors

2/3/09

Hey JAY,

- THANKS AGAIN for the wonderful presentation. We look forward to doing it AGAIN next year. Enclosed is A check For the Avalanche Center.

TAKE CARE,

DON +
BASE CAMP STAFF

1730 Grand Avenue
Billings, Montana 59102
Telephone 406/248-4555
Fax 406/248-7080

333 N. Last Chance Gulch
Helena, Montana 59601
Telephone 406/443-5360
Fax 406/442-5610

104 Michelle Court
Missoula, MT 59803
3 February 2009

Jay Pape, Treasurer,
Friends of the GNFAC
PO Box 6799
Bozeman, MT 59771

Hi Jay,

Glad to see from the GNFAC that you are still there. And greetings to Doug, Ron, Mark, and Karl.

Enclosed is a check for $50 to help the Center. I hope it can help sponsor the March 3 avalanche advisory in memory of Ben. I'll be at Chico Hot Springs this year with some of his friends and it will be good gazing at the mountains knowing the advisory is out there. Thanks for all your collective efforts there. (And just e-mail me if you have any questions).

Steve, Dudley, and company have done a great job here this year setting up the beacon park at Lolo with more planned. Now as year two closes, I have a seasonal remembrance pattern of giving to the West Central Montana Avalanche Center at Christmas, the Gallatin when Ben died, and his Boy Scout troop for summer camping and trips on his birthday in July. It helps mark the years.

Gratefully,

Becky

Becky Richards
rebecca.richards@umontana.edu

PO Box 3164
Bozeman, MT 59772

February 11, 2009

Gallatin National Forest Avalanche Center
PO Box 130
Bozeman, MT 59771

Dear Gallatin National Forest Avalanche Center,

Each year we donate our half of the proceeds from the hands of our Poker Run to the GNFAC and we at least match the amount. This year the proceeds were $475 and our half of that was $238. We're more than matching that! Enclosed please find a check for $600! Thank you for all your hard work!

We'd also like to thank Mark for presenting at our January meeting and annual Chili feed! He did a wonderful job!

Sincerely,

The Gallatin Valley Snowmobile Association

YELLOWSTONE CLUB

Gallatin National Forest Avalanche Center
Doug Chabot, Director
PO Box 130
Bozeman, MT. 59771

April 9, 2009

Dear Doug,

I would like to congratulate you and your crew on a job well done this year. Now that the winter season is winding down I would like to thank you, and your team for your first rate job of weather and avalanche forecasting. With this years early snow, the mild and dry period in February, and then a very snowy March it was extremely valuable to read, on your web page, your advisories and weather forecasts. Your increased use of photographs as well as the frequent use of video is a great addition to your Avalanche Advisories. Of course, the early morning discussions on days of heavy snow and wind were helpful in developing a safe and efficient control plan for the day.

Also, a belated thank you to Mark for conducting a day long avalanche course during our preseason Snow Safety Refresher. Feedback from the Ski Patrol and Guides indicated that the classroom time, as well as the field session, was a great way to prepare for the season.

Sincerely,

Tom Leonard
Ski Patrol/Snow Safety Director
Yellowstone Mountain Club

One Yellowstone Club Trail ~ Post Office Box 161097 ~ Big Sky, Montana 59716
TollFree (888) 700-7748 ~ Phone (406) 995-4900 ~ Fax (406) 995-7393 ~ www.yellowstoneclub.com

Moonlight Basin

P.O. BOX 160040 · BIG SKY, MONTANA 59716-0040 · (406) 993-6000

Jay;

Enclosed find a check in the amount of $ 707.00 that is destined for the friends account to help fund the GNFAC.

This donation was raised by the Moonlight Basin Ski Patrol in conjunction with Choppers Grub & Pub of Big Sky.

Choppers held a Pray for Snow benefit in November with us as one of the beneficiaries, generally speaking when we get donations from outside of our fundraising efforts they go right to the friends.

If somehow you can get some credit to Choppers along with us it would be greatly appreciated.

Keep up the great work and stay on top.

Randy Spence
Moonlight Basin Ski Patrol

ARTICLES

WEDNESDAY, DECEMBER 31, 2008

OUR OPINION

Recreationists can prevent backcountry avalanche fatalities

Backcountry winter recreation is still in its relative infancy. Better clothing and equipment have contributed to the rapidly increasing popularity of these activities over the last 20 years.

And with this growth has come a corresponding increase in avalanche deaths. Last year, there were 33 avalanche deaths nationwide, and one of those happened here in southwest Montana. Over the last 10 winters, there have been 307 avalanche deaths in the U.S. Already this winter, eight snowmobilers are feared dead in an avalanche near Fernie, British Columbia.

Sadly, many of these deaths could have been prevented with simple precautions. And more resources than ever are available to backcountry skiers, snowmobilers and climbers for the prevention of avalanche injuries and death.

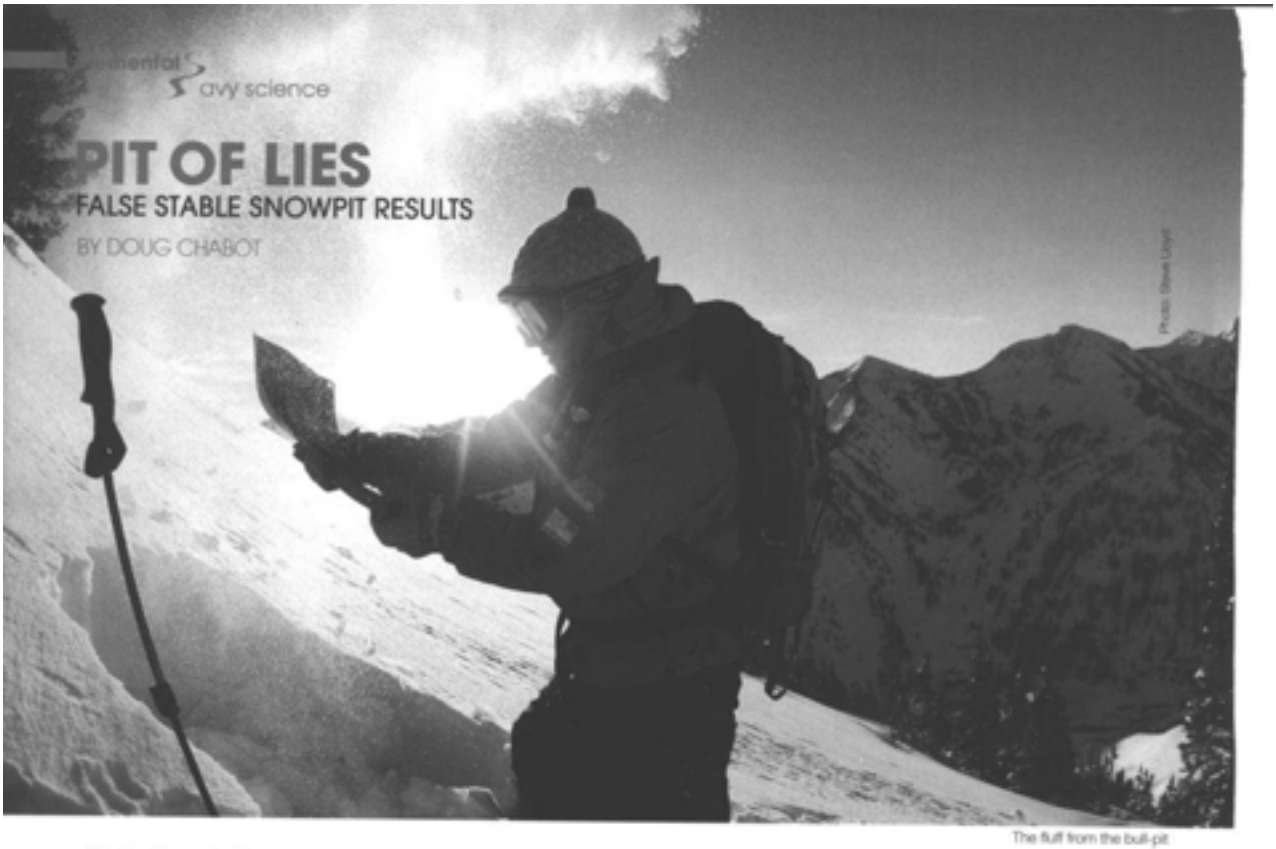
Transceivers, probes and shovels — once unheard of among backcountry snowmobilers — are now commonplace and should be carried by every backcountry recreationist. And those recreationists should make a point learning how to use them effectively.

Locally, we are fortunate to have the services of the Gallatin National Forest Avalanche Center. Personnel at the center produce avalanche advisories throughout the winter. Those advisories can be accessed by calling the center's hotline at (406) 587-6981, by visiting the center's Web site at http://www.mtavalanche.com/, or by clicking the avalanche advisory button on the Chronicle's Carve Web site at www.dailychronicle.com/carve.

The avalanche center issues frequent, detailed, site-specific warnings about what kind of snow conditions will be encountered in the backcountry and what dangers they pose. The center has also become noted for its extensive education programs. Basic and advanced avalanche training programs are available at nominal costs. Information on those programs is listed on the center's Web site. The site also offers links to a variety of online avalanche education tutorials.

Recent years have seen tremendous advances in avalanche safety technology, but those advances can only save lives if recreationists use them and use them correctly.

The 2003-04 season was the last southwest Montana winter without a single avalanche death. Let's make this winter another one.



The fluff from the bull-pit

At the top of a beautiful 2,000-foot run, my partner and I were finishing a snow pit evaluation. It was snowing and blowing, the powder was deep, and the results of our compression tests indicated a relatively stable slope. Even though conditions were worsening, the positive test result gave us the confidence we needed to drop in.

As my partner clicked into his skis, the slope collapsed with an audible, heart-stopping "whumph." A crack shot across the slope just below the pit, and the entire gulley ripped out. Avalanche forecasters aren't supposed to have close calls; we're supposed to know better. We made a huge mistake, and it was due to a "false stable" condition in our pit that day.

False stables result from variability in the snowpack... and in test procedures. The strength of a snowpack can differ considerably over the area of a slope, and snow nerds refer to this dissimilarity as "spatial variability." A pit dug for analysis might happen to be in a stronger location, where weak layers never formed, or where they were altered by wind, sun, or other factors. There are human factors in the analysis, too: The size of snow columns, the straightness and plumbness of cuts, the subjective force of compressions—all lead to testing variability. So how often are pit results false? And how can we mitigate false results?

I tapped the analytical mind of Karl Birkeland, avalanche scientist at the National Avalanche Center, to get his Ph.D horsepower behind these questions. Using the SnowPilot database, we considered 1,100 snow pits and over 3,500 individual stability tests. The Web-based SnowPilot database is a shared repository of snow pit test results and corresponding stability evaluations, useful for avy research.

We found 289 Rutschblock, Stuffblock, and Compression tests where the observer knew that instability was present, and 38 (or 13 percent), of those tests indicated false stability. The observers determined overall instability by recording recent avalanches, and cracking or collapsing of the snowpack. The criteria for "stable" pit test results on the same slopes were Rutschblock numbers of five or higher, Stuffblock drop heights of 40cm or greater, and Compression taps of 21 or more. When the cleanness or "snap" of the shear was factored into the tests, the percentage of false stables dropped to nine percent. A very clean shear quality (Q1), on a three-tiered ranking of shears, was considered an unstable result.

So, there's a nine-percent—nearly one in 10—chance that a test conducted on an unstable slope will reflect a stable condition. Fortunately, decisions aren't based on a single piece of data. Stability evaluation is, and should always be, a search for instability. We scrutinized the Snowpilot data further, looking for snowpits that underwent multiple tests. We found that an additional test, conducted in the same pit as was the false stable test result, yields an *unstable* result most of the time. Thus, conducting multiple tests per pit can significantly reduce the nine-percent chance of false stable results. Further, a new stability test, the Extended Column Test, shows significant promise for reducing the likelihood of false stables. Look for a description in the January issue of *Backcountry*.

In addition to conducting multiple tests, pit location is critically important for accurate pit results. The most frequent pit placement error is digging too high on a slope. Often, weak layers don't form, or are destroyed due to high winds near ridge tops, and the snowpack there is often comprised of dense, wind-transported snow. Dig lower, where the conditions more closely reflect those of the rest of the slope.

The best way to minimize false stables is by gathering and considering myriad data. Recent avalanches, or a collapsing or cracking snowpack trump stability tests every time. Hunt them out. Kick cornices, ski-cut small, steep test slopes, keep probing the snow, looking for instability everywhere.

I didn't see any of the obvious signs of instability on the day of the slide. We should've dug again. Looking at the problem from a purely statistical standpoint, if the results from a second pit are independent of the first, the chances of finding false stable conditions go from one in 10, to roughly one in 100. I wasn't paying attention to things like recent snowfall, rapid wind-loading, and a weak faceted layer two feet deep. If we'd dug another pit, odds are good that we would have found the instability we were looking for.

Doug Chabot is Director of the Gallatin National Forest Avalanche Center (GNFAC) located in Bozeman, MT. He has climbed and skied all over the world, and he hates "false stable" pit results.

elemental mountain skills

BACKCOUNTRY TRAVEL TIPS

EFFICIENCY 101

TEXT BY LANCE RIEK
ILLUSTRATIONS BY CARRIE COOK

Whether booting up a sidecountry stash or digging deep for a weeklong slog, traveling efficiently is key to minimize pain and maximize fun. But according to Bozeman, MT avalanche forecaster and globe-trotting alpinist Doug Chabot: "Being efficient is more than just packing light. It's about moving in the mountains smoothly, confidently; with every movement having purpose." Here's Efficiency 101.

BEFORE YOU GO:

Track the avy advisory all week and weigh your available time, and the avy and weather conditions against your objective. Drink as much water as possible the day before a tour, and eat a healthy meal the night before. Study maps and photos of your route beforehand, and consider a Plan B, in case stability, weather, or schedules aren't as planned.

Scrutinize each item you load into in your pack—do you really need the solar-powered margarita mixer? Bring only the tools and gear you know you will need, and keep snacks and water where you can access them on the move. Keep everything you will need immediately (clothing, boots, gloves, transceiver, etc.) in a separate bag, to avoid having to dig into your freshly loaded pack. And travel efficiency is just as important for sidecountry skiers—the backcountry begins as soon as you leave the resort.

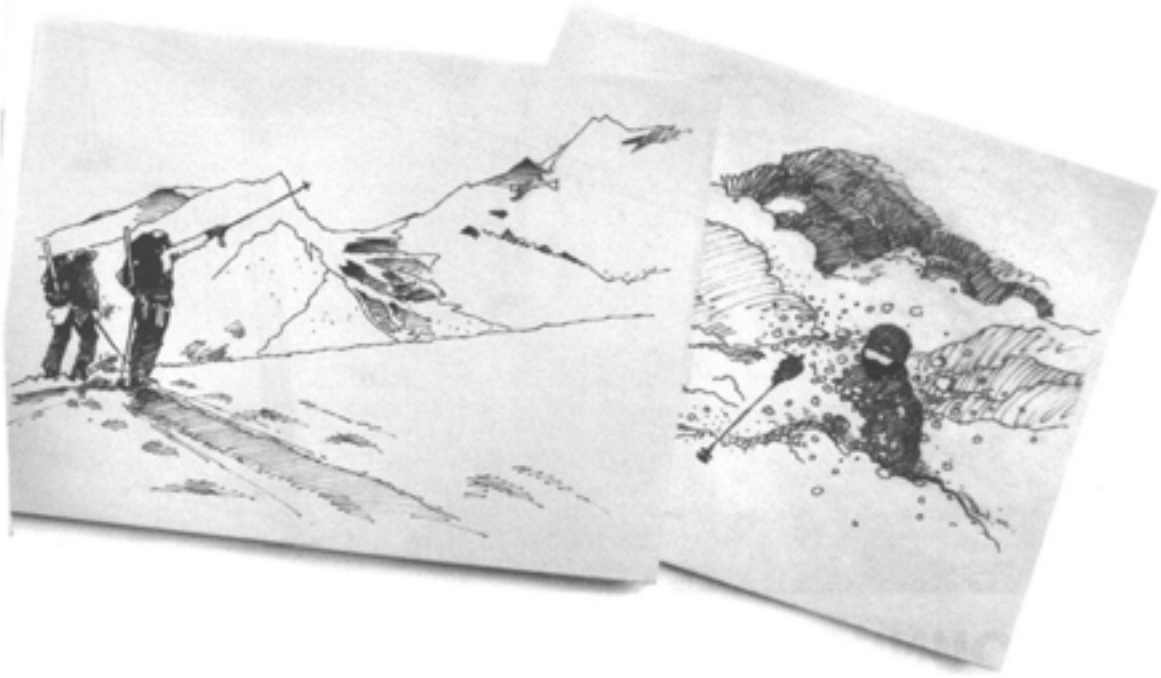
ON THE ASCENT

Number one rule: Set Efficient Skintracks. The most efficient angle, gaining the most vertical with least expended energy, is super-low—between 5 and 10 degrees. Yes, it seems like it takes forever to get anywhere, but ultimately you'll be able to go further, faster. Follow mellow ridges, contour gentle hillsides, look for the path of least resistance, and when terrain forces you up, minimize kickturns by looking ahead; *switchback* before you bump into insurmountable deadfall.

If you're a sidecountry bootpacker or the going just gets too steep to skin, find a comfortable rhythm that you can maintain, and—whether skinning or booting—swap trailbreaking duty with partners frequently. Your body will tell you its most efficient pace; don't argue with it. But don't try to push a slower partner up to your pace, slow down to theirs.

For tough, deep-snow skinning, conserve energy with each stride by moving the tip of the back ski directly through the track broken by the front ski for the first half of stride to keep the tip from plowing. Keep nibbling snacks and drinking, and work out a clothing system that regulates body heat with zippers, gloves, and hats instead of adding/removing layers that require pack access. And lastly, move steadily. Bursts and stops are notoriously exhausting and inefficient.

"Being efficient is more than just packing light. It's about moving in the mountains smoothly, confidently, with every movement having purpose." —Doug Chabot



AVY SAVVY

Remember your Level 1 Avalanche Class. You did take a Level 1, right? Get off the beaten track to feel the snow for cracking or collapsing, and keep scanning for evidence of recent avalanches. Never pass up a chance to ski across a small, steep—safe—test slope. If you observe instability, skip digging a pit, you have your answer: Think of safer Plan B's.

If you're new to the backcountry or skiing out of resort access gates, digging pits can seem like a waste of time—especially if there are already tracks on a slope—but it's crucial to assess the risk before you drop in. Dig a pit in a location representative of your potential descent *[Oct. Backcountry, Pit of Lies]*, every time. Forget hand lenses, pit books, and thermometers—you're interested in one thing: the slab/weak layer relationship, and resulting likelihood of triggering an avalanche. Apply what you learned in your avy classes. Non-diggers should hydrate, fuel-up, and manage clothing/gear during the break.

Talk over your findings with all of your partners. Where is the snow unstable? Sort it out; then, decide on the best, safest skiing. The worst case is skiing sub-30-degree slopes—not a bad way to spend a powder day.

PLAN YOUR DESCENT

Agree on a safe place to regroup. Don't stop, or shoot photos of your partners while standing in the middle of a potential deposition zone. It happens all the time—a group follows great avy protocol right up until face shots freeze their brains.

ANOTHER LAP

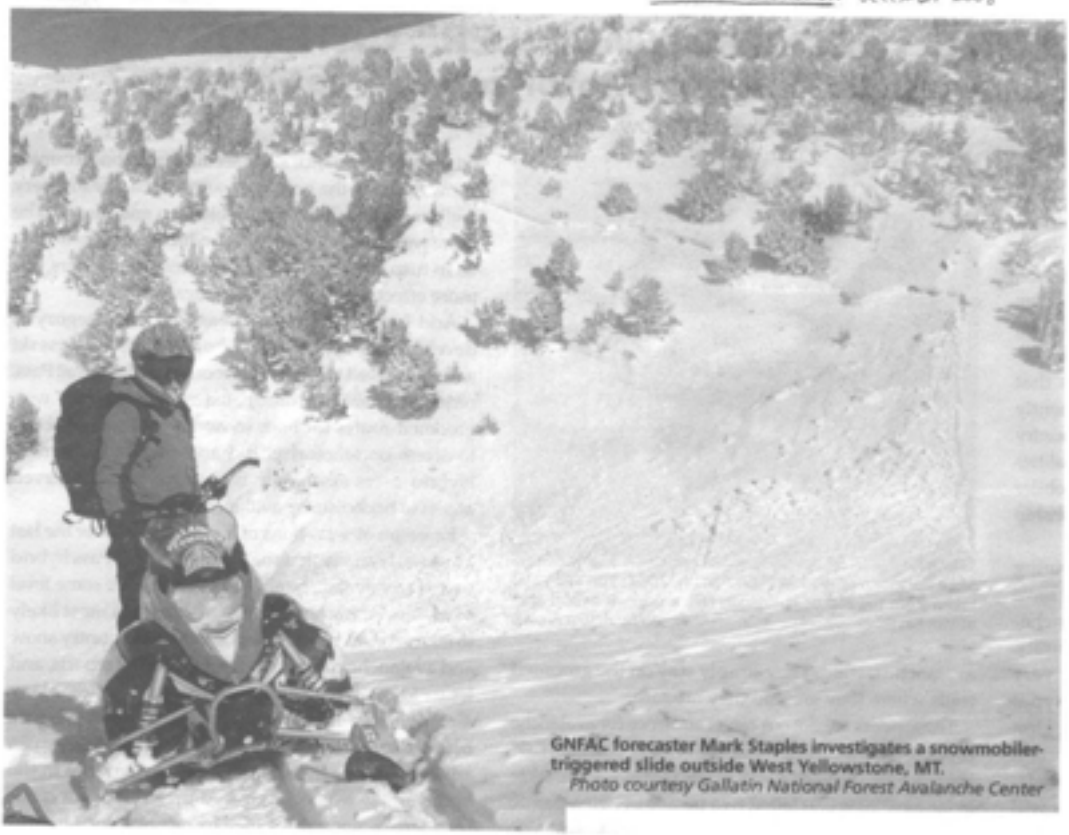
Efficient backcountry touring doesn't mean marching to the bark of a drill sergeant: "Five minute breaks, MAX!" "Set up a pace line for trailbreaking!" "You're carrying too much stuff!" The goal isn't to shave car-to-car time, but to reduce wasted energy and time. And if you did end up bringing the solar-powered margarita mixer, by all means, bust it out and soak up the views. Now that you're traveling efficiently—with purpose—you'll have the energy to go all day.

For more safe, efficient backcountry tips and techniques, check out:

SOURCES:

BACKCOUNTRY SKIING: SKILLS FOR SKI TOURING AND SKI MOUNTAINEERING
By Martin Volken, Scott Schell, Margaret Wheeler
$19.95
www.mountaineersbooks.org

FREE SKIING: HOW TO ADAPT TO THE MOUNTAIN
By Jimmy Odén
$49.95
www.freeskiing.nu



GNFAC forecaster Mark Staples investigates a snowmobiler-triggered slide outside West Yellowstone, MT.
Photo courtesy Gallatin National Forest Avalanche Center

SNOWMOBILERS.

As soon as a skier hears the word he automatically conjures up images of this user group – images that will be different from person to person. As Mike Bartholow points out in his article *(previous page)* he mainly deals with uneducated riders and his views are influenced accordingly. However, my coworkers and I at the Gallatin National Forest Avalanche Center in Montana have a much different perspective. Every field day we meet riders who have taken avalanche classes, carry rescue gear and ride responsibly in high-consequence avalanche terrain. They take their sport seriously.

Over the last nine years we've taught hundreds of local riders about avalanches and in the process they've taught us how to ride. Three of us put on close to 2,500 miles on our two sleds every winter, and during the season we easily ride more days than ski. In essence, we're snowmobilers too. If you ride outside West Yellowstone or Cooke City, I guarantee you'll see most people sledding with beacons and packs holding shovels and probes. This wasn't the case 10 years ago, but it is now. Last winter our forecast area had four full burials, all of them saved by their partners with beacons.

Bozeman Daily Chronicle 12/11/2008

AVALANCHE DANGER AHEAD

Some concern joins the excitement over new Schlasman chairlift at Bridger Bowl

ERIK PETERSEN/CHRONICLE

Skiers and snowboarders traverse the Bridger Ridge in February. With a new lift at Bridger Bowl going online, avalanche experts are worried that easier access to slopes high in the mountains could mean more skiers getting into trouble in the backcountry.

By DANIEL PERSON
Chronicle Staff Writer

As ski season ramps up in Gallatin County and a avalanche experts are worried that easier access to National Forest slopes high in the mountains could mean more skiers getting in trouble in the backcountry.

The new lift, the Schlasman chairlift, should start running next week, and will take skiers and snowboarders nearly to crest of Bridger's famed ridge.

While people have been hiking to that territory for decades, avalanche experts say a lift to the ridge, plus more liberal rules concerning backcountry access from Bridger, could lure some skiers to conditions that are over their heads.

"In the last several years, there has been an open gate that has allowed skiers to travel into the backcountry. (Now), there's easier access to out-of-bounds skiing," Ron Johnson, a specialist with the Gallatin National Forest Avalanche Center, said Wednesday. The lift "puts you right into avalanche terrain without having to work or climb for it."

Overall, the new lift is generating positive vibes in the local ski community. It marks the first expansion of terrain at the nonprofit ski area in 30 years, and will allow adrenaline seekers to fit more white-knuckle runs into a day.

(More on **Bridger**, page A8)

Overall, the new lift is causing positive vibes in the local ski community. It marks the first expansion of terrain at the nonprofit ski area in 30 years, and will allow adrenaline seekers to fit more white-knuckle runs into a day.

Bridger/ from page A1

But the regulations being put on the lift belie the fact that the easy transport to unpatrolled, uncontrolled terrain also brings some danger.

Avalanche mitigation already used on portions of the ridge within Bridger's boundaries will be used on the new in-bounds terrain opened up by the Schlasman lift, marketing director Doug Wales said.

Skiers will be required to carry avalanche beacons if they want to board the Schlasman lift, in-bounds terrain will be patrolled and canyons will be used to cause slides before skiers do.

Also, Bridger Bowl distributed a DVD about avalanche safety to all season-pass holders.

"We are going to be providing access to the ridge, and people will have the ability at Bridger to make that decision of going out of bounds," Wales said. "That was another good reason to make the lift a part of ridge management. It will be easier for people to go out of bounds."

Johnson said skiing in the backcountry adds several risks to an outing.

"All the users need to know there hasn't been any avalanche mitigation," he said. "They are traveling into the backcountry."

He said getting rescued is more difficult, as well.

"When people leave the ski area boundary and they're caught in an avalanche or injured, it's not the responsibility of the ski patrol," he said. "It's the Gallatin County Search and Rescue. It could take a while."

With that, Johnson offered these four tips for staying safe while skiing the backcountry:

- Read or listen to the daily avalanche advisory.
- Travel with a partner.
- Carry and know how to use avalanche rescue gear, which includes an avalanche rescue beacon, shovel and probe pole.
- Only travel one at a time in avalanche terrain.

Daniel Person can be reached at dperson@dailychronicle.com or 582-2665.

STAYING ON TOP OF SAFETY

Bridger Bowl working harder to prevent avalanches

JAMES WOODCOCK/Gazette Staff

Bridger Bowl Ski Patrol director Fay Johnson kicks away a cornice on the top of the Bridger Mountains above the ski area Friday during an early-morning avalanche patrol.

Story By
BRETT FRENCH
Photos By
JAMES WOODCOCK
Of The Gazette Staff

BOZEMAN — Peter Carse doesn't like to see his work on the front page.

"Just so you know, we've been working real hard to stay out of the news," the snow safety director at Bridger Bowl ski area said late last week.

Carse is likely more sensitive to attention since three inbounds skiers at Western resorts have been killed in avalanches this winter. Skiers and snowboarders traditionally consider inbounds areas safe because of the actions that people like Carse and the ski patrol take to reduce avalanche risk.

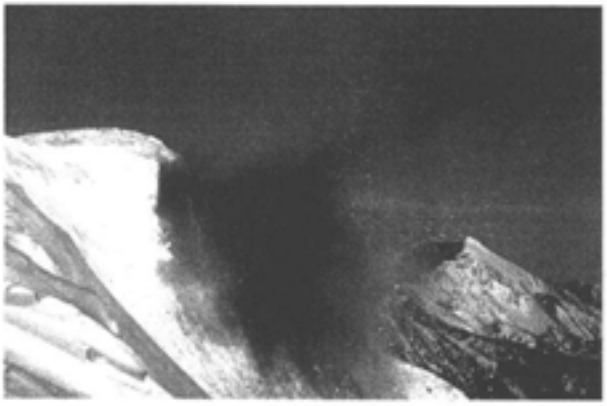
"The three avalanche fatalities got a lot of press and people are thinking, 'Oh my god, it's not safe anymore,' " said Doug Chabot of the Gallatin National Forest Avalanche Center in Bozeman, which issues daily snow reports for southwestern Montana. "It is safe. It's not widespread. It's not an ongoing problem. The resorts have taken care of it."

To watch the Bridger Bowl Ski Patrol set off charges on the ridge, and to see avalanche reports and forecasts from southwestern Montana and across the United States, click the links in this story at **billingsgazette.com**

Please see Safety, 11A

Inside on Outdoors:
Bridger Bowl ski area opens first new lift in 30 years, 1C

Richmond inspects a "hangfire" area of snow that did not release from a previous charge.



Above, Richmond throws a black-powder charge with a lit fuse that takes about 150 seconds to work. Johnson stands ready to help if needed. At left, the charge explodes on the face of the Bridger Mountains. The charges are powerful enough to blow a hole through half-inch steel.

Safety

Continued from 1A

At Bridger, as well as at other resorts, there's a daily routine to make sure that avalanches don't surprise inbounds skiers.

The mountain bustles to life around 7 a.m. as the ski patrol rides a series of lifts to reach the top of the mountain.

The area is quiet except for the lifts' squeaky wheels. Stars twinkled in the black sky as the mountain's 8,400-foot ridge loomed above in white silence.

Once they've arrived on top, the 16 ski patrollers (more than 20 on weekends) travel out along the two-mile ridge's knife edge to the south and west. Steady, 25-30 mph westerly winds rise up from the Gallatin Valley, buffeting the patrollers as they make their way to the five avalanche control routes.

The bonus to this cold morning work is watching the sun rise over the Absaroka Mountains to the southeast, slowly lighting up the stunning 360-degree views of other ranges – the Crazies and Castles to the east, the Gallatin and Madison ranges to the south, and back west the Tobacco Roots and Elkhorns. At the center of this view, Bridger Bowl carves a fat pizza slice from the ridge to the base area 2,000 feet below. The ski area is perched between the 9,000-foot tops of Saddle Peak to the south and the rocky spires of Ross Peak to the north.

Walking the ridge

The patrollers travel in pairs for safety, often taking off their skis and slinging them over their shoulder to hike up steps kicked into the hard-packed snow.

Fumaroles – warm volcanic vents – produce armpit-deep holes in the snow to be avoided. Along the way, the patrollers kick the edges off of wind-loaded cornices and eyeball the snowpack for weak-looking areas.

"We used to blow up huge cornices, it looked cool," said Doug Richmond, assistant ski patrol director. "Now we do the daily dirty work, so it's not as spectacular."

Black-powder charges are built and detonated in spots where avalanches look imminent and need a little coaxing. Richmond tossed a charge onto a hangfire – an area that didn't release after a previous detonation – above Alpine Lift on Friday. The charges are powerful enough to blow a hole through half-inch steel. The fuses are typically 150 seconds long, giving the patrollers plenty of time to get to safety.

To place them more precisely, the patrollers will sometimes use a line to lower the charge into position. They also use wires suspended above narrow chutes and gullies to slide the charge down into areas too dangerous to reach on foot.

Bridger also has a 75 mm howitzer that can fire rounds into its South Bowl. The rounds are surplus from the Korean War and no longer produced. With only 19 rounds left, the ski hill is likely to finish off its supply and retire its gun this year.

Cold routine

Little has changed in the morning avalanche routine for ski patrollers over the past 30 years, according to Fay Johnson, director of Bridger's ski patrol. What has changed is Bozeman-area skiers' and snowboarders' increasing appetite for untracked powder, extreme lines and backcountry experiences.

"There's been such an increase in skier traffic on the ridge," she said. "It has affected the way we do our job."

That's meant that the ski patrol has taken a more prominent role in education and avalanche awareness for the skiing and snowboarding public. This year, the ski area offered avalanche transceivers at a discount to all season pass buyers and sold about 500. And there are more signs warning people about the dangers of skiing out of bounds.

Education was stepped up a notch this year as the resort opened a lift that accesses expert-only terrain, the new Schlauman's Lift. The 311 acres of narrow chutes and wide bowls to the south of the resort's old boundary is limited to skiers and snowboarders with avalanche transceivers. A partner and shovel are strongly recommended.

"It's more of a backcountry type of experience and we want people to be adequately prepared," said Doug Wales, Bridger's marketing manager. "We're just making people aware of the terrain they're going into."

Bridger also implemented a more relaxed out-of-bounds access policy this year for surrounding national forest land, terrain not subject to the patrol's avalanche reduction efforts.

"We're excited about it," said Chabot, of the avalanche center, himself a backcountry skier. "But if you head out of bounds, you need to be hyper aware that it is a whole different world out there. It's a backcountry situation that you have to treat with respect. There's a huge difference. Just a few feet over that rope line is a different world."

Danger widespread

Although this winter has been unusual for its three avalanche deaths at ski resorts in Wyoming, Utah and California, skiing at resorts is still safe, Chabot said.

Considering the tens of thousands of people who ski every year, avalanche deaths are rare, he added. It's also unusual that the instability of the snowpack is widespread across the West, he said.

"We're all kind of facing a similar problem," he said. "We got early-season snow, it sat there, then we got cold temperatures. That turned the snow into big sugary grains of snow."

Those sugary grains can act like ball bearings, especially as heavier snow builds up on top of that weak layer. In spots, the weak layer has strengthened, Chabot said, but not uniformly, so that one slope may be strong while an adjacent one is ready to slide.

"At the ski areas, they use explosives to try and control all of that, the deep instability problem," Chabot said. "They do a phenomenal job of keeping these areas safe."

But in the backcountry, that's not the case, as evidenced on Saturday when three snowmobilers were killed in separate avalanches across southwestern Montana.

"It's tricky, it's not obvious," Chabot said. "It's a low-frequency, high-consequence situation. Because when there is a slide, it's taking the full season's snowpack."

Contact Brett French at french@billingsgazette.com or at 657-1387.

By the numbers

- 16 — Avalanche fatalities so far this winter.
- 9 — Snowmobiler victims among the total.
- 3 — Avalanche deaths in Montana this winter; all occurred Saturday and involved snowmobilers.
- 2 — Avalanche fatalities in Wyoming this winter.
- 36 — Avalanche fatalities last winter.

Not all "motorheads" are clueless. A couple years ago another forecaster and I were walking on debris investigating a recent avalanche. From far away two riders raced towards us and jumped off their machines. Before we could say anything, one guy got his beacon out while the other snapped together his shovel and yelled, "How many are buried?" So much for stereotypes.

I urge everyone reading these TAR snowmobile articles to have an open mind, and rethink your hard-held beliefs about snowmobilers. I've seen riders do incredibly stupid things and I've seen skiers be complete dopes too. But we're helping more and more riders take responsibility and get educated. Our job as avalanche professionals is to be an unbiased part of the solution. If you think that all riders are careless, uneducated, and have a death wish, please stick to educating skiers or other user groups. If you don't, they'll immediately see through your façade, making legitimate snowmobile education much more difficult.

Doug Chabot is director of the GNFAC and rides a 2008 Yamaha Nytro-MTX 900cc when he's not kick-turning down 35-degree slopes in the backcountry.

SHOPPING FOR SAFETY

This holiday, give the gift that keeps on giving: backcountry ski gear

BY DOUG CHABOT

Christmas is only days away and financial markets are in the tank. We can do our part to help stimulate the economy by going skiing — after shopping for new backcountry gear! No matter if it's a recession or depression, we can't put a price on powder turns.

What I carry every day in the field offers some gift ideas besides a new pair of undies or a CD of Christmas carols. My pack and pockets hold the staples of avalanche rescue gear and a few additional goodies to help me in a tight spot.

CHRIS KERR

Can't get there from here ... without the right gear. Bridger Bowl backcountry.

First and foremost is my avalanche beacon. I supply it with good alkaline batteries and never let the power fall below 80 percent. The beacon is strapped to my body, not tucked in a pocket of clothing where it can fall out. All beands are compatible but some have more features than others, like a digital display and a multiple burial function. The more expensive ones have two antennas (vs. one) and can fine search more accurately, a feature that's worth the extra money.

For tools, my shovel is used the most, besides skis and poles. I use it for digging snowpits and unsticking my truck, but its primary purpose is to dig out my partner if he or she is buried in a slide. I can only imagine what would go through my mind if I was buried, but I'd certainly be hoping my partner had a good shovel made of metal with a big scoop and solid handle; not a cute plastic one. The plastic ones can break plus their blade is much smaller. Mine has a telescoping handle which digs more efficiently and saves my back.

A third piece of vital gear, which contrary to popular belief is not an optional one, is an avalanche probe. It needs to be at least 230 cm in length in order to be effective in the typical snow depths of avalanche debris. The thin, straw-sized probes that fit into the handle of a shovel aren't going to cut it; they're not very long and they easily bend. It's better than nothing, but that shouldn't be a benchmark. Each brand has its own auto locking system which the user needs to get good at deploying — with gloves on.

Another compulsory piece of gear is an inclinometer. These cheap, plastic cards measure slope angles. I carry mine in my pocket so I can whip it out in an instant to find out if I'm in avalanche terrain, defined as any open, snow-covered slope steeper than 30 degrees.

Near the top of my pack, housed in protective Tupperware is my pit kit, consisting of a waterproof notebook, pencil, crystal card, ruler, hand lens and compass. I consider the pit-kit optional for recreational skiers, but my job requires that I dig and record all the layering in the snow. This kit is essential for tracking changes over time, but not imperative for deciding if a slope is stable enough to ski. For that all I need is a snow saw and inclinometer. With these I can quickly saw perfect snow columns for a Rutschblock or compression stability test on slopes approaching 30 degrees. I like a saw that attaches to a ski pole since I have to cut 3-4 feet deep in most instances.

Near the bottom of my pack is the first aid kit; a small pouch with a few gauze bandages, roll of tape, rubber gloves and pain medication. I'm not looking to do surgery in the field, but just to patch someone up well enough to get to the car. Alongside that is my ski repair kit: a Leatherman, six zip ties, duct tape and baling wire. If push comes to shove I can always limp out on one ski. It might take awhile, which is one reason I always carry a small LED headlamp.

At the very bottom of the pack are items which in good years never see the light of day. In the event of a real emergency when I have to spend the night out or, worse, leave an injured partner, I carry a few things to make a bitter, uncomfortable night survivable. A puffy jacket with a hood and spare pair of gloves are always welcome to a chilly, wet, injured skier. In my lightweight bivy sack someone can stay dry for hours. And sealed in a sandwich-sized Ziploc are matches, toilet paper and a fire-starter stick to make a downright cozy evening. I always think about the worse case scenario, and leaving behind an injured partner is one of the grimmest. Everything mentioned in this paragraph totals no more than 2 pounds. It's a lightweight alternative to a night of suffering and may well mean the difference between life and death in the backcountry.

Knowing your current location and heading is essential but difficult to achieve if visibility is low or new snow covers your tracks. I've been saved more than once by my GPS loaded with topo maps. It has steered me away from wrong drainages and spared me hours of bush-whacking. As a backup, I carry a tear resistant topo map of the area, but rarely have to use it.

Finally, tucked away in the lid of my pack is my only luxury item, a pair of hand warmers— the rip open and shake type — which pump out oven hot temperatures. It feels like cheating every time I use them, but I hate the "screamin' barfies" that come with re-warming numb hands.

Listing everything makes the load seem onerous, but it's not. All this fits into my 35 liter AvaLung pack, another fancy, hi-tech piece of gear that allows me to breath under the snow if I get buried. The entire kit weighs in at 14 pounds, a manageable amount.

Enjoy your holiday, help stimulate the economy and don't forget to contact the Avalanche Center for up-to- date weather and snowpack information (www.mtavalanche.com; 587-6981). ♦

Doug Chabot is the director of the Gallatin National Forest Avalanche Center. He can be reached at dchabot@fs.fed.us.com.

NEW RULES, NEW WORRIES

Taking a closer look at Bridger Bowl's new backcountry access policy

BY DOUG CHABOT

CHRIS KERR

The boundaries of Bridger Bowl are now open. Anyone — adult or teenager, at any level or lack of personal responsibility — at any time has the freedom to exit the controlled ski area into the uncontrolled, wild and potentially deadly backcountry.

All skiers will be happy about two new developments in the Bridger Range. First, Bridger Bowl added 311 acres of expert terrain, the first expansion in 30 years. Second, backcountry access from the ski area will be a lot easier starting in December. Skiers will be able to ski the west side of the Ridge from Northwest Passage to Z-Chute as well as Saddle Peak from the new Schlasman's chair lift. Like every local backcountry skier, I'm really excited about the open boundaries.

I'm also worried.

I'm worried because increased access means increased personal responsibility, including getting avalanche education, investing in good rescue gear, finding a solid partner, calling the avalanche advisory, and creating a flexible, safe travel plan. I've investigated all too many avalanche accidents, and time and time again I find adults generally do a poor job of being personally responsible. Adults!! Teenagers, as a whole, are even worse. They have more accidents, take bigger risks and are more likely to be influenced by peer pressure.

The boundaries of Bridger Bowl are now open. Anyone — adult or teenager, at any level or lack of personal responsibility — at any time has the freedom to exit the controlled ski area into the uncontrolled, wild, potentially deadly backcountry. Like trailheads everywhere, access is free and open and does not discriminate by age or skill. You are free to recreate and free to die — it's the American way.

Adults are the role models for kids, and adults get into trouble in the backcountry. And now kids are heading into the backcountry. This is a huge concern for the Avalanche Center and Bridger Bowl. Many young adults already have avalanche gear and ski the Ridge. By crossing the boundary they are literally just a few steps away from heading into avalanche terrain.

Picture this grim scenario: Mom drops off her 14-year-old son at the base area. As she drives toward Bozeman he starts up Saddle Peak, a backcountry area prone to avalanching. He's a talented skier who's been on the Ridge before and has his required avalanche transceiver, a Christmas gift worn like a badge. Unfortunately, he's clueless about backcountry avalanche danger. Since avalanches are all about timing, maybe he's fine. And maybe he's not. Maybe he gets caught in a slide and dies.

Mom doesn't know about avalanche terrain or that open boundaries require serious decision making skills. She certainly didn't know her son could easily slip out of bounds into the uncontrolled backcountry and die.

"You mean 14-year-olds can just head outside Bridger Bowl into dangerous terrain?" she asks. (Or should have asked.)

"Yup."

"There's no one to stop them?"

"Nope. They're on their own."

Instead of just worrying about the situation, the Avalanche Center partnered with Bridger Bowl to warn all backcountry users, especially parents and their kids, about the dangers of avalanches immediately outside the ski area. Together we made a 10-minute movie titled *Stay Alive*. The Friends of the Avalanche Center hired 16-year-old Sam Lowe-Anker to film it, while Bridger Bowl made 5,000 DVDs to hand out to every season pass holder. The movie, shot by a teen for his peers and parents, is an entertaining warning on the differences and dangers between the ski area and the backcountry. It's free, and you can view it online too at (www.mtavalanche.com/videos). I strongly urge every parent of kids who ski to watch "Stay Alive" and take responsibility for setting guidelines with their kids instead of blindly letting them ride the bus, or dropping them off at the ski area with insufficient backcountry education and without any worries. PARENTS: I give the terrain outside Bridger Bowls boundaries an R rating, definitely not PG-13.

The Avalanche Center partnered with Bridger Bowl to warn all backcountry users, especially parents and their kids, about the dangers of avalanches immediately outside the ski area. "Stay Alive," a movie made by Sam Anker-Lowe, is an entertaining warning on the differences and dangers between the ski area and the backcountry. It's free, and you can view it online too at (www.mtavalanche.com/videos).

Out of bounds access at Bridger Bowl will be gained from the ridge, new lift, or backcountry gates. Every skier and boarder is required to have an avalanche transceiver in order to gain the ridge or to ride Schlasman's, and Bridger will enforce this requirement. The ski patrol also strongly recommends that everyone ski with a partner and shovel; the bare bones minimum for anyone recreating in the backcountry.

The two major backcountry areas opened by the Schlasman's lift are Truman Gulch on the west side of the range and Saddle Peak. Each poses different challenges and dangers. Dropping off the backside of Bridger Bowl leads to Truman, a drainage fed by many long, open slopes with steep, serious avalanche terrain. Touring gear is needed to climb back out since Truman Gulch leads to the creek on the opposite side of the ski area. More importantly, the snowpack on the west faces are usually thinner, weaker and in many years more unstable than the snow on the east side. It is a mistake to assume that conditions are the same throughout the range.

Saddle Peak has a different set of dangers. First, it will be possible to glide back to the new lift from the summit. No skis or touring gear required. Anytime an activity gets easier or more convenient people tend to think it's safer, but this is definitely not the case here. The entire east face of Saddle Peak is prone to avalanche. And if that's not bad enough, the slopes end in large cliffs which are deadly if you don't know where you're going or get swept off your feet and over one.

Whenever you head out of bounds use basic backcountry precautions. Travel with a partner. Carry avalanche rescue gear. Know where you're going. And know the avalanche danger. Most important, take an avalanche class. Make sure your partner takes one as well. Daily avalanche advisories and an updated education schedule can be found at www.mtavalanche.com. If you get injured or buried in a slide it's going to be up to your partner to save you since rescue is, at best, hours away. ♦

Doug Chabot is the director for the Gallatin National Forest Avalanche Center. He can be reached at 587-6984 or at dchabot@fs.fed.us.com.

BOZEMAN DAILY CHRONICLE

THE BIG SKY

THURSDAY, DECEMBER 25, 2008

CITY DESK: 587.4491 OR E-MAIL: CITYDESK@DAILYCHRONICLE.COM

Avalanche centers warn of hazardous conditions

JACKSON, Wyo. (AP) — Avalanche centers around the Rockies warned that backcountry conditions were hazardous and likely to become even more dangerous with approaching storms.

As centers in Colorado, Montana, Utah and Wyoming issued avalanche warnings Wednesday, an avalanche killed two snowmobilers on Logan Peak in northern Utah. The Utah Avalanche Center warned people not to venture into the backcountry.

Bob Comey, director of the Bridger-Teton National Forest Avalanche Center in Jackson, said his area already had a weak snowpack. He said additional snowfall up to 2 feet was forecast.

Comey said the center anticipated a major avalanche cycle during the storm and immediately afterward. He said conditions were likely to remain dangerous for some time.

We have a weak snowpack, and we have a big storm coming in with strong winds ... we're expecting to see large avalanches."

– Bob Comey, Bridger-Teton National Forest Avalanche Center

"We are seeing natural avalanche activity," Comey said. "We have a weak snowpack, and we have a big storm coming in with strong winds. So we expect to see more avalanches. With the accumulated snow from the past several storms, plus the new snow that's anticipated, we're expecting to see large avalanches."

The National Weather Service predicted snow in Jackson every day through the weekend.

"It's a good time to back off and do something else," Comey said of the possibility to skiing or snowmobiling in the backcountry.

The Gallatin National Forest Avalanche Center in Bozeman, Mont., reported Wednesday that the avalanche danger in the mountains near Cook City, was high on all slopes steeper than 35 degrees and on any wind-loaded terrain. The center reported that four people were partially buried Saturday and that conditions Monday were dangerous enough to keep center personnel from entering avalanche terrain in the area.

The Montana center rated the avalanche danger as considerable in many other mountain ranges in the state.

Gallatin avalanche danger remains high

By Chronicle Staff

The danger of avalanches occurring in backcountry sections of the Gallatin National Forest remains high, the Gallatin National Forest Avalanche Center reported Friday.

"During the past two weeks, there have been only two or three days without snowfall" and that "nearly continuous snowfall has kept the snowpack at its breaking point," Mark Staples wrote in Friday's avalanche report on the center's Web site.

"Natural and human-triggered avalanches have occurred on many slopes [that] have been reloaded by new snow and wind-drifted snow. These slopes will produce more avalanches. … The snowpack is very unstable," Staples wrote.

The avalanche danger is high on all slopes in four areas:

- Southern Gallatin and Madison ranges;
- Lionhead area near West Yellowstone;
- Mountains around Cooke City;
- and the Washburn Range in northern Yellowstone National Park.

All the new snow means that the snowpack is "continually stressed and has not been given time to adjust to the loading," Staples wrote. "Additionally, much of this snowfall has been accompanied by high winds, which have scoured some slopes and further loaded others. Skiers and riders have reported significant avalanche activity as well as widespread collapsing and cracking of the snowpack."

In some cases, the weight of a skier or snowboarder alone can produce an avalanche, according to the report, posted at www.mtavalanche.com.

In the Bridger, northern Madison and northern Gallatin ranges, avalanche activity has decreased, but "most avalanche activity has been confined to steep wind-loaded slopes where human triggered avalanches remain probable." The danger level in those ranges is considerable on wind-loaded slopes and moderate on other slopes.

Temperatures were expected to drop to near 10 degrees Friday evening, with winds blowing 15 mph, with snow moving in from the southwest and a cold front moving in from the north, according to the report posted at www.mtavalanche.com.

Eleven people have died in avalanches in the United States this winter, but none in Montana.

However, "Several close calls have occurred near Cooke City," Staples wrote. "Please continue to have fun and play it safe."

BZN Chronicle 1/03/09

Skiers ease into newly open terrain at Bridger

Avalanche danger high in southern Gallatin

By DANIEL PERSON
Chronicle Staff Writer

Avalanche danger remained high in the area Monday, but all is well so far this winter around a new ski lift some feared would exacerbate avalanche dangers in the Gallatin National Forest.

The new Schlasman's Lift at Bridger Bowl has been running since Dec. 19, and so far has not seen serious avalanche or injury, Bridger Bowl marketing director Doug Wales said Monday.

The lift takes skiers and snowboarders to just below the ski area's ridge, famous for its steep-and-deep terrain. Aside from the extreme terrain the lift serves within Bridger's boundaries, some avalanche experts said out-of-bound terrain easily and legally accessible from Schlasman's posed serious avalanche danger if accessed by people unfamiliar with backcountry procedure.

INSIDE
Avalanches strike Jackson Hole resort; snowmobilers killed in B.C.
PAGE A4

But Wales said so far the biggest problem in-boundary skiers and snowboarders have faced is getting "cliffed-out."

"People are getting used to the terrain," he said. "If you can't see it, don't ski it."

And Mark Staples, an avalanche expert at the Gallatin National Forest Avalanche Center, said that people have been acting responsibly so far this season.

"My impression so far is (the lift) is a really great opportunity to get out and ski in the forest, and I think people are making good decisions," he said.

Staples said those decisions include skiing terrain one at a time, carrying avalanche gear and checking avalanche conditions.

"People are doing a really good job doing those three things," he said.

So far this year, the avalanche danger has been the highest in the southern stretches of Gallatin County.

The avalanche center Monday put out another backcountry avalanche warning for the southern Gallatin and southern Madison ranges, the Lionhead area near West Yellowstone, the mountains around Cooke City and the Washburn Range in northern Yellowstone National Park.

A similar warning went out Friday, but Staples said Monday's warning had the added factor of wind, which drifted lots of snow onto slopes that couldn't handle the extra weight.

Still, like at Schlasman's, the avalanche dangers have yet to result in any injuries in the Bozeman area, Staples said, again attributing that to good education and behavior among backcountry winter users.

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Bozeman Daily Chronicle, 12/30/08

SUNDAY
CHRONICLE
DAILYCHRONICLE.COM SUNDAY, JANUARY 11, 2009 Serving South

Avalanches strike area mountains, no deaths

Skier caught in two slides in Bridger Mountains; snowmobiler injured in slide south of Big Sky Resort

By JODI HAUSEN
Chronicle Staff Writer

A Bozeman skier and a group of North Dakota snowmobilers were caught in three separate avalanches in the mountains of Gallatin County Saturday afternoon, but only one man was injured.

"We've got very sensitive snow right now," Gallatin County Sheriff's Sgt. Jason Jarrett said Saturday evening. "These are exceptional avalanche conditions and the issue becomes, is the fun worth it? (Everybody) was very lucky (today)."

The first avalanche was triggered by a group of eight snowmobilers from North Dakota in McAtee Basin just south of Big Sky Resort. A 39-year-old man was injured in that slide. Details on his condition were not available at press time.

The other two avalanches took place on the west side of the Bridger Mountains, triggered by a lone skier, a 24-year-old Bozeman man, who had dropped down from the Bridger Bowl ski area. He was not injured.

(More on **Avalanches**, Page A8)

Avalanches/ from Page A1

"We've been watching with interest and worry with the opening of the Schlasman chairlift," said Jarrett, who is also coordinator for Gallatin County Search and Rescue. "When you step out of bounds there, there is no avalanche control, no ski patrol and no roads. If you get into trouble (there), you're in real trouble."

Jarrett declined to identify the skier or snowmobilers citing legal concerns about privacy.

The rescue calls were received about an hour apart.

The 150-square-yard Big Sky slide was triggered around 2:30 p.m. when the snowmobilers were traversing the bottom of a mountain, about six miles from the nearest trailhead, Jarrett said.

Two riders were buried. One was able to dig himself out, but the other was buried under 6 feet of snow. Others in the group dug him out within about 10 minutes, according to rescue reports.

Initially the man was semi-conscious and had difficulty breathing. But his condition improved as rescuers waited for a helicopter to air lift him to Bozeman Deaconess Hospital.

But as the helicopter was on its way, around 3:40 p.m., the second and third avalanches were reported, Jarrett said. Because the injured man near Big Sky appeared to be stable, rescuers with a specialized snowmobile opted to take him on a sled to a waiting Big Sky Fire Department ambulance and then to the hospital, according to reports.

The helicopter, meanwhile, was diverted to the west side of the Bridgers to find the Bozeman skier who had called for help.

The skier said he had gotten caught in one avalanche in the Jones Creek area, skied for the trees, got caught in a second slide and lost a ski, Jarrett said.

He was not injured, but he was in trouble, Jarrett said.

The new lift to that area of the Gallatin National Forest from Bridger Bowl poses challenges, he said.

"We've been worried about the west side of the Bridgers because of the new access," Jarrett said. "We're glad people have more access, but with more access comes more personal responsibility."

Rescuers were able to find the man and he was brought by helicopter to search-and-rescue headquarters on Tamarack Street in Bozeman, where a friend picked him up.

The Gallatin National Forest Avalanche Center's report for Saturday indicated that "stability has definitely improved, but this is not a big green light to go everywhere. This means good skiing or riding and stable slopes can be found, but many unstable slopes can also be found."

Thursday, January 8, 2009 Outthere E-mail outthere@dailychronicle.com
Southwest Montana's recreation and adventure resource

ANATOMY OF AN AVALANCHE

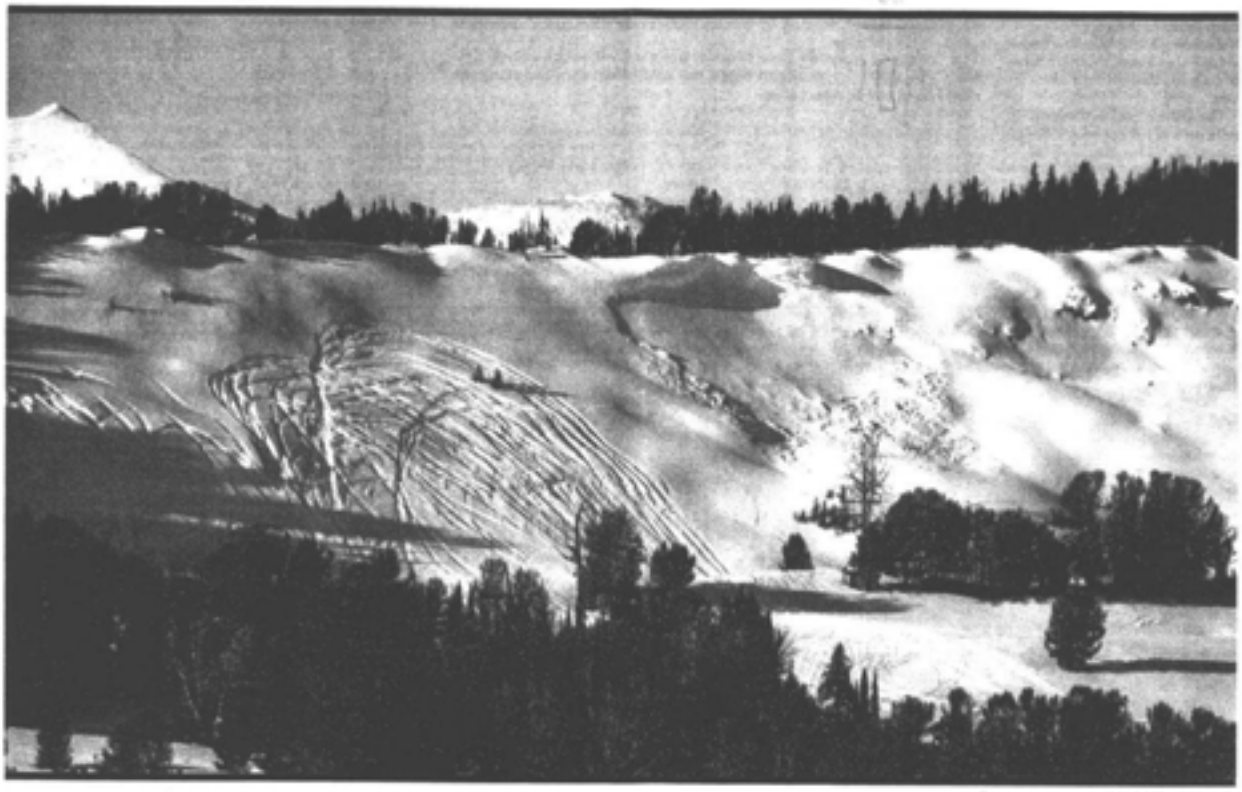

PHOTO COURTESY GNFAC

This avalanche was triggered by a snowmobiler on the slopes of Buck Ridge near Big Sky on Sunday. At left are snowmobile tracks with evidence of the slide visible at right. Avalanche danger in Southwest Montana has been high over the last few weeks.

By BEN PIERCE
Chronicle OutThere Editor

Avalanche danger has been high in many areas of Southwest Montana this winter. Numerous natural and triggered avalanches have been reported in the southern Gallatins, southern Madisons, the Lionhead area near West Yellowstone and the mountains near Cooke City. While conditions have improved over the last week, avalanche danger remains elevated in several areas.

"We were getting enough snow to see many natural avalanches occurring," said Mark Staples, an avalanche specialist with the Gallatin National Forest Avalanche Center. "Where as now the snowpack has had time to adjust to that load and it can support all the snow that has fallen up until now, it may only take a skier, snowmobiler, or more snow to tip the balance."

"When the danger is high and we are seeing natural avalanches and debris, people are thinking about it," Staples said. "Once this activity subsides and there are beautiful slopes and powder, it is easy to feel like the situation is different overnight. We may be in a more dangerous situation because of the human factor."

While avalanche research is a complex and evolving field of science, a general understanding of how an avalanche occurs is essential knowledge for backcountry recreationists.

ILLUSTRATION COURTESY GNFAC

This illustration shows the different layers of snow found in the snowpack. A weak layer, a slab of snow above it and a trigger are the three ingredients that cause an avalanche.

Avalanches are caused by weak layers in the snowpack covered by a slab of more cohesive snow. On a slope over 30 degrees, the combination can result in a slide.

There are three basic types of weak layers involved in most avalanche accidents. These layers include depth hoar, faceted snow and surface hoar. All three types of weak layers form commonly in Montana.

Depth hoar forms when we have a shallow snowpack in the early season combined with low temperatures.

"Typical Montana weather is favorable for each of these weak layers," Staples said. "This season, snow from October and November was exposed to unseasonably warm weather and an ice crust formed. Below zero temperatures in December created depth hoar crystals."

Faceted snow crystals are formed when we experience warm sunny days and clear cold nights. A period of days with those alternating conditions can form a weak layer of faceted snow near the surface, though these crystals can form much more rapidly.

"It is a metamorphic process where the snow changes from a new snowflake to an angular faceted snow crystal," Staples said. "(Surface facets) can form within the span of a morning."

The final weak-layer type, surface hoar, forms during clear cold nights.

"It is the exact same process as when frost forms on your windshield," Staples explained. "Except on snow it forms these fragile, feathery crystals. They are weak and can be blown down by the wind or destroyed by the sun before they get buried by subsequent snowfall."

As the winter season progresses and new dumps of snowfall accumulate on mountain slopes or are driven onto those slopes by wind, multiple weak layers comprised of different types of snow crystals become buried in the snowpack.

"The crystals themselves don't cause the danger, it is the slab on top," Staples said. "For an avalanche to happen you need a slope of at least 30 degrees, a weak layer and a slab on top."

The additional ingredient in most avalanche accidents is a trigger. There are two main types of triggers — natural and human-caused.

(More on **Avalanche**, Page C2)

Avalanche/

from page C1

Natural triggers include new snow and wind-blown snow. A cornice formed on a ridgeline that collapses above a slope causing a slide is an example of a natural trigger.

Human-caused triggers can be intentional, such as a ski patroller using a charge to mitigate avalanche danger, or unintentional, such as a skier or snowmobiler navigating an unstable slope.

"It is a matter of strength versus stress," Staples said. "Once you have a weak layer and you add more snow to it, then it is a matter of what it takes to tip the balance."

According to the National Snow and Ice Data Center, there are three distinct parts that define an avalanche.

"The starting zone is the most volatile area of a slope, where unstable snow can fracture from the surrounding snowcover and begin to slide," NSIDC says on its Web site, www.nsidc.org. Starting zones can occur at any point on a slope, but are typically located higher on slopes, beneath cornices and in bowls.

The avalanche track is defined as the path of the slide as it progresses down a slope. An avalanche builds speed and strength over time and can wipe out anything in its path. Avalanche tracks are often evident on hillsides where stands of trees have fallen under the force of a slide.

Finally, the runout zone — or deposition zone — is the region where snow and debris piles when an avalanche comes to a stop.

PHOTO COURTESY GNFAC

This avalanche at Saddle Peak south of Bridger Bowl, which occurred on March 10, 2007, let loose just below the wind-blown cornices along the ridgeline of the Bridger range.

"Although underlying terrain variations, such as gullies or small boulders, can create conditions that will bury a person further up the slope during an avalanche, the deposition zone is where a victim will most likely be buried," NSIDC says.

"Over 90 percent of the time, it is the victim or someone in their party that triggers an avalanche," Staples said. "What that means is that we are in control and we have a choice."

Staples said the first step backcountry users can take before visiting avalanche terrain is to call the avalanche advisory at 587-6981 or visit www.mtavalanche.com. The GNFAC updates its avalanche report on a daily basis assessing conditions across Southwest Montana. Second, Staples encourages individuals to take an avalanche education course. Third, backcountry users should carry a probe, shovel and transceiver.

Still, the risks of travelling in avalanche terrain are considerable and the safety of knowledge and preparedness is limited. Twenty-five to thirty percent of all people caught in avalanches die of trauma. Those who escape trauma but are buried have just 15 minutes to be dug out, according to Staples.

"The thing we really like to drive home is to go one at a time in avalanche terrain," Staples said, "so if an avalanche happens, there is someone there to dig you out."

Ben Pierce can be reached at bpierce@dailychronicle.com and 582-2625.

Crews called out for fourth avalanche

Winter accidents and avalanches continue, but education can divert catastrophe

By NATASHA COLLINS
For the Chronicle

Search-and-rescue crews were called out again Sunday when a 39-year-old man injured his knee in a snowmobiling accident on Two Top Mountain near West Yellowstone.

The man's snowmobile hit a tree, according to Sgt. Jason Jarrett, head of Gallatin County Search and Rescue. The man was taken to Bozeman Deaconess Hospital. Details of his injuries were not available at press time.

"This year we have weak, unstable snow near the ground and this is causing problems everywhere. Weak snow leads to avalanches."

– Doug Chabot, Gallatin National Forest Avalanche Center

That accident came on the heels of two search-and-rescue calls involving avalanches Saturday, heightening awareness of the need for caution when snowmobiling or skiing in the backcountry.

"This year we have weak, unstable snow near the ground and this is causing problems everywhere," Doug Chabot, director of the Gallatin National Forest Avalanche Center, said Sunday. "Weak snow leads to avalanches."

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High country danger

Recent storms make backcountry snowpack unstable

y Greg Lemon, The Sun

If you're an inbound resort skier, all te snow southwestern Montana has re-eived in the past two weeks is exhilarat-g.

But if you're an avalanche forecaster r a backcountry adventurer, the condi-on of the snowpack is cause for serious 'orry.

An avalanche warning for the moun-ains of southwest Montana was issued 'ec. 29 and lasted until Jan. 3. During hat time Cooke City received nearly five et of snow and West Yellowstone got bout four feet, said Doug Chabot, ava-nche forecaster with the Gallatin Na-onal Forest Avalanche Center in Boze-an.

"Everyday we were getting tons of now down there," Chabot said.

But it wasn't just the snow that made te backcountry slopes dangerous. High 'inds loaded slopes on the lee side of idges and mountain tops with deep now, he said.

But all of this new snow was laid own on an unstable layer of snow from arly in the season.

It's hard to remember, but back in November, Montana and most of the West was in the midst of a fairly mild fall. But in the early part of December, a little snow fell, finally blanketing the high country. However, after this snow fell the weather turned dry and bitterly cold.

The cold dry weather changed the shape of the snow crystals already on the ground. Rather than being good stable snow, the snow crystals became weak and brittle – or what experts call faceted, Chabot said.

"It's a really poor layer to be holding up the seasons snowfall," he said. "Then Christmas week comes and the snow starts and it wasn't just a few little snow storms, it was a pretty long series of storms that just never let up."

The heavy snow on the weak base layer set up the perfect scenario for extremely unstable snowpack, Chabot said.

Over the past week, as snow accumulated in the high country, natural slides were a regular occurrence, he said.

"When we're adding that kind of snow and that kind of weight to the snowpack quickly, we see the avalanche activity rise quickly," Chabot said.

In different conditions, the weak base layer could have stabilized as snow accumulated gradually, but when the snowpack deepened quickly, the instability increased.

There's been so much snow that even some of slopes that have had avalanches have already been reloaded with snow and are primed to slide again, he said.

"We're just hoping we're not going

Please turn to HIGH COUNTRY on A3

HIGH COUNTRY
continued from A1

to see anymore really cold weather that keeps burying this layer," Chabot said. "We could be seeing avalanches on this layer all through the winter."

The upshot is avalanche danger in southwestern Montana is still high.

"If you get into avalanche terrain, which is open slopes steeper than 30 degrees, you're probably going to see an avalanche," he said. "It's a little scarier (now) because the signs of instability are not as obvious as they were a week ago."

More snow on Monday and Tuesday kept the danger level high.

The recent weather is typical of an active winter weather pattern in southwest Montana, said Julie Arthur, meteorologist with the National Weather Service in Billings.

Over the past 10 days the jet stream as been generally coming out of the west. This brought moisture off the Pacific Ocean to the northern Rockies in the form of snow. Now the jet stream is shifting north and coming more from the northwest, which will continue to bring in moisture and active weather, Arthur said.

As disturbances cycle through the area, temperatures will be expected to drop and snow showers should impact the mountain foothills and high country, she said.

"Not only is it a northwest flow but it's a strong northwest flow," Arthur said. "Periods of strong winds are likely in this pattern."

Look for one of these systems to impact the region toward the end of the week, she said. Beyond that it the forecast becomes more unpredictable, but people should expect weather systems every couple of days as long as the northwest flow persists.

Editor Greg Lemon can be reached at lemon@thebigskysun.com or at 586-1066.

AVALANCHE CYCLES

Too much snow can be a bad thing. Really

BEAU FREDLUND

A large natural avalanche on Amphitheater Mountain near Silver Gate is shown during the December 2008 avalanche cycle.

BY DOUG CHABOT

We need snow, just not all at once. Too much too quickly creates avalanches, and the latter half of December served us a giant helping of snow. From Big Sky to West Yellowstone to Cooke City avalanches unloaded tons of snow from slopes of many sizes, aspects and degrees of steepness. The mountains were full of vacationers, mostly out of state snowmobilers, yet no one died. One reason for this is that we issued Avalanche Warnings that were broadcast on the NOAA weather radio, on the FM dial, in the papers, on television and in our advisories.

The seed for the avalanche cycle was planted in November. Storms from October and the first week of November piled up two feet of snow on the ground. We were all excited about the prospects of another banner winter until record warmth ruined the party with temperatures reaching 70 degrees in the valleys. Melting and sporadic rain showers further saturated the surface. When it finally froze by Thanksgiving an ice layer had formed.

At this early stage of snowpack development nothing was predetermined about its future stability. None of us at the Avalanche Center were overly concerned. The snow on the ground seemed solid and strong. An infinite number of possibilities existed because the snowpack is always changing. Snowflakes can turn to ice or consolidate and bond into strong, rounded grains. Other times they grow in size and lose cohesion.

Unfortunately, the worst happened. It got cold. Not just chilly, but brutal, bone-rattling Montana cold. The days were short and temperatures sunk to -20 for a week in mid December. Cold is the enemy of a thin snowpack because it transforms snow into angular, faceted crystals that don't bond together. A handful of this snow looks and feels like big grains of sugar that can't be compressed into a snowball. This weak snow becomes unstable when more snow falls on it. Like a house with a crumbling foundation, it can only support a small amount of weight.

Once these facets grew on both sides of the November ice crust we knew we had a problem. Ice underlying faceted snow creates a firm sliding surface. To create an avalanche we need a steep slope, a weak layer and a slab of snow on top. Smaller 2-4 inch storms would build the slab slowly and give the facets time to strengthen. But this is not what happened. On December 19th it started to snow in the southern mountains, and it didn't stop for 17 days.

As forecasters we're interested in how much weight was added to the snowpack. More weight equals more stress. We measure this in inches of water known as Snow Water Equivalent (SWE). Saying 20 inches of snow fell doesn't give us the information we need to assess snow stability. Twenty inches of heavy glop weighs a lot more than 20 inches of cold smoke powder. That's why we look at SWE.

From the 19th to the 28th, 4 inches of water in more than 4 feet of snow fell outside Cooke City and West Yellowstone. The snowpack was near its breaking point on the facets and ice crust. Our stability tests showed easy fractures and we saw consistent signs of instability like "whumphing" and shooting cracks as we skied.

The avalanche danger slowly crept up.

On the 29th the scale was tipped with another huge 24 hour dump. Widespread natural avalanche activity kicked in and the avalanche cycle was born. We rated the avalanche danger HIGH on all slopes, aspects and elevations. Natural and human triggered slides were likely. We issued an Avalanche Warning that wasn't lifted for the next six days.

On the first day of the Warning I was able to trigger a huge 1,000 foot wide avalanche from the safety of a ridge near Cooke City. The snowpack was hair trigger and I was tip-toeing around. Two days later three snowmobilers were sitting on the flats below the south face of Crown Butte outside Cooke City. They had their sleds turned off when another rider on an adjacent hill unknowingly triggered the slope above them. They fired up their machines and full throttled out, but one rider's snowmobile took one pull too many and he lost the race with the avalanche. As soon as the slide stopped his two partners saw the ski and skid plate of the sled sticking out of the snow, rushed over and found a glove and boot wiggling frantically. They dug him up and the buried rider was OK. Even though they were in the flats, they were exposed to the runout zone of the avalanche path above them. The snow was so unstable it was easy to trigger slides from afar and risky to be underneath avalanche terrain. During the week of the Warning, a whopping five feet of snow fell (4.7 inches of SWE).

When it stopped snowing the Warning expired and the avalanche danger decreased. The back side of an avalanche cycle is a dangerous time because natural avalanches and other signs of instability are no longer common, yet folks can easily trigger slides. All slopes unable to support the weight of new snow have already avalanched, but many others are poised to break, just waiting for a skier or snowmobiler to trigger it.

As I write this on Jan. 8th we've escaped unscathed with no fatalities, but many slopes are still weak and unstable. We can only hope they will begin to strengthen with warmer weather and dry conditions, but just like at the start of winter there's an infinite number of possibilities. Only time will tell. ♦

Doug Chabot is the director of the Gallatin National Forest Avalanche Center. He can be reached at dchabot@fs.fed.us.com.

BOZEMAN DAILY CHRONICLE

THE BIG SKY

TUESDAY, JANUARY 20, 2009

CITY DESK: 587-4491 OR E-MAIL: CITYDESK@DAILYCHRONICLE.COM

Victims of weekend avalanches identified

By AMANDA RICKER
Chronicle Staff Writer

Authorities have released the names of three snowmobilers killed in avalanches in southwest Montana on Saturday.

Kirk Hewitt, 50, of Belgrade, was killed in a snow slide in the Gravelly Range near Black Butte, said Madison County Sheriff Dave Schenk.

Travis Engstrom, 35, of Bozeman, died in an avalanche in the mountains north of Cooke City near Daisy Pass, according to Park County Coroner Al Jenkins.

And, Joshua Jenkins, 21, of Idaho Falls, Idaho, died in an avalanche on Mount Jefferson in the Centennial Range near the Idaho border, Beaverhead County Coroner Ron Briggs said.

All three men had taken safety precautions, riding in a group and wearing a transceiver, said Doug Chabot, director of the Gallatin National Forest Avalanche Center.

"Assessing the snow pack is tricky," Chabot said. "There are lots of stable slopes, but there are some that are just prime to go."

Hewitt owned the Silent Knight muffler shop in Bozeman and was one of the founders of Citizens for Balanced Use, a group advocating shared use of public lands.

Hewitt was riding in a group of 14 experienced snowmobilers and the group had been playing it safe, "boondocking," or mostly riding around trees and small hills, Chabot said.

When the group stopped in a meadow, they noticed that Hewitt was missing and turned around to look for him. They found his snowmobile nearby, sticking out of the snow at the bottom of avalanche debris. They turned on their transceivers, detected a signal from Hewitt's beacon and began digging.

Hewitt was found within 15 minutes and about two feet from the surface of the snow, but efforts to revive him were unsuccessful, Chabot said. The avalanche that killed him was relatively small, falling about 75 vertical feet and 200 feet wide.

Kerry White, a board member for Citizens for Balanced Use, said Hewitt knew more about snowmobiling and motorcycling in area forests than anyone else he knows.

"It was a love of his life, riding on these trails whether it was in the winter or the summer," White said.

In addition to being an avid outdoorsman, Hewitt's friend, Justin Hass, said Hewitt was an all-around likable guy.

"Kirk basically opened his arms to anybody, it didn't matter who it was," Haas said. "If you met Kirk, you'd be his friend. He didn't have anything against anybody."

(More on **Avalanches**, Page A8)

Authorities identify skier who died at Bridger

Chronicle Staff Report

Authorities identified Russell Hochhalter, 32, of Bozeman, as the man who died unexpectedly while skiing Friday at Bridger Bowl ski area.

Autopsy findings show that Hochhalter died of natural causes, according to the Gallatin County Sheriff's Office.

Hochhalter was found on a traverse between the South Bowl and the Deer Park lift. Authorities said he had previous medical issues.

He was not injured, but he was trapped and missing a ski. He called for help and was airlifted out by helicopter.

The Bozeman skier reached the top of the mountain via Bridger Bowl ski area's new Schlasman chairlift, which gives properly equipped skiers relatively easy access to backcountry skiing on Gallatin National Forest land. Every skier using the lift must have an avalanche transceiver; a partner and a shovel are also highly recommended.

While the access is a dream come true for many expert skiers, Doug Wales, Bridger Bowl's marketing director, reiterated that the ski area has no responsibility for what happens on Forest Service land, nor does it maintain or patrol those slopes.

"It's an individual's decision," Wales said.

Before the Schlasman lift opened, skiers had to hike, albeit illegally, to backcountry ski areas. Now there is less effort necessary to access such risky terrain.

"The ease of accessibility has changed ... people were doing it before, now its just legal," he said.

Many ski resorts in the Rocky Mountains have made similar arrangements with the National Forest Service, Wales added.

Even though Bridger Bowl is not liable for accidents on Forest Service land, the ski area realizes that it has a responsibility to educate the public of the risks involved in backcountry skiing, Wales said. "We aren't naive to concerns, that's why we've been proactive."

Like Bridger Bowl, the Avalanche Center advocates for safety education. The organization's Web site provides daily avalanche reports, schedules of avalanche-safety workshops, weather reports, accidents reports and online tutorials.

"There are some very basic rules to stack the deck in your favor," Chabot said. Those rules include: never ski alone, only allow one skier on the slope at a time, carry a shovel and rescue gear and check the advisory of the slope you plan to ski.

The New York Times

January 20, 2009

Solving Avalanches' Mysteries

By JIM ROBBINS

BOZEMAN, Mont. — Not long ago, Ed Adams, a civil engineering professor, studied avalanches by setting them off with dynamite and studying their movement as they buried him, his instruments and his colleagues in a tiny shack.

Recently, though, Dr. Adams, a 58-year-old materials researcher, started a new and somewhat quieter phase of research, studying avalanches in the lab at Montana State University. A $2 million "cold lab" financed primarily by the National Science Foundation and the Murdock Charitable Trust and completed here in November allows Dr. Adams to replicate and control the uncontrollable field conditions of mountains in winter and understand in detail how snow behaves under widely varying conditions. The goal is to be better able to predict an avalanche.

Forecasting avalanches has always been as much an art as a science because of the wide variability of conditions, from time of day and year to type of snow, to slope and temperature.

"Snow seems simple, but it's extraordinarily complex," Dr. Adams said. "If I set a box of snow in the refrigerator and come back in an hour, it's changed significantly. It's almost always in a constant state of motion, and studying it is a moving target." That is where the lab comes in, allowing researchers to vary the sky, sun and temperature to see how snow responds.

There have been 31 fatalities this winter season, 16 in the United States and 15 in Canada, including three snowmobilers in separate avalanches on Saturday in Idaho and Montana. The record in the United States is 35 in the winter of 2001-02. Three of this winter's fatalities occurred within the boundaries of ski trails in commercial skiing areas, which is highly unusual, because of the careful forecasting and control work done in skiing areas.

"The number of fatalities we have had shows they're a difficult phenomenon for us to understand," said Karl Birkeland, an avalanche scientist at the Forest Service's National Avalanche Center here. "There's definitely a need to better understand them."

Montana State is well situated for the study of avalanches. There are four Class A avalanche zones — the most severe — at nearby skiing areas, and numerous backcountry locations for study.

For years, Dr. Adams and his colleagues set up their instruments in a small shack on a steep slope at Bridger Bowl, about 15 miles from the university, and sent another researcher up the slope to ignite a two-pound bomb that set off an avalanche.

http://www.nytimes.com/2009/01/20/science/20cold.html?_r=1&emc=eta1&pagewanted=... 1/28/2009

As the wall of snow rumbled around or over the shack, Dr. Adams, bundled up against the cold, watched his laptop record information on velocity, depth, flow and temperature. He estimates he survived dozens of such self-inflicted avalanches.

In the cold lab, however, where the temperature is 8 degrees below zero, the focus is on a one-square-meter panel, brilliantly lighted by an artificial sun and watched over by an icy artificial sky that can be widely varied to replicate different winter conditions. Wearing his puffy down jacket, wool hat and sunglasses, Dr. Adams shows how he can reproduce the wide range of conditions found on mountain slopes and create different types of snow. "We want to understand what conditions cause the change in the crystalline structure and the bonding between crystals," he said. It is the missing part of the puzzle of understanding avalanches.

Once he and his students and colleagues have created the snow crystals under certain conditions, they put them under the microscope to see what conditions made for the strongest or weakest layers. Snow layers are the key to predicting avalanches.

The biggest cause of avalanches is a weak layer of snow on a slope covered by solid layers, Dr. Adams said. "The weak layers are faceted crystals, very smooth and unbonded to each other," almost like ball bearings, he said. Strong layers have stronger bonds between crystals, which makes them more stable.

"It's like a layer cake with very weak frosting," Dr. Adams said. When something causes the weak layer, usually less than an inch thick, to give way, the strong layer or layers — there can be dozens, some of them feet thick — go with it. Even skiing at low altitudes can fracture a weak layer and set off an avalanche far above. Contrary to conventional wisdom, sound, unless it is from an explosion, does not set off avalanches.

Some ski areas offer skiers free skiing in exchange for "boot packing" — trampling weak layers with their boots to harden them.

The key to improving forecasting, Dr. Adams said, is understanding the surface layer, where sun and cold cause the snow crystals to change. Understanding the energy transfer on the surface can provide information about what is going on underneath.

As usual, weak layers are the key to this winter's avalanches. "We've had weak layers laid down early in the season," Mr. Birkeland said. "Then a big storm puts a whole lot of load on the weak base."

Heavy, dense snow makes it harder for skiing areas to use ordnance to set off slides for safety reasons; instead the avalanches happen on their own.

Data collected by Dr. Adams in the cold lab on the microscopic level is added to data gained in work setting off avalanches, and to information from weather conditions and from daily snow samples gathered by the ski patrol at the Yellowstone Club, a private skiing area near Yellowstone Park where he is doing research.

Dr. Adams's team plans to combine that data with results from a thermal imaging program developed with Thermal Analytics, a company based in Houghton, Mich. The system, which creates far more detailed data than any previous modeling, is expected to greatly enhance forecasting. It will go into use here in Bozeman in two weeks.

"We have tons of people out in the backcountry" pursuing various forms of recreation, said Mark Staples, a researcher who forecasts conditions for the avalanche center for the Gallatin National Forest and who will use the new program. "There's a lot of variability spatially and temporally. Some days it's safe, and some days less so. But we only have three people forecasting, so the more we can use what Ed's doing, the more we can forecast over a wider area." Right now forecasting is based on field observations and weather forecasts.

Based in the jagged mountains of the northern Rockies, the avalanche center at Montana State was founded by Charles Bradley and John Montagne, veterans of the Army's Tenth Mountain Division who came here after World War II.

Other major avalanche centers include the Swiss Federal Institute for Snow and Avalanche Research in Davos, the world's largest, and the Nagaoka Institute for Snow and Ice Studies in Japan. The University of Calgary and the University of British Columbia have smaller but highly regarded programs.

Avalanche prediction has become more important as many more people ski and snowmobile in the backcountry. Until the 1970s, an average of only five people died each year in avalanches in the United States. In the 1990s, with more skiers and snowmobilers on the slopes, the average increased to 20. In the last decade, the deaths have averaged 28 a year, but experts say the deaths have not increased as quickly as the number of backcountry users.

The jury is still out on the best way to survive an avalanche. Some researchers say the most critical thing is to create a pocket in front of the face to breathe while waiting for rescue. "I would swim, though," Dr. Adams said. "Get prone in the snow and stay on top." A new product called an avalanche balloon system is carried by some skiers. If they get caught in an avalanche, they can pull a ripcord that inflates balloons and is said to keep them afloat on the surface of the snow.

Dr. Adams traces his zeal to understand avalanches to his days as a bartender and ski bum at Alta, a ski resort in Utah. "The lodge I was working in got hit by an avalanche," he said, "and it took a whole wing out and blew cars from the parking lot across the road. It was impressive."

Avalanche stories often have much worse endings. Eight snowmobilers were killed in an accident in British Columbia in December. In 2003 in British Columbia just north of Glacier National Park, 17 teenage cross-country skiers were buried as they skied across a meadow; 10 survived. Tragedy has struck the researchers as well. One of Dr. Adams's former graduate students, Blake Morstad, was killed in a slide while skiing in Idaho's backcountry. A documentary, "A Dozen More Turns," recounts the story.

Despite the danger of avalanches, Dr. Adams says he may one day return to doing research from the inside of an avalanche. "I'd like to go back," he said. "But for me understanding the metamorphosis of snow in the cold lab is every bit as interesting."

This article has been revised to reflect the following correction:

Correction: January 21, 2009
An article on Tuesday about the "cold lab" at Montana State University, for studying snow to better predict avalanches, misstated the title of a documentary about the death of a researcher in an avalanche. It is "A Dozen More Turns," not "The Last Dozen Turns."

BY THE NUMBERS

Weak snowpack, human triggers lead to fatalities

BY DOUG CHABOT

Saturday, Jan. 17, was a rare beautiful day with plenty of sun, warmth and calm blue skies in the mountains of southwest Montana where it has snowed 30 out of the last 37 days. Like wilting plants stretching for sunshine, skiers, snowmobilers, hikers and climbers headed out to soak up rays and reinvigorate souls. Not only was the weather going to hold, it was a long holiday weekend that we could all enjoy. Unfortunately, three separate avalanches killed three people.

This winter has been dangerous. Early season snow metamorphosed into granular, faceted grains which do not bond together, do not hold much weight before avalanching and is an unstable foundation. When it snowed over Christmas and New Year's Holiday the GNFAC issued avalanche warnings because the danger was acute and obvious. Avalanche danger is defined as the potential for avalanches to cause injury or death and is rated on a 5 tiered scale of low, moderate, considerable, high and extreme. The danger during the holiday warning period was high on all slopes in the backcountry.

The avalanche warning was broadcast far and wide through newspapers, radio, television and the National Weather Service. People were nervous and cautious. It was snowing so much and so hard that backcountry travel was limited. Trail breaking on skis was slow. The snow was so deep and unconsolidated that snowmobiling off trail was more getting unstuck than moving. In time the snow settled, travel became easier, avalanches and other signs of instability were in decline and the danger rating settled in at moderate over most of our area. moderate means natural avalanches are unlikely but human triggered avalanches are possible. The danger doesn't need to be high or considerable in order to trigger a slide and die.

Looking for the body of an avalanche victim on Crown Butte Jan. 18.

The unstable snow at the ground had gained strength since the termination of the warning on Jan.3. The snow was supportable and skiers and snowmobilers ventured farther and higher. People got onto big slopes with no consequences. But that was not the whole story. The snow was not getting stronger uniformly. Many slopes were safe, but others were just waiting for a trigger to avalanche. These slopes were isolated, but in no way small.

On Jan.17 there was phenomenal weather, a holiday weekend and folks hungry for powder.

In perfect weather we tend to think the snow is perfect too. It's human nature to infer one from the other. On Friday and Saturday of that week everyone was pushing and tickling the slopes. Highmarks marched across bowls as folks devoured the untracked powder. It was a holiday weekend and many, many more backcountry users than normal were present. People drove in from other states. Hotels were booked and trailheads packed.

The sheer volume of people almost guaranteed that if only one out of 100 slopes were unstable someone was going to find it. People are triggers. An individual did not have increased odds of triggering a slide — the danger was moderate — but collectively the odds spiked that *someone* would get caught in an avalanche. And they did.

Two of the three avalanche fatalities occurred outside our advisory area, but the snowpack and situation were similar to ours; a weak snowpack structure, no obvious signs of instability and a crowd of potential triggers. Even though the snowpack has been gaining strength and people are skiing steep lines and hammering slopes with their sleds, folks still die in avalanches when the danger is only rated moderate. And that's why it's still a numbers game. ♦

Doug Chabot is the director of the Gallatin National Forest Ava-

KING AND QUEEN OF THE RIDGE

Bridger Bowl and the Friends of the Avalanche Center are teaming up again for the 6th Annual King and Queen of the Ridge competition on Saturday, Feb. 14. It's a major fundraiser for the Friends with people hiking laps on the Ridge for pledges. If you're competitive, you can get friends, family and co-workers to pledge cash per lap. Or you can take a more carefree, easy on the knees approach (my favorite) and hit them up for a flat rate for the day. The event lasts five hours. Last year 42 participants hiked and seven were under the age of 15. All proceeds are earmarked for avalanche education in southwest Montana. Since 2003 we've raised over $61,000! Further enticement to participate is provided by Bridger Bowl which gives away great prizes like skis, packs, gift certificates and other high dollar goodies. For more information and registration forms, go to the Events page at www.bridgerbowl.com

Avalanche

Lessons of recent accidents

Looking for the body of an avalanche victim on Crown Butte Jan. 18.

By Mark Staples
Gallatin National Forest Avalanche Center

Every avalanche accident is different and each has different lessons to teach. Spending a few moments examining recent accidents in southwest Montana can help us avoid the mistakes that caused them.

1. Tracks on a slope do not mean it's stable. On January 17th Travis Engstrom was killed in an avalanche on Crown Butte near Cooke City. Photos and a video clip taken just before the accident show snowmobile tracks covering the slope. We'd like to think the first rider, or at least the 10th or 20th rider, will trigger the avalanche, but avalanches do not work this way, especially ones that fracture on deeply buried, persistent, weak layers. To trigger such an avalanche it is necessary to find what ski patrollers call the "sweet spot," places where patrollers commonly place explosives to release avalanches. At ski resorts they usually know where these sweet spots exist. In the backcountry we do not.

2. Check your partner's beacon and your own. After Travis was caught and buried his partners were unable to find him because he turned his beacon off at lunch and forgot to turn it back on. We've all made this mistake. I used to assume my partner's beacon was on, and we didn't always check each other. Since Travis' death I never put my beacon on my body unless it is transmitting, and before leaving the truck I turn my beacon to receive and check my partners'. This practice has already caught both my beacon and my partner's beacon not on three times this season.

3. Rescue gear doesn't work without a partner. Another snowmobiler, Kirk Hewitt, died on January 17th in the Gravelly Range. Kirk and his group knew the current avalanche conditions were dangerous and decided to avoid avalanche terrain. But Kirk rode away from the group and was caught in an avalanche. By the time his group realized Kirk was missing and retraced his tracks and found him buried in avalanche debris it was too late. Kirk was wearing an avalanche air bag but didn't have time to deploy it, and even if he had these devices only help keep one closer to the surface and easier to find by your partners. A rider was

caught in an avalanche on Two Top Mountain February 11th. His partners initially searched for him with their beacons but did not detect a signal. Fortunately, they spotted his hand and were able to dig him out of the debris. He was badly injured but alive. In any avalanche the best hope for survival is a well prepared partner watching from a safe location.

■ 4. Small slopes can be deadly. The slope that caught Kirk ran 75 vertical feet. The avalanche on Two Top Mountain ran about 150 vertical feet. Small slopes can be more dangerous than big ones because they are less intimidating. Avalanches running less than 300 ft have caused many fatalities. The Two Top avalanche swept the victim through trees that caused serious trauma. Terrain traps such as trees, cliffs, rocks, and gullies amplify the consequences of an avalanche on a small slope. A rider near Big Sky in early January was buried 6 ft deep under debris piled up in a gully. He was found alive only because his partners knew how to use their rescue gear quickly and effectively. Deep burials rarely have happy endings.

■ 5. Do not park in a run out zone. We use a picture of riders parked in a spot where avalanches routinely run as an example of a poor decision. Recently, near Lionhead as I watched my partner climb a steep hill I realized I was parked in a run out zone. My engine was off and my snowmobile was facing uphill. I couldn't believe it. I restarted my sled and turned away from the hill, leaving it running in case my partner triggered an avalanche. I should have moved to a safe spot to observe any potential avalanche and the likely burial location of my partner. Three riders near Cooke City were parked under a slope on December 30th when another rider remotely triggered an avalanche above them. Two escaped, but the third had trouble starting his sled and was caught. His avalanche air bag malfunctioned and he was partially buried. He survived uninjured, but the incident could have been avoided by parking a little further away.

As an avalanche forecaster I spend my winters in avalanche terrain and teaching avalanche classes. I like to think I can avoid some of the above mentioned mistakes because I should know better, but I'm never completely sure in avalanche terrain and I pay close attention hoping to learn from every accident. I hope we all can learn a few things and enjoy a safe winter filled with fresh powder. SM

KING AND QUEEN OF THE RIDGE

Hiking to help

NICK WOLCOTT/CHRONICLE

Colter Delin nears the top of the Ridge at Bridger Bowl during this year's King and Queen of the Ridge race on Saturday.

Competitors for Ridge royalty raise money for Avalanche Center

By SEAN FORBES
Chronicle Sports Writer

Usually the snow has to fall for a few hours before a human chain forms on the steep steps leading to Bridger Bowl's Ridge.

But not on Saturday.

Valentine's Day found Bridger hosting the King and Queen of the Ridge.

The event is a slightly less romantic, slightly sweatier royalty-crowning affair than others and has evolved from a much more hardcore, even macho image of expert terrain and expert skiers.

The King and Queen of the Ridge is a unique fundraiser benefiting the Gallatin National Forest Avalanche Center, which uses the ski area's backcountry-style terrain. So that as a couple of self-described "hecklers" sitting beside the transition area pointed out, the only way the race could be more like a backcountry experience would be to require hikers to dig a pit and perform a beacon search.

As it was, competitors had five hours to complete as many circuits of the terrain as they could, with the man and woman tallying the biggest numbers being crowned King and Queen.

By the time the small flakes began to give a ghostly blur to the surroundings, the 45 participants were well under way — lining the parallel boot-packed trails and streaming down the chute to the south and into the transition area carved into the slope above the end of the Bridger chairlift.

"It's a fund-raising event. So people get pledges, and typically you get pledges per hike," said Leah Knickerbocker, events coordinator for Bridger Bowl. "It's raised — this event — probably like $50,000 in all the years it's been going on and we usually get $14,000 or $15,000 per year."

(More on **Ridge**, page B2)

Ridge/ from page B1

The Avalanche Center, started in 1990, employs three forecasters to routinely venture into the surrounding mountains documenting the snow conditions. This information is then compiled into a daily report made available to the public for free via phone, email or the center's Web site.

"The Avalanche Center is all about education," said Karl Birkeland, one of the founders of the Gallatin Avalanche Center, who was hiking with his 7-year-old daughter Kelsey. "Providing education, information through the avalanche advisory and also through providing avalanche education courses.

"It covers the area from the Bridgers down to Cooke City and over to West Yellowstone. The purpose of the Avalanche Center really, is to serve all the public. We make a really strong effort to reach all the different user groups. Because we're all out there playing in the mountains and the key is: try and keep everybody safe."

There were even rumors circling from last year about a snowmobiler who, not having hiked the Ridge before, took nine laps to show his support.

Though the Avalanche Center is part of the Forest Service, it also relies on additional funding from outside sources, such as grants and donations.

Helping with this additional fund-raising is the non-profit group the Friends of the Avalanche Center.

But the King and Queen event — with the support of several friends — is really Bridger Bowl's effort to support the local skiing and outdoors community.

"It's one of the biggest fundraisers for the avalanche center every year," said Birkeland, currently an avalanche scientist for the national avalanche center. "Bridger Bowl as a whole basically puts the whole thing together."

As the hours passed, the pace for most began to slow as competitors reached double-digit laps on the almost 400 vertical-foot climb and those resting in the transition area took a little extra time strapping skis or snowboards to their packs.

Mike Harrelson, a regular participant and member of the board of Friends of the Avalanche Center, stood with his wife watching for their son, Clyde.

For Mike Harrelson, competing with his family, it's not just getting bodies out to raise money, it's about raising awareness — especially as younger people venture deeper into the mountains.

"As parents (we) believe that avalanche education is an important part of the curriculum here in southwest Montana," said Harrelson. "It's such a cumulative thing, in terms of paying attention to what the snow is doing.

"You can't stop paying attention for three weeks and come back and really feel as good about going into the mountains outside of the ski areas, whether you're a backcountry skier, snowboarder or sledder, or an ice climber. That cumulative information that the avalanche center puts out is really, really helpful."

As a family, the Harrelsons counted 34 hikes.

"What's been kind of neat it that the last couple of years we've gotten more families," said Knickerbocker, commenting on the fundraiser's appeal to a growing audience.

Saturday's field included kids in the single-digit ages. Though the actual steps may have seemed much larger for the little ones, they had the advantage of being able to hike their age, like 9-year-old Fritz Arnold, who racked up 10 hikes.

The final minutes were counted off amidst a rush of competitors trying for a last hike. By the time the last few finished their runs, the numbers had been totaled.

Erich Peitzsch was King and Sarah Williams the Queen.

The royalty-in-waiting awards of Prince and Princess went to Gunnar Perkins and Katrina Perkins.

As the participants filtered back down to the regular ski area, several breathless skiers stood in the transition area trying to recover. Andy Barefield, competing in his third King and Queen event, tried to catch his breath before elaborating on the description of the circuit he calls "the hamster wheel." Barefield finished with 22 laps.

Nearby, Peitzsch rehydrated.

"26, one shy of tying the record," Peitzsch said. "This is my first time doing it. Pretty much the last two hours were tough ... but it's fun and social — good benefit — and it's fun to get folks out and everyone's rallying, so it's kind of cool to cheer each other on."

Peitzsch also had one small advantage, the skinniest skis and lightest gear of the day, including a backpack he didn't have to take off to strap his skis to.

Asked if the gear helped in the long run, Peitzsch said, "Yeah, definitely. Well it helps on the uphill. But the downhill is pretty interesting."

Sean Forbes can be reached at sforbes@dailychronicle.com.

Results

Male 12 and under

Isaac Lowe-Anker	11
Fritz Arnold	10
Niko Hinz	6

Male 13-17

Gunnar Perkins (Prince of the Ridge) 21

Mitchel Johnson	18
Clyde Haenelson	16
Sam Lowe-Anker	16

Male 18 and up

Erich Peitzsch (King of the Ridge) 26

Ben Nobel	24
Colter Delin	23
Andrew Barefield	22
Gregg Smith	22
Ben Zwiers	21
Scott Schmidt	21
Mark Staples	18
Dan Clem	18
Dan Jupka	18
Matthew Burke	17
Chris Kraus	16
Cody Stevens	16
Conrad Anker	16
William Moore	15
Michael Wolfe	14
Paul Gannon	13
Mike Harrelson	13
Jim Carter	13
John Parker	11
Stephen Craig	8
Lance Griffen	6
Doug Chabot	3

Women 12 and under

Katrina Perkins (Princess of the Ridge) 8

Kelsey Birkeland	3

Women 18 and up

Sarah Williams (Queen of the Ridge) 21

Angela Patnode	20
Marcie Hahn	18
Dawn Wilson	18
Wendi Urie	14
Heidi Hensant	12
Jane Kadma Arnold	10
Jennifer Lowe Anker	6
Cindy Harrelson	3

POWDER FRENZY

Skiers, snowboarders revel in fresh snowfall at Bridger Bowl

NICK WOLCOTT/CHRONICLE

Vinnie Urgo enjoys the copious amounts of snow that blanketed Bridger Bowl on Friday morning. Winter has returned with local ski areas receiving more than a foot of new snow.

By KARIN RONNOW
Chronicle Staff Writer

The lift line at Bridger Bowl Ski Area started forming shortly after the sun rose Friday.

Skiers and boarders, starved for fresh powder, flocked to the community mountain by the hundreds, eager to tackle the first significant snowfall in more than a month.

After that extended dry spell, bright blue skies, more than a foot of new snow in the high country and mild temperatures combined to create what one skier called "a feeding frenzy" at Bridger.

One boarder called the day "epic."

Yet another said with a satisfied grin on his sunburned face that the runs had been "awesome."

The winter storm that began Thursday morning dumped the most snow on Bridger Bowl since Jan. 6, when 15 inches was recorded, according to the Bridger Web site.

Going seven weeks without a major slug of snow is not unusual around Bozeman, said Doug Chabot, director of the Gallatin National Forest Avalanche Center, who spent part of Friday on the mountain.

"Every year we get high pressure that just sits here and keeps things pretty dry," he said. "This one seemed to last a little longer than most."

Chabot warned, however, that the backcountry is ripe for avalanche activity this weekend – for two reasons.

"First, because there's a weak layer about 2 feet below the surface that is straining to hold up the new snow," he said. That weak layer is "faceted" and "sugary," he said.

(More on **Snow**, Page A10)

MORE FACE SHOTS ON THE WEB
Log onto www.dailychronicle.com for a slideshow of additional photos of the big day at Bridger Bowl

Bright blue skies, more than a foot of new snow in the high country and mild temperatures combined to create what one skier called "a feeding frenzy" at Bridger.

28 FEB 2009 Bozeman Chronicle

Snow/ from Page A1

"Second, Saturday is going to be a beautiful day and it hasn't snowed in awhile" so people are going to flock to the mountains, he said. "So if you have an unstable situation and you put a lot of people on it, people are triggers. The combination of these things indicates we should brace ourselves for some human-triggered avalanche activity."

He encouraged people to be careful. In January, three people died in avalanche-related accidents in the Gallatin forest.

He also encouraged people to call the avalanche center or visit the Web site – 587-6981 or www.mtavalanche.com – Saturday and Sunday to check on conditions just before they head out to ski, snowmobile, snowshoe or hike.

"The conditions can change rapidly," he said. "The conditions today are vastly different than they were yesterday."

On Friday, the avalanche danger was "high" on all slopes steeper than 35 degrees, particularly those that were windloaded, Karl Birkeland wrote in the daily avalanche advisory. He set the danger on other slopes at "considerable."

He also reiterated Chabot's caution for the weekend.

"With our extended period of dry weather, winter enthusiasts of all stripes are excited to see new snow falling in Southwest Montana," Birkeland wrote. "However, don't let your excitement cloud your judgment. Remember the last time we put a sizable load on our snowpack? That was back in January and the avalanches (after that snowfall) resulted in several close calls and three fatalities.

"We just added a lot of weight to our snowpack and with clearing weather … many slopes will look tempting. However, they will also be dangerous. On days like today it's often best to steer clear of avalanche terrain while the snowpack adjusts to its new load."

NICK WOLCOTT/CHRONICLE

Hundreds of people stand in line at Bridger Bowl Friday morning.

BOZEMAN DAILY
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As spring approaches, avalanche forecast is good

"The snowpack is getting stronger and it was tested this week and it's going pretty good. But as we've seen in Cooke, it's not 100 percent."

– Doug Chabot, Avalanche Center

Snowmobilers trigger one of two avalanches near Cooke City, no injuries were reported in either slide

By NATASHA COLLINS
For the Chronicle

Two avalanches, one of which was triggered by snowmobilers, occurred near Cooke City this weekend, but no one was injured in either slide.

The snowmobile-triggered avalanche took place Saturday on a small, wind-loaded slope with weak snowpack, according to the Gallatin National Forest Avalanche Center. The rider was neither injured nor buried.

The second slide was smaller and occurred on Sunday. No one was injured and it's unknown what triggered it. No further details were available at press time.

Despite these incidents, Doug Chabot, director of the Avalanche Center, says Cooke City is at less risk for serious avalanches than some other areas in the region.

"Cooke City is doing relatively well," Chabot said Sunday. "It was a surprise. Overall, given that they just got 3 to 4 feet of snow in the last week, the snowpack handled the new snow load very well. It's is actually looking better there than some other areas around West Yellowstone and the Southern Madison Range. The snow down there is a little more sensitive.

"We were worried about the weekend, but so far we haven't heard anything," he said.

Although there haven't been any reported avalanche fatalities in Southwest Montana recently, a group of snowmobilers in Wyoming weren't so lucky Friday.

(More on **Avalanches**, Page A8)

Three riders died after a group of four was caught in an avalanche in the Snake River Range. Officials identified the deceased as Robert Clark, 48, and Scott Smith, 45, both of Soda Springs, Idaho; and Bob Tiechert, about 55, of Grace, Idaho.

Chabot said of the Wyoming incident, "The thing that stands out here is that there were four people in the slope. What we really try to get snowmobilers to do is only one at a time."

Chabot says people still need to be careful on the slopes, but he's not anticipating widespread avalanches.

"The snowpack is getting stronger and it was tested this week and it's going pretty good," he said. "But as we've seen in Cooke, it's not 100 percent."

In the Sunday avalanche report, the center's Mark Staples said the avalanche danger is "considerable" on wind-loaded slopes steeper than 35 degrees, while the danger on all other slopes is "moderate."

■■■

For more information and daily advisories, go to www.mtavalanche.com.

Natasha Collins can be reached at natasha@dailychronicle.com.

elemental savy science

EXTENDED COLUMN TEST

EXTENDING YOUR SEARCH FOR INSTABILITY

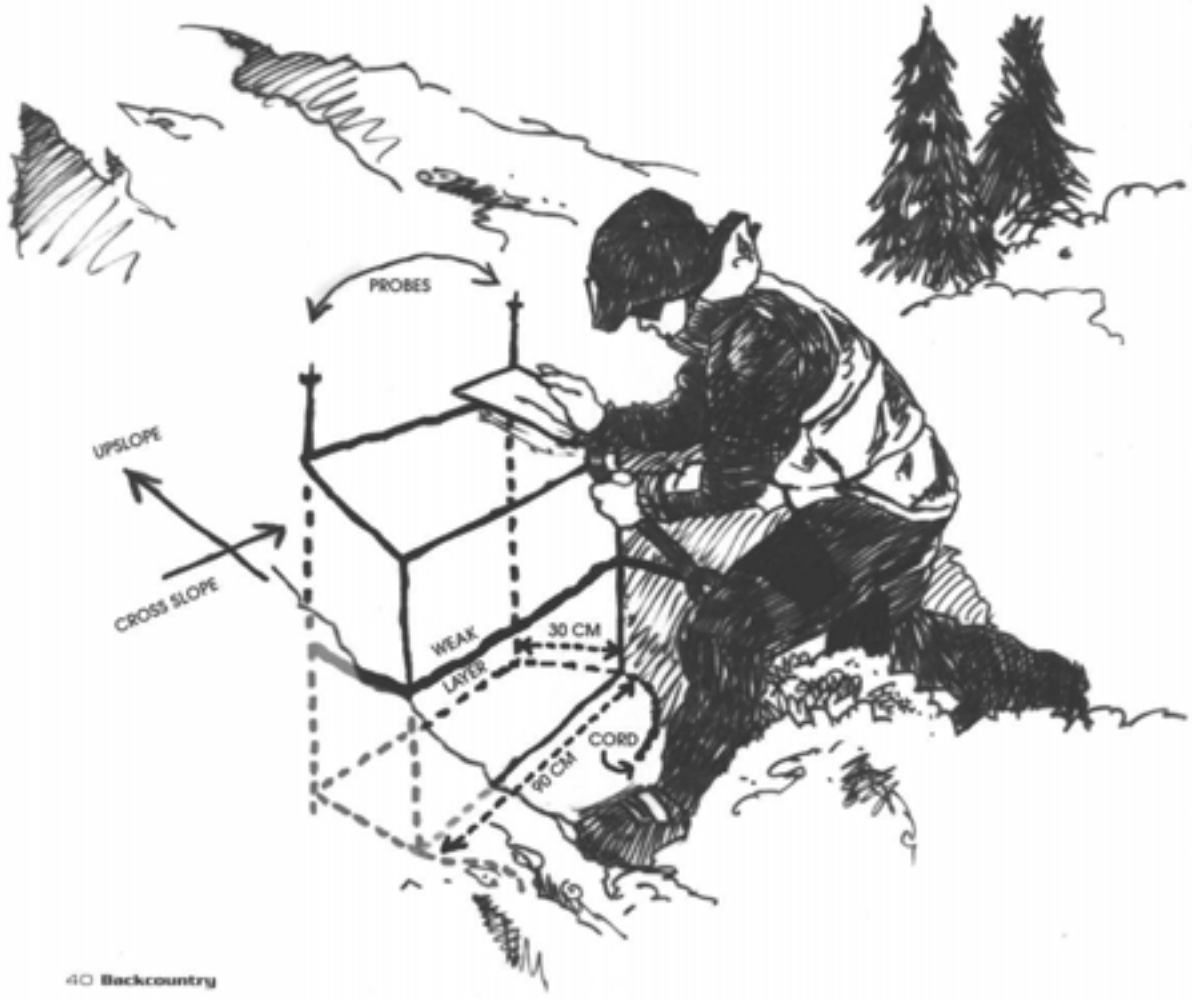
TEXT BY LANCE RIEK AND DOUG CHABOT
ILLUSTRATION BY CARRIE COOK

Your local avalanche center reports "moderate" danger and you haven't seen any avalanches or felt any cracking or collapsing. Good news, right? Your compression tests (CT) fracture on a near-surface faceted layer, but only after some abuse. Also good news. The shear quality [Shearing Season, pg. 47] is clean, but not quite definitive. Something in your gut tells you to keep prodding. Luckily, there's a new test that's quick, easy, simple to read, and accurate: the Extended Column Test (ECT).

Most stability tests highlight weak layer fracture *initiation*. The ECT was designed by Copper Mountain, Colo. ski patroller Ron Simenhois to assess fracture *propagation* (spreading), across an isolated snow column. The ECT is performed similarly to a CT, and can be done very quickly. The fracture is initiated on one side of a wide column with a shovel compression, and if the fracture propagates through the weak layer to the other side, it indicates that the relationship between the slab and weak layer is ripe for avalanching.

Another bonus of the ECT is that so far, data for the ECT indicates a false stable rate of just 5-10 percent. A false stable result says the snowpack is stable when it's really not—scary stuff. Other stability tests, including the new Propogation Saw Test [Dec. *Backcountry* 2008] have false stable rates of 10-30 percent.

Karl Birkeland, a snow scientist with the U.S. Forest Service, advises adding the ECT to your pit routine because of the low false stable rate, but also because of its ease of interpretation. But, he cautions, "The ECT is not the final answer." It doesn't replace other observations or pit tests, it augments them. No one test or piece of information is the final answer unless it indicates *instability*. Here's a rundown:



Avalanche season ends with 3 fatalities

By BRETT FRENCH - Billings Gazette - 04/23/09

One deadly day — Jan. 17 — accounted for all three of the avalanche fatalities in Montana's backcountry this winter. But there were numerous close calls.

And while spring has arrived — according to the calendar, at least — snowfall this week continues to make forest travel sketchy.

"Even though it's the end of the forecasting season, we still have some very weak layers we're concerned about," said Doug Chabot, director of the Gallatin National Forest Avalanche Center. "The predominant weak layer is two feet off the ground, and we just put a heavy load on it. It will take a while to stabilize."

April 10 marks the end of the center's forecasting season. In its annual report, the center noted there were 45 avalanche incidents, 12 partial burials and four full burials that included the three deaths - all in southwestern Montana.

Two of the three avalanche injuries were slides triggered by skiers who were slammed into trees, Chabot said. Luck played a role in those incidents not being fatal, he added.

Deaths down in West

Nationwide, there were 26 avalanche fatalities this winter, compared with 36 last year. Fifteen of the 26 fatalities involved snowmobilers, including the three in Montana. The Montana deaths occurred near Cooke City, on Mount Jefferson in the Centennial Range and in the Gravelly Range.

Wyoming was the deadliest state for avalanches this year, with five people killed. Three of those were snowmobilers in one group riding in the Indian Peak area of the Snake River Range. The other two deaths were a Jackson Hole skier and a Cody-area ice climber.

Colorado followed Wyoming with four avalanche fatalities, while Idaho, Utah and California, as well as Montana, recorded three deaths. Chabot noted that most of the Western U.S. was plagued by a weak snowpack similar to Montana's. Last year, three people were killed in Montana avalanches and seven were killed in Wyoming.

Perfect storm

Chabot said the three Montana deaths on Jan. 17 involved a "perfect storm" of coalescing conditions. Large snowstorms carpeted the state as January began, kicking off the center's longest-running avalanche warning - seven days of high danger in the southern mountains.

The unstable conditions didn't settle much in the following weeks, and when a sunny and long Martin Luther King weekend rolled around, conditions were prime for avalanches.

"There were tons of people in the backcountry," Chabot said.

Despite the loss of life, southwestern Montana's winter backcountry users may be better informed than

in the past, if the center's numbers are any indication. This season, more people than ever received the center's daily updates on avalanche conditions through the Internet and e-mail, a 20 percent increase. On average, 3,239 folks read or heard the advisory every day.

Spring concerns

With new snow added in the past few days and warm weather in the forecast, Chabot advised backcountry users to keep an eye out for wet slides. He said "pinwheels" — globs of snow that roll downhill — are telltale signs of weakening snowpack.

And snow that has become practically bombproof in overnight freezing, he said, can be dangerous again by noon on sunny slopes.