



GALLATIN NATIONAL FOREST  
**AVALANCHE CENTER**  
*2005-2006 Annual Report*



This Annual Report is dedicated to our fallen friends, **Doug Coombs** and **Walter Rosenthal**, who died while rescuing others.

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**Doug Coombs** died in a skiing accident in La Grave, France. He was trying to rescue his partner when he slipped.



Information on Doug's life can be found at: <http://dougcoombsmemorialfund.com/>

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**Walter Rosenthal**, snow safety director at Mammoth Mountain Ski Area, died while trying to save his fellow patrollers.



Information on Walter's life can be found at: <http://www.mammothmountain.com/memorial/>

# GALLATIN NATIONAL FOREST

# AVALANCHE CENTER

# **ANNUAL REPORT**

## **2005-2006**

### ***OUR 16<sup>th</sup> YEAR OF OPERATION***

*by*

Doug Chabot

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Cover: Snowmobiler triggered avalanche on Sheep Mountain near Cooke City, MT.

## **ACKNOWLEDGMENTS**

The success of the Gallatin National Forest Avalanche Center (GNFAC) is the result of many partnerships. These relationships include other state and federal agencies as well as businesses in the local and national outdoor community. Below is a listing of those who provided significant contributions to either the Friends of the Avalanche Center or to the Gallatin National Forest.

**Friends of the Avalanche Center  
Hans Saari Memorial Fund  
Team Bozeman and Yamaha  
Bridger Bowl  
Drew and Jennifer Seessel  
Jerry Carish**

**Montana Fish, Wildlife and Parks Recreation Trails Program  
Gallatin County Search and Rescue  
Oro y Plata  
Community Food Co-Op  
Pine Edge Cabins of Silver Gate  
Jeff King at Edward Jones Investments  
Advanced Performance Rehabilitation Services  
Montana Fish, Wildlife and Parks Snowmobile Safety Program  
Cold Smoke Awards  
Northern Lights Trading Company  
Natural Resources Conservation Service  
Big Sky Ski Patrol  
Montana Alpine Guides  
Gallatin Valley Snowmobile Association  
Ace Powder Guides  
Friends of the Chugach National Forest Avalanche Center  
The Yellowstone Club  
John Layshock**

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## Gallatin National Forest Avalanche Center 2006 Season Summary

Greetings!

On Sunday, April 9<sup>th</sup> we put out our 134<sup>th</sup> and last avalanche advisory of the season. Ron Johnson, Scott Schmidt and I want to thank you for all your support this winter. It was a real Montana winter that we'll remember for many years—deep snow and great powder. Our mission is to give people the tools to make good, safe decisions about avalanche danger, but unfortunately folks still get into trouble. This winter we were notified of 22 human triggered avalanches resulting in 4 partial burials, 4 full burials and 2 fatalities.

We're proud of our accomplishments this season. Our advisories are being accessed more than ever, our education programs continue to be popular and our community support through the Friends of the Avalanche Center is at an all-time high.

- ❑ Our advisories were accessed an average of 2,052 times a day totaling 275,000 hits for the season. This is an 18% increase over last year mostly due to a rise in people hitting our web site and subscribing to the emails.
- ❑ As technology changes, so do we. This season we added our voice recording as an mp3 file to the web page so folks can listen to us online. At the end of the season we created a Podcast for our advisories. Now folks who are savvy about getting their news via RSS feed can also get the avalanche advisory downloaded to their iPod.
- ❑ Our education programs continue to be popular. This season we taught 47 classes to 2,891 people.
  - We taught at the National Avalanche School in Snowbird, UT; the Winter Sports Workshop in Mammoth, CA; 3 two-day avalanche classes for local snowmobilers and guides; the 7<sup>th</sup> graders at Sacajewea and Chief Joseph Schools; lectures in Helena, Big Timber, Lewistown, Livingston; and the popular MSU Basic and Advanced courses.

- ❑ We organized the printing of 40,000 snowmobile safety brochures that were distributed throughout the western U.S. In southwest Montana we handed out 4,000 of the brochures.
- ❑ Team Bozeman, working with the Friends of the Avalanche Center for the 7<sup>th</sup> year in a row, invited Yamaha to loan us two 4-stroke Vector Mountain SE sleds for our field and education work.
- ❑ Our web site was upgraded with a new header and photos. We also added an Image Galley to make it easier to post and look at pictures.
- ❑ We worked with two filmmakers to create avalanche education movies.
  - Team Sno-Quest, a Minnesota film company that makes extreme snowmobile videos, is creating a ½ hour dvd on avalanche safety for riders. We will be working with them again next year to complete filming.
  - Amber Seylor, an MSU graduate student, is making an avalanche awareness video for her MFA degree.
- ❑ With the Friends, we launched *SnowPilot*, a software program to record, display and archive snowpit and avalanche occurrence data. Over 1,000 snow profiles from all over the western US were added this winter.

As you can see, it was a productive and busy year at the Avalanche Center. Ron, Scott and I wish you a great summer.

Thanks for another great year!

Doug Chabot  
Director  
Gallatin National Forest Avalanche Center

## STAFF BIOGRAPHIES

### Doug Chabot

Doug, director of the Gallatin National Forest Avalanche Center, received his B.A. in Outdoor Education from Prescott College in 1986. From 1990 to 1999 he worked as a professional ski patroller at Bridger Bowl Ski Area in Bozeman, Montana. Starting part-time in 1995 and moving to full-time in 1998, Doug has worked for the GNFAC as an avalanche specialist. He has taught several avalanche workshops, including courses for the American Avalanche Institute and National Avalanche School. He's worked as a professional mountain guide in Alaska and the western US from 1989 to the present, and is a senior guide at Exum Mountain Guides in the Tetons. Doug has been on 16 Alaskan climbing expeditions as well as climbs in Nepal, India, Afghanistan and Pakistan.



### Ron Johnson

Ron received a M.S. degree from Montana State University in 1983 in Earth Science and conducted research in glaciology. He also did some independent studies related to avalanches as well as worked as a graduate teaching assistant under Dr. John Montange. He worked as a professional mountain guide from 1984 to 1988 in the North Cascades, Alaska, and South America and also taught Nordic skiing in Bozeman, Montana. From 1988 to 1992, Ron worked as a professional ski patroller at Bridger Bowl Ski Area. Since that time, he has worked as an avalanche forecaster at the Gallatin National Forest Avalanche Center. He has instructed at several avalanche workshops, including at the National Avalanche School since 1997. He is a professional member of the American Avalanche Association and has served as chairman of that organization's Education Committee. Since 1990, he has worked as a climbing ranger for the National Park Service at Denali National Park and Grand Teton National Park.



### Scott Schmidt

Scott holds a B.S. degree in Physics and received his PhD in Applied Mechanics from Montana State University in 1999. His published work includes research in wind blown snow transport, avalanche flow dynamics, and snow metamorphism. Scott has worked as a consultant since 1996, contributing solutions to a number of snow-related engineering problems. He currently works as a professional ski patroller at Bridger Bowl and has been an avalanche specialist with the Gallatin National Forest Avalanche Center since 1999.

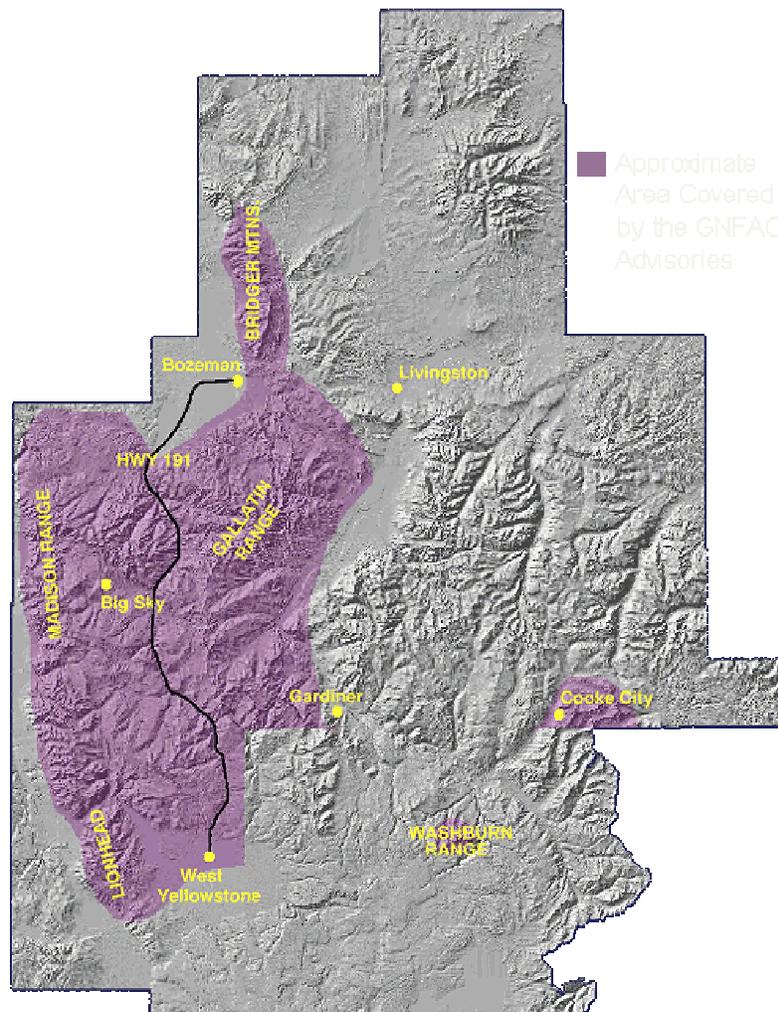


## ADVISORY AREA

The Gallatin National Forest Avalanche Center covers over 10,000 sq. kilometers of National Forest land. Our area includes the:

- ❑ Bridger Mountains
- ❑ Gallatin Mountains
- ❑ Madison Range
- ❑ Washburn Range
- ❑ Mountains around Cooke City
- ❑ Henry Mountains (aka. Lionhead area near West Yellowstone).

Our advisories cover specific areas that are frequently broken into sub-groups in order to accurately describe current avalanche conditions. Some people also extrapolate from these advisories to adjacent mountain ranges. The shaded areas on the map represent the approximate area covered by our advisories.



## ADVISORIES

Every morning, all winter long, one of us wanders into the office at 4 a.m. to compose the daily avalanche advisory. After looking at the weather, reading the public observations and utilizing our snowpack data from the field, we write a 1-2 page advisory outlining the avalanche conditions. Our mission is to help backcountry users make sound travel decisions, and the daily avalanche advisory is our primary tool to accomplish this.

**Flip to page 84 for an article describing how we put out the advisories.**

By 7:30 a.m. the advisory has been posted on our web page, recorded on the phone lines and emailed out. Our email subscription continues to be the most popular way to get the advisory and this year we saw record numbers sign up for this free service. Over 1,450 folks a day get it delivered to their inbox in time for their morning coffee.

Additionally, the advisory web page averaged 421 hits a day, a 29% increase from last year while the phone line leveled off at 95 calls a day. We also send out 37 faxes and 50 Forest Service internal emails.

**The avalanche advisories are accessed an average of 2,052 times a day! This is an 18% increase from last season and an 84% jump from 5 years ago.**

Abbreviated advisories were also played on many radio stations throughout Gallatin Valley. These Public Service Announcements outline the day's avalanche danger and are heard by thousands of people.

*Jim Earl* is our web master and was responsible for many changes and additions to our web site. We worked with him to freshen up the look and navigation of our site making it even easier to subscribe and read the advisories. Specific changes include:

- ❑ We added an Image Gallery page. This allowed us to add photos to the website and have them linked to specific advisories. The Sawtooth National Forest Avalanche Center graciously provided the template for this.
- ❑ We recorded every day's advisory as an mp3 and you can now listen to it online.
- ❑ We created a Podcast for our advisories. Folks can now sign up for an RSS feed and download the advisory to their iPod.

**The GNFAAC was the *first* avalanche center to offer mp3 downloads of our advisory, and remains the *only* center with Podcasts.**

We began issuing daily advisories November 27<sup>th</sup> and continued through April 9<sup>th</sup> for a grand total of 134 advisories. These were accessed 275,000 times (*Figure 1*).

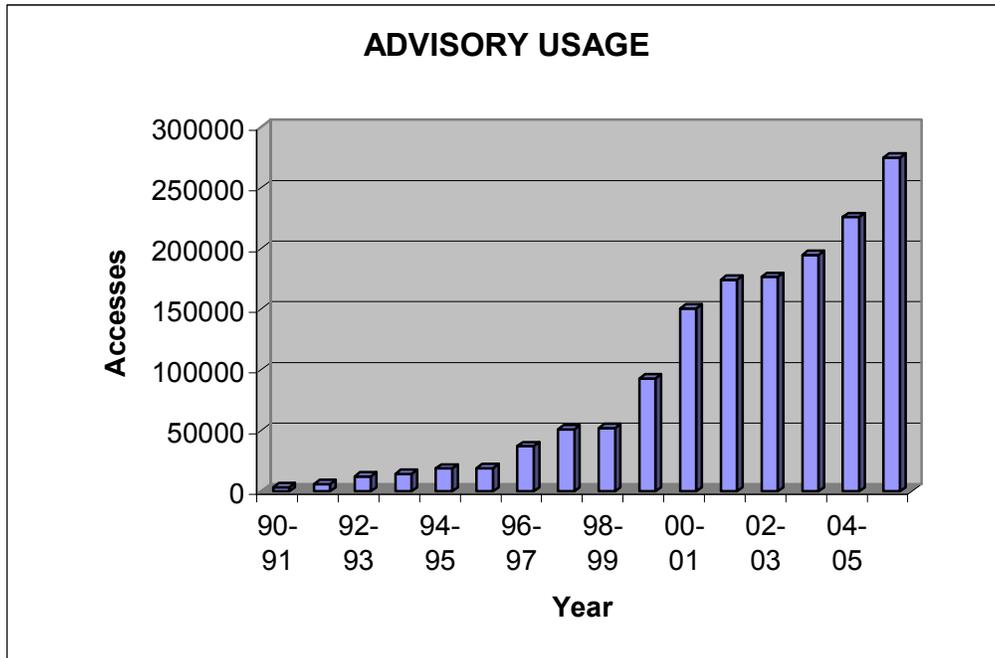


Figure 1: Advisory usage from 1990-91 to 2005-06



*Ron Johnson hard at work in the avalanche Nerve Center*

## AVALANCHE EDUCATION

Avalanche education continues to be a major focus of the GNFAC. All of our programs are free and this year we expanded our offerings even more. Most of our lectures are one to two hours long, however, we also teach multi-day courses with field sessions.

**This winter the GNFAC gave 47 talks to 2,891 people.**

The demand for avalanche classes increases every year and this winter was no exception. I started booking classes in October and dates filled fast. Ron, Scott and I juggled our schedules to accommodate as many groups as possible, but we had to bring on a few folks to help us with the workload.

The Friends of the Avalanche Center used money from the Hans Saari Memorial fund to pay for these additional instructors. *Dale Gullett* and *Jeff Watt* were regular teachers to the snowmobile crowd. Jeff owns Ace Powder Guides, a snowmobile guide service in West Yellowstone, and Dale is one of the Gallatin National Forest Snow Rangers. *Jay Pape*, a volunteer and instructor with us for many years, traveled over southwest Montana to round out our teaching efforts. Other instructors included *Karl Birkeland* of the National Avalanche Center; *Eric Lutz*, PhD graduate student in snow at MSU and *Mike Cooperstein* of the Yellowstone Club Snow Safety. We are lucky to have such strong and competent instructors in our community.

Besides lectures and field sessions we try and get as much avalanche information as possible into the hands of winter recreationists. We printed another 40,000 8-panel brochures on Avalanche Safety for Snowmobilers that were distributed to other avalanche centers throughout the western US. Here at home we handed out 4,000 of these. We also gave away 1,000 magnets and 2,500 stickers with the GNFAC avalanche advisory information. Our objective is to get everyone who recreates in avalanche terrain to call our avalanche advisory before venturing outside.

This winter we worked with two filmmakers to make avalanche education videos. *Amber Seyler*, a MFA graduate student at MSU, is making a documentary on avalanches. Her film includes snow research, avalanche forecasting, backcountry skiing and snowmobiling and interviews with avalanche survivors. In addition to her film we worked closely with *Jason Nieters* and *Paul Berg* of Team Sno-Quest. These two are based out of Minnesota and produce professional snowmobile videos. We worked hand-in-hand with them to create a 30-minute avalanche awareness video targeting snowmobilers. Although there is many avalanche videos on the market none exist for the snowmobile crowd. We helped them write the script and shot list and ended up spending a few days filming in the backcountry with them. I'm excited about this project and think it'll be a huge hit. The plan is to distribute them throughout the US. Many riders travel from the Midwest to play in the deep powder and big mountains, but arrive with very little avalanche knowledge. This video is intended to be the first step towards avalanche awareness and will hopefully save lives with its simple, effective message.

Table 1: **AVALANCHE EDUCATION**

<b>DATE</b>	<b>INSTRUCTOR</b>	<b>GROUP</b>	<b>COURSE</b>	<b>#</b>
11-Oct	Pape	Chief Joseph 7th Grade	Ava. Awareness	100
12-Oct	Pape	Chief Joseph 7th Grade	Ava. Awareness	100
20-Oct	Chabot	Gallatin Leadership Team	GNFAC Overview	15
24-Oct	Chabot	National Avalanche School	Terrain	200
24-Oct	Chabot	National Avalanche School	Snow Profiles	200
27-Oct	Johnson	National Avalanche School	Rescue	200
28-Oct	Chabot	National Avalanche School	Ava. Education	200
3-Nov	Pape	The Basecamp-Helena	Ava. Awareness	75
6-Nov	Johnson	BS Volunteer Ski Patrol	Ava. Awareness	90
8-Nov	Chabot	NRCS	Ava. Awareness	30
16-Nov	Chabot	Bozeman Leadership	Ava. Awareness	30
10-Nov	Cooperstein	Adult Ed-Big Timber	Ava. Awareness	18
16-Nov	Johnson	Northern Lights Trading Co.	Ava. Awareness	40
18-Nov	Johnson	Ski Patrols	Ava. Awareness	80
30-Nov	Johnson, Birkeland	ASMSU	Basic Avalanche	130
1-Dec	Johnson, Birkeland	ASMSU	Basic Avalanche	110
3-Dec	Johnson, Birkeland, Schmidt	ASMSU	Field	100
4-Dec	Chabot	MT FW&P Snowmobilers	Ava. Awareness	29
8-Dec	Birkeland	Bridger Ski Patrol	Ava. Accidents	35
8-Dec	Chabot, Schmidt, Gullett	Team Bozeman	Basic Avalanche	26
9-Dec	Chabot, Schmidt, Gullett	Team Bozeman	Basic Avalanche	26
11-Dec	Chabot, Schmidt, Gullett, Watt	Team Bozeman	Field	20
13-Dec	Chabot	Rotary Club	GNFAC Overview	75
18-Dec	Schmidt, Pape, Watt	West Yellowstone Guides	Basic Avalanche	27
19-Dec	Schmidt, Pape, Gullett, Watt	West Yellowstone Guides	Field	12
8-Jan	Lutz	National Guard	Ava. Awareness	35
12-Jan	Johnson	Wolverine Researchers	Ava. Awareness	6
12-Jan	Chabot	Timber Trails-Livingston	Ava. Awareness	38
16-Jan	Schmidt	Gallatin Co, SAR	SAR	30
17-Jan	Johnson	Grand Teton Nat. Park	Ava. Awareness	25
18-Jan	Johnson	Grand Teton Nat. Park	Field	12
19-Jan	Johnson	Museum of the Rockies	20/20 Hindsight	120
21-Jan	Gullett	Big Timber Snowmobile Club	Field	13
24-Jan	Schmidt	Gallatin Valley Snomo Assoc.	Current Conditions	22
25-Jan	Johnson, Birkeland	ASMSU	Basic Avalanche	130
26-Jan	Johnson, Birkeland	ASMSU	Basic Avalanche	110
28-Jan	Johnson, Birkeland, Schmidt	ASMSU	Field	100
27-Jan	Schmidt	Bozeman Special Ed	Weather	3
2-Feb	Johnson, Watt	West Yellowstone Guides	Basic Avalanche	15
3-Feb	Johnson, Watt	West Yellowstone Guides	Field	11
8-Feb	Johnson, Birkeland	ASMSU	Advanced	33
9-Feb	Johnson, Birkeland	ASMSU	Advanced	33
10-Feb	Pape	Sacajewea 6th Grade	Ava. Awareness	80
11-Feb	Johnson, Birkeland, Schmidt	ASMSU	Field	33
11-Feb	Gullett	Livingston Snowmo Club	Field	9

13-Feb Pape	Big Sky Youth Empowerment	Ava. Awareness	8
17-Feb Schmidt	Morning Star 2nd Grade	Ava. Dogs	52
23-Mar Johnson	Boy Scouts	Ava. Awareness	30
25-Mar Johnson	Boy Scouts	Field	20
25-Mar Gullett	Snowmobile Groomers	Ava. Awareness	12
<b>TOTAL= 47 Talks/Seminars/Field Sessions to 2,891 People</b>			



*Jeff Watt, owner of Ace Powder Guides, films an avalanche video for Team Sno-Quest.*

## ACCIDENTS AND INCIDENTS

This winter southwest Montana had two avalanche fatalities. Both occurred in the mountains outside Cooke City on January 5<sup>th</sup> and 6<sup>th</sup>. The first fatality happened as five riders climbed a south-facing slope on Mt. Abundance. The slide caught and buried 2 of them, one fatally. They all had rescue gear and dug up the victim within 10 minutes, but it was too late.

The next day a party of three rode up on Miller Mountain. They were in a steep drainage when they triggered a massive slide. Two of them were able to jump off their machines and run to the side, but the third rider was fatally buried 7 feet deep. They had rental beacons, but no shovels. The victim was buried deep enough that shovels would likely not have affected the outcome, but it illustrated the need to always be prepared for the worst.

**You can read detailed reports on these incidents on the Accidents page of our web site [www.mtavalanche.com](http://www.mtavalanche.com).**

*Table 2* represents all of the avalanche incidents and accidents reported to us. We only hear about a handful of the avalanches actually triggered, but with incidents involving injury and death we're usually notified quickly. The table shows that many of these incidents are clustered around certain dates. Not surprisingly, these were usually preceded by significant snowfalls.

*Table 3* compiles all the avalanche incident data for sw Montana over the last 16 years.

*Table 4* lists all the avalanche fatalities this year in the US. As of June 1<sup>st</sup> there were 23 deaths. The tally is: MT-4; AK-4; CO-4; ID-3; UT-3; WY-2; WA-2; CA-1.

*Table 5* records the US avalanche fatalities for the last 16 years grouped by activity.



Miller Mountain Avalanche

**This winter 12 snowmobilers died in avalanches, triple the amount killed backcountry skiing.**

Education is our most effective tool in decreasing the number of incidents and fatalities in the backcountry. Locally, more skiers and riders than ever before have attended one of our workshops, carry rescue gear and read our advisory. While our education efforts are mostly targeted at home, we're trying to expand our reach to recreationists from other states. As the two deaths in Cooke City illustrate we need to educate folks who are not locals. Team Sno-Quest's video, brochures, and a future on-line avalanche tutorial will begin to address these needs.

Table 2: **SW Montana AVALANCHE INCIDENTS & ACCIDENTS**

DATE	LOCATION	DETAILS
8-Nov	Moonlight Basin	1 skier + 1 dog caught; skier buried, uninjured
1-Dec	Cooke City	1 snowmobile triggered
11-Dec	Cooke City	1 snowmobile triggered
18-Dec	Madison Range	1 skier triggered, caught, uninjured
28-Dec	Cooke City	1 snowmobile triggered, caught, uninjured
1-Jan	Lionhead	1 snowmobiler triggered, caught, uninjured
1-Jan	Cooke City	1 snowmobiler caught, buried, uninjured
5-Jan	Cooke City	5 snowmobiler triggered, 3 caught, 2 partial buried and 1 buried and killed
6-Jan	Cooke City	3 snowmobiler triggered, 3 caught, 2 partial buried and 1 buried and killed
20-Jan	Bridger Range	4 separate ski triggered slides, no one caught
29-Jan	Taylor Fork	1 snowmobile triggered
5-Feb	Taylor Fork	2 snowmobile triggered
11-Feb	Taylor Fork	1 snowmobile triggered
11-Feb	Big Sky	1 skier triggered, caught, uninjured
13-Feb	Yellow Mt.	1 skier triggered, caught, uninjured
26-Feb	Lone Peak Lakes	1 skier triggered
5-Mar	Two Top	1 snowmobiler triggered, caught, uninjured
27-Mar	Bridger Range	1 skier triggered, caught, uninjured
28-Mar	Bridger Range	1 skier triggered
<b>TOTAL= 22 Incidents resulting in 4 partial burials, 4 full burials and 2 deaths.</b>		



*Felicia Ennis measuring a crown at Moonlight Basin*

Table 3: **SW Montana Avalanche Incident Data For 1990-2006**

	Total Incidents	Skiers, Boarders, Climbers, buried	Snowmobilers buried	Skier, Boarder, Climbers, fatalities	Snowmobiler fatalities
2005-2006	22	1	7	0	2
2004-2005	35	4	4	2	0
2003-2004	25	2	1	0	0
2002-2003	40	4	17	0	3
2001-2002	35	0	7	0	3
2000-2001	42	8	4	3	1
1999-2000	30	2	3	1	0
1998-1999	13	3	1	0	0
1997-1998	29	8	9	0	4
1996-1997	20	1	2	0	0
1995-1996	22	4	13	0	2
1994-1995	23	8	3	0	0
1993-1994	23	5	2	0	1
1992-1993	35	6	8	0	1
1991-1992	25	2	2	0	1
1990-1991	10	0	5	0	0
<b>TOTALS</b>	<b>413</b>	<b>58</b>	<b>88</b>	<b>6</b>	<b>18</b>

Since the fall of 1990 through April 11, 2006 in southwest Montana:

- ❑ 18 snowmobilers, and 6 non-snowmobilers died in avalanches.
- ❑ 88 snowmobilers were partially or completely buried. 58 non-snowmobilers were partially or completely buried.
- ❑ 63 people were buried and 11 people killed in the mountains near Cooke City. All fatalities were snowmobilers.
- ❑ 14 people were buried near West Yellowstone. 5 of the burials resulted in fatalities. All fatalities were snowmobilers.
- ❑ 13 people were buried in the Bridger Range killing one skier.
- ❑ 36 people were buried elsewhere on the Gallatin National Forest. Fatalities included one skier, four climbers and three snowmobilers.

Table 4: **2005-06 US AVALANCHE FATALITIES**Avalanche Fatalities: **23**

<b>DATE</b>	<b>LOCATION</b>	<b>STATE</b>	<b>DESCRIPTION</b>
4/18	Mount Herman, west of Mt. Baker Ski Area	WA	1 skier caught, carried, and killed
4/08	Patriot Bowl-west of Trinity Mtn.	ID	1 snowmobiler caught, buried, and killed
4/03	Pioneer Ridge, an out-of-bounds area near Brighton Ski Resort	UT	1 snowboarder caught, buried, and killed
4/02	Mountains outside of Spencer	ID	2 snowmobilers caught, one killed
3/19	Tiffany Mountain near Conconully	WA	2 snowmobilers caught, 1 buried and killed, 1 partially buried
3/11	Ogden Mtn., Taylor Canyon	UT	1 snowboarder caught, buried, and killed.
3/01	Mountains near Antelope Creek	ID	1 snowmobiler buried and killed
2/28	Marmot Mountain, Hatcher Pass Area	AK	1 snowboarder caught and buried. Still missing and presumed dead.
2/14	Rainy Pass; Dalzell Creek, in the Alaska Range	AK	1 snowmobiler buried and killed.
2/08	Flattop Mtn, Chugach State Park, Chugach Mtns	AK	2 snowshoers caught & carried. 1 buried and killed
2/01	Blacksmith Creek drainage, Twin Lakes area; Sawtooth Range	CA	3 people caught, 2 carried, 1 partially buried, 1 killed
1/14	Whitefish (Red Meadow Lake)	MT	2 snowmobilers buried and killed
1/6	Cooke City (Miller Mountain)	MT	1 snowmobiler buried and killed
1/5	Cooke City (Mt. Abundance)	MT	1 snowmobiler buried and killed
1/5	Teton Pass	WY	1 backcountry skier buried and killed
1/3	Raggedtop Mountain (near Girdwood)	AK	1 backcountry skier buried and killed
1/1	Trap Park (Front Range)	CO	2 snowmobilers buried and killed
12/31	Aspen Grove (east of Provo)	UT	1 snowshoer buried and presumed killed
12/27	Togwotee Pass/Squaw Basin	WY	1 snowmobiler buried and killed
12/22	Kelso Mountain (Front Range)	CO	1 hiker buried and killed
11/6	Berthoud Pass (Front Range)	CO	1 backcountry snowboarder buried and killed

Table courtesy of Colorado Avalanche Information Center  
<http://geosurvey.state.co.us/avalanche/>

Table 5: **US AVALANCHE FATALITIES BY ACTIVITY, 1990-2006**  
 BC = backcountry and OB = out-of-bounds

ACTIVITY	90-91	91-92	92-93	93-94	94-95	95-96	96-97	97-98	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	16-winter totals
climbers	3	7	3	2	6	9	6	3	1	0	2	3	5	1	5	0	<b>65</b>
BC skiers*	2	7	9	2	7	6	0	0	3	8	5	5	5	2	10	4	<b>92</b>
in-area skiers/riders	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	<b>4</b>
OB skiers*	0	4	5	0	0	1	0	1	2	5	5	2	2	0	0	0	<b>41</b>
BC snowboarders	0	0	2	0	1	3	1	4	4	0	2	0	3	3	5	4	<b>31</b>
OB snowboarders	0	0	1	0	2	1	0	0	3	1	0	4	1	0	0	0	<b>13</b>
snowmobilers	2	2	2	9	7	5	6	14	13	5	15	18	14	5	4	12	<b>133</b>
misc. recreation	1	2	4	0	1	2	7	4	4	1	4	3	0	5	2	3	<b>42</b>
patrollers	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	<b>6</b>
motorists/highway workers	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	<b>4</b>
residents	0	0	0	0	2	1	0	0	0	1	0	0	0	2	0	0	<b>6</b>
others @ work	0	1	1	0	0	1	2	0	1	0	0	0	0	1	0	0	<b>7</b>
<b>total</b>	<b>8</b>	<b>24</b>	<b>29</b>	<b>13</b>	<b>28</b>	<b>30</b>	<b>22</b>	<b>26</b>	<b>32</b>	<b>22</b>	<b>33</b>	<b>35</b>	<b>30</b>	<b>19</b>	<b>27</b>	<b>23</b>	<b>400</b>

This table was compiled by the Colorado Avalanche Information Center.



*Scott Schmidt feeling the power of the new Yamaha Vector.*

## MEDIA

Print, television and radio media are all part of our avalanche education program. Typically media interest follows avalanche accidents and big snowstorms, and this winter was no exception. We gave interviews to local television stations, national radio and many magazines and newspapers. Most notable was a piece in *Powder Magazine*, many reports through the AP, a live interview on CNN, and a great piece on the local PBS station.

**Copies of the various newspaper and magazine articles begin on page 51.**

This season we had 36 media contacts. Many involved local papers in Bozeman, Livingston, Billings and Missoula. Others were with papers and television stations in Minnesota following the two fatalities. Our contacts resulted in favorable

articles and television spots that piqued the public's interest in our work and increased the demand for our classes.

Besides the media interest that follows significant events we've established solid partnerships over the years with other outlets. This was our third year working with KGLT (90.1 FM) radio. Every day they read an abbreviated version of our advisory. We also worked with The Eagle KBZM (104.7 FM) who played a 1-minute recording of avalanche conditions every Wed through Saturday. Reier Broadcasting, which represents 5 radio stations, also played our recording with Team Bozeman and Yamaha sponsoring these ads. Additionally, Danhof Chevrolet paid for a weekly ad with the Avalanche Hotline number in the *Mini-Nickel*. Another plug for the Avalanche Center appeared every month in the *Montana Snowmobile Association News* who gave us free ad space with our hotline and web site information.

## ARTICLES

Besides writing the daily avalanche advisory we also wrote articles for newspapers, newsletters and trade journals. We find that these articles are a great way to educate the public about avalanches. These are usually general avalanche awareness topics and they allow us to increase avalanche awareness to a wider, more diverse population.

These articles included:

- ❑ Ron and Scott both wrote articles for snowmobilers every month in the *Montana Snowmobile Association Newsletter*. Besides the articles, two of our photos ended up as cover shots.
- ❑ Doug authored four articles on avalanche safety in his "Snow Advisory" column in the monthly *Carve* magazine published by the *Bozeman Daily Chronicle*.
- ❑ Doug wrote two articles for *Outside Bozeman* covering Avalanche Safety and Spring Skiing.
- ❑ For the December 2005 issue of *The Avalanche Review* Doug wrote a piece on *SnowPilot*.

Copies of these articles are included at the end of the report in the "Newspaper and Magazine Articles" section starting on page 51.

## FINANCES AND FUND RAISING

Since the Avalanche Center's inception in 1990 the Gallatin National Forest had been our biggest source of funding. They fund two full-time positions (mine and Ron's) plus most of the expenses associated with our operation (vehicles, office space, computers, supplies, etc.). This totals over \$85,000 a year. Scott's salary, as well as the snowmobiles and extra administrative expenditures, is covered by the generosity of many other agencies, businesses and individuals.

### **Friends of the Avalanche Center**

These dedicated volunteers are our safety net. This year they donated \$13,174 to cover our snowmobile expenses, administrative and field supplies. Page 21 outlines their efforts in detail.

### **Montana Fish, Wildlife and Parks Recreation Trails Grant**

Bob Walker and Steve Gilbert of Montana Fish, Wildlife and Parks are strong advocates for the state avalanche program. Through a Recreation Trails Grant they awarded us \$8,600 which represents 7% of our operating budget.

### **Gallatin County Search and Rescue**

Gallatin County Search and Rescue has been one of our most steadfast supporters with donations of \$4,000 every year. Our partnership with them is invaluable and the funds we receive are greatly appreciated.

### **Montana Fish, Wildlife and Parks Snowmobile Safety Fund**

Ray Paige of FW&P is in charge of the state snowmobile safety program and generously donated \$3,000 again this year. Additionally, Ray paid for the printing of 10,000 snowmobile avalanche brochures that were distributed throughout Montana.

### **2006 Centennial of Service Challenge**

The GNFAC successfully competed for a National Forest grant. We were awarded \$10,000 to promote avalanche safety. We were extremely thankful to have the extra money this winter, especially since we started the season with a budgetary shortfall.



*Dick Lewan skiing powder in Bradley Meadows, Bridger Range. Photo by Kevin Fletcher.*

## CONTRIBUTIONS OF LABOR AND EQUIPMENT

Volunteer labor and equipment to the GNFAC totaled \$33,400 this season (see page 29 for details). Without this help we would not be able to operate in our current capacity.

### Observers

A host of “unofficial” volunteers called in observations on a regular basis. Since our advisory area is so large we rely on folks to feed us information about current snow conditions. Over 60 individuals fall into this category and we appreciate their timely emails and phone calls. We are also thankful for the combined efforts of Bridger Bowl Ski Area, Big Sky Ski Area, Moonlight Basin Ski Area, the Yellowstone Club, and Ace Powder Guides.

### Government Agencies

Some “official” agencies and businesses that help us include the National Weather Service, the Natural Resources Conservation Service (NRCS), the Forest Service offices in West Yellowstone, Bozeman and Gardiner, and the National Park Service offices in Canyon and the Northeast Gate. We also owe thanks to the Forest Service Snow Rangers *Will Shoutis* and *Dale Gullett* for their steadfast field observations and snowpit data.

### Field Volunteers

On most days of the week one of us is outside gathering data for the next day’s advisory, but our small staff makes it difficult to get out with each other. For safety, we always travel with partners and we rely on a group of volunteers to accompany us in the field. This year our field partners were Ed Adams, Nick Bilton, Karl Birkeland, Chas Day, Jim Earl, Felicia Ennis, Marty Faulkner, Dale Gullett, Cliff Gullett, Fay Johnson, Jeff Johnson, Kathy Kinser, Cameron Lawson, Eric Lutz, Pete and Terri Maleski, Beth MacConnell, Chris McQueary, Alan Oram, Jay Pape, Christine Raymond, Lance Riek, RA Schmidt, Eric Scranton and Amber Seyler. These volunteers donated over 600 hours of time!

**Mike Cooperstein**, Assistant Snow Safety Director at the Yellowstone Club, traveled to Big Timber to tech a class during a scheduling conflict.

**Jim Earl** deserves special mention for all his work on our web site, [www.mtavalanche.com](http://www.mtavalanche.com), and also on the *SnowPilot* web pages at [www.snowpilot.org](http://www.snowpilot.org).

**Northern Lights Trading Company**, a local outdoor store, has been supporting the Avalanche Center since the beginning. Once again, they generously loaned us skis and boots for the winter.

## FRIENDS OF THE AVALANCHE CENTER

The Board of Directors include: *Drew Seessel* (President), *Chas Day*, *Jeannie Wall*, *Greg Caracciolo*, *Laura Ryan*, *Dale Sexton*, *Jay Pape*, *Mike Harrelson*, *Lance Riek*, *Alan Oram*, *Brian Grossenbacher* and *Cliff Gullett*.

The Friends of the Avalanche Center continue to be a cornerstone of our program. Without their volunteer fundraising efforts we would be unable to sustain the GNFAAC at our current level. Ron, Scott and I are extremely thankful for all the time and energy the Friends put into making our operation successful.



**FRIENDS  
OF THE  
AVALANCHE  
CENTER**

This year the Friends gave us \$13,174 in support, paying for many expenses incurred outside of our normal operations. Some large purchases included 3 new Motorola radios. These were bought locally at a cost of \$1,900. Our previous radios were big, heavy, difficult to use and very old—in complete contrast to the sleek newer ones. The Friends also purchased a Nikon slide scanner for \$700 since the old one died in November.

Through Team Bozeman, Yamaha donated two snowmobiles to the Friends for our use. These were 2006 RS Vector Mountain SE 4-strokes, a powerful and clean mountain climbing machine. The Friends paid all of the delivery charges, general maintenance, upgrades, insurance, and covers totaling over \$4,400. Additionally, the Friends covered many administrative expenses to the tune of \$3,382. These included fees to our email provider and Internet server, office supplies, new software, subscriptions, magnets and stickers for our education programs and *Dick Dorworth* for his professional editing services. They also paid \$2,602 in salaries/expenses for additional instructors.

**The Friends are a non-profit 501(c)(3) organization providing a means for individuals and organizations to financially support avalanche education and information. These community partnerships are an important and valuable resource to the GNFAAC.**

### **Hans Saari Memorial Fund**

Hans Saari was killed in a skiing accident in France in 2001. His untimely death was felt throughout the Bozeman community, home to his family and many friends, as well as in the larger international skiing and climbing community. Donations sent to the Friends in his memory are used to fund avalanche education. Interest from the fund is drawn annually, allowing the principal to be maintained in perpetuity.

The Hans Fund paid the salaries of additional instructors for all our classes. Also, through the Hans Saari Scholarship program, ten \$200 scholarships were awarded to avalanche professionals to attend the International Snow Science Workshop held October 2006 in Telluride CO. Two scholarships went to each ski patrol (Bridger Bowl, Moonlight Basin, Big Sky and Yellowstone Club) with two others for MSU graduate students. The Hans Saari Fund supports education in southwest Montana and the Friends are excited to help local, dedicated snow professionals further their education.

Page 24 lists those contributing to the Hans Sarri Fund. The majority of these contributions were for the “King and Queen of the Ridge” competition.

## Powder Blast

The 7<sup>th</sup> Annual Powder Blast fundraiser was held the first weekend in November. It was huge

Thank you to the following donors for making the

### 2005 POWDER BLAST

AVALANCHE CENTER FUND RAISER  
a huge success!

Local Donors	Corporate Donors
Alpine House, Jackson, WY (Hans Johnstone)	Shoefly Shoes
Barrel Mountaineering	Simms Fishing Products
Backpacking Light	Spire Climbing Center
Big Sky Ski and Summer Resort	Starkey's
Bikram's Yoga	Summit Sales
Blackfoot River Brewing Company	Team Bozeman
Body In Balance	Teamthirteen
Bohart Ranch	The Barn
Bridger Bowl	The Roundhouse
Cameron Lawson	Threshold Sports
Cataye Café	Timber Trails
Chris Ankeny Photography	Worldboards
Conrad Anker and the North Face	Yellowstone Public Radio
Focus Massage Therapy	
Gallatin Alpine Sports	
Heliroving Ski Adventures	
JA Gear	
KGLI	
KMMS	
Kristen Elena	
Liz Allen Massage	
Mainstreet Gym	
Marylee Herrer Massage	
McKenzie River Pizza	
Merica Design	
Monkey Business	
Montana Ale Works	
Montana Outdoor Science School	
Moonlight Basin	
Mystery Ranch	
Northern Lights Trading Company	
Nova Café	
Pacific Outdoor Equipment	
Pro Skis	
Rick Alexander and Arc'teryx	
Sage Salon	
	Atlas Snowshoes
	Atomic Skis
	Backcountry Access
	Black Diamond Equipment
	Camelback
	Cascade Designs
	Dave Egan and IbeX
	Garment
	Gregory Packs
	Indigo Equipment
	Jetboil
	Lifelink
	Marmot Outdoor Products
	Mountain Safety Research
	Ortovox
	Outdoor Research
	Patagonia
	Salomon
	Smith Goggles
	Vasque
	Volle
	Yukon Trading Company

Title Sponsors  
Community Food Coop & Pine Edge Cabins

Additional Support  
Jeff King and Edward Jones Investments  
Advanced Performance and Rehabilitation Service

success with 250 people attending. The Friends worked hard to make the evening memorable. They had great food, drink, music and an amazing silent auction of outdoor gear. After all the money was counted and bills were paid the Friends were left with \$13,300—their best year ever! Part of the success was due to sponsorship by the **Community Food Co-Op** and **Pine Edge Cabins of Silver Gate**. As title sponsors they kicked off the party with a \$1,000 donation. Additional sponsorship came from **Jeff King and Edward Jones Investments** and **Advanced Performance and Rehabilitation Services** who gave \$500 each.

## Bridger Bowl

Bridger Bowl has been a supporter of the Avalanche Center since we started in 1990. This year they sponsored the third annual “King and Queen of the Ridge” competition. It was a huge success with 25 participants raising \$13,059 for the Hans Saari Memorial Fund. *John Parker* reigned King with a record 26 hikes and *Maria Lundgren* reigned Queen with an awesome 16 hikes. The

real KING in our eyes is **Jerry Carish**, age 65. He hiked 11 laps and single-handedly raised \$6,000!! He's a fund raising machine!

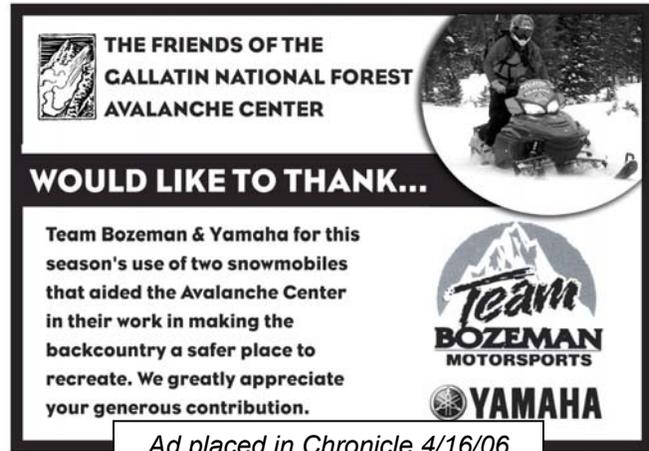
King and Queen Competitors: *Ron Johnson, Ian Foley, Kevin Fletcher, Dick Lewan, Bryce Johnson, Teri Maleski, Darren Schwehr, Kyle Christenson, Derek Black, Ben Wilkinson, Hermes Lynn, Micheal Asay, Amy Hewey, Jes Falvey, Fay Johnson, Katherine Kinser, Andrea Hedblom, Jean Watson, Blair Wood, Matt Freeck, Jerry Carish, John Parker, Timothy Weston, Maria Lundgren, Doug Chabot.*

## Drew and Jennifer Seessel

*Drew and Jennifer Seessel*, long time supporters of the Avalanche Center and volunteers with the Friends, made a substantial donation to the Hans Saari Memorial Fund for the 6<sup>th</sup> year in a row. We all appreciate their generosity of time and money. Drew is also President of the Friends Board and volunteers countless hours of his time.

### Team Bozeman/Yamaha

*Cliff Gullett*, owner of Team Bozeman, once again worked with Yamaha and the Friends to loan us two snowmobiles for the winter. Yamaha gave us new 4-stroke RS Vector SEs to ride. These machines have been instrumental in our education efforts and fieldwork. Team Bozeman also donated prizes to the Powder Blast and gave us valuable advice about snowmobiling. Cliff also discounted parts, repairs and warranties worth well over \$1,500. Furthermore, they sponsored the radio spots of avalanche conditions every Wednesday through Friday on Rier Broadcasting stations and The Eagle.



### John Layshock

*John Layshock*, professional snowmobile photographer, raffled his new SkiDoo Rev 800 as a benefit to the Friends of the Avalanche Center. He traveled all over the Greater Yellowstone area with his sled in tow promoting the GNFAC and avalanche safety. John worked countless hours on this project and we owe him huge thanks for all his time.

### The 3<sup>rd</sup> Annual Cold Smoke Awards

These awards, held the first week in April, were organized by *Jonas Grenz*, *Jeremy Mistretta*, *Anjin Herdon* and *Brad Van Wert*. Part of the proceeds of this event went to the Friends. This local film festival on winter adventure packed the Emerson Cultural Center and has become THE event of the winter! There was standing room only the night of the Awards, plus they threw a rockin' party that was unparalleled in Emerson history. These four guys are an inspiration and we're lucky to have them in our community. I can't wait for next year!

### Friends of the Chugach National Forest Avalanche Center

The Friends of the Chugach Avalanche Center in Alaska donated \$3,800 for *SnowPilot* development in December 2005. We had a budget shortfall and they came to our rescue! They are using the program with a crew of volunteer observers and have entered hundreds of pits into the database.

### Oro y Plata Foundation

This Montana Foundation has supported us three years in a row with a \$1,000 contribution.

The **Big Sky Ski Patrol** generously donated \$500 from the proceeds of their Dirt Bag Ball. **Exum Mountain Guides** donated the proceeds of the Rendezvous Hill climb to the Hans Saari Memorial Fund that totaled \$659. The **Yellowstone Club** donated \$750 this winter. The **Gallatin Valley Snowmobile Association** raised \$500 from their annual Poker Run and **Montana Telemark Corporation** raised \$250 from the Pinhead Classic.

## HANS SAARI MEMORIAL FUND CONTRIBUTORS

### \$5,000

Drew and Jen Seessel

### \$1,000+

Keith Fleishman

Jerry Carish

### \$500+

Exum Mountain Guides

Donna Shanahan

### \$200+

Alta Physical Therapy

Patrick and Cheryl Asay

John Bailey

John Brennan

Cascade Beef

Mike Coil

John Cole

Orville Fisher

Tim Forbes

Larry Griffith

Carl Jones

Matthew Kraska

Locati Architects

Paul Lubratt

Darren Schwehr

Blair Wood

Zoot Enterprises

### \$100+

AAI

Ed Amende

Richard Bliss

Ryan Dorn

Randy Elliott

Scott Fletcher

Patricia Gamble

David Gates

Marvin King

Tom Leonard

Sally Maison

Matasasky Foundation

McGovern and Fisher

L.A. Media

Heather Remitz

Greg and Lisa Rye

Weber Architects

### \$50+

Boulder Properties

Dene Brandt

Doug Chabot

Cronin Law Office

N.L. Fleet

Matthew Freeck

Ron and Fay Johnson

Cindy Lake

Chris Lundy

Bruce McGregor

Doug Neuhoff

John Parker

Kurt Puckett

Kirk Richardson

Scott Schmidt

Phil Sgamma

John Staker

Bruce Stender

Jan Stoddard

Thomas Wolfe

### \$25+

Rick Alexander

Kurt Borge

Elizabeth Burden

Kelly Cordes

Laurie Freeck

Zoe Hallowell

Richard Jeffers

Nancy Johnson

Landon Krogstad

Hermes Lynn

William Lynn

Rande Mack

Pete and Terri Maleski

Mary McFadzen

Katryn Mitchell

Jack Nichol

Scott Schumacher

William Seymour

Mark Story

Graham Turnage

Jeannie Wall

Gregory Waring

# SNOWPILOT

For the last three years we've worked on *SnowPilot*, a free software program that allows users to input snow profile and avalanche occurrence data onto a PC or a PDA. It was developed for three primary reasons. First, it enables users to easily collect and graph their data. Second, a web interface allows users to display and share their information with others. Finally, it allows the databasing of large amounts of snowpit data from many sources.



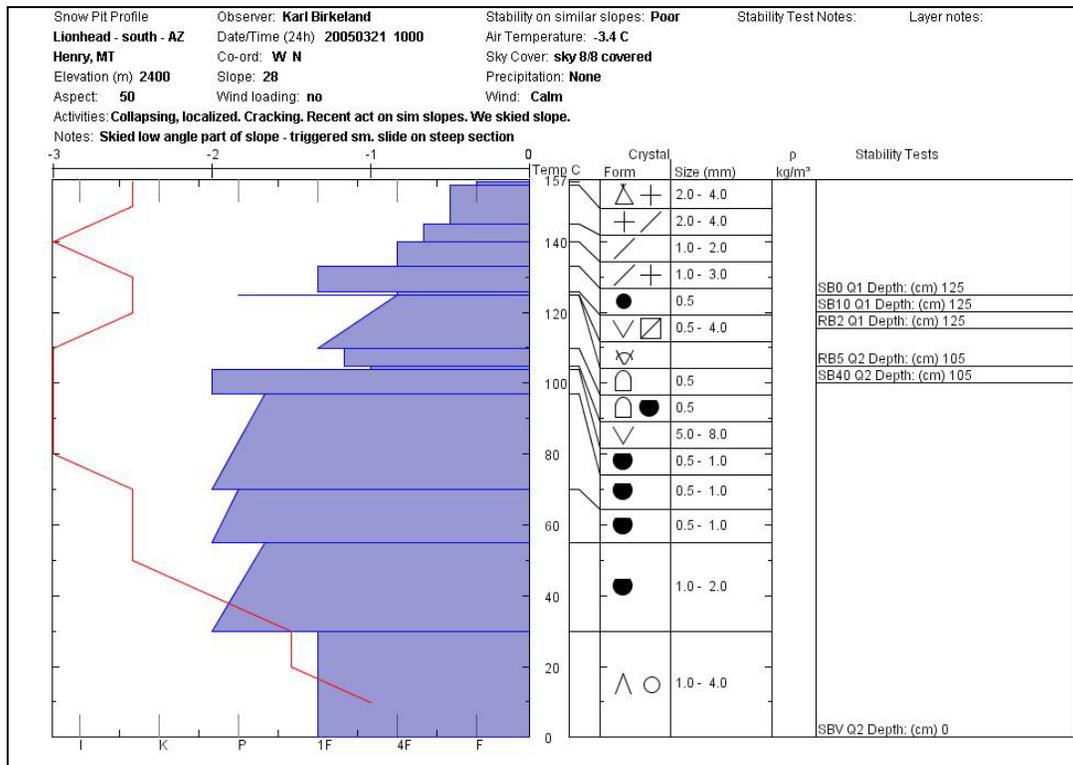
[www.snowpilot.org](http://www.snowpilot.org)

This season folks from across North America used *SnowPilot* to enter their snow profiles into the database. By the end of April we had almost 1,000 snow pits and nearly 3,500 stability tests recorded. Karl Birkeland and I are analyzing this data and will present our

findings make at the International Snow Science Workshop (ISSW) in Telluride, CO this October. Our abstract on the next page details our ISSW submission.

*Mark Karhl* of Bishop CA has been the brain behind *SnowPilot*. He turned our crazy ideas into reality and is the sole programmer of the project. Without him *SnowPilot* would not exist.

Almost all funding for the project came initially from the **Omega Foundation** and recently from the **Children of Light Foundation**. Also, the Friends of the Chugach National Forest Avalanche Center helped us with a timely donation.



This graph was generated using *SnowPilot*.

This is the abstract submitted to the 2006 ISSW:

**Minimizing “false-stable” stability test results:  
Why digging more (rather than less) snowpits is a good idea**

Doug Chabot<sup>1</sup> and Karl Birkeland<sup>2</sup>

<sup>1</sup>Gallatin National Forest Avalanche Center, PO Box 130, Bozeman, Montana 59771

<sup>2</sup>Forest Service National Avalanche Center, PO Box 130, Bozeman, Montana 59771

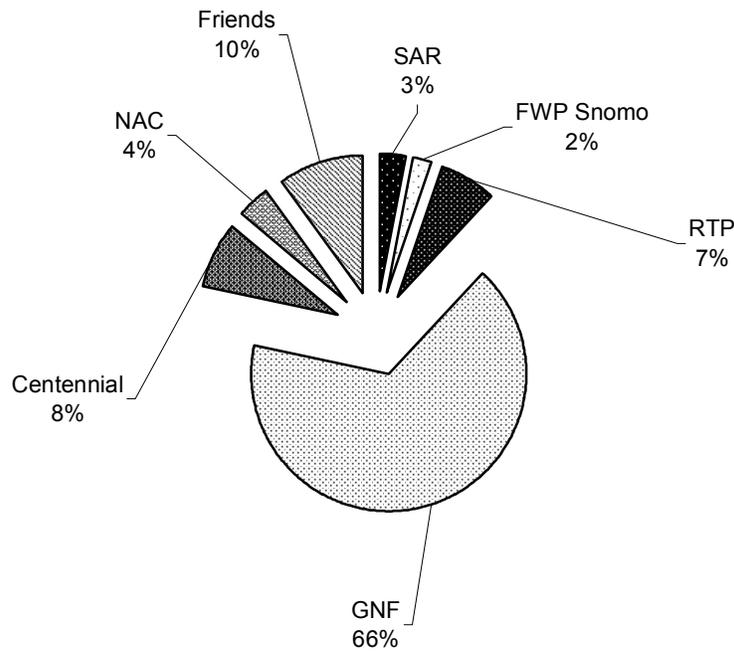
*Abstract:* The worst nightmare for an avalanche worker is to assess an unstable slope as stable since the consequences of such an assessment is that you, your clients or the public could be caught in an avalanche. Thus, a primary goal in avalanche forecasting is to minimize such “false-stable” errors. In this paper we analyze the first season of data from the SnowPilot database. Starting with nearly 1000 snowpits and 3,500 stability tests, we use stability test scores, shear quality, and weak layer depth to identify what we term the “critical weak layer” in each pit. We also divide the pits into “stable” and “unstable” categories based on the assessed snow stability and obvious signs of instability like collapsing, cracking and recent avalanche activity. This filtering leaves us with 300 stability tests conducted on the critical weak layer on unstable slopes. Of those 300 tests, 40 of them (13%) presented “false-stable” results, which we define as CTH, RB5 or greater, or SB drop heights 40 cm or greater. If we include shear quality and consider strong test results with a Q1 shear to be unstable, we decrease our “false-stable” cases to around 10% of the total. This implies that 1 in 10 times we assess unstable slopes we will conclude that it is stable, which is unacceptably high for professional operations and most recreationists. Recently spatial variability research has led some to argue that digging snowpits is unnecessary or futile, but we believe our data reinforce the idea that the key to analyzing snow stability lies in digging more rather than fewer pits. Though our dataset is limited, it suggests that digging multiple pits might be the most effective way to minimize “false-stable” situations. In fact, having stability tests and associated shear quality from two different, but representative locations on the slope might decrease the chance of a “false-stable” error from around 10% to closer to 1%.

# BUDGET

## INCOME

Montana FW&P Rec. Trails Program	\$8,600
Gallatin County Search and Rescue	\$4,000
Friends of the Avalanche Center	\$13,147
Montana FW&P Snowmobile Safety	\$3,000
Centennial Challenge Grant	\$10,000
National Avalanche Center <sup>1</sup>	\$5,000
TOTAL CASH CONTRIBUTIONS	\$38,745
TOTAL GALLATIN NATIONAL FOREST CONTRIBUTION	\$85,925
TOTAL INCOME	\$129,672

## INCOME

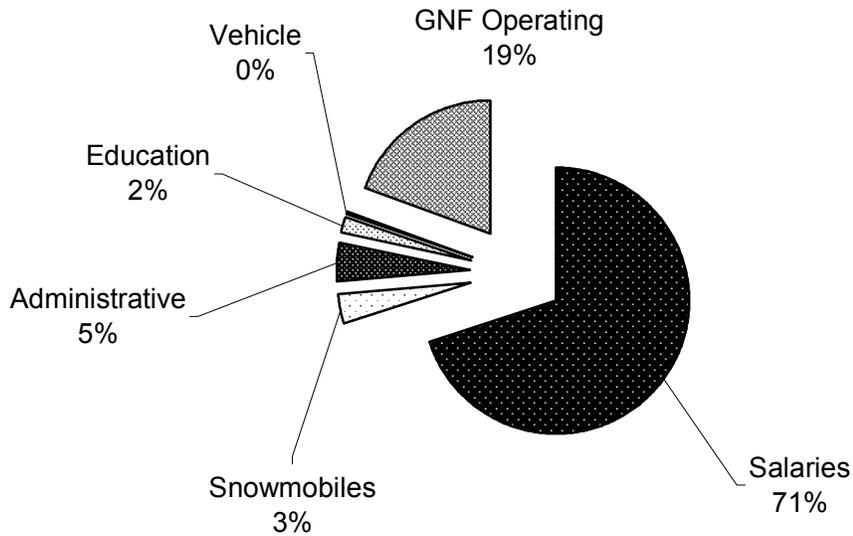


<sup>1</sup> Reimbursement for Doug and Ron teaching at the National Avalanche School in Snowbird, UT last October.

**EXPENSES**

Salaries	\$90,613	
GNF operating costs <sup>1</sup>	\$25,500	
Snowmobiles equip/maintenance <sup>2</sup>	\$4,445	
Education <sup>1</sup>	\$2,602	
Administrative costs <sup>4</sup>	\$6,099	
	<hr/>	
TOTAL EXPENSES		<\$129,259>

**EXPENSES**



<sup>1</sup> The operating costs incurred by the Gallatin National Forest include travel, vehicle, office space, supplies, mailings, computers, support personnel, six phone lines, sat/cell phones, and 19% overhead for grants.

<sup>2</sup> The Friends of the Avalanche Center paid for these expenses: Insurance, oil, delivery charges, covers, and trailer repairs.

<sup>1</sup> Salaries and supplies for extra field and classroom instructors.

<sup>4</sup> The Friends of the Avalanche Center paid for these expenses: New handheld radios, software, teaching materials, wx stations, web maintenance, emailing service and editing.

## DONATED LABOR AND EQUIPMENT

In addition to cash contributions the GNFAC also relies heavily on \$33,400 in donated equipment and labor. The labor donations represent a dollar estimate of what it would cost to hire people to collect the information that these business and agencies provide. It's clear that without these donations the Avalanche Center would be unable to operate at its current level.

Equipment:

Yamaha	\$8,000
Northern Lights Trading Company	\$1,500

Labor:

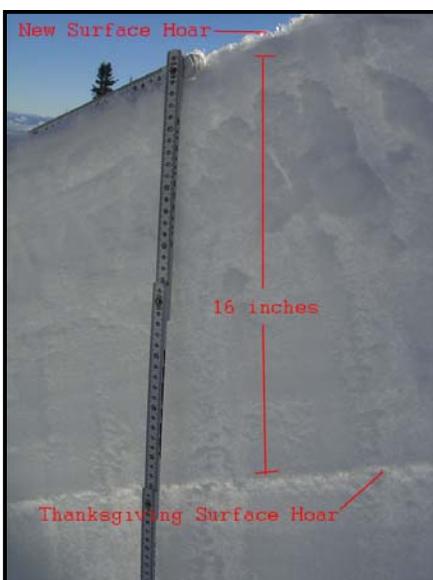
Big Sky Ski Area	\$3,000
Bridger Bowl Ski Area	\$2,000
Yellowstone Club	\$2,000
National Weather Service	\$1,700
National Park Service	\$1,500
Team Bozeman	\$2,000
Volunteer observers and office help	\$6,500
Field volunteers (600+ hours)	\$6,500
Merica Design	\$500

TOTAL \$33,400

## SEASONAL SNOWFALL HISTORY

By Ron Johnson

The season started with an exceptionally wet November. Stormy periods during the first and last weeks produced well above average SWE in the mountains of southwest Montana. The warmest temperatures of the month occurred Thanksgiving week, when high temperatures for several days were in the 40's F, except near West Yellowstone where high temperatures were in the 30's and overnight lows were in the single digits and teens F. During this time, surface hoar formed in the mountains around West Yellowstone. A storm, which started the day after Thanksgiving brought cooler temperatures and excellent powder skiing. Settled snow depths at the end of the month were: 28 inches at Brackett Creek, 36 inches at Shower Falls, 43 inches at Carrot Basin, 29 inches at Madison Plateau, and 50 inches at Fisher Creek.



December was another snowy month. Similar to November, most of the precipitation occurred during the first and last weeks of the month. The warmest temperatures were during the week preceding Christmas. Periods of sub-zero temperatures during December 6-8 and 16-18, allowed surface hoar and near surface facets to form, especially in the mountains around West Yellowstone and Cooke City. Significant snowfall during the end of the month produced widespread avalanches on these layers. This meant the only Avalanche Warning of the season was issued December 26 and continued through January 2. It was valid for the mountains around West Yellowstone.

During January, sunny days were far and few between. Consistent snowfall meant SWE for the month were 100% to 150% of average. Significant snowfall from late December through early January in the mountains around Cooke City produced numerous avalanches including two that took the life of two snowmobilers in separate incidents on January 5 and 6. These were the only fatalities of the season in southwest Montana. No significant warm or cold spells occurred during the month. Periods of strong winds and consistent snowfall kept avalanche danger ratings at considerable and moderate during most of the month.

Though a decent series of storms deposited 1-3 feet of snow during the last week of February, total SWE for the month was below average. Temperatures during a four day cold spell, mid-month, reached -30 F throughout much of southwest Montana. Near surface faceted snow developed during this period. Subsequent snowfall at the end of the month produced avalanches that fractured on this layer.

Except for Brackett Creek (107%) and Madison Plateau (100%) the SWE was below normal for March. Storms early and late in the month produced a combination of rain and snow even at elevations above 9000 feet. Even with these warm storms, minimum temperatures during the month managed to cool below freezing every night. This limited

the release of wet snow avalanches, while the dry snow avalanche danger during most of the month was moderate or low.

It was a good snow season. Early storms formed a good base and consistent snowfall produced excellent conditions for all snow riders. The season SWE compared to the average at the end of March was: 104% at Brackett Creek, 100% at Shower Falls, 113% at Carrot Basin, 107% at Madison Plateau, and 110% at Fisher Creek.

Data used for this summary is from November 1, 2005 through March 31, 2006. Weather data was primarily derived from five SNOTEL sites.

	NOV	DEC	JAN	FEB	MAR
<b>BRACKETT CREEK</b>					
SWE (inches)	4.6	5.6	4.9	2.3	4.8
AVG. (1971-2000) SWE (inches)	3.7	4.0	4.4	3.7	4.5
% Of AVG.	124	140	111	62	107
Snow Depth at End of Month (inches)	28	35	48	55	59
<b>SHOWER FALLS</b>					
SWE (inches)	7	4.8	3.9	2.8	3.7
AVG. (1971-2000) SWE (inches)	3.6	3.8	3.9	3.4	5.3
% Of AVG.	194	126	100	82	70
Snow Depth at End of Month (inches)	36	54	63	71	81
<b>CARROT BASIN</b>					
SWE (inches)	7.7	5.8	6.8	4.6	4.5
AVG. (1971-2000) SWE (inches)	4.7	5.2	5.1	4.5	5.5
% Of AVG.	164	112	133	102	82
Snow Depth at End of Month (inches)	43	64	86	96	99
<b>MADISON PLATEAU</b>					
SWE (inches)	5.7	6.5	7.6	2.5	4.6
AVG. (1971-2000) SWE (inches)	4.4	5.1	5.0	4.7	4.6
% Of AVG.	130	127	152	53	100
Snow Depth at End of Month (inches)	29	54	73	71	78
<b>FISHER CREEK</b>					
SWE (inches)	10.3	8.7	8.7	5.6	3.3
AVG. (1971-2000) SWE (inches)	6.3	7.2	7.5	5.8	5.8
% Of AVG.	163	121	116	97	57
Snow Depth at End of Month (inches)	50	78	104	111	108

**Brackett Creek** at an elevation of **7320 feet** in the **Bridger Range**.

**Shower Falls** at an elevation of **8100 feet** in the **northern Gallatin Range**.

**Carrot Basin** at an elevation of **9000 feet** in the **southern Madison Range**.

**Madison Plateau** at an elevation of **7750 feet**, **southwest of West Yellowstone**.

**Fisher Creek** at an elevation of **9100 feet**, **north of Cooke City**.

Precipitation data is expressed as Snow Water Equivalent (SWE) or as snow-depth. Comparisons of precipitation amounts to average are for the period 1971-2000.

## AVALANCHE ADVISORY



### Gallatin National Forest Avalanche Advisory

Saturday, January 7<sup>th</sup>, 2006

Internet: [www.mtavalanche.com](http://www.mtavalanche.com)

Recorded Information:  
Bozeman, Livingston,  
West Yellowstone, Cooke City:  
406-587-6984  
Office: 406-587-6981

**You can listen to the advisory at:**

<http://www.mtavalanche.com/data/audio/Jan72006.mp3>

Good morning. This is Scott Schmidt with the Gallatin National Forest Avalanche Advisory issued Saturday, January 7, at 7:30 a.m. **Team Bozeman and Yamaha**, in partnership with the **Friends of the Avalanche Center**, sponsor today's advisory. This advisory does not apply to operating ski areas.

#### AVALANCHE INCIDENT

A snowmobiler died in another avalanche near Cooke City yesterday. This is the second fatality in this area in the past two days. Three riders were playing in a steep ravine when the avalanche released above them. Two of the riders escaped to the side of the slide and were only partially buried. The third rider, who was trying to free his stuck sled, was buried. He was quickly located with a transceiver but rescuers were unable to dig him out in time to save his life. Doug is in Cooke City investigating Thursday's incident and will investigate yesterday's accident as well. He'll post the details on both fatalities when he returns on Sunday.

#### MOUNTAIN WEATHER

Winds have been 20 – 30 mph from the west for the past 24 hours, and morning temperatures are in the low-30's at upper elevations. These warm temperatures will diminish this afternoon as a cold front pushes into southwest Montana. This system will bring 4 – 6 inches of snow to the mountains by morning, with westerly winds blowing 20 – 35 mph, and overnight lows in the mid-20's.

#### SNOWPACK AND AVALANCHE DISCUSSION

*The southern Gallatin and southern Madison Ranges, including the Lionhead area near West Yellowstone. The mountain around Cooke City and the Washburn Range:*

Doug was in the mountains north of Cooke City yesterday investigating the avalanche that claimed the life of a snow machiner on Mt Abundance Thursday. The avalanche, which released on a steep, south-facing, wind-loaded slope, broke out 700 feet wide, 3 feet deep, and ran 1100 vertical feet. This slide ran on faceted snow that formed during the cold spell in early December. A second avalanche fatality occurred yesterday afternoon in the Sheep Creek drainage just to the east. This avalanche also occurred on

a south-facing, wind-loaded slope. Today, a **CONSIDERABLE** avalanche danger exists on all slopes steeper than 35 degrees in the mountains around Cooke City and in the Washburn Range. A **MODERATE** danger exists on less steep slopes.

These same danger ratings apply to the southern Madison and southern Gallatin Ranges, including the Lionhead area near West Yellowstone, but for a different reason. Here, two layers of surface hoar have produced a significant avalanche cycle over the past two weeks. The first layer formed in early December and is now buried about 2 feet deep. The second layer, which formed at Thanksgiving, is buried 3 – 4 feet deep. This layer is producing natural avalanches on steep, wind-loaded slopes. Ron, Doug, and Karl all found these layers have gained strength but are still likely to produce human-triggered slides, especially on wind-loaded slopes.

*The northern Madison Range:*

All accounts indicate that snowpack is stabilizing in the northern Madison Range. Recently wind-loaded slopes in this area still warrant caution but will be less than “likely” to release if you venture onto them. Today the avalanche danger in the northern Madison Range is **MODERATE** on all recently wind-loaded slopes. A **MODERATE** danger also exists on non-wind-loaded slopes steeper than 35 degrees. All other slopes have a **LOW** danger.

*The Bridger and northern Gallatin Ranges:*

Yesterday the Bridger Bowl Ski Patrol triggered avalanches with large cornice drops and explosives. The wind-slabs that released were not particularly big; however, this is the second day in a row that these slabs have formed. Steep, wind-loaded slopes outside the ski area boundary should be approached with caution as it may be possible to trigger them with your added weight. Today, the avalanche danger in the Bridger and northern Gallatin Ranges remains **MODERATE** on wind-loaded slopes steeper than 35 degrees. A **LOW** danger exists on all other slopes.

I'll issue the next advisory tomorrow morning at 7:30 am. If you get out in the backcountry today, let us know what you find. You can leave us a message at 587-6984 or email us at [r1\\_gallatin\\_gnfac@fs.fed.us](mailto:r1_gallatin_gnfac@fs.fed.us).