

# 2016-17 Annual Report



## Gallatin National Forest AVALANCHE CENTER



**GRIZZLY OUTFITTERS**  
**BRIDGER BOWL**  
**YC COMMUNITY FOUNDATION**  
**YELLOWSTONE ARCTIC YAMAHA**

**World Boards**  
**Mystery Ranch**  
**Spark R&D**  
**Montana Ale Works**  
**Community Food Co-op**  
**Cooke City Super 8**  
**Excel Physical Therapy**

Alpine Orthopedics  
Javaman  
Buck Products  
Gallatin Valley Snowmobile Association  
Bountiful Table  
Wisetail  
Ticket River  
ISMA

Montana Telemark Corporation  
Soda Butte Lodge  
Gallatin County SAR  
Yamaha Motor Corp.  
Katabatic Brewing Co.  
Edward Jones  
Cooke City Motorsports



Alex Marienthal



Eric Knoff



Doug Chabot

*Cover : Surveying the damage after a large avalanche cycle this February in Cooke City.*



# 2016-17 Annual Report

## Gallatin National Forest Avalanche Center

APRIL 2017

### Season Summary

We are wrapping up our 27<sup>th</sup> year of operation after issuing 138 avalanche advisories. Less snow in the northern mountains (87% of average) contrasted with the southern ranges which received up to 117% of average snowpack. A skier in the Bridger Range triggered our first reported slide on November 24<sup>th</sup>. A weak and unstable layer of snow at the ground



led to our first avalanche warning on December 2<sup>nd</sup>, the same day we started our daily advisories. On December 11<sup>th</sup> a skier outside Cooke City was killed in an avalanche on a small, steep slope that carried him into timber. Thankfully this was our only fatality of the season, although there were several close calls with 32 avalanche incidents resulting in 7 people being caught, 2 being partially buried and 2 fully buried victims that were dug up by their partners. Nationally, there are only 11 avalanche deaths so far this season compared with a 10-year average of 27.

Storms spiked the avalanche danger and we issued avalanche warnings on 13 days, including our first ever Extreme danger rating on February 11<sup>th</sup> for Cooke City. In this storm, 11" of snow water equivalent (11+' of snow) fell, the 3<sup>rd</sup> highest 14-day total ever measured at Fisher Creek SNOTEL site. The avalanches were huge. One monster slide off Mt. Henderson put over 20 feet of debris on a groomed snowmobile trail. The last two times this path ran that large were in 1997 and 1986.

December and January were the busiest part of the season with an elevated avalanche danger, crowds in the backcountry, and a nearly continuous schedule of avalanche awareness classes. During this time we relied heavily on field volunteers and observations from the public, along with 20 professional avalanche educators with the Friends of the Avalanche Center. We could not do our job without everyone's support.

### GNFAC Index

- Number of people who receive our daily avalanche advisories: 4,707
- Percentage visits to mtavalanche.com on mobile phone, desktop and tablet: 54%, 40%, 6%
- Total number of avalanche classes and attendees: 117 and 5,266
  - Total number of elementary and secondary school students: 724
  - Total number of snowmobilers and classes: 1,098 and 52
- Percentage of avalanche advisories accessed through Facebook: 17%.
  - Number of followers we have on FB and its 1-year increase: 7,128 and 30%
- Number of videos we posted and total views: 79 and 150,388
  - Increase in views from last season: 50%
- Number of subscribers to YouTube, Instagram and Twitter: 2,367, 4,686 and 1,849

### Section/Page

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- Total number days we went into the field to check the snowpack: 106
  - Number of days with a volunteer and each other: 79 and 27
  - Number of snowpits recorded: 85
- Witnesses to Doug hitting a tree with his snowmobile: 0
  - Number of pictures Alex took after the fact: at least 10
  - Number of those that have been posted: 0
  - Alex's boss: Doug
- Number of times Alex's snowmobile "ghost rode" downhill with him running in hot pursuit: 1 that we know of.
  - Number of videos of this incident: Unfortunately, none.
- Outside temperature when Eric forgot his beacon on purpose (according to Alex): -26°F

## *Avalanche Advisories*

The daily avalanche advisory is the product of many hours digging snowpits, looking at outputs from weather models and weather stations and reading observations from many volunteers. We strive to make the advisory accurate, easy to understand, memorable and to arm folks with relevant information so they can make safe decisions in the backcountry for that day.

THIS WINTER  
4,707 PEOPLE A  
DAY RECEIVED  
OUR AVALANCHE

The lights go on at 4 a.m. and one of us begins the process of writing the advisory. Some days are easy, others are a challenge. We are slaves to the whims of weather. Unforeseen storms and those we predict that do not materialize cause us heartburn. Luckily, these times are rare. Cranked up on strong coffee we type, record, post and email the advisory without fail by 7:30 a.m.

ADVISORY.

This winter we averaged 4,707 people a day getting the advisory, mostly by email or on our website. 53% of our users get advisories on a smartphone, 40% on a desktop and 7% on a tablet. These percentages have not changed from last season, suggesting a saturation of smartphones. In 2012 we had 20% smartphone use. Since over half our users are on smartphones, we have a duty to make sure our advisories, videos, and photos are accessible on all operating systems, a constantly evolving task.

We have evidence contrary to the belief that people don't read anything longer than a 140-character tweet. In general, people read about subjects they are interested in and our avalanche advisory bears this out. We are happy to report that people average 2 minutes 32 seconds on our advisory page, about as long as it takes to read aloud.

## *YouTube*

You Tube was the first social media platform we embraced back in 2006. Since then we have made 586 videos with over 1.5 million views. This season we posted 79 videos about snowpack stability that were watched 122,976 times on YouTube and an additional 27,412 views on Instagram. That's an average of 1,904 views/video, an astounding 50% increase since last year!



## ***Instagram, Facebook, Twitter***

Social media allows us to reach many more people than we ever could with just our website. Instagram is a rising star in disseminating avalanche information. We posted 19 videos, countless pictures, and at the end of season we began posting our field observations. We have 4,686 followers (+44% in one year) and plan on using Instagram more aggressively next season to give and receive field observations.



Facebook is the granddaddy of social media platforms that we use to post our daily advisories, warnings, videos and pictures. 17% of all traffic to our avalanche advisories page originates from Facebook. At the end of this season we have 7,128 followers, a 30% jump from last season.

Twitter, all the rage in politics and exposés, had a 9% increase in followers to the GNFA. We usually post the same content that we put on Facebook for Twitter users, currently numbering 1,849.

WE POSTED 79  
VIDEOS THAT  
WERE VIEWED  
150,388 TIMES.

## ***Traditional Print and TV Media***

Traditional print and television media remain an important part of getting avalanche information out to the public, especially during dangerous times. This season we had 32 interviews with print and television media.

## ***Avalanche Articles***

Every year we write avalanche articles for Publication. These can be found on the Resources/Articles page of our website. This year we wrote 10 articles that appeared in *The Avalanche Review*, *Explore Big Sky*, *Carve* magazine and *Montana Snowmobile Association Newsletter*.

## ***Avalanche Incidents***

An *avalanche incident* is defined as someone triggering an avalanche unintentionally. This season 32 incidents were reported to us, involving one skier death. The complete list is on page 16.

Over the last ten years Montana is ranked third in the nation in avalanche fatalities (32) and first in snowmobiler avalanche fatalities (18). We are not happy with this ranking and continue to increase our education offerings to reduce these numbers. Pages 14 and 15 have graphs showing the last 10 years of avalanche incidents grouped by activity and state.

## *Avalanche Education*

We work closely with the Friends of the Avalanche Center to bring abundant high quality avalanche education to the public. This year we broke records by teaching 117 classes to 5,266 people. We strive to accommodate all requests for classes, no matter the age or user group: motorized users or human-powered. David Zinn and Chris Billbrey shared the education coordinator role for the Friends. They took care of scheduling, staffing and training of instructors as well as teaching classes. Seventeen other lecturers rounded out the Friends' roster: Scott Barrier, Ella Darham, Mark Greeno, Dale Gullett, Nina Hance, Quint Gidley, Forrest Madsen, Ben Nobel, Jim Norlander, Josh Olsen, Andrew Olson, Peter Ramos, Jodi Redfield, Paul Smith, Allen Steckmest, John Sykes and Lenore Thompson.

Our avalanche education programs reach many 7<sup>th</sup>-8<sup>th</sup> graders and high school students in Bozeman, Big Sky, Livingston, and Belgrade. Young adults are a prime target of our education efforts since ski area sidecountry use is exploding. This year we educated 724 kids and young adults under 18 years old. Snowmobilers are a huge audience for us and we expanded our offerings this year, teaching 52 snowmobile specific classes to 1,098 riders! We lecture to ski patrols, Search and Rescue groups, local snowmobile clubs, MSU, ski and outdoor stores in Bozeman and Big Sky. We have taught in Bozeman, Big Sky, West Yellowstone, Ennis, Dillon, Livingston, Gardiner, Cooke City, Billings, Big Timber, Helena, and Great Falls.

The Friends also maintain beacon parks outside West Yellowstone and at Beall Park in Bozeman, allowing the public to practice with their avalanche transceivers efficiently. The Friends also have three wireless beacon parks that are used when a portable option is necessary.

Our four main education offerings are:

*1. 1-hour Avalanche Awareness lecture.* This class is a starting point for people to learn about avalanches. We have specific talks for each user group that cover Terrain, Weather, Snowpack and Decision-making.

*2. Introduction to Avalanches with Field Session.* These classes consist of 5 one-hour lectures, usually over two evenings, with an all-day field session. We offer classes for skiers/snowboarders and one tailored for snowmobilers.



THIS YEAR WE  
TAUGHT 117  
AVALANCHE  
CLASSES  
REACHING 5,266  
PEOPLE.



3. *Companion Rescue*. This is the third year we offered this popular class. It is a six-hour field based course that concentrates on avalanche rescue. We ran classes outside Bridger Bowl, in Beehive Basin near Big Sky, and outside Cooke City.

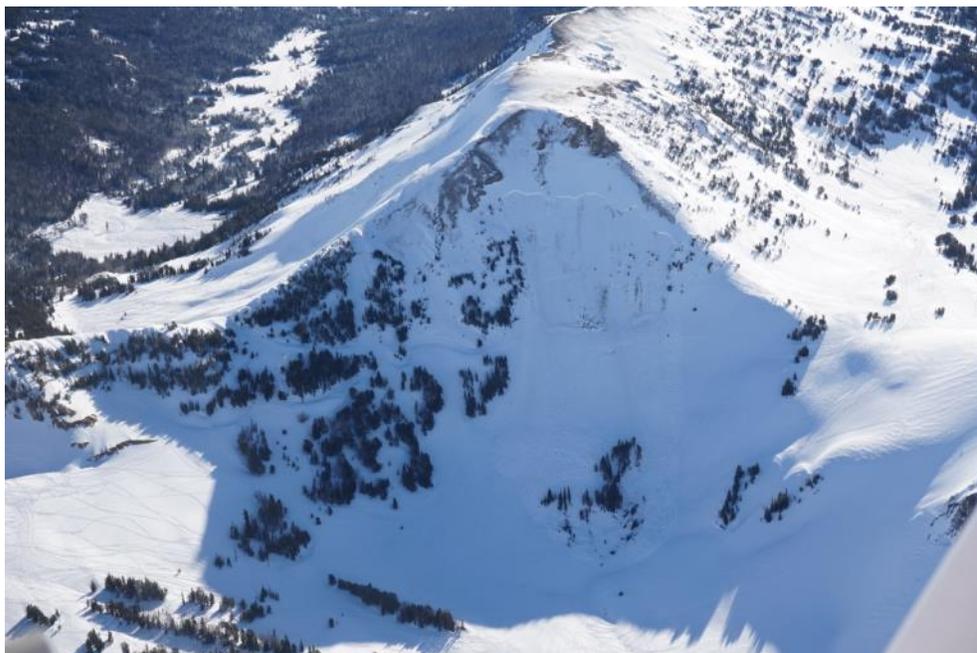


4. *Snowmobiler Avalanche Awareness and Avalanche Rescue*. This new course was held in Cooke City every Friday and Saturday from Thanksgiving until mid-March. A lecture on current conditions, basic awareness and avalanche rescue was held every Friday night. On Saturday, instructors set up a beacon park that passing riders were encouraged to train on. This program was made possible by a donation from Seth McArthur at Montana State Parks.

On March 29 we hosted the *8<sup>th</sup> Professional Development Workshop for Avalanche Professionals*. The topic for the day was [Avalanche Science and Avalanche Stories](#) and ten speakers talked about this season’s avalanches, Extreme danger, backcountry forecasting, thermal properties of ice, slope-scale variability, sidecountry, and avalanche accidents. Sixty professionals attended from Montana, Utah, Idaho and Wyoming. The lectures were filmed and are posted on our YouTube channel for everyone to watch.

WE TAUGHT 52  
SNOWMOBILER  
AVALANCHE  
CLASSES  
ATTENDED BY  
1,098 RIDERS.

This year the friends hired Jahrig Media to make 4 short films to encourage young adults and college freshman to take an avalanche class. With sidecountry use exploding and more people coming to Bozeman to ski, we are increasing awareness about the risks and dangers associated with backcountry travel. We will launch these films on social media in the fall with hopes to drive more people into classes.



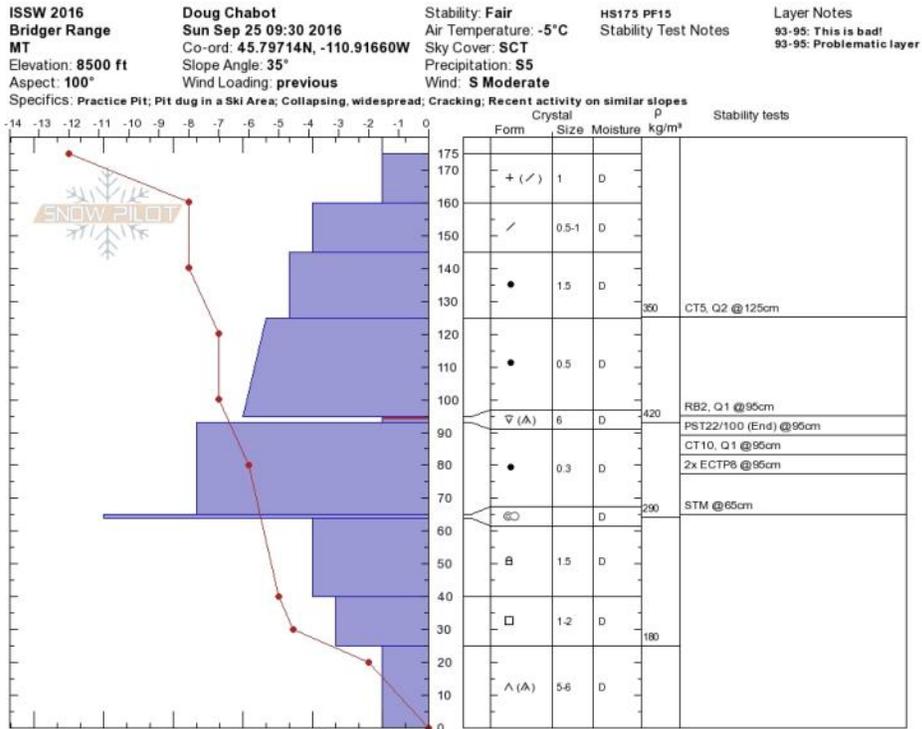
# SnowPilot

SnowPilot underwent a major restructuring this fall with the help of Mark Kahrl and Jim Earl. The following abstract was from a poster I presented at the 2016 International Snow Science Workshop in Breckenridge, CO last October. This winter Snowpilot was used to graph and database over 2,500 snowpits from around the world.

**Abstract:** *SnowPilot* ([www.snowpilot.org](http://www.snowpilot.org)) is open-source, free software that allows users to graph, record and database snowpit information. Initially developed during the winter of 2003-2004, *SnowPilot* was originally created as a way to enter snowpit data into a Personal Digital Assistant (aka. PDA, Palm Pilot) that would be stored and graphically viewed on a PC. As technology changed, *SnowPilot* left the PDA platform and became a standalone program for PC and Mac, while still populating the central database with snowpit data for use by avalanche researchers. Currently the database holds near 7200 snowpits from fifteen countries (*April 8673 update: 5366 pits*).

New for this year is an online version of *SnowPilot*. It follows the US Snow, Weather and Avalanche Guidelines (SWAG) and the Canadian Avalanche Association guidelines (OGRES). After data gets entered, an image is created that can be printed and/or downloaded from the website. All data entered is owned by the user and error-checked to ensure a clean, robust database.

*SnowPilot* does not charge a fee or collect any personal data other than what gets entered, nor do we advertise or sell anything. We respect privacy. In exchange for providing a free platform to enter snowpit data, *SnowPilot* gets an expanding database that is readily shared with researchers to advance the field of snow science. SnowPilot snowpits have in presentations at every ISSW since 2004.



Notes: Welcome to the ISSW in Breckenridge, Colorado! Snowpilot is now online and offers FREE snowpit graphing and databasing of all your snowpits. It uses the standards set in SWAG and OGRES and you can export your pit as a jpg, png, CAAML or snowpilot.xml. Try it out.



## ***Finances of the GNFAC***

The Custer Gallatin National Forest provided the Avalanche Center with 59% of its funding which covered salaries, benefits, travel, vehicles, computers and office space. We rely on other sources for the shortfall, namely our long-term supporters, Friends of the Avalanche Center (28%) and Montana FW&P (13%).

## **Friends of the Avalanche Center**

The Friends of the Avalanche Center is a nonprofit organization whose mission is to financially support the work of the Avalanche Center. The Friends cover expenses related to the avalanche education program, as well as administrative, snowmobile, weather station and website costs.

The Friends were founded in 1992 and have donated over \$538,654 to the operation of the GNFAC. This year their total contribution was \$62,654. This total reflects spending \$52,442 for avalanche education and \$10,212 for direct GNFAC support. Almost all monies came from local businesses and individuals in southwest Montana with the following long term, recurring support:

- 18<sup>th</sup> Annual Powder Blast
- Yellowstone Club Community Foundation
- 15<sup>th</sup> Annual King and Queen of the Ridge at Bridger Bowl
- Pinhead Classic (supporters since 1990)
- 9<sup>th</sup> Annual Avalanche Social at Montana Ale Works

The Board of Directors represents a varied slice of the winter recreating community. They are a volunteer board with three paid, part-time staff: Education Coordinators (David Zinn and Chris Bilbrey) and Treasurer (Allyson Fauver). They are a lean, effective and backcountry savvy group led by Board President Jeannie Wall. They include: Emily Stifler-Wolfe (Secretary), Ben Nobel, Tyler Allen, Ben Zavora, Mark Greeno, Laura Ryan and Dawn Brown.



## Donated Labor and Equipment

The Avalanche Center would not be able to operate at its current level without the local community donating time, expertise and equipment. Added up, their donated work totals \$34,610. These donations reflect a dollar estimate of what it would cost to hire people or buy/rent equipment.

### **Field Volunteers/Observers**

27 VOLUNTEERS  
ACCOMPANIED  
US ON 79 FIELD  
DAYS TOTALING  
528 HOURS.

It's not possible for the three of us to always go in the field with each other so we rely on a team of skilled volunteers to be our partners. Twenty-seven volunteers accompanied us on 79 field days totaling 528 hours. They are: Tyler Allen, Gabrielle Antonioli, Chelan Babineau-Z, Chris Bilbrey (our intern), Bill Buchbauer, Clark Corey, Wes Dudley, Ryan Eisfeldt, Nick English, Allyson Fauver, Zach Guy, Marcie Hahn-Knoff, Nina Hance, Jordan Mancey, Jill McMurry, Matt Menge, Ben Nobel, Andy Olson, Alan Oram, Andrew Schauer, Emily Stifler-Wolfe, John Sykes, Kyle Taylor, Jason Thompson, Vincent Urgo, Ben VandenBos and David Zinn.

These folks are our peers and several are professional snow workers. We also count on folks emailing their personal field observations, stability test results and snowpits. The accuracy of our forecasts is a direct reflection of their detailed and steady reports. We owe a special thanks to Big Sky and Bridger Bowl Ski patrols for their daily observations.

### **Yellowstone Arctic Yamaha and Yamaha Corporation**

Jason and Bill Howell, owners of Yellowstone Arctic Yamaha in West Yellowstone, loaned the Friends two sleds this year. They worked with Craig Gagne of Yamaha Corporation and had us riding a pair of 2017 SR Viper M-TX SE 153". We put over 1,000 miles on each one, mostly off trail. We could not do our jobs without Jason, Bill, and Yamaha's generosity and dedication to avalanche safety.

#### VOLUNTEER LABOR (billed at \$15/hour):

NRCS	\$3,600
Big Sky Ski Area (~175 hours)	\$2,625
Bridger Bowl Ski Area (~130 hours)	\$1,950
Yellowstone Club (~80 hours)	\$1,200
National Weather Service (121 hours)	\$1,815
Volunteer observers (~500 hours)	\$7,500
Field volunteers (528 hours)	\$7,920

#### EQUIPMENT RENTAL (Contributed):

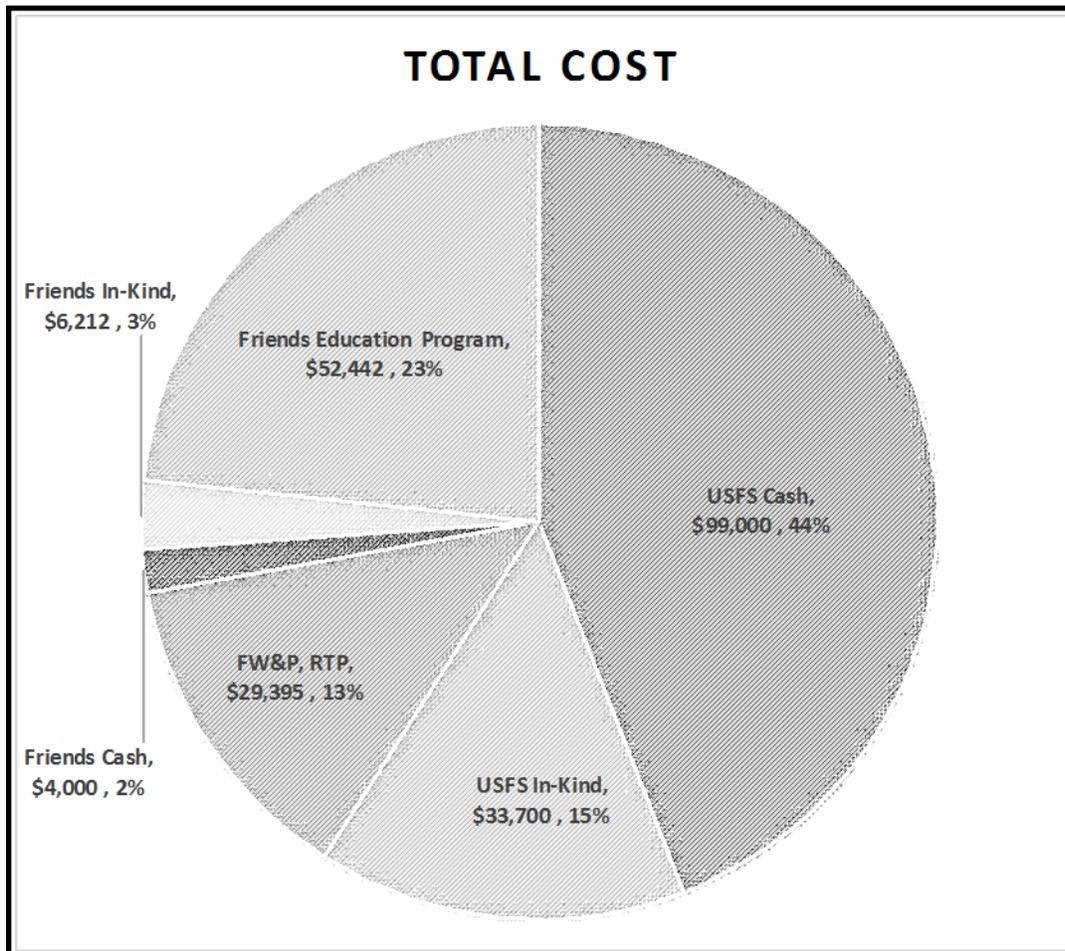
Yellowstone Arctic Yamaha (two sleds loaned):	\$8,000
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<b>TOTAL</b>	<b>\$34,610</b>
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## Total Costs

Custer Gallatin National Forest (salaries/benefits)	\$99,000
◆ CGNF In-Kind (vehicles, office, etc)	\$33,700
Montana FW&P Rec Trails Program (salaries)	\$29,395
Friends of the Avalanche Center (education program)	\$52,442
◆ FOAC In-Kind	\$6,212
◆ FOAC Cash	\$4,000
<b>Total Costs</b>	<b>\$224,749 (100%)</b>
<i>CGNF Contribution</i>	<i>\$132,700 (59%)</i>
<i>Outside Contributions (non federal government)</i>	<i>\$92,049 (41%)</i>



## *Snowpack and Weather Summary*

Winter in southwest Montana began with snow in early October. By November 1st, the mountains south of Bozeman and mountains near Cooke City had 2-3 feet of snow on the ground with no more than a foot elsewhere. This snow turned into a melt-freeze crust and cold temperatures allowed it to persist on shady, high elevation slopes.

In late November, 1-2 feet of dense snow formed the foundation of the snowpack on slopes that did not previously hold snow. Cold temperatures quickly turned this snow into depth hoar on all aspects, which created a perfect recipe for avalanches.

Heavy snow and wind in early December created very unstable conditions. A foot of snow totaling

1" of snow water equivalent (SWE) put the first significant load on the early season weak layer. We issued the first avalanche warning for the mountains near Bozeman on December 2<sup>nd</sup> and the southern mountains on December 5<sup>th</sup>. Ski patrols at Bridger Bowl, Big Sky, and the Yellowstone Club triggered large avalanches that broke 3-4' deep and were more widespread on slopes with the basal October ice crust.

Between storms in December, below zero temperatures formed another layer of weak facets. Snowfall resumed On December 10<sup>th</sup>, and a snowmobiler in the northern Madison Range near Big Sky was fully buried and recovered uninjured within 10 minutes. On December 11<sup>th</sup> a skier from Sun Valley, Idaho was tragically killed in an avalanche near Cooke City. He was the seventh skier down a small slope. The avalanche broke 3' deep, 150' wide and failed on the facets above the October ice crust.

Three to 4.5" of SWE in the southern mountains produced dangerous avalanche conditions and warnings were issued on December 16<sup>th</sup> and 17<sup>th</sup>. During the warning, large natural avalanches broke on facets near the ground, and human triggered avalanches occurred days after the warning expired. Snowfall tapered off through the end of December, but intermittent accumulations kept things fresh.

2017 began with frigid temperatures and a dusting of snow. In Cooke City, a mid-January storm with 4" of SWE accompanied a three-day avalanche warning. Large natural avalanches ran full track and broke on facets that formed in mid-December. The end of January was marked by increased snowfall and a quick return to winter.

Between January 30<sup>th</sup> and February 11<sup>th</sup>, an historic storm dropped 10.9" of SWE in the mountains around Cooke city. This was the third highest 14-day storm total on record. On February 10<sup>th</sup>, the GNFAC issued its first ever EXTREME avalanche danger, a rating





validated by historic avalanches on February 11<sup>th</sup>.

Avalanche activity tapered off quickly after this historic storm and persistent instabilities were not widespread in the mountains around Cooke City. In the southern Madison Range and mountains near West Yellowstone a couple different weak layers formed between storms in mid-January and early February. In mid-February a snowmobiler triggered a slide that partially buried another rider. Snow tapered off and stability improved in the southern ranges towards the end of February.

The Bridger Range received a February farewell of cold smoke powder reported by the majority of skiers as the deepest snow they've ever skied. Six feet of snow over two days averaged 3% density and fully engulfed skiers all weekend. We issued an avalanche warning the second day of the storm due to deep snow. Avalanche activity was confined to the new snow and instabilities diminished quickly with the lack of widespread persistent weak layers.

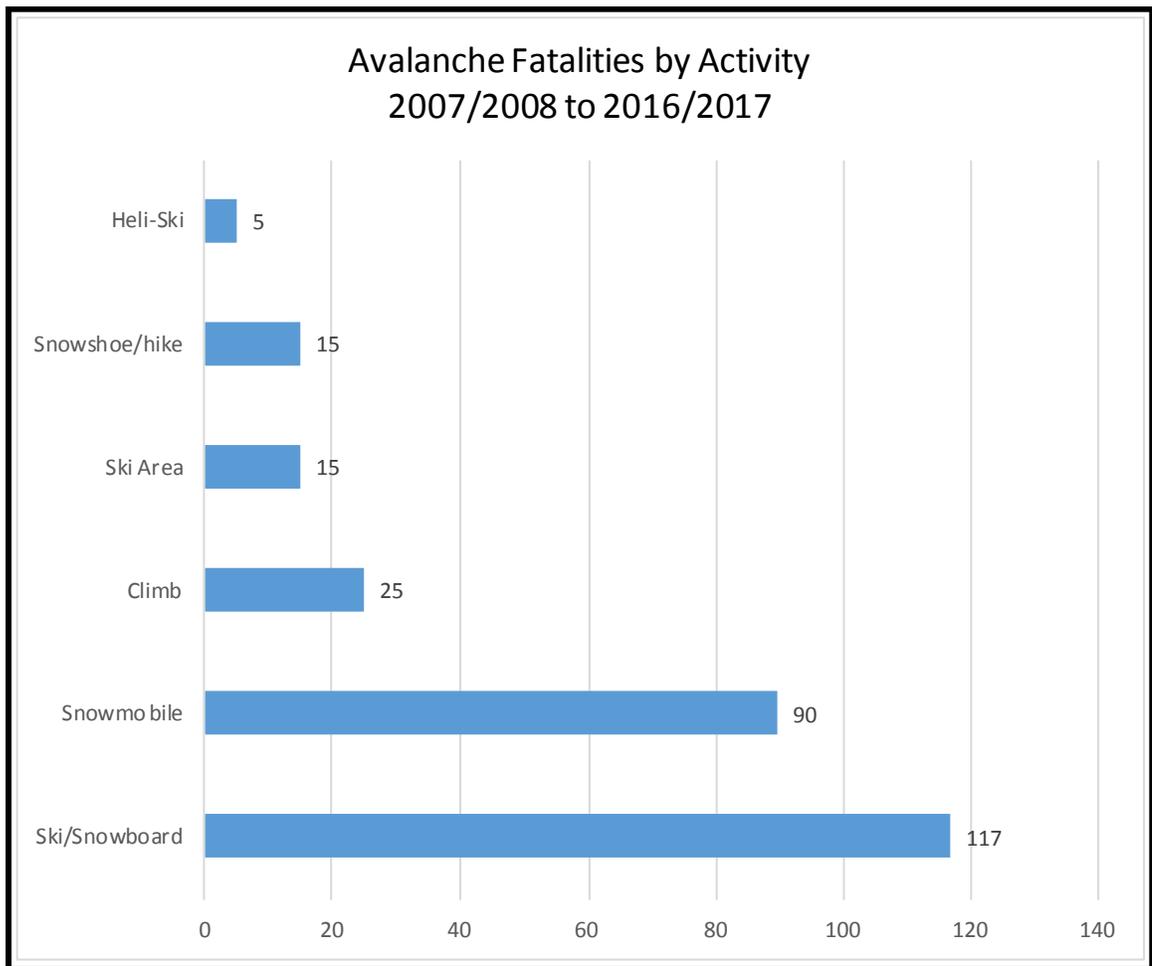
March started quietly with only a few inches falling in the first five days. Winter returned on the 5<sup>th</sup> with measurable snowfall being recorded for six straight days. Snow totals were heaviest in the southern mountains, which prompted an avalanche warning for the mountains around Cooke City on March 9<sup>th</sup>. Large natural avalanches were observed during this time and two separate close calls were reported by riders triggering large cornices. In both events, the riders were able to stay on the ridge while their machines took the ride over the edge. In one incident, a rider's snowmobile tumbled over a 150' cliff with large chunks of cornice, a close call indeed. Fortunately, nobody was injured in either incident.

By the middle of the month, winter loosened its grip and temperatures rose well above average. Wet snow instabilities became the primary avalanche concern as the snowpack began to transition. By the third week in March, the snowpack had turned isothermal in lower elevation terrain and access became limited. While everyone prayed for snow, the big question became – Will it freeze again? Thankfully, temps cooled off by the end of the month and normal spring weather ensued.

With a standard freeze-thaw cycle in place, stability remained good through the early part of April. Bridger Bowl closed on April 3<sup>rd</sup> and Big Sky closed on April 15<sup>th</sup>. With one ski area out of operation and limited access in the backcountry, the GNFAC issued its last advisory on April 9<sup>th</sup>. Despite an active start to the season, the GNFAC recorded the fewest number of avalanche incidents in five years, 32 total.

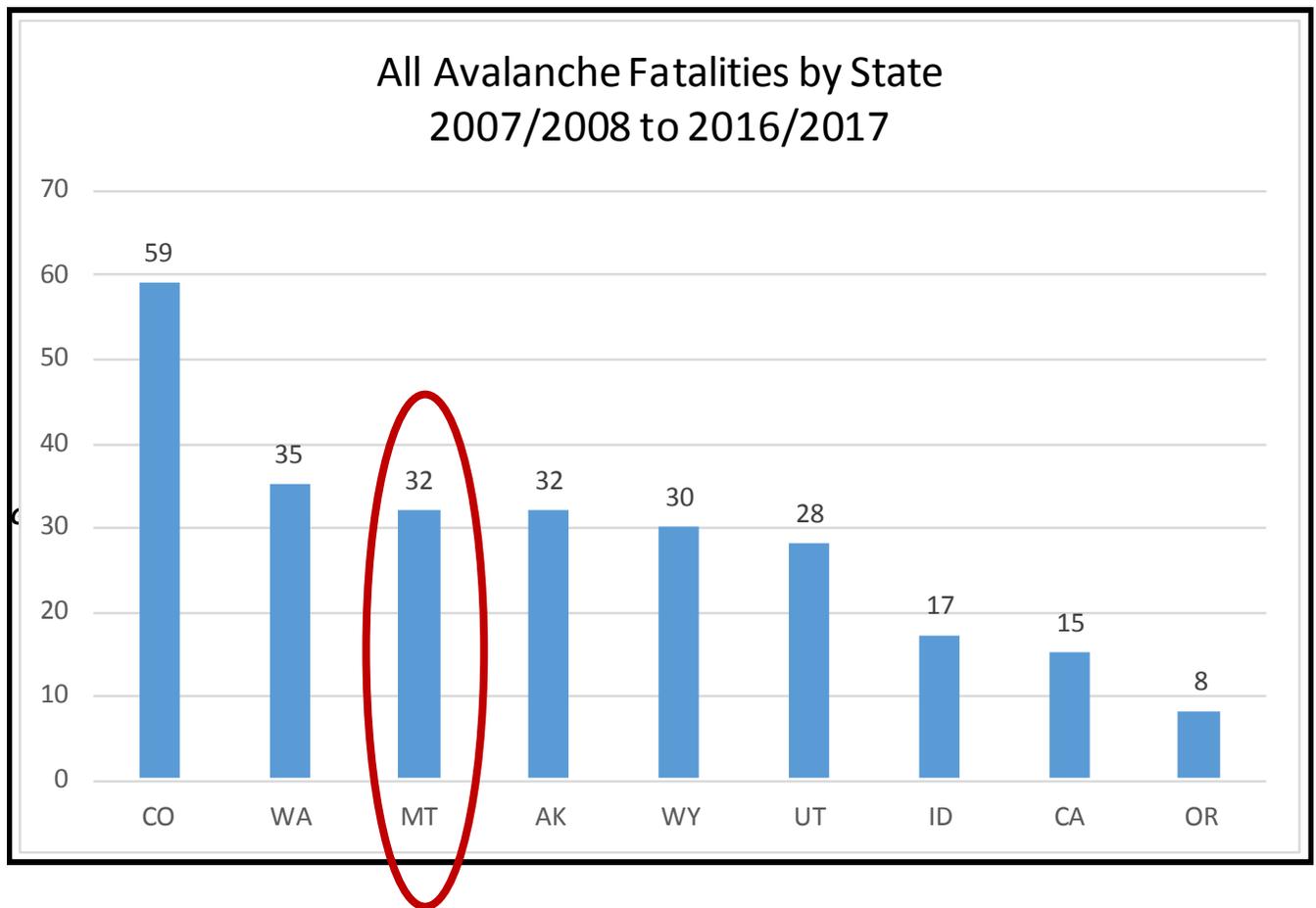
## Avalanche Incident Graphs: 10 Years

Graph 1: *NATIONALLY, 10 years of Incidents by Activity*

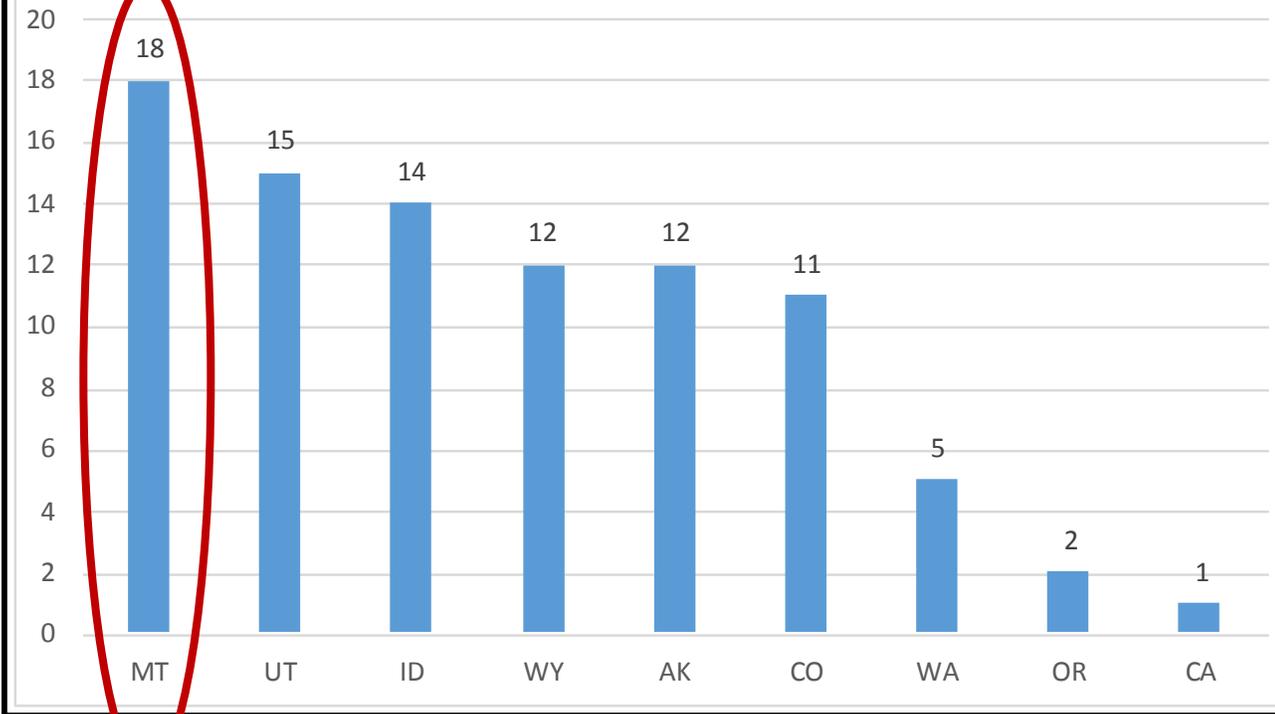




Graph 2



Snowmobiler Avalanche Fatalities by State  
2007/2008 to 2016/2017





## Avalanche Incidents Table

### 32 Incidents resulting in 2 burials and 1 deaths

DATE	LOCATION	DETAILS
11/24/2016	Bridger Range - Sacajewea Bowl	1 skier triggered, caught, not buried.
12/3/2016	N. Gallatin - Hyalite, Mummy 3 gully	1 climber triggered, not caught
12/7/2016	Bridger Range - Bridger Bowl (closed)	1 skier triggered, not caught
12/10/2016	N. Madison - Buck Ridge	1 snowmobiler caught, fully buried, uninjured
12/11/2016	Cooke City - Henderson Mountain	1 skier triggered, 2 caught, 1 partially buried, 1 fully buried and killed
1/12/2017	Lionhead -	1 snowmobile triggered from below, not caught
1/15/2017	Bridger Range - Throne	1 skier triggered small wind slab
1/15/2017	Bridger Range - Saddle	1 skier triggered small wind slab
1/26/2017	Bridger Range - Saddle	1 skier triggered medium wind slab
1/27/2017	N. Madison - Beehive	1 skier triggered medium wind slab
1/29/2017	S. Madison - Sage Peak	1 snowmobiler triggered
1/29/2017	S. Madison Range - Ernest Miller	1 skier triggered
1/29/2017	N. Gallatin Range- Maid of Mist	1 skier triggered
2/4/2017	Beehive - N. Madison Range	1 skier triggered small wind slab
2/5/2017	Cooke City - Lulu Pass	1 snowmobile triggered, many on slope, none caught
2/5/2017	Cooke City - Henderson Mountain	1 skier triggered, 1 partially buried and uninjured
2/5/2017	Cooke City - Town Hill	1 skier triggered, caught and uninjured
2/9/2017	Taylor fork - Sunlight Basin	Snowmobile triggered, not caught
2/11/2017	Buck Ridge	Snowmobile triggered, not caught
2/12/2017	Taylor fork - Sunlight Basin	1 Snowmobile triggered, partially buried and uninjured
2/12/2017	Bridger Range - Saddle Peak	1 skier triggered small wind slab
2/12/2017	Cooke City - Daisy Pass	1 snowmobiler triggered, not caught
2/12/2017	Crazy Mountains	1 snowmobiler triggered, caught, partially buried
2/20/2017	Lionhead	1 Snowmobile triggered, not caught
2/25/2017	Bridger Range - Fariy Lake	1 Skier triggered 3' deep storm slab, not caught
3/4/2017	S. Madison - Boat Mountain	1 skier triggered medium soft slab, not caught
3/5/2017	Lionhead	1 Snowmobile triggered cornice, not caught, sled fell 600'
3/8/2017	Lionhead	1 snowmobiler triggered. not caught (small)
3/8/2017	N. Gallatin - Lick Creek	1 skier remote trigger, not caught (small)
3/22/2017	Cooke City - Sheep Crk.	1 skier triggered, caught and carried, uninjured
4/1/2017	N. Madison - Beehive Peak	4 climbers triggered wind pocket, non caught
4/15/2017	Bridger Range - Bridger Bowl (closed)	1 skier triggered, caught, partially buried

***Avalanche Education (next 3 pages)*****TOTAL: 5,266 (724 kids <18 y.o.; 1,098 snowmobilers)**

Date	Instructor	Group/Topic	Total
9/16/2016	Marienthal	Avy basics, forecasting, metamorphism for SAR	9
9/17/2016	Marienthal	Avy basics, forecasting, metamorphism for SAR	6
10/7/2016	Chabot	Avalanche Forecasting /ISSW	1030
10/25/2016	Bilbrey	Awareness and terrain recognition for Wolverine Researchers	6
10/28/2016	Greeno	Avalanche Safety for PhD Skis Employees	70
11/2/2016	Olson	Avalanche Awareness @ REI	38
11/7/2016	Marienthal	Understanding the avalanche advisory for SAR Posse	41
11/8/2016	Greeno	Avy Safety for Roundhouse Employees	12
11/9/2016	Knoff/Marienthal	MSUSAW, Snowmobiling in SW Montana / Saddle Peak	99
11/10/2016	Chabot	Last season overview/SAR Hasty Team	36
11/13/2016	Hance	Awareness for REI retail employees	9
11/15/2016	Bilbrey	Avalanche Awareness @ Basecamp, Billings	31
11/16/2016	Olsen/Zinn	Avalanche Awareness @ Grizzly Outfitters, Big Sky	28
11/16/2016	Darham	Avalanche Awareness @ Yellowstone Hall, MSU	25
11/16/2016	Gidley	Avy Awareness for Sledders @ Gallatin Rec., Four Corners	19
11/18/2016	Chabot	SnowPilot and ECT@ Ski Patrol training	175
11/18/2016	Greeno	Avy Awareness @ Anderson School	43
11/26/2016	Hance/Zinn	Rescue training in field @ Cooke City	4
11/30/2016	Birkeland/Knoff	ASMSU Intro to Avalanches w/ field day	156
12/1/2016	Knoff/Marienthal	ASMSU Intro to Avalanches w/ field day	156
12/1/2016	Gidley	Avy Awareness @ Redline in Butte	16
12/2/2016	Greeno	Awareness at Livingston H.S.	159
12/2/2016	Gidley	Rescue Lecture in Cooke	2
12/3/2016	Gidley	Rescue training in field @ Cooke City	45
12/3/2016	Field Instructors	ASMSU Intro to Avalanches - field day	76
12/4/2016	Field Instructors	ASMSU Intro to Avalanches - field day	80
12/6/2016	Greeno	KBYG @ Bozeman H.S.	96
12/6/2016	Hance	Avy Awareness w/ BC Squatters @ MSU	80
12/6/2016	Greeno	Avy Awareness @ Manhattan H.S.	23
12/7/2016	Greeno	Beacon training park @ Bozeman H.S.	96
12/7/2016	Sykes	Avy Awareness @ REI, Bozeman	23
12/7/2016	Gidley	Snowmobiling In and Identifying Avalanche Terrain, Big Timber	11



12/8/2016	Greeno	Avy Awareness @ Basecamp, Helena	32
12/8/2016	Chabot	Avalanche Awareness for Ice Fest	250
12/9/2016	Gidley	Rescue Lecture in Cooke	4
12/10/2016	Gidley	Rescue training in field @ Cooke City	2
12/11/2016	Darham	Avy Awareness for REI employees	19
12/12/2016	Greeno	KBYG @ Big Sky H.S.	12
12/15/2016	Greeno	Avy Awareness @ Helena H.S.	12
12/15/2016	Knoff/Norlander	Snowmobile intro to avalanches w/ field in W. Yellowstone	28
12/15/2016	Olsen	Avy Awareness and Beacon Practice @ Beall Park	28
12/15/2016	Gidley	Riding In and Identifying Avalanche Terrain, Billings	100
12/16/2016	Knoff/Norlander	Snowmobile intro to avalanches field day in West	18
12/16/2016	Gidley	Rescue Lecture in Cooke	30
12/17/2016	Gidley	Rescue training in field @ Cooke City	15
12/19/2016	Knoff/Nobel	Avy Ed night (private)	20
12/20/2016	Greeno	KBYG @ Bozeman H.S.	23
12/22/2016	Zinn	KBYG @ Belgrade M.S.	150
12/28/2016	Hance	Youth Companion Rescue Workshop	8
12/30/2016	Marienthal/Nobel	Rescue Lecture in Cooke	52
12/31/2016	Marienthal/Nobel	Rescue training in field @ Cooke City	30
1/4/2017	Darham	Avy Awareness @ REI, Bozeman	40
1/6/2017	Greeno	Avy Awareness @ Hi-Line Climbing Gym, Great Falls	50
1/6/2017	Olson/Gidley	Rescue Lecture in Cooke	25
1/7/2017	Olson/Gidley	Rescue training in field @ Cooke City	2
1/7/2017	Norlander	Awareness @ West Yellowstone	8
1/9/2017	Gidley	Awareness @ NW Energy, Bozeman	80
1/10/2017	Dunn	Awareness @ UM-Western, Dillon	60
1/10/2017	Hance	Women's specific avalanche awareness @ Beall Park	18
1/11/2017	Greeno/Hance	Snow School field day, Livingston H.S.	24
1/13/2017	Olsen	Awareness @ NW Energy, Livingston	17
1/13/2017	Greeno/Ramos	Companion Rescue Clinic @ REI, lecture	20
1/13/2017	Olson/Gidley	Rescue Lecture in Cooke	8
1/14/2017	Olson/Gidley	Rescue training in field @ Cooke City	7
1/14/2017	Greeno/Ramos	Companion Rescue Clinic @ REI, field day	20
1/16/2017	Gidley/Sykes	Beacon training @ NW Energy, Bozeman	24
1/17/2017	Thompson	Awariness @ Big Timber, Sweetgrass H.S.	2
1/18/2017	Greeno	Livingston Links after school	10
1/18/2017	Hendrikx/Knoff	ASMSU Intro to Avalanches w/ field day	159
1/19/2017	Marienthal/Bilbrey	ASMSU Intro to Avalanches w/ field day	159
1/21/2017	Field Instructors	ASMSU Intro to Avalanches - field day	80
1/22/2017	Field Instructors	ASMSU Intro to Avalanches - field day	79
1/20/2017	Marienthal	Rescue Lecture in Cooke	15
1/20/2017	Olsen/Gidley	Beacon Training @ NW Energy, Livingston	10

1/21/2017	Field Instructors	ASMSU Intro to Avalanches - field day	80
1/21/2017	Gullet/Barrier/ Madsen	Rescue training in field @ Cooke City	21
1/21/2017	Gidley/Olson	Avy training for Ruby SAR - field day	12
1/21/2017	Maclean	Lvingston Snowmobile Club	10
1/21/2017	Norlander	Avalanche Awareness @ West Yellowstone	20
1/22/2017	Field Instructors	ASMSU Intro to Avalanches - field day	79
1/22/2017	Gullet	Snowmobile awareness and Cooke conditions, private	15
1/23/2017	Greeno	Snow School Lecture, Big Sky H.S.	14
1/27/2017	Gidley	Rescue Lecture in Cooke	10
1/28/2017	Field Instructors	Advanced avalanche awareness - field day	50
1/28/2017	Gullett	Beacon Training for GVSA Poker Ride	20
1/28/2017	Gidley	Rescue training in field @ Cooke City	14
1/28/2017	Ramos	All Out2017, REI national event	10
1/29/2017	Gidley/Maclean	Field day for Hi-Tech Motorsports, Cooke City	11
2/1/2017	Darham	Women's specific avalanche awareness @ REI	8
2/3/2017	Bilbrey	Morning Star STEM expo	50
2/3/2017	Madsen	Rescue Lecture in Cooke	0
2/4/2017	Taylor/Dixon	Rescue training in field @ Cooke City	6
2/4/2017	Norlander	Awareness @ West Yellowstone	20
2/7/2017	Olsen	Sidcountry specific avalanche talk @ Beall Park	11
2/8/2017	Hance	Avalanche Awareness @ Roskie Hall, MSU	30
2/10/2017	Dunn	Avy training for Beaverhead SAR	25
2/10/2017	Hance	Companion Rescue Clinic @ REI, lecture	14
2/10/2017	Steckmest/Redfield	Rescue Lecture in Cooke	22
2/11/2017	Dunn	Avy training for Beaverhead SAR, field day	15
2/11/2017	Hance/Ramos	Companion Rescue Clinic @ REI, field day	14
2/11/2017	Steckmest/Redfield	Rescue training in field @ Cooke City	15
2/11/2017	Norlander	Awareness @ West Yellowstone	15
2/17/2017	Marienthal/Hance	SplitFest Rescue Clinic	5
2/17/2017	Marienthal	SplitFest current conditions and awareness talk	30
2/17/2017	Olson	Avalanche Awareness @ Ennis, MT	9
2/17/2017	Redfield	Rescue Lecture in Cooke	6
2/18/2017	Redfield	Rescue training in field @ Cooke City	11
2/18/2017	Olson, A.	Awareness Field Day @ Madison valley SAR	4
2/24/2017	Norlander	Snowshoot Avy Trainings, West Yellowstone	70
2/24/2017	Barrier	Rescue Lecture in Cooke	9
2/25/2017	Barrier	Rescue training in field @ Cooke City	8
3/1/2017	Darham	Avy Awareness @ REI, Bozeman	9
3/1/2017	Norlander/Gidley	Snowshoot Avy Trainings, West Yellowstone	80
3/3/2017	Redfield	Rescue Lecture in Cooke	15
3/4/2017	Taylor/Dixon	Rescue training in field @ Cooke City	2
3/11/2017	Greeno	Avy awareness field day w/ Boy scout troop	6
3/11/2017	Knoff	Rescue training in field @ Cooke City	20
3/29/2017	Marienthal	Pro Development Workshop	60



## Letters of Support



November 30, 2016

Board of Directors

Sam Byrne,  
President

Loren Bough,  
Vice President

Charlie Callander,  
Secretary-Treasurer

Joanie Hall

Andrew McEntire

Jim Murphy

Yucca Rieschel

Steve Taylor

Maud Welles

Friends of the Avalanche Center  
Doug Chabot  
PO Box 6799  
Bozeman, MT 59771

Dear Doug,

On behalf of the board of directors of the Yellowstone Club Community Foundation, I am honored to inform you that your grant request has been accepted and the board has voted to provide the Friends of the Avalanche Center with a \$3,000.00 grant for the Saving Lives through Avalanche Information and Education program.

Please fill out and return the enclosed Grant Acknowledgement Form to the address noted. You should receive your funding within 10 days after we receive this form. If for some reason you do not receive the check within 2 weeks please contact me.

As you know, the YCCF is a modest Foundation that is fully funded by our membership and ownership with a clear focus on our mission to stay local and be realistic in our support. The mission of the Foundation is to provide resources and build partnerships with local nonprofit organizations that promote education, arts, healthcare, conservation, and community services. We believe your organization's work reflects these objectives.

Again, congratulations and thank you for all you do to make this part of Montana a special place to live and work. We are proud to support this program. I look forward to following your continued success.

Kind Regards,

K. Casey Schwartz  
Executive Director  
Yellowstone Club Community Foundation

**Chabot, Doug -FS**

---

**From:** Yelstondoc@aol.com  
**Sent:** Thursday, March 30, 2017 8:49 AM  
**To:** mtavalanche@gmail.com; Chabot, Doug -FS  
**Cc:** john.staley@gmail.com; ellie@downtownbozeman.org  
**Subject:** Avalanche Advisories 2016-2017 Season

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Mr Doug Chabot, Director  
Gallatin National Forest Avalanche Center  
United States Forest Service  
10 E. Babcock St.  
Bozeman, Montana 59715

Dear Doug and Staff at GNF Avalanche Center , Thursday March, 30th, 2017

Snowfall is one of the more fascinating events in nature and combined with gravity creates both risks and rewards. I suppose most folks think of the rewards so it is good there are those focused on minimizing risks and communicating an awareness of hazards.

Each morning during the winter season I look forward to reading your advisory review. But this year it often occurred to me that what I was reading every day ( think seven days a week ) or watching a one to two minute video clip of was folks -- up before daylight, monitoring the previous 24 hours of weather data, looking at submitted observations, applying accumulated experience-knowledge-training, and equally significantly doing the hard physical work - driving snowy roads, accessing the steep mountains, digging snow pits, toting equipment, presenting awareness seminars, etc. And unfortunately dealing with tragedy.

This season with the deep snows falling relentlessly at times, the physical demands struck me as perhaps more so than normal especially the day when you held the end of a 10' pole and shoved it in the snowpack , striking ground with only your upper arm showing. And i thought, did they just dig a pit to evaluate stability !! With all the Warnings issued this season, seems you were especially busy, likely some short nights.

As your reporting season will soon end, thanks for the good work and best wishes to you and all the staff at the GNF Avalanche Center .

-----Doug

Snow equals water -- The Alfalfa grows green and Sweet Corn is sweet along the Yellowstone .



12/10/16 8:00 AM

### Gallatin National Forest Avalanche Center



Eric Knoff



Alex Marienthal



Doug Chabot

A donation of \$100 has been provided to the Avalanche Center as a Christmas 2016 present to Brian Story from Mark Story & Joanna Ellison

Thanks for you continued excellent work!



Soda Butte Properties, Inc.  
5220 Pryor View Drive  
Billings, Montana 59101

BILLINGS MT 591

14 FEB 2017 PM 1 L



Friends of the GFNAC  
Attn: Mark  
PO Box 6799  
Bozeman, MT 59771



WE WANTED TO SAY THANK YOU FOR PUTTING  
ON THE AVALANCHE CLASSES IN COOKE CITY.  
HOPE THIS SMALL DONATION WILL HELP IN  
FUNDING THE CONTINUATION OF KEEPING  
EVERYONE SAFE FOR WINTER SPORTS!

SINCERELY,

RANDY & RAE ANN EKUND  
SODA BUTTE LODGE  
COOKE CITY, MT



*Ruggles*  
705 E Orange Street • Bozeman Montana  
59715

Dear Friends of the Avalanche Center -  
Wow, you have been busy this season!  
Thank you for all your exceptional work in  
spreading avalanche awareness and education  
to our community. We especially enjoy the  
videos and real-time snowpack / weather  
updates.  
Thank you for all your outreach and amazing  
work,  
-The Ruggles Family

Delaney Floral, 2011 — Leah Reena Goren  
From Pattern Box: 100 Postcards by 10 Contemporary Pattern Designers.  
Published by Princeton Architectural Press.  
© 2013 Leah Reena Goren.

104 Michelle Court  
Missoula, MT 59803  
February 4, 2017

Allyson Fauver, Treasurer  
Friends of the GNFAC  
PO Box 130  
Bozeman, MT 59771

Dear Allyson,

Enclosed is my annual donation to the GNFAC in memory of my son, Ben Richards. It will be ten years since March 3, 2007 when Ben died and my gratitude as always to the GNFAC and Doug, Eric, and Alex for their help then and now for others. I'd appreciate a tribute to Ben on March 3 on the advisory and hope that it will help everyone stay safe who gets out that day.

Retirement is going well. I am volunteering with the Missoula Nordic Ski Club' youth ski program and "teaching" first through third graders classic skiing Thursday afternoons January through mid February. Its great fun and we've had some great sessions of mostly games on skis. It is a welcome reminder of how much Ben loved the snow.

Many thanks,



Becky Richards



Hey Guys!

THANKS FOR ALL OF THE  
AMAZING WORK YOU DO! OUR  
COMMUNITY IS SO LUCKY TO  
HAVE AN ORGANIZATION LIKE  
THIS.

CHEERS TO WINTER!

- PINHEAD  
CREW

Mark Momberg 4615 Equestrian Lane Bozeman MT 59718 [mmomberg@aol.com](mailto:mmomberg@aol.com)

January 14, 2017

Friends of the Gallatin National Forest Avalanche Center  
10 East Babcock  
Bozeman, MT  
59718  
Attention: Doug Chabot

Dear Mr. Chabot,

Please accept my sincere communication of gratitude for the recent partner rescue class sponsored by REI and delivered by your organization.

Mark's lecture on the first evening was clear and concise. It is obvious Mark has a background in instruction and has mastered his craft. Learning a new skill in a challenging environment can be intimidating to say the least. Mark did a great job of communicating to our group the knowledge, skills and abilities required to participate in the class and exercise.

On the day of the exercise Mark introduced Peter as his co-instructor. Mark and Peter did an outstanding job organizing our group to actively participate in search drills to gain the skills and confidence needed for avalanche partner rescue. You can be proud to have folks like Mark and Peter representing your organization in an effective and professional manner.

Thanks to you, your organization and volunteers for a memorable and valuable experience.

Sincerely,



Mark Momberg



WESTEND LOCATION  
2331 Lewis Avenue  
Billings, MT 59102  
406.656.1452  
edm@fismt.com



HEIGHTS LOCATION  
848 Main St., Ste 16  
Billings, MT 59105  
406.281.8144  
maxg@fismt.com

[www.fismt.com](http://www.fismt.com)

THANK'S FOR COMING  
TO BILLING AGAIN!  
SEE YOU ON DEC. 15<sup>TH</sup>  
THIS IS A FAMILIES  
FOR OUT DOOR RECREATION  
EVENT  
6<sup>TH</sup> ANNUAL SCOTT  
HERREN MEMORIAL  
EVENT.

Auto • Home • Health • Life • Business • Worker Compensation  
Employee Benefits • Farm & Ranch • Recreational Vehicles • Medicare Plans

WE LOST SCOTT IN  
COOK CITY DOING  
WHAT HE LOVED TO DO  
RIDING SNOWMOBILES.

THANK'S  
ED MELCHER  
406-656-1452



**International Snowmobile Manufacturers Association**

1640 Haslett Rd., Suite 170 • Haslett • Michigan 48840 • (517)339-7788 • Fax: (517)339-7798



Web: [www.snowmobile.org](http://www.snowmobile.org)

8/15/16

Hello Jim.

Here is the check to help support the Beacon Park. We all think this is a great idea - helping train our customers.

Thanks - I will be at the ISSW in CO. this October - and in MONTANA in Feb. - Send me photos of your work if possible. Hope to see you.



Bozeman Women's Activity Groups (B.W.A.G.s)  
Bozeman, Montana  
<http://www.bwags.org/>

Bozeman Women's Activity Groups (B.W.A.G.s)  
c/o Patti Steinmuller  
952 Knolls Drive  
Bozeman, MT 59715

December 7, 2016

**Friends of the Gallatin National Forest Avalanche Center**  
PO Box 130  
Bozeman, MT 59717

Dear Gallatin National Forest Avalanche Center:

Enclosed is a check for \$150.00 as a donation to the Gallatin National Forest Avalanche Center from the Bozeman Women's Activity Groups (B.W.A.G.s). Many of us receive the Avalanche Center report each morning and have attended your educational sessions. Thank ypu for your service to our community.

Sincerely,

A handwritten signature in cursive script that reads "Patti Steinmuller".

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

Enclosure



**International Snowmobile Manufacturers Association**

1640 Haslett Rd., Suite 170 • Haslett • Michigan 48840 • (517)339-7788 • Fax: (517)339-7798



Web: [www.snowmobile.org](http://www.snowmobile.org)

October 31, 2016

Jay Pape  
Friends of the Gallatin NF Avalanche Center  
PO Box 6799  
Bozeman, MT 59771

Dear Jay,

On behalf of the snowmobile manufacturer members of ISMA (Arctic Cat, BRP, Polaris, and Yamaha) I am pleased to send you the enclosed check for your Organization. The snowmobile manufacturers and the snowmobile community are pleased to support all of your efforts in safeguarding our National Forests.

We are thankful for all of the work you are doing in supporting avalanche safety education and in particular the advancement of safety classes specifically designed for snowmobilers. Your avalanche safety training teams are recognized as leaders in their field.

We look forward to working with you, encouraging and welcoming visitors to enjoy our great National Forests.

Sincerely,

Ed Klim  
President, ISMA

enclosure

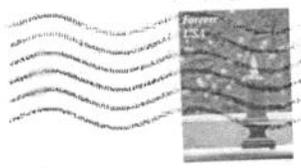


In memory of  
Jens Hagen Anderson  
who would have turned 30  
on January 7<sup>th</sup>, 2017.

Thanks for all you do  
to promote avalanche  
awareness and safety in  
the backcountry.  
Peder + Jess Anderson

Anderson  
1306 Pinnacle Star St.  
Bozeman MT  
59715

BILLINGS MT 591  
12 JAN 2017 PM 1 L



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









**Gallatin National Forest Avalanche Center**

**PO Box 130, Bozeman, MT 59771**

**[mtavalanche@gmail.com](mailto:mtavalanche@gmail.com)/406-587-6984**