

FLATHEAD NATIONAL FOREST
FLATHEAD AVALANCHE CENTER
2017-2018 ANNUAL REPORT



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Cover Image: Crown of a natural slab avalanche on Link Mountain in the northern Whitefish Range. Credit: FAC 1/15/18.

Director's Summary

A poor basal snowpack structure and momentous snowfall made for a difficult and memorable avalanche season. The constant stream of Pacific Northwest storms over persistent weaknesses contributed to 13 avalanche fatalities in Washington, Montana, and Idaho, one of which tragically struck down a member of our community in the backcountry of Big Mountain. The Flathead Avalanche Center team continues to expand avalanche information and education to the Flathead Valley, working tirelessly to provide accurate and useful products. The public applauded the quality of our daily avalanche advisories, which included substantial increases in the number of field observations, photos, and supplemental videos. Outreach efforts are making a clear impact: website use continues to increase while our social media products saw exponential growth. Even as we expand the number and level of avalanche classes, attendance is brimming at capacity. Community feedback has been overwhelmingly positive. These successes would not be possible without the dedication and support from our community and partners. Thank you to everyone who contributed time or resources towards avalanche safety in the Flathead Valley.

Sincerely,
Zach Guy
FAC Director



Figure 1: The photo says it all. It was a deep and busy winter for our forecast team. Credit: FAC, 2/23/18.

Background

The purpose of the Flathead Avalanche Center is to prevent the loss of life, limb, and property to human and naturally occurring avalanches through information and education to the community. The FAC operates as a Type 1 Avalanche Center. With three full-time forecast staff and two part-time observers, current resources allow for daily avalanche advisories for three geographic regions: the Swan Range, the Whitefish Range, and the Flathead and Glacier National Park. Due to an unusually early arrival of wintry conditions (the first avalanche fatality in Montana, outside of our advisory area, occurred on October 7), the FAC began issuing regular snowpack updates on October 2, 2017. We began full operations and daily avalanche advisories on December 9, 2017 and continued through April 8, 2018. With an unusually deep snowpack and active spring weather, we extended regular snowpack updates until April 15, 2018 and published 423 information or advisory updates for our three forecast areas.

This year, the FAC expanded its forecast coverage to include the Northern Whitefish Range extending to the Canadian Border and a new area in Central Glacier National Park near Lake McDonald. This is in response to increased backcountry usage and a robust network of field observers assisting with operational data collection. The advisory area now includes the entire Whitefish Range, the northern Swan Range, northern Flathead Range, the Apgar Range, and portions of the Livingston and Lewis Ranges in Glacier National Park. These mountainous regions see substantial backcountry usage and are reasonably accessed by FAC field staff.

While partnering with the Friends of the Flathead Avalanche Center (FOFAC), the FAC also provided numerous education classes including free avalanche awareness, Introduction to Avalanche courses, Level 1 Avalanche courses, companion rescue courses, and avalanche basics for school-aged children throughout Flathead Valley.

Avalanche information product season totals:

- Pre-season avalanche information updates (beginning on 10/2/2017) = **16**
- Avalanche advisories (12/9/2017 through 4/8/2018) = **121**
- Post-season avalanche information updates (beginning on 4/9/2018) = **4**

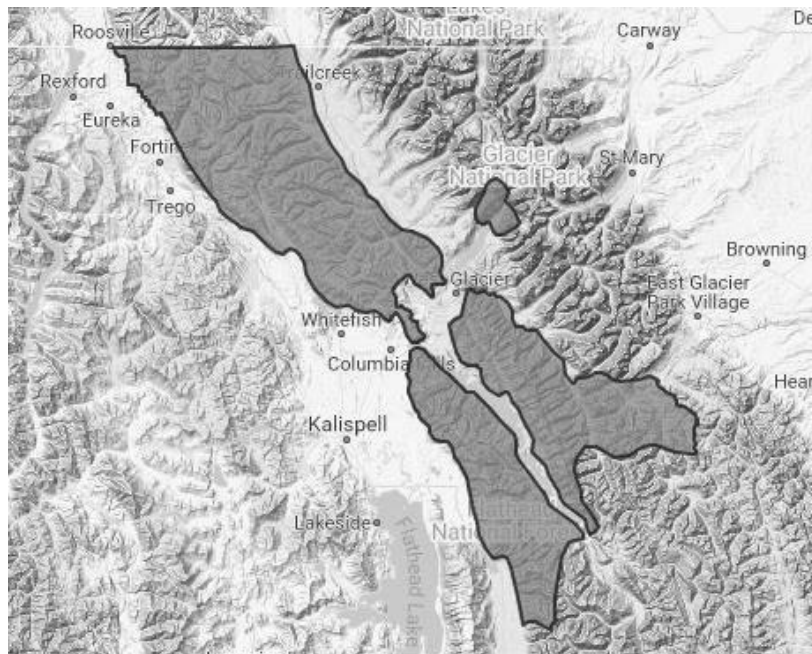


Figure 2: Overview of the Flathead Avalanche Center advisory area, including new additions of central Glacier National Park and Northern Whitefish Range this season.

New and returning staff members compose the FAC team for this season, operating under the US Forest Service (USFS) in Hungry Horse, MT. Zach Guy, former director of the Crested Butte Avalanche Center, relocated to the Flathead Valley last spring to take on his new role as FAC's Director. Mark Dundas, with over 20 years of experience in the Flathead Valley, returned for his 3rd season with the FAC as lead forecaster. Chris Bilbrey rounded out the full-time forecast staff by joining the FAC from MSU's snow science program in Bozeman. Guy Zoellner and RJ Hannah contributed to the fieldwork and educational efforts as part-time professional observers. The center also engaged Seth Carbonari, Todd Hannan, and Zack Gidley with the USFS and Erich Peitzsch with the US Geological Survey. The program is supervised by Chris Prew under the umbrella of the Recreation Program for the Flathead National Forest. The Friends of the Flathead Avalanche Center (FOFAC) is a non-profit partner of the FAC, with the mission of financially supporting the FAC and saving lives through avalanche education. FOFAC is steered by a board of directors, and Jenny Cloutier is FOFAC's education coordinator.

The FAC website (www.flatheadavalanche.org) is the primary source for communicating avalanche information to the public. The website houses all of the avalanche advisories, observations, media, reports, and other information provided by the FAC. FOFAC owns the website and funds website maintenance and development. This season, we implemented several improvements to the website, including: 1) a redesigned observation platform and database to encourage an increase in public observations and streamline data management. 2) a simpler, more responsive website theme which incorporates more media. Website statistics have been collected since the introduction of the new site in November 2012. Site visits and use continue to increase substantially.

Table 1: Descriptive statistics of the FAC website for 2017-2018.

Total Visits (#)	Total Unique Visitors (#)	Page Views (#)	Pages/Visit (#)	Avg. Visit Duration (minutes)
75,540 Increase of 7.3% from 2016-2017	23,969 Increase of 4.3% from 2016-2017	240,738 Increase of 32% from 2016-2017	3.19	2:58

Media

The Flathead Avalanche Center was featured in at least 33 media outlets, including television, newspaper, online news, and radio outlets. Topics included avalanche conditions, avalanche incidents, educational opportunities and highlighting the work of the avalanche center. The FAC began issuing "Avalanche Watches" this season to communicate when conditions are expected to develop to warning criteria within the next 24 hours. This was a strategy for getting information disseminated through the media before the peak of instability, rather than after. Some examples that illustrate the kinds of media featuring the FAC include: 1) [a Daily Interlake article](#) highlighting the work of FAC Director Zach Guy. 2) [a KPAX feature](#) saluting the service of the FAC. 3) an [NBC Montana piece](#) highlighting dangerous avalanche conditions. 4) [a KPAX story](#) highlighting education opportunities offered by FAC. 5) [a KULR update](#) on a buried snowmobiler. Some of these media features involved FAC staff interviews, and others drew information from our website or social media accounts.

The FAC continues to develop and improve its social media strategies, and our efforts were rewarded with exponential growth. The center uses Twitter, Instagram, Facebook, and YouTube to reach a broader audience. The goal is to steer additional users to our website, while also engaging them with media and simple avalanche messaging. New this season, we published videos directly to Instagram and Facebook, and we invested more resources to video content and editing. Rather than simply show the state of the snowpack, the goal of our videos is to form a holistic message incorporating snowpack observations into decision making and terrain selection. We also began supplementing daily morning social blasts that coincide with our advisories with afternoon updates of observations from the field. The backcountry community applauded our social media presence, and we will continue to improve this evolving public messaging platform.

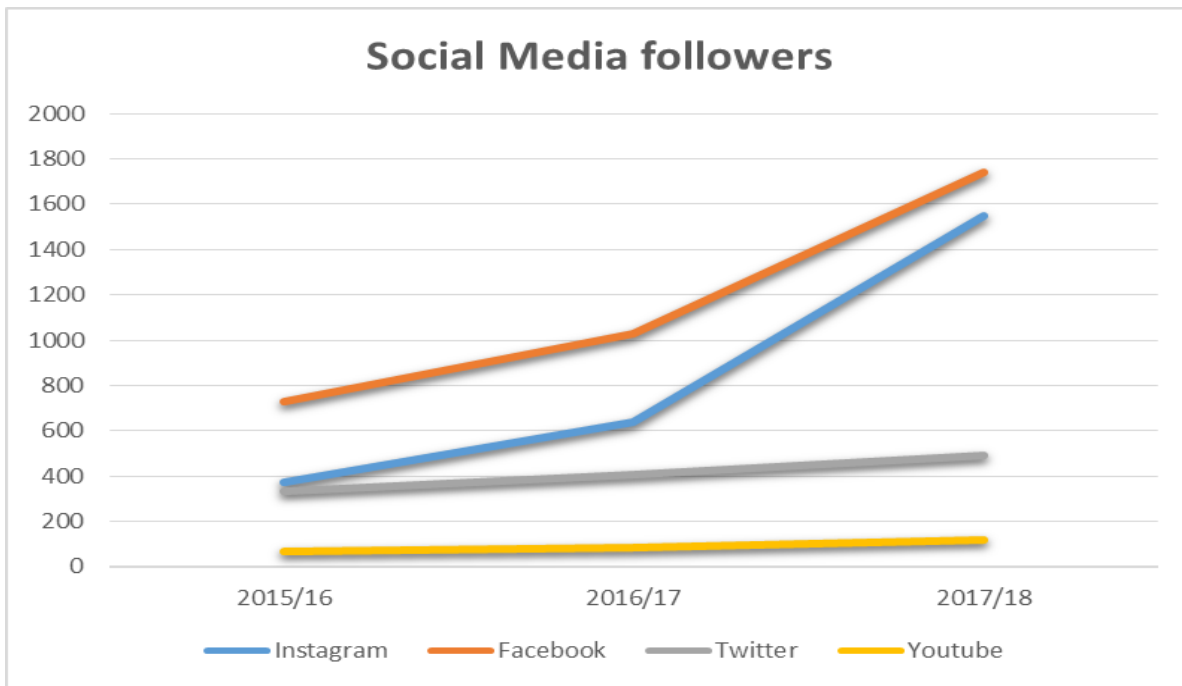


Figure 3: Three year plot in FAC social media followers highlights exponential growth this season.

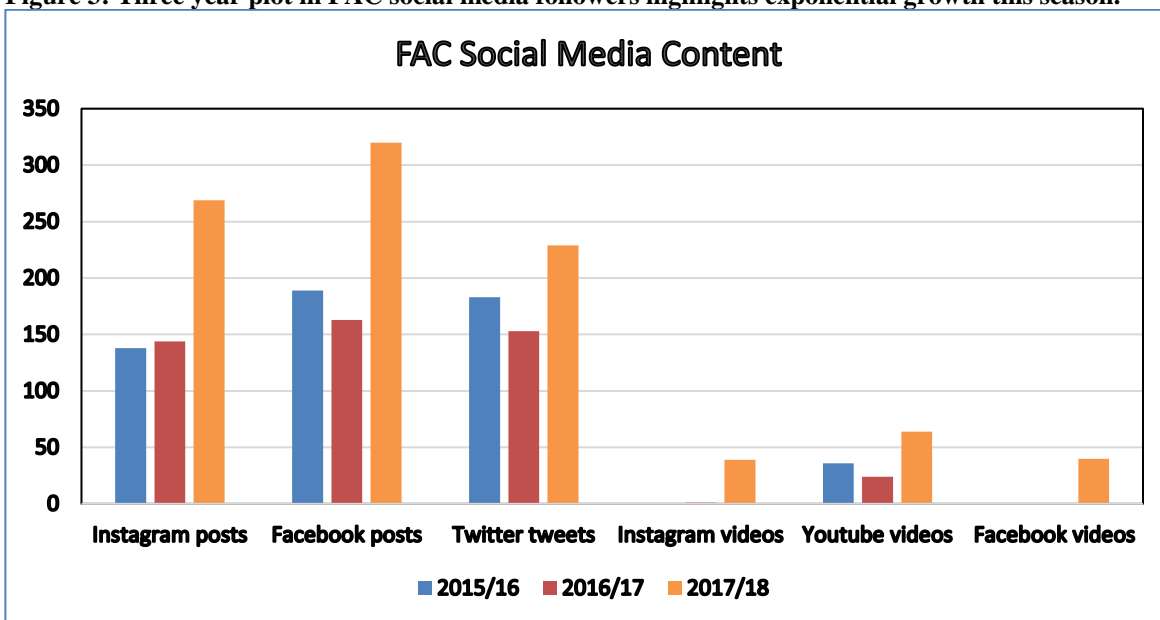


Figure 4: Graphs of FAC authored social media content for the past three seasons demonstrates the increase in FAC generated videos and photos this season.

The FAC Instagram account (<https://instagram.com/flatheadavalanche/> and @flatheadavalanche) is our fastest growing outreach platform. We made 269 posts this season, up from 144 last year, and increased our followers from 637 to 1,549. We posted 39 informative videos with 36,024 views. This season we began using #flatheadavalanche to link our content and to crowd-source publicly tagged content.

Our Facebook page (<https://www.facebook.com/friendsofflatheadavalanchecenter> and @friendsofflatheadavalanchecenter) continues grow and engage a large number of users. We doubled our content this year to 320 posts. Our Facebook audience grew from 1,029 to 1,743 page likes. Our reach and engagement

roughly tripled and quadrupled since last season, respectively, with 424,575 post reaches and 37,038 engagements. Our 40 Facebook videos were viewed 55,875 times.

The FAC Twitter account (<https://twitter.com/FACavalanche> and @FACavalanche) continues to grow in popularity. Followers increased from 405 to 489 this season. Our 104,879 impressions and 2780 engagements roughly doubled from last season. We published 229 tweets with 232 retweets and 195 likes, all substantial increases from previous seasons.

The Flathead Avalanche YouTube channel (<http://www.youtube.com/user/FlatheadAvalanche>) stores all of our field based videos, which we embed into advisories and observations pages. This season we produced 64 videos from the field, nearly triple the content from last year. Our YouTube channel had 14,188 views (an increase in 61%), 18,771 minutes watched, with 119 subscribers. Our most popular video of the season was a site visit to a snow cat burial in the Whitefish Range on February 7.

Weather, Snowpack, and Avalanche Summary

The 2017/18 winter season was characterized by a constant flow of Pacific systems leading to an atypically deep snowpack. By mid-April, the Flathead River Basin snowpack was at 152% of average. The warmest and heaviest rain event occurred on Thanksgiving and the longest dry spell occurred during the first two weeks of December. These two weather events set the stages for a poor basal snowpack structure that plagued higher elevations into February. As this Thanksgiving Crust/facet layer was buried progressively deeper, avalanches on this layer became larger. We had few other active weak layers this season, and the bulk of other avalanche activity was the result of direct action storm, wind, or wet avalanches. Although snowfall was nearly perpetual from mid-December until March, there were 5 distinct peaks and noteworthy avalanche cycles. We issued avalanche warnings for four of these events. The most widespread avalanche cycle was the first storm on Thanksgiving Crust/facet later in mid-December, and the most destructive was a heavy rain event to 6,000+ feet in elevation on February 8th. Storms and associated avalanche activity tapered in intensity by late February, although wintry conditions persisted beyond mid-April. The snowpack peaked and then finally began to melt beginning the fourth week of April.

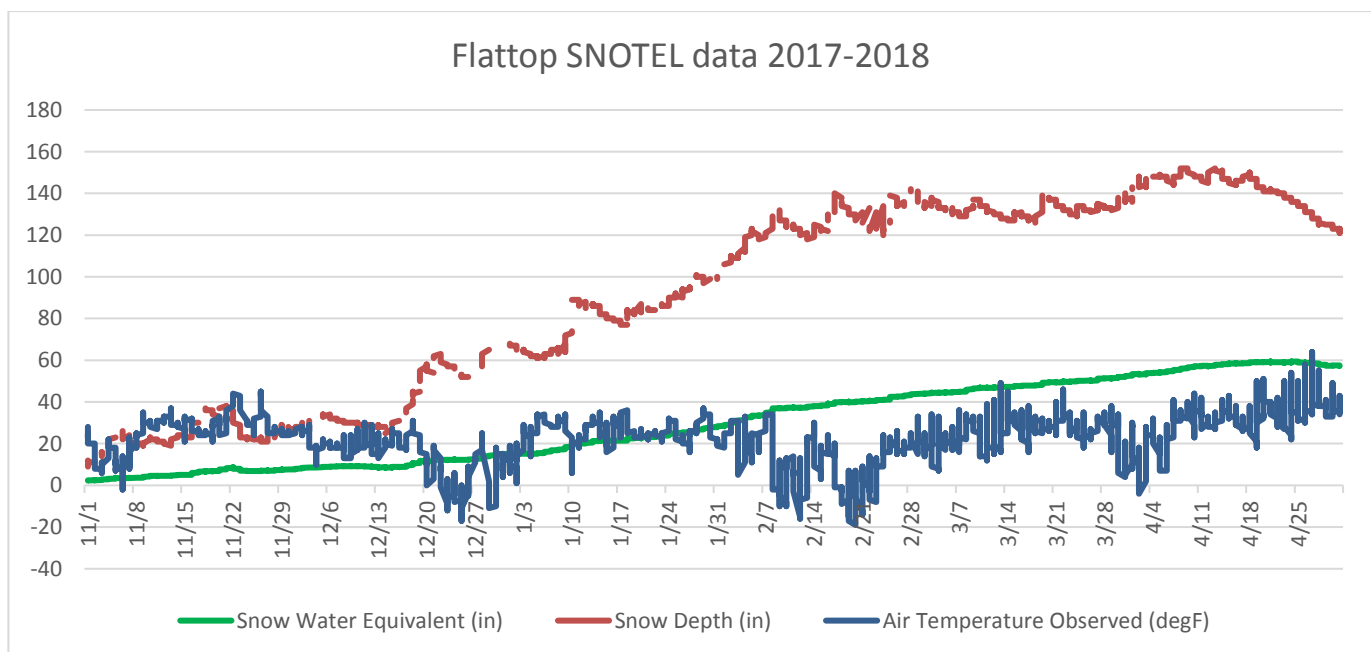


Figure 5: Snow depth, snow water equivalent, and air temperature data from Flattop SNOTEL station in Glacier National Park.

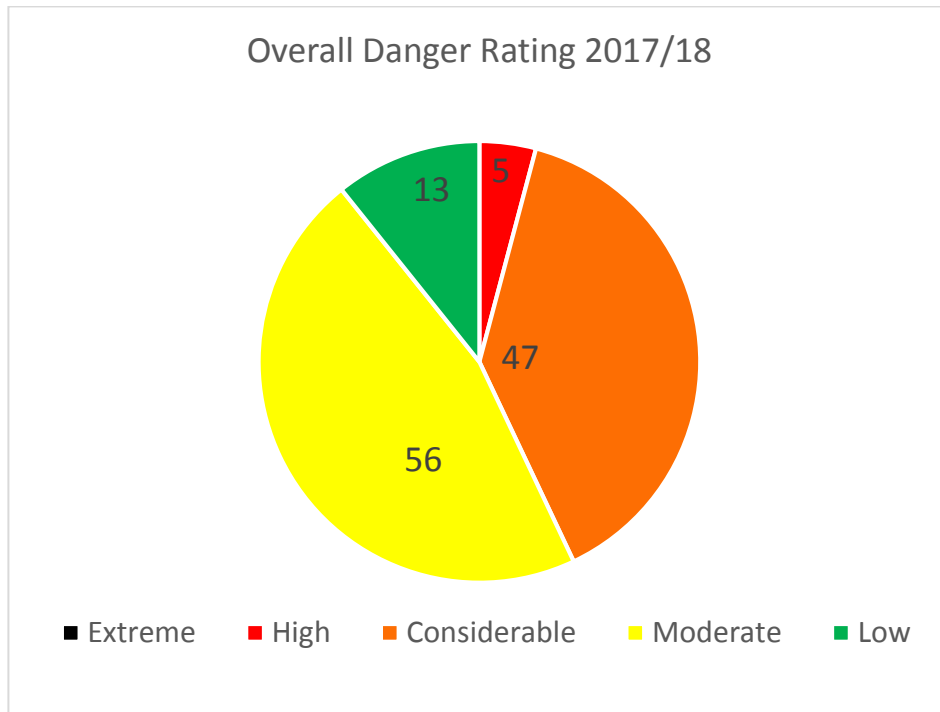


Figure 6: Frequency of highest overall danger ratings this season. The overall danger rating is based on the most dangerous elevation band and the most dangerous region of the three forecast areas for a given day.

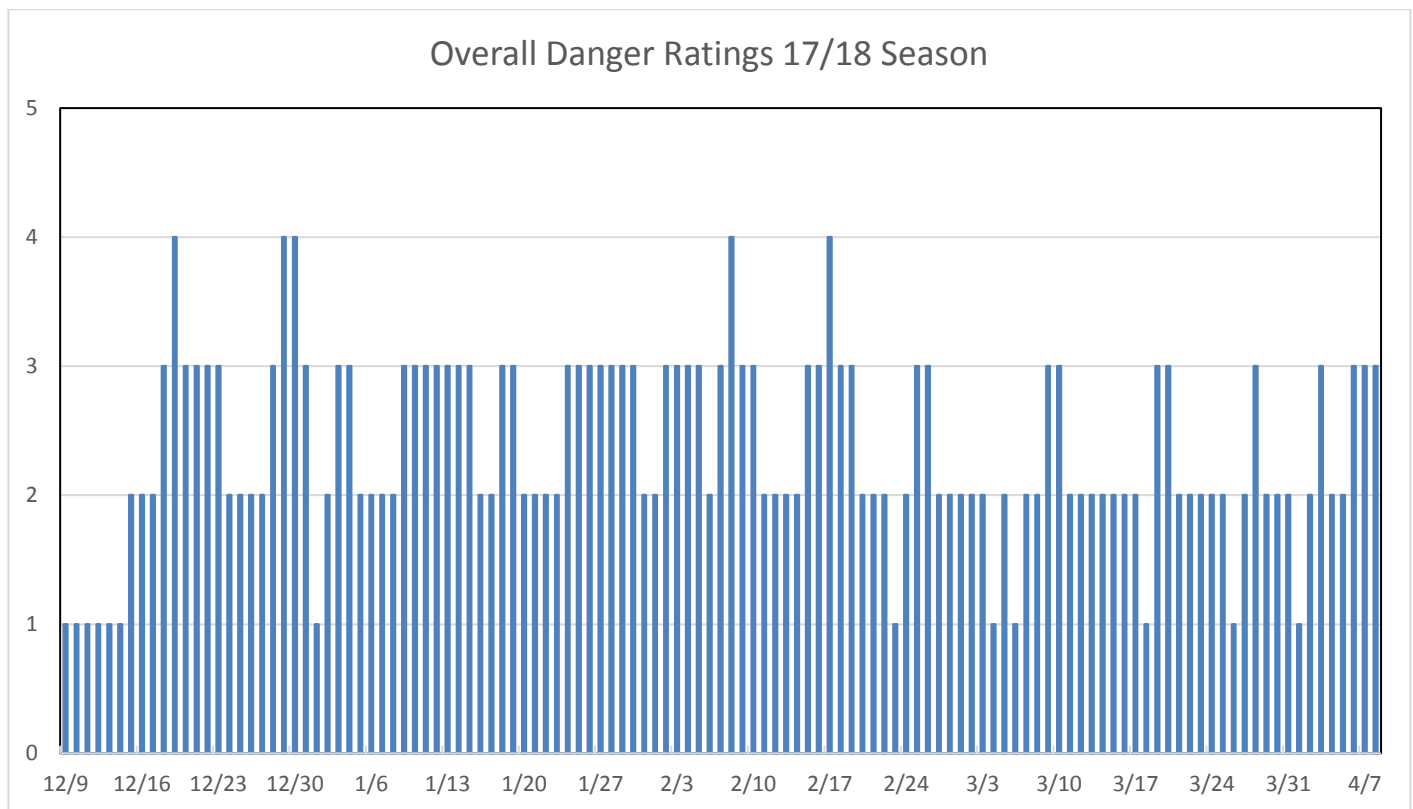


Figure 7: Temporal trend of overall danger ratings (1=Low, 5=Extreme) for the 2017-2018 winter season. The graphic highlights more dangerous conditions developing in mid-December and continuing through mid-February, and a generally lower danger in March.

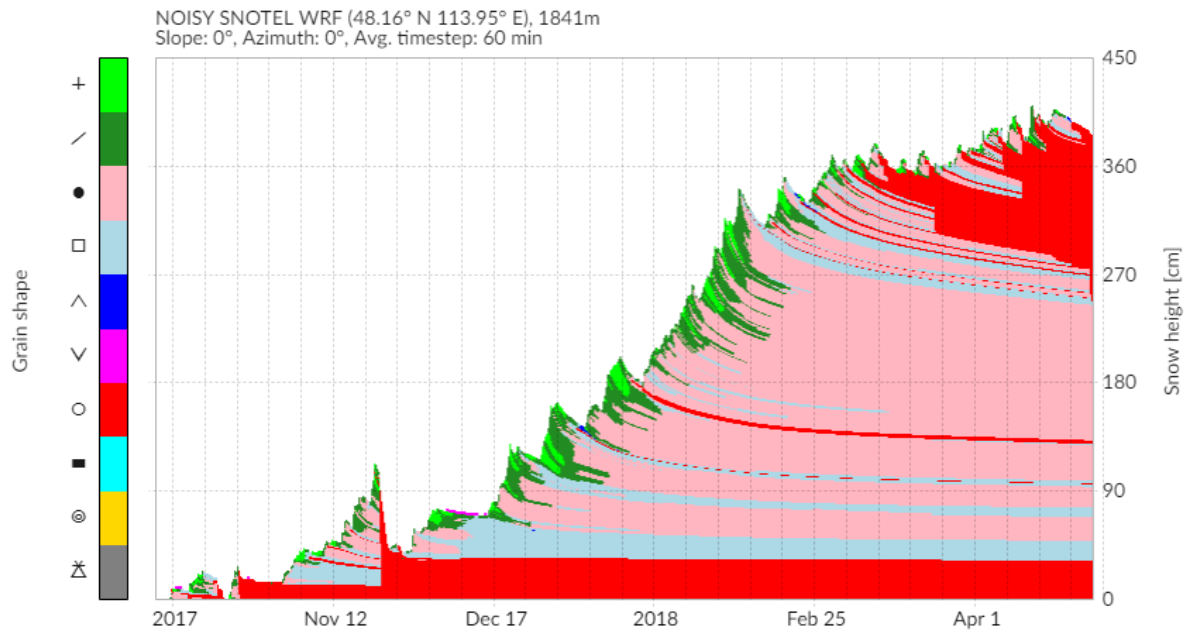


Figure 8: Modeled snowpack structure, using the SNOWPACK model with WRF inputs, for Noisy Basin. Of note is the pronounced Thanksgiving crust/facet layer forming the foundation of the snowpack prior to a series of prolonged snowfall events through February.

November

November was characterized by unusually cold temperatures accompanying snowfall at all elevations. At upper elevations, the snowpack grew to more than a meter in thickness and produced shallow storm-related instabilities throughout the first few weeks of November. A pineapple express the week of Thanksgiving produced nearly 5” of rain at all elevations on a dry snowpack, spurring a wet avalanche cycle up to D3 in size. This soaking event washed away the snowpack at lower elevations but left a thick, stout crust at upper elevations. The Thanksgiving Crust plagued the snowpack as a recurring bedsurface for the next 3 months.



Figure 9: Avalanche Lake in the aftermath of a torrential rain event on Thanksgiving. Upwards of 5” of rain caused wet avalanches and left a stout crust at mid and upper elevations. Credit: FAC, 11/28/17.

December

Light snowfall at the beginning of the month gave way to nearly two weeks of high pressure and low avalanche danger. The fresh snow subsequently rotted into cohesionless facets capped by surface hoar, overlying the Thanksgiving Crust or bare ground.

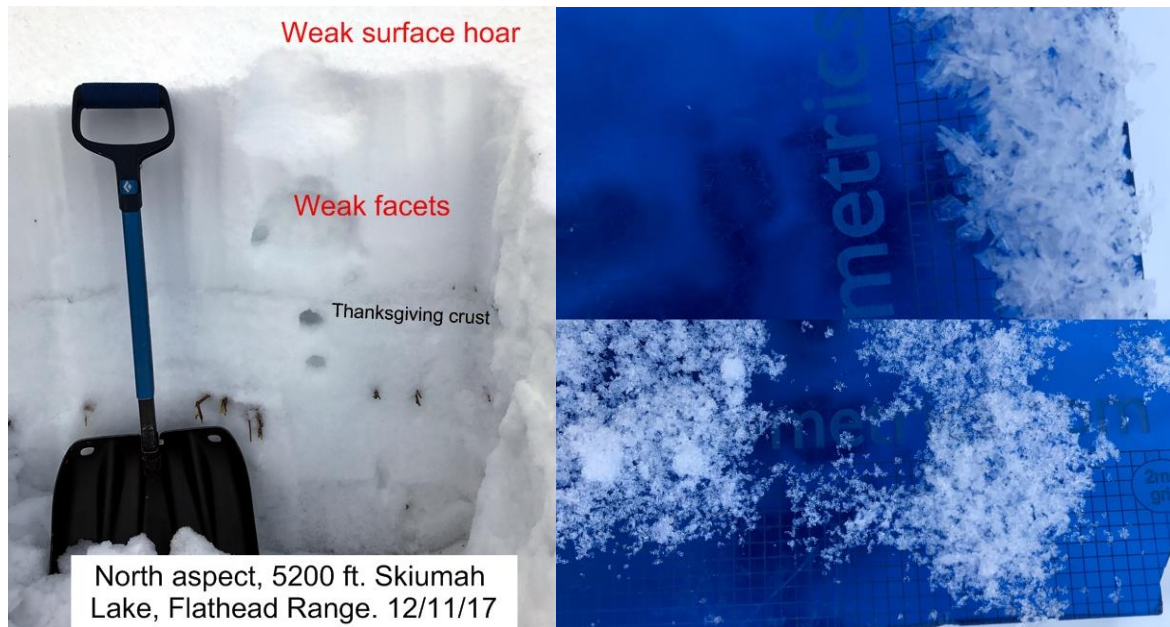


Figure 10: This pit from Skiumah Lake captures the weak foundation that would plague our snowpack through February. Credit: FAC, 12/16/17.

This weak foundation was buried in earnest starting December 15, and over the next four days, 2 to 3 feet of dense snow (up to 4.8" of SWE) produced our most extensive avalanche cycle of the winter. Nearly all of the start zones that we observed produced soft slabs, up to D2.5 in size, failing on the buried facet/crust layer. A short lull through Christmas was followed by another system of equal potency. 2 to 5 feet of snow (up to 5.3" of SWE) inundated the mountains, peaking the last few days of the year. The storm started low density and finished top heavy, resulting in another widespread soft slab cycle breaking on mid-storm layers. We also observed several thicker slabs breaking up to 5 feet deep and D3 in size on the Thanksgiving crust.



Figure 11: A widespread storm slab cycle resulted from the first major loading event on the early December weak layers. This is a skier triggered slide above Crystal Creek on December 18. Credit: FAC, 12/18/17.



Figure 12: An upside-down storm near the end of the year spurred a widespread storm slab cycle, such as this avalanche on Big Mountain. Credit: FAC, 12/29/17

January

The snowpack caught a brief respite during the first week of 2018, before we entered into another pronounced loading event and avalanche cycle in mid-January. The pattern started with a rain event on January 9th, which formed a troublesome rain crust that persisted through the month. By January 14, several feet of snow (up to 5.8" of SWE) caused continued storm instabilities and triggered numerous deep slab avalanches, up to D4 in size, failing on the Thanksgiving crust/facet layer.

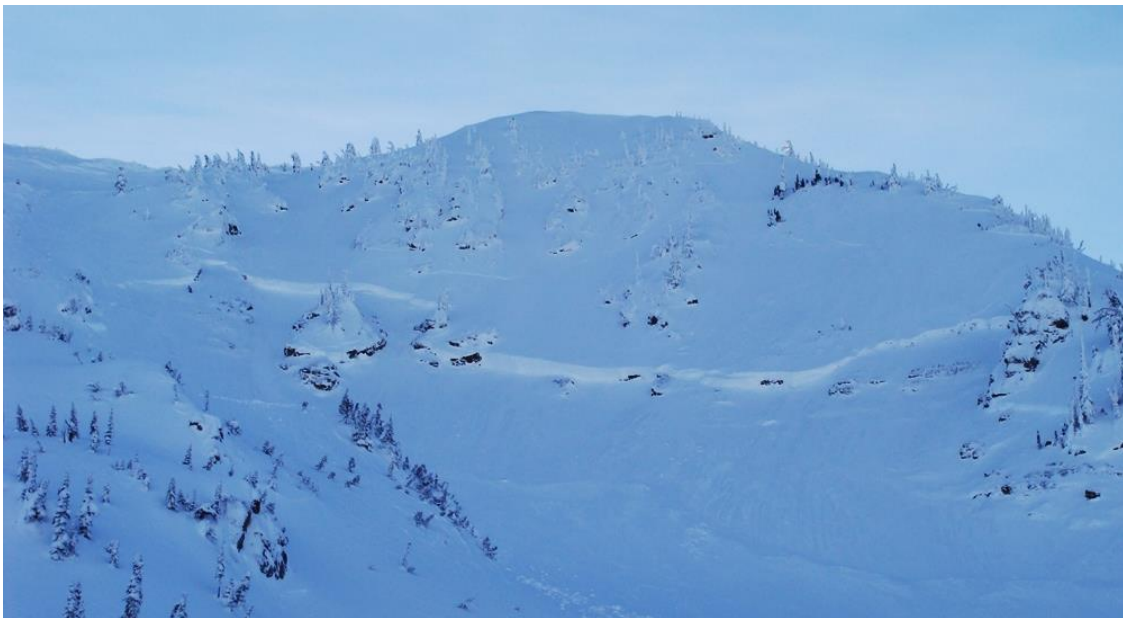


Figure 13: This deep slab on Mt. Nyack in the Flathead Range ran naturally around January 13, 2018, sliding on the Thanksgiving Crust. We measured the crown at over 7 feet and the debris ran 3,500' to the valley floor. Credit: FAC, 1/15/18



Figure 14: This photo near Marion Lake highlights the complicated snowpack in January, characterized by basal and mid-pack persistent weak layers, as well as ongoing storm instabilities. Note several distinct failure planes in the photo, taken after the storm cleared. Credit: Michael Reavis, 1/16/18

Another prolonged loading event, accompanied by strengthening winds, began January 18th through January 29th. Up to 5.5" of SWE accumulated during the extended period. The intensity of snowfall and subsequent avalanche activity diminished, relative to earlier cycles, yet we continued to observe storm and wind slab instabilities as well as several destructive deep slabs. Cornices grew in size through late January and served as triggers for deep slabs on several occasions. Avalanche activity in January culminated with a warming temperatures and sunshine, which initiated a noteworthy wet loose event.



Figure 15: A skier triggered this deep slab on January 31 near Skiumah Lake by knocking a cornice onto the slope.
Credit: FAC, 2/1/18

February

The pattern of hard-hitting storms carried into February. A sustained snowy period punctuated by a rain event on February 8th produced the most destructive avalanche cycle of the season. This 8-day loading event brought up to 9" of SWE, culminating in 3" of rain reaching upper elevations. The result was widespread storm slabs, wet avalanches, and an impressive deep slab cycle, at least one of which cleared mature swaths of forest. This event marked the last observed deep slab of the season and transitioned the snowpack towards simpler and more manageable avalanche problems.



Figure 16: This widely propagating deep slab on Mt Cameahwait appeared to be triggered by a shallow storm slab on February 4. The Thanksgiving crust is visible on the bed surface. Credit: Michael Reavis, 2/6/18



Figure 17: Wet debris flows from the February 8th rain event, which produced up to 3" of rain to approximately 6400'. Credit: FAC, 2/9/18.



Figure 18: The debris from a deep slab that ran 4900 vertical feet off Heavens Peak, dammed Arrow Lake with 50 to 100 feet of debris, and extended the historic runout of the path into mature swaths of forest. The slide likely ran on February 8th. Credit: Jackson George, 3/12/18.

The February 8th rain event was replaced by a cold front the same day. This refroze the upper snowpack and improved stability during the subsequent days of dry weather. The few inches of new snow above the crust faceted into the next weak layer, which was buried on Valentine's Day and was immediately touchy under small wind-loading and snowfall events. A series of storms deposited up to 1 to 3 feet of relatively low-density snow (up to 4.3" SWE), culminating in heavy snowfall rates on the evening of February 17th. Over the next several days this pattern produced several cycles of loose snow and storm slab avalanches up to D2 in size. Unfortunately, a backcountry skier near Big Mountain went missing on February 17th, and it appears that he was caught and killed by a storm slab avalanche. The February 17th cycle marked the last in a series of prolonged storms that resulted in avalanche warnings and avalanche cycles that began in mid-December. The tide began to change through the rest of the winter and into the spring as storms waned in intensity and frequency, and danger ratings were commonly lower. Apart from a short-lived storm in late February, the month ended in relative drought, and we saw several days of low danger across the forecast area for the first time since December. The Valentine's Day facet layer became unreactive and we removed deep slabs off the problem list.



**Storm slab avalanches that failed on a faceted rain crust last night.
Rescue Creek, Flathead Range**

Figure 19: The Valentine's Day facet layer was immediately touchy under new loading, and continued to be reactive for the next week.

March

March was characterized by small storms, wind events, dry weather and a prolonged warm, sunny period mid-month. Mountain temperatures crested into the upper 40's F during a mid-month dry spell but the snowpack remained relatively wintry and dry. Shallow storm instabilities followed by loose wet avalanches on sunny aspects were the most common avalanche problems through the first three weeks of March. The most notable storm occurred on March 19th, dropping up to 16" of snow (2.4" of SWE). A rain event up to 7,400' formed a slick crust that was a problem for the next several weeks. Gusty winds and minor snowfall contributed to heightened wind slab concerns the last week of March.



Figure 20: Spring sunshine appeared during the first few weeks of March, triggering shallow loose wet avalanches on warmer days, such as these slides on Elk Mountain. Credit: FAC, 3/11/18.



Figure 21: Strong winds and small snowfall during the last week of March made wind slabs the primary concern. This slide ran on the 3/22 rain crust, a slick layer that was problematic into mid-April. Credit: FAC, 3/27/18.

April

Wintry conditions and heavy snowfall returned the first half of April. An unusually cold system brought up to 2 feet of snow the first week of April (up to 3.0" SWE), which caused continued loose avalanche activity on the 3/22 rain crust. Mountain temperatures rose above freezing for the first time of the month on April 7th, spurring natural instabilities in the recent snow. Another storm on April 12th brought up to 18" and 2.8" SWE. Due to unusually active weather and avalanche issues, the FAC extended their season an additional week to April 14th, before publishing a spring travel advisory. The last half of April ended on a quiet note. High pressure brought clear skies and a warming trend, with mountain temperatures peaking near 60°F. A consistently refreezing snowpack each night kept wet avalanche activity confined to loose wet slides in the upper snowpack.

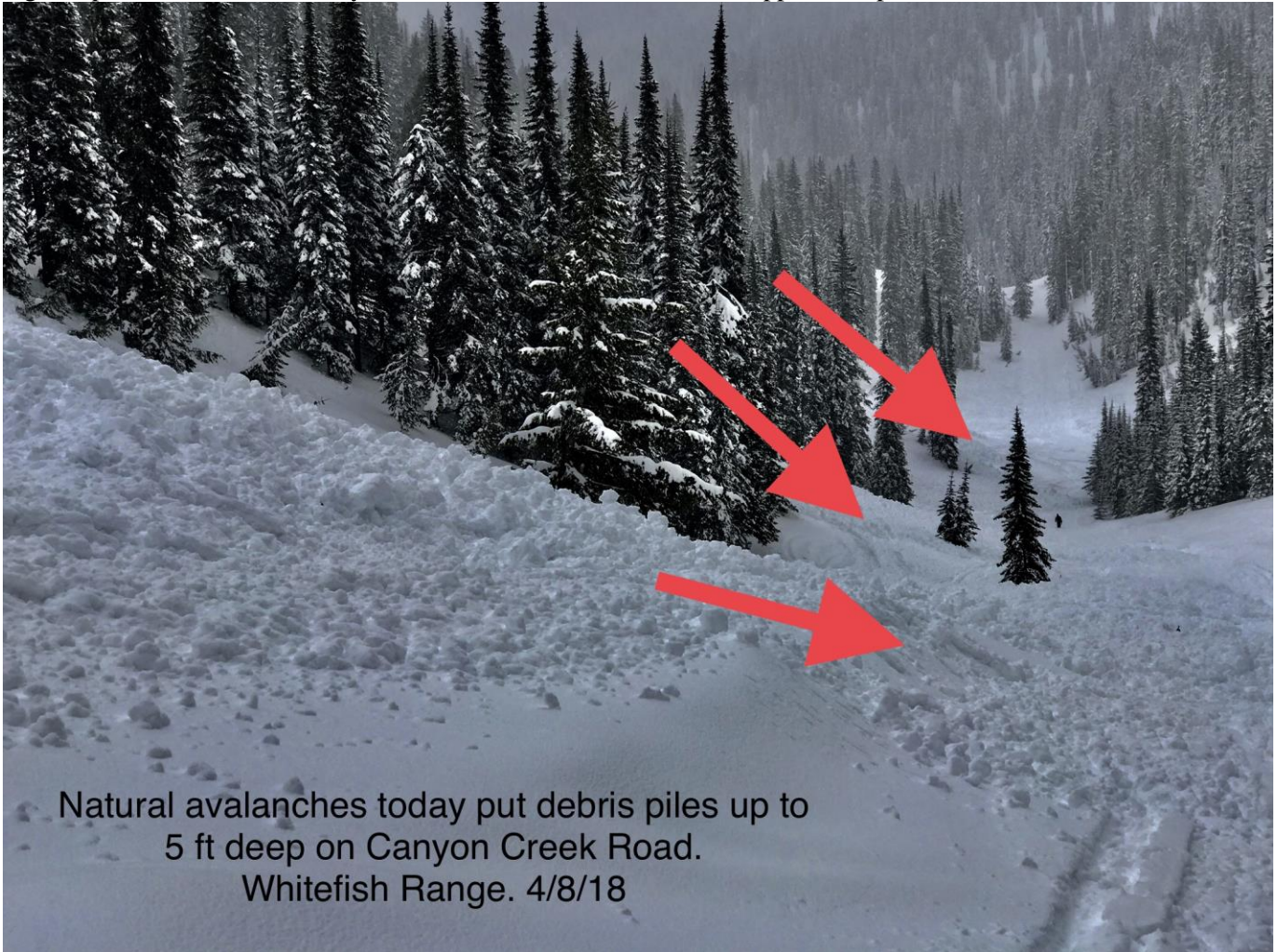


Figure 22: Stormy weather caused a flurry of avalanche activity in the first two weeks of April. These D2 storm slabs ran across Canyon Creek Road on April 8, narrowly missing several groups of hikers near Whitefish Mountain Resort.

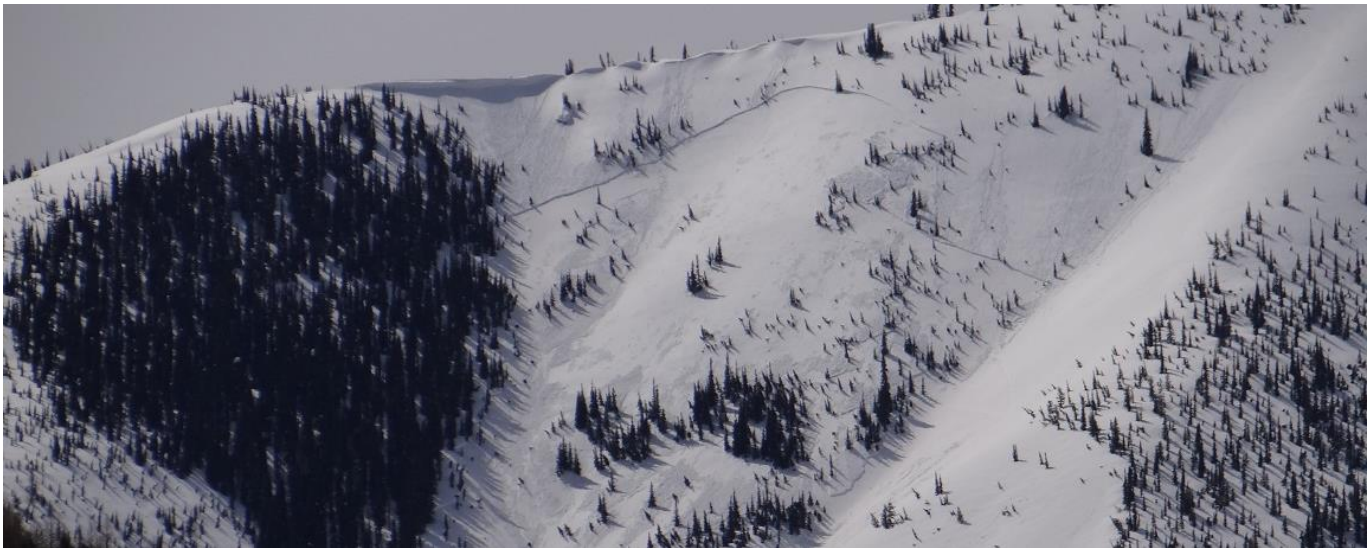


Figure 23: A large natural slab avalanche on Java Mountain that likely failed on the faceted 3/22 rain crust that was buried at the beginning of April. Credit: Ted Steiner, 4/11/18.

Incidents

During the 2017-2018 winter, there were 25 avalanche fatalities in the U.S., and 13 of those were from Washington, Idaho, and Montana. Unfortunately, one of these fatalities appears to be avalanche-related within our forecast region.

On February 17, 2018, a backcountry skier was reported missing from his tour in “The Canyon” area of Big Mountain. Despite extensive search efforts, his body was not recovered until May 12, 2018, and it appears that he was caught and buried in a storm slab avalanche. The avalanche likely occurred at the onset of a potent, fast-hitting storm, which concealed evidence and inhibited search efforts. We send our sincere condolences to all family and friends involved, and thank the tireless search efforts of the community.



Figure 24: On February 17, a skier near Big Mountain went missing. He was recovered on May 12 in this terrain trap near the Beaver Ponds area, presumably buried by an avalanche. Credit: Ted Steiner, 5/15/18.

This season we received reports of three other non-fatal avalanche incidents (<http://www.flatheadavalanche.org/incidents>). The first was a partial burial in the Northern Whitefish Range on January 1, 2018. A snowmobiler triggered a persistent slab while side-hilling above the Grave Creek Road. He was buried up to his chest on the road and his partner dug him out. The second incident was a snowcat burial on the night of February 6, 2018 in the Southern Whitefish Range. A snowcat and its driver were partially buried while grooming the Werner Peak Road after the blades of the cat triggered a persistent slab above the road. The driver was able to evacuate and the snow cat was retrieved later that week. The final incident occurred on April 22, 2018, in Glacier National Park, after FAC had concluded daily operations. A skier was ascending the Northeast ridge of Heavens Peak when a cornice broke around his skis. He was carried down a steep slope with cliff bands and injured, but able to self-rescue despite losing a ski and both poles.



Figure 25: A snowmobiler was caught in this persistent slab avalanche while sidehilling above the road on January 1st. He was buried up to his chest without injury. Credit: FAC, 1/1/18.



Figure 26: On February 6, a snowcat was partially buried by a persistent slab on Werner Mountain Road. The cat's blade triggered the slide, and the driver was able to evacuate unharmed. Credit: FAC, 2/7/18.

Education

The FAC increased the scope and scale of their course offerings this season with a variety of new classes this year including their first Motorized Level 1 and a Companion Rescue Skills course. The season kicked off with the Northern Rockies Snow and Avalanche Workshop in Whitefish which was attended by 225 local snow professionals and recreationalists. In addition, FAC hosted 10 General Avalanche Awareness classes and 4 Introduction to Avalanches classes. Over 1880 students were presented to during the 2017/2018 season, an increase of hundreds of attendees compared to last season. We diversified our student demographics by teaching several women's specific and motorized specific courses and grew our presence in local schools. Classes are listed in the table below (Tables 3-4).

The FAC collaborates many local businesses for education venues, Rocky Mountain Outfitter supported staffing gear needs and provided a venue for several courses. Penco Power Products, Jesco Marine and Power Sports, Sportsman & Ski Haus, Stumptown Snowboards, Kalispell Brewing Company, Montana Tap House, Stonefly Lounge, and Whistling Andy Distillery all hosted general awareness classes as well.

These local businesses also offered discounts on avalanche safety gear and/or raffle incentives for class attendance. The generous support of these community businesses continues to foster a thriving and educated backcountry community.

Both FOFAC and FAC increased outreach to local youth and partnered with schools throughout the Flathead Valley to provide snow and avalanche education to over 750 students in 20 youth specific courses this season. A partnership with the Whitefish Legacy Partners connected FAC staff with every 6th grade student in the town of Whitefish for a field day focused on rescue skills and snow metamorphosis. The Flathead Valley Ski Education Foundation partnership also grew in scope this season. With local racers, their coaches and parents attending Awareness talks and custom field courses throughout the season. The combined efforts of in-class sessions with FAC instructors and field classes with the Flathead National Forest Winter Program at Whitefish Mountain Resort continued this season. All of these programs allow students learn how to be safe while having fun in the winter environment. Students also explore the dynamics of snow while learning about avalanches.

Table 2: List of education classes provided by FAC or affiliated with FAC

Date	Class	City	Attendees	Attendees < 21 y/o
November				
11/4/2017	Northern Rockies Avalanche Safety Workshop	Whitefish	225	15
11/9/2017	Avalanche Awareness	Kalispell	52	5
11/24/2017	TGR Film and table	Whitefish	100	
11/30/2017	Avalanche Awareness	Kalispell	25	2
12/2/2017	Snowshow	Kalispell	100	
12/5/2017	Avalanche Awareness	Whitefish	78	3
12/7/2017	FVSEF Coach Awareness Talk	Whitefish	15	
12/13/2017	Motorized Avalanche Awareness	Kalispell	25	2
12/14/2017, 12/16/2017	Introduction to Avalanches (non-motorized) Classroom	Kalispell and Whitefish	21	
12/18/2017-12/20/2017	Border Patrol L1	Hungry Horse	15	
12/19/2017	HS Awareness Talk	Kalispell	23	22
1/3/2018	Avalanche Awareness	Whitefish	28	2
1/4/2018	Avalanche Awareness	Coram	22	
1/3/2018	GNP Staff Training	Whitefish	14	
1/5/2018-1/7/2018	Motorized L1	Hungry Horse	12	2
1/8/2018-1/10/2018	Border Patrol L1	Hungry Horse	15	

1/11/2018	Flathead Vo-ag Awareness	Kalispell and Whitefish	46	45
1/11/2018, 1/13/2018	Ladies Introduction to Avalanches (non-motorized) Classroom	Kalispell and Whitefish	27	
1/13/2018	FVSEF Youth Field Day	Whitefish	48	45
1/17/2018	Edgerton Elementary	Whitefish	30	22
1/18/2018	Edgerton Elementary	Whitefish	31	23
1/23/2018	WLP Youth	Whitefish	52	45
1/23/2018	Avalanche Awareness	Browning	35	
1/27/2018-1/28/2018	FCSAR	Hungry Horse	18	
12/19/2017	HS Awareness Talk	Kalispell	31	30
1/30/2018	WLP Youth	Whitefish	55	45
1/30/2018	Ladies Awareness	Kalispell	28	
1/31/2018	Edgerton Elementary	Whitefish	35	25
2/1/2018	Edgerton Elementary	Whitefish	31	17
2/1/2018 and 2/3/2018	Introduction to Avalanches (motorized)	Kalispell	12	
2/6/2018	WLP Youth	Whitefish	52	45
2/9/2018	Hedges Visit	Kalispell	72	
2/9/2018-2/10/2018	Companion Rescue Course	Hungry Horse	16	2
2/12/2018	DREAM Intro	Whitefish	11	
2/12/2018	Ruder Elementary	Columbia Falls	100	100
2/14/2018	Freeflow-WHS	Whitefish	27	24
2/15/2018	Somers Middle School	Somers	80	75
2/28/2018	FNF Youth	Whitefish	24	24
3/1/2018, 3/3/2018	Introduction to Avalanches (non-motorized) Classroom	Kalispell	21	
3/1/2018	Edgerton Elementary	Whitefish	35	29
3/1/2018	Avalanche Awareness	Whitefish	45	14
3/3/2018	MWA Hike	Round Meadow	7	
3/6/2018	St. Matthews	Kalispell	9	8
3/7/2018	Homeschool	Whitefish	18	16
3/8/2018	St Matthews	Whitefish	16	14
3/13/2018	Smith Valley School	Kalispell	60	60
3/15/2018	Avalanche Awareness/Wet Snow	Kalispell	3	
3/16/2018	Avalanche Awareness	Bigfork	36	3

Table 3: Participant totals of avalanche education component of FAC and Flathead National Forest.

All Classes	All Students	Motorized Classes	Motorized Students
50	1880	6	100
Students <21	Awareness Classes	Intro Courses	Professional Courses
765	18	4	4

Finances

The Flathead Avalanche Center is funded through federal dollars, grants, and community partners. The Friends of the Flathead Avalanche Center (FOFAC) is a 501(c)3 organization that leverages funding through grants, private donations, sponsorships, events, and other fundraising opportunities. New this season, FOFAC funded a third full-time forecaster position while also providing various in-kind support. Major federal and state contributors include the U.S. Forest Service Region 1, Glacier National Park, Flathead National Forest, and the Montana Department of Fish Wildlife and Parks Recreation Trails Program. We received additional support from the United States Geological Survey (USGS), the US Border Patrol, and Flathead Valley Community College (FVCC).

Table 4: Revenue for the Flathead Avalanche Center Winter 2017-2018.

Source	Value (US\$)	Details
Forest Service cash	63,000	Flathead National Forest and U.S. Forest Service Region 1
Forest Service in-kind	11,500	Vehicles, office space and maintenance, supplies
Glacier National Park cash	23,000	Glacier National Park for general avalanche center operations within and around GNP and training for GNP staff.
State of Montana cash	45,000	Montana Department of Fish, Wildlife and Parks (FWP) Recreational Trails Program (RTP) Grant
FOFAC cash	20,049	Funding for 3 rd full-time forecaster
FOFAC in-kind	15,588	Website development and maintenance, staffing and contracting, and miscellaneous
Other agencies cash	2,800	U.S. Border Patrol funding for avalanche education for their staff.
Other agencies in-kind	7,125	USGS partnership through research and development with Erich Peitzsch and weather station maintenance. FVCC provided a venue and funds for instructors for the Intro to Avalanches workshop.
Total Budget(\$)	188,061	

Observations

The FAC relies heavily on field observations to improve the accuracy and content of our advisory products. Our center strives to expand the frequency and geographic extent of professional fieldwork within the scope of our resources. FAC professional staff published 172 observations from field visits this season, an increase from 105 field visits last season. These written observations included 620 photographs, most of them avalanche activity and snowpack observations. Additionally, FAC staff produced 64 field videos about conditions and travel advice. Anecdotal feedback from backcountry users showed that videos and photos are welcomed and helpful. Sharing point-specific observations are valuable for making safe travel plans and decisions and for illustrating avalanche concerns within our advisories.



Figure 27: Example of media content produced from an FAC snowpack observation.

We use an observation platform on FAC's website for collecting, maintaining, and sharing all public and professional field observations. The observations page was viewed 34,000 times this season, second in popularity only to the homepage. Avalanche, snowpack, and weather data in the observations page is also databased for analysis, a valuable tool for forecasting and future research.

The Flathead Valley community continues to contribute to our products with a steady flow of valuable observations relating to snow, weather, and avalanches. We published 221 observations, including 116 pieces of media that public users or professional partners submitted to us. The public's participation effectively doubles our field reach and substantially improves the quality of our forecasts. This season, we developed a simplified observation form and offered raffle incentives through FOFAC to encourage public observations. Avalanche centers operate in a world of spatial variability and forecaster uncertainty: public observations are a tremendous value to our operation. Thank you for your observations!

We'd also like to acknowledge several professional operations for their continual data sharing: Ted Steiner and Adam Clark of the BNSF Railway Avalanche Safety Department; Lloyd Morsett and the Whitefish Mountain Resort professional ski patrol. WMR patrol also helps maintain the Big Mountain Weather Station that is owned and operated by FOFAC. We look forward to continued partnerships with these avalanche professionals in the future.

Volunteers

Volunteers for FAC were extremely valuable as field assistants, instructors, and event hosts. Volunteers donated approximately 430 hours of field time towards FAC operations, and FOFAC board members and volunteers contributed 620 hours to avalanche education, outreach, events, and fundraising. Without their efforts much of our work would not be possible. FAC extends our personal gratitude to everyone who donate time towards avalanche safety in the Flathead Valley.

Partnerships

The National Weather Service-Missoula (NWS) continues to be a strong operational partner, providing valuable support through regular weather forecasts and disseminating avalanche information to the public through warning platforms and social media. New this year with the support of the NWS, we used snowpack modeling as an additional resource to supplement forecasting and field observations.

Another extremely valuable partnership exists with Glacier National Park. Through an interagency agreement with the National Park Service, the FAC provides forecasting resources for the Park and educational opportunities for their staff in exchange for financial support. Through their support, we have the resources to conduct fieldwork and accident investigations in Glacier National Park, as well as operate as a Type 1 Avalanche Center to produce daily avalanche advisories.

The Flathead Avalanche Center works closely with the National Avalanche Center (NAC) and the American Avalanche Association (AAA) for support and guidance. These organizations provide financial support and cost-sharing opportunities for website development, warning platform development and weather station products. The FAC collaborates with Avalanche Canada (AvCan) and joined them for forecast staff training and shared observations with their Southern Rockies field teams. Our center also exchanges information and guidance with other U.S. avalanche centers.

U.S. Geological Survey Northern Rocky Mountain Science Center (USGS) partners with the FAC through their research program. Former FAC Director Erich Peitzsch of the USGS offered expertise with the transition to a new director at FAC this season. The USGS also shares snow science research resources. We plan to continue working with the USGS and their research component to improve our forecasting operations.

The FAC also partnered with Flathead Valley Community College (FVCC) for four Introduction to Avalanches classes. The FVCC provided instructor compensation, logistical support, and classroom space. We intend to continue this valuable collaboration.

Two local snow safety programs continue to be valuable assets. The BNSF Railway Avalanche Safety Department shares field observations of the John F. Stevens Canyon corridor from while maintaining several remote weather stations in the area. The Whitefish Mountain Resort Ski Patrol assists with maintenance of FOFAC's Big Mountain Summit weather station, shares observations, and provides access to FAC personnel for education venues and field observations. Their snowpack and avalanche observations are an asset to our forecasting operations, and we greatly appreciate the support and professional collaborations of these programs.

The FAC collaborates with local businesses for education venues, financial contributions and other operational needs. Rocky Mountain Outfitter supported staffing gear needs and provided a venue for several courses. Penco Power Products, Jesco Marine and Power Sports, Sportsman & Ski Haus, Stumptown Snowboards, Kalispell Brewing Company, Montana Tap House, Stonefly Lounge, and Whistling Andy Distillery all hosted general awareness classes. These local businesses also offered discounts on avalanche safety gear and/or raffle incentives for class attendance. The generous support of these community businesses continues to foster a thriving and educated backcountry community.

Both FOFAC and FAC increased outreach to local youth by partnering with schools throughout the Flathead Valley to provide snow and avalanche education to over 600 students. A partnership with the Whitefish Legacy Partners connected FAC staff with every 6th grade student in Whitefish for a field day focused on rescue skills and

snow metamorphosis. The Flathead Valley Ski Education Foundation partnership also grew in scope this season with local racers, coaches and parents attending FAC awareness talks and custom field courses. The FAC also partnered with Flathead County Search and Rescue (FCSAR) and the Flathead Nordic Backcountry Patrol (FNBP), providing expertise and resources during a prolonged missing person search in February and observation-specific training to FNBP members.

Friends of the Flathead Avalanche Center (provided by Jenny Cloutier)

The Friends of the Flathead Avalanche Center operates under the mission to financially support the Flathead Avalanche Center and to save lives through avalanche education. Funds are raised through event income, grants, and private donations. Those funds in turn support educational offerings and the day to day operations of the Flathead Avalanche Center. FOFAC volunteers invested substantial time and effort in continuing the mission of financial support of FAC and delivering lifesaving avalanche education and resource opportunities for Northwest Montana over the last year and their efforts are greatly appreciated.

The Northern Rockies Snow and Avalanche Workshop (NRSAW) is FOFAC's largest event of the year. This educational event provides the community with lectures from world renowned experts in the snow science field. Over 225 attendees gathered at Whitefish's O'Shaughnessy Center for this day long learning event that generated over \$8,000 in support of snow and avalanche education. For more information about educational offerings supported by FOFAC please visit the Education section of this report.

The organization's largest fundraiser of the year is the Great Fish Community Challenge, sponsored by the Whitefish Community Foundation (WCF). In 2017 FOFAC was able to raise \$28,000 through this matching program that provides much of the funding for the Flathead Avalanche Center's educational offerings. FOFAC also had outstanding community support through our annual Snowball held at the Great Northern Bar as well donations from a variety of private individuals and businesses.

Current Board of Directors:

President - Mike Block

Vice President – Ronald Bachrach

Secretary – Lloyd Morsett

Treasurer - Roland Frey

Dow Powell

Becky Smith-Powell

Felicia Ennis

Cheri DeBeau

Ed Visnovske

Zach Miller

Ben Parsons – In Memoriam

For more information about FOFAC please email friends@flatheadavalanche.org.

Table 5: Donation structure and number of supporters for FOFAC for 2017-2018 season.

Extreme - Sponsors who donated more than \$500



Dow & Becky Smith-Powell



Katie Callahan



Robert Novy



Tamarack Foundation



Tom & Teresa Quinn



AGL Foundation

High - Sponsors who donated between \$250 and \$499

Alan Myers-Davis

Janet Mayo

Kyle Haugen

Ted & Lisa Steiner

Bayne Family Fund

Kalispell Brewing Co.

Linda Maetzold

Tim Strand

Dick & Cheryl Gordon

Kim & Jan Richards

Mammut

Tory Baughan

Felicia Ennis

Kim Corette

Pete & Linda Costain

Travis Berro

Great Northern Brewing Co.

Kramer Family Fund

Seth Carbonari

Whitefish Mountain Resort

Considerable - Sponsors who donated between \$100 and \$249

Bob & Judy Glatz

Jeremy Rossman

Kellsey Perkins

Ron Bachrach

Chip Weber

Jim Watson & Carol Bibler

Ken & Karen McFadden

Seth Anglin

Danielle Coffman

John Evenhuis

Linda Cloutier

Shawnee Barge

Don & Sue Lewis

John Middleton

Lisa Cloutier

Stumptown Snowboards

Erich Peitzsch

Josh Bryer

Mike Block

Sydney Lillard

Esther Barnes

Joshua Nielsen

Neil & Jenny Huether

Tyler Roe

Fred & Sarah Jones

Karen Perser

Roland Frey

Wendy Farrens

Jen Parsons

Moderate - Sponsors who donated between \$50 and \$99

Adam & Aubrey Clark	Erin & Noah Bodman	Lloyd & Stephanie Morsett	Pete Francisco
Bill Sugars	Gary Danczyk	Louis Schmidt	Rick Bagley
Chelaine Penrod	Heather Vrentas	Marc & Kelly O'Brien	Ryan Feuel
Coon Hollow Forge	Judah & Tanya Gersh	Matt & Sadie Baldwin	Stephen Miller
David & Linda Grady	Karen Black	Matt Kennedy	Tim & Allison Good

Low - Sponsors who donated between \$25 and \$49

Alice Ford	Erin Chester	Jeremiah Martin	Rebecca Briber
Allyson Hakala	Fred Robinson	Josephine Parsons	Stan & Liz Makman
Becca Wheeler	Grete Gansauer	Lance & Kelly Mortensen	Zach Miller
Charles Cameron	Hartman Counseling	Martha Hunt	Zaneray Group
Courtney Moch	Jenny Cloutier		

The Future of the Flathead Avalanche Center

2018/19 Goals:

- Improve the accuracy and quality of avalanche advisories and expanding public outreach through media and public engagement.
- Maintain income sources by honoring the terms of grants and agreements and being fiscally responsible.
- Work with FOFAC to develop a strategic plan for the next 3 to 5 years. Goals include a sustainable education model, increased fundraising and financial support for the FAC and a robust network of volunteers and staffing.
- Hire a second permanent position (GS-9 lead forecaster), with continued training and staffing of the director, avalanche specialists, and professional observers.
- Organize volunteer training opportunities for educators and field assistants in the fall.
- Continue to provide Avalanche Awareness, Introduction to Avalanches, Level 1, and motorized specific classes.
- Continue collaborations with existing partners while seeking new opportunities that augment our mission.
- Continue to develop mobile responsive website products to keep stride with advancing technology.
- Respond when an incident occurs and work closely with all rescue agencies and personnel involved. Prepare a timely report on incident.
- Look for cost-effective ways to replace our aging snowmobiles.

FAC would like to extend our gratitude to all of the partners, collaborators, volunteers, supporters, and USDA Forest Service personnel who helped FAC produce advisories, teach classes, provide observations, and generally help in disseminating avalanche information. Thank You!

Any questions regarding this report or the Flathead Avalanche Center can be directed to Zach Guy, 406.407.1394 or zach@flatheadavalanche.org.

References

NRCS (National Resources Conservation Service). 2017. Snow Telemetry (SNOTEL) and Snow Course Data and Products. <https://www.wcc.nrcs.usda.gov/snow/>. Last accessed: May 17, 2018.