

**FLATHEAD AVALANCHE CENTER  
2013-2014 ANNUAL REPORT**



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Lower Left: *Snowmobile parked near debris from a large natural avalanche in early March in the Lost Johnny drainage, Swan Range*. Photo: FAC

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## Background

The Flathead Avalanche Center (FAC) operations ran from November 9, 2013 to April 6, 2014. The FAC advisory area consists of portions of the Swan Range, Flathead Range, Lewis Range (southern Glacier National Park), Apgar Range (Glacier National Park), and portions of the Whitefish Range (Figure 1). The FAC is a Type 3 avalanche center meaning it employs part-time avalanche specialists who work for the avalanche center in addition to other non-FAC related duties. (Type 1 and 2 avalanche centers have a minimum level of funding necessary to meet personnel and equipment requirements, issue daily advisories, and provide ample avalanche education throughout the season.) FAC avalanche specialists collected snowpack and weather data from various locations within the advisory area and issued three regularly scheduled advisories per week (Wednesday, Saturday, and Sunday). This season's current funding and resources for FAC allowed for three regularly scheduled advisories per week (and associated field days) and two free Introduction to Avalanche courses. However, FAC personnel were committed to providing quality and timely products. Therefore, extra updates, advisories, and avalanche classes were deemed necessary this season. Avalanche information product season totals:

- Pre-season avalanche information updates (beginning on 11/9/2014) = 5
- Scheduled avalanche advisories (through April 5) = 52
- Extra avalanche information updates/bulletins/special advisories = 22



Figure 1: Overview of the Flathead Avalanche Center advisory area (shaded in gray) as well as portions of the Kootenai National Forest. The FAC hosts the Kootenai National Forest advisory on their website.

The FAC experienced substantial change this season on many fronts. The principal changes occurred within the avalanche center personnel realm. In the summer of 2013 the Flathead National Forest decided to create a director position for the FAC. Hiring processes delayed the implementation of this position and an interim director was selected for the 2013-2014 season. Erich Peitzsch was selected to be the interim director for the season. Erich served under a detail position from the U.S. Geological Survey. Other changes in personnel for FAC included the hiring of Todd Hannan as a part-time avalanche specialist. Erich and Todd completed the majority of the field work and published almost all the advisories this season, and were the regular part-time employees of the FAC. Seth

Carbonari assisted with avalanche education courses, unscheduled advisories/updates, and some field data collection. Tony Willits provided some field assistance to aid in the advisories.

Flathead National Forest snowmobile stewards (formerly snowmobile rangers) Lucas Stacy and Guy Zoellner worked as part-time liaisons for the winter backcountry motorized community. Their duties included education about appropriate motorized recreation zones, avalanche education, and collecting data for the FAC. Their efforts were valuable in assisting avalanche specialists with observations while completing their other duties. Overall, it was a team effort that produced the public products issued by the FAC.

### ***Website***

Another major change came in the form of the advisory format (Figure 2). A synopsis of previous mountain weather as well as expected weather is the first section in the advisory. Then, recent observations from FAC avalanche specialists, other avalanche professionals (i.e. BNSF Avalanche Safety) and from the public were summarized in this section along with pertinent photos and videos (videos were also on our YouTube channel (<http://www.youtube.com/user/FlatheadAvalanche>)). The snowpack discussion lists the current avalanche problems and associated travel advice for each problem. Finally, the bottom line summarizes the overall avalanche hazard and hazard rating.

## Avalanche Advisory – 3/29/2014

Posted on 03/29/2014 by Erich Peitzsch

Issued: March 29, 2014 at 7:00 a.m.

Valid Until: 11:59 p.m. of issue date

Good morning! This is Erich Peitzsch with the Flathead Avalanche Center avalanche advisory for Saturday, March 29, 2014. This advisory applies only to backcountry areas outside established ski area boundaries. The next scheduled advisory will be Sunday, March 30, 2014.

### MOUNTAIN WEATHER



A series of moist and progressively warmer storms impacted the advisory area over the past 48 hours. The current stream of moisture from the southwest is pointed directly at us. Currently, **remote weather stations** and **SNOTEL** sites report temperatures from 24 to 34°F with winds out of the southwest at 10-20 mph and gusts into the 30 mph range. Snowfall should continue at upper elevations with rain at lower elevations through the morning. Colder air should move into the region by this afternoon causing snow levels to drop a bit. Expect another 3-6 inches through the day with temperatures in the upper 20s to mid 30s F. Wind should be out of the southwest today at 10-25 mph and gusts into the 40 mph range particularly near the Continental Divide.

Storm totals over the past 48 hours:

Noisy Basin SNOTEL: 14 in. snow, 2.5 in. SWE

Stahl Peak SNOTEL: 10 in. snow, 1.9 in. SWE

Flattop SNOTEL: 9 in. snow, 1.1 in. SWE

Pike Creek SNOTEL: 12 in. snow, 0.7 in. SWE

Shed 7 weather station: 10 in. snow

### RECENT OBSERVATIONS



It is spring and the mixed bag of weather continues as do the avalanches. Rain on new snow and heavy snow at upper elevations continue to fall throughout the advisory area. This will cause a slew of problems that include storm slabs, wind slabs, and wet avalanches. The Swan Range has received the most precipitation with impressive **snow water equivalent** totals (2.5 inches) over the past 48 hours.

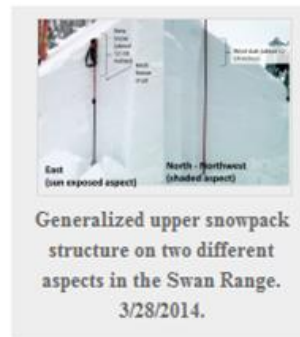
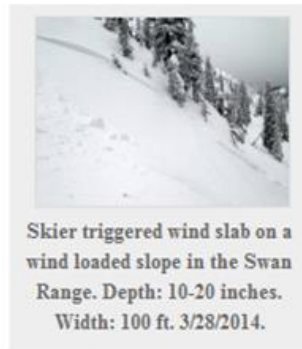
Wind slabs were the biggest problem yesterday when we rode into Lost Johnny and Doris Creek drainages in the Swan Range. We found about 10-12 inches (25-30 cm) of new snow from Thursday into Friday ([video](#)). Moderate to strong winds created sensitive **wind slabs** on **leeward** slopes. We observed four natural slides that occurred on wind loaded slopes along the Swan crest. We also triggered two smaller wind slabs (10-20 inches deep) from the top of a ridge just by approaching the slopes ([photo 1](#), [photo 2](#)). This evidence combined with the shooting cracks and unstable results in our stability tests ([snow profiles](#)) kept us far away from any wind loaded slope. Given the new load and the potential for storm slabs, we also stayed away from slopes steeper than 35 degrees. These problems will become even worse today with additional precipitation and continued moderate to strong winds.

We found a melt-freeze crust on all but the most shaded slopes underneath the new snow (photo) and also found this crust in the Middle Fork corridor in the Flathead Range on Thursday. This crust could provide a good bed surface for the new snow to slide on.

BNSF avalanche safety reported small wet, loose sluffs in John F. Stevens Canyon yesterday as well as other avalanche debris but did not observe any crown lines. However, they suspect these crown could have already reloaded with new and wind transported snow.

Glide cracks are beginning to rear their ugly heads again this spring. We noted a couple of glide cracks yesterday in the Swan Range (photo), and Glacier National Park rangers noted a few in the park this past week.

We received no other observations within the past 48 hours from any other locations.



## SNOWPACK DISCUSSION

### Avalanche Problem #1



Storm slabs and wind slabs are the main problem with heavy, new snow at upper elevations (particularly in the Swan Range) and moderate to strong winds the past 48 hours. Wind slabs were breaking yesterday about 10-20 inches deep and up to 200 feet wide. These wind slabs are sensitive particularly along ridges and cross-loaded terrain features like gullies. Avoid wind loaded terrain and stick to lower angled slopes today. Expect new storm slabs today as well with the new snow at upper elevations. Large cornices exist and with warming temperatures this time of year they can become particularly sensitive. Longer days with even short periods of more intense sun can make them unstable. Give cornices a wide berth when travelling around them and avoid

travel below them.

### Avalanche Problem #2



It is hard to pin down the exact elevation of the rain/snow line this morning, but, regardless, wet avalanches will be a problem today. Rain on snow is never a good thing. We could see the whole gamut of wet avalanches today: wet loose, wet slab, and maybe even glide avalanches. Rain can accelerate the glide process so we can't rule those out. Wet, loose avalanches can start as small point releases, but are able to entrain recent storm snow and present a slow moving but increasing hazard particularly near terrain traps. Wet slabs are difficult to predict but rain on this new storm snow could cause wet slabs at mid and lower elevations. Avoid slopes greater than 25

**AVALANCHES** could cause wet slabs at mid and lower elevations. Avoid slopes greater than 35 degrees and think about turning around when it begins to rain as conditions can change rapidly.

### Avalanche Problem #3



**Deep slabs** are still a problem given the weak snow found in shallow areas ([video](#)) as well as the rain crust from early March. Though these layers are deeply buried and difficult to trigger the possibility of an avalanche breaking on these layers still exists. The recent load placed on the snowpack combined with a human trigger in the right spot may be the tipping point for a deep slab. The best place to trigger an avalanche on these layers is shallow, rocky areas so avoid this type of terrain. While the chances of triggering a slide on these layers may be low the consequences are high. Given the uncertainty of these deep slabs, it is best to avoid slopes where these layers exist or just avoid steep slopes altogether.

## BOTTOM LINE

With continued new snow, strong wind, and rain on snow the avalanche hazard is **CONSIDERABLE** on most slopes and **HIGH** on wind loaded slopes steeper than 35 degrees above 6,000 feet. This means that human triggered avalanches are likely, particularly on steep wind loaded slopes, and natural avalanches are possible to likely. Tricky and dangerous avalanche conditions exist so conservative decision making and terrain selection will be important today. Avoid wind loaded slopes and slopes steeper than 35 degrees. Recent and new wind and storm slab instabilities exist at higher elevations with wet avalanche problems at lower elevations. Periods of heavy snow, rain, and daytime warming effects can quickly change the likelihood of avalanches and the hazard could rise if more snow and rain fall than expected.

Note: The accuracy of the avalanche advisory becomes much more robust when we have more information. Thus, observations from all of you are extremely valuable to us. Even it is just a simple email saying "Hey, we found good riding in Mountain Range X, and observed no signs of instability or recent avalanches". This type of information is just as important as observations of avalanches. The observations need not be formal, and can remain anonymous. Don't worry, we won't give away your secret riding/skiing spot either. Call us at 406.261.9873 or email us at [fac.admin@flatheadavalanche.org](mailto:fac.admin@flatheadavalanche.org). Thanks for your help.

See recent snow profiles as well as snow profiles from the entire season [here](#).

Check out an interesting new research project that you can participate in about winter backcountry riding/snowmobiling and decision making from the Snow and Avalanche Lab at MSU. Details [here](#).

### DISCLAIMER



content.

This advisory applies only to backcountry areas outside established ski area boundaries. This advisory describes general avalanche conditions and local variations always occur. This advisory expires 24 hours after the posted time unless otherwise noted. The information in this advisory is provided by the USDA Forest Service who is solely responsible for its

Figure 2: Sample avalanche advisory



Website statistics were collected since the introduction of the new site (flatheadavalanche.org) last year. Site visits and use increased substantially since last year (Table 1).

Table 1: Descriptive statistics of the FAC website for 2013-2014.

Total Visits (#)	Total Unique Visitors (#)	Page Views (#)	Pages/Visit (#)	Avg. Visit Duration (minutes)
52,360 Increase of 92.9% from previous year	21,364 Increase of 145.59% from previous year	309,891 Increase of 201.9% from previous year	5.92 Increase of 56.5% from previous year	2:36

### **Media**

FAC staff conducted 26 interviews throughout the season with television, print, and radio outlets. FAC was featured on KPAX TV, KTMF TV, KCFW TV, KAJ TV, Montana Public Radio, Daily Interlake, Flathead Beacon, Hungry Horse News, and Whitefish Pilot. Many of these focused on current avalanche conditions, but a few were features of changes occurring at the Flathead Avalanche Center including profiles of the interim director.

The FAC Twitter account (@FACAvalanche) continued to be a popular form of communicating new and updated avalanche information. Followers increased from 90 to 176 (as of 4/13/2014) this season. We published 154 tweets with 236 retweets and 19 favorites through this season.

We produced 39 videos this year with 6,503 total views (9,013 minutes watched) and 23 subscribers to the Flathead Avalanche YouTube channel (<http://www.youtube.com/user/FlatheadAvalanche>). Anecdotal feedback from the backcountry user community showed that videos and photos were welcome and helpful in communicating the avalanche hazard. The most viewed videos were accident site investigations.

### **Weather, Snowpack, and Avalanche Summary**

Overall, it was an active avalanche season plagued by a persistent slab problem most of the season. We issued 12 avalanche warnings for at least one portion of our advisory area this season. Often, the FAC avalanche specialists issue multiple hazard ratings for our advisory area based on terrain (i.e. slope angle), location, or elevation. The highest hazard of the day was rated MODERATE 15 days, CONSIDERABLE 28 days, and HIGH 15 days. The lowest hazard of the day was rated LOW 3 days, MODERATE 32 days, CONSIDERABLE 15 days, and HIGH 8 days. Precipitation this season resulted in an above average snowpack where snow accumulated fairly consistently throughout the season with a smattering of cold, arctic air mass intrusions (Figure 3-5).

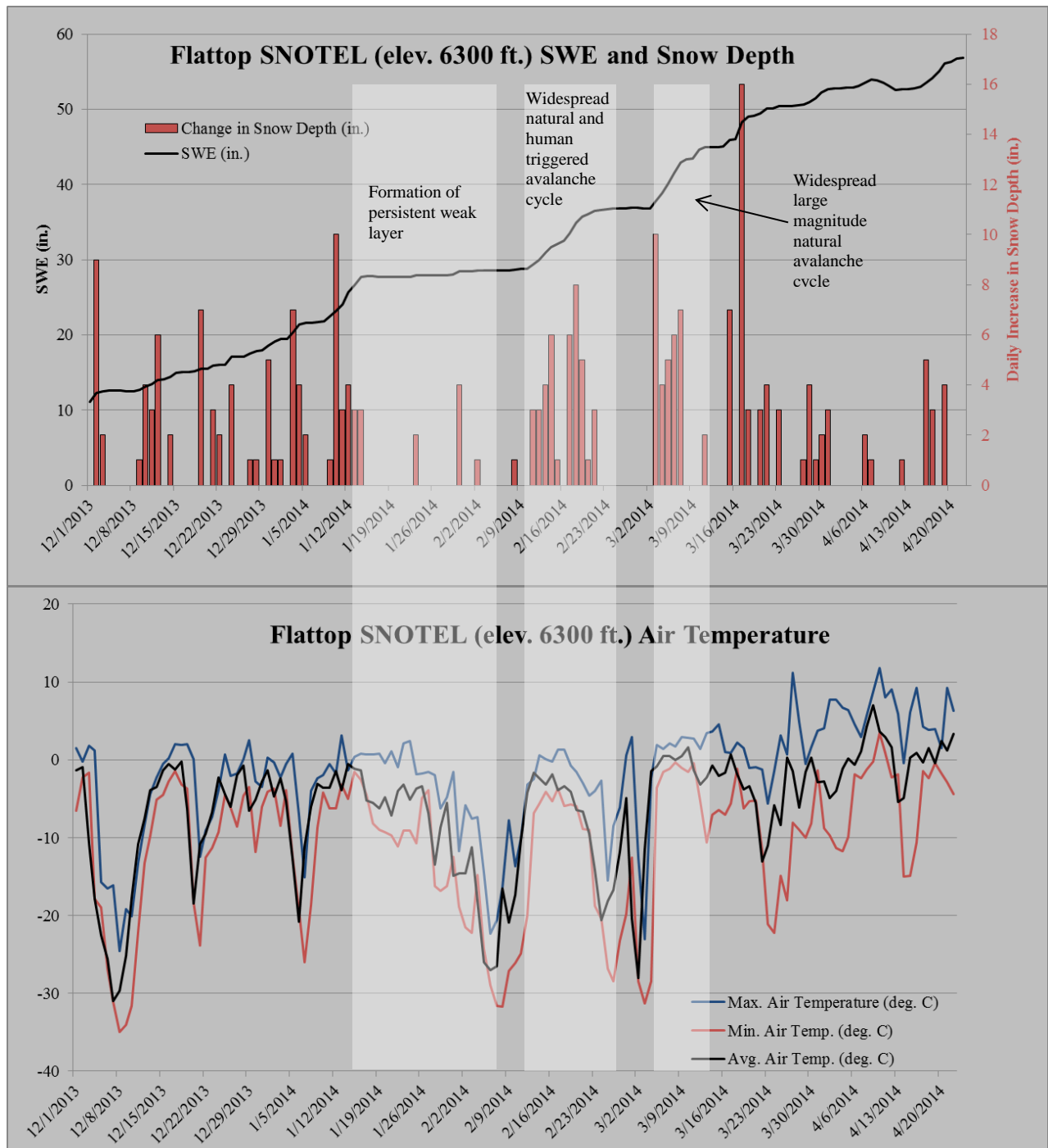


Figure 3: SWE, snow depth, and air temperature for Flattop Mountain SNOTEL (6300 ft.) in the Lewis Range. This SNOTEL station is adjacent to the advisory area but is representative of the Flathead Range and portions of southern Glacier Park which is within our advisory area. Three important periods of the season (the formation of a weak layer which eventually became a persistent slab problem, the first widespread avalanche cycle involving this layer, and the second major cycle (widespread large magnitude avalanches) involving this particular layer). Note: these two cycles were not the only avalanche cycles of the season, but rather the two most widespread cycles of the season.

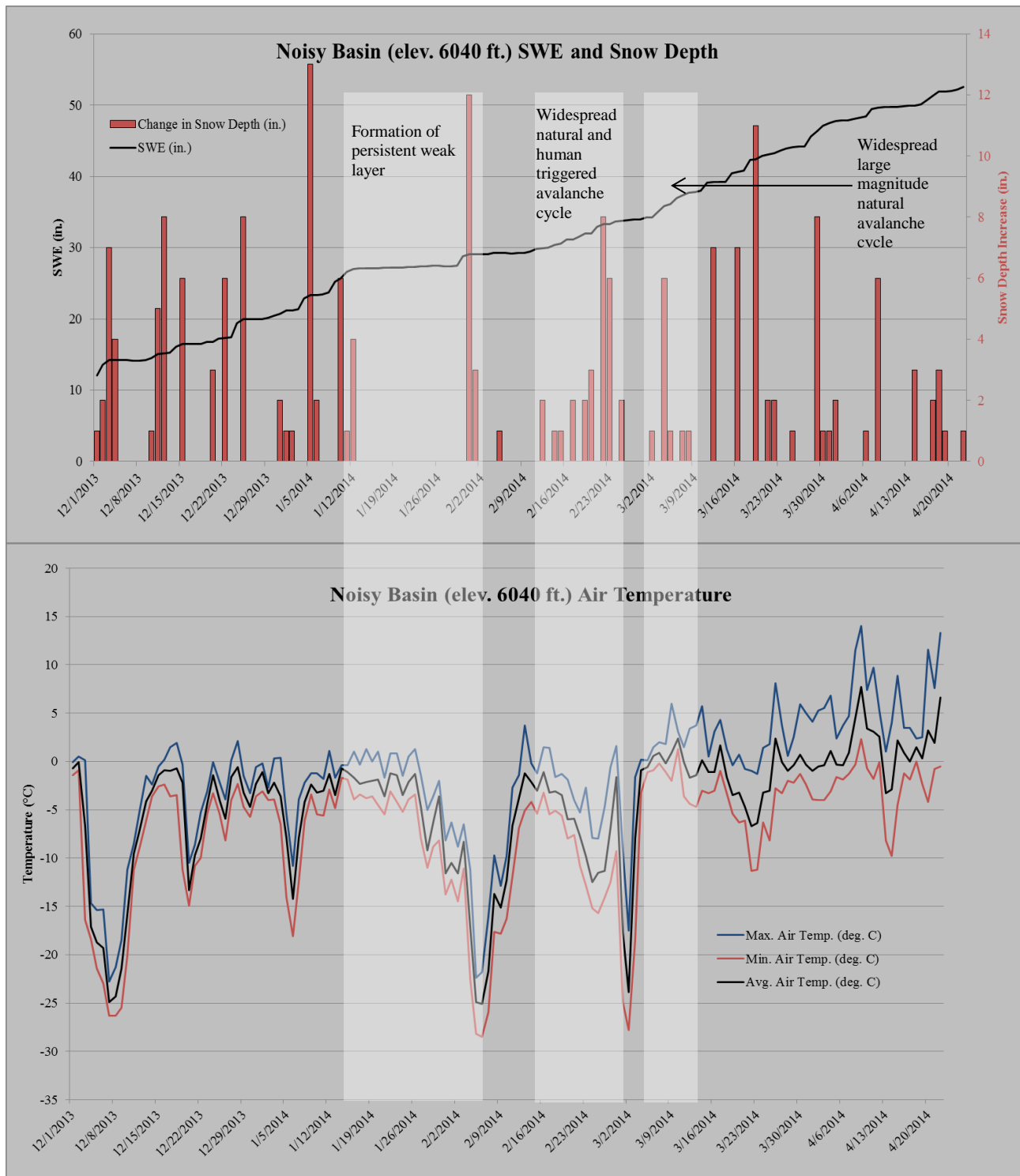


Figure 4: SWE, snow depth, and air temperature for Noisy Basin SNOTEL (6040 ft.) in the central Swan Range. This SNOTEL station is fairly representative of the Swan Range. Three important periods of the season (the formation of a weak layer which eventually became a persistent slab problem, the first widespread avalanche cycle involving this layer, and the second major cycle (widespread large magnitude avalanches) involving this particular layer. Note: these two cycles were not the only avalanche cycles of the season, but rather the two most widespread cycles of the season.

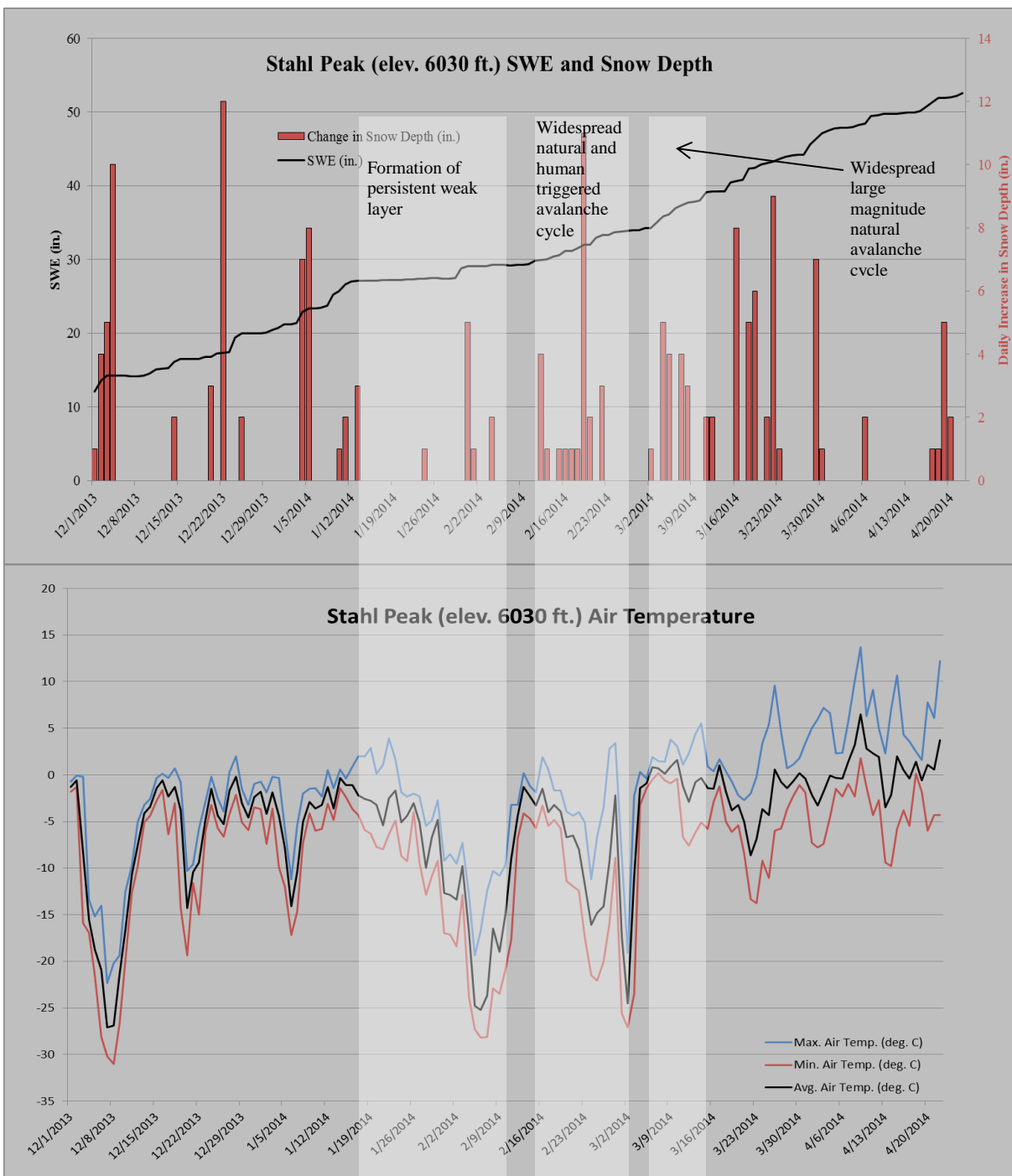


Figure 5: SWE, snow depth, and air temperature for Stahl Peak SNOTEL (6030 ft.) in the northern Whitefish Range. This station is adjacent to the advisory area and is fairly representative of the Whitefish Range. Three important periods of the season (the formation of a weak layer which eventually became a persistent slab problem, the first widespread avalanche cycle involving this layer, and the second major cycle (widespread large magnitude avalanches) involving this particular layer. Note: these two cycles were not the only avalanche cycles of the season, but rather the two most widespread cycles of the season.

### *November*

Winter came in like a lion in early November with two major storms that provided hope for a bountiful and stable season. Avalanche information updates began on 11/9/2013 with general early season avalanche condition information.

### *December*

Early season promise continued through December with a consistent pattern of storms through the month and the first intrusion of arctic air the first week. These cold temps fostered weak layer development and along with strong winds provided the cause of the season's first reported avalanche incidents. Two incidents occurred in the Swan Range less than a mile from each other and a week apart. The first incident occurred on December 8, 2013 in the Noisy Basin area north of Camp Misery and the second on December 14, 2013 in the Picnic Notch area in Noisy Basin. The first incident resulted in 2 skiers caught and partially buried both sustaining minor to moderate injuries. The second incident resulted in very minor injuries and a partial burial.

### *January*

The first week in January saw a storm that began cold and gradually became warmer with rain to about 5,500 feet and our first HIGH avalanche danger rating of the season. The rest of January saw the region under mostly high pressure which was a welcome sight for us sun deprived northwest Montanans. Unfortunately, this set the stage for the formation of a very persistent weak layer by creating a melt-freeze crust on sun exposed slopes. Glide cracks also formed on sun exposed slopes during this time and at least one of these failed naturally (D3) in the Lewis Range in southern Glacier Park in late January (Figure 6).



Figure 6: Looking down the Shed 11 avalanche path in John F. Stevens Canyon, Glacier National Park of a glide avalanche (GS-N-R3-D2.5-G). Photo: BNSF Avalanche Safety.

### *February*

This is when the show really started. Small storms gradually plunked down new snow on top of this crust, and a prolonged arctic outbreak during the first two weeks of February caused faceting above this crust. Shortly thereafter, continued snowfall in mid-February tipped the scales and human triggered avalanches began failing on this crust/facet layer. The persistent slab was finally becoming cranky. An incident in the popular Canyon Creek in the Whitefish Range began the spate of accidents with four partial (nearly full) burials in once incident. Another three incidents were reported with a total of three partial burials and 13 people involved in all incidents. Snowfall continued and then a natural cycle began with the persistent slab rearing its ugly head. Sadly, this persistent slab was the cause of an accident on February 22, 2014 that involved two individuals and resulted in one fatality in nearby Idaho Panhandle National Forest within Montana. KNF personnel investigated the scene of the snowmobile triggered soft slab classified as a class 3 on the destructive scale (D3). The FAC extends our deepest condolences to the family and friends of those involved.

Another close call occurred in late February when a suspected natural avalanche failed in Canyon Creek in the Whitefish Range on the same facet/crust combination, and buried one snowboarder up to his neck. This avalanche was perplexing as natural activity had abated for about 10 days prior, and no new load was added in the days leading up to this event (Figure 7). In fact, it was a sunny day where temps rose from about  $-5^{\circ}\text{F}$  to right around freezing ( $32^{\circ}\text{F}$ ) by the afternoon. Other natural activity was reported adjacent to the advisory area in Glacier National Park this day as well. It was an active month with numerous folks getting surprised by the lurking dragon.



Figure 7: Overview of avalanche crown in Canyon Creek, Whitefish Range, which occurred on February 25, 2014.  
Photo: FAC

### *March*

A lull in avalanche activity occurred at the end of February into the first couple days of March. This respite was short lived as the largest avalanche cycle of the winter occurred in early March. The seemingly dyslexic storm started with snow and ended with hellish rain to nearly 7000 feet. We issued an avalanche warning for four days in a row with natural activity reported all four days. The apex of the activity occurred on the third night/fourth morning when large (D 3.5-4) avalanches occurred along Highway 2 in the southern portion of Glacier National Park. One slide reached the road grade (but not the road) and another ran under a bridge and continued another 1500 feet finally damming the Middle Fork of the Flathead River for a short period (Figure 8). Assessing the

aftermath the next field day was jaw-dropping as widespread D 3.5-4 slides destroyed forests and deposited debris up to 20 feet deep in some locations (Figure 9). SWE totals from the storm ranged from 3.5 - 6.5 inches in five days throughout the advisory area. To our knowledge, the recreating public remained unscathed through this cycle as most folks were smartly unwilling to even venture into the backcountry.



Figure 8: Debris from a large natural avalanche in the Goat Lick avalanche path along Highway 2 in southern Glacier Park. This avalanche traveled about 3000 vertical feet and temporarily dammed the Middle Fork of the Flathead River with debris. Photo: Brian Bales.



Figure 9: Crown of a natural avalanche on Peak 7798 (across the entire northeast face) in the Flathead Range near Essex that occurred during the large natural avalanche cycle in early March. Photo: FAC.

### *April/May*

We issued our last advisory on April 5. An above average year (~120% of normal) provided plenty of snow to ride and slide on for a while, but spring had sprung for the most part. The typical spring glide avalanche cycle began in late April peppered with a few natural wet slabs during a warming period at the beginning of May. Fickle spring weather continued into May with periodic storms and sunshine interludes; classic spring weather in northwest Montana.

### *Incidents*

Within the Flathead Avalanche Center advisory areas as well as the Kootenai National Forest advisor area, 19 avalanches involving humans (i.e. human triggered or caught and buried) were reported to the Flathead Avalanche Center. Of these 19 avalanches, 10 people were partially buried and one was fully buried resulting in a fatality on the Kootenai National Forest. All incident reports are hosted on the website (<http://www.flatheadavalanche.org/category/incidents-2013-2014/>). We investigated five incidents in which humans were caught and at least partially buried within the FAC advisory area. Jon Jerešek of the Kootenai National Forest investigated three incidents (one of them a fatality) that occurred on the Kootenai National Forest or adjacent. The FAC appreciates all of those involved in all incidents who share information. This helps provide a more accurate report so that we may all learn from these incidents.

#### *1. 12/8/2013 - Noisy Basin, Swan Range*

On Sunday, December 8, 2013, a party of two skiers was traveling in the Noisy Basin area near Camp Misery in the Swan Range, MT. At approximately 1500, both skiers were descending a slope when they triggered an avalanche that failed approximately 100 feet above them. Skier #1 (a 36 year old male) was caught in the avalanche, carried downslope approximately 300 to 400 feet through some trees, lost one ski, and came to rest buried up to his neck in



the snow. He sustained a broken nose, lacerations to the face that required six stitches, multiple contusions and bruises, and a minor injury to his leg. Skier #2 (a 35 to 40 year old male) was following a few turns behind Skier #1 and was also caught in the avalanche. Skier #2 was carried downslope, sustained an injury to his knee when one of his skis was torn off, but was not buried. Skier #2 was able to find Skier #1 downslope and dig him out. They called a friend via a mobile phone to come help them with a snowmobile and slowly worked their way to the road to meet him. At this point they were able to depart for the trailhead. An attempt at a site investigation occurred on Dec. 10 by Flathead Avalanche Center staff, but the site could not be located due to new snowfall and dangerous avalanche conditions. The information contained in this report became available on December 18. The avalanche occurred on a west facing aspect within a defined avalanche path. The reported crown depth was approximately 8 to 10 inches, with a crown width of approximately 150 feet and ran approximately 500 vertical feet. Approximate elevation of the crown was 6400 feet and the toe of the debris was 6200 feet (Figure 1). The United States classification of the avalanche is SS-ASu-R4-D2-U..

#### *2. 12/14/2014 - Picnic Notch, Swan Range*

On Saturday, December 14, 2013, a party of two skiers was traveling in the Noisy Basin area near Camp Misery in the Swan Range, MT. Around noon, both skiers were ascending a slope they had previously descended. The skier in front (a 34 year old male) triggered an avalanche that released about 20 feet above him. He was caught in the avalanche and was carried to a tree where he came to rest fully buried except for one arm. He was able to extricate himself with this free arm and sustained no injuries. The avalanche occurred on a southwest facing slope that wraps around to more of a northwesterly aspect. A small sub-ridge bisects the slope causing cross loading of wind transported snow. The average slope angle of the starting zone was 39 degrees. The crown face depth averaged 12 inches with a maximum crown depth of 20 inches. The avalanche was approximately 250 feet wide and ran approximately 200 vertical feet. The crown was located at approximately 6700 feet in elevation and the toe of the debris was around 6620 feet. The caught skier was carried approximately 50 vertical feet. The United States classification of the avalanche is SS-ASu-R4-D2-I (Greene et al. , 2010).

#### *3. 2/15/2014 - Canyon Creek, Whitefish Range*

On Saturday, February 15, 2014, a snowmobiler triggered an avalanche on a southeast facing (aspect 150 degrees) slope in the Canyon Creek drainage in the southern Whitefish Range. The slope the rider triggered the slide on is one of a series of southerly facing chutes known as the “Skook Chutes” or “Seven Sisters”. We investigated the avalanche on February 16, 2014. The avalanche failed on a layer of soft, faceted snow sitting on top of a hard, melt-freeze crust about 30 cm (13 in.) from the surface. It was approximately 275 m (900 feet) wide, ran 213 m vertical (700 vertical feet) (from approximately 5930 feet to 5235 feet), and 387 m linear (1270 lineal feet). Avalanche debris reached and crossed the Canyon Creek Road (closed in winter and used as a groomed snowmobile trail), and was reported to be about 1.8 m (6 feet) deep on the road. We measured other debris piles not on the road at 2.5 – 4.5 feet deep. The debris reached the creek bottom below the road which is a [terrain trap](#). The debris and bed surface were already covered by 5-20 cm (2-8 inches) of new snow overnight which made assessment slightly more difficult.

The alpha angle (toe of debris to the crown of the avalanche) was 31.5 degrees. The average slope angle at the crown was 40 degrees. We received detailed information from an individual involved who was sitting on the Canyon Creek Road when the avalanche occurred. Four people were partially buried, and he was buried with only his right arm and head out of the debris.

The avalanche was classified: SS-AMu-D2-R4-I (This translates to a soft slab (SS) avalanche triggered unintentionally by a snowmobiler (AMu). The avalanche rates 2 out of 5 on the destructive scale (D2) which means it could bury, injure, or kill a person. It was large relative to the path (R4), and failed at the interface between the new and old snow (I).)

#### *4. Whoopee Basin, Cabinet Range, Kootenai National Forest*

On Sunday, February 16, 2014 a group of six snowmobilers were in the headwaters of Whoopee Creek, approximately 2 air miles north of Spar Peak and one air mile west of Spar Lake (see Map A). The weather was

clear, cool and breezy. Enroute to Whoopee Basin the party observed a natural soft slab release and experienced a collapse under their snowmobiles. Rider C, who was leading, informed the party that it was a good day to stay on gentle terrain in the trees. Around 1100, Rider A left the group and triggered an avalanche that released above the party as they traveled northwest in Whoopee Basin. Rider A, in triggering the soft slab avalanche, was able to maintain control of his snowmobile and get upslope of the slide. Rider A was not buried or injured. His snowmobile was not buried or damaged. The other five party members observed the avalanche and were not directly involved. Shortly after the incident the party traveled eight miles back to the Spar Lake trailhead. The following information was developed from an onsite investigation on Thursday, February 27, 2014. The avalanche crown measured approximately 350 feet across as it ran down a west to east trending spur ridge. The flanks angled down to Whoopee Creek Basin for distances of 200 feet on the west and 150 feet on the east. The avalanche was on a northeast aspect in terrain averaging 40 degrees slope angle. The avalanche involved soft slab and loose snow material that accumulated near the basin floor. Crown depths varied from 24-30 inches deep. US classification of the avalanche is SS-AMu-R2/D2-I, which denotes a (SS) soft slab avalanche (AMu) artificially triggered by a snowmobile unintentionally – (R2) the avalanche was small relative to its path – (D2) the avalanche was large enough to bury, injure or kill a person – (I) the avalanche released at the new snow/old snow interface.

#### 4. 2/22/2014 - Spar Peak, Cabinet Range, Kootenai National Forest (Fatality)

On Saturday, February 22, 2014, a group of four snowmobilers were playing in the trees in the headwaters of East Fork Creek, two air miles north of Spar Peak, Montana. Around 1315, two members of the party were caught by an avalanche that released above them while the other two members of the party were not caught. One fully buried rider was extracted, but tragically CPR efforts were unsuccessful. The other nearly fully buried rider (only face exposed) was extracted without injuries and participated in rescue efforts. One snowmobile was buried and remains on site, location unknown. Another snowmobile was buried except for a ski loop sticking out of the snow and was extracted and used to return to the trailhead. While CPR efforts were ongoing, one rider drove two miles to a site with known cell phone coverage to call 911. The ALERT helicopter from Kalispell arrived on scene but could not find a safe landing spot and dropped a hand held radio to the party. The snowmobile party told ALERT they had discontinued CPR and never had attained a pulse or any other response from the victim. The Flathead County Sheriff's Office Helicopter with hoist capabilities was ordered and successfully retrieved the victim. The three remaining party members snowmobiled approximately 11 miles to the trailhead.

The following information was developed from video taken by the Flathead County Sheriff's Office Helicopter as it transferred people to/from the site and circled the avalanche area. The avalanche crown measured approximately 1,200 feet across the top of a ridge that trends north to south and downward from 6,175 feet to 6,025 feet. The south flank of the avalanche measured approximately 1,000 feet. The north flank of the avalanche measured approximately 750 feet to the burial location at 5,685 feet elevation. The avalanche occurred on an east aspect and involved mostly soft slab and loose snow material. It is evident from the photographs that immediately below the ridgeline for a distance of 100' – 150' is a hard slab wind deposit that was also released (Figure 4). Crown depths of this wind deposit vary from 30" to 50". Victims of this party were transported a very short distance due to their original location in the run out zone. US classification of the avalanche is SS-AMr-R4/D3-I, which denotes a (SS) Soft Slab avalanche- (AMr) artificially triggered by snowmobile remotely-(R4)the avalanche was large relative to the path-(D3) the avalanche was large enough to bury and destroy a car, large truck, destroy a wood frame house, or break a few trees-(I) the avalanche released at the new snow/old snow interface.

#### 5. 2/22/2014 - McGinnis Creek (Depuy Creek), Whitefish Range

On Saturday, February 22, 2014, a snowmobiler triggered an avalanche on a northeast facing (aspect 65 degrees) slope in the Depuy Creek drainage in the southern Whitefish Range. We investigated the avalanche on February 23, 2014. The avalanche failed on a layer of weak, faceted snow sitting on top of a hard, melt-freeze crust about 95 cm (37 in.) from the surface. It was approximately 130 m (425 feet) wide, ran 166 m vertical (546 vertical feet) (from approximately 5556 feet to 5010 feet), and 362 m linear (1187 linear feet). Avalanche debris was approximately 2.75 m (9 feet) deep in a confined gully above an old logging road.

The alpha angle (toe of debris to the crown of the avalanche) was 31 degrees. The average slope angle at the crown was 37 degrees with a maximum slope angle of 41 degrees.

We received detailed information from the individual involved. One person was mostly buried with only his airbag visible to his companions, another individual remained on their sled and was only slightly buried.

The avalanche was classified: SS-AMu-D2.5-R4-I (This translates to a soft slab (SS) avalanche triggered unintentionally by a snowmobiler (AMu). The avalanche rates 2.5 out of 5 on the destructive scale (D2.5) which means it is on the high end of D2 on the scale and could bury, injure, or kill a person. It was large relative to the path (R4), and failed at the interface between the new and old snow (I).

#### 6. 2.22.2014 - China Basin, Purcell Range, Kootenai National Forest

On Saturday, February 22, 2014 a group of three snowmobilers departed the Lynx Creek trailhead at 0900. At approximately 1100, the party arrived in China Basin after travelling 10 miles on the 4445 road. At China Lake, they encountered two riders tending to a broken snowmobile. Just before 1130, Rider A left China Basin and ascended a ridgeline commonly called China Rim. Thereafter, Rider A descended northeast down a spur ridge into the headwaters of an unnamed tributary of the West Fork of Quartz Creek, approximately one air mile northeast of China Mountain and 2.5 air miles north of Flagstaff Mountain (see Map A). The weather was clear, cool and breezy. After arriving in the flat basin bottom, Rider A started playing on the open lower slopes of an old burn area. At approximately 1200, Rider A triggered a small (D1/R1) soft slab avalanche. Rider A was separated from his Polaris 800 snowmobile and swept downslope 100 yards. His snowmobile remained near the top of the slide. Riders' B and C had followed Rider A into this old burn basin. Rider A was partially buried but able to free himself without assistance. Rider A walked upslope to his snowmobile to find it undamaged. After starting his snowmobile, Rider A proceeded down slope to the basin flats into a grove of live trees to gather himself. Riders B and C were enroute to the spur ridge to exit the basin at this time. At 1210, while ascending the spur ridge, Riders B and C triggered a large (D3/R4) hard slab avalanche that came within 40 yards of Rider A as he waited in the tree grove below. After the slide settled, Rider A hastily exited the basin via the spur ridge to the top of China Rim. Shortly after the incident the party traveled back to the Lynx Creek trailhead via the China Face Road #4445. The following information was developed from an onsite investigation on Thursday, March 13, 2014. The avalanche crown measured approximately 800 feet across as it ran along China Rim in a northwest to southeast direction. The flanks funneled down the old burn basin headwall for distances of 910 feet on the west and 700 feet on the east. The avalanche was on a northeast aspect in terrain averaging 40 degree slope angle. The avalanche involved hard slab wind deposits and loose snow material that accumulated near the basin floor. Crown depths varied from 40-130 inches deep. US classification of the avalanche is HS-AMu-R4/D3-O, which denotes a (HS) hard slab avalanche (AMu) artificially triggered by a snowmobile unintentionally – (R4) the avalanche was large relative to its path – (D3) the avalanche was large enough to bury/destroy a car – (O) the avalanche released within the old snow.

#### 7. 2/25/2014 - Canyon Creek, Whitefish Range

The synopsis was provided by a member of the party involved: *At 15:00 on 2/25/14 I was part of a three person snowboarding group that was caught in an avalanche in the Canyon Creek area in the Whitefish Range. At 14:00 we hiked Flower Point and dug a pit on a ENE Aspect, 35 degree slope. We found a weak layer about 50cm down from the surface. Our stability tests showed CT24Q3, ECTP22Q3. We rode the ridge out toward Banana Chutes and dropped into the Canyon approximately 300yds skiers right of Banana Chutes. We reached the bottom, quickly rechecked our beacons and began hiking out back to chair 7. At 15:00, just as we were reaching the top of the hike out, we heard a boom and an avalanche descended on us from the opposite face we rode (Skookoleel ridge, fiberglass hill). The avalanche missed me by about 20 feet but caught the other two members of my party. One person was swept off his feet but was able to swim out of it and was not buried. The second person was also swept off his feet and was buried with only his head and one arm sticking out. We were able to quickly locate and dig this person out. No one in our group was seriously injured and we were all wearing beacons and had shovels and probes.*

SS-NO-R3-D2.5-O (Comments on classification: After investigating the avalanche and based on statement from those involved, we decided to classify the avalanche as a natural trigger. All evidence suggests it was a natural avalanche. We were unable to find any tracks above the crown. We were on the ridge on the opposite side of the canyon just prior to the avalanche release, but did not witness it. We observed a small loose sluff on the slope prior

to the slab release. It is possible that a small sluff from the rocks on the slope could have triggered the slide, but aside from the sluff we observed that already existed we observed no other evidence of sluffing.)

This was the second avalanche incident involving partial burials in Canyon Creek within 10 days.

Widest part from flank to flank: 233 m (766 ft.)

Crown depth: Avg. 70 cm (28 in.), Maximum 100 cm (39 in.)

Vertical fall: 183 m (600 ft.)

Ground distance: 255 m (840 ft.)

Debris pile width (max.): 260 m (850 ft.)

Debris depth: 160-200 cm

Failure layer: Faceted snow (FC) above melt-freeze (MF) crust from late January.

Slope angle at crown: 39°

HS (height of snow) at crown = 165 -218 cm (65 – 79 in.)

Aspect at portion of crown investigated: 209°

### ***Education***

The Flathead Avalanche Center conducted two free Introduction to Avalanche courses this season which conformed to American Avalanche Association Guidelines. FAC, in partnership with the Flathead Snowmobile Association and Penco Power Products, held free motorized specific avalanche awareness courses. Other classes are listed in the table below (Table 2).

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

Date	Location	Class	# of Students
11/22/2013	Stonefly Lounge - Coram	Introduction to Avalanches	18
11/25/2014	Hungry Horse Ranger District, FNF	District Safety Meeting - HHRD	25
12/3/2013	Whitefish Library	Avalanche Awareness	15
12/4/2013	Flathead NF Supervisor Office	Avalanche Awareness	5
12/12/2013	Three Rivers Ranger District, KNF	Avalanche Awareness	30
12/18/2013	Flathead NF Supervisor Office	Introduction to Avalanches - Classroom	38
12/19/2013	Flathead NF Supervisor Office	Introduction to Avalanches - Classroom	38
12/21/2013	Whitefish Mountain Resort	Introduction to Avalanches - Field	23
1/17/2014	DTSAR	Introduction to Avalanches - Classroom	45
1/22/2014	Flathead NF Supervisor Office	Introduction to Avalanches - Classroom	28
1/23/2014	Flathead NF Supervisor Office	Introduction to Avalanches - Classroom	28
1/25/2014	Whitefish Mountain Resort/Canyon Creek	Introduction to Avalanches - Field	20
2/1/2014	Swan Lake Ranger District, FNF	District Safety Meeting - SLRD	20
2/8/2014	Turner Mountain - SAR class	Introduction to Avalanches - Field	15
2/12/2014	Penco Power Products - Kalispell	Avalanche Awareness	15
2/20/2014	Eureka CanAm SAR	Introduction to Avalanches - Classroom	20

2/21/2014	Turner Mountain - Flathead/Glacier HS	Avalanche Awareness	30
3/5/2014	Noxon HS - Noxon	Avalanche Awareness	75
3/6/2014	Whitefish Royal Order of the Moose Hall	Avalanche Awareness Community Evening	90
3/12/2014	Martin City/Coram/Hungry Horse FD	Avalanche Awareness	20
3/12/2014	Columbia Falls Rotary Club - Columbia Falls	Avalanche Awareness	20
3/14/2014	Penco Power Products - Kalispell	Avalanche Awareness	25

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

All classes (taught by Friends and Center) (#)		All students (#)	
22		799	
Snowmobile classes (#)	Snowmobilers (#)	Kids (<18yo) (#)	Other students (#)
5	53	229	N/A
Awareness Classes (#)	Intro to Avalanches (#)	Companion Rescue (#)	
13	4	4	

Youth (school-aged) programs for Flathead Valley Schools and other northwest Montana schools: 229 total students with 8 different classes 5<sup>th</sup>-8<sup>th</sup> grade and one HS class. This is included in the total # of students (799) above. Teresa Wenum coordinates and leads the winter safety program for school-aged children with Jennifer Cloutier and Megan Chaisson. This is a program where students learn how to be safe while having fun in the winter environment. Students also explore the dynamics of snow while learning about avalanches.

### **Finances**

The Avalanche Center is currently funded by federal dollars and grants. Contributors include the Flathead National Forest and yearly grants from Montana Department of Fish Wildlife and Parks Recreation Trails Program.

Table 4: Income for the Flathead Avalanche Center Winter 2013-2014.

Forest Service cash (\$)	22,500	Flathead National Forest
Forest Service office, vehicles, & in-kind (\$)	4320.62	Flathead National Forest
Other agencies cash(\$)	26,788.00	Montana Department of Fish, Wildlife and Parks (FWP) Recreational Trails Program (RTP) Grant
Other agencies in-kind (\$)	6,000.00	Kootenai National Forest for their own avalanche specialist that produced a 2x/week advisory for Kootenai NF. FAC hosted this advisory and posted it for KNF personnel.
Outside support cash (\$)	0.00	This does not include donations made to Friends of the Flathead Avalanche Center

		(FOFAC).
Outside support in-kind (\$)	10,820.00	Northern Rockies Avalanche Safety Workshop Steering Committee, Flathead Nordic Backcountry Patrol, and Whitefish Mountain Resort donated for weather station equipment on Big Mountain.
<b>Total Budget(\$)</b>	<b>53,608.52</b>	

### *Observations*

This season FAC introduced a more formal observation program. This observer network was incorporated into the FAC advisory program to assist avalanche specialists with additional objective based field data related to avalanche, snowpack, and weather. This additional data helped improve advisory accuracy and allowed for observer-based observations to be posted between advisory issuance as observers will be able to post objective field observations on the FAC website. The need for this observation network was based on the fact that the FAC advisory provides an avalanche forecast that covers a large geographic area, and objective accuracy of the FAC advisory is dependent on the amount of data available from different locations within the advisory area. Simply, the more data available to FAC avalanche specialists, the more accurately the FAC advisory will represent current conditions.

In January, two sessions were held to acquaint backcountry users with the type of information pertinent in observations. The first session was held at Whitefish Mountain Resort where 12 participants attended. The second session was scheduled for the last weekend in January and was a motorized specific session, but inclement weather was the likely cause of no attendance for this session. Throughout the season observers provided valuable data and these observations were posted on the FAC website (<http://www.flatheadavalanche.org/category/observations/>). Thank you to all of you who provided us with important and valuable observations!

We also greatly appreciate the support and continual data flow from Ted Steiner and Mark Dundas of the BNSF Railway Avalanche Safety Department. Their expertise and observations are a tremendous asset to the avalanche specialists of FAC. Their detailed observations are a key component to FAC advisories. FAC is looking forward to continuing to work with BNSF Avalanche Safety.

### *Volunteers*

Volunteers for FAC were extremely valuable and without their efforts much of the work we do would not be possible. These volunteers assisted with field days as well as educational classes (Figure 10). We at FAC personally extend our gratitude to Jen Carpenedo, Adam Clark, Jenny Cloutier, Mark Dundas, Laura Fay, Mike Foote, Greg Fortin, Kevin Jacks, Jason Keister, Brad Lamson, Chris Miller, Derek Milner, Danl Moore, Ben Parsons, Louis Schmidt, Ted Steiner, and Ich Stewart. These volunteers donated over 240 hours to FAC this season.



Figure 10: FAC volunteer Louis Schmidt stands next to an old avalanche crown in the southern Whitefish Range in early March.

### *Partnerships*

The FAC strengthened existing partnerships and forged new ones this season. The wildly successful Northern Rockies Avalanche Safety Workshop (held annually in the fall) contributed funds toward a new remote weather station to be located atop Big Mountain at the Whitefish Mountain Resort for next season. This weather station is a collaborative project funded by the Northern Rockies Avalanche Safety Workshop, Flathead Nordic Backcountry Patrol (FNBP), and Whitefish Mountain Resort. FAC will maintain the weather station. This station will become a tremendous resource for the FAC as well as the recreating public by providing valuable weather data adjacent to a popular backcountry area.

The FAC also collaborated with the Flathead Snowmobile Association and Penco Power Products in Kalispell to provide free monthly motorized specific avalanche education seminars. This season was the first effort and two sessions were held at Penco where FAC staff and Penco employees discussed beacons and avalanche safety gear in the first session and terrain selection/management during the second session.

The FAC also worked with Flathead Nordic Backcountry Patrol during the field days of the Introduction to Avalanches courses. FNBP's involvement was essential to accommodate the participation of these popular courses. FNBP and FAC also discussed this season future avalanche education projects including companion rescue skills field days at Camp Misery in the Swan Range next season. Along the education front Glacier Adventure Guides also hosted an avalanche awareness course in Columbia Falls in February where FAC Avalanche Specialist Seth Carbonari discussed current snowpack conditions and recent incidents.

The Flathead National Forest and FAC hosted avalanche advisories for the Kootenai National Forest. FAC staff provided avalanche advisories for the Flathead National Forest advisory area while Kootenai National Forest staff focused their efforts in the Cabinet and Purcell mountain ranges on the Kootenai National Forest.

### *Friends of the Flathead Avalanche Center*

The end of the season arrived with the formation of the new non-profit Friends of the Flathead Avalanche Center (FOFAC) dedicated to supporting avalanche education and the FAC. The mission of the Friends of the Flathead Avalanche Center (FOFAC) is to ensure the financial viability of the Flathead Avalanche Center and to save lives through public education and awareness about avalanches and avalanche safety. This group is modeled after other successful “Friends Of” groups affiliated with other backcountry avalanche centers throughout the United States. They are currently planning social gatherings and fundraisers for the summer and fall in order to support avalanche education as well as the FAC. The current President of the Board of Directors is Mike Block. For more information about FOFAC email [fac.admin@flatheadavalanche.org](mailto:fac.admin@flatheadavalanche.org). A few monetary donations were made to the Friends of the Flathead Avalanche Center this spring, and FOFAC greatly appreciates this early support from these individuals. It is this type of support and the belief that FOFAC is ultimately a community resource that will drive this group to success. Look for more to come from this motivated group of individuals including more educational opportunities.

### *The Future of FAC*

The Flathead National Forest has outlined a general plan looking into the future for the FAC.

2015 Goal – Provide a Type 3 Avalanche Center with Forest Service funding with the option of moving to a Type 2 Avalanche Center and hiring a full-time director if outside funding becomes available.

- With secured funds; complete a classified job description for a full time seasonal avalanche director
- Advertise a position for a full-time avalanche director
- Provide training for avalanche specialists
- Provide 3-4 avalanche advisories per week
- Organize a fall meeting for all agency, organizations, individuals, and partners involved with avalanche information and education.
- Continue partnership with Friends of the Flathead Avalanche Center group; actively supporting community outreach and public involvement.
- Provide at least two Introduction to Avalanche classes with separate field sessions for motorized and non-motorized users.
- Provide a hotline phone for recorded messages.
- Incorporate social media as appropriate and approved by USDA.
- Be responsive to requests for short avalanche education classes such as evening classes, one day field days, or other requests that can be accommodated within the given budget.
- Continue working with partners that share common goals and working relationship; i.e. GNP, USGS, Big Mountain Ski Patrol Inc., FNBPA, and others.
- Accept community support when and where appropriate
- Respond when an incident occurs and work closely with all rescue agencies and personnel involved. Prepare a timely report on incident.
- Write the Montana Fish, Wildlife, and Parks Recreation Trails Program grant for out year funding.

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 Erich Peitzsch, 406-888-7925.