Crested Butte Avalanche Center
2016-2017 Annual Report

Produced by Zach Guy - Director of CBAC
7/3/17

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Director's Summary

The winter of 2016-17 was indeed a memorable one! Last year's annual report concluded with "As always, the CBAC optimistically but unrealistically looks forward to a deep and stable snowpack next year." In many ways, we got our wish. As the season progressed, expressions such as "Pacific Southwest", "British Colorado", and even "rain on snow" and "glide avalanches" became more prevalent in our advisories than "depth hoar" or "monsters in the basement."

A prolonged drought through the fall stifled our typical basal weak layer development, and an active storm track through December and January put Crested Butte in the crosshairs for plenty of snow and avalanche activity. We dodged all fatal bullets this winter with several near misses on Red Lady, a full snowmobile burial, and a couple of traumatic avalanche rides resulting in unfortunate injuries. The winter was highlighted by our historic "Snowpocalypse" storm and avalanche cycle in January, which left our town and surrounding backcountry buried beneath one of the deepest mid-winter snowpacks on record and swaths of mature trees down across numerous valley floors. Going into February, an unusually widespread and reactive surface hoar layer was the spoiler to an otherwise stable snowpack, with tricky instabilities releasing into low angle terrain and in dense aspen groves. However, by early March, our weather quickly transitioned towards a relatively warm and dry spring, and we were able to wave farewell to our all-too-familiar persistent slab concerns. This brought a generally stable and predictable snowpack through March, April, and May with amazing snow coverage for recreating in the mountains.

Our CBAC team rose to meet an exceptionally challenging and exciting season. During "Snowpocalypse," school closed for the first time in decades, the town's public works was crippled, and even the ski resort shut down for a day. The CBAC forecasters didn't miss a beat; we were racing 100 mph all season to keep up with conditions, and we easily surpassed the number of field days, observations, and media content of any previous season. The public was thirsty for more information: our Awareness Night and Beacon Brushup events were overflowing capacity, and our usage statistics show a 20% increase on our website and twice the audience on our social media outreach since last year's benchmark season. Our goal is to meet the growing needs for accurate and tangible avalanche information, and we couldn't do it without the overwhelming support from our community. Thanks for another great season!

CBAC Operations

The Crested Butte Avalanche Center (CBAC) has been operating as a non-profit 501c3 avalanche center since 2002. This season, the CBAC issued 139 daily weather and avalanche advisories beginning on November 26, 2016 that were disseminated to the public through our website, email, and radio broadcasts. Additionally, we provided six snowpack updates during the shoulder seasons.

The CBAC was staffed with one full time director/lead forecaster, two part-time forecasters, one forecaster intern, and a development director. Zach Guy served as Executive Director and Lead Forecaster. This was Zach's 5th season with the CBAC, a role which evolved from part-time avalanche forecaster in 2012-13 to lead forecaster from 2013-2015, to director/lead forecaster since 2015. Ben Pritchett filled Zach's role in late March after Zach took on a new position as Director of the Flathead Avalanche Center in Montana. Ian Havlick and Evan Ross both worked as part-time avalanche forecasters. This was Ian's 4th season and Evan's 3rd season with the CBAC. The CBAC introduced a new development director position this season which was taken on by Karen Williams. Arden Feldman volunteered as the CBAC's intern. The CBAC's board of directors is comprised of 10 members: Than Acuff (President), Steve Banks (Vice President), Chad Berardo, Seth Tucker, Christie Hicks, Kirk Haskell, Billy Rankin, John Dugenske, Chris Read, and Keitha Kostyk.

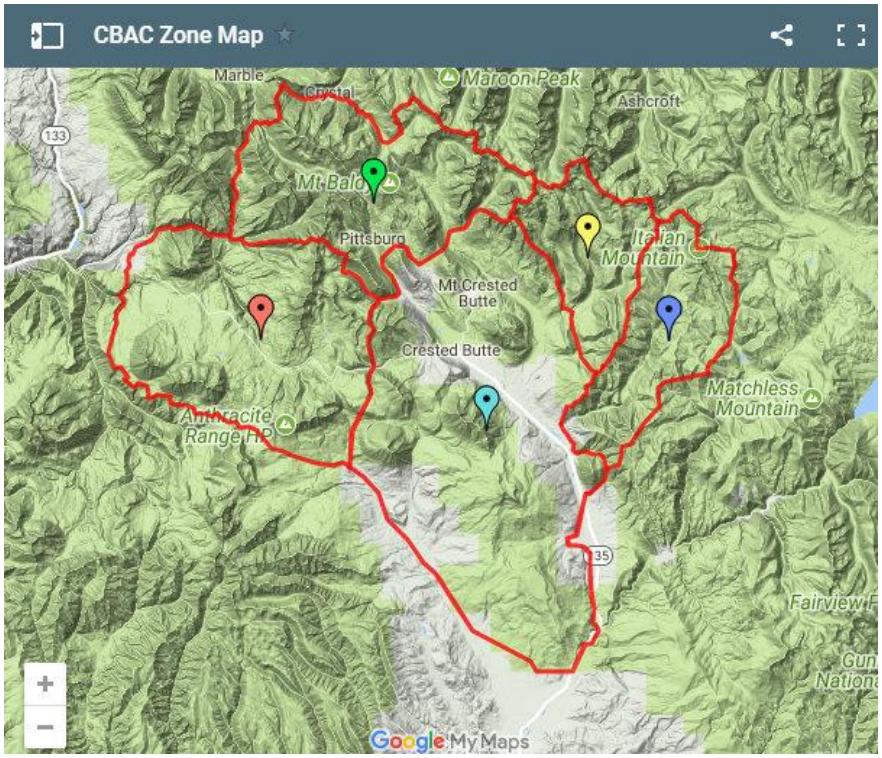


Figure 1: Overview of the CBAC advisory area; approximately 326,000 acres.

Weather, Snowpack, and Avalanche Summary

The 2016-2017 is characterized by a very active storm and avalanche cycles in December and January (Figure 2) which built a snowpack well above average through the rest of the season. Early and late season both brought unusually warm and dry weather with general lulls in avalanche activity. The snowpack in the Gunnison River Basin peaked on March 10, nearly a month earlier than normal and 123% above its normal peak (Figure 3).

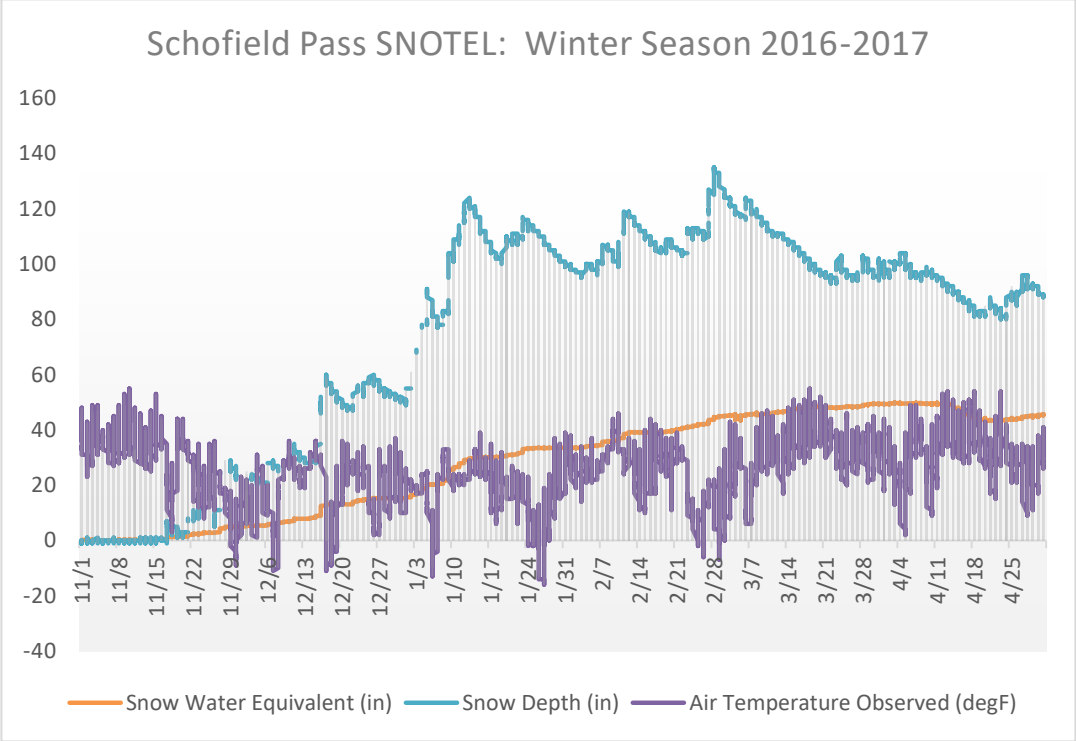


Figure 2: Air temperature, snow water equivalent, and snow depth measurements from Schofield Pass SNOTEL, at 10,700 ft. Schofield Pass is in the orographically favored "snow belt" of the Elk Mountains.

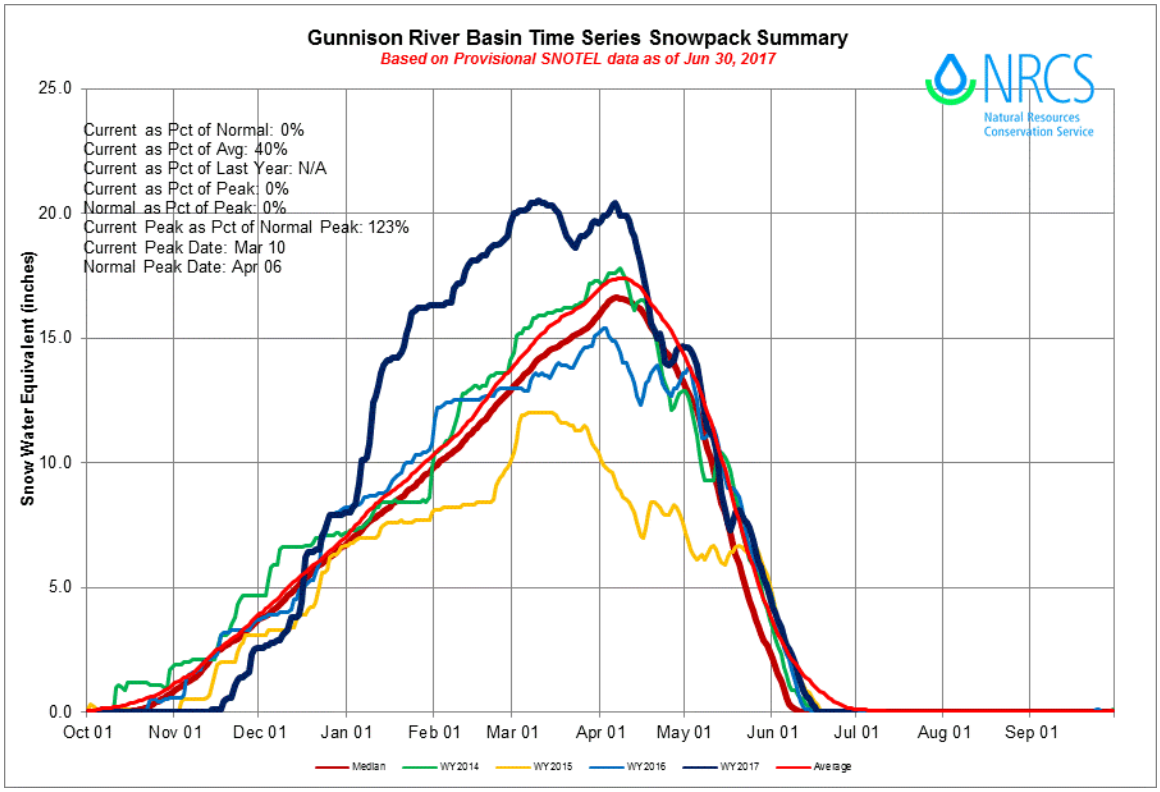
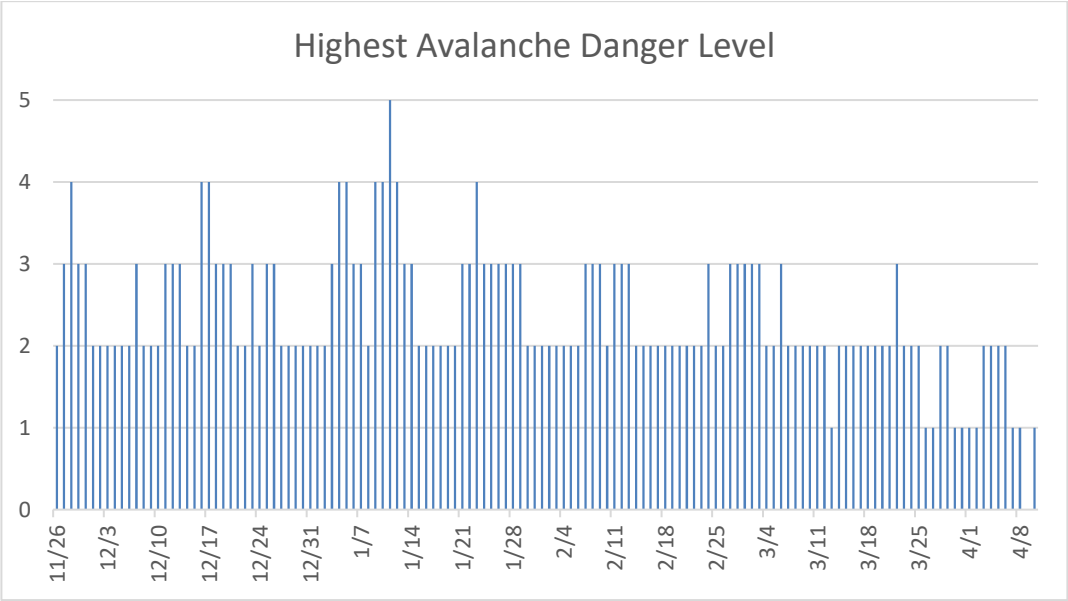


Figure 3: Comparison of this season's water year (navy blue line), relative to previous seasons and the 30 year average for the Gunnison River Basin. The snowpack was below average until mid-Decemeber, but then it skyrocketed in January to nearly 200% of average at many SNOTELS.

The CBAC uses the 5-level North American Danger Scale to offer travel advice to backcountry users. Each day, three elevation bands (above, near, and below treeline) are given an avalanche danger rating. This season, the highest avalanche danger between the three elevation bands was rated Extreme (Level 5) once, High (Level 4) nine times, Considerable (Level 3) 40 times, Moderate (Level 2) 75 times, and Low (Level 1) 10 times.



November

Figure 4: 11/15/16. Prolonged drought through mid-November left bare ground on all but the highest, northerly facing slopes in the Paradise Divide area.

Our winter started off slowly this season, with unusually mild temperatures and little snow through mid-November. Any snow left on the ground from October's light snowfall events was confined to northerly aspects at high elevations (Figure 4). This snow formed a pronounced layer of facets, coupled with crusts in some cases, creating a future persistent weak layer. From mid to late November, we saw a few small storms. This new snow began to facet on various aspects. The storms were often windy with lots of snow transport forming stout, reactive slabs on top of the October facets. Natural and skier triggered avalanches were observed during this time, mostly D1 to D2 in size (Figure 5). The first major storm of the season occurred on November 28th, with accumulations near 2 feet (up to 2.2" SWE) in the western parts of the forecast area. This spurred the first avalanche cycle of the season, with HIGH avalanche danger above treeline on November 28th. High elevation northerly aspects were the most suspect slopes, with numerous natural slab avalanches up to size D2 failing on basal facets. At least a few avalanches also occurred on southerly aspects, including a close call in Red Lady Bowl on November 29 (Figure 6).

Figure 5: 11/20/16 – Skier triggered hard slab avalanche on a northerly aspect near Yule Pass. It slid on fragile facets that were preserved through the fall drought and buried by the first significant snow event in November.

Figure 6: 11/29/16 – Skier triggered avalanche in Red Lady Bowl after the November 28th storm.

December

A brief lull in early December caused further faceting and crust formation before the forecast area came back into zonal storm flow starting on the December 6th. This new snow added a load to the basal weak layers (Figure 7) and also built slabs on the recently formed weak layers. Numerous small avalanches were observed failing on the December 6th weak layers. On December 12th, a snowmobiler was buried by a persistent slab that failed just above the ground.

Figure 7: 12/4/16. Persistent slab remotely triggered from nearly 1000 feet away in flat terrain on a northwest aspect of Scarp Ridge.

The consistent storm pattern ended with a bang on the 15th through 17th of December when a very powerful Pacific trough hit the region, bringing with it heavy, wet snow. Near the end of the storm, late on the 16th, a powerful cold front passed over dropping temperatures up to 30 degrees. The cold front brought with it wind gusts up to 100 mph and snowfall rates up to 4" per hour. The Schofield Pass Snotel site recorded a massive 4.8" of SWE and 31" of snow during the mere 36-hour extent of the storm. Closer to town the Butte Snotel recorded 2" of SWE and 15" of snow. This huge load easily tipped the scales on our relatively weak and shallow snowpack, causing a widespread avalanche cycle. An Avalanche Warning was in effect on both the 16th and 17th, and the avalanche danger was rated as HIGH at all elevations for both days. Numerous D2 to D3 avalanches, both natural and skier triggered, were observed at various elevations and aspects in the forecast area (Figure 8). On the first clear day after the storm, a solo skier triggered a very large (D3) avalanche in Red Lady Bowl after 4 other skiers had skied the bowl earlier in the day. The avalanche propagated across much of the bowl but luckily the skier was not caught. (Figure 9)

Figure 8: 12/16/17. One of numerous large natural persistent slabs that failed naturally during the mid-December cycle. This slide was about 3 feet deep over basal facets in the Climax Chutes.

Figure 9: Crown and debris of a very large (D3) skier triggered slab avalanche on 12/18/17.

Figure 10: 12/18/16. Persistent slab avalanche crown covering multiple aspects and elevations on Mount Belleview. Dozens of similar slides were observed around the zone in the clearing after the mid-December storm cycle.

Figure 11: 12/20/16. Natural activity from the mid-December cycle. This crown above "The Shield" was up to 8 feet thick, pencil hardness.

A brief lull in the storm track and a stabilizing snowpack was quickly replaced by active storm systems from December 22nd through Christmas Day. Upwards of two feet of snow (2.1" of SWE) accumulated under strong southerly and westerly winds. Natural avalanche activity continued, breaking on both mid-pack and basal weaknesses (Figure 12). The storm track relaxed towards the end of the month allowing everyone to catch their breath before the real fireworks kicked off in January.

Figure 12: 12/24/17. Natural avalanche on northeastern aspect of Gothic Mountain

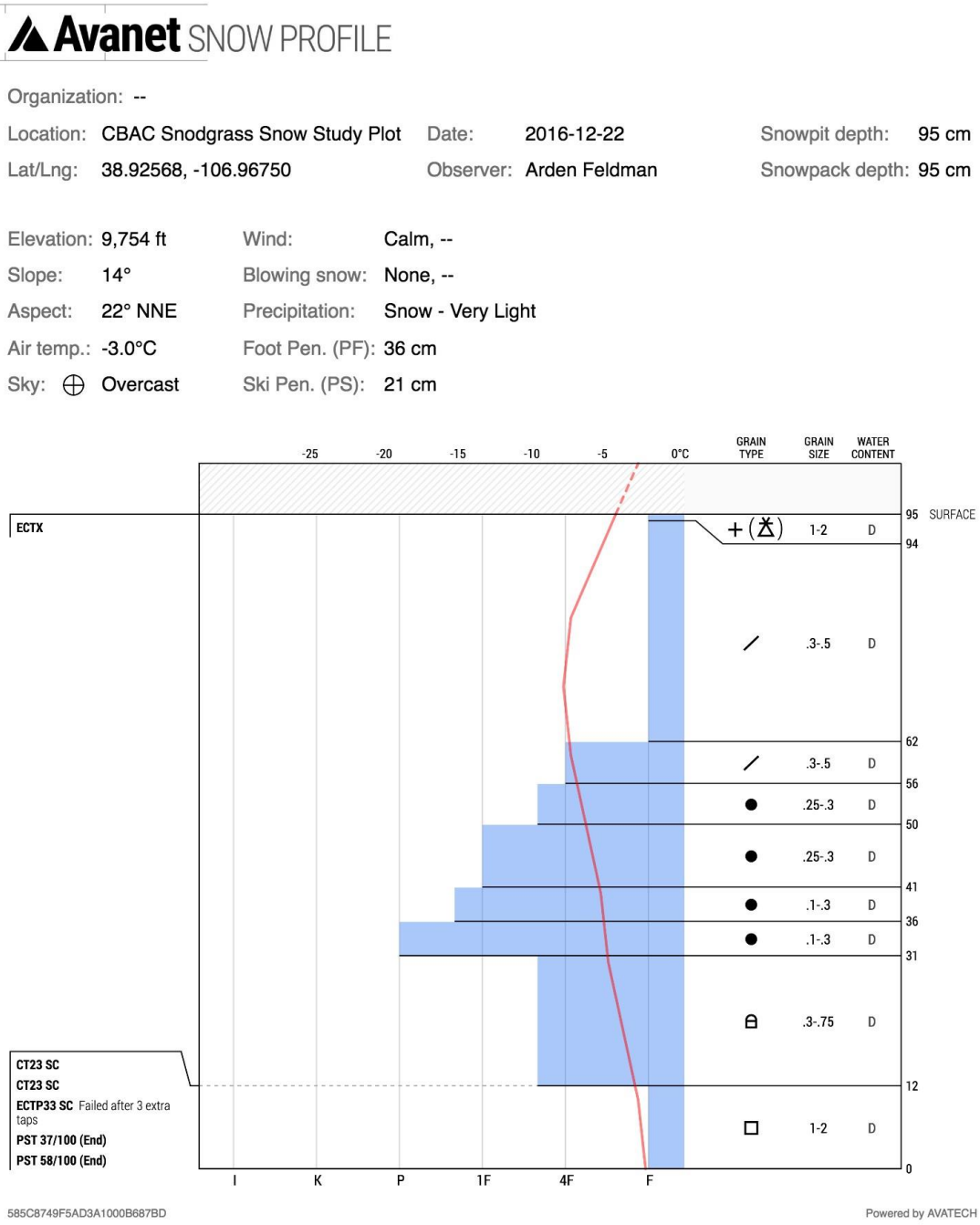


Figure 13: 12/22/17. Snodgrass study plot showing the December slab over basal facets that formed from late November's snowfall. These layers were reactive through December and into January, but fortunately they weren't developed enough to plague us all season as they frequently do in Colorado.

January

Figure 14: January, 2017: "Snowpocalypse" underway in Crested Butte.

Starting on New Year's day, the Gunnison Valley was in the bullseye for heavy moisture streaming in from the Pacific. The first two days brought 12-18" of low density snow across the area. The storm picked up in intensity from the night of January 3rd through the 5th as the jet stream lined up overhead. On the 5th, a powerful cold front slowly sagged south over Colorado and the Crested Butte area got pummeled with 2-3" per hour rates throughout the day. In the wake of the cold front, skies cleared for a single day and storm totals since January 1st were 5.6" of SWE and 57" of snow at Irwin, 5" of SWE and 41" of settled storm snow at Schofield, and 47" of snow at CBMR. There were a number of problematic surfaces at the storm interface that had formed over the previous dry week. touchy shallow storm instabilities early in the week grew larger in size and were failing naturally by the latter half of the storm. The avalanche danger was rated as HIGH on both January 4th and 5th and another significant natural avalanche cycle occurred with reports of many D1 to D3 avalanches around the zone.

The first week of January wasn't completely out of the ordinary by Crested Butte standards. But what followed the next week was one of atmospheric absurdity: warmer, wetter, and windier. A very warm and moist airmass straight from the Hawaiian Islands began ramping up snowfall on the 8th. Over the next 24 hours, the sky fell. On January 9th, CBMR got 30" of dense snow (2.5" SWE) (Figure16). Schofield picked up 3" of SWE in a mere 16 hours. Extreme gusts were evident at all elevations. Two natural avalanches crossed Kebler Pass Road putting as much as 8 feet of debris along this frequently traveled corridor (Figure 15). An avalanche warning was in place, but our observations of avalanche activity would be relatively limited over the next week as the Pacific kept surging with more moisture. A brief "lull" on the 10th brought another 6-8" before the next pulse brought 1.6" of SWE to Schofield on the 11th and another 1.4" SWE on the 12th. We raised the danger to Extreme on the 12th, with the expectation of historic slides running full track around our zone. The relentless river of moisture finally eased off by mid-January, but not before leaving its mark in the history books. Over the course of 14 days, the Snowpocalypse storm delivered 14.7" of precipitation to Schofield Pass, surpassing all other major storms since the stations inception (Figure 17).

Figure 15: 1/9/17. The crown of a large natural avalanche in the Seven Sisters slide path above Kebler Pass Road. This slide put 8 feet of debris on the road, and another similar slide crossed the road later that day.

Figure 16: 1/9/17. Nearly 4" of Snow Water Equivalent (SWE) fell over a 24 hour period at Schofield Pass and 2.5" of SWE at Butte, causing closures at the ski resort, CB community school, and elsewhere.

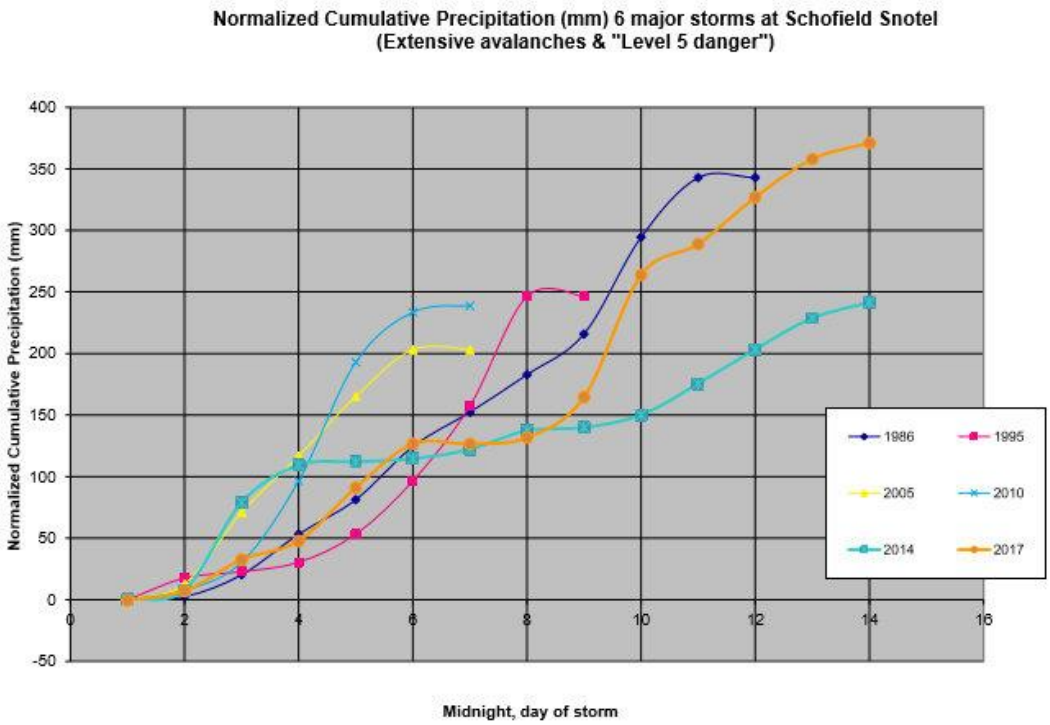


Figure 17: Cumulative snow water equivalent from the January 2017 cycle surpassed all previous major storms ever recorded at Schofield Pass SNOTEL since its installation in 1986 (although technically, this cycle was two separate storms).

Figure 18: Destructive debris crossed Taylor Canyon highway and river on 1/12/17, burying the popular fishing site below Taylor Reservoir.

Clearing skies during the following week finally gave views of avalanches that occurred during the storm cycle. Several large, natural deep slab avalanches, up to size D4, were observed (Figures 18 and 19). As the season progressed, and even now into the summer, we continue to find carnage from this major storm and avalanche cycle. Although the activity was not as widespread as some past cycles, mature swaths of trees were knocked down in all corners of the zone.

Figure 19: 1/16/17. Evidence of a hard slab that broke 8 feet deep off of Scarp Ridge during the "Snowpacalypse" cycle. The debris broke mature timber and reached its historic runout.

Figure 20: 1/16/17. Valley fog below Mt. Crested Butte

Clear and calm weather took hold in the wake of the storm, and the snowpack quickly adjusted to the tremendous load from the first half of January. An unusual fog layer developed over the next week, reaching into the alpine at times. This aided in the formation of a very widespread surface hoar layer that was subsequently buried and preserved by snowfall on January 19th. A series of three consecutive storms, the first one low density without wind, the second one relatively minor, and the third stronger and winder than the previous two combined to drop upwards of 3" of SWE in the favored zones and half that near town. The last in the series toppled the surface hoar layer in impressive fashion, and the avalanche danger bumped to High on the last day of the storm (Figure 21). Numerous natural and skier triggered avalanches were observed failing on the surface hoar, even on low angle slopes, in relatively dense aspen groves, and as remote triggers (Figure 22). In places, the surface hoar layer was deceptively touchy: we had several field days where it didn't produce propagating results in ECTs but it was easily triggered on terrain steep enough to slide. Over the course of the week, 39 natural and 37 human triggered avalanches were observed, and we had limited views of alpine terrain (Figure 23).

Figure 21: 1/24/17. Crown lines of natural and remotely triggered D2 and D3 slides in Climax Chutes showed impressive propagation and ran full track. These, like numerous other natural and human triggered avalanches observed that day, failed on the January 19th surface hoar layer.

Figure 22: 1/26/17. Persistent slabs over surface hoar remained touchy for several weeks with unusual behavior. They released in dense aspen groves, on slopes as low as 30 degrees, and instabilities were conflicting with our stability test results.

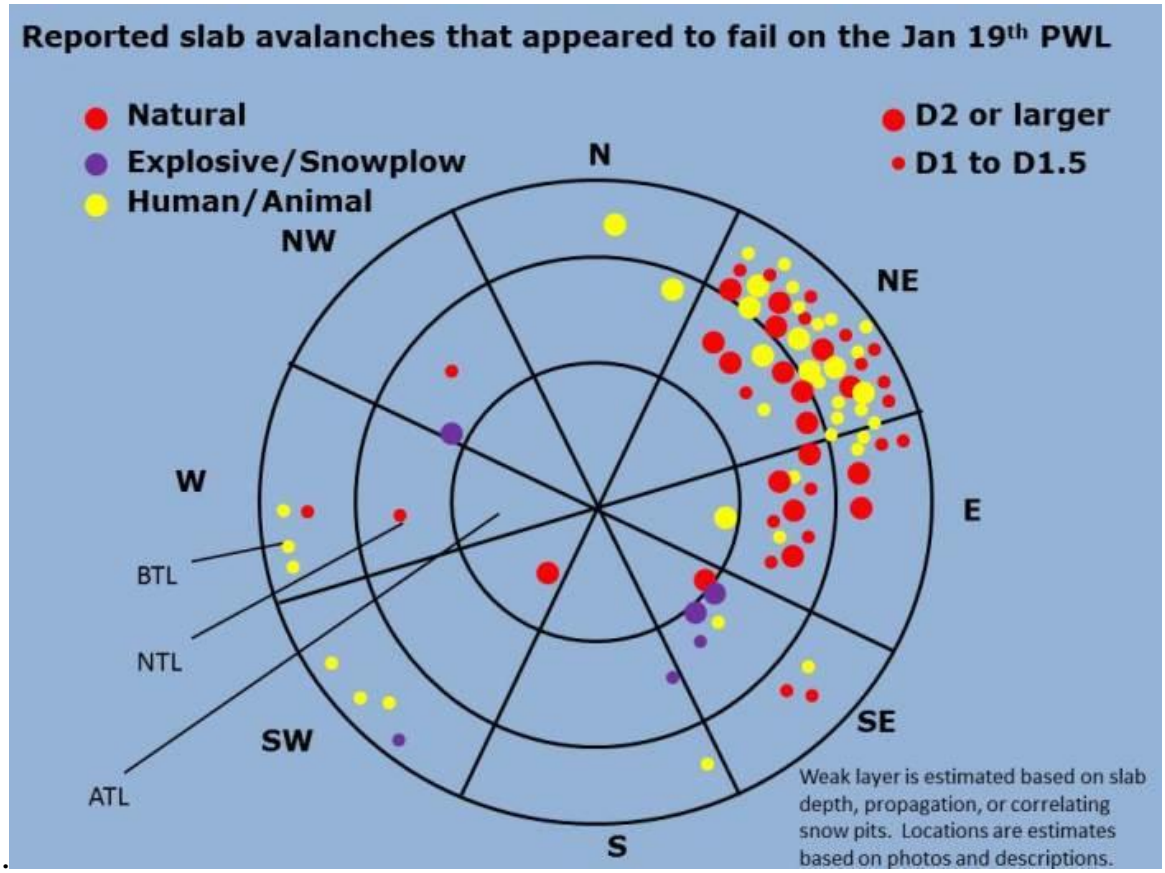


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Figure 23: January avalanche activity on the January 19th surface hoar layer. This layer remained active well into February.

Avanet SNOW PROFILE

Organization: --

Location: CBAC Snodgrass Snow Study Plot | Date: 2017-01-28 | Snowpit depth: 190 cm

Lat/Lng: 38.92588, -106.96778 | Observer: Arden Feldman | Snowpack depth: 190 cm

Elevation: 9,754 ft | Wind: Light, 315° NW

Slope: 17° | Blowing snow: None, --

Aspect: 22° NNE | Precipitation: No Precipitation

Air temp.: -6.0°C | Foot Pen. (PF): 17 cm

Sky: Few | Ski Pen. (PS): 35 cm

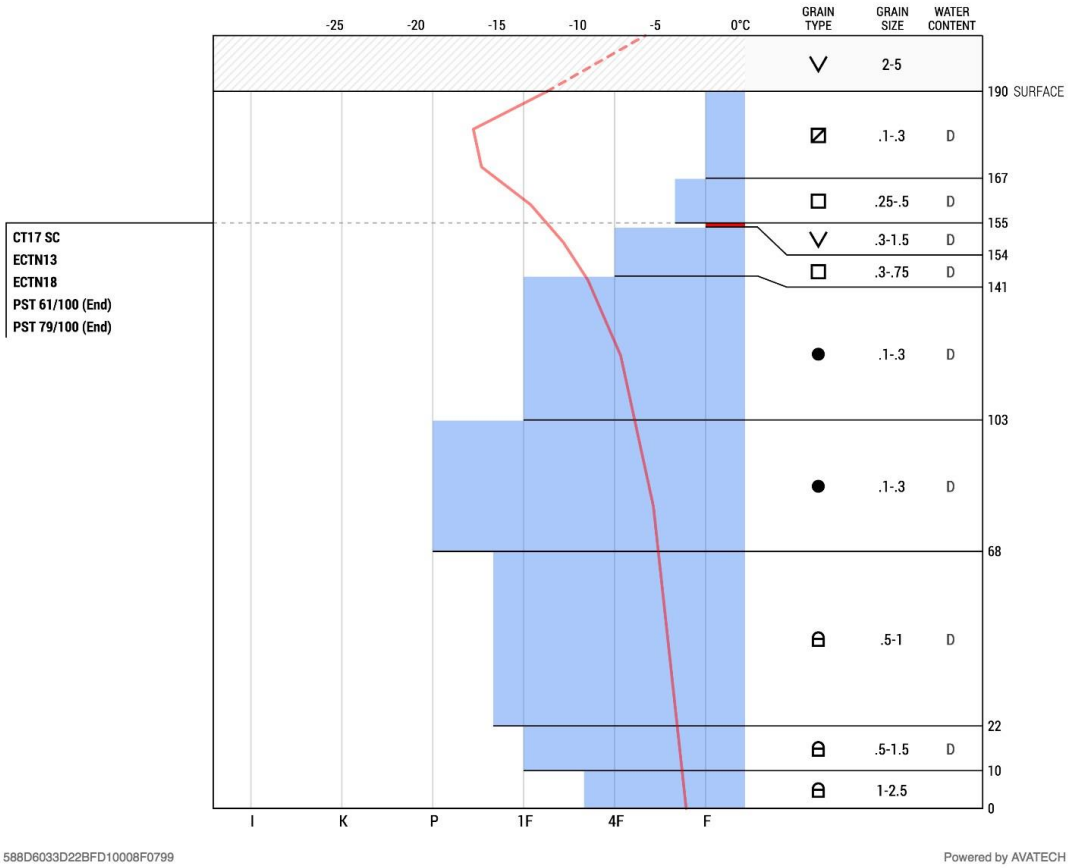

Figure 24: 1/28/17. Snodgrass study plot showing a deep and fairly consistent snow profile with the exception of the January 19 surface hoar layer in the upper snowpack.

February

Clear weather returned for the remainder of January into early February, but alpine winds continued to transport the recent snow. A handful of natural wind slabs ran at higher elevations. On the 1st, an experienced backcountry skier was caught, carried, and sustained multiple injuries after being washed down a long gulley and over a large cliff band above Copper Creek. Persistent slabs continued to plague or area into the first week of February, with a human triggered slide on failing on the 1/19 surface hoar layer almost every day in our zone or neighboring Aspen zone.

A warm and potent storm hit the area from February 6th to 8th, delivering nearly 2" of SWE and a foot of dense snow across most of the zone. Accompanied by strong winds, this spurred a round of natural and human triggered wind slabs and also kicked off a few more persistent slabs.

Winter was put on hold temporary hold in the wake of that system, and the mercury spiked to spring-like temperatures starting on February 9th. Record temperatures over the next two days were followed by a warm system that produced rain up to 10,000 feet, a rarity for this time of year. The first significant warm-up of the season spurred a round of wet avalanche activity, including a handful of glide avalanches (Figure 25) and wet slabs (Figure 26). On the evening of the 11th, a cold front passed overhead sparking heavy snowfall and allowing temperatures to finally drop below freezing throughout the forecast area. By the 12th, 3" of SWE and 19" of snow had accumulated at Schofield Pass, and 14" of snow was reported at CBMR. This spurred yet another round of natural persistent slabs that appeared to fail on the same nagging surface hoar layer (Figure 27). Sadly, Colorado's first and only fatality of the season occurred on February 14th on the same problematic surface hoar layer in the Flat Tops region to our north. The last of the surface hoar-related avalanches in the Elk Mountains was reported on February 14th, and we were able to move away from this concern, uneasily at first, by later this week.

Figure 25: 2/16/17. Fresh glide avalanche near Highway 135.

Figure 26: 2/19/17. Large wet slab observed on 2/19/17 on Teocalli Mountain. This likely ran naturally sometime during the warmup earlier in the week.

Figure 27: 2/14/17. Recent natural on Schuylkill Ridge that appeared to step down to the 1/19 surface hoar layer.

The last round of snow remained soft and untouched by the wind, and faceted quickly during the dry weather that followed during mid-February. Unsettled weather returned on February 19th, and over the next week, modest accumulations but significant winds formed a fresh round of wind slabs over the newly

buried facet layers. During the latter half of this period, several wind slabs were skier triggered (Figure 28) and were responsible for a couple of close calls, including a near miss in Coon Basin and on Purple Peak.

Figure 28: 2/20/17. Remotely triggered slab above Green Lake Chutes. The slide was triggered from where the 2 skiers are standing in this photo in the upper left, and failed on freshly buried facets that would be our next problem layer into early March.

Minor disturbances fueled minor snowfall until a powerful winter storm arrived on February 27th and 28th. By the evening of the 28th, Schofield Pass picked up 25" of snow (2.4" SWE) while Kebler Pass received 18" of snow (1.5" SWE). The near surface facet and crust/facet layer that formed mid-February was now put to the test, and we saw a noteworthy persistent slab cycle, mostly confined to leeward alpine slopes, with crowns generally 1 to 3 feet deep.

Figure 29: 3/1/16. Natural slab avalanches on Mt. Belleview observed after the 2/28 storm. Numerous slides ran naturally above treeline on the crust/facet layers that formed during our mid-February dryspell.

March and April

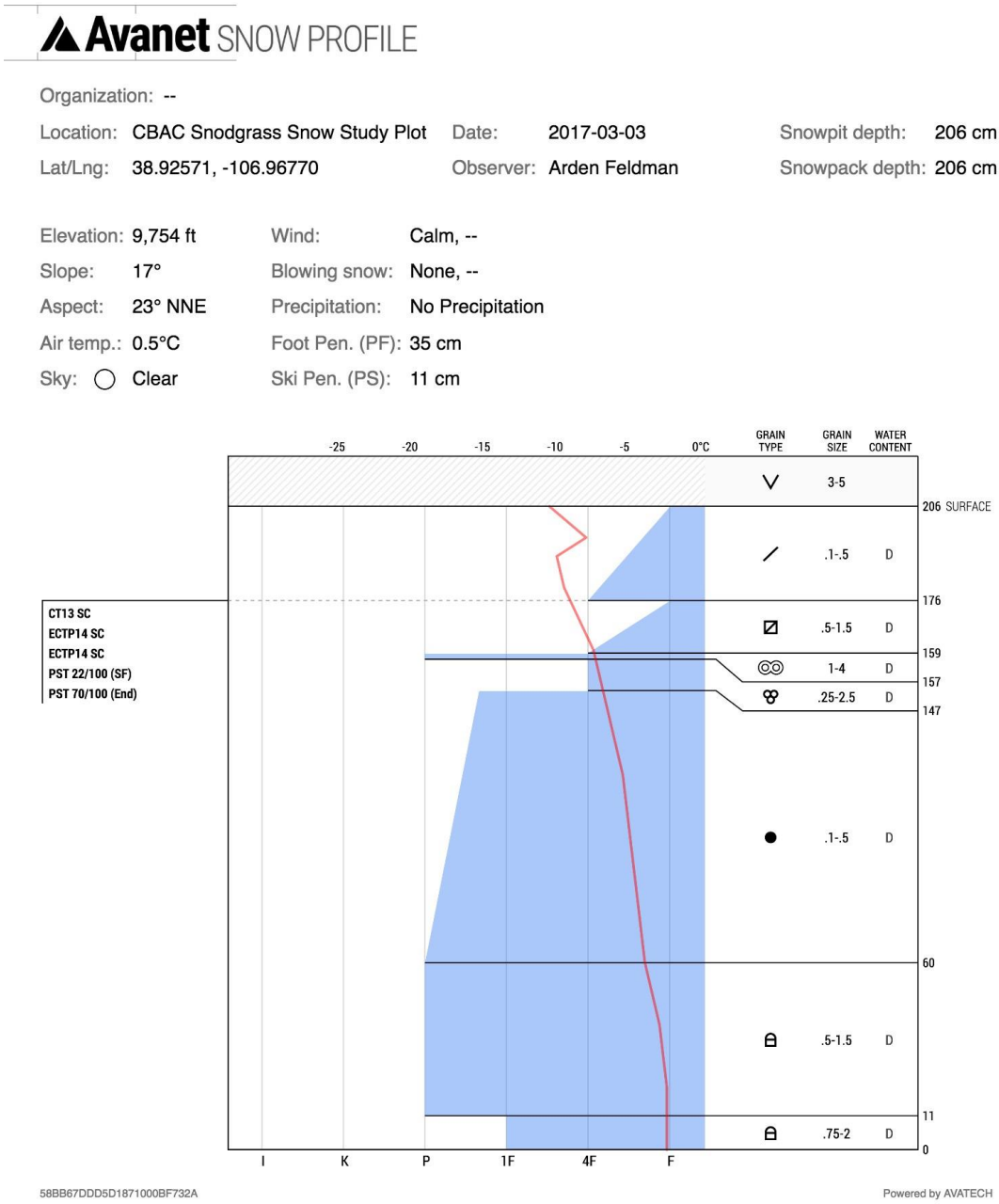

Figure 30: 3/3/17. Snodgrass study plot, showing the problematic crust/facet layer in the upper snowpack, which was buried by a larger and more reactive slab at higher elevations.

The first half of March featured relatively benign weather compared to the previous two months. Some small disturbances and a major wind event gave way to another round of record breaking temperatures in the middle of the month. Persistent slab instabilities began creep further and further from our radar, with the last observed slide remotely triggered on March 4th (Figure 31).

Figure 31: 3/4/17. A remotely triggered persistent slab in Purple Palace.

The Elkton weather station at 11,000 feet recorded daytime highs in the mid to upper 40s from March 15th through the 21st, and nighttime lows that did not drop below freezing from the 14th through the 20th. Wet avalanches came to the forefront of our concerns as free water started draining into the snowpack. As the warmup progressed, we saw larger and more frequent wet loose avalanches releasing during daytime heating, but only a few wet slab releases (Figures 32 and 33).

Figure 32: 3/9/17. Skier triggered wet loose avalanches

Figure 33: 3/19/17. Large natural wet avalanche below Gothic Peak

March came in like a lamb and out like a lamb, and so did April. Colder temperatures and light snowfall returned on the 24th of March and the danger fluctuated between Low and Moderate for the rest of the operating season. Small disturbances and subsequent warm spring days would put shallow wind slabs or loose snow avalanche concerns on the table, but at this point, the avalanche show was rolling credits after a captivating thriller (Figure 34). We issued our last advisory on April 10th but there was still plenty of spring skiing and riding to be had by all well into May and June.

Figure 34: 4/6/17. Shallow wet loose activity following small snowfall events was the primary avalanche concern in April.

Incidents

Fortunately, there were no avalanche fatalities in the Crested Butte forecast area this season. However, we received reports of one full avalanche burial and two other avalanches that resulted in skiers being carried and injured. There were several other "near misses" reported or observed as well.

The first incident of the season occurred on December 12, 2016, when a group of snowmobilers was riding in the Washington Gulch area. One of the riders triggered a 3-foot thick persistent slab from below a small slope while descending a gully (Figure 35). The rider was completely buried but his partners were able to quickly locate and extract him from the snow, and no injuries were sustained.

Figure 35: 12/12/16. The crown of a persistent slab that buried a snowmobiler in a terrain trap near Washington Gulch.

On December 18, 2016, a solo skier descending Red Lady Bowl triggered a very destructive slab avalanche that was up to 6 feet thick, 1500 feet wide, and ran over a half a mile into the runout of the bowl (Figures 36 and 37). The slide sympathetically triggered another slab and the two avalanches left a small swath of snow in the middle of the bowl where the skier was escaped unharmed. Fortunately no one else was in the runout of the bowl. We used this close call as an opportunity to produce an informative video about backcountry skiing in Red Lady Bowl, which is one of the more popular backcountry ski objectives in the valley.

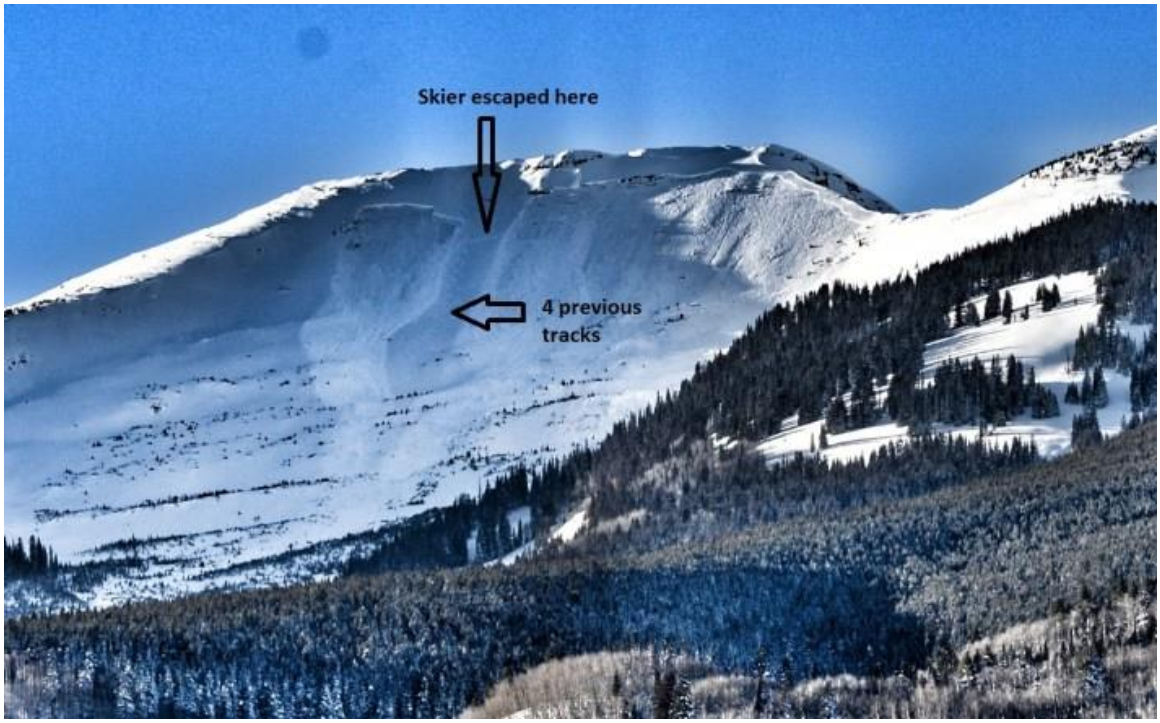

Figure 36: 12/18/16. Red Lady Bowl on Mt Emmons, where a solo skier triggered two sympathetic slides that ran on either side of his or her tracks. The debris ran far into the runout of the bowl, snapping small trees along the way.

Figure 37: 12/20/17. Crown investigation on Red Lady Bowl several days later. Note person in the middle of the photo for scale.

On February 3, 2017, a skier triggered a relatively small slab while descending a consequential gulley above Copper Creek (Figure 38). The skier was carried 1,350 feet and over a large cliff band, which caused numerous severe injuries. His partner was able to initiate an emergency response by cell phone, and the pair of skiers successfully evacuated with the help of Crested Butte Search and Rescue.

Figure 38: 2/4/17. View of the terrain trap near White Mountain where a skier was caught, carried, and severely injured in a small slab avalanche on 2/3/17. The upper red arrow indicates where the skier triggered the slide, and the lower red arrow points to where he was deposited on top of the debris after being carried 1,350 vertical feet and over an 80 foot cliff.

On February 21, 2017, a solo skier was carried 700 feet into Coon Basin after triggering a large wind slab just below the ridgeline (Figure 39). The skier was partially buried and sustained several leg injuries. A team of CBAC and CAIC forecasters witnessed the incident while ascending Mt. Emmons and responded to the scene. They retrieved a lost ski and the injured individual was able to self-evacuate for medical attention.

Figure 39: 2/21/17. A CBAC forecaster investigates the crown of a wind slab that caught and carried a skier into Coon Basin. The skier lost a ski and sustained several leg injuries.

We are grateful to all of the parties of reported or shared information about these incidents. They provide excellent learning opportunities for all of us. Complete incident reports from this season can be accessed at the following link: http://cbavalanchecenter.org/2016-17-avalanche-incidents-map/

Media

The CBAC's website (www.cbavalanchecenter.org) is our primary tool for communicating information to the public. The website was completely redesigned 3 years ago. This season, our website had 145,000 views, up 21% from last year (Figure 40). The CBAC also sends a daily advisory email to a list of 427 subscribers. Furthermore, avalanche advisories are broadcast daily on two local radio stations, KAYV and KBUT and an abbreviated advisory is published on the local TV station, CBTV.

The CBAC continues to expand and improve upon its social media presence. The center uses Instagram and Facebook on a daily basis to reach a broader audience while providing visual media and dialogue to highlight current conditions. The CBAC also regularly produces YouTube videos to demonstrate avalanche concerns in the field. Our social media audiences continue to explode: our Instagram followers, Facebook reach, and Youtube view-time all doubled since last season (Figure 40). We plan to continue our avalanche-related social media products and look for new opportunities to expand and improve in this arena.

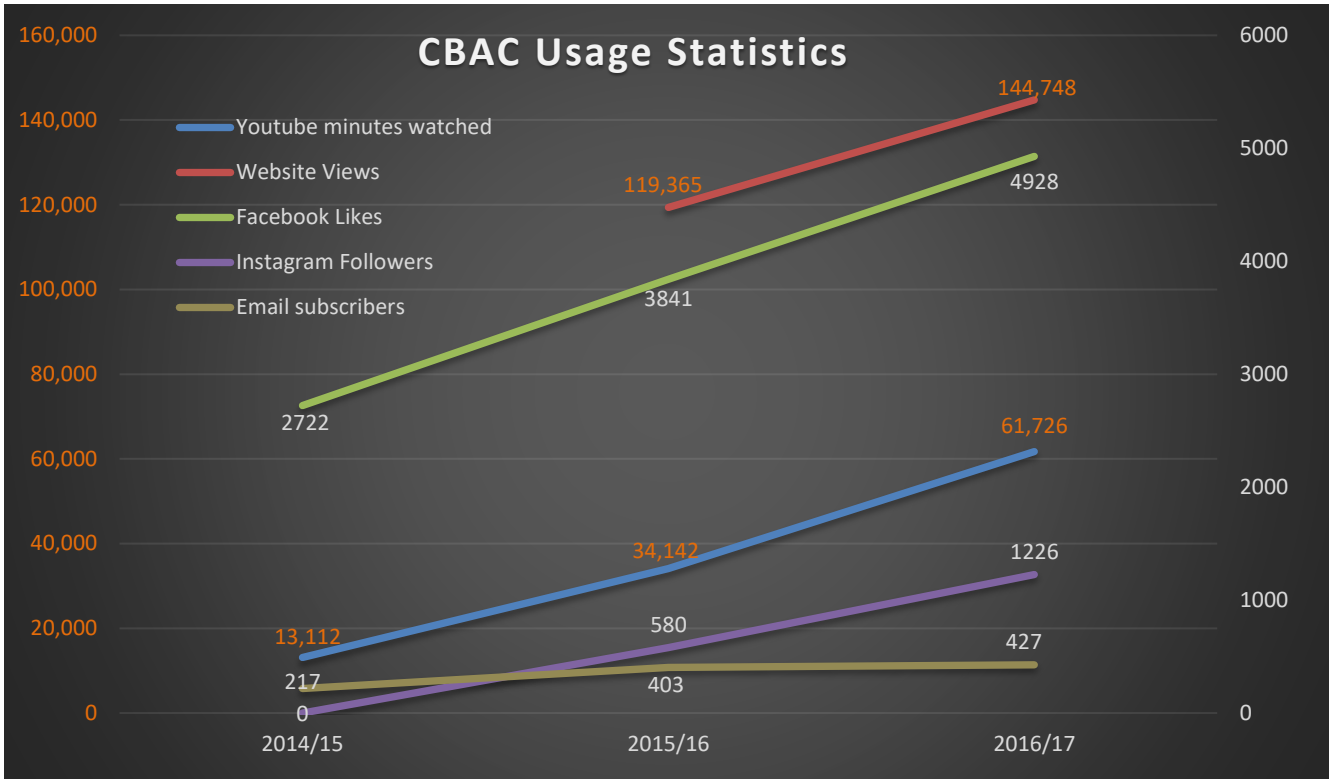

Figure 40: User statistics from the CBAC's various media outlets show strong growth in audience.

CBAC staff conducted over a dozen interviews throughout the season with local and regional media sources, including KBUT (example), the Crested Butte News (example, example), the Gunnison Country Times, and the Colorado Springs Gazette (example). Our content was also featured in state and national media sources, such as the Denver Post, Channel 9 News, Channel 7 News, Fox 31 News, Unofficial Networks (example), and more. Additionally, CBAC regularly publishes short backcountry-related articles to the Crested Butte News and to our avalanche center's blog, and we published several articles about this season's storm cycles and near misses to The Avalanche Review.

Observations

The CBAC relies heavily on field observations to improve the accuracy and content of our advisory products. Accordingly, our center has made a goal of expanding the frequency and geographic extent of professional fieldwork. This winter, the CBAC purchased a snowmobile through a CFGV community grant to help with access and efficiency. Additionally, the CBAC funded two pro observers, Ben Pritchett and Alex Banas, for a handful of targeted snowpack observations through the winter.

CBAC staff published 170 observations from field visits this season. These written observations included 599 pieces of media, most commonly photos or videos of avalanche activity or snow profiles (Figure 41). This is nearly twice the media content from last year and 6 times the amount of media content from the previous year! Anecdotal feedback from the backcountry user community showed that videos and photos are a welcomed and helpful means of communicating avalanche hazard. The CBAC also maintains a weather station near Elkton (The Dan K Weather Station) and conducts full snow profiles on a bi-monthly basis at our study plot near Snodgrass.

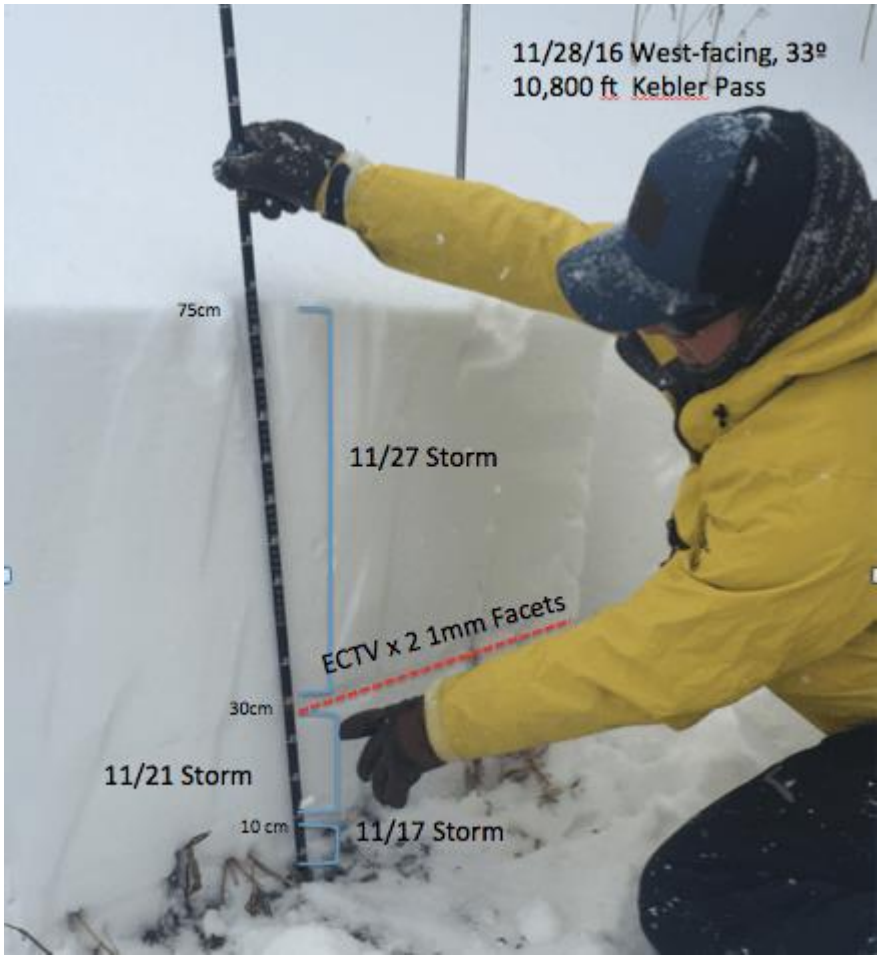

Figure 41: An example of media produced post field visit.

The CBAC relies heavily on public observations for additional field data. Given our expansive geographic forecast area and limited resources, crowd-sourced information helps us improve advisory accuracy and provides an additional resource for backcountry users. The Gunnison Valley community continues to impress us with a steady flow of observations relating to snow, weather, and avalanches. We published 268 observations that came from sources outside of the CBAC, and these were of tremendous value to our products. Simply put, we couldn't produce our quality of forecasts without your contributions. Thank you for your observations!

We'd also like to acknowledge several professional operations for their continual data sharing. Irwin Guides sends us daily observations from their cat ski operation, and Irwin's backcountry guides share their field observations with the CBAC on a regular basis. billy barr in Gothic maintains meticulous weather records and makes a special and timely effort to email us weather and avalanche data during storm cycles. The Crested Butte Ski Patrol also contributes valuable avalanche observations from their mitigation routes.

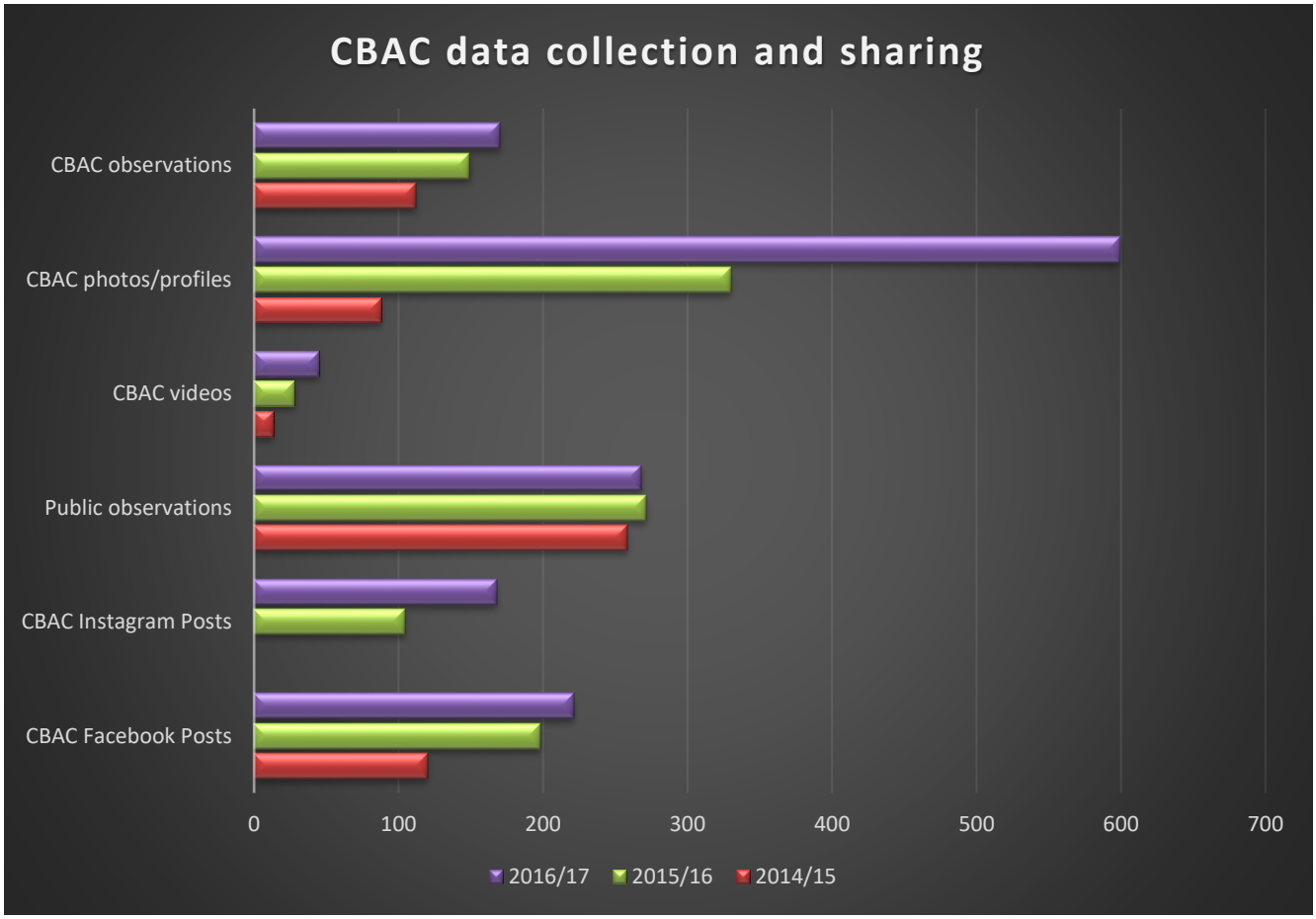

Figure 42: CBAC data collection and sharing has increased substantially over the past few years, thanks to more paid field time, a better website, and a concerted effort to improve our media presence.

Outreach and Events

The CBAC hosted two major educational events this year: Avalanche Awareness Night and Beacon Brush-up. Both events saw their largest turnouts yet and were brimming at capacity. Awareness Night featured avalanche-related presentations from Matt Kuelhorn, Zach Guy, Liz Lamphere, Billy Rankin, Evan Ross, and Ian Havlick. These can be viewed on our YouTube channel. We estimate 350 people attended this year's event (Figure 43). Beacon Brush-up provided a day-long venue for rescue training and practice scenarios for enthusiasts of all ages and abilities (Figure 44). We had an overwhelming public response with an estimated 150 attendees this year. These outreach events would not be possible without the many volunteer hours as well as financial and in-kind support, including sponsorship from Kooler Painting and Doors and Irwin Guides.

Figure 43: A full house at this year's Avalanche Awareness Night.

CBAC staff gave 14 presentations at various educational programs this year, including the International Snow Science Workshop, WSCU's Avalanche Awareness Night, Know Before You Go, the Gallatin Pro Development Seminar, and the Backcountry Film Fest.

Figure 44: Students participating in a rescue scenario at the Beacon Brushup.

The CBAC also hosted two other fundraising events: The Al Johnson Race and the GoDeeper Beer Tasting. These were both successful and fun ways to increase community support and awareness for the CBAC.

Finances

As a 501c3 non-profit organization, the CBAC operates on a fiscally streamlined budget to provide a valuable community resource while working under limited financial resources. The majority of our income comes from individual and business donations and our fundraising events. We exceeded our fundraising goals this season and are grateful for the community's continued support. Thank you! The CBAC continues to operate on a small and sustainable budget, largely centered on staff and operating expenses.

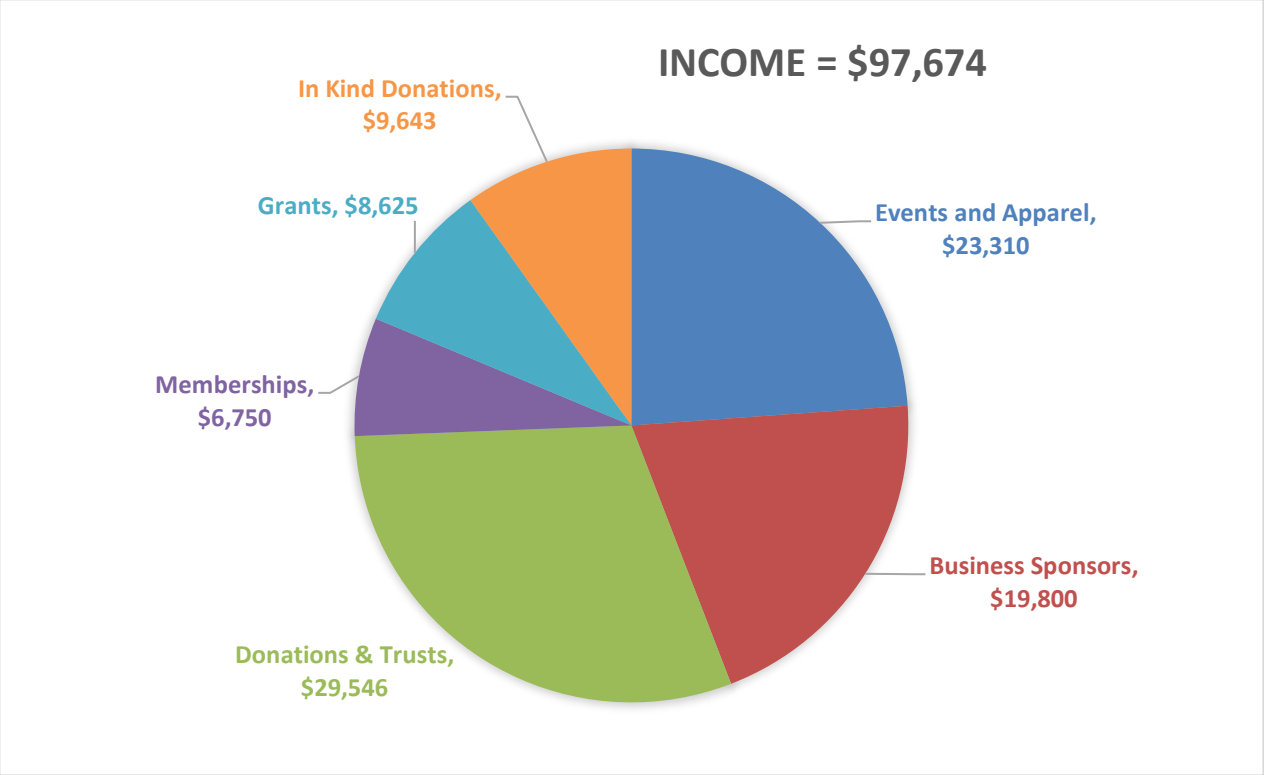

Figure 45: CBAC income for the 2016-2017 fiscal year.

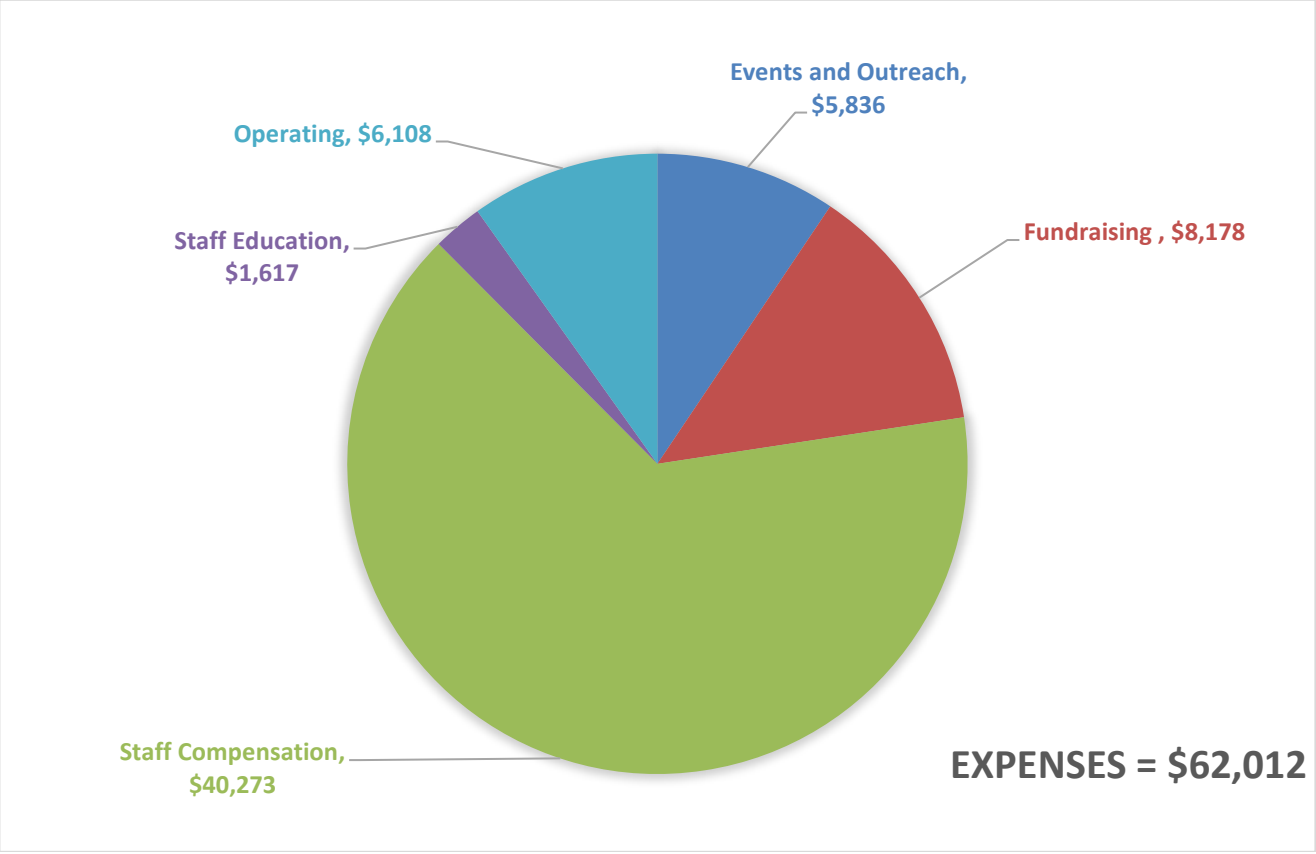

Figure 46: CBAC expenses for the 2016-2017 fiscal year.

Partners and Sponsors:

The CBAC strengthened existing partnerships and forged new ones this season. We would like to extend a sincere thank you to all of our partners and sponsors who help contribute to the quality of our product.

The CBAC has a valuable partnership with the Colorado Avalanche Information Center (CAIC) under the common goal of working cooperatively to promote avalanche safety. Both centers share weather, snowpack, and avalanche data, engage in daily meetings and consultations on data collection, the forecast process, and product delivery, and collaborate on accident investigations. The CBAC provides local avalanche specialists to collect, analyze, and log data into a statewide database, and the CAIC offers in-kind support including weather and forecasting tools, database management, and web support. By working together, our two forecast centers are able to provide high quality local and statewide forecast products, and we look forward to future collaborations.

Irwin Guides continues to be a major resource and valuable partner for CBAC operations. Their snow safety team shares daily snowpack, weather, and avalanche information from their cat ski tenure on a daily basis as well as observations of the surrounding backcountry along the Kebler Pass corridor. Irwin also provides remote data access to their Scarp Ridge wind station and Lake Irwin snow study plot. Their backcountry guides submit post-trip field observations to the CBAC as well, another tremendous resource. Irwin also provides financial support, training opportunities, and professional correspondence for the CBAC.

CBAC's media partners are an asset in circulating our avalanche information to the public. The KAYV broadcasts our advisories several times per day, KBUT plays our advisory every morning at 8:00 a.m., and CBTV relays our avalanche danger rating across the TV screen while providing technical support for our YouTube videos. The Crested Butte News provides print space for our "Backcountry Notes" section in the newspaper.

We rely on the resources of several government agencies for our daily operations. The National Weather Service in Grand Junction provides weather products and resources while relaying avalanche watches and warnings. The National Resources Conservation Service (NRCS) maintains several SNOTEL weather stations (including Schofield Pass, Butte, Upper Taylor, and Park Cone), which are vital to our daily operations.

The CBAC would not be able to operate without the many businesses and donors that contribute financial resources. We would like to thank everyone who contributed through membership purchases and private donations, and want to acknowledge the donations this season made in memory of Brad Sethness, Dan Krajewski, and Kyle Mattingly. We also want to give a special thanks to the Budd Family, the Dugenskes, the Community Foundation of the Gunnison Valley, the Jean Thomas Lambert Foundation, Western State Colorado University, and the Town of Crested Butte for their generous donations or grants.

CBAC's business sponsors are a huge asset to our operation. Thank you to these businesses and to the many companies that donated in-kind goods or services for our events.

Whiteroom Sponsors
Journey's End Development, Irwin Guides, Black Diamond
Event Title Sponsors
Kooler Painting & Doors, Irwin Guides, Brick Oven, In Memory of Dan K
Waist Deep Sponsors
Skyhigh Offroad, KNS Reps, Avery Brewing, Black Tie Ski Rental, Griggs Orthopedic, Powder Hound Marketing, The Alpineer, Crested Butte Mountain Resort
Knee Deep Sponsors
BCA, Last Steep, CB Builders, Dragon Sheet Metal, Elk Mountain Lodge, Huckstep Law, Alpha Theory, Beckwith Builders/Brickworks, Brick Oven Pizza, CORE, Precise Painting, Romp Skis, Terrain Atlas
Boot Top Sponsors
Michael Vaughn Law, Colorado Adventure Rental, Teo Tamale, Shades of Crested Butte, Resource Engineering Group, Mikey's Pizza, Ibar Ranch, International Mountain Adventures, Eagle Sales of Crested Butte, Crested Butte News, Backountry Cannabis Club, Altitude Auto, Non-Native, Old Town Inn, Pat's Screen Printing, Ginger Cafe, CB Publishing & Creative, Summit Construction, Crested Butte Bank, Avalanche Bar and Grill, Alpine Acupuncture, Colorado Adventure Rentals, Mountain Spirits Liquor, Beth Appleton Law, Crested Butte Professional Ski Patrol Association, Colorado Structural, The Bean Coffeehouse, Mammut, Hammertime Construction, Alpine Acupuncture, High Alpine Brewing Co.

Thank you to the many partners and sponsors this year who support our mission to save lives and promote avalanche safety in the Gunnison Valley.

Volunteers

The CBAC relies on volunteer work to succeed in our mission. This season, we estimate approximately 1,100 hours were volunteered to the center. These hours were generally split three ways between event/fundraising efforts, field assistants, and work produced by our intern. A special thanks is in order for Than Acuff, who donates a huge amount of time to keep the fundraising wheels turning, Arden Feldman, our intern, and the entire board of directors for their time and energy. Thank you to everyone who volunteered this season.

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The Future of the CBAC

The CBAC is dedicated towards its mission to prevent the loss of life, limb and property to natural and triggered avalanches in Crested Butte, Mt Crested Butte and the surrounding backcountry. We have met many of our short-term goals in the past few years but we will continue to strive for excellence going into the future. The CBAC has developed a strategic 3 to 5 year plan based on the following goals:

Goal #1: Improve the quality and accuracy of our public safety products and advisories

- Infrastructure and Equipment: Purchase and maintain necessary field and forecasting equipment to allow for accurate, efficient, and/or more effective weather and avalanche forecasting. This includes snowmobiles, field safety gear, weather stations, and website.
- Research and development: Designate and ration a portion of the operating budget and shoulder seasonfor the design and development of research to improve forecast accuracy and quality.
- Education and training: Continue to fund educational and training opportunities for CBAC forecasting staff, including ISSW, regional workshops, and forecaster exchange programs.

- Professional partnerships: Maintain and develop professional partnerships with local, regional, and national avalanche centers or snow safety programs. Goals include improved data and resource sharing with the CAIC and local ski/guiding operations, and collaboration with the National Avalanche Center to meet the standards of Type 1 Avalanche Centers.
- Staffing Needs: Meet the staffing needs for a 7-day week avalanche center by moving towards more full-time forecast positions
- Safety and sustainability of staff: Develop improved fieldwork protocols and supply personal protection equipment for staff to meet or exceed the safety standards of other full-time snow safety operations. Increase staff compensation and benefits to develop a more sustainable and competitive career opportunity for forecasters.

Goal #2: Increase our outreach and education to a broader audience

- Outreach and Education Opportunities: Designing and expanding community outreach and education opportunities to increase public reach. Free or affordable awareness classes to K-12 and WSCU students and educational programs for visitors or uneducated demographics.
- Diversify, Expand, and Improve Platforms: Goals include adapting to evolving social media to "stay with the times" and continued improvements in social media platforms.
- Resource allocation: Committing funding and staff hours towards research, development, and implementation of outreach and education improvements.

Goal #3: Develop a more sustainable and larger income to increase our operational budget.

- Staffing needs: Increasing the involvement of the development director to accommodate growth as necessary
- Donors: Increasing and diversifying the demographics of private donors through increased networking and outreach, new events catering to targeted donors, and life insurance and endowment designations
- Corporate Sponsors: Increasing donations from outdoor industry companies outside of the Gunnison Valley through networking and solicitation.
- Grant and foundation income: Researching and applying to larger regional or national grant opportunities while improving the internal non-profit structure, financials, and documentation of the CBAC.

Any questions regarding this report or the Crested Butte Avalanche Center can be directed to Zach Guy, 208.371.8046 or zach.guy@gmail.com.