The 2012/2013 Season Snowpack Summary
Crested Butte Avalanche Center
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On December 3rd, a couple of inches of new snow ended the long November dry snap, burying a very reactive layer of near-surface-facets as well as depth hoar which had been forming since October's first snowfall. Skier's remotely triggered several widely propagating 4" slab avalanches from hundreds of yards away (Figure 1), and we waved goodbye to low danger for the rest of the winter. The stage was set for an exciting avalanche season.

Figure 1: December 3, 2012. 4" deep soft slab remotely triggered from several hundred feet away. This slide highlighted the reactive the layer of near surface facets that formed during November's dry spell and was well-preserved on northerly aspects prior to the December storm cycle. SS-ASr-R2/D1-I

The snow guns were pointed at our corner of the Elk Mountains during December, which was our snowiest month of the year. Constant storms dropped 104" (7.8" SWE) at Irwin, and 7.0" SWE at Schofield Pass. The profile below (Figure 2) shows the state of the snowpack early in the December cycle, with touchy persistent weak layers both in the alpine and below treeline mostly on northerly aspects. Despite limited visibility during December, 161 avalanches were reported, with 16 slides larger than D2's occurring towards the latter half of the month. We reached high danger on December 18th and 19th. Overwhelmingly obvious signs of instability (ex. Figure 3) kept most skiers and riders on low angle terrain or seeking refuge on southerly aspects that

were dirt prior to December storms, and our most active cycle of the season passed without any reported incidents.

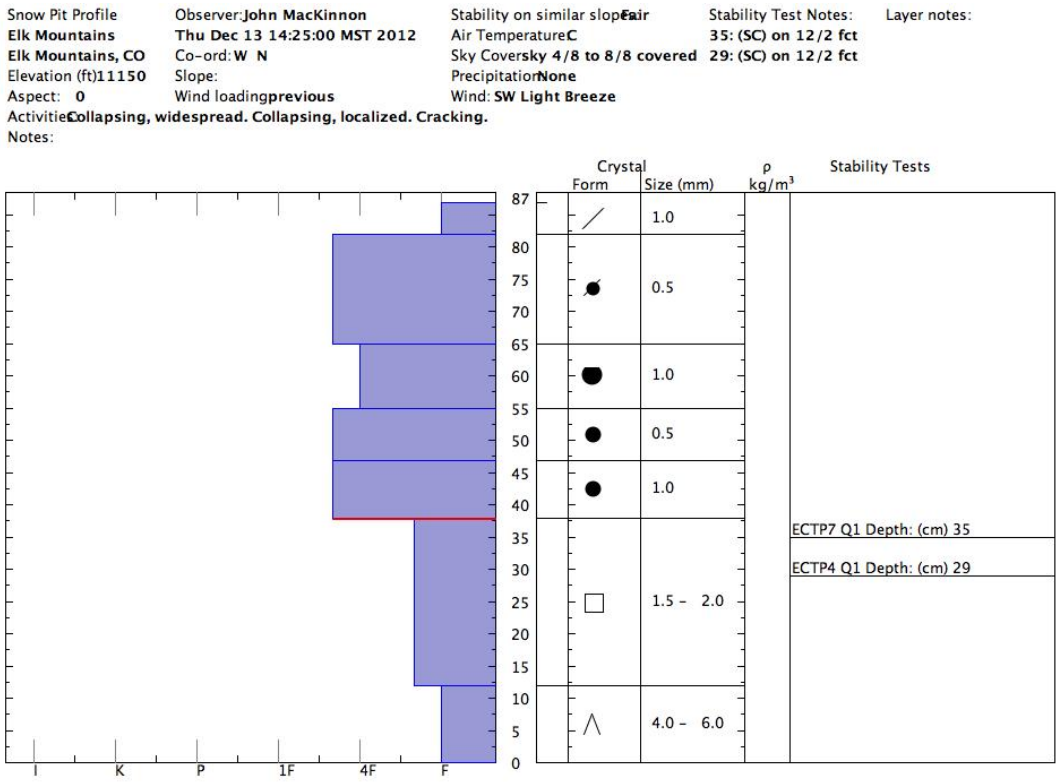

Figure 2: December 13, 2012. Snow profile on a north facing slope above treeline, showing the early stages of the persistent slab problem that would linger all season.

Figure 3: December 15, 2012. Rumbling collapses and remotely triggered slides were the norm for December, such as this one on a northeast aspect of Schuykill Ridge. SS-ASr-R3/D2-O.

The onslaught of heavy snowfall and avalanche activity subsided around New Year's. Roughly 20 days of high pressure in January gave us bluebird skies and a down-trending scary moderate danger. We braced ourselves for a long period of broken-record advisories warning of low likelihood/high consequence persistent slabs. In what was perhaps our most effective tool in educating the public on the threat of deep instabilities, one of our forecasters remotely triggered a slide to the ground in Coon Basin from a ridgeline (Figure 4). The frightening crown up to 8 feet deep was plainly visible from town and made our jobs easier during the several weeks that it glared down on local pedestrians.

Figure 4: December 31, 2013. Remotely triggered persistent slab in Coon Basin, with crown depths upwards of 8' deep. The slide was in plain view from town and served as a good reminder of lurking weak layers. SS-ASr-R3/D2.5-O

It is amazing how quickly snow will rot in Colorado when it is not snowing. Towards the end of January, many lower elevation slopes had metamorphosed to all weak facets. For the second year in a row, we were warning skiers and riders of potentially large "facet sluffs" entraining the entire season's snowpack, a type of avalanche that doesn't quite fit into our current list of avalanche problems (ex. Figure 5). I propose new SWAG code, such as LSP (loose-shit-pile) or DBS (don't-bother-skiing).

Figure 5: January 17, 2013. Skier triggered "facet sluffs" on low elevation northerly slopes. LSP-ASc-R2/D2-G

Apart from a few shallow windslabs at high elevations and numerous facet sluffs below treeline, the January dry spell ended uneventfully but left us with a fresh coat of

widespread persistent weak layers. Southerly aspects joined the game as well by serving up a not-so-tasty crust/facet sandwich. Weak layers near the ground had gained substantial strength in deeper parts of our forecast area (ex. Figure 6), while they remained fragile or got even weaker on shallower slopes.

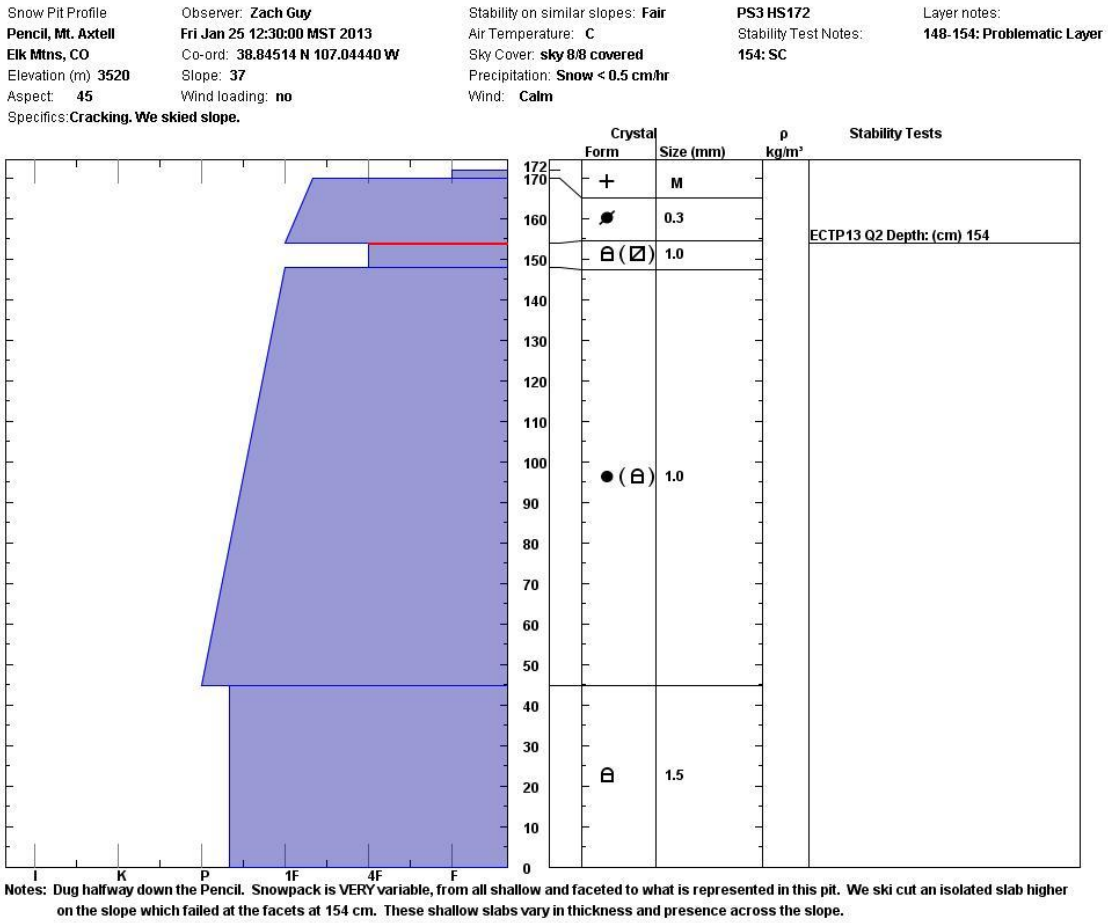

Figure 6: January 25, 2013. Snow profile on a northeast aspect near treeline, demonstrating the January dry-spell near-surface facets that would become a problem with future storms.

In the last 5 days of January, upwards of 55" of new snow (3.5" of SWE) clobbered the Elk Mountains, and the danger jumped to high for two days. Avalanches were widespread on all elevations and aspects (ex. Figure 7), with a number of close calls involving backcountry users. A skier near Mt. Baldy triggered a 10 foot deep slab and managed to grab a tree to avoid getting swept downslope. A solo snowboarder required search and rescue evacuation from Red Lady Bowl after being caught and injured in a slide. In the 10 days during and following the storm, 152 avalanches were reported, 10 of which were larger than D2's, and 33 of which were human-triggered.

Figure 7: January 31, 2013. A slab avalanche at the Anthracites that failed on the January dry-spell facet s. HS-N-R2/D2.5-O.

Small but steady doses of snow through all of February kept considerable danger present somewhere on the rose through the entire month. All of the slides reported in the last 3 weeks of February involved just storm snow or windslabs and were all D1's or D2's. While the northern half of Colorado was entering into a widespread deep slab cycle, our zone held a relatively deeper and stronger snowpack from favorable December storms and was holding tough under small and gradual loads.

Spring weather arrived in March, with a mix of warm, sunny days and several short but potent storms. Our biggest warm-ups occurred mid-March and again the last week of March. Moist to wet snowpacks developed at low elevations and some high southerly slopes. Wet loose slides were common, and several wetslabs were observed, most notably a very destructive slide in Rustler's Gulch (Figure 8). Approximately 6" of SWE fell in March, and with each of the three notable storms, we'd receive one or two observations of persistent slabs failing in old layers or near the ground (ex. Figure 9). The problem had reduced to higher elevation slopes on northerly aspects, especially in areas that had held relatively shallow snowpacks all season. A snow profile from Crystal Peak (Figure 10), the location of which was wiped out by a deep slab avalanche several weeks later, illustrates the snowpack structure that we were concerned with. All of the other slides reported in March were D1 or D1.5 soft slabs.

Figure 8: March, 2013. A destructive wet slab that failed at the ground sometime during March-warmup in Rustler's Gulch. WS-N-R4/D3.5-G

Figure 9: March 10, 2013. Naturally triggered persistent slab in Peeler Basin with crown depths up to 8' deep. HS-NC-R2/D2.5-O.

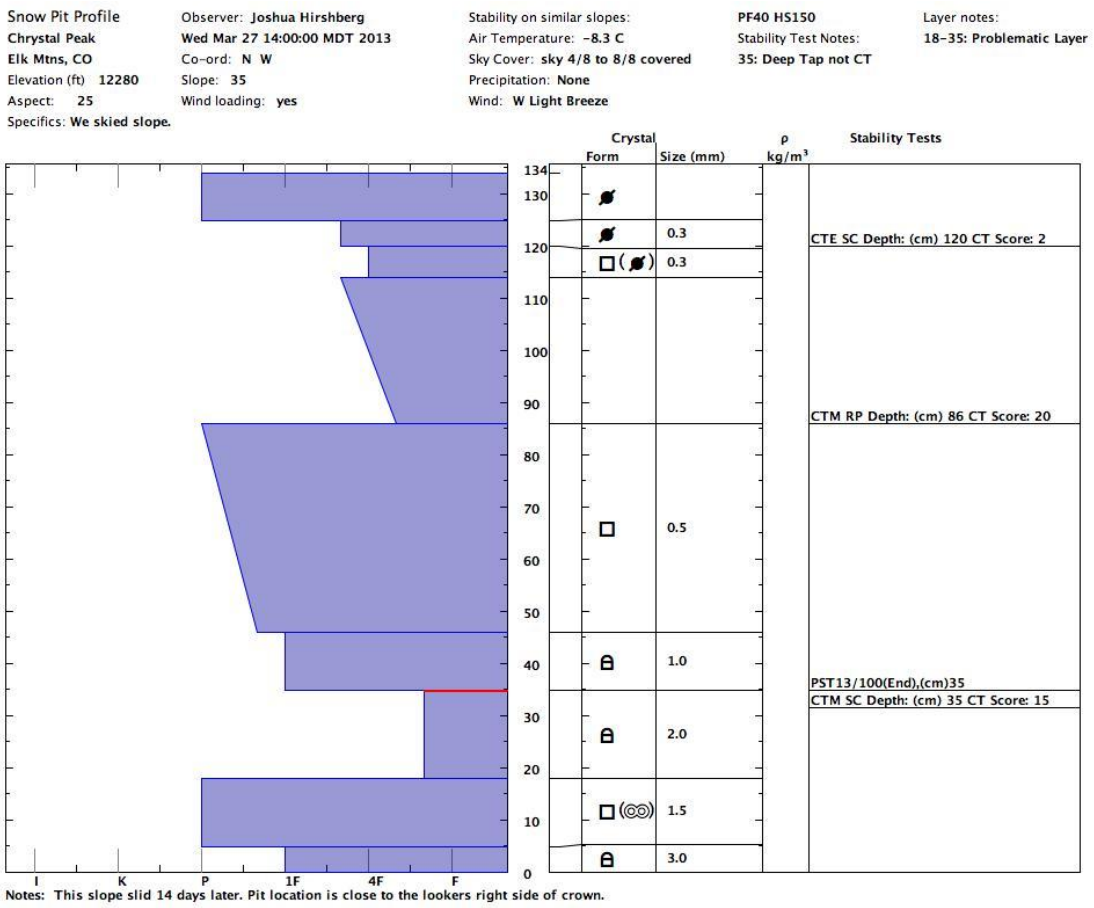

Figure 10: March 27, 2013. Snow profile from Crystal Peak on a north facing aspect above treeline, illustrating the lurking persistent weak layers near the bottom of the snowpack. The location of the pit was wiped out two weeks and several storms later when a snowmobiler triggered a deep slab across the slope.

A 12-day lull in significant snow or windloading with cooler temperatures allowed us to trim the danger to low by April 6th, with unreactive deep slabs and no wind slabs to be found. Skiers and riders were enjoying big and bold routes around the Elk Mountains. The jet stream quickly snuffed out all green lights by lining up directly over Colorado, and bringing with it abundant moisture, strong winds, cold temperatures, and dust. The mountains picked up 20" and over an inch of SWE from April 9 -11, and a handful of skier triggered slides were reported. A skier was caught and partially buried on Mt. Whetstone in a large wind slab on April 12th. From April 14th to 15th, up to 2' of dense snow fell (2.4" of SWE at Schofield Pass), accompanied by the strongest winds of the season, gusting over 80 mph. Numerous windslab avalanches failed up to 4 feet deep, and several natural deep slab avalanches ran on northerly alpine bowls off of Whetstone Mountain, Cement Mountain, and Redwell Basin (Figure 11). 56 avalanches were reported as a result of the week-long April storm cycle. We issued our last advisory on April 20th, with storm instabilities mended but the ever-lurking deep slab problem still persisting.

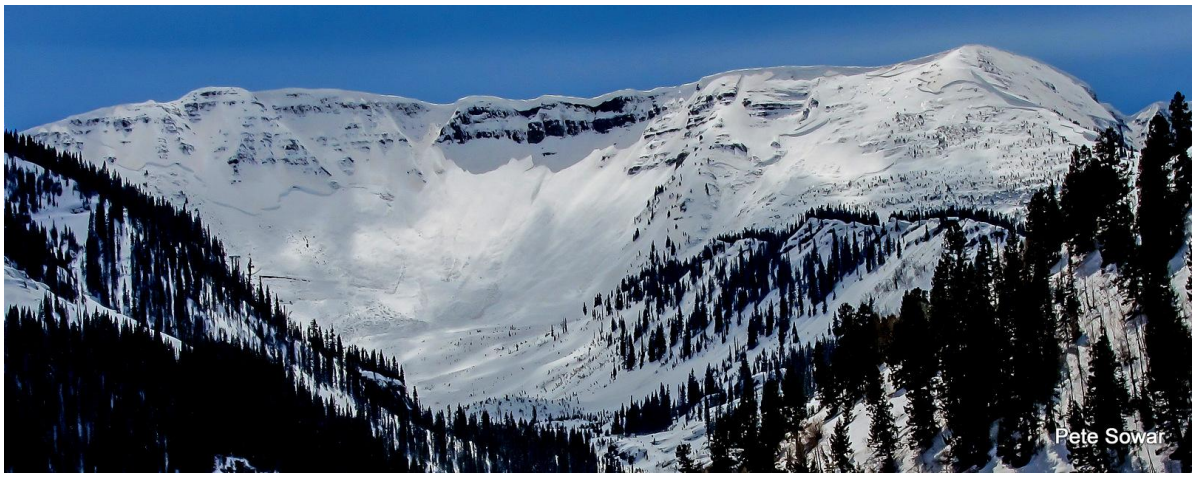

Figure 11: April 15, 2013. Deep slab avalanches in Redwell Basin following a major spring storm. HS-N-R3/D3-O.

This season, the Gunnison River Basin reached approximately 80% of its average peak in snow water equivalent. As of the end of April, Irwin reported 420" of snow (28.1" SWE), Schofield Pass Snotel received 24.6" SWE, and Butte Snotel received 13.4" SWE (Figure 12). From October through March, the town of Crested Butte reported 105" of snow, which is 56% of its average over the past 50 years.

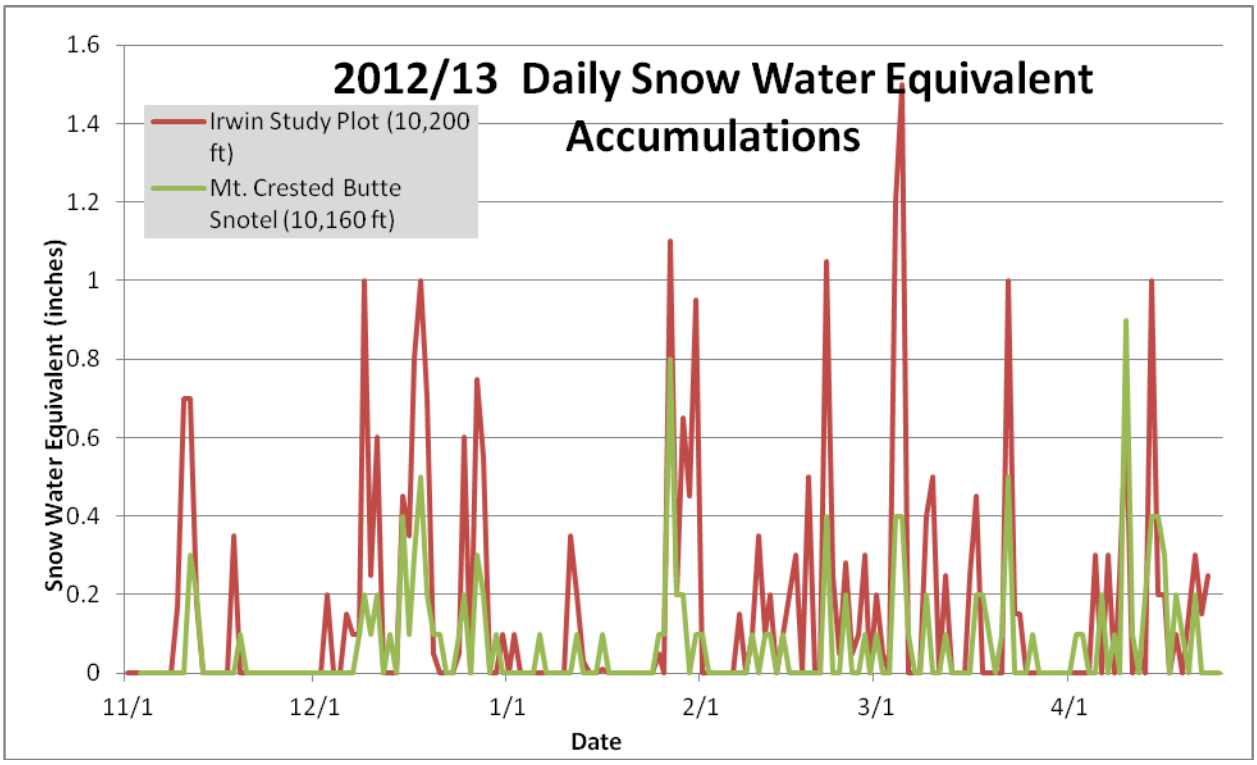

Figure 12: Daily snow water equivalent (SWE) accumulations for Irwin study plot and Mt. Crested Butte Snotel.

The CBAC operated from November 21st through April 20th, and issued 148 daily advisories. We extended our season an extra two weeks in April due to heightened avalanche condtions. We had 4 high danger days during the peaks of the December avalanche cycle and late January cycle. Considerable danger was present most of December, all of February, roughly half of March, and a few days in January and April, for a total of 77 days. We had 60 days at moderate danger and 7 days at low danger (Figure 13).

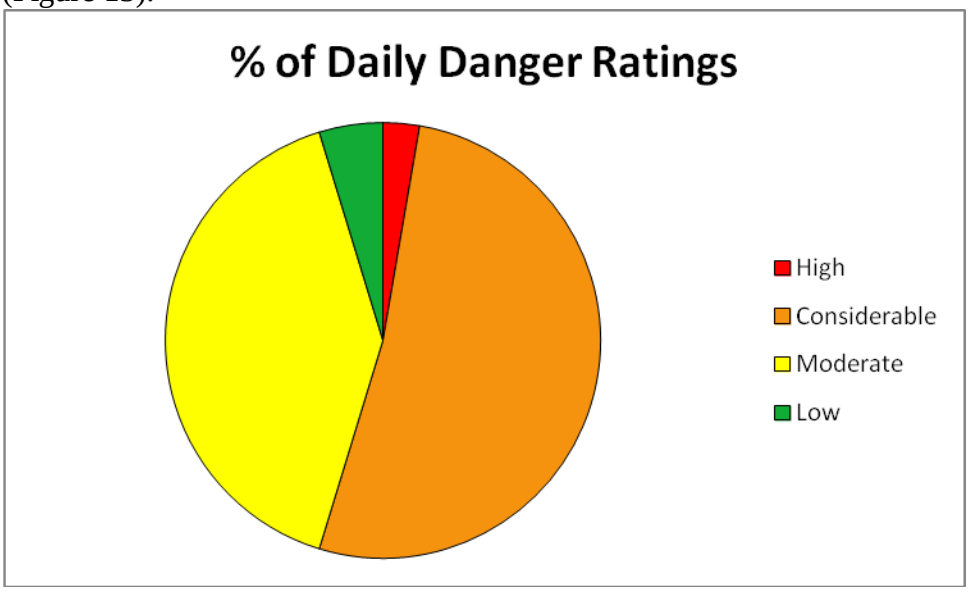

Figure 13: Percentage that each danger rating was present during our forecasting season.

Within our forecast zone, we received reports of one caught and injured, and one caught and partially buried. Ski operations within our zone also reported one caught, partially buried, and injured, and one injured due to avalanches. We feel fortunate that no fatal incidents occurred during this challenging season, and applaud our community for the constant stream of observations which we rely on for our daily advisories. We published 339 snow and avalanche observations, which is nearly twice what more populated forecast areas around the state receive. We send our deepest sympathies to friends and families of the members of our community caught in the Loveland Pass avalanche this year.

Challenges, Successes, and Deep Persistent Thoughts from the 2012/2013 Season

We continue to struggle with putting our square avalanche problem pegs into the round danger scale hole. To ease the headache, we tossed around terms like Moderable and Mow between fellow forecasters. Which of our three columns from the danger scale (travel advice, likelihood, or size/distribution) takes trump when reality doesn't nicely line up under one color? From discussions with forecasters from Alaska to Utah to Colorado to Montana, I found that we aren't all in unison on what a loose term like "large avalanches" in the danger scale really means. Our website analytics suggest that a number of users are simply glancing at the danger rating on their way out the door, which

makes condensing the situation in the mountains down to one color even more frustrating.

It is a constant challenge to forecast one danger and one problem list for two different snow climates that our topography lends itself to. Our western zone gets battered by storms with an almost-Wasatch type snowpack, while the easier accessed peaks near town sit in the rain shadow with pure-bred Colorado characteristics. Figure 13 captures this problem well: The Irwin snow study plot is less than 9 miles from Butte Snotel site and at the same elevation, but received more than twice the amount of snow water equivalent this winter. By late December, we knew some slopes in Ruby Range were holding stubborn deep slabs over 10 feet deep, while areas near town had 18" touchy persistent slabs on the same weak layer. We addressed this by describing both types of problems under one persistent slab icon and conveying what subtleties we can in our text. Our transition from the persistent slab icon to deep persistent slab was certainly not black and white, and was fraught with many lengthy email threads between our staff and forecasters around the state.

Our center continues to look for creative ways for public outreach and education. This year our forecasting staff focused on incorporating more media into our product: we produced 10 youtube videos and published 84 photos to help illustrate avalanche problems or snowpack structure. We received lots of positive feedback from the community, with over 9,000 online youtube views. One of the videos was featured in Colorado Channel 9 News. Other successful outreach projects included several trailhead days, an ambassador team, awareness night, and several other fundraising events.

Thanks for a great season. We'll see you next winter!

Respectfully,
Zach Guy