

Henderson Mountain Avalanche Fatality

1 skier caught, buried and killed
1 snowboarder partially buried, uninjured
Beartooth Mountains, Cooke City, MT
Custer Gallatin National Forest – December 11, 2016

SYNOPSIS

On Sunday, December 11, two skiers joined another group of three friends to ski and snowboard a short run on the shoulder of Henderson Mountain. The group of three had already skied a lap on the slope and the two others joined them for a run. Skiing one at a time the three skied to the bottom, leaving the two others at the top. With 6 tracks on the slope another skier descended. After two turns the slope avalanched with the crown line breaking at the tips of the top person's skis. The slope was 40-43° steep where it was triggered. The avalanche broke 3 feet deep, 80 feet wide at the crown, 150 feet wide mid-path and traveled 250 vertical feet. The slide carried him into a terrain trap of trees where he was completely buried. A snowboarder in the runout zone was buried to his waist. He was uninjured and extricated himself quickly. The four did a beacon search and uncovered the victim in 15-20 minutes. They performed CPR but the trauma was fatal. The avalanche is classified SS-ASu-R4-D2-O with a runout angle of 34°.

GPS coordinates and elevation:

Toe of debris/victim location: 45.0418, -109.92142 (9,120')

Crown: 45.04734, -109.92219 (9,375')

Google Map:

<https://www.google.com/maps/place/45%C2%B002'50.4%22N+109%C2%B055'19.9%22W/@45.04734,-109.9265664,1656m/data=!3m1!1e3!4m5!3m4!1s0x0:0x0!8m2!3d45.04734!4d-109.92219>

Photos:

<http://www.mtavalanche.com/images/16/henderson-Charliechlooking-down-path>

<http://www.mtavalanche.com/images/16/henderson-Charliechsnowpit-crown>

<http://www.mtavalanche.com/images/16/henderson-Charliechentry-tracks>

<http://www.mtavalanche.com/images/16/henderson-Charliechdigging-crown>

<http://www.mtavalanche.com/images/16/henderson-Charliechburial-location>

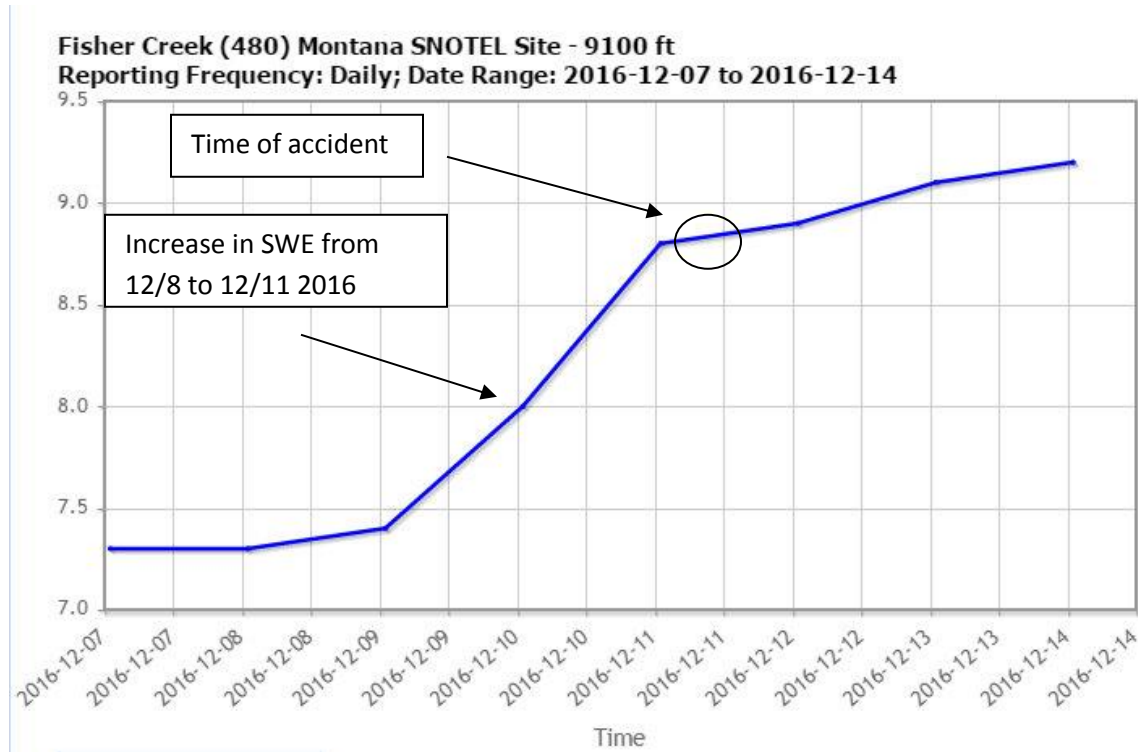
<http://www.mtavalanche.com/images/16/henderson-Charliechava-path-1>

<http://www.mtavalanche.com/images/16/henderson-Charliech-avalanche-121116-0>

Video: <https://youtu.be/kc4ydOyfT1A>

WEATHER

Weather data was collected from the Fisher Creek SNOTEL site (9,100') and Lulu Pass Weather Station (9,984'). The stations are located approximately 1 ½ and 2 miles away to the northwest, respectively. Sunday, December 11th was a cold and windy day. The air temperature at the time of the accident (2:30 p.m.) was 15° F and winds were blowing 15-35 mph out of the west to southwest. No new snow was recorded the day of the accident, but during the three days prior the mountains received over a foot of snow totaling 1.5 inches of snow water equivalency (SWE). Snowfall data was collected from the Fisher Creek SNOTEL site and wind data was collected from the Lulu Pass Weather Station.



SNOWPACK

The avalanche occurred at 9,375' on the southeast end of Henderson Mountain on the southern end of Henderson Bench on a northeast aspect (30°, measured). The crown was consistently 3 feet deep (measured) for its 80 foot width (estimated). The slide ran a total of 255 vertical feet (measured). We measured the slope steepness to be 35° at the crown and averaging 40° with a 43° rollover mid-path. The snowpack consisted of new snow over older, denser snow that was sitting on facets (depth hoar) above an ice crust. The facets collapsed and propagated the fracture across the slope with an ice crust as the bed surface.

Early season snowfall from the 6th to 17th October (2.6" SWE) created a dense, icy mass at the ground. Small snow storms followed by weeks of clear weather formed a couple layers of weak, faceted snow by the end of November. The avalanche released 97cm deep on 2-3 mm sized grains of depth hoar that formed on top a melt freeze crust 24 cm above the ground. The overlying soft slab (4-Finger to Fist

hardness) grew throughout November and December. Three days prior to the avalanche the snowpack was loaded with 1.5" of SWE creating a CONSIDERABLE avalanche danger on all slopes the day of the accident. The slope was not wind-loaded.

Crown Profile is attached, and also here: <http://snowpilot.org/node/564>

Avalanche Advisory: <http://www.mtavalanche.com/advisory/16/12/11>

AVALANCHE

On the morning of Sunday, December 11, Alpha (skier, aged 27), Bravo (skier, aged 27) and Charlie (split boarder, aged 27) rode snowmobiles to the mountain, parked, and then broke trail to the top of a slope on Henderson Bench. They were all experienced in the backcountry and were familiar with the slope as they have been there in past years. All three carried avalanche transceivers, shovels and probes. Bravo wore a helmet. Alpha had taken an avalanche Level 2, Bravo a level 1 and Charlie had avalanche awareness training. They were out touring the day before (Saturday) and Alpha commented that they were "skeptical of the slope" as breaking trail was bottomless and they knew the fresh snow was increasing the avalanche danger. He admitted "it was hard to resist the fresh powder", but they did. On Sunday, they felt conditions had improved. At the top of the slope Alpha held onto a tree and jumped hard at the convexity, then made two ski cuts to try and trigger the slope with no results. They skied one at a time in the deep powder. They decided to take another lap and ran into Delta (skier, aged 27) and his dad Echo (telemark skier, aged 55). Both Alpha and Bravo were friends with Delta and they have all skied together in the past.

Delta and Echo were acknowledged by the other three as having the most avalanche experience in the group. They both had taken Level 1's multiple times and were proficient at digging pits and analyzing snow stability. They each carried an avalanche transceiver, shovel, probe and helmet and Delta also carried an airbag. They had just taken a run on a nearby low-angled slope that Delta described as "super-mellow". He said the snow "felt good" and they had no collapsing or cracking or other obvious signs of instability. Delta and his dad had read the avalanche advisory that morning, as had the others, and knew the danger was rated Considerable on all slopes. They vocally agreed that if they went to steeper terrain they would dig a pit, which was standard procedure for them.

The group of five snowmobiled to the top of the slope that the three had just skied. Echo commented to Delta that "this looks like avalanche terrain". Delta agreed and acknowledged it was very steep as he had skied this slope in past years. Delta, Alpha and Charlie all agreed that this was a slope they had gone to in the past during periods of more dangerous avalanche conditions. Bravo went first after jumping hard at the top of the slope a few times to test stability. Alpha skied next, followed by Charlie. All three were now at the bottom.

With six ski tracks on the slope below, Delta and Echo had a frank discussion. Delta asked, "What do you want to do?" After discussing the potential wind pillow skiers' right, Echo said, "Let's burn a run and go back (to their previous slope)." In Delta's words, "we forfeited digging a pit". Below, there was lots of hooting and hollering in excitement from the great powder. Echo dropped in and the slope avalanched

on his fourth turn. Delta yelled, "Avalanche" and kept his eyes on his Echo until he disappeared. The avalanche crown broke at Delta's ski tips. Down below, Bravo watched Echo while Alpha had eyes on Charlie. Charlie had his back to the slope trying to get out of his bindings when the slide hit and buried him to his waist without carrying him away.

Delta jumped off the crown and skied the icy bed surface. Everyone started a beacon search. As they got close they yelled out the display distances to one another. Echo was buried somewhere in the trees at the bottom of the slope. With their skis off, the four had a strenuous time moving because of falling into air pockets between logs. Delta described falling chest deep in snow to the ground, having to swim out, reorient, and continue searching only to have it happen again. He said "it was the most insane thing I've ever had to go through... mind-boggling." When they got close with readings of .9m to 1.2m they tried a fine grid search. Bravo was probing and getting lots of false strikes on logs, but eventually hit Echo's boot.

Echo was wrapped around a tree "like a corkscrew" with his boots 2 ½ feet higher than his head. Echo's legs were severely broken and the orientation of his lower leg gave a false indication of where his body was. It took approximately 15 minutes to locate Echo and another 5 minutes to uncover his face, which is when they decided that Bravo should snowmobile to town to alert search and rescue. The remaining three started CPR. Delta noted that he "knew early on it was a neck injury" and that his leg was mutilated and bleeding badly.

RESCUE

All times are estimates from Cooke City Search and Rescue (CCSAR) and the survivors.

After Echo's face was unburied, they untangled him from the tree, laid him on his back and began CPR. The time was approximately 2:50 p.m. With the group's consensus, Bravo left the scene on a snowmobile and rode 10-15 minutes to Cooke City Exxon and alerted CCSAR. CPR was continued for approximately 30 minutes. CCSAR Hasty Team (4 members) arrived on scene at 3:55 p.m. and put an AED defibrillator on Echo. The AED displayed "no shock advised" and after discussion with Delta it was decided that no shock would be administered since so much time had passed. Echo had fatal trauma to his neck and lower extremities. Kay Whittle, Hasty Team member and Park County Deputy Coroner, declared Echo deceased at 4:00 p.m. His body was evacuated to Cooke City in a rescue sled.

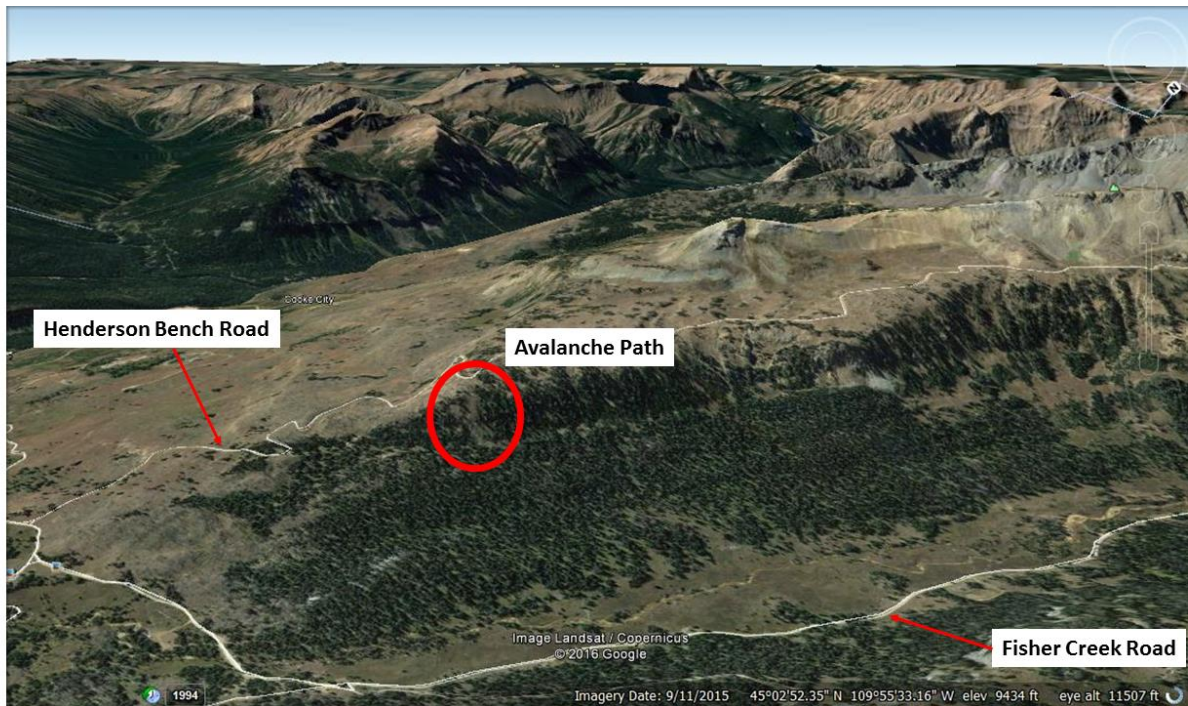
INVESTIGATION

The onsite investigation occurred on December 12. It was conducted by Doug Chabot (author), and Eric Knoff (GNFAC Avalanche Specialist). On that same day Doug Chabot and Eric Knoff interviewed Charlie in Cooke City while Alex Marienthal (GNFAC Avalanche Specialist) interviewed Alpha. On December 13 Doug also interviewed Delta.

Any questions should be directed to:

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Map 1: The avalanche path was at the southeast end of Henderson Charliech at an elevation of 9,375'.

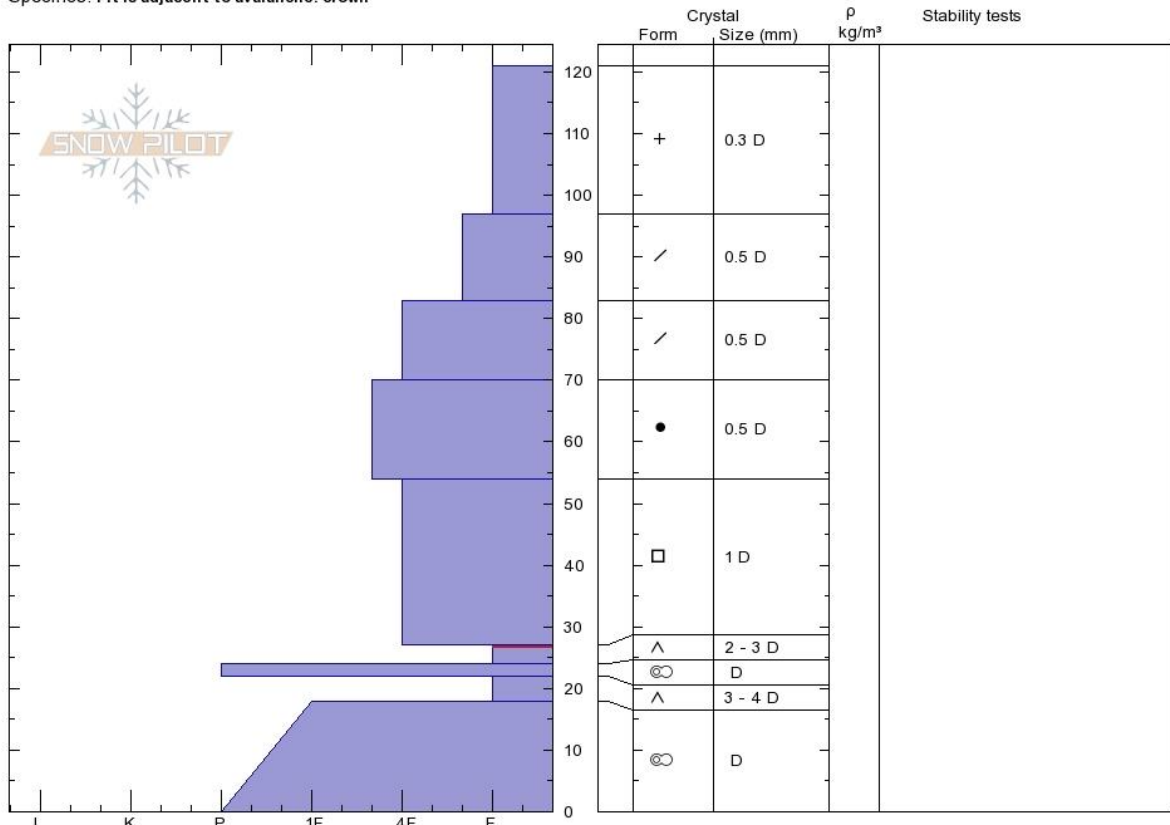


This snowpit profile was dug in the crown the day after the accident. Depth hoar crystals on an ice crust was the layer that failed.

Henderson Bench Ava Doug Chabot
Cooke City **Mon Dec 12 10:30 2016 (MST)**
MT Co-ord: **45.04734N, -109.92215W**
 Elevation: **9375 ft** Slope Angle: **34°**
 Aspect: **30°** Wind Loading: **no**
 Specifics: **Pit is adjacent to avalanche: crown**

Stability: **Poor** HS121
 Air Temperature: **-11°C**
 Sky Cover: **4/8 to 8/8 covered**
 Precipitation: **None**
 Wind: **Calm**

Layer Notes
 24-27: **Problematic layer**



Notes: This avalanche killed a skier on 12/11/2016. SS-AS-R4-D2-O.