

Henderson Mountain Avalanche Accident

Two riders caught, one partially buried, one fully buried

Custer-Gallatin National Forest – 28 November 2014

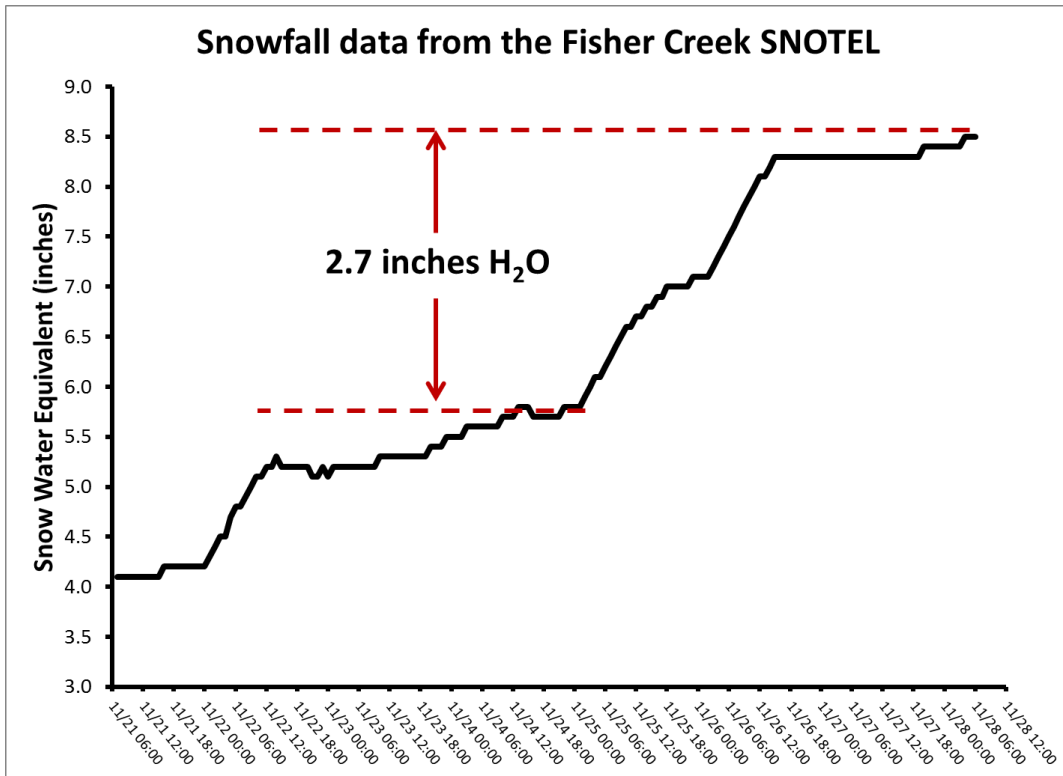
Synopsis

A group of 6 or 7 snowmobilers (part of a larger group of 13) ascended the northern end of Henderson Mountain from Fisher Creek. Two were climbing a slope, two were parked in a run out zone, and two or three others were riding in nearby trees when an adjacent slope avalanched. Of the two parked riders, one escaped and the other was buried 7 feet deep. Of the two riders climbing, one turned downhill as the avalanche released and was caught in the edge of the debris. He was caught, inflated his air bag backpack, and was buried to his waist. The other turned downhill after the avalanche released and were not caught. The two or three riders in the trees were not caught. The group assisted the partially buried rider. They quickly realized another was missing, located him, and dug him out of 7 feet of snow. His skin was blue, but he began breathing on his own. They estimated he was buried for 13 minutes. He did not have any serious injuries.

The avalanche danger was rated CONSIDERABLE. An avalanche fatality occurred two days prior on the southeast end of Henderson Mountain on November 26, 2014 during an Avalanche Warning. Avalanche dimensions and location were estimated from information from a phone interview and topographic maps. An on-site investigation did not occur. Estimated dimensions of the avalanche are 450 feet wide, 200 vertical feet, 2-3 foot fracture depth. The starting zone is near 9800 feet in elevation on a NE facing slope. An approximate location of burial is N 45.06001 W 109.95066. U.S. classification is SS-AMr-D2-R3.

Weather

Weather data come from two sites. Precipitation data come from the [Fisher Creek SNOTEL](#) (0.5 miles east) and wind data from a [GNFAC station at Lulu Pass](#) (1 mile north). The entire region experienced five days of extreme cold weather beginning the evening of November 10, 2014. The Fisher Creek SNOTEL recorded three days with low temperatures ranging from -13 F to -22 F. During that time Henderson Mountain had 16 inches of snow on the ground (3.1 inches of [snow water equivalent, SWE](#)). A series of storms followed. In the 3 days prior to the accident 2.7 inches of SWE fell which increased the snowpack water content by almost 50%. For seven days prior, westerly winds averaged 15 mph and gusted 35 mph.



Data from the Fisher Creek SNOTEL site show a rapid increase in snow water content. Total snow depth doubled and water content increased by almost 50%.



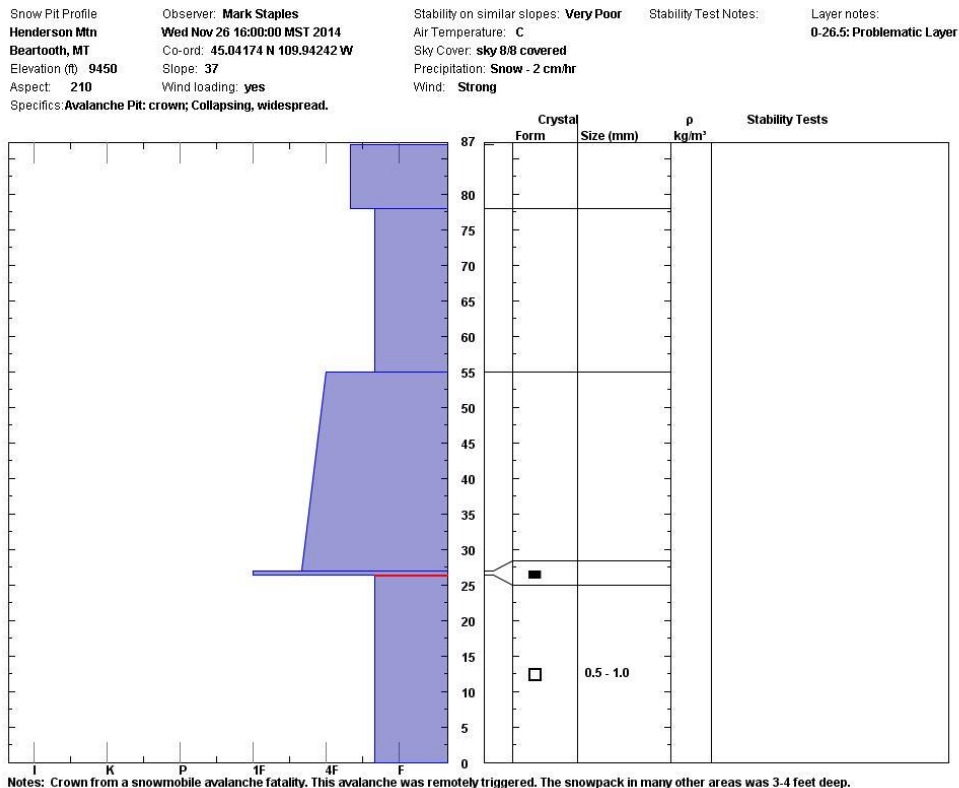
Snow conditions on 11-26. Notice the buried snowmobile. There was no base, only a layer of weak faceted snow crystals (aka – rotten snow) at the ground and it could not support the weight of so much new snow.

Snowpack

GNFAC Avalanche Specialist Mark Staples and a field partner investigated the fatal avalanche on November 26. They experienced collapsing and cracking of the snowpack, a clear sign of instability. Visibility was very poor, but they observed one fresh avalanche on the northwest side of Henderson Mountain above Fisher Creek that day.

Most slopes contained weak, faceted crystals near the ground. These facets formed during very cold weather in the second week of November and were immediately capped by 8 inches of snow. At the end of the third week of November, another 9 inches of snow fell and stressed these weak faceted crystals. Following this 9 inch storm, a group near Lulu Pass reported collapsing and cracking of the snowpack, an early sign of instability. Snowfall continued to load the snowpack and stress this weak layer. Between November 25 and 28, another 2.7 inches of SWE (about 30 inches of snow) fell. This was a very heavy load of new snow.

We were not able to investigate this avalanche. Snowpack stratigraphy from the fatal avalanche on 11-26 was likely very similar to the snowpack layering involved in this accident.



Snowpack profile in crown face of fatal avalanche two days prior. A very similar stratigraphy likely existed on the slope involved in the avalanche accident on 11-28.

Avalanche

Everyone in the group was an expert snowmobiler and familiar with the terrain near Cooke City. One member of the group, KS, visits Cooke City at least once per month during winter while others ride in the area as much as once a week. Every rider carried avalanche rescue gear, and most carried avalanche air bag backpacks. KS did not have an avalanche air bag pack. Several riders may have taken an avalanche class.

They were aware of avalanche conditions. They had seen avalanche debris from the fatal avalanche and knew it caused a fatality. They were aware of recent heavy snowfall and observed heavy wind loading on the NE side of Henderson Mtn.

They were riding in a group of 13 snowmobilers along Fisher Creek. 6 or 7 expert riders left the main group to climb a gully on the north end of Henderson Mountain past an old mine. Their goal was to reach a slope where one of their friends had been buried on January 17, 2014 the previous winter. He was fully buried, successfully recovered, but unfortunately died over the summer due to unrelated causes. They rode to that slope to remember their friend.

While in the area where their friend had been buried, KS and another snowmobiler were parked facing uphill under a slope that two riders were climbing. The remaining riders (2 or 3) were playing in a treed area when an adjacent slope released. We believe that one of the snowmobilers who was climbing triggered the avalanche. Triggering an avalanche some distance away from a slope is called a remote trigger.

KS and the other rider had their machines parked facing uphill in the run out zone. To escape, they had to start their machines and turn around. The other rider was able to get out of the way. KS was not and was caught. Riders in the trees were not in the run out zone and were not caught. Of the two snowmobilers climbing, one who turned downhill first, was caught in the edge of the avalanche debris as he descended into the runout zone. He inflated his avalanche air bag and was buried up to his waist. It is unclear if the air bag prevented a deeper burial or if it was his position in the avalanche that prevented a deeper burial. The other rider made his turn after the avalanche released and descended behind the moving avalanche debris. He was not caught.

Search and Rescue

The group converged on the partially buried rider. Initially they were not aware another person had been caught in the avalanches, but quickly realized someone was missing. They initiated a beacon search, acquired the signal from KS's beacon, got close to his location, and pinpointed his exact location with an avalanche probe. They left the probe in the snow when it struck KS. Because he was buried about 7 feet deep, they initially excavated a foot or two of snow over a wide area. After removing that snow, they dug to KS. When they uncovered him, he was blue and not breathing but started breathing on his own. KS does not remember much besides tumbling in the avalanche debris then "passing out" after a minute or two.

KS was uncovered in about 13 minutes. He was buried about 75 feet from his snowmobile but we don't know if he was above, below, or to the side of his sled. His partners did not see the sled initially but later found it with one ski sticking out of the snow a few inches.

KS did not sustain any major injuries and only reported a bad cough that lasted for about a month and bruising over much of his body.

Lessons

KS's partners executed a textbook rescue, but he is very lucky because few people survive burials deeper than 6 feet. Excavating someone that deep takes a lot of time, often too much time. Shoveling avalanche debris is the hardest and most time consuming part of a rescue. Additionally, the weight of that much snow prevents a person from expanding their chest to breathe.

There are several lessons from this accident:

1. **Park facing downhill:** The best option is to not park in a runout zone. However, it can be easy to misjudge where an avalanche will run and a good piece of insurance is to park facing downhill or away from the slope in question. Leaving your engine running is another good practice if possible.
2. **Keep track of everyone:** In large groups, keeping track of everyone is difficult. While it may be an inconvenience in non-avalanche terrain, it is a matter of life or death in avalanche terrain. If KS's partners had not realized he was missing, they would have wasted precious seconds. In large groups, pairing up with another rider of similar riding ability is a good option.
3. **Remote triggers and run out zones:** Avalanche terrain is any slope steeper than 30 degrees. Avalanche terrain is also flat terrain if it's underneath steeper slopes. During similar conditions with a collapsible weak layer of snow or during HIGH avalanche danger, you don't have to be on a steep slope to trigger an avalanche. Keeping wide margins from steep slopes is a good practice.
4. **Burial location:** Riders are often buried relatively close to their sled. If you see their sled in the debris, it is a good place to start your search. They can be buried uphill, downhill, to the side, or even under the sled.
5. **Buckle your chin strap:** KS did not have his chin strap buckled, and his helmet came off during the avalanche. He said many in his group ride without their buckles fastened. Purchase a quick release buckle so you are more likely to fasten your chin strap and retain your helmet during an avalanche.

Information in this report was gathered by Mark Staples who investigated the fatal avalanche two days prior to this one. KS provided a phone interview in June 2015. This report was prepared in July 2015.

Please direct any questions regarding this report Gallatin NF Avalanche Center at mtavalanche@gmail.com or 406-587-6984.

Mark Staples
Avalanche Specialist
Gallatin National Forest Avalanche Center