March 12th, 2024 Avalanche Fatality - Montana - West Fork Camp Creek near Lost Trail Pass, Bitterroot Mountains

Published by the West Central Montana Avalanche Center

Avalanche Details:

Location	West Fork Camp Creek near Lost Trail Pass, Bitterroot Mountains
State	Montana
Date	03/12/2024
Summary	1 backcountry skier caught, buried, and killed
Type	HS
Trigger	AS
Subcode	u - an unintentional release
Size - Relative	R3
Size - D Scale	D2
Weak Layer	Surface Hoar
Sliding Surface	O - Within Old Snow
Aspect	N
Elevation	8000 ft
Slope Angle	36-42 degree start zone
Width	225 feet
Depth	2-3 feet
Vertical	400 feet

Avalanche Summary:

On Tuesday, March 12th, 2024, a skier unintentionally triggered a large avalanche on a north-facing slope at 8000 feet, near Lost Trail Pass in the southern Bitterroot range (Figures 1-4). The skier triggered the avalanche on his first turn as he entered the slope just below a rocky convexity, about 100 vertical feet below the top of a ridge (Figure 5). The avalanche was triggered on a 42 degree slope but pulled back above the skier onto a more shallow 36-degree slope angle. The skier was caught and buried by the avalanche and, unfortunately, succumbed to traumatic injuries at the site. The avalanche was 2-3 feet deep, 225 feet wide, and ran 400 vertical feet through timber (Figures 6-10). The avalanche failed on a weak layer of surface hoar and is characterized as HS-ASu-R3-D2-O.

Snowpack Summary:

The snowpack at the crown of the avalanche consisted of a hard (up to 1F+) slab of snow above a thin layer of soft (F), 5-10mm needle-shaped surface hoar, which the avalanche broke on (Figures 11-14). The bed surface below the weak layer consisted of a 2 cm thick melt freeze crust.

Through late January, the winter in the Bitterroot range was characterized by a late start, below-average snowfall, and widespread weak layer formation. On January 27th and 28th, a warm atmospheric river brought rain to upper elevations across the region, forming a melt freeze crust at the snow surface. High pressure moved over the region between January 29th and February 1st, bringing above-average temperatures and dry weather. During this period, the Saddle Mountain Snotel, 1.1 miles to the southeast at 7,940 ft, recorded high temperatures in the upper 30s and low 40s and low temperatures near freezing. A layer of large (5-10 mm), needle shaped surface hoar formed above the crust in this location during this timeframe.

Light snow began to fall with calm to light winds on February 2nd, and the layer of surface hoar was subsequently buried. Observers reported the layer preserved in the snowpack near the accident site on February 2nd, 3rd, and 4th. This was an isolated layer of surface hoar. This is the only location in the region where observers found surface hoar buried directly on the crust interface. Across the majority of the forecast region, a layer of small facets formed above and below the crust in early February. See the comments section below for more details and conjecture about the formation and preservation of the surface hoar layer.

Several storms during the month of February built a slab above the layer of surface hoar. Between February 2nd and February 24th, 3.3” of SWE (Snow Water Equivalent) accumulated at the Saddle Mountain Snotel. Two skier triggered avalanches were reported that failed on the small facets above the crust during this period, but no avalanches were reported failing on surface hoar above the crust.

Between February 25th and March 2nd, two stronger storms tested this layer, with 2.2 total inches of SWE recorded at the Saddle Mountain Snotel, and a prolonged period of strong winds. The avalanche danger reached High with an Avalanche Warning on February 26th (a non-scheduled full forecast). When the weather cleared after this stronger storm cycle, observers reported a couple of isolated slab avalanches in other parts of the region that failed with large cornice fall triggers and may have stepped down to the layer of facets above the crust.

Between March 3rd and 6th, light snow showers continued and accumulated another 0.5” of SWE at the Saddle Mountain Snotel. High pressure moved in between March 7th and 10th, bringing mild temperatures, and generally calm and sunny weather. During the period between March 3rd and March 10th, the avalanche danger gradually decreased as the snowpack settled and adjusted to the load. On Sunday, March 10th, the avalanche danger reached Low.

A more active weather pattern began on the night of Sunday, March 10th. 0.1” of SWE accumulated at the Saddle Mountain Snotel between the night of March 10th and the morning of the accident on March 12th. Light snowfall continued during the day on the 12th, accumulating 0.2” of SWE at the Saddle Mountain Snotel by 2 pm.

There is minimal wind data for this region, with no upper elevation anemometers in the Bitterroot mountains. There is a DOT highway weather station at 7090’ along the highway on Lost Trail Pass, but this location is sheltered from most winds and is not representative of upper elevations. Lost Trail Ski Area operates an internal weather system for its chairlifts, which showed very light winds during the period when the surface hoar layer was buried in early February.

Backcountry Avalanche Forecast:

The Bitterroot forecast zone spans approximately 80 miles north-south and 30 miles east-west, with high degrees of spatial variability across the zone. Lost Trail Pass is the furthest south area within the forecast zone and usually has a weaker snowpack than the central or northern Bitterroot.

This area is serviced by an avalanche center that only issues forecasts four days per week on Thursdays through Sundays. As such, there was no active avalanche forecast when the accident occurred on Tuesday, March 12th. The danger was rated Low on Sunday, March 10th, and did not include a persistent slab problem. The Forecast Discussion included the following:

“We removed the persistent slab problem and the older wind slab problem yesterday. Triggering a slab avalanche has become very unlikely, and neither issue reaches the threshold to be included as a full avalanche problem. However, this does not mean they are no longer of any concern. Isolated and stubborn wind slabs may still linger in the highest terrain. Also, the poor snowpack structure that we have talked about for months did not suddenly disappear. The poor structure remains on some upper elevation slopes, especially those facing north and east. However, the buried weak layers have gained significant strength over the last few weeks and have been tested by several strong storms with minimal resulting avalanches.
[...]
If you dig down into the snow and find a poor snowpack structure with softer snow around hard crusts, or loose sugary snow below a firmer slab, recognize the continued potential for a large and dangerous persistent slab avalanche. You can reduce your exposure by sticking to slopes free of terrain traps and without rollovers or convexities.”

On Mondays, the avalanche center issues a General Avalanche Information product for the period of Monday to Wednesday. The General Avalanche Information product includes a brief Bottom Line and a request for donations and support. The Bottom Line of the General Avalanche Information Product published on Monday, March 11th stated:

“The snowpack is generally stable beneath the new snow. The likelihood of triggering a larger persistent slab avalanche on a buried weak layer is very low. However, poor snowpack structure remains on some upper elevation slopes.”

Events Prior to the Accident:

On Tuesday, March 12th, 2024, a group of 5 yurt-based backcountry skiers were recreating on Lost Trail Pass in the southern Bitterroot range of Montana (Figure 1). All of the skiers were experienced, with some members in the group having 30+ years of backcountry skiing experience. Skiers 1 and 2 live locally on the Idaho side of the pass and were familiar with the terrain. This was their first time on this slope this season. Skiers 3, 4, and 5 were not local to the area.

In the days leading up to their trip, all parties read the avalanche forecast. The most recent forecast was issued on Sunday, March 10th. On March 11th, a General Avalanche Information product was issued for the period of March 11th-13th, which all party members read.

The group arrived at their yurt around noon to drop gear and eat lunch before leaving to ski at approximately 1230. The group skinned to the ridgeline above the West Fork of Camp Creek. They kept their skins on and moved about 30 feet off the low angle slope near the ridge to view the terrain they were looking to ski before transitioning to ski mode.

Accident Summary:

The group observed ski tracks on the slope, estimated to be from the weekend before. Skiers 1, 4, and 5 chose to descend a slope on the skiers left side of a sub-ridge, and skiers 2 and 3 chose a slope on the skiers right side. The group waited at the top of the sub-ridge to watch each skier descend. Skier 1 skied first and descended partway down before traversing skiers right to an island of safety. Skier 5 entered the slope next, just below a rocky convexity, and triggered the avalanche on his first turn. Skier 1 saw the avalanche pass and saw Skier 5 involved in the avalanche. Skier 1 communicated the avalanche to the rest of the party before beginning a beacon search.

Skiers 2, 3, and 4 met at the top of the avalanche. Skier 2 descended to the right of the avalanche before cutting onto the debris. A second, smaller avalanche was triggered while skiers 2, 3, and 4 were descending to begin their search. All parties put their beacons into search mode once they had descended the steeper terrain and made it onto debris. Skier 1 picked up a beacon signal and followed it to within three feet. Skier 2 arrived and confirmed the beacon signal. Skier 1 pulled out a probe, while Skier 2 pulled out a shovel. Skier 2 found a ski, still attached to Skier 5. Skier 1 found a hand. All parties involved moved quickly to get an airway and estimated ten minutes from the time of the avalanche to the time they had a clear airway for Skier 5. Skier 5 struck a tree during the avalanche and sustained significant traumatic injuries. The group worked together to manage Skier 5’s injuries and coordinate communication with search and rescue.

Rescue Summary:

The group used a satellite messaging device to alert search and rescue of the incident. Ravalli County Search and Rescue and a hoist-capable helicopter from Kalispell, Montana, responded. Unfortunately, Skier 5 succumbed to his injuries and passed away before the helicopter's arrival. The helicopter removed the victim from the scene.

Ravalli County search and rescue accessed the slope via snowmobile by traveling through Lost Trail Ski Area and descending off the backside to the accident site. This is a steep and timbered area, and in the following days, a helicopter was required to longline the snowmobiles back out.

Comments:

The fatal avalanche accidents we investigate are tragic events. We do our best to describe each one to help the people involved and the community better understand them. We offer these comments in the hope that they will help people avoid future avalanche accidents.

This was an experienced group, and two of the members were familiar with the terrain. Although they did not dig a snowpit or perform any stability assessments that day, snowpits and stability tests on slopes of similar aspect/elevation in the previous days showed a stronger snowpack structure than the slope that avalanched. The slope that avalanched contained an isolated pocket of especially weak snow (surface hoar) - the weakest snow forecasters had observed in the region in quite some time.

There is some uncertainty as to why this layer of surface hoar was only observed on or very near this slope, and not in any other part of the region or on other nearby slopes. There were other isolated observations of surface hoar buried near the crust, within the slab above. However, this is the only location where the surface hoar was observed directly on the crust interface. Buried surface hoar distribution can be patchy, and it is possible that the layer existed on other slopes but was not observed. Lost Trail Pass can have unique weather conditions that are not observed in other parts of the forecast zone due to its geographic location at the north end of the Salmon River Canyon. Winds typically funnel up the Salmon River, then swing north up the North Fork of the Salmon and over Lost Trail Pass. This results in higher wind speeds over the pass than in other areas of the forecast zone. The slope where the avalanche occurred is more sheltered by trees than other start zones in the West Fork of Camp Creek, which could have allowed a pocket of surface hoar to be protected from the wind and preserved. Additionally, the sunshine and above-average temperatures during the formation period likely destroyed any surface hoar that formed on non-northerly aspects. The slope where the avalanche occurred is steep, north facing, and well protected from the sun, which also could have allowed a pocket of surface hoar to be preserved.

The group did a commendable job in their search and first aid. Managing traumatic injuries is one of the most difficult parts of an avalanche rescue. Trauma is responsible for approximately

30% of avalanche deaths. In addition to standard rescue equipment of a beacon, probe, and shovel, first aid equipment and the knowledge of how to use it is an important piece of the avalanche rescue progression.

Any questions should be directed to:

West Central Montana Avalanche Center

info@missoulaavalanche.org

Figures:

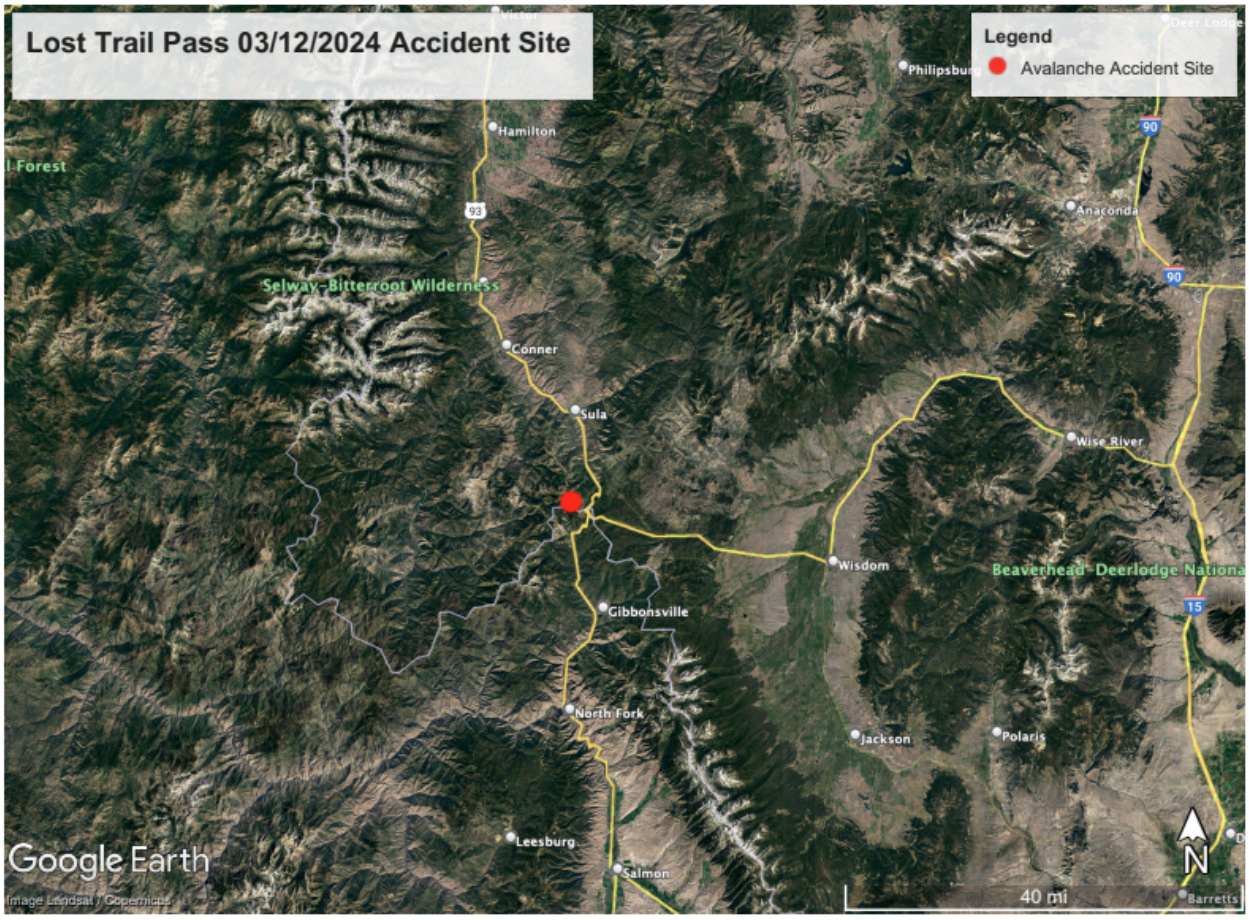

Figure 1: Google Earth map showing the avalanche accident site within the region.

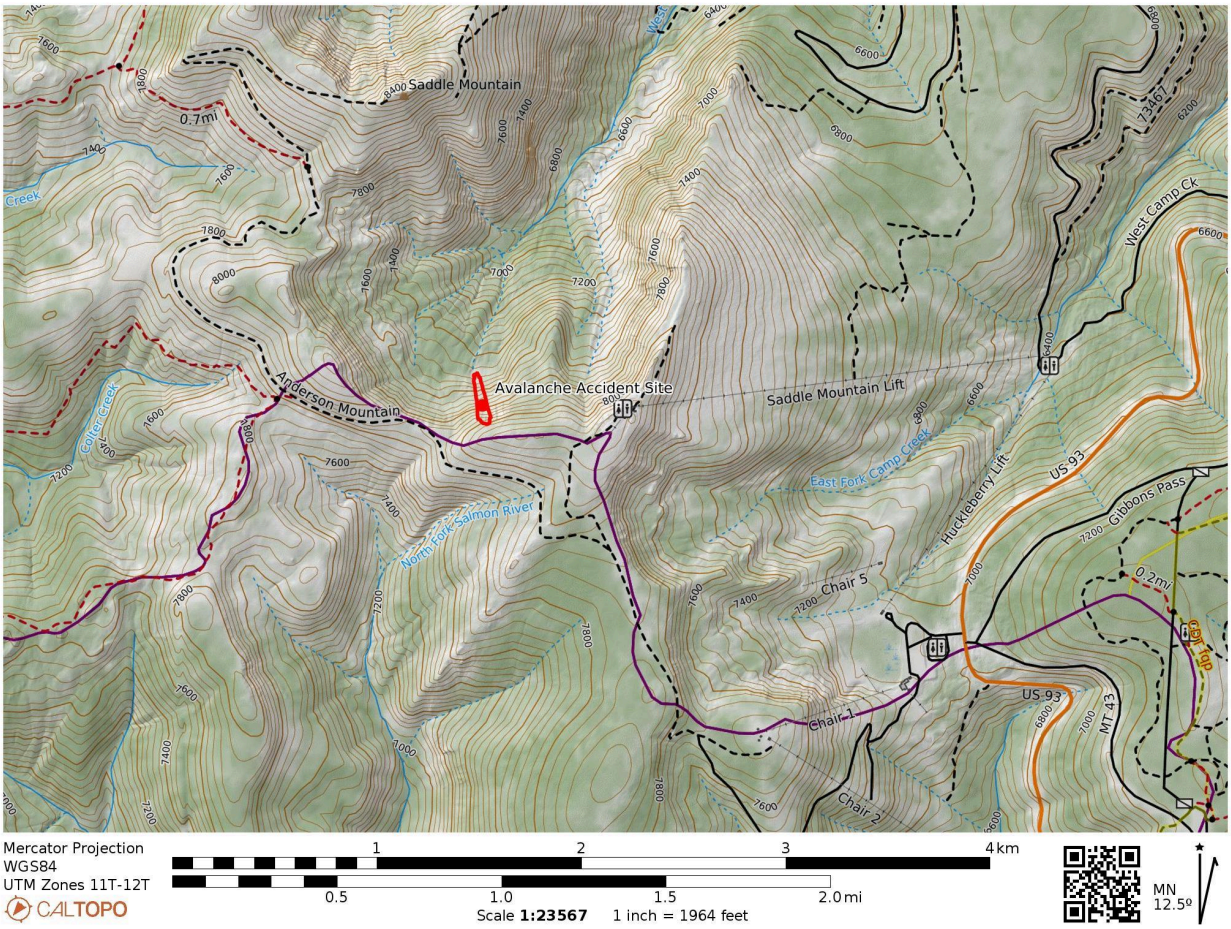

Figure 2: Caltopo topographic map showing the location of the avalanche.

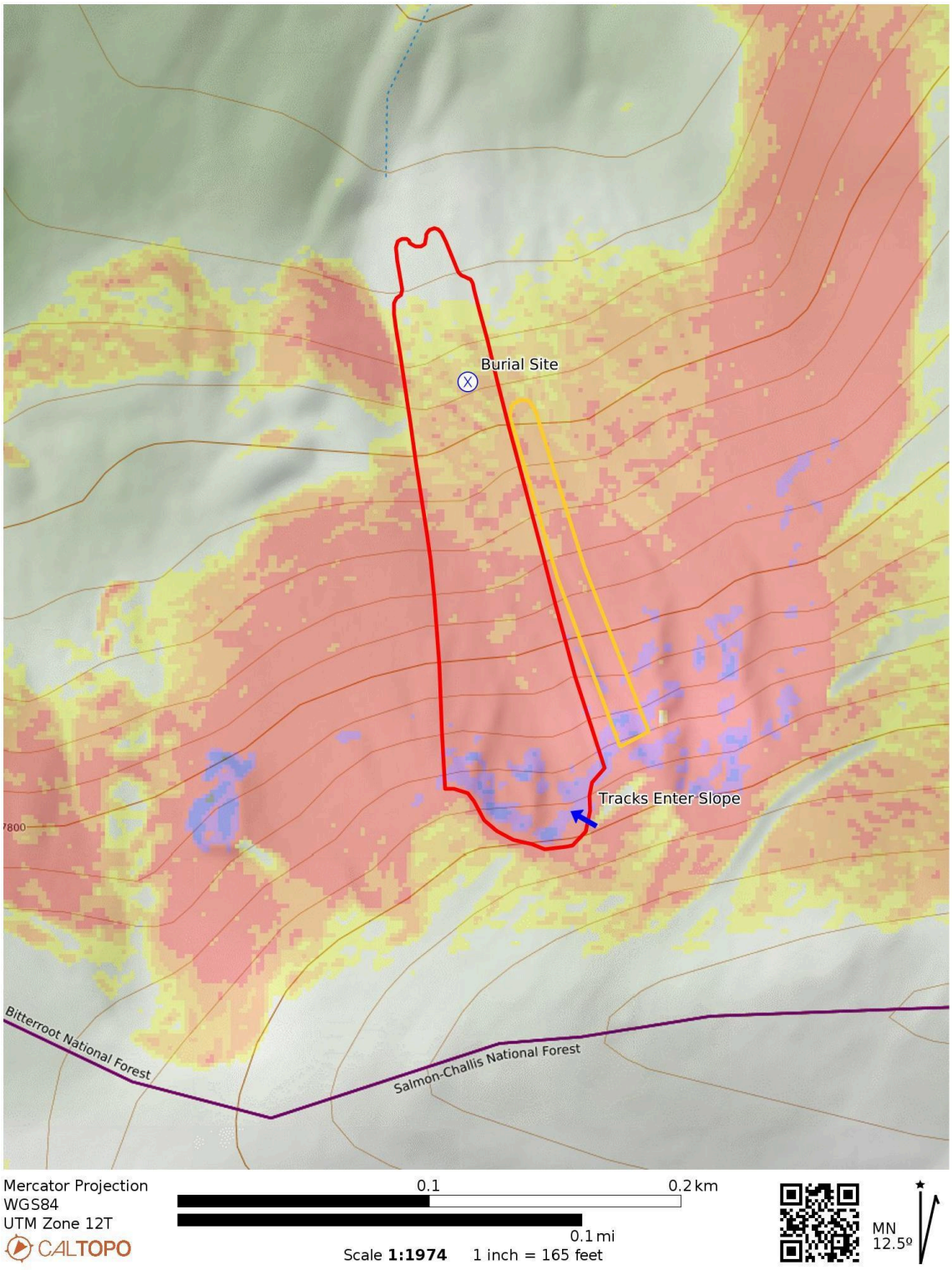

Figure 3: Caltopo topographic map with slope angle shading that depicts the avalanche accident site. Both the burial location and the location of the tracks entering the slope are marked. The red outline shows the extent of the avalanche. The orange outline shows the second avalanche triggered during the rescue.

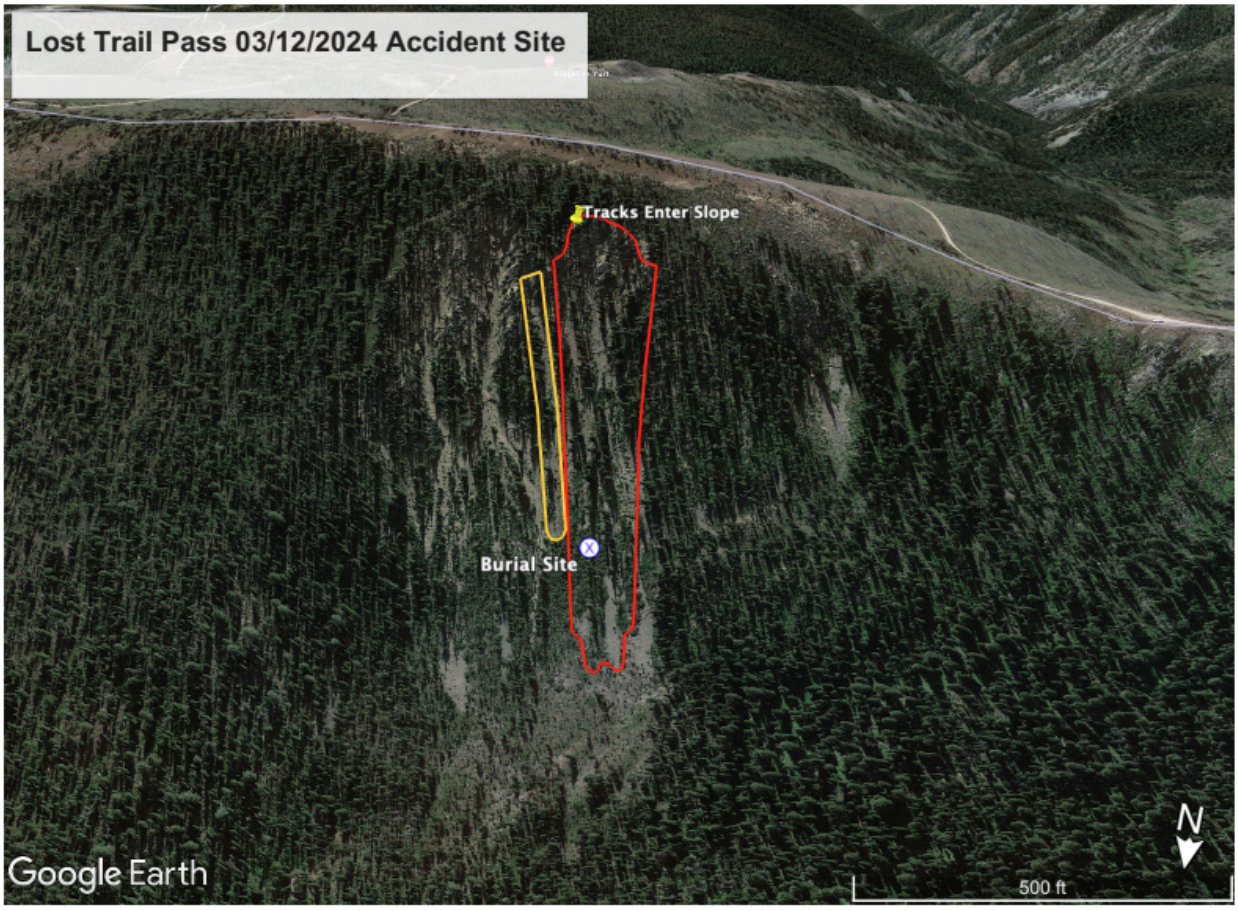

Figure 4: Google Earth map of the avalanche accident site. The burial location and the location of the tracks entering the slope are marked. The red outline shows the extent of the avalanche. The orange outline shows the second avalanche triggered during the rescue.

Figure 5: Looking up at the crown of the avalanche where the skier's tracks entered the slope. The tracks are visible just above the orange flagging tied to a tree. Photo taken on March 13th, 2024, the day after the avalanche.

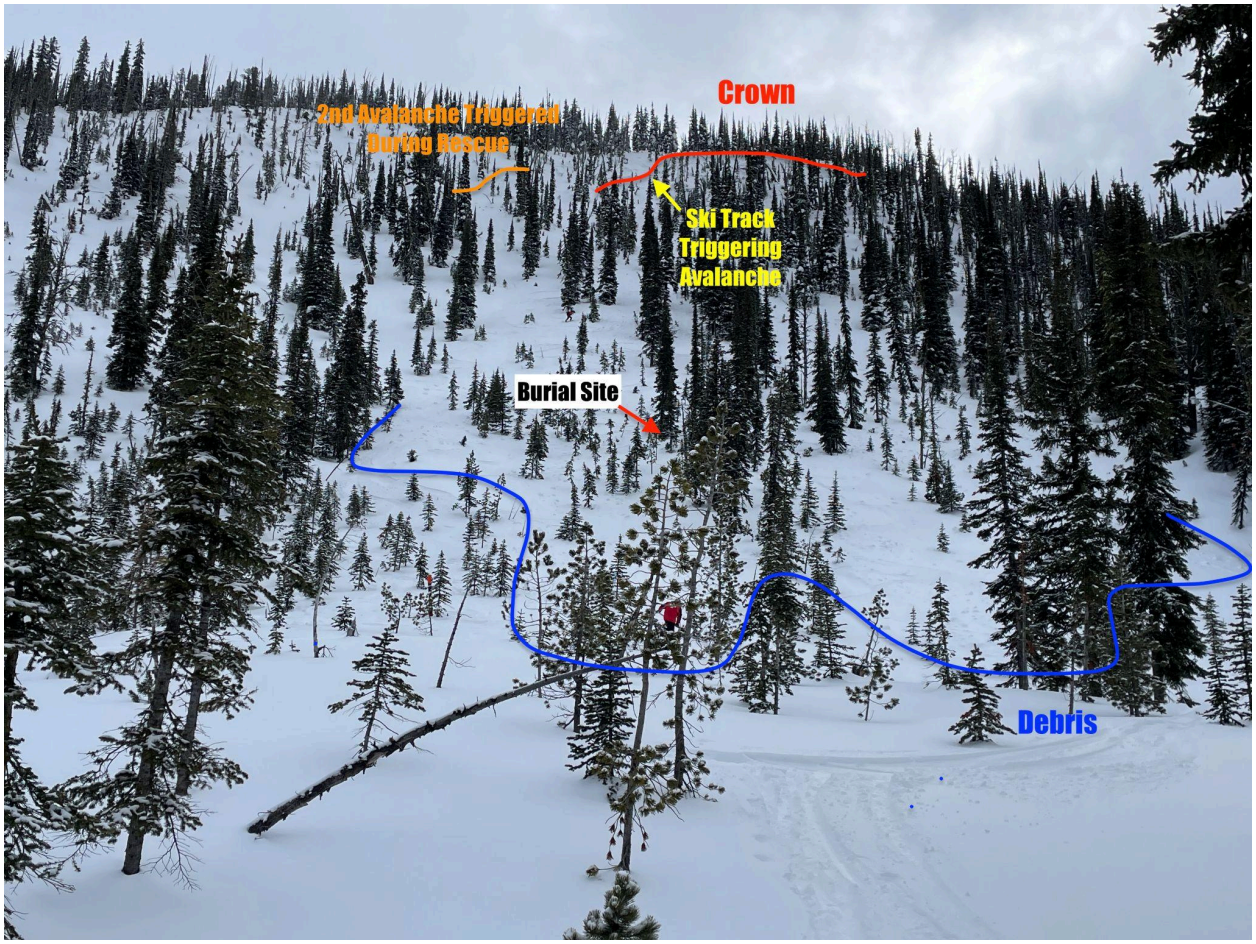

Figure 6: Looking up at the avalanche accident site. The ski tracks entering the slope, and the burial location are marked. The red line is the crown, and the blue line is the extent of debris. The orange line is the second avalanche that was triggered during the rescue. Photo taken on March 13th, 2024, the day after the avalanche.

Figure 7: Looking up at the avalanche accident site on the day after the avalanche. The crown is visible near the ridgeline, and the person is standing near the toe of the debris.

Figure 8: The crown of the avalanche, where it pulled back to a 36 degree slope. Photo taken on March 13th, 2024, the day after the avalanche.

Figure 9: Looking down the avalanche path from the start zone near where the skier's tracks enter the slope. Photo taken on March 14th, 2024, two days after the avalanche.

Figure 10: The burial location with the avalanche path above. Photo taken on March 13th, 2024, the day after the avalanche.

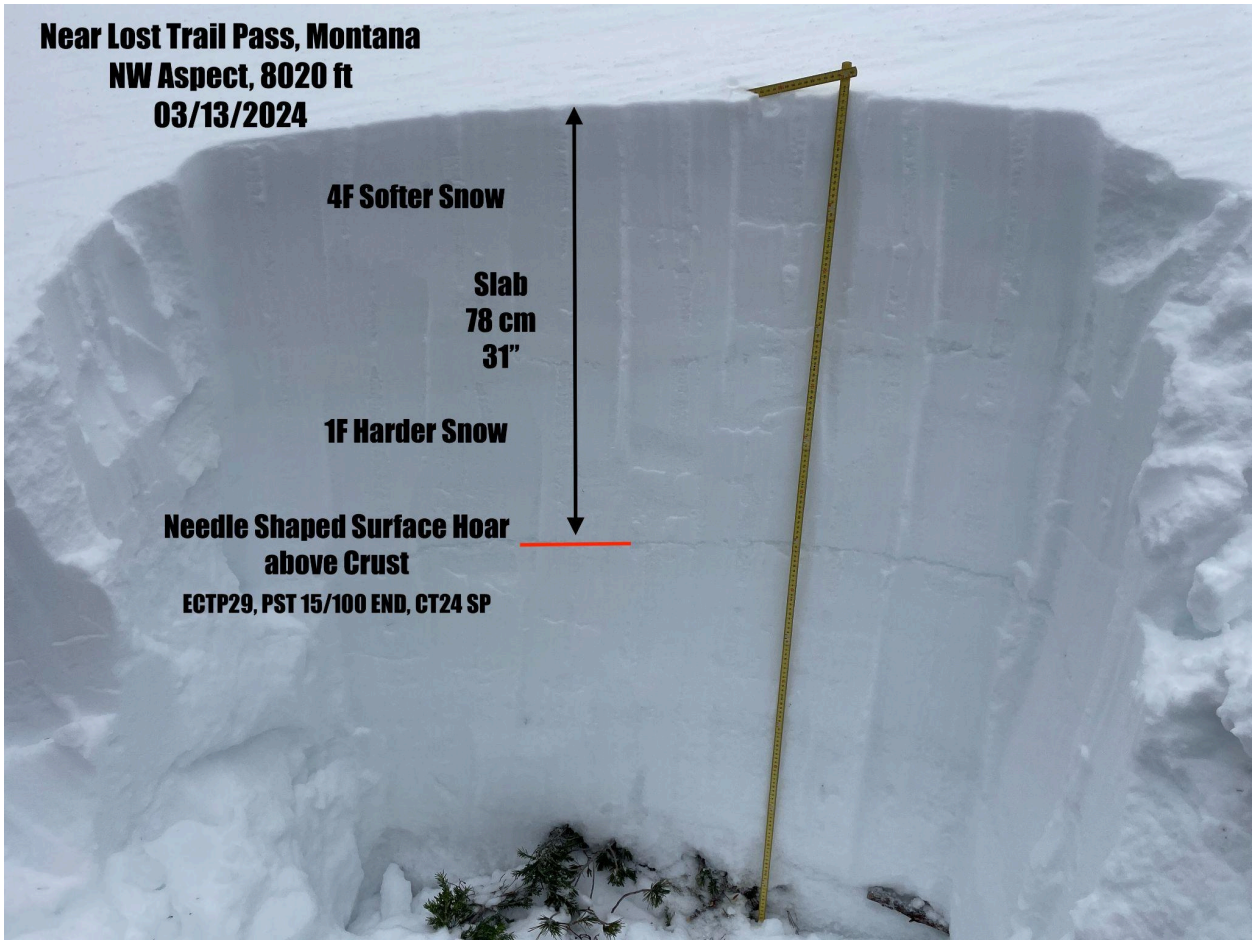

Figure 11: A snowpit that was dug approximately 40 feet away from the crown on the day after the avalanche, showing the slab and weak layer.

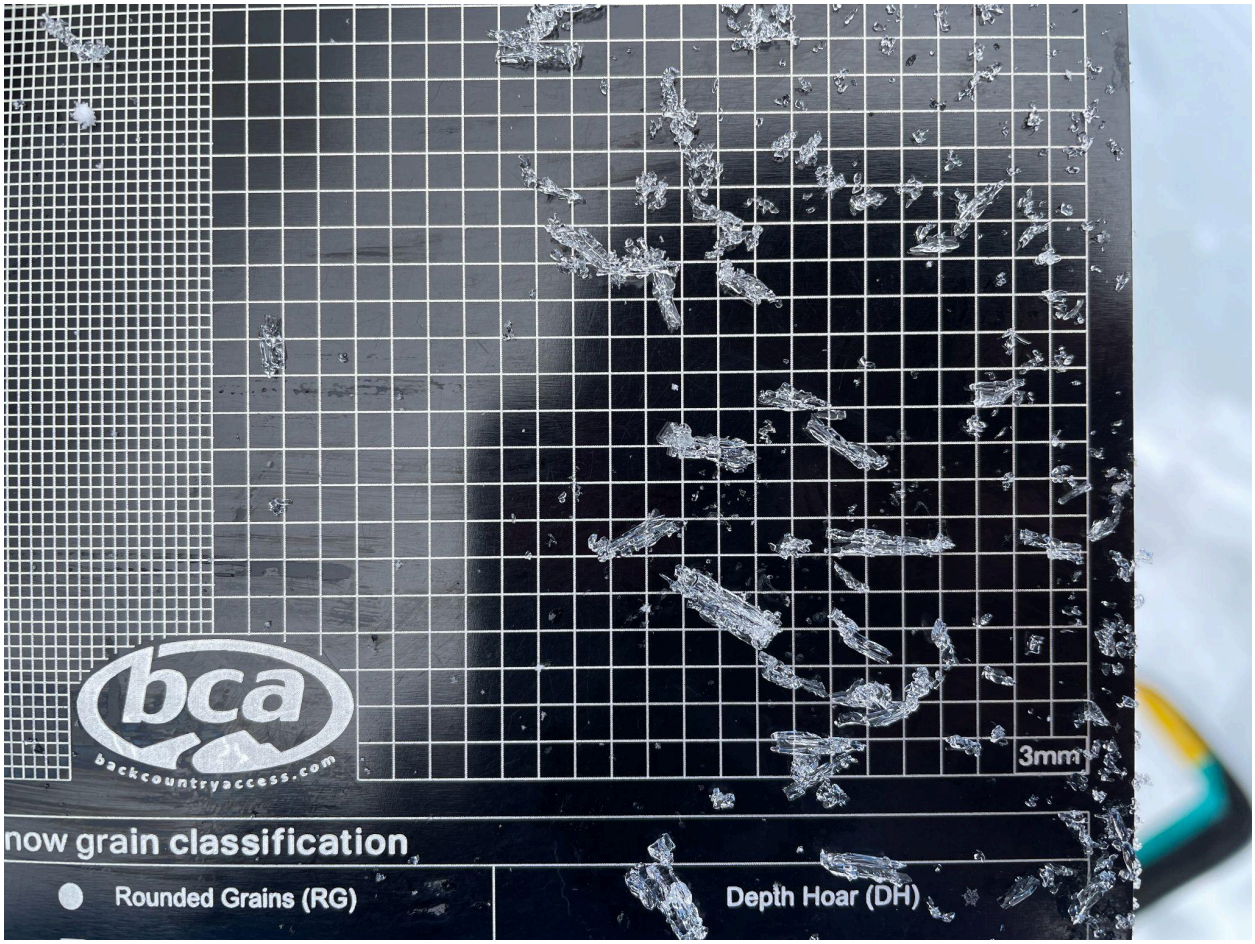

Figure 12: Large, needle shaped surface hoar crystals - the weak layer the avalanche failed on. Photo taken on March 13th, 2024, the day after the avalanche.

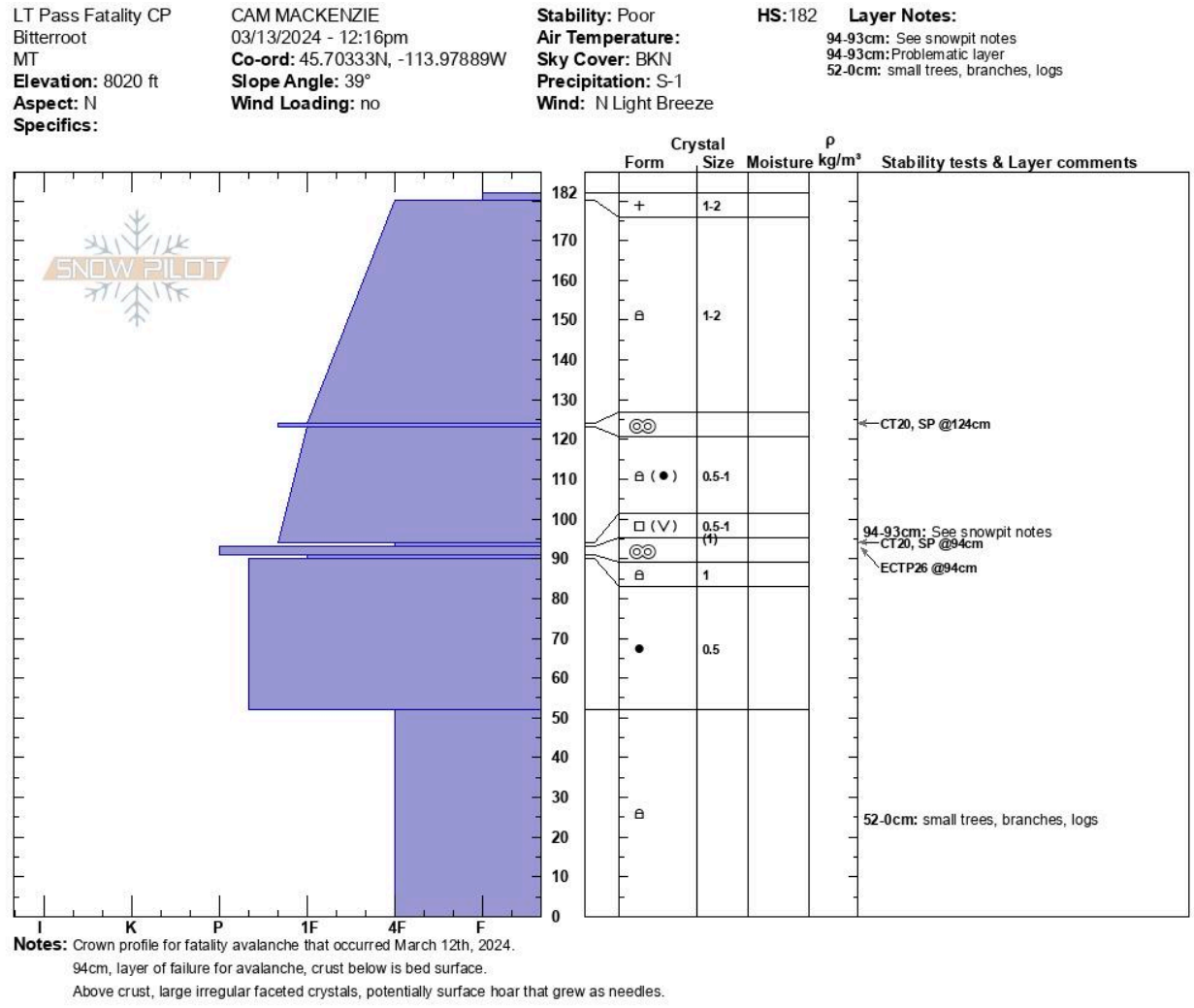

Figure 13: Snowpit profile from the crown of the avalanche. Observed and recorded March 13th, 2024, the day after the avalanche.

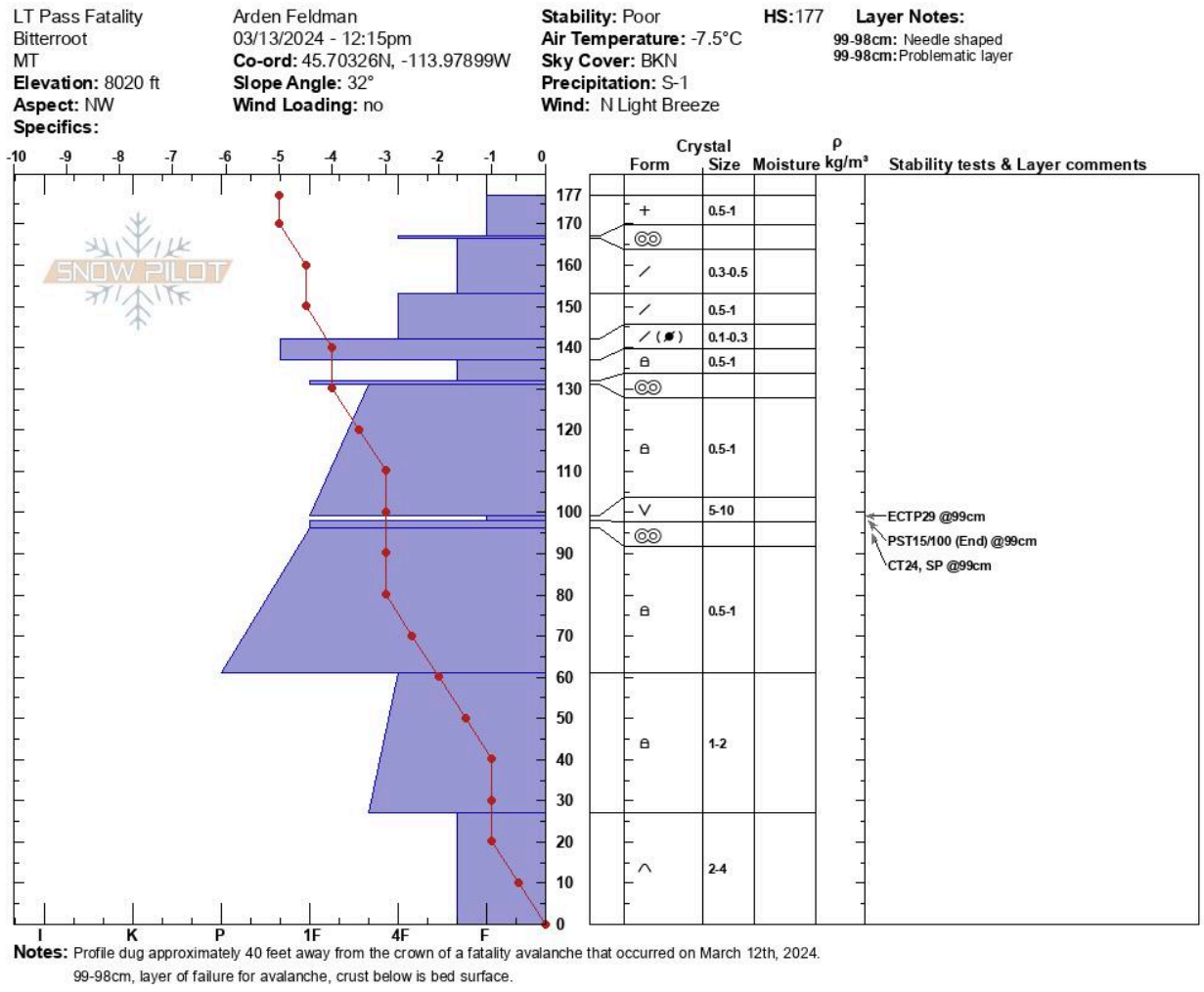

Figure 14: Snowpit profile from approximately 40 feet away from the crown of the avalanche. Observed and recorded the day after the avalanche.