

Silver Basin Avalanche Fatality

December 11, 2021

Report by Andy Harrington and Dallas Glass

Incident Summary

On the morning of Saturday, December 11, a party of 6 skiers toured from the parking lot at Crystal Mt. The group planned to ski Silver Basin, a section of the ski area that had not yet been opened for the season, had not received avalanche mitigation, and thus contained a backcountry snowpack. After a short break near the bottom of the basin, the team began a long ascending traverse heading towards Silver Saddle. About 250 vertical feet below the ridgeline locally known as The Boxcar, the group noticed small cracks and felt "the snow change". They turned back across the slope, intending to find a place to transition for the ski down. At this point, all six members were traveling close together when the slope avalanched. The entire party was caught and carried and three were fully buried. A nearby party of two witnessed the accident, called 911, and assisted with the rescue. Crystal Mt Ski Patrol was notified of the accident through 911 and also responded to the scene. Although two of the buried skiers were rescued, the third sustained multiple injuries. The party was escorted away from the scene by ski patrol and several volunteers. The Northwest Avalanche Center and Crystal Mt Ski Patrol returned to the scene on December 12 to conduct an avalanche investigation.

Occurrence Time and Date: Approx 10:50 on Dec 11, 2021

Time First Reported to SAR: 10:50

Recovery/Rescue Time: Approximately 25min, All members were located and extracted by 11:16

Lat/Lon: 46.91158, -121.50222

Location: Crystal Mountain Ski Area, Silver Basin, Pierce County, Mt Baker-Snoqualmie NF, WA

Number in Party: 6

Number Caught: 6

Number Partially Buried, Critical or Not-critical: 2 partial non-critical, 1 partial critical

Number Completely Buried: 3

Duration of Burial: <15min

Number Injured: 0

Number Killed: 1

Avalanche Type: SS

Trigger: ASu

Size: R3 /D2.5

Start Zone Aspect: NE-E

Start Zone Angle: Est. Avg 35

Start Zone Elevation: Approx: 6600'

Height of Crown Face: Est. 2'

Width of Fracture: Estimated 600'

Vertical Fall: Est: 650'

Slab Characteristics: Unknown

Weak Layer Characteristics: Unknown

Bed Surface Characteristics: Unknown

Burial involved a terrain trap: Yes, trees and a small cliff.

Number of people that crossed start zone before avalanche: None

Avalanche occurred during: Ascent

Location of group in relation to start zone during avalanche: All six members were grouped together in the middle of the start zone.

Avalanche Safety Gear Carried: All members carried shovels, probes, and transceivers

Avalanche Training and Experience at Activity: Most if not all members in the group had a Level 1

Signs of Instability Noted by Group: Blowing snow, significant new snow, small shooting cracks

Extent of Injuries or Cause of Death:

- Skier 2: was found unconscious, not breather, but did have a pulse. Once the snow was removed and the skier was repositioned he began breathing. He reported no injuries and did not seek medical attention.
- Skier 4: was strained through a stand of small trees and sustained blunt trauma.
 - M.E. cause of death: "multiple blunt force injuries"

NWAC Forecast Zone: West South Zone

Avalanche Danger Rating (Above, Near or Below Tree-line):

The forecasted avalanche danger was Considerable near and above tree-line and Moderate below tree-line at the time of the accident. You can read the forecast for 12/11 [here](#).

Terrain

The accident occurred on an east to northeast facing open bowl below a ridgeline saddle at approximately 6600 feet. From the saddle, the ridgeline carries northward and ascends a mountain (Silver King) where multiple larger east to southeast avalanche paths exist. In the other direction, the ridge trends southeast and becomes more rocky as it wraps around to provide more northerly facing avalanche paths that feed back into Silver Basin. The predominantly westerly winds often wind load this bowl and build a large corniced area locally known as The Boxcar just to the north of the saddle as the season progresses.

The main bowl of Silver Basin is concave shaped with steeper slopes ranging from 33-44 degrees near the ridgeline. The lower slope angles lie near the middle of the saddle with steeper terrain on the sides of the bowl. Near the foot of the slope, slope angles decrease to the

lower 30s with sparse knobs, tree islands, and small cliffs. Subtle gullies between these knobs and tree islands filter toward a relative bench before descending into a steeper gully at the bottom of the basin.

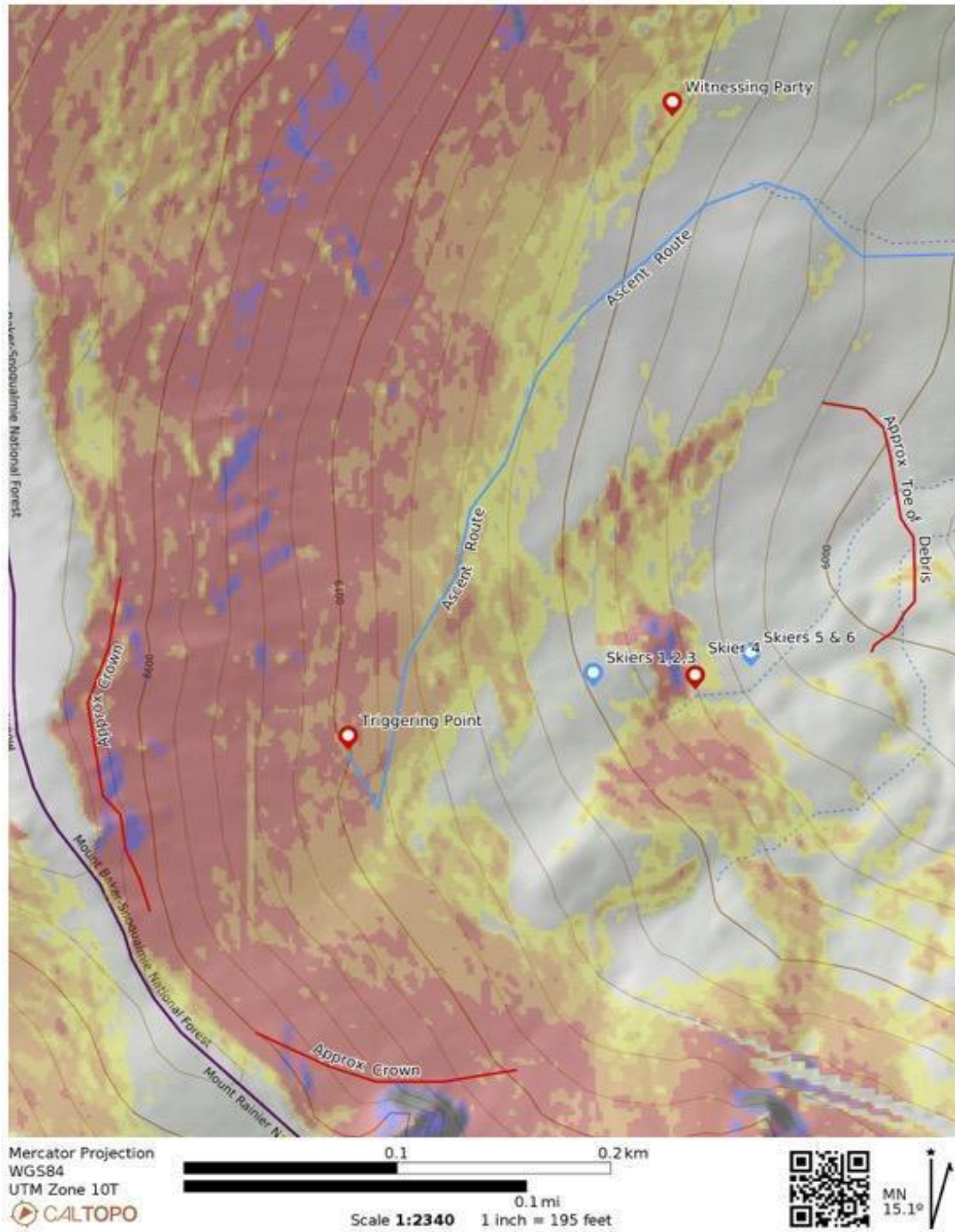


Figure 1: Approximate travel route and locations of burials based on GPX tracks from the involved group.

Avalanche

The avalanche occurred on a NE-E aspect at approximately 6600 feet. It had an estimated crown depth of two feet and an estimated width of 600 feet. The ascending party triggered the slide from an area climber's right of the saddle with a slope angle of approximately 33 degrees. The crown ran through steeper terrains near the ridgeline with slope angles in the 40s. The weak layer and avalanche character are unknown, but a layer of 1mm rounding facets found in a nearby snow profile 130cm below the surface may have played a role.

A second slope released sympathetically just to the south of the triggered avalanche. This second slide failed approximately 400 feet wide and two feet deep. Slope angle ranges from 33-44 degrees in this area. The debris from both avalanches came together and ran approximately 650 vertical feet, crossing through small treed knobs and filtering into subtle gullies. The bulk of the debris came to rest in a large gentle depression where many of the gullies converge. The side of at least one of the knobs also released as the debris descended. Crystal Mountain Ski Patrol relayed that the side of this feature has not slid in recent memory.



Photo: 1: A photo of the accident site taken on the day of the slide. Faint crown lines are visible near the ridgeline.

Snowpack

Conditions in the Silver Basin area were still considered early season at the time of the accident. Silver Basin is within the Crystal Mountain Ski Resort operating boundary, but this terrain was not yet opened, patrolled, nor mitigated for avalanches due to lack of snow cover. On Sunday, 12/12/21, the snow depth in a representative location of Silver Basin was found to be 162cm with a generally right-side-up snow profile. A layer of 1mm rounding facets was found at 32cm but cannot be confirmed as the weak layer responsible for this accident. This layer was above a knife-hard melt-freeze crust formed and buried on 12/8. The slope that failed was observed to be wind-loaded.

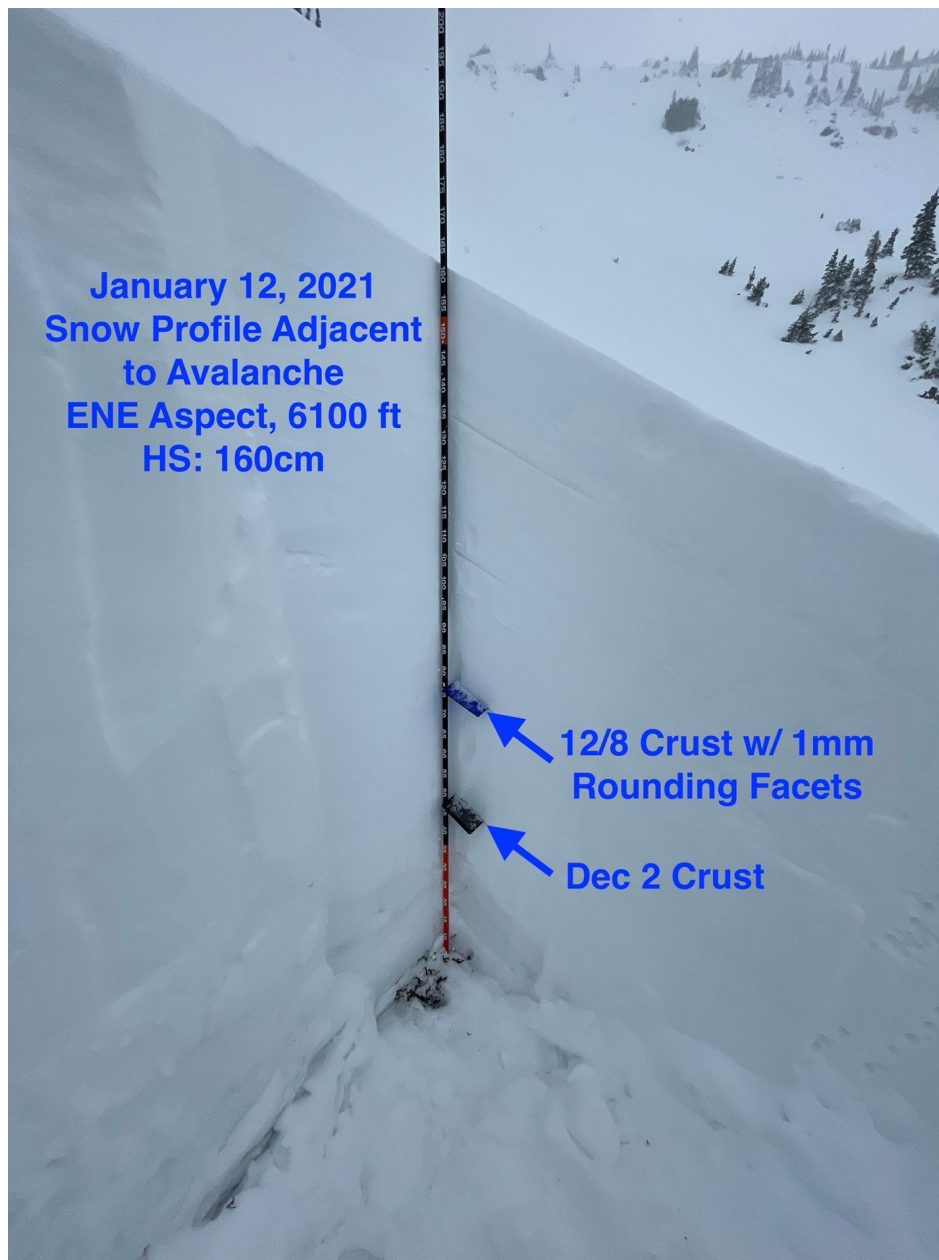


Photo 2: Snow profile near the avalanche site. About 1 ft of snow fell at the site overnight between the accident and the investigation.

Weather Summary

The first real winter storm of the season was forecast to impact the area on the day of the accident. Crystal Mountain was expected to receive up to 2" of water Friday night and Saturday along with strong ridgeline winds and a brief warm-up on Saturday.

Automated weather stations at Crystal Mountain recorded 11 inches of new snow overnight with an additional 5 inches falling throughout the day on 12/11. Winds averaged WSW 40-50 mph with gusts of 60-90 mph leading up to the time of the accident. A brief warmup did occur on Saturday morning and corresponded with the highest precipitation rates of the storm.

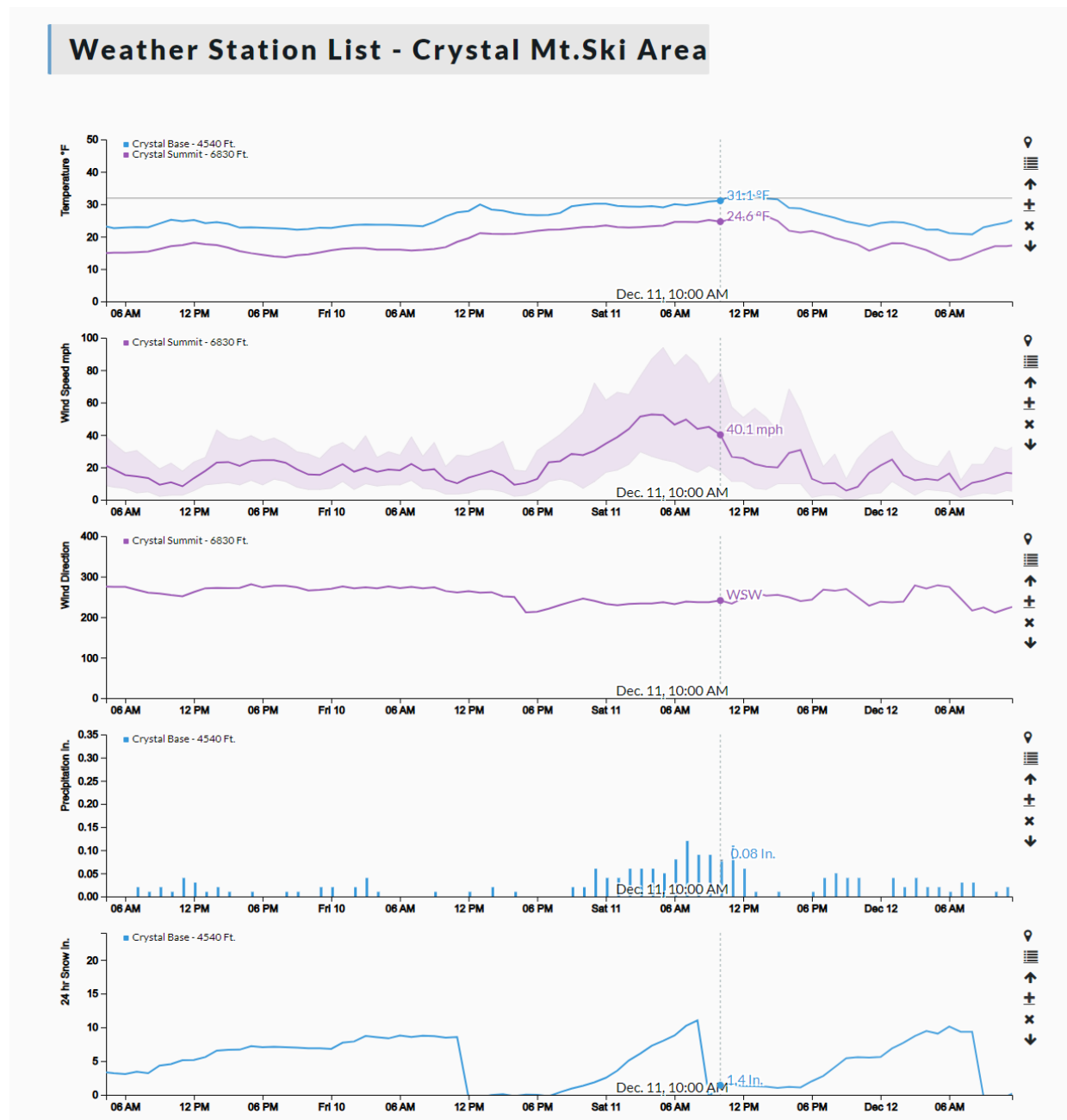


Figure 2: Weather from Crystal Mountain weather stations on the day of the accident.

Accident Summary

On the morning of December 11, a group of six ski tourers arrived together in the Crystal Mountain parking lot to ski in the Silver Basin area. The party took the approved uptrack through the open resort toward Silver Basin. As they left the confines of the operating ski resort, they broke trail and continued up into the basin instead of trending left toward the backcountry terrain away from the resort. The group decided to take a break on a knoll below the headwall of Silver Basin. At this point, some members of the party reported feeling uneasy about ascending the headwall toward the ridgeline. A brief discussion occurred and they decided to continue.

As the team ascended the headwall via a long traverse, they continued to break trail and about 250 vertical feet below the ridgeline they saw cracking and “felt the snow change”. They turned back across the slope to the north, intending to find a place to transition for the ski down. At this point, all six members were close together when the slope avalanched. The entire party was caught, carried, and deposited in two groups of three.

The upper three members of the group came to rest approximately 200 vertical feet below the trigger point. Of this group, skiers 1 (not critical) and 3 (critical) were partially buried, while skier 2 was fully buried.

The other three members of the group were deposited approximately 350 vertical feet below the trigger point. Of this group, skiers 4 and 5 were fully buried, while skier 6 was partially buried (not critical). Skier 4 was swept through a tree island and over a small cliff during the descent.

Rescue Summary

Because the party was deposited into two separate groups, the ensuing rescue occurred in two stages. In the upper party, skiers 1 and 3 were able to free themselves, locate each other and begin searching for skier 2. Skier 3 called 911 and was patched through to Crystal Mountain Ski Patrol who assisted via telephone with best practices during a rescue. Skier 2 was located by skier 1’s transceiver and probe within minutes. Skier 2 was less than a foot below the surface, was quickly excavated and found to not be breathing, but did have a pulse. After clearing the snow from his face and rolling the skier over, skier 2 began breathing and was left to recover as skier 1 and 3 searched for other members of the party.

Simultaneously, rescue efforts were underway with the lower group. A nearby party of two had witnessed the accident. Witness 1 stayed in a safe zone and called 911 while witness 2 rushed to assist with the rescue. Skier 6 was able to self extricate and immediately began a transceiver search, quickly locating skier 5, who was fully buried, but had a large air pocket. Witness 2 confirmed verbally that skier 5 had an airway and then directed his attention toward finding other members of the involved party. Witness 2 located skier 4 by using a visual clue of a backpack hanging in a tree and then focussing his beacon search fall line from the backpack. Skier 4 was found fully buried about a foot below the surface and upon extraction deemed to have obvious trauma, no pulse, and was not breathing. After clearing the airway of snow, CPR was performed

by witness 2 where a soft thorax was noted. Witness 2 terminated CPR after a few minutes, thinking that 3 other individuals were still missing. At this time, skier 6 had gotten skier 5 to the surface, who was unharmed. Witness 2 started to proceed uphill where verbal contact with the upper party was established and it was determined that all involved individuals were accounted for and unharmed. Skier 4 was presumed dead by the group due to obvious trauma and lack of responsiveness to CPR.

At this point, a decision was made to exit the scene to a safer location and all individuals, apart from skier 4, descended toward the treeline to regroup. Around this time, volunteers and Crystal Mountain Ski Patrol arrived at the accident site. The scene was evaluated and Crystal Mountain Ski Patrol recovered skier 4 while the involved parties were escorted back toward Crystal Mountain Resort to debrief.

NWAC staff and Crystal Mountain Ski Patrol returned the following day, Sunday December 12, 2021 to conduct an accident investigation and take additional photos. Stormy weather on the day of the investigation limited access to the crown and hampered information gathering.

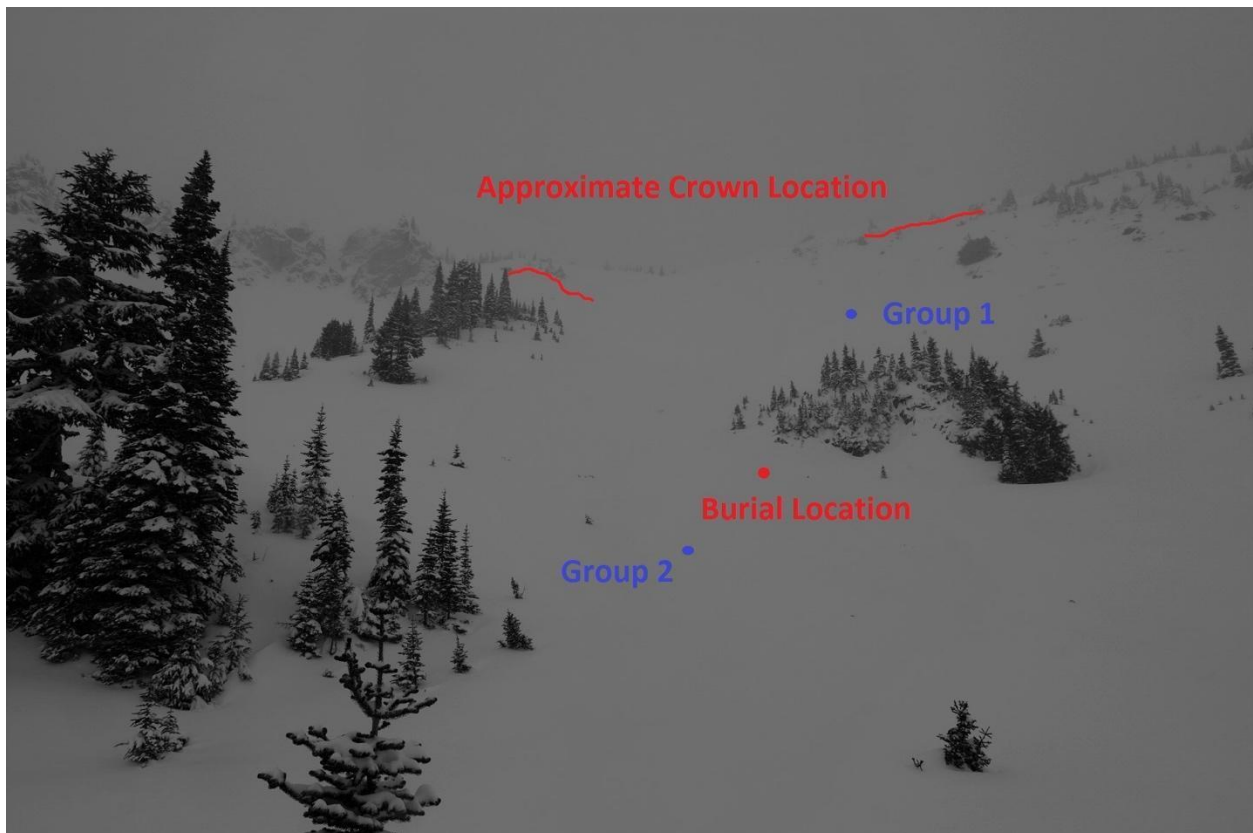


Photo 3: Approximate burial locations of party members.



Photo 4: Looking down the debris field from the burial location of skier 4.

Commentary / Discussion / Important Points

Silver Basin is within the Crystal Mountain ski area boundary and during full operations is regularly mitigated for avalanches by the Crystal Mountain Ski Patrol. On the day of the accident, a significant winter storm was set to impact the region. Due to low snow coverage prior to this storm, Crystal Mountain Resort was not running at full capacity, thus Silver Basin contained backcountry conditions at the time of the accident. Physical signs enroute to Silver Basin and information on the resort's website disclosed the resort's uphill travel policy, avalanche mitigation plans, and terrain closures. A special statement in the NWAC avalanche forecast conveyed that you could encounter backcountry snowpacks in pre-season ski area terrain. The group involved in the incident did not check in with Crystal Patrol on the day of the accident but they were aware that an uphill travel policy existed.

One member of the party frequently traveled in Silver Basin while others were not as familiar with the area. Some members of the group reported deferring to the more experienced friend for decision-making about terrain choices. This may have been a factor in the decision to climb the final headwall where the avalanche occurred. Members of the group reported feeling uneasy about the decision after noticing blowing snow and generally stormy conditions but did not speak up about their concerns. Despite the one member's knowledge of the terrain, the obtained GPS track shows that the party traveled under multiple larger avalanche paths as they ascended.

Witnesses reported that as the party ascended the headwall, they were bunched very closely together, almost tip to tail. Just before the avalanche occurred, the group reportedly noticed changing conditions and made the decision to abandon their ascent to the ridge. They attempted to find a location to transition and descend when the avalanche occurred. Traveling closely together was likely a factor in all six members being caught in the avalanche. Had they been more spaced out, it is possible that only a few members would have been in harm's way.

The small tree island and cliff played a key role in this fatality. The avalanche deposited the party into two groups and Skier 4 was unfortunately swept through this terrain trap. A medical examiner determined that multiple blunt force injuries were the cause of the fatality. In the same group, skiers 5 and 6 missed the knoll and came to rest near the toe of the debris unharmed.

As part of the interview process with NWAC forecasters post-incident, the group relayed that they had not thoroughly discussed the forecast hazard expected that day against their planned travel route/objective in Silver Basin. They were drawn to the area based on relatively good early season coverage, expected storm totals, and familiarity with the terrain.



Photo 5: Looking up the debris field toward the treed knob (center photo) and crown (upper center-right).

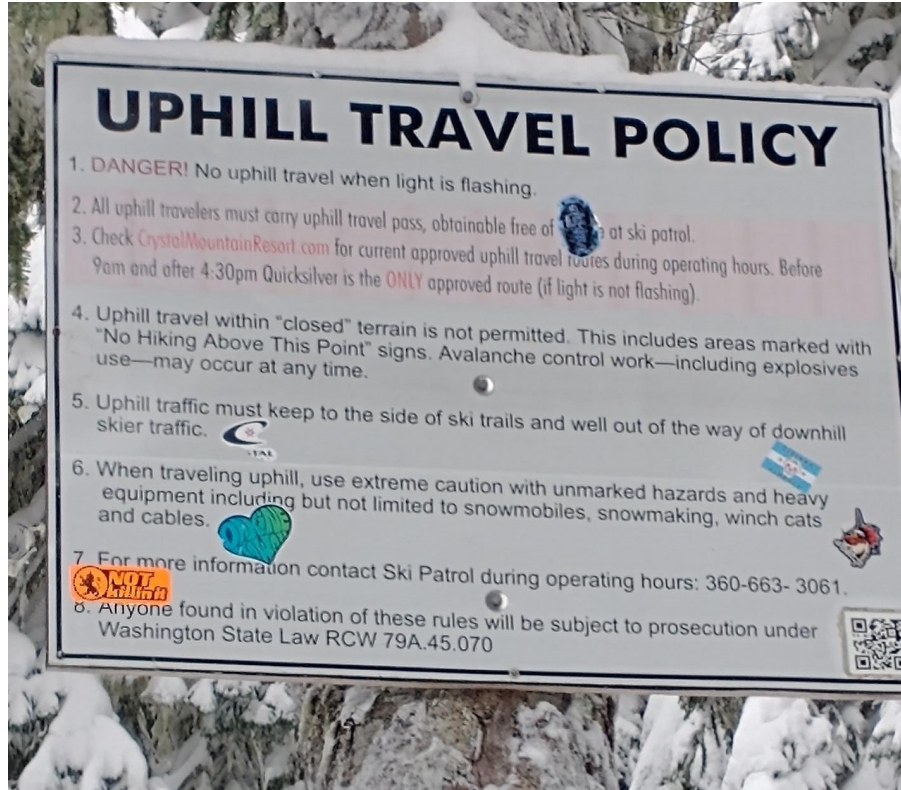


Photo 6: Uphill travel signage just above the Silver Queen chairlift along the travel route.



Photo 7: Uphill travel signage along the uphill travel route to Silver Basin.

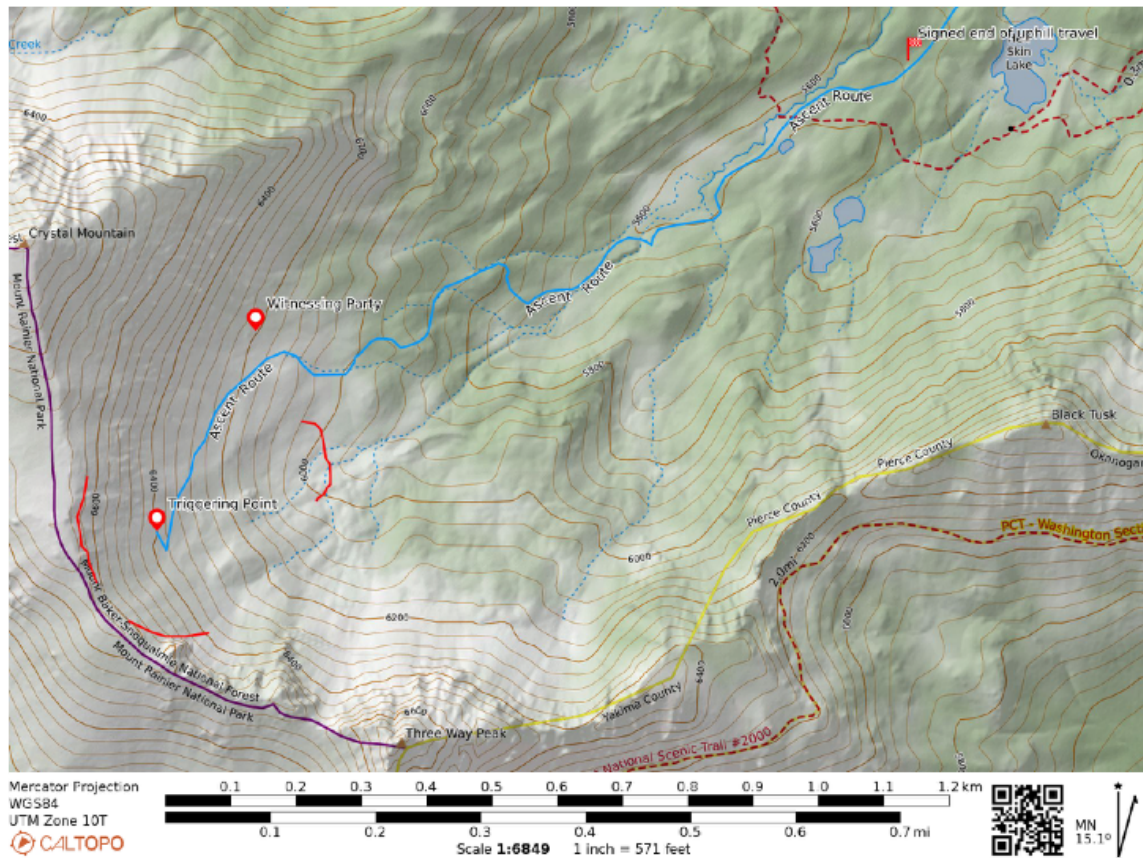


Figure 3: Overview map of the travel route and accident site.



**American Avalanche Association
Forest Service National Avalanche Center
Avalanche Incident Report: Short Form**



Occurrence Date : 20211211
Reporting Party Name and Address:

and Time: 1050

Comments:

Avalanche Characteristics:

Type: SS Aspect: NE-E
Trigger: ASu Slope Angle: 33-44 deg
Size: R 3 \ D 2.5 Elevation: 6600 ☐ m / Xft
Sliding surface (check one): Unknown
☐ In new ☐ New/old ☐ In old ☐ Ground

Location:

State: WA County: Pierce Forest: Mt Baker-Snoqualmie
Peak, Mtn Pass, or Drainage: Crystal Mountain
Site Name: Silver Basin
Lat/Lon or UTM: 10T 0614124E 5196465N

Group	Number of People	Time recovered	Duration of burial	Depth to Face <input type="checkbox"/> m / Xft
Caught	6			
Partially Buried—Not critical	2	skier 1: <5min skier 6: <2min		
Partially Buried--Critical	1	skier 3: <5min		
Completely Buried	3	skier 2: <15 min skier 4: <15min skier 5: <15min		skier 2: 0.8' skier 4: 1' skier 5: U
Number of people injured: 0		Number of people killed: 1		

Dimensions <input type="checkbox"/> m / <input type="checkbox"/> ft		Average	Maximum
Height of Crown Face		2 ft	
Width of Fracture		~600 ft	
Vertical Fall		~650 ft	
Snow	Hardness	Grain Type	Grain Size (mm)
Slab			
Weak Layer			
Bed Surface			
Thickness of weak layer:		<input type="checkbox"/> mm / <input type="checkbox"/> cm / <input type="checkbox"/> in	

Burial involved a terrain trap? ☐ no X yes → type: Trees

Number of people that crossed start zone before the avalanche: Zero

Location of group in relation to start zone during avalanche: ☐ high ☐ middle X low ☐ below ☐ all ☐ unknown

Avalanche occurred during X ascent ☐ descent

Equipment Carried

1	2	3	4	5	6
X	X	X	X	X	X
X	X	X	X	X	X
X	X	X	X	X	X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Transceiver
Shovel
Probe
Avalung

Experience at Activity

1	2	3	4	5	6
<input type="checkbox"/>	X	<input type="checkbox"/>	X	X	X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Unknown
Novice
Intermediate
Advanced
Expert

Avalanche Training

1	2	3	4	5	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
X	X	X	X	X	X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Unknown
None
Some
Advanced
Expert

Signs of Instability Noted by Group

- ☐ Unknown
☐ None
☐ Recent avalanches
X Shooting cracks
☐ Collapse or whumphing
☐ Low test scores

Injuries Sustained

1	2	3	4	5	6
X	<input type="checkbox"/>	X	<input type="checkbox"/>	X	X
<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>

None
First Aid
Doctor's care
Hospital Stay
Fatal

Extent of Injuries or Cause of Death

1	2	3	4	5	6
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>

Asphyxiation
Head Trauma
Spinal Injury
Chest Trauma
Skeletal Fracture
Other: Multiple Blunt Force Traumas

Damage

Number of Vehicles Caught: 0

Number Structures Destroyed: 0

Estimated Loss: \$ N/A

Rescue Method

1	2	3	4	5	6
X	<input type="checkbox"/>	X	<input type="checkbox"/>	<input type="checkbox"/>	X
<input type="checkbox"/>	X	<input type="checkbox"/>	X	X	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	X	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Self rescue
Transceiver
Spot probe
Probe line
Rescue dog
Voice
Object
Digging
Other:

BACKCOUNTRY AVALANCHE FORECAST

WEST SLOPES SOUTH



ISSUED

Friday, December 10, 2021 - 6:00PM

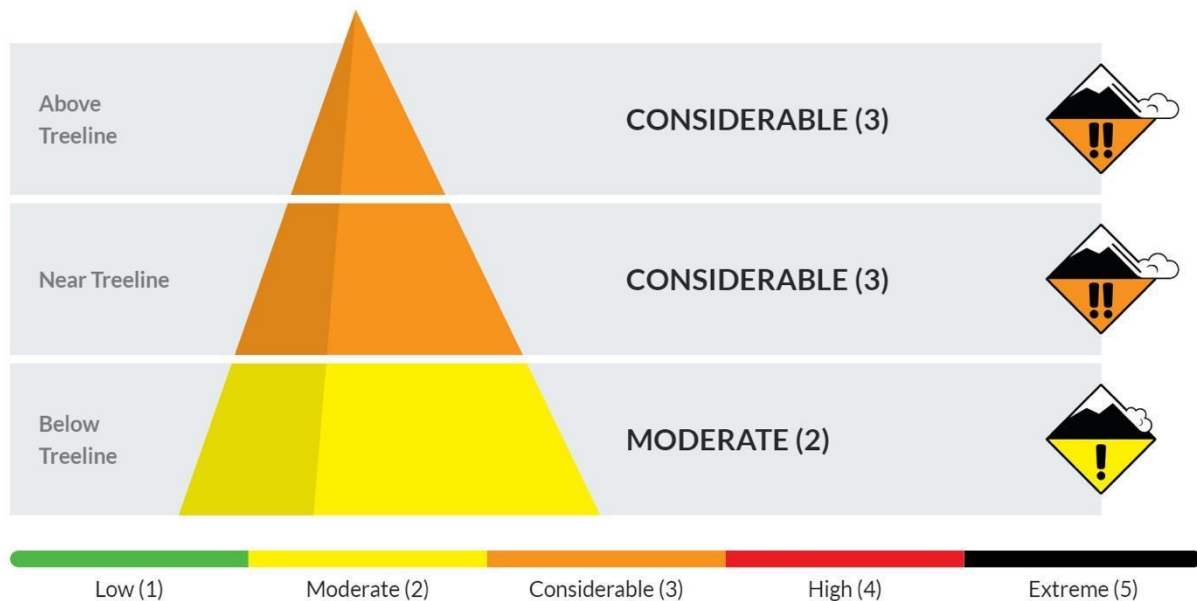
AUTHOR

Andy Harrington

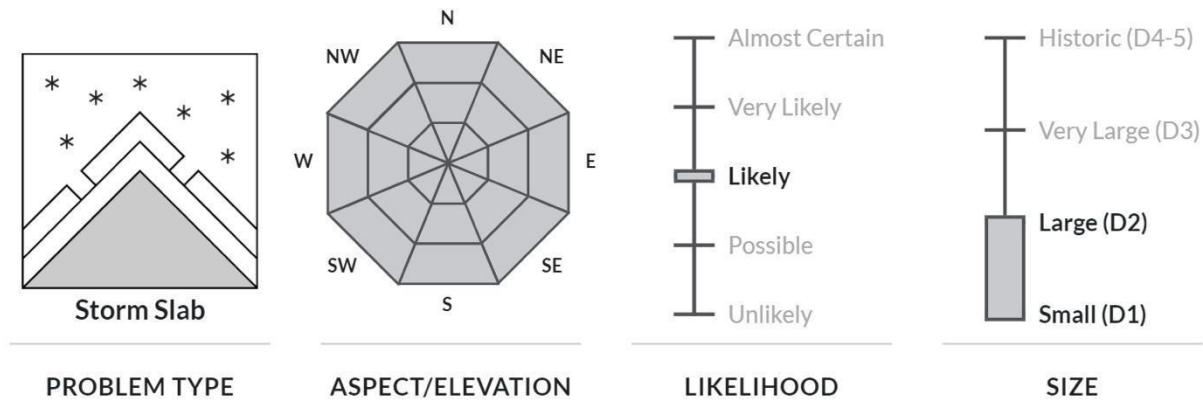
THE BOTTOM LINE

If you venture into the mountains on Saturday, expect to be battling a potent winter storm and dangerous avalanche conditions. Red flag signs of instability such as recent avalanches, whumpfing collapses, or shooting cracks should steer you away from slopes over 35 degrees. Choose conservative terrain and realize that early season conditions still exist.

AVALANCHE DANGER



AVALANCHE PROBLEM #1



Look for Storm Slabs to develop on Saturday at all elevation bands as the West South is targeted by a potent winter storm. These slabs will be thicker and more reactive as you ascend in elevation or in wind-loaded terrain, particularly on the volcanoes where more impressive water numbers are expected. Multiple storm layers and density changes are expected to exist above the Late November Crust, so use test slopes and hand pits as you travel to look for layers of concern. If you find heavy snow over light snow, see recent avalanches, or notice shooting cracks or blocks of snow failing in your tests, avoid slopes over 35 degrees.

FORECAST DISCUSSION

Snow depths have slowly increased since 12/8 around the West South, and Saturday should be the biggest dump of snow the zone has seen this season. The depth of the snowpack could double in some locations by the end of the day on Saturday, greatly expanding the amount of terrain where avalanches can occur. At Paradise, a whopping 3" of precipitation is forecast to fall by Saturday evening, which could produce more dangerous avalanche conditions than areas closer to the crest (where we are expecting ~1.75" of water). Regardless of location or elevation, new snow will thicken the depth atop a firm base we are calling the Late November Crust. Any layers of concern will exist above this easily identifiable layer going forward.

Keep in mind that despite the new snow, early season conditions still exist. Open creeks, rocks, stumps, and other natural hazards that may have been visible on Friday could be just buried under the surface on Saturday. Take it slow and ease into winter, we are just getting started.

"Uphill travel reminder: Check in with your local ski area this weekend regarding terrain access and parking updates. Closed ski areas often share a similar snowpack and avalanche hazard as the surrounding backcountry. You may also encounter other hazards like active avalanche mitigation, unmarked obstacles, snowmobiles, groomers, and other heavy equipment as ski areas prepare to open. Be prepared to make your own assessments and handle emergency situations."