20210208 Knox Creek Avalanche Fatality

Report by Dallas Glass and Matt Primomo

Incident snapshot

Occurrence Time and Date: Approx. 1100 am Monday, February 8, 2021
Time First Reported to SAR: 1240 pm
Recovery Time: Approx 700 pm
Lat/Lon: 47.35012, -121.19072
Location: Knox Creek, Kittitas County, Okanogan-Wenatchee NF, WA

Number in Party: 2
Number Caught: 2
Number Partially Buried, Critical or Not-critical: 1 not-critical
Number Completely Buried: 1
Duration of Burial: Approx**.** 8 hrs
Number Injured: 0
Number Killed: 1

Avalanche Type: HS (Hard Slab)
Trigger: AV (snow biking)
Size: R3/D3
Start Zone Aspect: NE
Start Zone Angle: 30-55+
Start Zone Elevation: Average 4750’

Height of Crown Face: Average 4-5’
Width of Fracture: 700-800’
Vertical Fall: Maximum 450’

Slab Characteristics: DF/RG, 1mm/0.5mm, F- to 1F+
Weak Layer Characteristics: FCxr, 1mm
Bed Surface Characteristics: K, MFcr, 3mm, Mid-Jan crust
Avalanche Classification: HS-AV-R3-D3-O

Burial involved a terrain trap: No
Number of people that crossed start zone before avalanche: 0
Avalanche occurred during: Snow biking, side-hilling
Location of group in relation to start zone during avalanche: The pair were in the lower portion of the start zone.

Avalanche Safety Gear Carried: Both snowbike riders carried a shovel, beacon, probe, and airbag pack. Rider 1 did not deploy his airbag. Rider 2 inflated his airbag. While rider 2 was wearing a beacon, it was found in the off position.

Avalanche Training and Experience at Activity:
Both snowbike riders had some formal avalanche training. Each completed an avalanche rescue course.
Both snowbike riders were very experienced winter motorsports users with 38 and 40 years of riding experience respectively.
Signs of Instability Noted by Group:
Unknown
Extent of Injuries or Cause of Death:
Rider 1: no major injuries known.
Rider 2: Asphyxiation

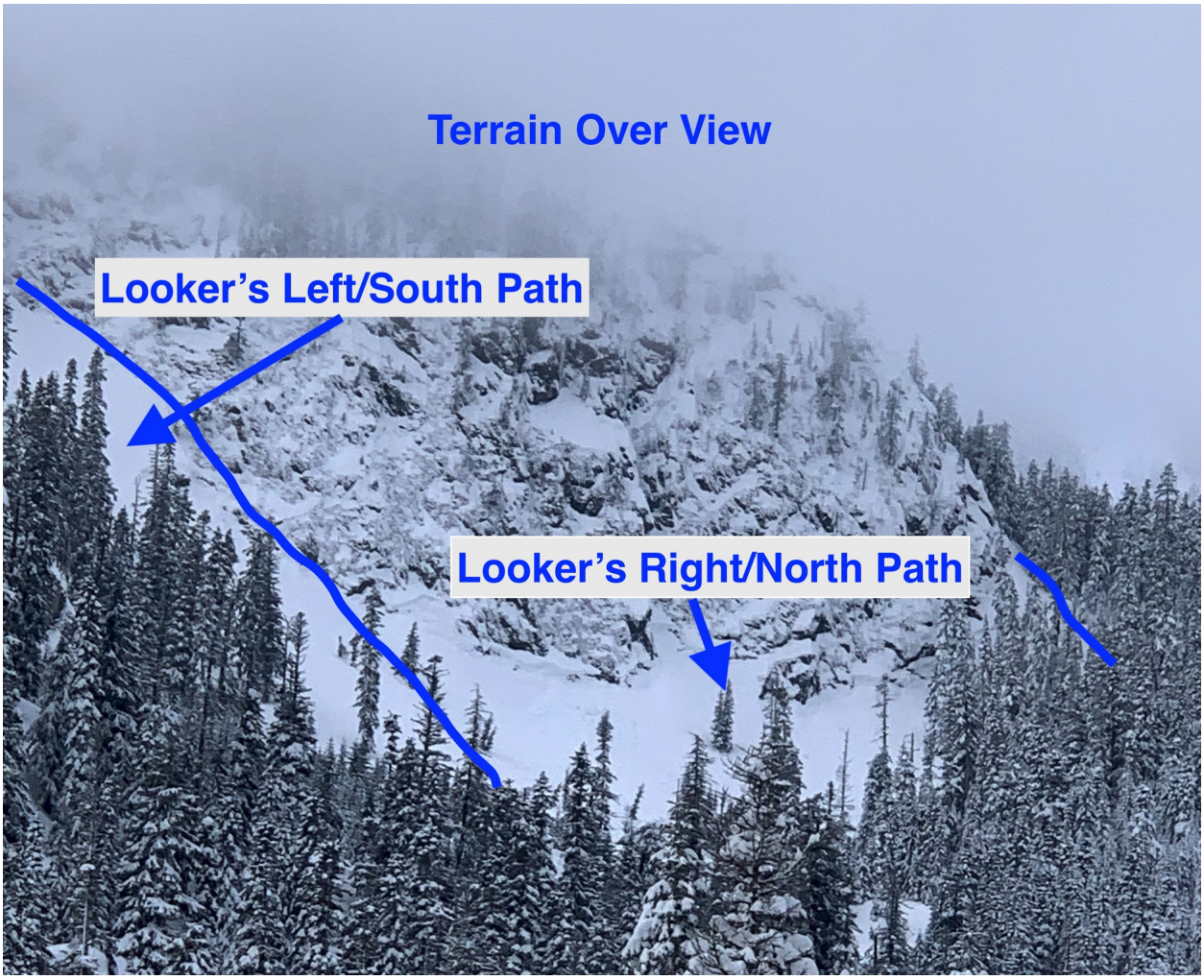
NWAC Forecast Zone: East Slopes Central
Avalanche Danger Rating (Above, Near or Below Tree-line):
Considerable avalanche danger in all elevation bands.

Incident Report - Video

Terrain

This piece of avalanche terrain consisted of two connected but characteristically different paths. Both paths were NE facing and no major terrain barrier separates them. The southernmost (lookers left) path consists of a long narrow chute originating high on a ridgeline between two cliff bands around 5300'. As the chute exits the cliffs, it fans into a large apron and small bench. Below this terrain bench, the runout continues into sparse trees, with a maximum run just below an old roadbed at 4300'. This terrain is much longer and narrower than the adjacent path. It also appears to produce more frequent large avalanches.

To the lookers right, north of the main chute, a several hundred-foot cliff sits above a steep open snowfield. Slope angles just below the cliff exceed 50 degrees, however, they quickly decrease to 30 degrees just downslope of the rocks. Unlike the chute to the south, this path generally terminates on a board low-angle bench only 150-200 feet downslope. Vegetative clues on the far lookers left side of the path do indicate it can occasionally overrun the bench and descend further downslope. This seems most likely when the paths run in concert as they did in this accident. In general, this path is very wide but uncharacteristically short due to the wide low-angle bench.



Avalanche

This wide hard slab failed on a layer of small facets just above a thick melt-freeze crust. Given the entry tracks onto the slope and final locations of the riders, the avalanche was likely triggered from the lower start zone where slope angles between 30-34 degrees were measured.

The avalanche released the entire width of the looker's right-hand path. The majority of the avalanche debris stopped on the low-angle bench. The crown continued into the looker's left path releasing slightly higher in the terrain, but not involving the majority of the rock-walled chute (only about ⅓ of the southernmost path released).
Debris from the looker's left path combined with the wider and shorter northern path. This debris overran the shallow bench and descended into sparsely treed terrain below. The majority of the avalanche fell less than 300 vertical feet with a maximum of 500'. Despite the relatively short path, debris piles were measured at 6-12' deep.

Snowpack

An atmospheric river event impacted the entire Pacific Northwest January 11-13. Nearby Snoqualmie Pass weather stations recorded more than 5.5” of W.E. during this period with rain to well above 5500’. This created a very thick and widespread melt-freeze crust. The event ended with a few inches of snow and cooling temperatures. Cold and generally dry weather for the remainder of January allowed the few inches of snow over the crust to facet. A thin, breakable melt-freeze crust formed following a brief light rain event, capping these facets on many slopes. Subsequent small storms during this time period did not add significantly to the slab; however, more substantial storms over the first week of February brought several feet of snow to the mountains. By the morning of Feb 8, this mid-January facet-crust layer was buried 3-5 feet below the surface on most slopes. The overlying slab consisted of several storm layers increasing in resistance from F to 1F+ over the persistent weak layer.

Weather Summary

A significant winter storm Feb 6-8 deposited 2-3 ft (3.5” WE) of snow above 4000’ at nearby Snoqualmie Pass. The Salmon la Sac area likely recorded slightly lower storm totals per their normal relationship to Snoqualmie Pass snowfall in westerly flow. This snow fell with moderate to strong westerly winds. By the morning of the 8th, the majority of the storm had ended with only occasional light snow showers persisting. Monday February 8th was marked by broken skies, occasional light snow showers, light winds, and cold temperatures.

Accident Summary

On the morning of February 8th, the two snowbike riders left the French Cabin Creek Snopark near Salmon la Sac to go riding in the Knox Creek area. Fresh snowbike tracks observed at the scene indicate the riders traveled several nearby slopes in the drainage prior to the accident. Several large avalanches covered portions of the riders’ tracks on a nearby peak. It is unclear if the riders were aware of these avalanches, or if they occurred after the accident but before SAR arrived. Around 11:00 am the riders traveled along an old roadbed toward the accident area. They were making their first pass from E to W across the terrain, passing just below a rock buttress before entering the avalanche paths. The riders were traveling on parallel tracks with Rider 1 slightly ahead of Rider 2. The riders triggered the avalanche from somewhere in the lower start zone.

Both men were immediately caught and carried. Rider 1 was partially buried. Rider 2 deployed his airbag but was still fully buried.

Rescue Summary

Rider 1 immediately extracted himself and initiated a search for his companion. This included a beacon search and a visual search of the area. Unable to locate Rider 2 after approximately 30min, Rider 1 recognized the need for additional assistance. He retrieved his bike and rode towards the trailhead for assistance. 911 was contacted at 12:40 pm by a third party.

Kittitas SAR responded to the scene. The initial SAR team included 2 avalanche rescue dogs, their handlers, and one additional member. The team initially located snowbike tracks covered by fresh avalanche debris. Upon further inspection and searching, these were determined to not be the accident location. Additional tracks in the area led towards another avalanche seen from the road. The team arrived at the accident site at 4:28 pm. At this same time they were joined by additional personnel including 5 SAR members, Kittitas Sheriff's Deputy, and an NWAC forecaster. The teams searched the site including spot probing likely catchment areas. At approximately 6:00 pm, the group pulled out of the accident site to a nearby safe location to regroup and prepare for night operations. The 2 dog teams were sent back into the area just before 7:00 pm. Shortly after, one of the dogs alerted on an area of snow 20-30ft north of Rider 1's burial location. The alert was confirmed with a probe strike, and Rider 2 was recovered. Rider 2 was found head downhill, laying on his right-hand side. Average burial depth 4ft/120cm.

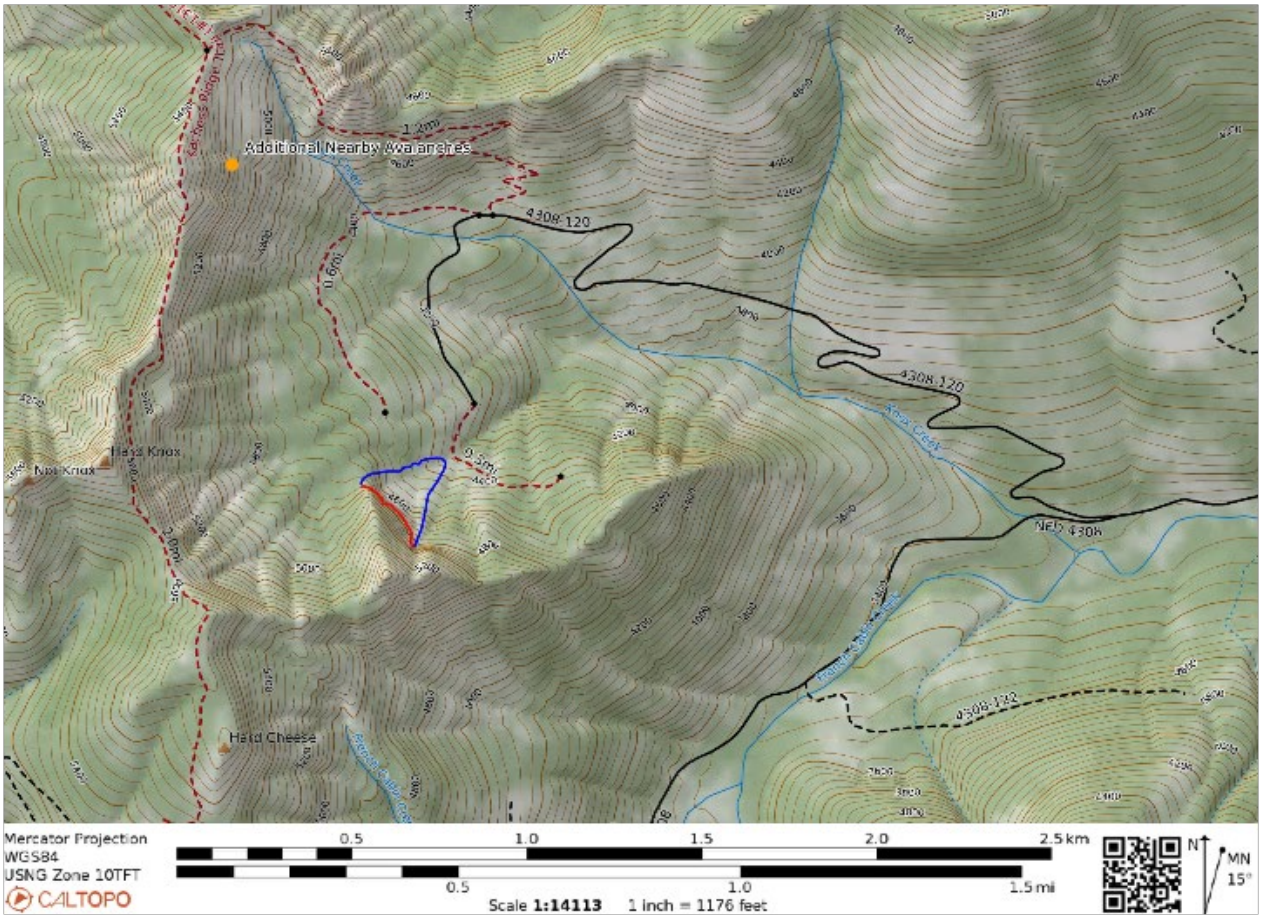
After Rider 2 had been safely removed from the scene, his bike was located by probe just uphill from his burial site.
NWAC staff returned the following day, Tuesday, February 9th 2021 to conduct an accident investigation and take additional photos.

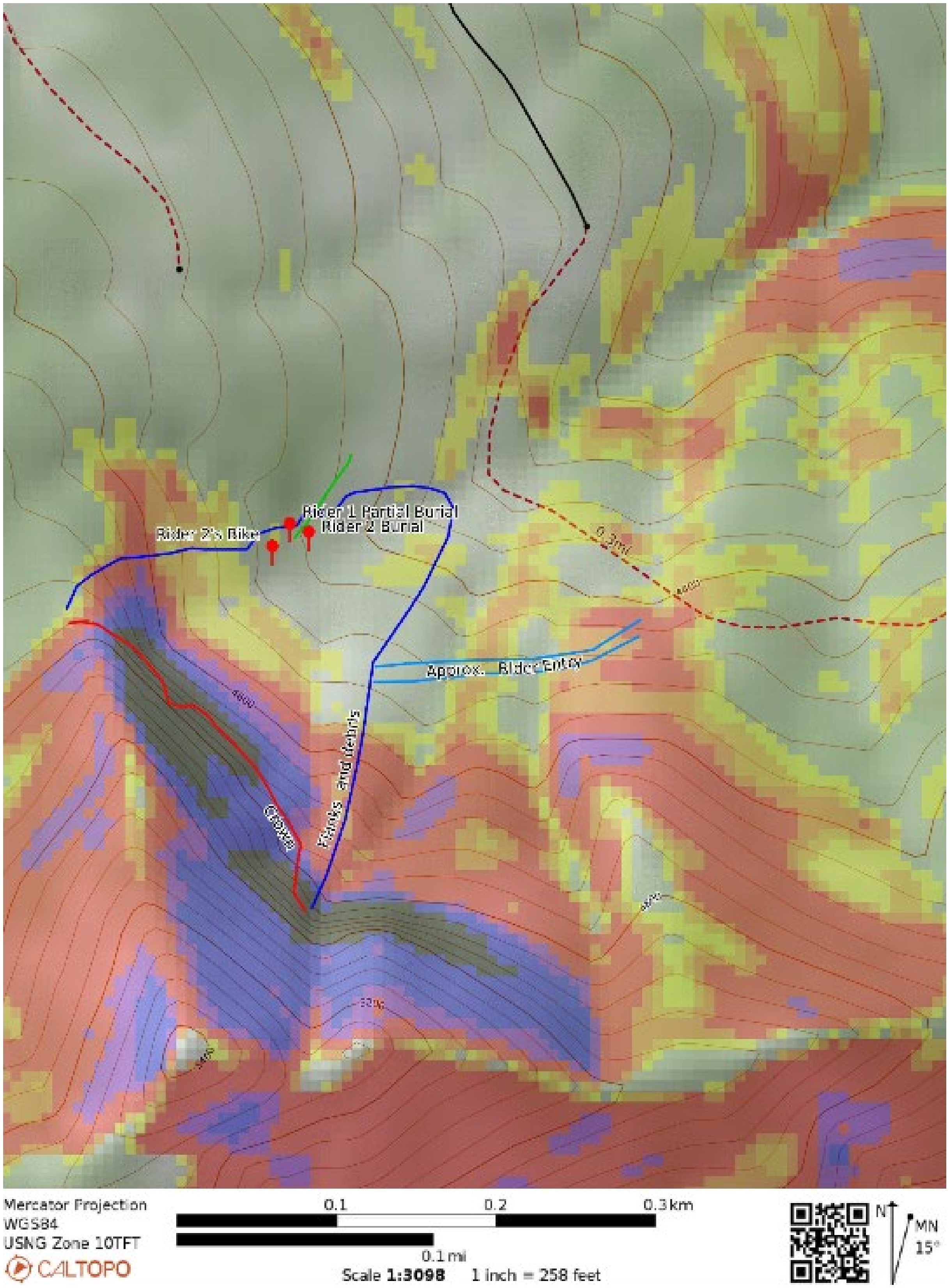
Commentary / Discussion / Important Points

Terrain: Despite this relatively short avalanche path, it still produced a very large avalanche. Looking at the northern section of the terrain, the start zone encompasses nearly half the height of the vertical fall. However, the width of the avalanche, combined with a 4-6' slab, resulted in a very wide and deep debris field.
Rescue Gear:

Avalanche Beacon: Even though the rider was wearing an avalanche beacon, it was found in the off position. A trailhead beacon check could have prevented this oversight.
Avalanche Airbag: Even though the rider inflated his airbag he was still fully buried under 3-4’ of snow.

Maps

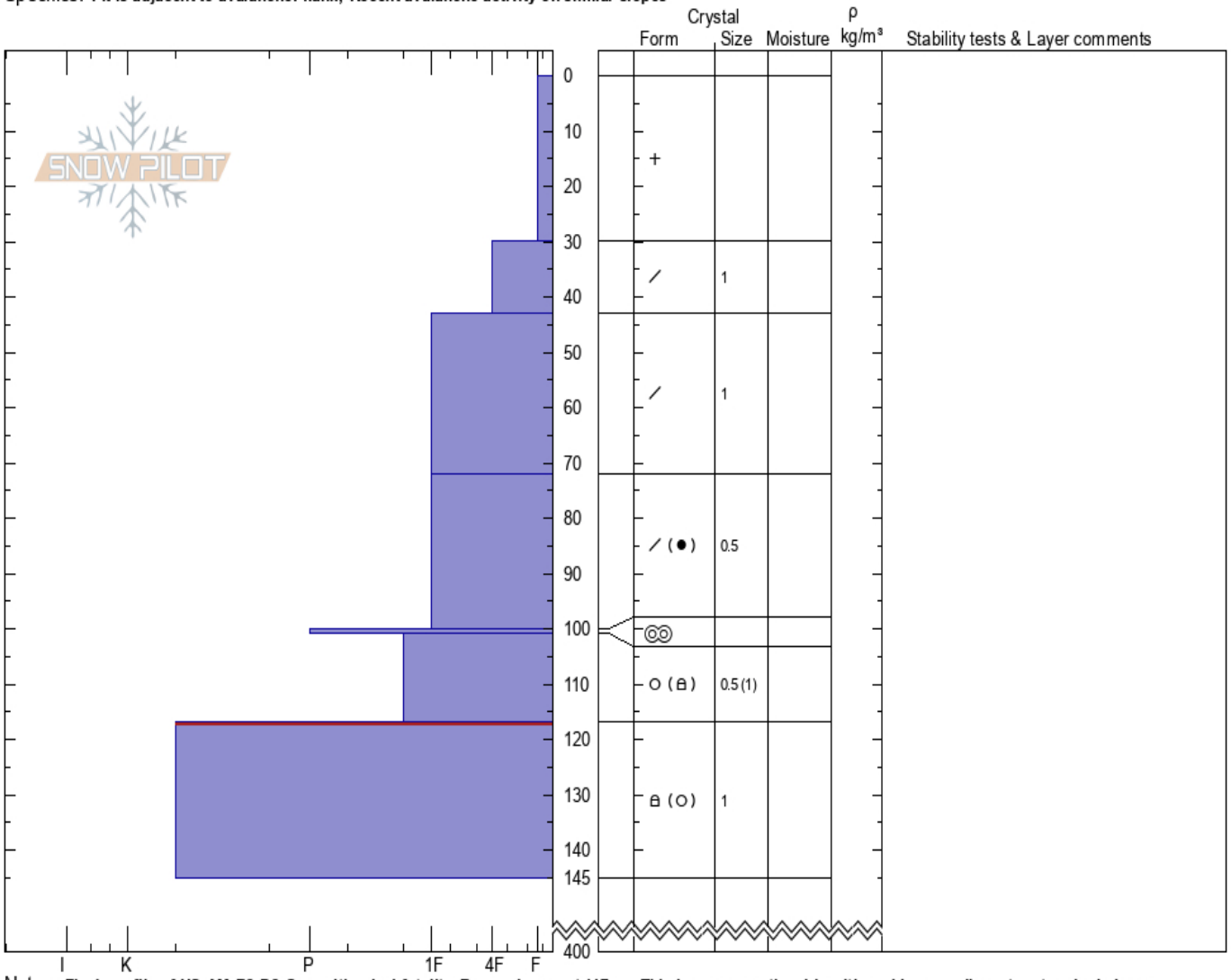



Rider 1 Partial Burial
Rider 2 Burial
Rider 2's Bike
0.3 mi
Approx. Rider Entry
Flanks and debris
Crown
Mercator Projection
WGS84
USNG Zone 10TFT
CALTOPO
0.1
0.2
0.3 km
0.1 mi
Scale 1:3098 1 inch = 258 feet
N
MN
15°

Snow Profile

20210209 Knox Creek	**Matt Primomo**	Stability: **poor**	HS: **400** Layer Notes:
Central Cascades, East	**02/09/2021 - 12:00pm**	Air Temperature:	PF: **80** 117-145cm: **Problematic layer**
WA	Co-ord: **47.35006N, -121.19249W**	Sky Cover: **BKN**	PS: **50**
Elevation: **4700 ft**	Slope Angle: **34°**	Precipitation: **NO**	
Aspect: **80°**	Wind Loading:	Wind: **Calm**	

Specifics: **Pit is adjacent to avalanche: flank; Recent avalanche activity on similar slopes**



Notes: **Flank profile of HS-AM-R3-D3-O resulting in 1 fatality. Ran on icy crust 117cm. This layer was noticeable with probing on adjacent, untouched slopes.**

0-100cm: Recent storm snow

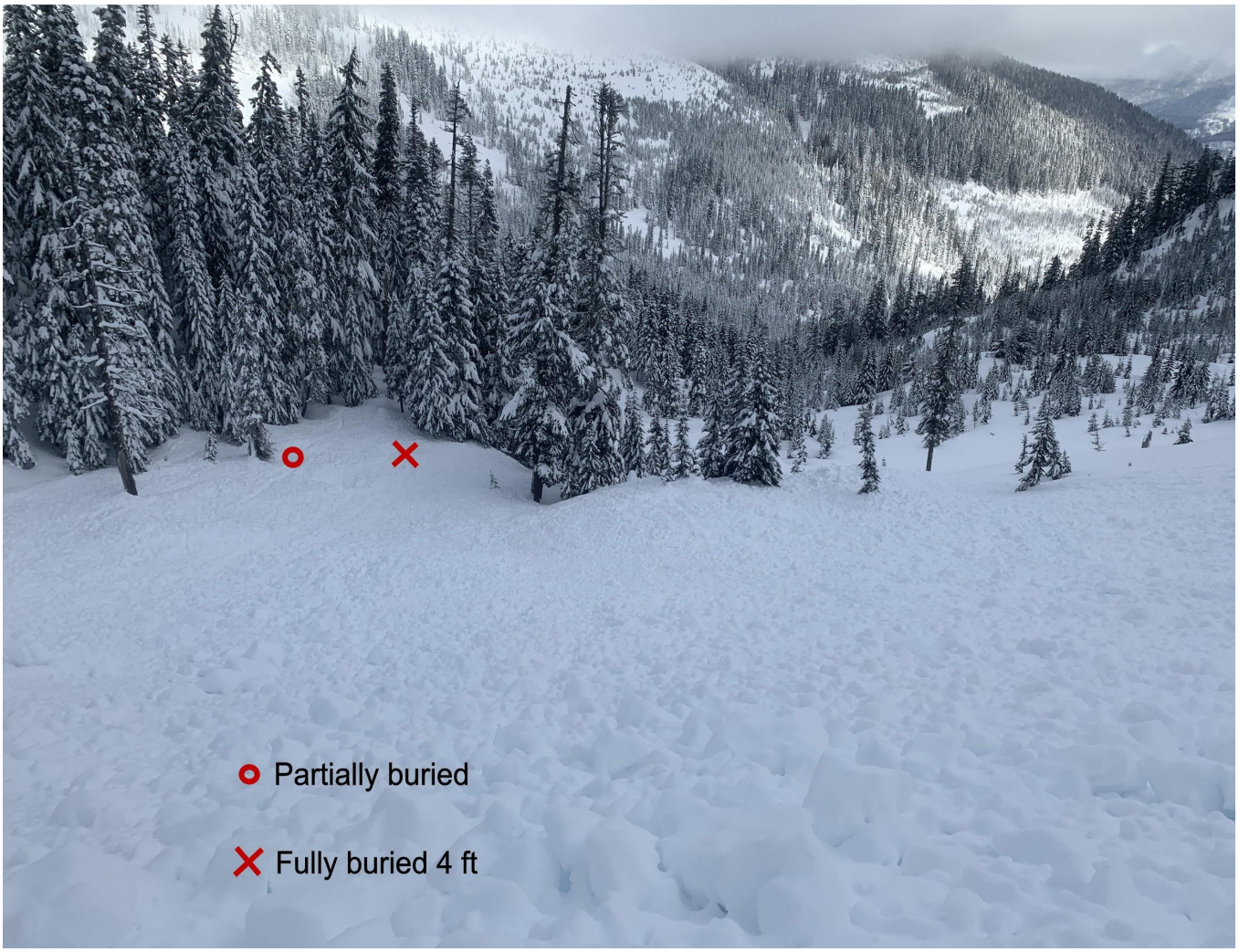
117: January 13 (mid-January) crust

Below 145cm: Old, refrozen debris below profile site.

Flank profile completed with Dallas Glass.

Photos

All photos by Dallas Glass and Matt Primomo Feb 8th or 9th


Partially buried
Fully buried 4 ft

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

Occurrence Date (20210208): and Time (approx):1100 Comments:
Reporting Party Name and Address:

Avalanche Characteristics:
Type: HS Aspect: NE
Trigger: AV Slope Angle: 30-55
Size: R3 \ D3 Elevation: 4750ft ☐m /☐ft
Sliding surface (check one):
☐ In new ☐New/old X In old ☐Ground

Location:
State: WA County: Kittitas Forest: Okanogan-Wenatchee
Peak, Mtn Pass, or Drainage: Knox Creek
Site Name: Knox Creek
Lat/Lon or UTM: 47.35012, -121.19072

Group	Number of People	Time recovered	Duration of burial	Depth to Face ☐m /☐ft
Caught	2			
Partially Buried—Not critical	1			
Partially Buried--Critical	0			
Completely Buried	1	7pm	8hrs	1m
Number of people injured:0		Number of people killed: 1		

Dimensions ☐m /☐ft	Average	Maximum
Height of Crown Face	1.3m	2.2m
Width of Fracture	250m	
Vertical Fall	140m	

Snow	Hardness	Grain Type	Grain Size (mm)
Slab	F-1F+	DF/RG	1/0.5mm
Weak Layer		FCxr	1mm
Bed Surface	K	MFCr	3mm
Thickness of weak layer: ☐mm /☐cm /☐in			

Burial involved a terrain trap? X no ☐yes → type: none
Number of people that crossed start zone before the avalanche: 0
Location of group in relation to start zone during avalanche: ☐ high ☐middle X low ☐ below ☐all ☐unknown
Avalanche occurred during ☐ ascent ☐descent

Subject	Name	Age	Gender	Address	Phone	Activity
1		51	M			snowbiking
2		51	M			snowbiking
3						
4						
5						

Equipment Carried

1	2	3	4	5	
X	X	☐	☐	☐	Transceiver
X	X	☐	☐	☐	Shovel
X	X	☐	☐	☐	Probe
X	X	☐	☐	☐	Airbag
☐	☐	☐	☐	☐	

Experience at Activity

1	2	3	4	5	
☐	☐	☐	☐	☐	Unknown
☐	☐	☐	☐	☐	Novice
☐	☐	☐	☐	☐	Intermediate
X	X	☐	☐	☐	Advanced
☐	☐	☐	☐	☐	Expert

Avalanche Training

1	2	3	4	5	
☐	☐	☐	☐	☐	Unknown
☐	☐	☐	☐	☐	None
X	X	☐	☐	☐	Some
☐	☐	☐	☐	☐	Advanced
☐	☐	☐	☐	☐	Expert

Signs of Instability Noted by Group	Injuries Sustained						Extent of Injuries or Cause of Death					
	1	2	3	4	5		1	2	3	4	5	
X Unknown	X	☐	☐	☐	☐	None	☐	X	☐	☐	☐	Asphyxiation
☐ None	☐	☐	☐	☐	☐	First Aid	☐	☐	☐	☐	☐	Head Trauma
☐ Recent avalanches	☐	☐	☐	☐	☐	Doctor's care	☐	☐	☐	☐	☐	Spinal Injury
☐ Shooting cracks	☐	☐	☐	☐	☐	Hospital Stay	☐	☐	☐	☐	☐	Chest Trauma
☐ Collapse or whumphing	☐	X	☐	☐	☐	Fatal	☐	☐	☐	☐	☐	Skeletal Fractures
☐ Low test scores							☐	☐	☐	☐	☐	Other:

Damage Number of Vehicles Caught: 0 Number Structures Destroyed: 0 Estimated Loss: $

Accident Summary Include: events leading to accident, group's familiarity with location, objectives, route, hazard evaluation, etc.

Rescue Summary Include: description of initial search, report of accident, organized rescue, etc.

Rescue Method					
1	2	3	4	5	
X	☐	☐	☐	☐	Self rescue
☐	☐	☐	☐	☐	Transceiver
☐	☐	☐	☐	☐	Spot probe
☐	☐	☐	☐	☐	Probe line
☐	X	☐	☐	☐	Rescue dog
☐	☐	☐	☐	☐	Voice
☐	☐	☐	☐	☐	Object
☐	☐	☐	☐	☐	Digging
☐	☐	☐	☐	☐	Other:

Attach additional pages as needed. Include weather history, snow profiles, reports from other agencies, diagram of site, photographs, and any other supporting information

Please send to: CAIC; 325 Broadway WS1; Boulder CO 80305; caic@state.co.us
and to the nearest Avalanche Center.

NORTHWEST AVALANCHE CENTER - HTTPS://WWW.NWAC.US/

BACKCOUNTRY AVALANCHE FORECAST

EAST SLOPES CENTRAL

ISSUED

Sunday, February 7, 2021 - 6:15PM

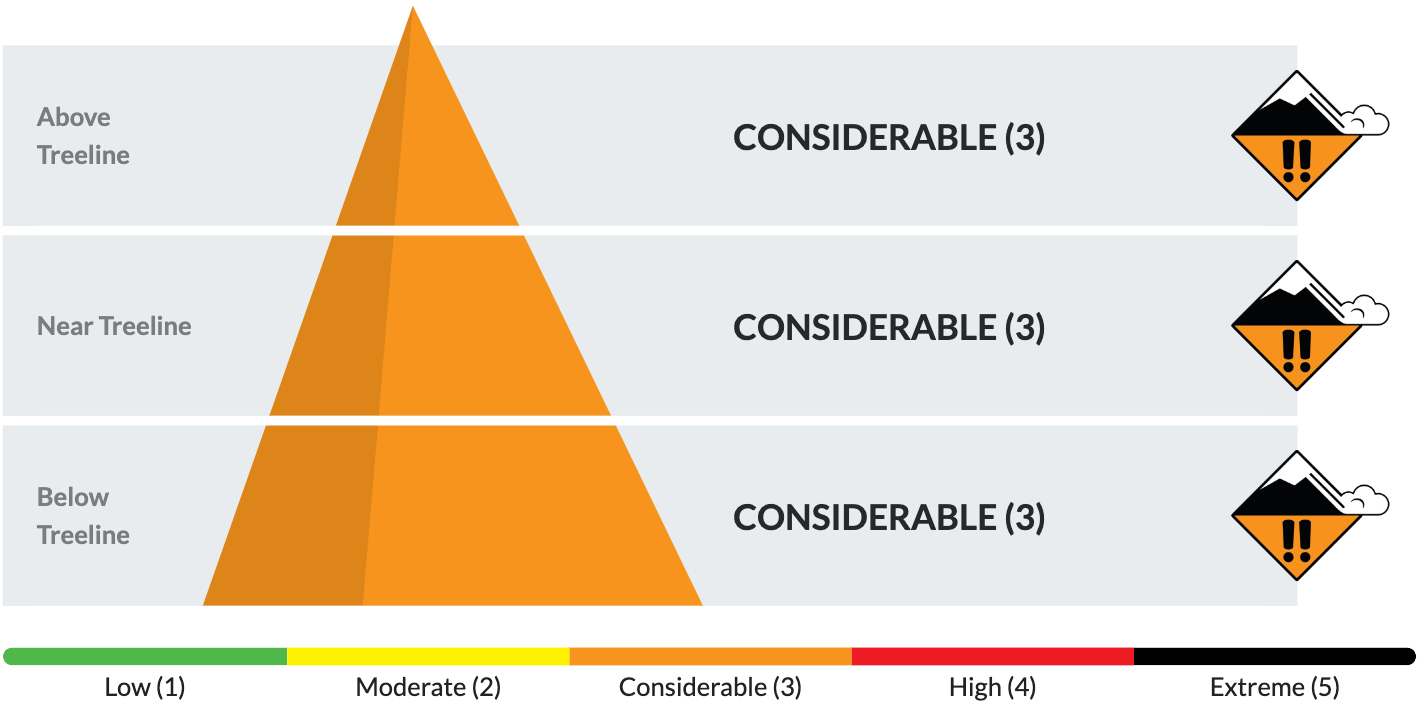
AUTHOR

Josh Hirshberg

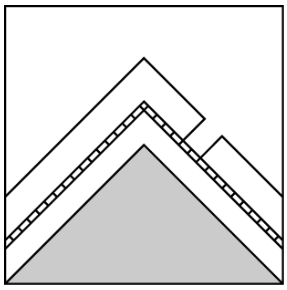
THE BOTTOM LINE

Dangerous conditions continue as significant snowfall and wind have added a heavy load and stressed older layers of weak snow. Stay far away from and well out from under wind-loaded, open terrain 35 degrees and steeper. Consider avoiding avalanche terrain at upper elevations where you can trigger very large and destructive avalanches that could break widely across slopes.

AVALANCHE DANGER

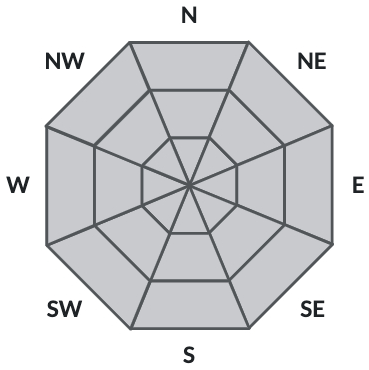


AVALANCHE PROBLEM #1

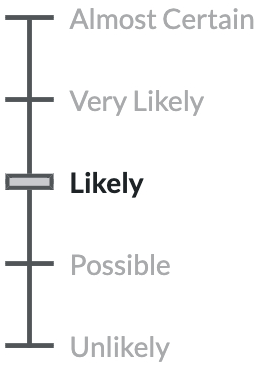


Persistent Slab

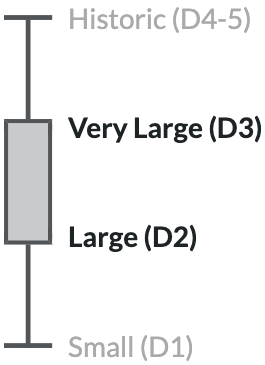
PROBLEM TYPE



ASPECT/ELEVATION



LIKELIHOOD

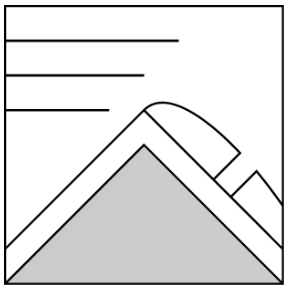


SIZE

The new snow and strong wind will increase the chances for triggering avalanches 3ft to 4ft deep. Persistent slabs can propagate widely across terrain features and can result in very large and deadly avalanches. Stay well out from under any large open slopes steeper than 30 degrees, as they can be triggered from a long distance away or from below. Be alert to signs of instability such as shooting cracks, and whumphing collapses.

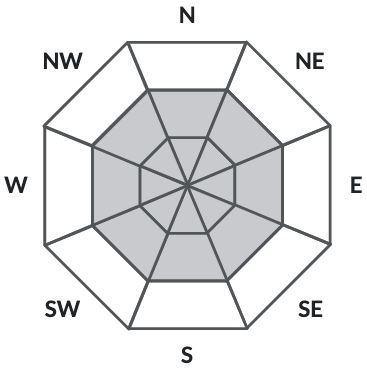
Recent observations continue to indicate that large slab avalanches can release on a crust from mid-January. These have occurred mainly on Northwest to Southeast aspects above 5,500ft. The Salmon la Sac, Icicle, and other areas on the southwestern edge of the zone could be favored for snowfall and could hold dangerous conditions on Sunday. While slabs are thinner and the danger may be less elevated in the Wenatchee Mountains, the avalanches will be similar. When the snowpack is this complex, keep your terrain choices simple.

AVALANCHE PROBLEM #2

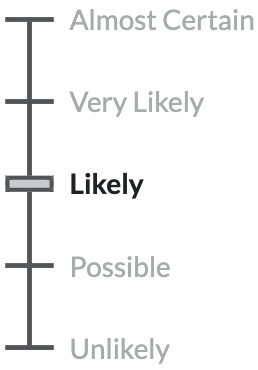


Wind Slab

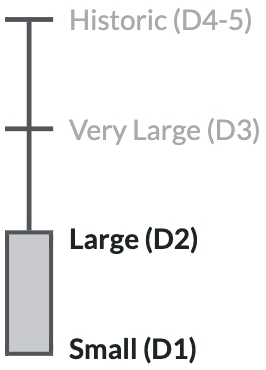
PROBLEM TYPE



ASPECT/ELEVATION



LIKELIHOOD



SIZE

Strong winds will continue to transport the snow in open and wind-exposed terrain. Feel for wind stiffened or hollow sounding snow as you enter open terrain, and change aspects. Any avalanche in the new snow could step down to deeper weaker layers and result in a very large and deadly avalanche above 5,000ft. Consider the terrain you're connected to and avoid steep, open wind loaded slopes. Stay alert to indicators of wind slab such as heavy snow drifting, shooting cracks and whumphing collapses. Small soft slab avalanches are possible on steep, sheltered slopes where more than 8" of new snow falls.

FORECAST DISCUSSION

Light snow and westerly wind will continue through the region. Expect that overnight snow will favor areas closer to the crest such as the Salmon la Sac, and the storm will produce more wind than snow for the Wenatchee Mountains.

On Sunday, observers on Blewett Pass found about 6 inches of new snow with lots of blowing snow forming drifts 1-3 feet deep. The saw cracking in wind drifted snow and tests failing in the mid-January crust-facet layer. On Saturday observers reported a D2 natural avalanche near Van Epps Pass and a D3 sized avalanche that resulted in a burial with no injuries near the Easton Sno Park. Observers reported a natural D2 avalanche on an east aspect at 5,500ft west of Blewett Pass on Friday. This appeared to have run on the deeper crust from mid-January. On Thursday, a snowboarder took a ride with a wind slab at Mission Ridge on a Northwest aspect in the Near Treeline elevation band. Luckily they escaped unharmed. An observer reported a number of large (up to D2.5) avalanches with the recent storm from February 1 or 2 near Holden Village. On Wednesday, Mission Ridge Ski Patrol reported 4 large hard slab avalanches with control work. These likely ran on the crust from 1/13, and were roughly 24"+ deep x 100ft wide in ridgetop, or near ridgetop terrain. Whumphing collapses such as those reported by forecaster, Matt Primomo, near the summit of Mt Lillian on Tuesday indicate that deeper weak layers are primed to avalanche. In all parts of the zone, weak structure can be observed in the top 2-3 feet of the snowpack, and could result in an avalanche. These include facets resting on a crust from mid-January, or a sandwich of crusts from that same time. At lower elevations, you'll find less new snow and a stronger recent rain crust.

During the ongoing Covid-19 pandemic, continue to follow the latest guidance from local, state, and federal health officials. Avoid unnecessary risks that could impact first responders and stress medical resources. Wear a mask when appropriate, practice social distancing, and consider recreating closer to home.