

Crystal Mountain Snow Safety

Union Creek Avalanche Accident Report

December 2, 2007

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Accident Summary

Time: December 2, 2007 (unverified)

Location: Union Creek Basin, northeast of Crystal Mt, WA

Activity: In camp (backcountry snowboarding trip)

Avalanche Type: SS-N-R4-D4-O

Caught: 3

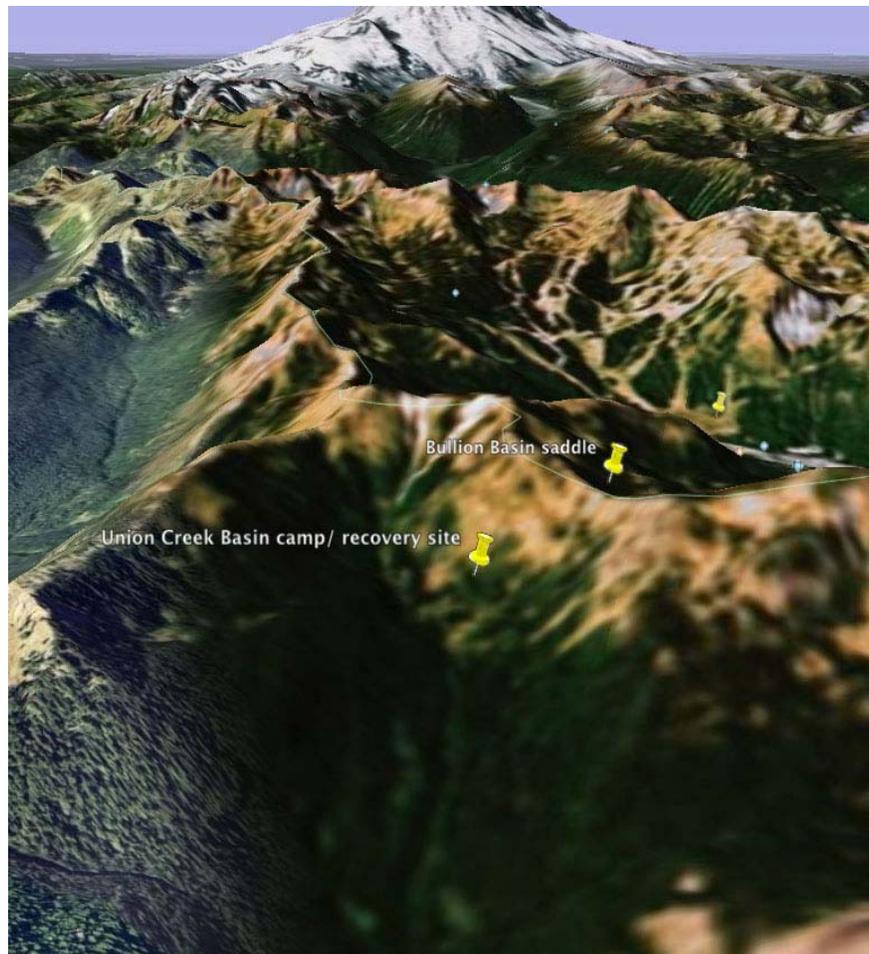
Buried: 3 (completely buried in camp site by large natural climax avalanche)

Injured: 0

Killed: 3

Recovered: June 21, 2008

Recovery Location: N46°55.749 W121°26.894 (WGS84 datum)



Incident Summary

On the evening of Friday, November 30, 2007, three Seattle snowboarders arrived in the parking lot of the Crystal Mt Ski Area. "The three men were Kevin Carter, 26, Devlin Williams, 29, and Philip Hollins, 41. All were from the Seattle area"- *Pierce County Sheriff's Department spokesman Ed Troyer*. Due to the lateness of their arrival it is believed they bivouacked somewhere in the immediate vicinity that evening. According to interviews with friends and family the group had planned to spend the weekend backcountry snowboarding in, and or near, Union Creek Basin. This is a backcountry area on the east side of the cascade crest several miles east of the Crystal Mountain ski area. Their "last seen area" was on the east side of the cascade crest, below the Bullion Saddle, descending into Union Creek Basin Saturday December 1. They were observed by a local backcountry skier:

"... They dropped in at the saddle between Bullion and Union. Since we skied the Union drainage the day before I noticed that there were snowshoe marks and what looked like a splitboard that had broken way from my uptrack. The reason I identified the boarders is that I was yelling at them from a distance of 50 feet to not slide over the uptrack put in Union Creek the day before..."



The local snowpack on Saturday December 1 was an average of 1 meter deep and consisted of a mix of facets and unconsolidated new snow. By Sunday at 11 am, 27" of new snow had fallen in the previous 18 hr period. High winds, warming temperatures, and poor visibility accompanied this high intensity snowfall. By Sunday morning the avalanche danger in the area was at high going to extreme. By Sunday afternoon rain began to fall up to 7000' level and the avalanche danger was extreme.

It is unknown where they traveled or rode on Saturday or where they camped on Saturday night. It is also unknown if they moved at all on Sunday December 2. The group was reported missing Sunday night. By Monday December 3, Pierce County Sheriffs began a SAR operation. Crystal Mountain Ski Patrol was contacted late Monday. The weather began to clear on Tuesday and using Crystal Mountain as a base of operations the search process began. The air search confirmed that nearly all of the steep slopes in the area had



SE Exposure of Union Creek

Bullion Saddle



released large climax avalanches running full path distances. The freezing level also dropped on Tuesday dropping the avalanche danger to low. This did however make travel difficult for ground teams in the area. There were numerous areas of deposition to be searched.

The search involved elements of Pierce County Sheriffs, Mountain Rescue, and Crystal Mountain Ski Patrol. These groups searched the area on the ground and by air continuously until Saturday December 8th. There were no significant findings and a decision was made to suspend the search operations until substantial snowmelt occurred in the area.

Recovery Summary

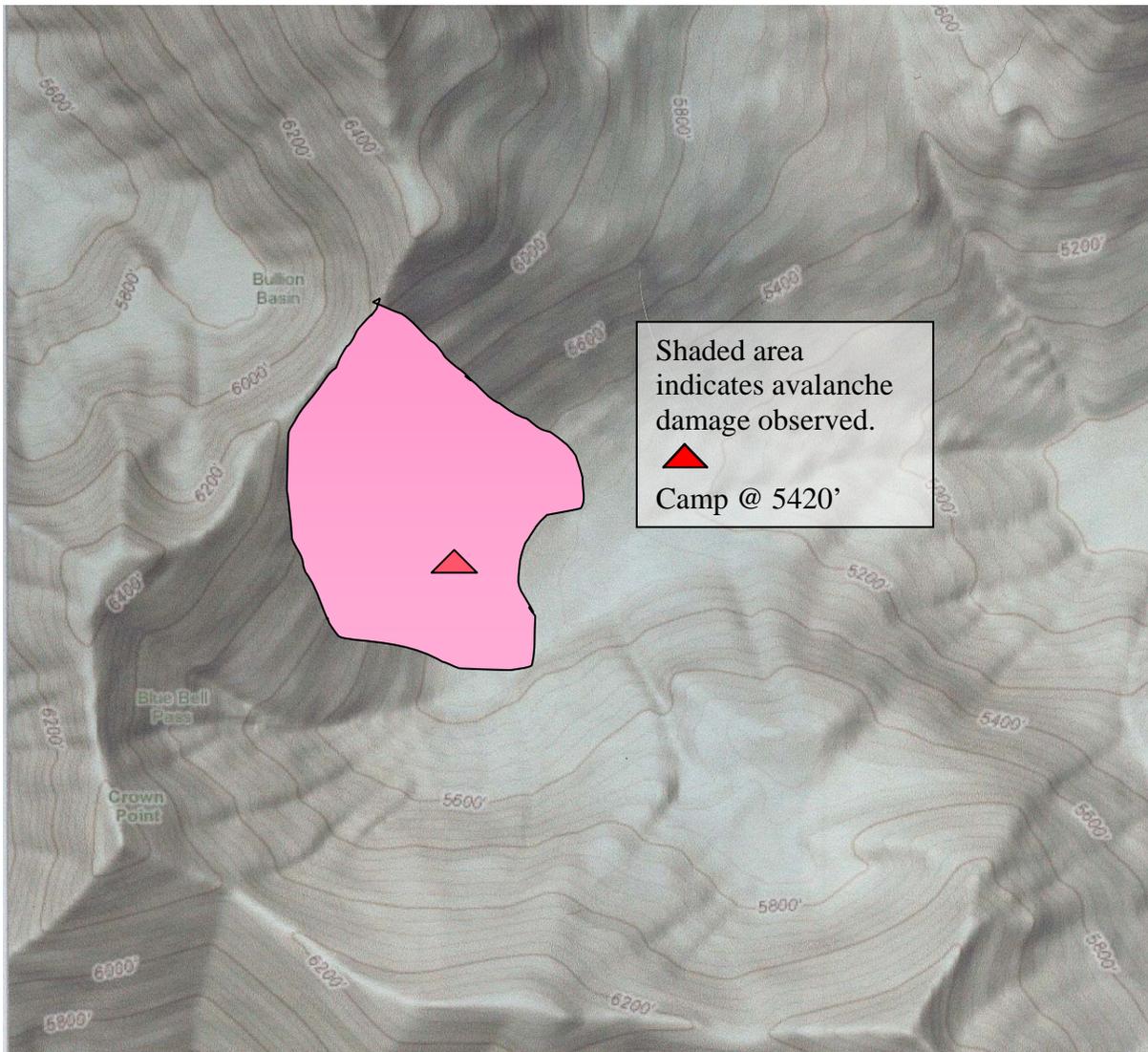
Finally on Saturday, June 21, 2008, the three missing snowboarders who were presumed caught and killed by avalanches on that tragic early December, 2007 weekend, were found in Union Creek by a group of backcountry skiers and friends. In a remarkable effort arranged via the local backcountry skier's website one of the searchers in the timber below the victim's last seen area spotted a yellow stuff sack hanging from a tree. The tree had been knocked over in an avalanche. After a concentrated search in this area the three missing snowboarders were found buried under the snow.



The group of backcountry skiers had linked up with Crystal Mt. ski patrollers who were also searching that day. The ski patrol director coordinated the effort between the search parties and the Sheriff. By the end of the day Saturday, deputy in charge Bill Cassio, ski patrol director Paul Baugher and Lynn Baugher, met patrollers Jen

Mowbray and Ben and Allison Wright, at the site along with Dave and Meghan, two friends of the victims. They performed a brief accident site investigation and made preparations for a subsequent helicopter extraction the following day.

The avalanche that struck the “campsite” most likely fell from the big open path above. The starting zone angles were in the high 30 degree to low 40 degree range. The vertical fall of the full depth avalanches that were observed on this slope during the December search were estimated to be approximately 800-1000 vertical feet.



The snowboarding trio was found at the 5420 ft level in the lower track in a copse of dense cedars and silver fir (probably 30-50 years old) near the bottom of Union Creek Basin. According to friends this was along the “shortcut exit” (Bullion saddle) they had taken from the hut to return to Crystal on previous trips. The victims themselves were found hunkered down in their sleeping bags with a tarp under them (a tarp that had previously been rigged over the bivouac site as shelter had been ripped off and taken further downslope by the slide). Their beacons were found turned off.

Weather Data

The weather trends during this tragic weekend indicate progression toward a highly unstable snowpack as cold temperatures, strong winds and increasingly heavy snowfall on December 1 were followed by further heavy precipitation, continued very strong winds and snow changing to rain on the 2nd of December. Such weather would load lower density and weaker snow layers from the 1st with increasingly dense snow or rain on the 2nd, depending on elevation. Summary data from NWAC weather stations at the Crystal Mountain ski area are given below:

*	Low temp (6870', deg F)	High temp (6870', deg F)	24 Hour Precipitation at 4 am (4480', water equivalent, inches)	24 Hour Snowfall at 4 am (4480', inches)	Total Snowdepth at 4 am, (4480', inches)	Wind at time of peak gust (6870', direction/average speed/gust, mph)
30 Nov	9	17	0	0	20	248/25/51
1 Dec	17	29	.02	0	21	247/36/70
2 Dec	30	38	.93	18	37	250/41/87
3 Dec	24	34	4.04	15	43	250/30/57
4 Dec	20	27	3.87	0	25	287/14/20

Daily summary weather data from NWAC weather instrumentation at Crystal Mountain Base area (4500") from November 30-December 4, 2007.

In order to help emphasize the severity of the evolving danger, in addition to the normal daily avalanche forecasts issued by the NWAC during this period which included watches and warning prior to and during the event, special avalanche statements were also issued Friday through the following Monday. The text of the statement issued on Friday, November 30th:

SPECIAL AVALANCHE STATEMENT FOR THE OLYMPICS WASHINGTON CASCADES AND MT HOOD AREA
 NORTHWEST WEATHER AND AVALANCHE CENTER SEATTLE WASHINGTON
 130 PM PDT FRIDAY NOV 30 2007

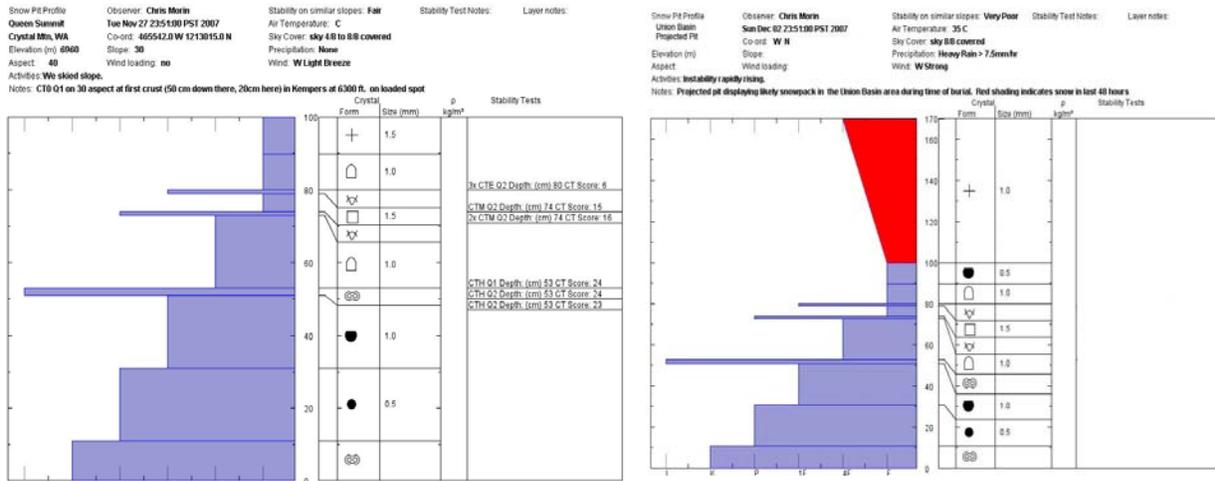
...AVALANCHE WATCH FOR THE OLYMPICS, WASHINGTON CASCADES AND MT HOOD AREA FOR SUNDAY AND MONDAY...

With an already unstable snowpack in place, abundant new snowfall mid-late Saturday and Sunday should combine with increasingly strong winds Sunday and a significant warming trend mid-late Sunday into Monday to produce a substantial increase in the avalanche danger both Sunday and Monday. Although a still relatively shallow snowpack in some areas is helping to limit the avalanche danger presently, significant new snowfall anticipated mid-late Saturday and Sunday should help to cover much of the current terrain and vegetative anchors. Large amounts of increasingly dense wind slab should load and stress a variety of buried weak layers on Sunday. Consequently, both natural and human triggered slides should become increasingly likely in steeper avalanche terrain, especially on lee slopes above 4 to 5000 feet where a deeper snowcover exists. Initially, most slides that release should primarily involve only the most recently deposited new snow received late Saturday and early Sunday. However, with more significant warming and sustained heavy loading likely later Sunday, larger slab slides ranging up to 3 to 5 feet or more should become probable as the increased stresses affect more deeply buried weak layers. As a result, back country travelers should remain very aware of the significantly increasing avalanche danger over the weekend and into early next week and modify their route selections and trip plans accordingly.

Snowpack Summary

A week before the accident there was 1-2 feet of snow above 5000' in the Crystal Mountain/ Union Creek areas from an early November snowfall. This shallow snowpack consisted of mostly weak snow (see profile from week prior to accident below left). Another foot of cold low density snow fell in the Cascades just before the weekend of December 1-2. This made the snow coverage in the area skiable for the first time of the season. Crystal Mountain ski area opened on November 30, with very limited terrain available.

Saturday December 1 dawned clear and cold but the next storm system brought precipitation and wind to the area by late afternoon. This storm system brought increasingly heavy precipitation, high winds and rising freezing levels (see weather data table above). By the afternoon of Sunday December 2, the very weak snowpack had developed a slab structure capable of producing full depth climax avalanches (see expected profile with new storm snow below right).



Avalanche Summary

The avalanche that buried the camp was one of several large soft slabs with average fracture depths of 1 meter. It probably released by mid day or almost certainly by the night of Sunday December 2. It can be classified as s SS-N-R4-D4-O or Soft Slab- Natural- Relative Size (to the path) was large -Destructive potential was large- Older layers of the snowpack were involved. Most steep slopes above 5000' had avalanched by the morning of Monday December 3. The weak layer for most of the large soft slab (both dry and wet) avalanches was the faceted snow from early November and the bed surface was either the ground or on weak melt-freeze crusts near the ground. By late Monday the avalanche cycle ended. Extensive avalanche release and gradually lowering freezing levels behind the storm resulted in stabilization of most slopes by the afternoon of Tuesday December 4. It should be noted that this storm event also triggered widespread flooding, power outages, and other weather related problems in western Washington. Extensive avalanche damage and debris fields in the area where the victims were eventually found were observed during the SAR operation. Most of this was caused by multiple large soft slab avalanches initiating in the steep starting zones near the NE – SW oriented ridge between Bullion Basin and Union Creek Basin around 6200'. A secondary release point observed was the steep convexity in the track at the 6000' level.

The east-facing track that descended into Union Creek Basin varied from large open grass areas with very little anchorage to small stands of fir. The runout of the track had increasingly dense timber and terminated in a bench in Union Creek Basin at the 5200' level. There was evidence of extensive timber damage in this area of the track from this destructive avalanche cycle. As stated earlier, the one meter deep snowpack on Saturday was weak but not unstable. In fact, many parties that were out that Saturday had to choose their route carefully not due to avalanche danger but due to the very thin cover in many areas.



Accident Factors Comments

- Experience in Activity:

The group of snowboarders had a moderate level of experience in backcountry snowboarding. They also had local knowledge of the Union Creek Basin area and had made numerous trips to the area to build a makeshift shelter. They planned on returning to the makeshift shelter during this trip. This was however their first winter trip into the area.

- Equipment Carried:

They carried full winter camping packs capable of staying out for several days or more in winter conditions. One of the men used a split board and the other two carried snowshoes (very small). The group carried shovels (# unknown) and all of them had avalanche beacons. Kevin Carter had just bought his avalanche beacon specifically for this trip.

- Avalanche Training:

It is believed that no one in the group had participated in any formal avalanche hazard evaluation training. However, Philip Hollins had read various books on the subject. The group had some experience digging snowpits and looking for instability, but they were still at the early stages of their learning process (information based on interviews with friends but unverified).

- Information and Signs of Instability Available:

The weather, especially by Sunday morning would be the primary field clue available to them. Saturday the group should have had no difficulty with travel or avalanches as the snowpack was weak but without slab structure. It is possible they could have observed small surface sluffing. By the end of the day Saturday the storm arrived and it is unknown where they camped on Saturday night. By Sunday morning the storm was at full intensity. Visibility and travel, especially with the small snowshoes and big packs they carried, would have been extremely difficult and dangerous.

The other primary information available to them was the forecast. The weak structure of the snowpack, approaching storm, and resulting avalanche cycle were well forecasted in advance of the weekend. Based on their late arrival at Crystal Friday evening they could have seen the special avalanche statement issued Friday November 30 (see report above). In the time leading up to the trip there had been some talk between the group and their friends about the incoming weather. According to a friend of the group, Kevin Carter noted that it “looked sketchy”.

- Decision Making:

It is unknown where they camped on Saturday night. The makeshift shelter that they had built over summer and told friends they planned to stay in was found during the December search operation at the 5700' level. It was found in a very clean state. If they had stayed there, it appears they did not leave it in a hurry.

Alternatively, they may have camped where they were found. This location is just below where they were last seen on Saturday. It is unlikely that they would have been buried there that night (too early in avalanche cycle). By Sunday morning they either decided to remain

in that camp or ended up there after moving. The group had bivouacked many times before. A friend at the recovery site commented that their final camp was consistent with past campsites of theirs and did not appear to be made in a frantic manner. This mentality combined with their slow methods of travel makes it possible to understand why they didn't retreat back to the hut, that was only .5 mile away. In either case, staying in camp or deciding to abandon travel and hunker down was a good decision.



Unfortunately the location they had chosen for their camp may have given them a false sense of security. The density of the timber in this part of the avalanche track may have offered protection from a small avalanche but not from one of this magnitude. There was no direct visibility of the steep open slope above them from their camp. However, they had descended this same open slope on Saturday.

They were found with their rescue beacons turned off. The assumption would be that they were camped in a secure spot and this would allow them to conserve batteries. Statistically it is much less common for avalanche victims to die in camps but it does happen. At least 11 fatalities in 3 separate avalanche accidents have occurred in this way in Washington.

- Other Comments:

Their trip into the backcountry came during a period of rapidly increasing avalanche danger. Anyone that was camped overnight or was forced to move on Sunday was already in jeopardy. Two hikers that were camped out Saturday night were killed while hiking out in an avalanche Sunday morning near Source Lake at Snoqualmie Pass. One hiker in that group of three survived. Another group of campers were rescued the same weekend. Also that Sunday the Patrol Director (and author of this report) and his control route partner were caught in a very small avalanche while doing avalanche control work a few miles away at Crystal Mountain. One of the team members was partially buried and able to extricate himself and then dig out his

completely buried partner. They were already up to their waists in deep heavy snow when they were knocked over by the small sluff. By mid morning they had to break trail even while going downhill. Even small avalanches were potentially lethal in this circumstance.

Search and Recovery Comments

Initial response was slow to start due to avalanche danger and strain on resources like air assets due to flooding/ other WX related emergencies. Crystal Mountain ski area had to shut down since most of the snow had avalanched or was washed out. The power and all phones (including cell service) were out initially.

Beacon search could have been facilitated by air search with long-range antenna as soon as possible (we now have one). Unfortunately this would not have made a difference in this SAR due to the beacons being off.

Victims found just below the last seen area. Without other clues in the widespread avalanche debris of the search area (3 other basins) this may have been an area to consider the use of avalanche dogs.

Due to the popular nature of the area, information of their last seen points was eventually garnered from members of online ski forums who had seen the group while touring near Bullion Basin that Saturday. In future situations, these online communities should be considered as a valuable source of information in calculating a last seen point or other valuable clue. In retrospect, had the information from these witnesses been combined with the exact hut location and potential exit routes explained by their friends, it may have narrowed the search area closer to their eventual found location. In practice it is very difficult to combine these distant sources of information during a search, but every effort should be made to do so.

One false assumption made was that they were caught while moving (triggering the avalanche that kills them is statistically most likely). When searching the timber next to where they were found earlier in that same week it was given lower search priority due to difficulty of bodies being carried that far into dense timber from above.

Perhaps the only “silver lining” to this tragic event was the determination and depth of effort that went into the search and recovery operation. An exhaustive effort was made in December with over 30 individuals representing law enforcement, ski patrol, mountain rescue, and others. As the snow began to melt in June, members of the ski patrol and other individuals made periodic search attempts in the area. The highlight was the remarkable effort of a group of local backcountry skiers. These selfless individuals organized themselves through a website and used good skill (and some luck) to find the camp location. The group cared for friends of the victims at the site and worked very well in coordinating with ski patrol and law enforcement to bring a swift and efficient resolution.

Thanks to everyone who participated in the search efforts in December and June. After more than 6 months the friends and family have some closure and we can finally put an end to a very unforgiving avalanche season.

