Avalanche Fatality near Crystal Mountain, WA

Report prepared by Paul Baugher—Crystal Mountain Patrol Director, Chet Mowbray and Ben Wright—Crystal Mountain Snow Safety, Kim Kircher, Chris Morin, Aaron Mainer—Crystal Mountain Professional Patrol and Mark Moore, NWAC

Date: Saturday afternoon, 2/24/2007
Location: Mt Rainier National Park (just west of Crystal Mountain Ski Area Boundary), Park Place avalanche path
Elevation: 6850 feet
Aspect: Northwest, ~40 degree
Victim(s): 1 male skier caught, buried and killed, victim age 53
Avalanche: SS-AS-R4-D3-O, slide traveled ~1500 ft vertical, ~4000 ft path length
Rescue: Victim recovered by transceiver search after approximately 25 minutes

Preliminary incident narrative:

After taking multiple ski runs within the area, two long time local skiers decided to leave the Crystal Mountain ski area boundary at around 2:50 PM on Saturday afternoon, electing to ski down toward closed Highway 410 within Mt Rainier National Park. Although this section of Hwy 410 is normally closed during winter-time due to numerous avalanche problems, it provides a return to the open portion of the highway from those desiring to descend the at times difficult and dangerous terrain on the back side of the ski area. While it is unknown whether the victim had avalanche training, he did carry a beacon, probe and shovel as well as a spare beacon which he loaned to his partner. Unaware of either the avalanche forecast or the current danger levels, the party may have concluded that snow stability outside the ski area was similar to what they had experienced within area, and they did not consult with any of the ski patrol about the potential danger prior to leaving the area. However, an avalanche watch had been issued by the Northwest Weather and Avalanche Center (NWAC) the previous day for a substantial increase in the danger on Saturday, and a warning had been issued Saturday morning for high avalanche danger above 4000 feet and considerable below.

In any case, shortly after entering the top of the uncontrolled and west exposure, out of area slope, the victim triggered a three foot wind slab (see figures below). The resultant slide, releasing on some faceted snow above an old crust formed about a week prior to the incident, caught and carried the skier about 1500 feet vertical, 4000 feet path length, sweeping him through or over numerous trees in the process. Upon witnessing the event, the victim’s partner used his cell phone to summon help. Within 15 minutes of the event, the Crystal Mountain ski patrol arrived on scene and discovered the victim’s tracks leading into the avalanche. The patrol quickly traveled down the avalanche path, searching for and locating the victim near the toe of the debris by beacon within 10 minutes. As rescuers reached the victim, they noticed that while a portion of his hip was visible, his head was extricated from under about a foot of snow. Despite resuscitation efforts, the victim did not respond and was transported by toboggan toward the highway below. The rescue team reached a snowcat sent up the closed road around dark (~7 PM). Though not confirmed, it appears that trauma was the probable cause of death.
Survivor/ Witness Interview
Feb 24, 2007 ~6:30pm
Interviewed by Kim Kircher and Paul Baugher

On Saturday February 24th, 2007 at approximately 2pm, Stan and Dan left the boundary of Crystal Mountain Ski Area with the intention of skiing into Mt. Rainier National Park down to Highway 410. They ducked underneath the boundary rope line behind High Campbell Chair into the area colloquially known as “Park Place”, approximately 4000 vertical feet above the highway.

Earlier in the day the two skiers had made several runs into the North Backcountry. The ski patrol had used explosives and ski cutting to mitigate the avalanche hazard in that area early in the morning. It had continued to snow heavily that day and many patrons had skied the North Backcountry that day. It was a particularly busy day at Crystal and the skiing public had cut up the slopes in the North Backcountry, further mitigating the avalanche hazard. Stan stated to Dan that based on their experience in the North Backcountry, he felt the slopes were “stable”.

Stan, who normally would not wear a transceiver to ski Crystal’s controlled “Backcountry” areas, had brought his shovel pack and two transceivers with the intention of skiing a run into the Park to the highway below. Earlier in the season, Stan and Dan had skied the same run, known as Park Place, to the highway without incident. In fact this was the pair’s fifth or sixth “410 run” in their ten year friendship. Stan’s wife and family knew of their plan to ski the run and she planned to pick them up at the Park gate later in the afternoon.

Dan describes Stan as the “leader”, who would often show him around Crystal Mountain. Dan borrowed Stan’s second transceiver for their intended run down to 410. Dan had only a cursory understanding of transceiver function and did not carry a shovel or probe. Neither of the skiers was known to have had avalanche training.

At the boundary line, the two did not discuss the avalanche conditions, even though it was still snowing hard and the visibility was limited. Dan entered the slope first, skied approximately ten turns and stopped on the left side to wait for his friend. Earlier, Stan had stated that skiing a suspect slope one at a time was the proper technique, and Dan was following this basic rule of thumb. He turned to watch his friend ski and saw that he was engulfed in a large slab. He saw him for only a few seconds before he disappeared in the powder cloud.

Immediately Dan attempted to call 911, which was unsuccessful. He also tried to call Stan’s daughter and did not get through. Finally, he successfully called his son and told him to get help. His son called the ski patrol and alerted them of the location of the slide. During this time, Dan turned off his cell phone and began a transceiver search. After searching for about ten minutes, several ski patrollers including Aaron Mainier, Kim Kircher and Chris Morin arrived at the boundary and saw the ski tracks going under the rope line. Mainier and Kircher followed the tracks while Morin stayed behind as the Avalanche Guard. Upon seeing the fracture line, Mainier and Kircher turned their transceivers to receive and began a search. Kircher heard someone called for help and after descending about 500’ came upon Dan, and began to interview the witness. The three continued to descend for another 500’. At that point, Kircher asked Dan if it were possible that Stan’s transceiver could be turned off. Dan stated that it was possible. Mainier continued to descend while Kircher further interviewed Dan. Thirty seconds later, Mainier stated on the radio that he “had a signal”. Kircher and Dan skied down to him, during which time Mainier stated on the radio that he had “found a body”. At that point, Kircher arrived and the two began extrication. Stan was found face down with his head down hill, partially buried with his legs wrapped around a tree. Upon seeing the massive trauma, the two patrollers alerted Dan to stay higher and not to come down. He remained twenty feet above the site. By this time, Morin joined the rescue along with Laura Blanchard, a firefighter and former ski patroller and Geoff Walker, a ranger for Mount Rainier
National Park. The five rescuers continued to shovel and extricate the victim. Soon afterwards Mike Gladstone, a paramedic, arrived on scene and determined that the patient was deceased.

The remainder of the rescue included route finding to the highway, which was a long and arduous process. Overall the avalanche ran approximately 1500’, and Stan was found among trees near the bottom of the debris (Figure 1).

Figure 1. Park Place avalanche accident diagram

Figure 2. Park Place avalanche fracture line
Figure 3. Fracture profile of the Park Place avalanche accident

Snow Pit Profile: Chet McEwenry
Observer: Sun Feb 25 14:32:00 PST 2007
Elevation: 6958
Aspect: SSE
Wind loading: yes
Notes: Fatally accident fracture profile stability test done 24hrs before on adjacent slope same aspect

Figure 4. Weak layer between upper crust and bed surface
Figure 5. Upper crust in fracture profile

Figure 6. Looking down the bed surface of the avalanche path
Weather history leading to Park Place avalanche accident:

During the first week of February Crystal Mountain was in high pressure with very warm temperatures into the upper forties. In the second week of February the ridge began to break down and the first few weak systems broke through the ridge. This cooled temperatures significantly creating a strong 4cm thick melt freeze crust. The 11th of February ushered in light snowfall (see figure 8) amounts at further cooling temperatures creating a shallow faceted layer (Figure 9, gradient on 2/13) by Thursday, February 15, 2007. On the 15th Crystal Mountain received rain (0.59 inch of water) to approximately 6500 ft. This created a thin crust up to 7000 ft, over-lying the faceted snow from earlier in the week. Following the Thursday rain event it cleared up and cooled, creating a strong temperature gradient across the crust, restarting the faceting (Figure 9, gradient on 2/16) process and further weakening the already weak upper crust. Light snowfall amounts were seen on the 16th through the 18th preserving the weak layers around the two crusts.

The storm cycle leading to the accident began on Monday morning, February 19, 2007, with heavy snowfall Monday morning and afternoon at further cooling temperatures. Accompanying the initial front were increasing westerly winds (Figures 10 & 11). Two more fronts passed during the week one on the 20th, the next on the 22nd, with significant southeasterly to southwesterly winds and 20 inches of snowfall. The 23rd saw heavy orographic snowfall (9 inches) with light winds. The morning of the 24th saw an increase in southwesterly winds shifting to southerly winds averaging 20+ mph with 13 inches of snowfall by the time of the accident. In summary, a total storm snowfall of 49 inches, wind loading, and buried weak layers overlying a smooth bed surface created the recipe for this avalanche accident on a northwesterly aspect at 6850 feet.
Figure 8. New snow depths at Crystal Mt base prior to incident

![New Snow Depth Green Valley Prior to Park Place Accident](image)

Figure 9. Snow temperatures prior to incident

![Snow Temps Prior To Park Place Accident](image)

Figure 10. Wind speeds at Crystal Mt summit prior to incident

![Wind Speed Prior to Park Place Accident](image)
Figure 11. Wind direction at Crystal Mt summit prior to incident

Wind Direction Prior to Park Place Accident

Wind Dir Ave

2/19/07  2/20/07  2/21/07  2/22/07  2/23/07  2/24/07  2/25/07
N         E       S        W         N
Ancillary Snowpack and Weather Information:

NWAC Avalanche Forecasts:

On Friday, February 23, the Northwest Weather and Avalanche Center issued an avalanche watch for the Olympics, Mt Hood area and the Washington Cascades near and west of the crest in an effort to highlight the anticipated significant increase in the avalanche danger levels on Saturday. A special avalanche statement was also issued on both Friday and Saturday and, in cooperation with the National Weather Service, the duty forecaster issued a special Avalanche Section of the NWS Area Forecast Discussion (AFD) on both Friday and Saturday, also to help disseminate the expected danger increase to a wider audience. Although none of this information reached the victim or his partner, the forecasts are shown here to help describe the snowpack and weather that helped lead to the incident and the efforts made to disseminate this information to help reduce the possibility of an avalanche incident. Of note is the fact that the faceted snow near the crust had been a continuing concern for forecasters throughout the previous week and this weak bond continued to be discussed and referenced in both forecasts.

Detailed avalanche forecast issued on Friday, February 23, 2007

BACKCOUNTRY AVALANCHE FORECAST FOR THE OLYMPICS WASHINGTON CASCADES AND MT HOOD AREA
NORTHWEST WEATHER AND AVALANCHE CENTER SEATTLE WASHINGTON
915 AM PST FRI FEB 23 2007, CORRECTED

NWAC Program administered by:
USDA-Forest Service
with cooperative funding and support from:
Washington State Department of Transportation
National Weather Service
National Park Service
Washington State Parks and Recreation Commission
Pacific Northwest Ski Area Association
Friends of the Avalanche Center
and other private organizations.

This forecast applies to back country avalanche terrain below 7000 feet and does not apply to highways or operating ski areas.

WAZ513-518-519-019-042-501-502-ORZ011-241700-

ZONE AVALANCHE FORECASTS

* OLYMPICS, WASHINGTON CASCADAS NEAR AND WEST OF THE CREST—
...AVALANCHE WATCH FOR SATURDAY...
Considerable avalanche danger above 5 to 6000 feet and moderate below early Friday slightly increasing later Friday morning and afternoon, mainly on sun exposed terrain. Danger gradually increasing late Friday night and early Saturday, becoming considerable below 7000 feet. Significantly increasing danger Saturday morning, becoming high above 4000 feet and considerable below Saturday afternoon. Slightly
decreasing danger Saturday night, becoming high above 5000 feet and considerable below.

* EAST SLOPES WASHINGTON CASCADES-
Moderate avalanche danger below 7000 feet early Friday slightly increasing later Friday morning and afternoon. Danger gradually increasing late Friday night and early Saturday, becoming considerable above 6000 feet and moderate below. Danger further increasing Saturday morning. Considerable avalanche danger below 7000 feet Saturday afternoon. Slightly decreasing danger Saturday night, becoming considerable above 4 to 5000 feet and moderate below.

* MT HOOD AREA-CORRECTED
...AVALANCHE WATCH FOR SATURDAY...
Considerable avalanche danger above 5 to 6000 feet and moderate below early Friday slightly increasing later Friday morning and afternoon, mainly on sun exposed terrain. Danger gradually increasing late Friday night and early Saturday, becoming considerable below 7000 feet. Significantly increasing danger Saturday morning, becoming high above 4 to 5000 feet and considerable below Saturday afternoon. Slightly decreasing danger Saturday night, becoming high above 5 to 6000 feet and considerable below.

* SUNDAY OUTLOOK-
Little change in the danger Sunday, with high danger continuing above 5 to 6000 feet and considerable danger below. Slightly decreasing danger late Sunday.

SNOWPACK ANALYSIS
In most areas near and west of the Cascade crest, recent cold showery weather has produced gradually increasing amounts of relatively loose, low density near surface snow. This high quality powder, along with a very weak sun crust on sun exposed terrain, lie over some slowly settling and generally higher density wind slabs over several old crusts formed from rain to relatively high elevations about a week ago. While this snow structure has produced some excellent back country sliding and riding, the near surface powder is also masking some 1-3 ft slabs that are continuing to lurk above the old crust, especially on north, northeast and east exposures above about 5 to 6000 feet. Several weak layers also exist within the old wind slabs which also have a gradually weakening bond to the old crust region through strong temperature gradients that are continuing to facet snow near the crusts. While recent slow settlement has helped to reduce the potential for triggering these older wind slabs over the crust, and most recent avalanche activity has involved shallow soft slabs releasing on weak layers formed during breaks between showers, a considerable danger remains above about 5 to 6000 feet where human triggered slides remain probable. At lower elevations, more settlement combined with a better initial bond of the underlying slab to the old snow surface are helping to produce a slightly lower and overall moderate danger, although both loose and isolated soft slabs remain possible, especially during daytime warming. Although a similar snow structure exists along the Cascade east slopes, recent lighter amounts of recent snowfall are producing an overall moderate danger; however, this danger should generally increase at higher elevations closer to the crest.

DETAILED FORECASTS

FRIDAY, FRIDAY NIGHT
Light to moderate showers should decrease later Friday morning, with scattered light showers and partial clearing expected mid-day through Friday evening. Along with continued low freezing levels and light winds, this should produce a slight increase in the danger later Friday morning and afternoon. This danger increase should be greatest on steeper sun exposed terrain beneath rocks, cliffs or trees where melting snow may trigger natural slide releases on the slopes below. Also some recently developing cornices may be susceptible to the destabilizing effects of sunshine and these overhangs as well as the slopes below should be approached with caution during
daytime warming. While the danger from buried wind slabs has gradually decreased at lower elevations, the possibility of buried wind slabs should continue on shaded terrain at higher elevations, mainly above about 5-6000 feet, and back country travelers are urged to use caution while traveling in steeper terrain. Snow stability tests to the old crust should be combined with appropriate route finding to help minimize avalanche danger. Increasing winds and slightly rising freezing levels should accompany light to moderate snow expected to spread over most areas later Friday night and early Saturday morning. This should produce generally increasing avalanche danger as increasing density wind slabs are deposited over either low density snow or some surface hoar that may have developed earlier Friday night. Greatest danger should be expected on west facing slopes near the Cascade passes and north to northeast exposures elsewhere.

SATURDAY
Light to moderate snow should increase and become moderate to heavy later Saturday morning and afternoon, along with strong winds and further slight warming. This should produce an increasingly unstable snowpack with rather sensitive wind slabs of 1 to 2 feet expected over multiple buried weak layers. As a result, high avalanche danger is likely above about 4000 feet mid-day and Saturday afternoon with considerable danger below. In the Olympics, Mt Hood area, and Washington Cascades near and west of the crest, natural and human triggered slides should become increasingly likely later Saturday morning and afternoon, especially on steeper wind loaded terrain—once again west exposures near the Cascade passes and north to northeast aspects elsewhere. While most expected avalanches should involve only the most recently deposited wind slabs releasing on previous near surface weaknesses, some avalanches may trigger isolated deeper slides involving all of the snow above the crust from a week ago. Due to the developing danger and anticipated weather conditions, back country travel in avalanche terrain is not recommended on Saturday. Although a slightly lower danger is expected along the Cascade east slopes, unstable but shallow wind slabs should still become probable on most wind loaded terrain.

SATURDAY NIGHT, SUNDAY, SUNDAY NIGHT
Although snowfall should decrease and become more showery mid-late Saturday afternoon along with slightly diminished winds, moderate showers and relatively cold temperatures should allow for only a slight decrease in the danger Saturday night as new wind slabs begin to settle, mainly at lower elevations. Light to moderate showers Sunday morning should increase Sunday afternoon and evening along with increased winds and continued low freezing levels. This weather should allow little change in the existing danger on Sunday with new snow adding additional stress to buried weak layers or recently formed wind slabs, with greatest danger continuing on northeast through northwest exposures. However, gradually decreasing showers and winds Sunday night should produce a slight decrease in the danger through slow snowpack settlement.

Special avalanche statement issued on Saturday, February 24, 2007

SPECIAL AVALANCHE STATEMENT FOR THE OLYMPICS WASHINGTON CASCADES AND MT HOOD AREA
NORTHWEST WEATHER AND AVALANCHE CENTER SEATTLE WASHINGTON
830 AM PST SAT FEB 24 2007

This statement applies to back country avalanche terrain below 7000 feet and does not apply to highways or operating ski areas.

WAZ513-518-519-019-ORZ011-250600-
OLYMPICS-
...AVALANCHE WARNING FOR HIGH DANGER ABOVE 4000 FEET FROM 10 AM SATURDAY THROUGH 10 PM SATURDAY NIGHT...

Light to moderate amounts of low density snowfall have been received in most areas during the past few days, with multiple weak layers existing above an old crust formed about a week ago. This generally weak upper snowpack structure should be loaded and stressed by increasingly dense snowfall created by strong winds and slight warming expected Saturday morning into early afternoon. As a result a significant increase in the avalanche danger is expected on Saturday with high danger and unstable wind slabs increasingly likely above about 4000 feet in Washington and above about 4 to 5000 feet in northern Oregon. Below 4 to 5000 feet, an increasing and considerable danger is expected with natural and human triggered avalanches probable. With this developing danger, back country travel is not recommended later Saturday morning through Saturday evening.

Note that while slight stabilization of the snowpack is expected Saturday night, additional snow, moderate winds and lowering freezing levels on Sunday should allow for little change from the current considerable to high avalanche danger. Hence, backcountry travelers are urged to confine travel to more gentle terrain away from avalanche path runouts.

Please see the NWAC web site at www.nwac.us for further information.

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Backcountry travelers should be aware that elevation and geographic distinctions are approximate and that a transition zone between dangers exists. Remember there are avalanche safe areas in the mountains during all levels of avalanche danger.

Detailed avalanche forecast issued on Saturday, February 24, 2007

BACKCOUNTRY AVALANCHE FORECAST FOR THE OLYMPICS WASHINGTON CASCADES AND MT HOOD AREA
NORTHWEST WEATHER AND AVALANCHE CENTER SEATTLE WASHINGTON
830 AM PST SAT FEB 24 2007

NWAC Program administered by:
USDA-Forest Service
with cooperative funding and support from:
Washington State Department of Transportation
National Weather Service
National Park Service
Washington State Parks and Recreation Commission
Pacific Northwest Ski Area Association
Friends of the Avalanche Center
and other private organizations.

This forecast applies to back country avalanche terrain below 7000 feet and does not apply to highways or operating ski areas.

WAZ513-518-519-019-042-501-502-ORZ011-251700-
ZONE AVALANCHE FORECASTS

* OLYMPICS, WASHINGTON CASCADES NEAR AND WEST OF THE CREST-
...AVALANCHE WARNING FOR SATURDAY...
Considerable avalanche danger above 4000 feet and moderate below significantly increasing Saturday morning and becoming high above 4000 feet and considerable below Saturday afternoon and evening. Slightly decreasing danger later Saturday night and early Sunday, becoming high above 5000 feet and considerable below. Little change in the danger on Sunday, with a slight decrease likely Sunday night.

* EAST SLOPES WASHINGTON CASCADES-
Considerable avalanche danger above 6000 feet and moderate below early Saturday, increasing Saturday morning and becoming considerable below 7000 feet Saturday afternoon. Slightly decreasing danger Saturday night, becoming considerable above 4 to 5000 feet and moderate below. Little change in the danger on Sunday, slightly decreasing Sunday night.

* MT HOOD AREA-
...AVALANCHE WARNING FOR SATURDAY...
Considerable avalanche danger above 4 to 5000 feet and moderate below significantly increasing Saturday morning and becoming high above 4 to 5000 feet and considerable below Saturday afternoon and evening. Slightly decreasing danger later Saturday night, becoming high above 5 to 6000 feet and considerable below. Little change in the danger on Sunday, with a slight decrease expected Sunday night.

SNOWPACK ANALYSIS
In most areas of the Olympics and Cascades near and west of the Cascade crest, including Mt Hood, recent cold showery weather since last Tuesday produced gradually increasing amounts of relatively loose, low density surface and near surface snow. While this recently high quality powder has produced some excellent back country sliding and riding, it lies over some slowly settling, and generally higher density wind slabs that have a weakening bond to several old crusts formed from heavy rain received over a week ago. Recent slow settlement has helped to reduce the potential for triggering these older wind slabs over the crust, and most recent avalanche activity has involved shallow soft wind slabs releasing on weak layers formed during breaks between showers. Nevertheless, with increasing snowfall and strengthening winds in most areas early Saturday, this snow structure is producing a generally increasing danger as higher density snow is deposited over previous weak surface snow, especially at higher elevations where stronger winds are occurring. At lower elevations, more settlement combined with a better initial bond of the underlying slab to the old snow surface and more slowly strengthening winds are helping to produce a slightly lower and overall moderate danger, although both loose and isolated soft slabs remain possible and the danger is also on the rise. Although a similar snow structure exists along the Cascade east slopes, recent lighter amounts of recent snowfall are producing an overall lower danger; however, this danger is also increasing early Saturday, especially at higher elevations close to the crest.

DETAILED FORECASTS
SATURDAY
Light to moderate snow should increase and become moderate to heavy later Saturday morning and afternoon, along with strong winds and slow but limited warming. This should produce a progressively more unstable snowpack with rather sensitive and increasingly dense wind slabs of 1 to 2 feet expected over multiple buried weak layers. As a result, high avalanche danger is likely above about 4000 feet mid-day and Saturday afternoon with increasing and considerable danger below. In the Olympics, Mt Hood area, and Washington Cascades near and west of the crest, natural and human triggered slides should become increasingly likely later Saturday morning and afternoon, especially on steeper wind loaded terrain—primarily west exposures near the Cascade passes and north to northeast aspects elsewhere. While most expected
avalanches should involve only the most recently deposited wind slabs releasing on previous near surface weaknesses created late this week, some avalanches may trigger isolated deeper slides up to 2 to 4 feet or more which could involve all of the snow above the crust from a week ago. Due to the developing danger and anticipated weather conditions, back country travel in avalanche terrain is not recommended on Saturday. Although a slightly lower danger is expected along the Cascade east slopes, unstable but shallower wind slabs should still become probable on most wind loaded terrain.

SATURDAY NIGHT, SUNDAY, SUNDAY NIGHT
Although snowfall should decrease and become more showery mid-late Saturday afternoon along with slightly diminished winds, moderate showers and relatively cold temperatures should allow for only a slow and slight decrease in the danger Saturday night as new wind slabs begin to settle, mainly at lower elevations. Light to moderate showers early Sunday morning should increase Sunday morning in the south and Sunday afternoon and evening in the north along with increased winds and continued low freezing levels. This weather should allow little change in the existing danger on Sunday with new snow creating further new wind slabs as well as adding further stress to buried weak layers or recently formed wind slabs from Saturday. Greatest danger should continue on northeast through northwest exposures at higher elevations; however, near the Cascade passes a switch from east to west winds early Sunday afternoon should shift the greatest danger to east facing slopes by late Sunday. Gradually decreasing showers and winds Sunday night should allow for a slight decrease in the danger as recent wind slabs start to settle.

Backcountry travelers should be aware that elevation and geographic distinctions are approximate and that a transition zone between dangers exists. Remember there are avalanche safe areas in the mountains during all levels of avalanche danger. Contact local authorities in your area of interest for further information.