Avalanche Mountain Incident
March 4th, 2017
Report by Dennis D’Amico, Robert Hahn and Jeremy Allyn

Incident snapshot

Occurrence Time and Date: Approximately 3 pm on March 4th, 2017
Time First Reported to SAR: 348 pm
Rescue Time: 730 pm (evacuated from incident site by helicopter at 830 pm)
Lat/Lon: 47.4690 N, 121.4330 W (location of victim)
Location: Avalanche Mountain, Snoqualmie Pass area, King Co., Mt Baker-Snoqualmie NF, WA

Number in Party: 3
Number Caught and Injured: 1
Number Partially Buried, Not-critical: 1 (Not-critical means the head was exposed)
Duration of Burial: 3 minutes

Avalanche Type: Soft Slab (SS)
Trigger: Skier (AS)
Size: R/D2 (estimated)
Start Zone Aspect: WSW
Start Zone Angle: 38-40 degrees (average)
Start Zone Elevation: 5200 feet

Height of Crown Face: 0.4 m (average)
Width of Fracture: 20 m (average)
Vertical Fall: 100 m (average)

Bed Surface Characteristics: Pencil Hardness, Crust

Burial involved a terrain trap: Gully, Trees
Number of people that crossed start zone before avalanche: 1
Avalanche occurred during: Descent
Location of group in relation to start zone during avalanche: High and Below

Avalanche Safety Gear Carried: All carried transceiver, shovel and probe
Avalanche Training and Experience at Activity: Two advanced (including victim), one novice
Signs of Instability Noted by Group: Recent avalanches
Extent of Injuries: Broken femur

NWAC Forecast Zone: Snoqualmie Pass
Avalanche Danger Rating (Near Tree-line): Considerable
Weather

The Avalanche Mountain incident took place approximately 2 miles north of the NWAC weather stations located at Alpental Ski Area at Snoqualmie Pass. The weather graphs from Alpental are included in this report.

A stormy period occurred during the 36 hours ending around dawn on Saturday, March 4th. During this period, a warming trend peaked mid-day on Friday, March 3rd and was followed by a sharp cooling trend Friday night. During peak warming, rain was observed up to at least 4800 feet in the Snoqualmie corridor (see Dallas Glass’s observation below) while it appears the Alpental summit station (5400 ft) stayed all snow or only briefly transitioned to rain, with below-freezing temperatures throughout the event. 19 inches (48 cm) of snow was recorded at the Alpental summit station with 7 inches recorded at the base station (3100 ft) over the 48 hours ending 4 am March 4th. Ridge-top winds at Alpental (5400 ft) averaged approximately 10 mph during much of the storm, with peak gusts approaching 30 mph. A relative break in wind and precipitation was observed at Alpental during the daylight hours on Saturday, March 4th.

Avalanche and Snowpack Observations from 3/4/17

Reporting Party

Test profile on north aspect of Snow Lake divide: CTH 21 (SP) failing 40 cm below the surface. They skied to Snow Lake without issue.

Seattle Mountain Rescue

Test profile on Kendall Peak at 5200 ft, WSW aspect: CT9 down 6-10 cm (no fracture character noted) within storm snow, CT12, SP (sudden planar), down 30 cm on HST/crust interface. This last result ties into the reporting party's CTH 21, SP, down 40 cm.

Dallas Glass, NWAC Professional Observer, Kendall Peak/Alpental Valley

New snowfall measurements: 5-8 cm @ 3500 ft; 15-20 cm @ 4500 ft; 30-35 cm @ 5500 ft.

The 3/3 rain crust was evident up to about 4800 ft. Failures of the new snow typically occurred about 2-3 cm above this crust. Snow over the crust was generally right-side-up.

Above 4800 ft the rain crust was not pronounced. Failures seemed to occur about 3-5 cm below the 3/3 heavy snow. Only one of numerous small slope tests produced failures on this layer (down 35-40 cm, on DFs, 0.5-1 mm.).

No significant evidence of wind transported snow observed outside some fresh cornices in Alpental's back bowls.

On 3/3: There were several avalanches that appeared to have released naturally yesterday during the rain event up to 5600 ft. Most were small, but a few may have reached the D2 range.

On 3/4: Small loose dry avalanches were ski triggered on very steep terrain below treeline. They ran well, but did not entrain much snow.
Two small natural storm slabs that likely occurred in the last 24 hrs were observed in the Alpental Back Bowls.

Accident and Rescue Summary (by reporting party)

A group of three skiers were hoping to have a mellow day of tree skiing in unfamiliar terrain, lacking a specific objective. They skinned to the Snow Lake divide and dug a snowpit on a north aspect with following result from a Compression Test; CTH 21 (SP) failing 40 cm down. They then skied to Snow Lake without issue. They were drawn to a slope east of the lake (on Avalanche Mountain) that they thought suited their plan for mellow tree skiing, accessible within an hour of skinning. They skinned to Avalanche Mountain and gained the ridge through the trees south of the peak. The party traveled north along the ridge to the summit. They observed no signs of instability on the ascent. They descended a WSW aspect, just below the summit where the slope was slightly more open and steep for the initial turns. Taylor made three or four turns before stopping on top of a rib separating two branching gullies. Everything appeared fine. Rich dropped in and on his first turn Taylor heard a loud noise and saw the slope break. He immediately skied down skier's left to get out of the way and managed to escape, while Rich was taken into the skier's right gully. Braydon remained at ridgetop.

After the avalanche, Taylor traversed back skier's right to the rib, calling for Rich and Braydon and only making contact with the latter. Taylor instructed Braydon to slowly make his way down the crust layer forming the bed surface to Taylor's location and to avoid moving into any fresh snow. Taylor kept traversing over to the gully that he assumed Rich had been dragged into and saw one of Rich's skis. Taylor kept calling Rich's name and eventually he called back. Taylor carefully descended the bed surface to reach him and instructed Braydon to follow his tracks, leaving a good amount of space between them. Taylor found Rich with his leg was wrapped around a large tree, begging Taylor to remove the snow to take the pressure off his leg. Taylor and Braydon freed Rich from the snow and flattened a platform behind him so he could lay back while they assessed his injuries. When they discovered he had broken his femur they knew they would need to call for rescue.

Taylor immediately activated his spot unit (received by SMR at 348 pm) from the victim's location. After making Rich as comfortable as possible and giving him all that they could to keep warm, Taylor skinned back to the ridgetop where they knew they had cell phone reception, while Braydon remained with Rich. From the ridgetop, Taylor was able to contact search and rescue and provided them with all of the necessary information. They waited until 730 pm (time given by rescue party) when the rescue party arrived on scene. Taylor remained at ridgetop to stay in cell phone reception, while making periodic visits down to Rich and Braydon to check their status. When the ground crew arrived, they prepared the site for the helicopter to remove Rich.

Taylor Brugh of SMR reports that the Naval Air Station Whidbey Island (NASWI) Search and Rescue (SAR) Heli arrived on the scene at 830 pm and evacuated Rich with a hoist. Subsequently, Braydon and Taylor skinned out with the ground crew after a successful rescue.
The reporting party reflected that had they avoided the initial, more open and steep pitch by beginning their descent further south on the ridge, they might have limited their avalanche exposure significantly.
Topographic map and satellite imagery marked where the party triggered the avalanche (black) and the rescue location of the victim (blue)
Locations marked where the party triggered the avalanche (green) and the rescue location of the victim (red)

Photo by the reporting party on their approach to Avalanche Mountain. 3-4-17
Weather Stations List – Alpental

Click here to bookmark your custom graph

Temperature °F

VW Speed mph

Precipitation In.

24 hour accum In.

Northwest Avalanche Center
www.nwac.us
NWAC avalanche forecasts apply to backcountry avalanche terrain in the Olympics, Washington Cascades and Mt Hood area. These forecasts do not apply to developed ski areas, avalanche terrain affecting highways and higher terrain on the volcanic peaks above the Cascade crest level.

The Bottom Line: The avalanche danger should decrease on Saturday but the decrease will be a moving target and careful snowpack evaluation and cautious routefinding will be essential.

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Saturday</th>
<th>Outlook for Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Treeline</td>
<td>Considerable</td>
<td>Dangerous avalanche conditions. Careful snowpack evaluation, cautious route-finding and conservative decision-making essential. Moderate</td>
</tr>
<tr>
<td>Near Treeline</td>
<td>Considerable</td>
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</tr>
<tr>
<td>Below Treeline</td>
<td>Moderate</td>
<td>Heightened avalanche conditions on specific terrain features. Evaluate snow and terrain carefully; identify problem features. Moderate</td>
</tr>
</tbody>
</table>

Avalanche Problems for Saturday

Wind Slab

Wind slabs can take up to a week to stabilize. They are confined to lee and cross-loaded terrain features and can be avoided by sticking to sheltered or wind scoured areas.

Storm Slabs

Storm slabs usually stabilize within a few days, and release at or below the trigger point. They exist throughout the terrain, and can be avoided by waiting for the storm snow to stabilize.
Snowpack Analysis

Weather and Snowpack

The most recent wet warm storm arrived on Valentines Day 2/14 and formed the uppermost, very strong rain crust in the snowpack.

A series of disturbances in cool, NW flow aloft from Saturday 2/25 through Tuesday 2/28 deposited 1.5 - 3.5 feet of snow along the west slopes of the Cascades. Very strong alpine west winds were seen in most of the Olympics and Cascades on Tuesday.

Southwest flow aloft began to ramp up again on Thursday as the first in a new series of fronts crossed the Northwest. Strong southwest flow is carrying a second stronger front across the Northwest on Friday evening. Along the Cascade west slopes this will be causing strong southwest alpine winds, heavy, moist, dense new snow above about 3-4000 ft and wet snow or rain below about 3-4000 ft. An avalanche cycle is expected in many areas along the Cascade west slopes Friday afternoon and evening.

Recent Observations

North

NWAC observer Lee Lazzara reported that extensive avalanche control was needed at the Mt Baker ski area on Friday but further detail are not currently available. Lee found an upside down warmer, wetter over drier, weaker profile and that test columns were failing on isolation in storm snow layers. A general top of the snowpack profile was 30-40 cm of 1F+ over 4F snow.

Central

NWAC observer Jeremy Allyn was in the Alpental Valley on Thursday and found storm snow instabilities still present and slowly stabilizing. Thin wind slab was forming in the upper portion of the below treeline band and showed signs of increasing sensitivity.

The Stevens patrol reported widespread 6-8" ski triggered storm slab on Friday morning. Sensitive loose wet ski tests were also seen below about 4500 ft.

NWAC observer was also at the Stevens ski area on a day off from the NWAC but reported upside down wetter over drier snow conditions.

Extensive 4-14" wind slab triggered by explosive control turned into wet debris at Alpental on Friday morning.

South

No recent observations.

Detailed Avalanche Forecast for Saturday

Decreasing winds and mostly light snow showers should be seen over the Cascade west slopes on Saturday with much lower snow levels and much cooler temperatures. Not a lot of snow is expected following the front Friday but we will see how it goes. The avalanche danger should decrease on Saturday but the decrease will be a moving target and careful snowpack evaluation and cautious routefinding will be essential.

Layers of recent or new wind and storm slab may need a day to mostly stabilize. Water may also need a day to drain from the upper snow pack below about 3-4000 feet.

Recent moderate to strong southwest to west winds will make wind slab most likely on northwest to southeast slopes but keep an eye out on all aspects in areas of more complex terrain. Watch for firmer wind transported snow from Friday and possible deeper wind transported layers such as from Tuesday.

New storm slab formed on Friday may need a day to mostly stabilize on Saturday. Storm slab is most likely in area that experienced more than a few hours of rapidly accumulating snow.

Cornices won't be listed as an avalanche problem in this area but avoid areas on ridges and mountain tops were a cornice might be present and avoid slopes below cornices.

Mountain Weather Synopsis for Saturday & Sunday

Showers have diminished through the day Saturday has the air mass has cooled, following a strong frontal passage Friday evening. The Pacific Northwest is under a cool regime once again with mostly light showers. A deep upper low pressure system is centered a few hundred miles off the Washington coast Saturday afternoon. This will keep a very cool and somewhat unstable air mass over the region over the next few days with bands of showers rotating into the area bringing periods of moderate showers at times. Only very light showers reached the east slope areas and that pattern should continue. An organized band of showers is developing along the coast Saturday afternoon and expected to renew light to moderate showers overnight and early Sunday as the upper low offshore continues moving towards the coast. Showers should again taper later Sunday as the upper trough begins moving inland across the region later Sunday. Snow levels should remain generally 1000 feet or lower over the next few days.
### 24 Hour Quantitative Precipitation ending at 4 am

<table>
<thead>
<tr>
<th>Location</th>
<th>Sun</th>
<th>Mon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hurricane Ridge</td>
<td>.25</td>
<td>.25</td>
</tr>
<tr>
<td>Mt Baker Ski Area</td>
<td>.50 - .75</td>
<td>.50</td>
</tr>
<tr>
<td>Washington Pass</td>
<td>lt .25</td>
<td>lt .25</td>
</tr>
<tr>
<td>Stevens Pass</td>
<td>.25</td>
<td>.25 - .50</td>
</tr>
<tr>
<td>Snoqualmie Pass</td>
<td>.25 - .50</td>
<td>.25 - .50</td>
</tr>
<tr>
<td>Mission Ridge</td>
<td>lt .25</td>
<td>lt .25</td>
</tr>
<tr>
<td>Crystal Mt</td>
<td>.25 - .50</td>
<td>.25 - .50</td>
</tr>
<tr>
<td>Paradise</td>
<td>.50</td>
<td>.50</td>
</tr>
<tr>
<td>White Pass</td>
<td>.25</td>
<td>.25 - .50</td>
</tr>
<tr>
<td>Mt Hood Meadows</td>
<td>.50</td>
<td>.50 - .75</td>
</tr>
<tr>
<td>Timberline</td>
<td>.50</td>
<td>.75</td>
</tr>
</tbody>
</table>

LT = less than; WE or Water equivalent is the liquid water equivalent of melted snow in hundredths of inches. As a rough approximation 1 inch of snow = about .10 inches WE, or 10 inches of snow = about 1 inch WE.

### Snow Level/Freezing Level in feet

<table>
<thead>
<tr>
<th>Day</th>
<th>Olympics</th>
<th>Northwest Cascades</th>
<th>Northeast Cascades</th>
<th>Central Cascades</th>
<th>South Cascades</th>
<th>Easterly Flow in Passes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturday Afternoon</td>
<td>1500'</td>
<td>1000'</td>
<td>1000'</td>
<td>1500'</td>
<td>2000'</td>
<td></td>
</tr>
<tr>
<td>Saturday Night - Sunday Morning</td>
<td>0'</td>
<td>0'</td>
<td>0'</td>
<td>0'</td>
<td>0'</td>
<td></td>
</tr>
<tr>
<td>Sunday Afternoon</td>
<td>1000'</td>
<td>500'</td>
<td>500'</td>
<td>1000'</td>
<td>1500'</td>
<td></td>
</tr>
<tr>
<td>Sunday Night</td>
<td>0'</td>
<td>0'</td>
<td>0'</td>
<td>0'</td>
<td>0'</td>
<td></td>
</tr>
</tbody>
</table>

Cascade Snow / Freezing Levels noted above refer to the north (approximately Mt Baker and Washington Pass), central (approximately Stevens to White Pass) and south (near Mt Hood). Freezing Level is when no precipitation is forecast.

* Note that surface snow levels are common near the passes during easterly pass flow and may result in multiple snow / freezing levels.
American Avalanche Association
Forest Service National Avalanche Center
Avalanche Incident Report: Short Form

Occurrence Date (YYYYMMDD): 20170304 and Time (HHMM): 1500
Comments: All fields estimated from reporting party except where indicated as reported by Taylor Brugh of Seattle Mountain Rescue (SMR)

Reporting Party Name and Address: Taylor Stephens, Revelstoke, British Columbia

Avalanche Characteristics:
Type: SS Aspect: W
Trigger: AS Slope Angle: 38-40 (est SMR)
Size: R \ D 2 Elevation: 5200 m / ft
Sliding surface (check one):
- In new
- New/old
- In old
- Ground

Location:
State: WA County: King Forest: Mt. Baker-Snoqualmie NF
Peak, Mtn Pass, or Drainage: Avalanche Mountain
Site Name: Alpental Backcountry
Lat/Lon or UTM: 47.4690N, 121.4330W (location of victim)

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of People</th>
<th>Time recovered</th>
<th>Duration of burial</th>
<th>Depth to Face</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caught</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Partially Buried—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not critical</td>
<td>1</td>
<td></td>
<td>3min</td>
<td></td>
</tr>
<tr>
<td>Partially Buried—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completely Buried</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of people injured: 1 Number of people killed: 0

Dimensions (m / ft)
- Height of Crown Face: 0.4
- Width of Fracture: 20
- Vertical Fall: 100
- Snow:
  - Hardness: 0
  - Grain Type: P
  - Grain Size (mm): MF
  - Thickness of weak layer: mm / cm / in

Burial involved a terrain trap? no yes → type: gully, trees
Number of people that crossed start zone before the avalanche: 1
Location of group in relation to start zone during avalanche:
- high
- middle
- low
- below
- all
- unknown

Avalanche occurred during ascent \ descent

Subject   | Name            | Age | Gender | Address          | Phone | Activity
----------|-----------------|-----|--------|------------------|-------|----------
1          | Taylor Stephens | 25  | M      | Revelstoke, BC   |       | Skiing   |
2          | Richard Smith   | 27  | M      | Revelstoke, BC   |       | Skiing   |
3          | Braydon Bourne  | 25  | M      | Seattle, WA      |       | Skiing   |
4          |                 |     |        |                  |       |          |
5          |                 |     |        |                  |       |          |

Equipment Carried
- Transceiver
- Shovel
- Probe

Experience at Activity
- Unknown
- Novice
- Intermediate
- Advanced
- Expert

Avalanche Training
- Unknown
- None
- Some
- Advanced
- Expert

Signs of Instability Noted by Group
- Unknown
- None
- Recent avalanches
- Shooting cracks
- Collapse or whumphing

Injuries Sustained
- None
- First Aid
- Doctor’s care
- Hospital Stay
- Fatal

Extent of Injuries or Cause of Death
- Asphyxiation
- Head Trauma
- Spinal Injury
- Chest Trauma
- Skeletal Fractures
Low test scores

Number of Vehicles Caught: 0  Number Structures Destroyed: 0  Estimated Loss: $65,000+ in hospital bills

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

A group of three skiers were hoping to have a mellow day of tree skiing in unfamiliar terrain, lacking a specific objective. They skinned to the Snow Lake divide and dug a snowpit on a north aspect with following result from a Compression Test; CTH 21 (SP) failing 40 cm down. They then skied to Snow Lake without issue. They were drawn to a slope east of the lake (on Avalanche Mountain) that they thought suited their plan for mellow tree skiing, accessible within an hour of skinning. They skinned to Avalanche Mountain and gained the ridge through the trees south of the peak. The party traveled north along the ridge to the summit. They observed no signs of instability on the ascent. They descended a west aspect, just below the summit where the slope was slightly more open and steep for the initial turns. Taylor made three or four turns before stopping on top of a rib separating two branching gullies. Everything appeared fine. Rich dropped in and on his first turn Taylor heard a loud noise and saw the slope break. He immediately skied down skier's left to get out of the way and managed to escape, while Rich was taken into the skier's right gully. Braydon remained at ridgetop. The reporting party reflected that had they avoided the initial, more open and steep pitch by beginning their descent further south on the ridge, they might have limited their avalanche exposure significantly.

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

After the avalanche, Taylor traversed back skier's right to the rib, calling for Rich and Braydon and only making contact with the latter. Taylor instructed Braydon to slowly make his way down the crust layer forming the bed surface to Taylor's location and to avoid moving into any fresh snow. Taylor kept traversing over to the gully that he assumed Rich had been dragged into and saw one of Rich's skis. Taylor kept calling Rich's name and eventually he called back. Taylor carefully descended the bed surface to reach him and instructed Braydon to follow his tracks, leaving a good amount of space between them. Taylor found Rich with his leg was wrapped around a large tree, begging Taylor to remove the snow to take the pressure off his leg. Taylor and Braydon freed Rich from the snow and flattened a platform behind him so he could lay back while they assessed his injuries. When they discovered he had broken his femur they knew they would need to call for rescue.

Taylor immediately activated his spot unit (received by SMR at 1548) from the victim's location. After making Rich as comfortable as possible and giving him all that they could to keep warm, Taylor skinned back to the ridgetop where they knew they had cell phone reception, while Braydon remained with Rich. From the ridgetop, Taylor was able to contact search and rescue and provided them with all of the necessary information. They waited until 1930 (time given by rescue party) when the rescue party arrived on scene. Taylor remained at ridgetop to stay in cell phone reception, while making periodic visits down to Rich and Braydon to check their status. When the ground crew arrived, they prepared the site for the helicopter to remove Rich.

Taylor Brugh of SMR reports that the Naval Air Station Whidbey Island (NASWI) Search and Rescue (SAR) Heli arrived on the scene at 2030 and evacuated Rich with a hoist. Subsequently, Braydon and Taylor skinned out with the ground crew after a successful rescue.

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.