

Paradise, Mt Rainier Avalanche Incident

January 1, 2003, 1345 PST

[Report prepared by Mark Moore, NWAC]

Location: Upper Golden Gate Trail

Avalanche Specifics:

- SS-AO-3 (US Classification), 3-4 ft fracture (estimated) x 40 ft across
- SW aspect, 6200 ft
- Vertical fall ~80 ft

Weather conditions at time of incident:

- Heavy snow
- NW wind 10-15 mph
- Temp ~

Incident Narrative

(Narrative courtesy National Park Service, Mt Rainier National Park—thanks to Ranger Dan Van Cise):

Based on statements made by the victims and a witness, the accident appears to have occurred in the following manner. Victims 1 (V1—male aged 26) and 2 (V2—female aged 20) were snowshoeing diagonally uphill across the small bowl near the top of the Golden Gate trail. Mr. V1 was in the lead with Ms. V2 two steps behind. Witness W (male aged 37) who had been ascending the trail but was well below and V1 and V2 had been watching their ascent after they and another couple had snow shod past him earlier. The other couple had peeled off to the east and was climbing up onto the ridge to the (climber's) right of the bowl.

Mr. W heard and then saw a snow slide initiate above V1 and V2 just southeast of the small waterfall at that location and start down the gully there. He yelled, "Avalanche!" This was heard by V1 and V2 who looked uphill to see the small slide, which had started approximately 30-40 feet above them, as it overtook them and knocked down V2. The depth of this slide was reported to be just below their knees. One or two seconds later a larger slide came down upon them. This one was chest high on V1 and knocked him down and carried both he and V2 downhill. The slide was very powdery and initially obscured the view of the scene. After this had settled somewhat, V1 was seen getting up. He had been transported approximately 40 feet down the slope. He stated that he had employed swimming motions as he was being carried along and as the slide stopped he found himself essentially on the surface and was able to get up without difficulty. V2 had been transported about 70-80 feet. She had been carried downhill headfirst and had also used swimming motions to stay near the surface. However, as the slide stopped she was completely buried. Her feet were approximately 4 to 5 feet below the surface and her head approximately 6 inches below the surface.

Initially, V1 was unable to find V2. V2 was able to move her left hand slightly, but otherwise was immobilized by the snow. As it turned out, her left hand was close to the surface and she eventually was able to wiggle half of her hand above the snow and only then was V1 able to find her. He was able to dig her out completely using just his hands after about 10 minutes. Her face had been under the surface for approximately 2 minutes. V2 stated that she had tried to use her

left hand to dig snow away from her face but was unsuccessful. She added that she had been able to provide an air pocket in front of her face before the slide stopped and that there was a small opening above her face to the surface. She had called out and V1 stated that he had heard her after he saw her hand. She said she could not hear V1 who had been calling out to her.

Mr. W stated that the larger slide was a slab avalanche approximately 30-40 feet across with a fracture line approximately 3-4 feet in depth. He stated that it ran over 100 feet. He added that it was the left half of the small bowl that slid. The right half did not slide, but appeared that it could have released at any moment. He stated that the man in the second snowshoeing party had hiked to the scene to assist. As V2 had been freed, W stated that he did not want to enter the bowl area due to the hazard from the snow above that had not yet slid. He tried to encourage V1 and the others to get out of that area quickly, but they spent approximately another 10 minutes looking for a snowshoe before clearing.

V1 stated that he had hiked and snow shod in the Paradise area many times in the past. V2 stated that this was her first time snowshoeing. Approximately 20 minutes before the accident, V1 had explained to V2 that if she was caught in an avalanche to use swimming motions to stay near the surface and try making an air pocket in front of her face before the slide stopped and set up. V1 and V2 admitted that neither of them was carrying avalanche transceivers, shovels or probes. V1 also stated that at the time he didn't believe the risk was that high using snow shoes in that area in those conditions.

V1 stated that his back was sore after the accident. Otherwise he and V2 stated that they were not injured.

Ancillary Weather and Snow pack Information

(Data and forecast displays prepared by Mark Moore, Northwest Weather and Avalanche Center)

- **Remote Weather Station Data**

- The past 40+ hours from the nearby Paradise remote weather station indicated that almost .7 inches WE had been received since 0900 by the time of the incident (around 1345 PST) along with an associated temperature rise of 2-3 degrees F. From analyzing data from the 24-hour automated depth gage, snowfall appeared to be accumulating at around 1-2 inches/hour. While the automated wind speeds were notably low, in some situations the speed sensor may be adversely affected by wind flow around the cap of the Johnson Visitor Center or higher speed winds may have become detached and more turbulent, perhaps flowing over the sensor. In any case, manual observations provided by the Park Service and other witnesses around the time of the incident indicated winds of approximately 10-15 mph from the southwest.

1-1-2003

Northwest Weather and Avalanche Center

Paradise, Mt Rainier National Park, Washington

| MM/DD | Hour | Temp | Wind | Wind | Wind | Wind | Hour | Total | 24 Hr | Total |
|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | PST | F | Min | Avg | Max | Dir | Prec. | Prec. | Snow | Snow |
| | | 5500' | 5500' | 5500' | 5500' | 5500' | 5500' | 5500' | 5500' | 5500' |
| 12 30 | 1600 | 30 | 0 | 1 | 5 | 262 | .02 | .02 | 1 | 38 |
| 12 30 | 1700 | 30 | 0 | 0 | 1 | 270 | .06 | .08 | 2 | 57 |
| 12 30 | 1800 | 30 | 0 | 0 | 1 | 4 | .06 | .14 | 3 | 38 |
| 12 30 | 1900 | 30 | 0 | 2 | 7 | 76 | .03 | .17 | 3 | 38 |
| 12 30 | 2000 | 30 | 2 | 4 | 8 | 81 | .02 | .19 | 4 | 39 |

| | | | | | | | | | | |
|-------|------|----|---|---|----|-----|-----|------|----|----|
| 12 30 | 2100 | 29 | 3 | 6 | 11 | 94 | .04 | .23 | 5 | 39 |
| 12 30 | 2200 | 28 | 2 | 5 | 10 | 84 | .04 | .27 | 6 | 62 |
| 12 30 | 2300 | 29 | 0 | 2 | 6 | 48 | .02 | .29 | 6 | 60 |
| 12 31 | 0 | 29 | 0 | 2 | 7 | 329 | .02 | .31 | 6 | 57 |
| 12 31 | 100 | 29 | 0 | 5 | 9 | 309 | .05 | .36 | 7 | 66 |
| 12 31 | 200 | 29 | 1 | 4 | 7 | 308 | .07 | .43 | 7 | 62 |
| 12 31 | 300 | 29 | 3 | 6 | 11 | 288 | .06 | .49 | 8 | 65 |
| 12 31 | 400 | 25 | 4 | 7 | 11 | 278 | .05 | .54 | 9 | 63 |
| 12 31 | 500 | 24 | 1 | 5 | 9 | 283 | .01 | .55 | 9 | 41 |
| 12 31 | 600 | 24 | 2 | 4 | 7 | 287 | .01 | .56 | 9 | 41 |
| 12 31 | 700 | 23 | 0 | 3 | 6 | 289 | .01 | .57 | 9 | 42 |
| 12 31 | 800 | 24 | 0 | 0 | 2 | 290 | 0 | .57 | 10 | 42 |
| 12 31 | 900 | 25 | 0 | 1 | 4 | 279 | 0 | .57 | 10 | 41 |
| 12 31 | 1000 | 26 | 1 | 3 | 7 | 278 | .01 | .58 | 10 | 40 |
| 12 31 | 1100 | 26 | 0 | 4 | 9 | 283 | .08 | .66 | 10 | 40 |
| 12 31 | 1200 | 28 | 0 | 3 | 8 | 278 | 0 | .66 | 0 | 39 |
| 12 31 | 1300 | 27 | 3 | 6 | 11 | 275 | 0 | .66 | 0 | 40 |
| 12 31 | 1400 | 28 | 2 | 5 | 11 | 284 | 0 | .66 | 0 | 39 |
| 12 31 | 1500 | 25 | 2 | 6 | 9 | 280 | 0 | .66 | 0 | 41 |
| 12 31 | 1600 | 24 | 3 | 7 | 13 | 273 | 0 | .66 | 0 | 41 |
| 12 31 | 1700 | 23 | 2 | 6 | 15 | 272 | 0 | .66 | 0 | 42 |
| 12 31 | 1800 | 23 | 0 | 3 | 7 | 280 | 0 | .66 | 0 | 42 |
| 12 31 | 1900 | 23 | 1 | 5 | 8 | 289 | 0 | .66 | 0 | 42 |
| 12 31 | 2000 | 23 | 3 | 5 | 12 | 288 | 0 | .66 | 1 | 42 |
| 12 31 | 2100 | 25 | 1 | 5 | 12 | 286 | 0 | .66 | 0 | 41 |
| 12 31 | 2200 | 23 | 0 | 2 | 8 | 256 | 0 | .66 | 0 | 42 |
| 12 31 | 2300 | 25 | 0 | 3 | 11 | 267 | 0 | .66 | 0 | 41 |
| 1 1 | 0 | 26 | 0 | 4 | 11 | 281 | 0 | .66 | 0 | 41 |
| 1 1 | 100 | 27 | 1 | 6 | 12 | 274 | 0 | .66 | 0 | 40 |
| 1 1 | 200 | 28 | 3 | 7 | 12 | 282 | 0 | .66 | 1 | 61 |
| 1 1 | 300 | 28 | 3 | 6 | 12 | 279 | 0 | .66 | 1 | 39 |
| 1 1 | 400 | 28 | 2 | 7 | 18 | 278 | 0 | .66 | 1 | 39 |
| 1 1 | 500 | 28 | 2 | 4 | 6 | 288 | .02 | .68 | 1 | 58 |
| 1 1 | 600 | 27 | 0 | 3 | 8 | 280 | 0 | .68 | 1 | 60 |
| 1 1 | 700 | 26 | 0 | 4 | 13 | 290 | 0 | .68 | 1 | 41 |
| 1 1 | 800 | 27 | 0 | 3 | 11 | 322 | 0 | .68 | 1 | 40 |
| 1 1 | 900 | 27 | 0 | 3 | 14 | 332 | 0 | .68 | 1 | 40 |
| 1 1 | 1000 | 27 | 0 | 3 | 9 | 17 | .1 | .78 | 2 | 40 |
| 1 1 | 1100 | 29 | 0 | 2 | 6 | 353 | .14 | .92 | 2 | 39 |
| 1 1 | 1200 | 29 | 0 | 3 | 10 | 327 | .14 | 1.06 | 3 | 64 |
| 1 1 | 1300 | 29 | 0 | 5 | 11 | 303 | .15 | 1.21 | 3 | 71 |
| 1 1 | 1400 | 29 | 0 | 2 | 6 | 283 | .15 | 1.36 | 5 | 72 |
| 1 1 | 1500 | 30 | 0 | 0 | 5 | 242 | .18 | 1.54 | 7 | 73 |
| 1 1 | 1600 | 29 | 0 | 1 | 4 | 237 | .18 | 1.72 | 8 | 73 |

○

1.72

- **Weather:** The mountain weather forecast 1/1/03 issued by the NWAC for the Cascade west slopes (including Mt Rainier) at 0700 that morning indicated an expectation of increasing snowfall, rising freezing levels and increasing winds, as shown by the extracted parts of the archived forecast below. This weather forecast corroborated the trend of increasingly worsening weather that had been previously indicated in the mountain weather forecast issued at 2 PM on the 31st of December, 2002 (not shown here):

MOUNTAIN WEATHER FORECAST FOR THE OLYMPICS, WASHINGTON CASCADES AND MT HOOD AREA

This weather forecast is prepared expressly for federal, state and private snow safety programs in Washington and Northern Oregon.

 0700 AM PST Wednesday, January 01, 2003

 ZONE FORECASTS

WEST SLOPES WASHINGTON CASCADES....

Occasional light rain or snow increasing Wednesday morning and becoming moderate to heavy north and moderate south late Wednesday morning and afternoon. Heavy rain or snow north and moderate to occasionally heavy rain or snow south later Wednesday afternoon and night. Rain or snow decreasing in the south Thursday morning and gradually decreasing in the north later Thursday morning and becoming more showery. Rain or snow increasing in the south Thursday afternoon and spreading northward, becoming moderate to heavy late Thursday and Thursday night.

SNOW LEVELS--CASCADE MTNS

2000 ft N, 3500 ft S Wednesday morning
 2500 ft N, 3000 ft C, 4500 ft S Wednesday afternoon
 4000 ft N and C, 5000 ft S Wednesday night
 4500 ft N and C, 5000 ft S Thursday
 3500 ft N, 4000 ft C, 4500 ft S Thursday night...except snow levels near the surface Cascade passes and east slopes Wednesday, rising to near free air levels early-mid Thursday morning, briefly lowering back to near the surface Thursday night

 24 HOUR FORECAST OF PRECIPITATION IN INCHES OF WATER EQUIVALENT
 ENDING AT 4AM

| | THURS | FRI |
|-----------------|-------|--------|
| HURRICANE RIDGE | 1-1.5 | 1-1.5 |
| MT BAKER | 1-1.5 | 1.5 |
| WASHINGTON PASS | .75-1 | .75-1 |
| STEVENS PASS | .75-1 | 1 |
| SNOQUALMIE PASS | .75-1 | 1 |
| MISSION RIDGE | .75 | .5-.75 |
| CRYSTAL MTN | 1 | 1 |
| PARADISE | 1-1.5 | 1-1.5 |
| WHITE PASS | .75-1 | .75 |
| MT HOOD | .75 | 1-1.5 |

(LT = LESS THAN, NR0 = NEAR 0)

FREE WINDS AT 5000 FT

SW 15-25 Cascades, 20-40 Olympics Wednesday morning
 S-SW 20-40 Cascades, 40-60 Olympics Wednesday afternoon
 S-SW 30-50 Cascades, 40-60 Olympics Wednesday night
 SW 40-60 Thursday morning
 SW 30-50 mid-day Thursday
 W-SW 15-30 Cascades, 20-40 Olympics Thursday afternoon
 S-SW 20-40 N, 30-50 S and Olympics Thursday night,
 increasing late

FREE WINDS AT 9000 FT

SW 15-30 Cascades, 20-40 Olympics Wednesday morning
 SW 30-50 Cascades, 40-60 Olympics Wednesday afternoon and
 night
 W-SW 50-70 Thursday morning

W-SW 20-40 Thursday afternoon
 S-SW 25-40 N, 40-60 S and Olympics Thursday night, increasing
 late

- **Avalanche:** As a result of the increasingly stormy weather and the existing snow pack structure, the NWAC had issued an avalanche watch on the morning of the 1st for significantly increasing danger throughout the day. The excerpted zone forecasts, snow pack analysis and forecast for Wednesday, the 1st are shown below:

0830 AM PST Wednesday, January 01, 2003

HAVE A HAPPY AND SAFE 2003!!!

ZONE AVALANCHE FORECASTS.....

OLYMPICS....WASHINGTON CASCADES NEAR AND WEST OF THE CASCADE
 CREST....

.....AVALANCHE WATCH.....

Considerable avalanche danger above 5 to 6000 feet and moderate below significantly increasing later Wednesday morning through Wednesday night and becoming high above 4 to 5000 feet and considerable below Thursday morning. Slightly and briefly decreasing danger Thursday afternoon, but increasing again later Thursday and Thursday night and becoming high above 5000 feet and considerable below.

SNOWPACK ANALYSIS.....

Generally light amounts of new snowfall during the past 24 hours have combined with briefly decreased winds and relatively low freezing levels to allow for a slight decrease in the danger as recent slabs and older buried weak layers begin to strengthen. However, a considerable danger remains in most areas above 5 to 6000 feet as several buried weak layers remain beneath 1-3 feet or more of recent snow. These buried weak layers include surface hoar from the 21st and 22nd of December, lower density snow from early last week, and more recent lower density snowfall deposited during breaks between recent storms. Field reports indicate that skier or snowboarder triggered slides are still occurring on some of these buried layers. As recently as yesterday, Mission Ridge reported a skier triggered 2 ft slab over surface hoar on a 25 degree north exposure near 6000 feet, with Mt Hood Meadows reporting several 1 ft + slabs releasing on control on lower density snow layers along with a 2-4 ft natural slab in a wind loaded NE exposure around 7000 ft above Heather Canyon. Finally a Rutschblock score of 2- was found on buried graupel about 16 inches down near Stevens Pass at about the 4500 ft level along with a clean shear. All of these reports indicate the continued existence of considerable instability in the back country and travelers are encouraged to test the snow using ski cuts, probing, snowpits and related shear tests prior to jumping into steeper avalanche terrain, but also remember that some recent avalanches have released on much lower angle terrain than normal when buried surface hoar is the weak layer. Due to recent winds, greatest danger exists on north and northeast exposures at higher elevations, but other slopes may be loaded as well, especially near the Cascade passes. Also the current snow pack structure provides an excellent stage for a significant increase in the danger with expected warming and loading.

WEDNESDAY...WEDNESDAY NIGHT.....

Light to moderate rain or snow should increase later Wednesday morning, with moderate to heavy rain or snow, strong winds and rising freezing levels expected Wednesday afternoon through early Thursday. Combined

with several buried weak layers, significant amounts of recent snowfall, and a generally weak snow surface this should result in a substantial increase in the avalanche danger with increasingly large and increasingly dense wind slabs becoming likely at higher elevations and probable at lower elevations. Greatest danger should remain on north and northeast facing slopes near higher ridgelines, but should also develop on west facing slopes near the Cascade passes. As a result of this

weather and both the existing and developing snow pack structure-increasingly dense wind slabs over lower density snow or other buried weak layers combined with heavy rates of loading and a possible change from snow to rain-back country travel in avalanche terrain is not recommended Wednesday afternoon through Thursday morning.

- Both the avalanche and mountain weather forecast issued the previous afternoon indicated an increasingly stormy day forecast for the 1st of January, 2003, along with significantly increasing danger. Excerpts of the avalanche forecast are shown below:

2 PM PST TUESDAY 31 DECEMBER 2002

ZONE AVALANCHE FORECASTS.....

OLYMPICS...WASHINGTON CASCADES NEAR AND WEST OF THE CREST...

Considerable avalanche danger above about 5000 feet Tuesday morning and moderate below. Decreasing avalanche danger Tuesday afternoon to Wednesday morning, becoming considerable above about 6000 feet and moderate below. Avalanche danger increasing Wednesday afternoon and night, becoming high above 5-6000 feet and considerable below.

WEDNESDAY.....

Increasing winds and increasing rain or snow is expected Wednesday with warmer temperatures. Snow and then rain or snow should become moderate to heavy by Wednesday afternoon and evening. This should allow new slab layers to develop on lee slopes and lead to a greatly increasing avalanche danger later Wednesday. This will be due mainly to increasing denser snow layers accumulating over lower density layers on lee slopes. This should be mainly on north to east aspects at higher elevations or on more varied aspects near the Cascade passes, due to east winds in the Cascade passes. It will be interesting to see if the new loading will activate to older buried layers or the hoar frost layer. Back country travel at higher elevations near avalanche terrain is not recommended later Wednesday.