PRELIMINARY REPORT

Tunnel Creek Avalanche Incident

February 19, 2012

Time and Date: 1200 noon, 2/19/2012

Submitted by: Patty Morrison and Jamie Owens (Stevens Pass Professional Ski Patrol) and Mark Moore (NWAC)

Location: Tunnel Creek drainage, back side of Cowboy Mountain (beyond ski area boundary—back country (*side country*) just SW of Stevens Pass Mountain Resort, central WA Cascades, WA USA)

Slope specifics: starting zone elevation 5800 ft, SSW exposure, 42 degree slope

Fracture line details: SS-AS-O-R2-D3; Slab size and structure—32 inch deep x 200 ft. wide soft slab (Fist to 4F hardness); slab is thought to have released to surface hoar layer above early February crust (Pencil hardness)

Avalanche details: Slide caught 5, one of whom was able to arrest by holding onto tree; remaining 4 caught were carried about 2400 vertical feet through a twisting, tree ringed chute

Fatalities / Injuries: Three skier fatalities—all died from trauma; one other skier caught, deployed air bag, partially buried, uninjured, and extricated with the help of rescuers

Accident Summary:

Just before noon a group of 15 skiers made the short hike to the top of Cowboy Mountain from the 7th Heaven Chair, exited the Stevens Pass Mountain Resort, and entered the back country. The group consisted of locals and visiting skiers, all experienced backcountry skiers equipped with avalanche rescue gear. Skiing one at a time, the first six skiers negotiated the top meadow of the popular Tunnel Creek area to then wait in various locations in the trees on the skiers left…just prior to traversing to another meadow. At around noon, the seventh skier entered the meadow and on his third turn triggered the 2-3 ft slab avalanche that would catch him and three of the six who were waiting below (although one other skier was also caught, he was able to arrest by grabbing a nearby tree). The avalanche funneled the four skiers into the very dangerous creek drainage/gulley beneath them and the valley floor runout some 2400 vertical feet below (see Figures 4-7 below showing route of avalanche). Owing to many objective dangers including exposed rock outcrops, trees and other obstacles, the skiers had not intended to ski the very steep and winding gulley into which the avalanche descended…planning instead to traverse skiers left into a series of meadows before hitting the more open terrain near the power lines.

Rescue Summary:

Several of the remaining skiers initiated beacon searches from the top of the slide path and made their way to the debris pile in the valley. The only survivor had deployed an airbag device at the top of the path and was found partially buried yet uninjured. When this victim came to rest, only her hands were above the snow and she was able to uncover her face. Although unable to self-extricate she was dug out by other party members in about 10 minutes. Meanwhile, the three deceased skiers were found with beacon searches and visual clues. All three were dug out and CPR was initiated on them by other members of the party. At 1215, the Stevens Pass Ski Patrol received 911 calls of multiple avalanche burials in Tunnel Creek, at which time they closed access to this area and sent an initial response team to the top of Cowboy Mountain. At 1243 a team of three patrollers descended the slide path with an AED while two patrollers and a rescue dog were dispatched to the bottom of the slide to aid in the search. All efforts to resuscitate the three victims were unsuccessful, with trauma the likely cause of death. All members of the party were accounted for and transported to the highway and back to Stevens Pass.

Accident Location and Photos (all photos by Jamie Owens):

As shown below in this Google Earth display the starting zone of the avalanche path lies just to the SSW of the top of Cowboy Mountain, with the path itself composed of some steep twisting sections surrounded by tree cover.

Figure 1. Google Earth image showing avalanche start zone, path and approximate runout. Stevens Pass Mountain Resort in backgound to the NNE of Cowboy Mountain

Figure 2. Upper meadow around 5700 ft above entrance to chute though which slide traveled.

Figure 3. Snow profile above fracture line that caught skiers. Due to significant remaining slab and associated continuing danger, profile was done about 60 ft above actual avalanche release point. Note several weak layers in profile wall noted by tongue depressors.

Figure 4. Weak layers around 82-86 cm are thought to be those triggered by the party.

Figure 5. View up chute (mid-upper path) through which avalanche traveled

Figure 6. View down avalanche chute/gulley through which avalanche traveled. Photo taken from mid-upper part of the path.

Figure 7. Lower part of avalanche runout looking upslope toward gulley exit in upper center of photo.

Figure 8. View downslope from near gulley exit toward gradual runout and debris field near small trees beyond mid-photo brushy area.

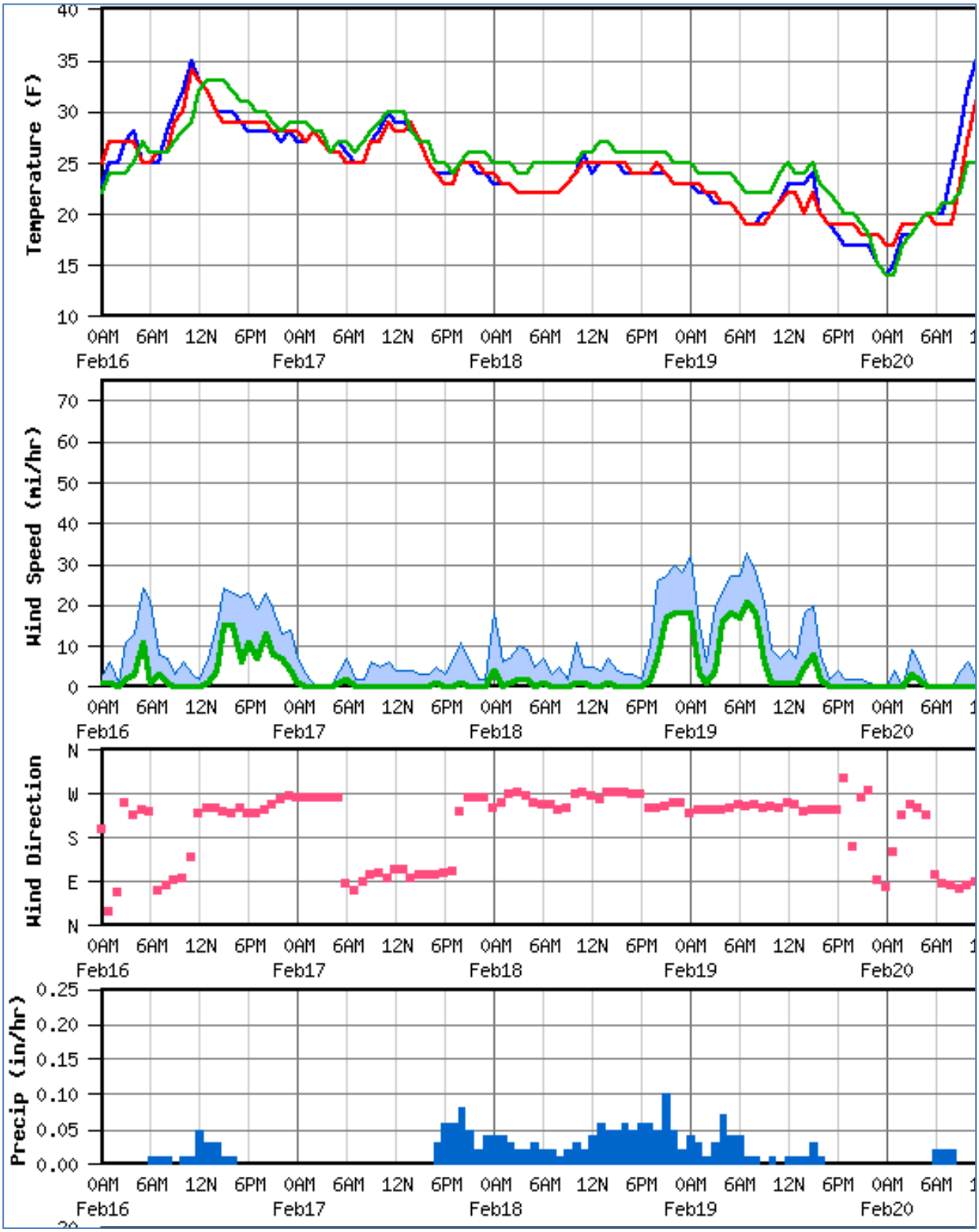
Recent Weather and Ancillary Snowpack Information:

Weather information: the two days of preceding weather brought heavy snowfall and strong winds at low freezing levels to much of the region, with heavy snowfall received in most locations near and west of the Cascade crest. The Stevens Pass ski area reported 26 inches of new snowfall over the previous two days along with strengthening winds at lowering temperatures. These weather trends are evident in the automated weather station reports from the nearby NWAC/WSDOT Stevens Pass Schmidt Haus/Brooks Chair weather station shown below (latest time at top).

Northwest Weather and Avalanche Center
Stevens Pass Ski Area Brooks Chair (4850')
Washington Department of Transportation Schmidt Haus (3950')
Stevens Pass, Washington

MM/DD	Hour PST	Temp F 4850'	Temp F 3950'	RH % 4850'	RH % 3950'	Wind Avg 4850'	Wind Max 4850'	Wind Dir 4850'	Hour Prec. 3950'	Total Prec. 3950'	24 Hr Snow 3950'	Total Snow 3950'
2 19	1500	23	27	93	83	2	10	218	0	.09	0	108
2 19	1400	21	27	93	86	3	13	236	0	.09	0	109
2 19	1300	22	28	94	83	2	11	246	0	.09	0	109
2 19	1200	22	27	95	84	2	12	238	0	.09	0	109
2 19	1100	21	26	95	85	3	13	225	0	.09	0	109
2 19	1000	21	26	95	87	3	14	231	0	.09	0	110
2 19	900	21	26	95	88	4	18	222	0	.09	0	111
2 19	800	21	26	96	88	6	18	214	0	.09	0	111
2 19	700	21	26	98	88	5	16	220	.01	.09	0	112
2 19	600	21	26	98	86	4	13	227	.03	.08	0	112
2 19	500	22	27	100	93	4	15	223	.05	.05	1	111
2 19	400	23	27	100	92	4	13	226	.07	1.55	18	110
2 19	300	23	27	100	92	5	18	219	.04	1.48	47	110
2 19	200	24	28	100	90	5	20	232	.03	1.44	16	109
2 19	100	24	28	100	90	6	15	225	.04	1.41	17	110
2 19	0	24	28	100	91	7	19	219	.06	1.37	16	109
2 18	2300	25	28	100	93	6	21	218	0	1.31	16	109
2 18	2200	24	28	100	94	7	19	219	.06	1.31	16	109
2 18	2100	25	29	100	94	4	18	225	.22	1.25	15	109
2 18	2000	26	29	100	94	7	21	212	.08	1.03	14	106
2 18	1900	25	29	100	94	4	13	215	.12	.95	13	107
2 18	1800	25	29	100	93	3	14	234	.11	.83	11	104
2 18	1700	25	29	100	93	4	15	239	.08	.72	9	104
2 18	1600	26	29	100	93	3	14	244	.13	.64	9	104
2 18	1500	26	29	100	93	2	12	248	.1	.51	47	101
2 18	1400	26	29	100	92	3	13	247	.06	.41	6	100
2 18	1300	26	29	100	92	2	9	257	.1	.35	4	100
2 18	1200	26	29	100	91	1	8	239	.04	.25	3	98
2 18	1100	26	29	100	91	2	11	240	.03	.21	2	97
2 18	1000	24	29	100	90	5	19	245	.03	.18	2	97
2 18	900	24	28	100	90	6	17	247	.01	.15	2	97
2 18	800	23	28	100	90	6	19	238	.04	.14	1	97
2 18	700	24	28	100	90	6	20	243	.02	.1	0	97
2 18	600	24	28	100	91	7	20	236	.04	.08	10	97
2 18	500	24	28	100	92	6	16	237	.04	.04	9	96
2 18	400	24	28	100	92	6	21	250	.03	.61	47	95
2 18	300	24	27	100	93	5	16	249	.04	.58	8	95
2 18	200	24	28	100	92	5	18	230	.04	.54	8	95
2 18	100	25	29	100	93	5	15	243	.08	.5	6	93
2 18	0	25	29	100	93	4	16	224	.05	.42	5	92
2 17	2300	26	29	100	94	3	13	241	.05	.37	5	92
2 17	2200	26	29	100	93	1	5	250	.01	.32	4	91
2 17	2100	26	29	100	94	1	7	260	.06	.31	4	91
2 17	2000	26	28	100	93	2	10	223	.09	.25	3	90
2 17	1900	24	28	100	91	5	14	56	.04	.16	3	89
2 17	1800	24	28	100	90	6	14	56	.06	.12	2	88
2 17	1700	25	29	100	91	4	12	51	.06	.06	1	88
2 17	1600	26	30	100	91	6	15	52	0	0	0	87
2 17	1500	26	30	100	91	5	14	52	0	0	0	87
2 17	1400	27	30	100	90	5	15	52	0	0	0	87
2 17	1300	27	32	99	89	4	14	49	0	0	0	87
2 17	1200	27	32	99	87	4	13	47	0	0	0	87
2 17	1100	27	31	100	88	4	12	40	0	0	0	87
2 17	1000	27	31	100	90	3	9	43	0	0	0	87
2 17	900	27	30	100	92	4	10	63	0	0	0	87
2 17	800	26	30	100	92	4	10	63	0	0	0	87

2	17	700	27	30	100	93	2	7	71	0	0	0	87
2	17	600	27	31	100	93	5	12	69	0	0	0	87
2	17	500	27	31	100	95	4	12	54	0	0	2	87



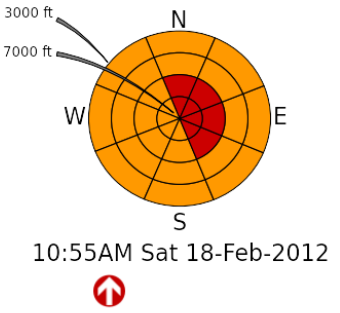
Graphical weather date for period leading up to incident from Ski Area Weather Station. Note increased winds late on the 18th and early on the 19th.

Avalanche and Snowpack Information: Back country avalanche information and forecasts for the time of the incident from the NWAC are shown below. This also gives a summary of related avalanche and snowpack conditions. The snowpack information contained in the analysis late Saturday morning (day prior to the incident)indicated the dangerous snowpack conditions observed at that time along with the potential for larger slides*: " …at Stevens Pass where slab depths are ranging up to 8-12 inches and some slides are stepping down to facets or surface hoar above an early February crust. Also, increasing winds through the passes are just beginning to make surface snow more cohesive and able to propagate fractures over longer distances*". And in the forecast for Sunday, the forecast stressed that: "*…cold temperatures should slow stabilization of existing wind slabs and help maintain the threat of further human triggered avalanche activity, especially on previously wind loaded terrain showing no evidence of recent avalanche activity*"

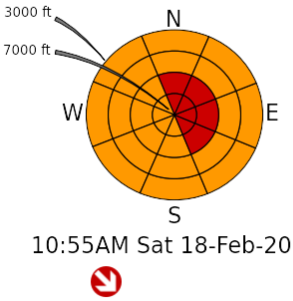
Unfortunately along with great powder conditions in the Northwest, the threat of avalanche activity…and the potential for human triggered slides also increases…especially if deposited over buried weak layers as had been reported for over a week in many locations of the Cascades (Crystal Mountain, Mission Ridge, NE Cascades, Stevens Pass). During this sad and sobering weekend in the Northwest, human triggered avalanches occurred in many Cascade areas on both the 18th and 19th, with a snowboarder fatality also reported in the BC near Alpental Ski Area (just south of Stevens Pass). Nature is constantly sending out warning messages, and it is up to those venturing into the BC to interpret and act upon them…always assessing the consequences of possible slide release and the ensuing "what if" options of the terrain below.

NWAC Forecast for Feb 18-20, 2012

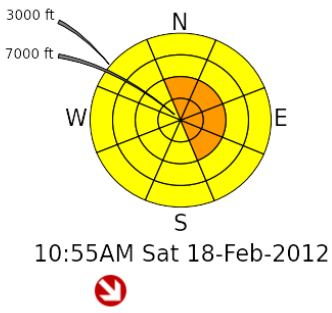
Stevens Pass, Snoqualmie Pass, WA Cascades near and west of crest - between Stevens and Snoqualmie Pass



Danger Rose for Saturday



Danger Rose for Sunday



Danger Rose for Monday

Saturday and Saturday night: Considerable avalanche danger above 5000 feet and moderate below early Saturday increasing into Saturday night and becoming high on lee slopes above 5000 feet and considerable elsewhere...especially on north through east exposures.

Sunday outlook: Slowly decreasing danger expected Sunday except for a slight increase on any slopes receiving sunshine. Danger continuing to slowly decrease Sunday night, becoming considerable on lee slopes above 5000 feet and moderate below.

Monday outlook: Slightly decreasing avalanche danger expected Monday, becoming considerable on lee slopes above 6000 feet and moderate elsewhere. Slightly increasing danger expected Monday night.

Snowpack Analysis

Prior to the recent moderate to heavy snowfall arriving mid-late Friday and continuing Saturday morning, the old snow surface consisted mainly of one of the following:

- generally shallow amounts of recent snow overlying strong near surface melt-freeze or sun crust layers
- shallow wind deposits over an old crust on north through east exposures
- a thin freezing fog or drizzle crust from Thursday night and early Friday(Alpental, Snoqualmie Pass).
- thin wind slab deposits on higher elevation north through east exposures
- shallow settled powder or recycled powder over a firm underlying crust
- some buried surface hoar layers near Stevens Pass (recently unreactive due to burial by several thin crusts)

Increasing moderate to heavy amounts of snowfall at lowering freezing levels and increasing winds were deposited over this variety of pre-existing snow surfaces mid-late Friday into Saturday morning, with up to 12-14 inches of new snowfall being reported as of mid-late Saturday morning. As temperatures cooled during precipitation, a relatively good bond of the moderate to heavy snow accumulations formed with the most of the old snow surfaces below about 5000 feet, and this temporarily helped limit the danger increase associated with the heavy snowfall. However, a gradually weakening bond with increasing elevation above 5000 feet has combined with stronger winds to create increasingly dangerous avalanche conditions on most lee slopes above 5 to 6000 feet and dangerous conditions in most avalanche terrain elsewhere.

Field information from Crystal Mountain early Saturday indicates 4-8 inch soft slabs releasing easily with increasing propagation on either an old crust or previously settled old snow surface, with these slides running far and fast but as of yet only creating relatively shallow debris in the runout. Meanwhile, larger and slightly more sensitive slides have been reported from higher ridges above 5000-5500 ft on morning control at Stevens Pass where slab depths are ranging up to 8-12 inches and some slides are stepping down to facets or surface hoar above an early February crust. Also, increasing winds through the passes are just beginning to make surface snow more cohesive and able to propagate fractures over longer distances.

Detailed Forecasts

Saturday and Saturday night

Relatively strong ridgetop and increasing pass winds, low freezing levels and moderate to heavy snow or snow showers are expected for most of Saturday, with locally heavy snow accumulations likely. This weather should combine to produce a further increase in the avalanche danger as thickening, more cohesive and somewhat brittle wind slabs develop over either the old snow surface or weaker snow layers produced between breaks between showers later Friday night or early Saturday. Some of these slabs may reach 2-3 feet or more by later Saturday and run quickly on an old smooth crust surface. As a result, increasingly dangerous avalanche conditions are expected on lee slopes near higher ridges...especially northeast through southeast exposures where human triggered avalanches should become very likely and where back country travel is not recommended. As indicated earlier, on lee slopes receiving heavy loading, some slides may involve or activate some recently buried weak layers, such as the surface hoar reported about a week ago near Stevens Pass. Also some large and unstable cornice formations are likely near higher ridges, and these overhangs as well as the slopes below should be avoided.

Sunday and Sunday night

Although decreasing light showers and decreasing winds are expected Sunday, cold temperatures should slow stabilization of existing wind slabs and help maintain the threat of further human triggered avalanche activity, especially on previously wind loaded terrain showing no evidence of recent avalanche activity. Also some brief sun breaks should allow for a slight danger increase on more southerly facing slopes receiving sunshine during the afternoon, when recent cornice formations should also weaken. Scattered light showers and relatively light winds late Sunday and Sunday night should allow for a slow decrease in the danger as recent wind slabs slowly settle. However, relatively cold temperatures should make such stabilization a slow process, and may begin to weaken the bond of recent snow to any of several buried crusts.

Finally, in areas experiencing brief partial clearing Sunday night, some surface hoar is likely to form, and this should be closely monitored prior to the onset of light snowfall expected to redevelop on Monday.

Monday Outlook

Light snow showers should briefly develop in the north Cascades and Olympics Monday morning, with briefly increasing light snow expected in the south and central Cascades later Monday morning and afternoon. Along with continued relatively low freezing levels and light winds, light to moderate snowfall accumulations should either maintain existing danger or allow for a slower danger decrease as further shallow soft wind slab deposits are possible. Increasing winds near higher ridgetops...slow warming...and increasing light rain or snow arriving late Monday night may begin to increase the danger by early Tuesday.