

YELLOW MOUNTAIN AVALANCHE FATALITY

03 March 2007

SYNOPSIS:

One skier was caught and killed in an avalanche that occurred on Yellow Mountain near Big Sky, Montana. The avalanche released on a wind-loaded slope with a southerly aspect. The crown was 2 feet at its deepest point, had a slope angle of 39 degrees, fractured 75 feet across, and ran 2070 vertical feet. The victim, who triggered the avalanche on his second turn, was caught and carried over a cliff and down through a rocky chute. Cause of death was blunt force trauma. US classification of the avalanche is SS-ASu-R2-D2-O.

WEATHER:

This area received snow every day for 9 days prior to the avalanche. Total snow accumulation during this period was 36 – 42 inches. Of this total accumulation, 6 - 10 inches fell in the 48 hour before the avalanche, which occurred on 3 March. Strong north winds (25 – 40 mph) blew the night of the 1st and into the morning of the 2nd. Temperatures were seasonal, with nighttime lows below zero and daytime highs in single digits.

AVALANCHE:

21 year old Ben Richards and a partner skinned to the top of Yellow Mountain intent on skiing a steep, south-facing gully locally name "The Titanic Chute". The top of the chute is 38 – 42 degrees, but quickly flattens into the mid-30's before making a sharp right-hand bend half way down. Immediately after the bend is a steep cliff which terminates in a narrow, rock strewn gully. The victims partner skied a short distance onto the slope to test the stability. He stopped just above the point where the slope rolls over to steeper angles. When nothing happened, Ben entered the chute. On his second turn he initiated the fracture which propagated 75 feet across. The fracture depth was 1 – 2 feet deep. He was caught and carried over the cliff mid-track. The avalanche continued down the gully for another 1000 feet slope distance before coming to rest. The victim was buried 4 feet deep near the toe of the debris.

RESCUE:

The avalanche was triggered at approximately 12:00 in the afternoon. Ben's partner skied to the bend in the chute and then made his way up and over a rib into adjoining terrain. He was able to negotiate this steep, rocky slope and reach the burial location approximately 30 minutes after the avalanche released. He located and dug up the victims who had suffered significant trauma. The victim had no pulse and was not breathing. The partner left the scene and went to a near by house to report the incident. Search and Rescue was called out at

approximately 1:00 pm. Big Sky SAR responded and was on-scene within an hour. The Gallatin County Helicopter Rescue Team was also dispatched and the helicopter was used to short-haul the body from the scene. The Gallatin County Deputy Coroner ruled that the victim died from multiple blunt force trauma.

SNOWPACK:

A layer of small-grained facets formed during a short period of clear weather the second week on February. This layer was subsequently buried by almost continuous snowfall over next several weeks. Strong north winds 36 hours prior to the event deposited a pencil hard wind slab in the starting zone of the avalanche path. Compression test performed during the investigation produced clean shears with moderate force on the weak layer of facets.

If you have questions about this incident please feel free to call me at 406-587-6984 or email me at sschmidt@fs.fed.us.

Scott Schmidt
Avalanche Specialist
Gallatin National Forest Avalanche Center

Photos:

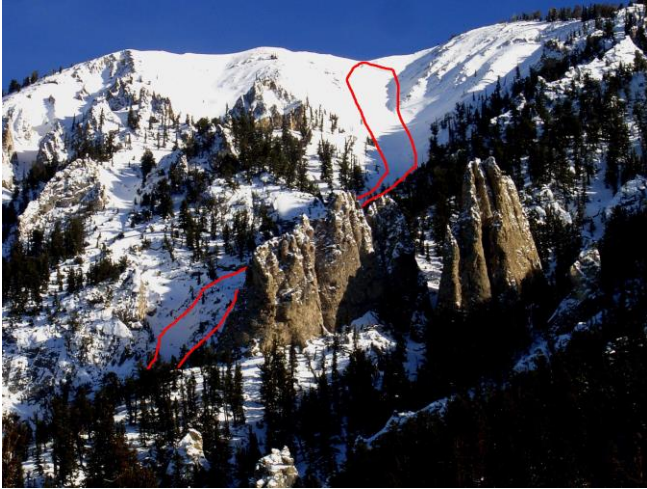
<http://www.mtavalanche.com/images/07/yellow-mountain-avalanche-path>

<http://www.mtavalanche.com/images/07/yellow-mountain-looking-down-path>

<http://www.mtavalanche.com/images/07/yellow-mtn-crown>

<http://www.mtavalanche.com/images/07/yellow-mtn-cliffs>

ACCIDENT SCENE PHOTOS:



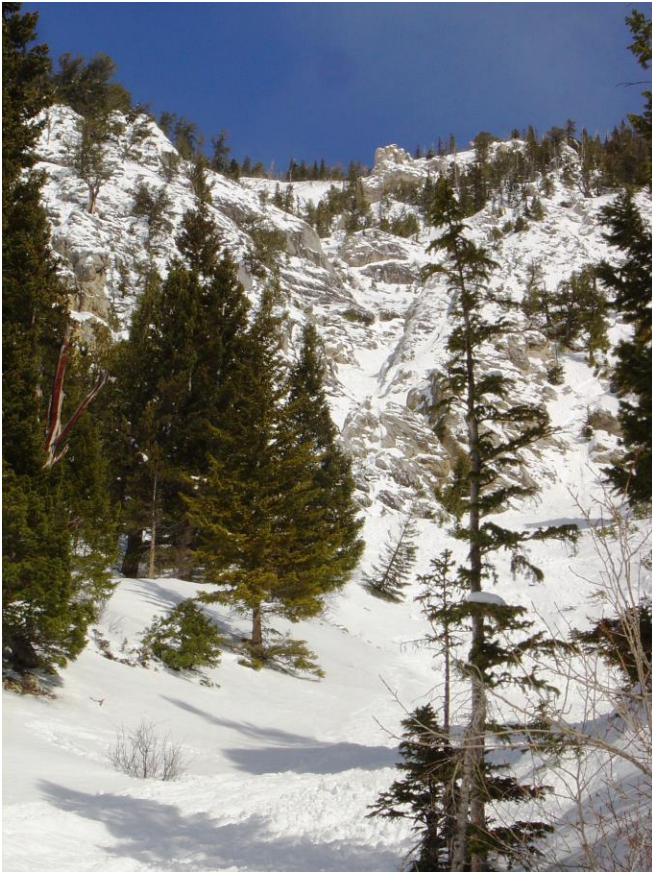
Avalanche path on Yellow Mountain. Avalanche ran 2070 vertical feet. The avalanche descended a steep cliff band shortly after making the right-hand turn that is marked in the photo.



Crown line on Yellow Mountain. Fracture was 2 feet at deepest point and 75 feet wide. Avalanche released on a layer of small-grained facets that had been buried by a recently deposited wind slab.



Looking down the avalanche path from the crown line. Path makes a sharp right-hand bend and descends over a cliff band near the rock outcropping that is seen center-right in photo.



Avalanche victim was carried down through this cliff band and rock chute.



Victim was buried four feet deep near the toe of the debris. Cause of death was blunt force trauma.

WEATHER DATA:

Snowfall Data From Big Sky Ski Area South Face Weather Station For Four Day
Period Prior to Event

BIG SKY 48 HR WX REPORT - BAVARIA STATION

DATE	TIME	BATTERY VOLTAGE	AVG TEMP deg F	AVR RH %	AVR WNDSPD mph	MAX WNDSPD mph	AVG WNDDIR deg	SNOW FALL inches
2 27	100	13.1	4	77	3	9	320	4.9
2 27	200	13.1	8	61	3	8	324	4.9
2 27	300	13.0	7	66	3	11	341	4.8
2 27	400	13.0	5	81	3	9	19	4.9
2 27	500	12.9	6	83	6	13	35	5.0
2 27	600	12.9	5	85	8	14	45	5.1
2 27	700	12.8	5	86	11	17	53	5.1
2 27	800	13.0	6	86	8	17	43	5.1
2 27	900	13.5	6	85	4	9	24	5.1
2 27	1000	15.0	10	86	3	10	2	5.1
2 27	1100	15.0	12	88	4	19	224	4.9
2 27	1200	15.0	13	87	4	10	245	4.9
2 27	1300	14.9	12	85	8	17	216	5.1
2 27	1400	15.0	9	87	10	23	218	5.4
2 27	1500	15.0	8	86	13	25	238	5.7
2 27	1600	15.0	9	83	12	21	248	5.8
2 27	1700	13.9	8	86	10	22	257	6.4
2 27	1800	13.7	7	86	12	23	253	5.4
2 27	1900	13.6	7	86	11	27	263	5.6
2 27	2000	13.5	7	86	10	20	269	6.4
2 27	2100	13.4	6	86	9	17	257	6.7
2 27	2200	13.3	7	86	10	19	255	6.9
2 27	2300	13.3	6	86	13	24	251	6.7
2 27	2400	13.2	6	86	14	29	243	6.7
2 28	100	13.1	6	86	15	27	249	6.7
2 28	200	13.1	4	81	14	25	248	6.7
2 28	300	13.0	4	75	14	25	253	6.8
2 28	400	13.0	3	77	11	23	251	6.7
2 28	500	12.9	2	73	8	16	275	6.7
2 28	600	12.9	2	71	6	10	288	6.6
2 28	700	12.8	3	70	4	8	283	6.6
2 28	800	15.0	5	64	4	7	276	6.5
2 28	900	14.9	10	62	3	7	296	6.3
2 28	1000	14.6	17	52	3	8	183	6.2
2 28	1100	14.8	12	59	3	10	205	6.5
2 28	1200	14.7	8	66	5	11	255	6.5
2 28	1300	14.7	9	58	6	13	227	6.5
2 28	1400	14.7	11	64	8	16	233	6.5
2 28	1500	14.8	8	72	7	18	240	0.0
2 28	1600	15.0	7	73	7	13	255	-0.0
2 28	1700	14.9	10	67	5	14	262	-0.1
2 28	1800	13.8	5	73	4	9	257	-0.1
2 28	1900	13.6	5	75	5	11	279	-0.0
2 28	2000	13.5	5	68	3	9	277	-0.1
2 28	2100	13.4	4	73	3	8	266	-0.1

2 28	2200	13.3	5	79	4	8	278	-0.0
2 28	2300	13.3	3	86	4	8	249	0.1
2 28	2400	13.2	4	84	5	12	246	0.4

Page 1

BIG SKY 48 HR WX REPORT - BAVARIA STATION

DATE	TIME	BATTERY VOLTAGE	AVG TEMP deg F	AVR RH %	AVR WINDSPD mph	MAX WINDSPD mph	AVG WNDDIR deg	SNOW FALL inches
3 1	100	13.1	3	85	11	22	245	0.6
3 1	200	13.1	3	85	15	27	242	0.6
3 1	300	13.0	2	84	15	25	247	0.6
3 1	400	13.0	2	84	14	25	245	0.6
3 1	500	12.9	2	84	11	22	253	0.6
3 1	600	12.9	1	84	12	23	259	0.8
3 1	700	12.8	1	84	13	22	263	0.7
3 1	800	12.9	0	83	11	22	256	1.1
3 1	900	13.6	-1	83	13	22	278	1.1
3 1	1000	15.1	1	82	11	24	262	1.1
3 1	1100	15.1	2	81	10	22	240	1.1
3 1	1200	15.1	1	83	12	21	243	1.0
3 1	1300	15.1	1	83	11	21	250	1.1
3 1	1400	15.1	-2	81	13	29	255	1.3
3 1	1500	15.0	2	82	13	24	278	0.1
3 1	1600	15.1	0	79	12	31	271	0.1
3 1	1700	14.8	-0	66	8	20	277	0.0
3 1	1800	13.9	-1	68	10	16	277	0.0
3 1	1900	13.7	-1	67	9	15	282	0.0
3 1	2000	13.6	-2	76	8	18	280	0.0
3 1	2100	13.5	-2	81	6	17	263	0.0
3 1	2200	13.4	-2	81	2	6	124	-0.0
3 1	2300	13.4	-3	80	3	8	64	-0.0
3 1	2400	13.3	-3	84	3	7	110	0.0
3 2	100	13.2	-4	81	5	13	139	-0.0
3 2	200	13.2	-5	78	4	10	166	-0.1
3 2	300	13.1	-5	82	6	18	197	-0.0
3 2	400	13.1	-4	81	5	13	155	0.0
3 2	500	13.0	-4	81	4	10	111	-0.0
3 2	600	12.9	-4	81	3	9	101	0.1
3 2	700	12.9	-4	81	4	11	132	0.2
3 2	800	14.7	-1	78	3	8	167	0.2
3 2	900	15.2	1	79	4	11	131	0.3
3 2	1000	14.9	6	69	4	12	127	0.2
3 2	1100	14.9	9	59	4	13	163	0.1
3 2	1200	15.0	6	68	5	12	187	0.3
3 2	1300	14.7	8	68	8	19	230	39.7
3 2	1400	14.8	6	69	8	20	242	0.5
3 2	1500	14.8	7	61	7	14	220	0.1
3 2	1600	14.8	6	59	6	16	219	0.1
3 2	1700	14.9	10	46	6	16	231	-0.1
3 2	1800	13.9	3	61	4	11	240	0.0
3 2	1900	13.7	1	67	8	12	277	0.1
3 2	2000	13.6	2	60	9	14	282	0.0
3 2	2100	13.5	3	49	9	14	282	-0.0

3 2	2200	13.4	2	52	9	16	280	0.0
3 2	2300	13.3	3	57	9	16	277	-0.0
3 2	2400	13.3	3	51	12	20	279	0.0

Page 2

BIG SKY 48 HR WX REPORT - BAVARIA STATION

DATE	TIME	BATTERY VOLTAGE	AVG TEMP deg F	AVR RH %	AVR WINDSPD mph	MAX WINDSPD mph	AVG WNDDIR deg	SNOW FALL inches
3 3	100	13.2	4	49	12	19	277	-0.0
3 3	200	13.1	4	46	12	20	276	-0.0
3 3	300	13.1	5	46	13	26	280	0.0
3 3	400	13.0	5	51	13	22	278	0.1
3 3	500	13.0	6	60	12	21	278	0.0
3 3	600	12.9	9	79	11	26	246	0.0
3 3	700	12.9	8	82	5	10	40	0.0
3 3	800	13.0	11	85	9	30	256	0.0
3 3	900	14.9	12	85	13	26	260	0.1
3 3	1000	14.9	14	88	12	28	249	0.0
3 3	1100	14.9	15	89	14	26	255	0.0
3 3	1200	14.9	18	85	13	27	244	0.1
3 3	1300	14.8	19	82	4	12	39	0.2
3 3	1400	14.7	20	78	3	8	53	0.1
3 3	1500	14.8	20	84	4	17	253	0.1
3 3	1600	14.6	21	83	7	20	248	0.0
3 3	1700	14.0	18	92	10	22	250	0.1
3 3	1800	13.7	19	92	10	27	261	0.0
3 3	1900	13.5	19	92	9	19	254	0.0
3 3	2000	13.4	19	92	10	19	274	0.0
3 3	2100	13.3	19	92	7	15	267	0.0
3 3	2200	13.2	20	92	7	15	270	0.0
3 3	2300	13.2	19	92	8	16	273	-0.0
3 3	2400	13.1	19	92	8	14	288	-0.0

Wind Data From Big Sky Ski Area Summit Weather Station For Three Day
Period Prior to Event

BIG SKY 48 HR WX REPORT -SUMMIT STATION

DATE	TIME	AVG TEMP deg F	AVR WINDSPD mph	MAX WINDSPD mph	AVG WNDDIR deg
3 1	100	-18	20	29	286
3 1	200	-21	21	38	288
3 1	300	-17	20	38	287
3 1	400	-19	21	28	285
3 1	500	-20	19	25	282
3 1	600	-23	20	29	289
3 1	700	-23	20	28	289
3 1	800	-22	15	24	290
3 1	900	-19	17	25	304
3 1	1000	-23	17	23	299

3 1	1100	-19	13	23	296
3 1	1200	-16	13	23	295
3 1	1300	-22	15	25	301
3 1	1400	-22	20	34	295
3 1	1500	-21	23	36	303
3 1	1600	-24	21	32	299
3 1	1700	-22	15	23	302
3 1	1800	-22	15	22	300
3 1	1900	-25	14	23	305
3 1	2000	-24	14	20	308
3 1	2100	-22	12	19	304
3 1	2200	-23	12	16	306
3 1	2300	-25	13	28	310
3 1	2400	-23	13	18	321
3 2	100	-27	14	23	330
3 2	200	-27	14	23	332
3 2	300	-25	15	22	333
3 2	400	-26	13	17	327
3 2	500	-23	16	28	328
3 2	600	-26	16	19	321
3 2	700	-24	15	20	321
3 2	800	-26	15	23	325
3 2	900	-24	17	23	345
3 2	1000	-25	15	19	340
3 2	1100	-12	12	17	325
3 2	1200	-17	11	17	313
3 2	1300	-17	14	24	315
3 2	1400	-17	12	20	304
3 2	1500	-19	12	60	306
3 2	1600	-17	15	23	312
3 2	1700	-19	15	20	298
3 2	1800	-21	14	19	304
3 2	1900	-21	18	24	307
3 2	2000	-22	19	31	303
3 2	2100	-23	20	25	308
3 2	2200	-22	19	23	306
3 2	2300	-19	20	25	308
3 2	2400	-21	24	29	305

BIG SKY 48 HR WX REPORT -SUMMIT STATION

DATE	TIME	AVG TEMP deg F	AVR WNDSPD mph	MAX WNDSPD mph	AVG WNDDIR deg
3 3	100	-21	26	31	304
3 3	200	-17	27	32	306
3 3	300	-16	29	36	304
3 3	400	-14	30	37	309
3 3	500	-13	32	37	311
3 3	600	-16	32	38	323
3 3	700	-10	29	36	325
3 3	800	-13	23	32	316
3 3	900	-12	24	34	314
3 3	1000	-9	25	34	317
3 3	1100	-3	29	42	317
3 3	1200	0	31	36	325
3 3	1300	-5	27	35	325
3 3	1400	-8	25	32	320
3 3	1500	-3	21	28	311
3 3	1600	-5	19	25	311
3 3	1700	-6	17	23	308
3 3	1800	-6	15	23	297
3 3	1900	-7	14	18	305
3 3	2000	-6	13	16	290
3 3	2100	-6	11	16	293
3 3	2200	-6	9	12	279
3 3	2300	-7	7	10	263
3 3	2400	-5	6	11	272

SNOW PROFILE FROM CROWN:

Snow Pit Profile
Yellow Mt - Titanic Chut
Madison, MT
 Elevation (ft) **8900**
 Aspect: **195**
 Activities:
 Notes: **Avalanche Fatality Investigation**

Observer: **Scott Schmidt**
Sun Mar 04 11:00:00 MST 2007
 Co-ord: **111.32718 W 45.30189 N**
 Slope: **39**
 Wind loading: **previous**

Stability on similar slopes:
 Air Temperature: **C**
 Sky Cover: **Clear**
 Precipitation: **None**
 Wind: **SW Calm**

Stability Test Notes: Layer notes:

