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Avalanches *and* *Extreme* Snowmobilers

by Karl Birkeland, Director, Southwest Montana Avalanche Center

Snowmobiling isn't what it used to be—or at least it's not what I thought it used to be. That much has become clear to me working as an avalanche forecaster in southwest Montana. I should have known that, just as not all skiers are content to ski the groomed slopes all day, not all snowmobilers are going to stay in flat, groomed areas.

It really hit home recently when Randy Elliot, the former patrol director and current mountain manager at Bridger Bowl Ski Area, told me about some snowmobilers who came to talk to him about having a hill climb up a run called "Hidden Gully." Hidden Gully is a run right off the top of the infamous ridge at Bridger Bowl. Having skied it, I knew that the top must pitch out somewhere between 45 and 50 degrees and that you could barely get a pair of 210's through the narrows. I couldn't imagine a run like that being used for a snowmobile hill climb, but what I really couldn't imagine was that the guy told Randy that Hidden "wasn't hard enough." Even Hidden Gully, it seems, is too easy for "extreme" snowmobilers.

What other games do "extreme" snowmobilers like to play? One favorite is "High Point," where you open the throttle and get as high as possible on a slope or bowl before turning around and coming back down. Then your buddy can get even higher by using your packed track for traction. In the right conditions, the expert riders can easily get up slopes steeper than 40 degrees.

That game pales in comparison to what they are doing up in Alaska, however. Doug Fesler from the Alaska Mountain Safety Center told me that "Cornice Break" is a favorite game that has developed up north over the past few years. The objective here is to scream along a cornice at full throttle, with the cornices breaking off behind you. Sounds to me like they should call it "Cornice Roulette"!

Another game many profess to play is actually triggering and riding avalanches. A snowmobiler who was caught in a large slide here last year told me that he had "triggered several avalanches and rode 'em out." He and his brother didn't ride this one out—his brother ended up in the hospital with a punctured lung. Bruce Tremper from the Utah Avalanche Forecast Center told me about a Utah snowmobiler who liked to make a habit out of finding and triggering avalanches. He went out in search of slides during the huge February 1986 avalanche cycle and found a bit more than he bargained for. His machine was buried, but he was uninjured and commented, "Of all the avalanches I ever rode, that one was the meanest."

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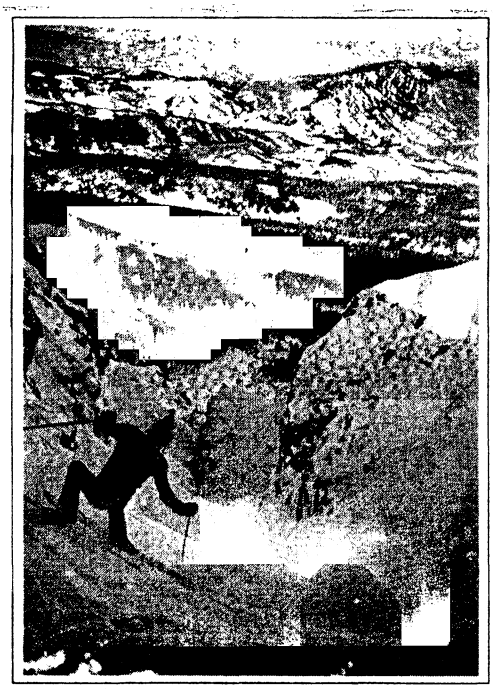
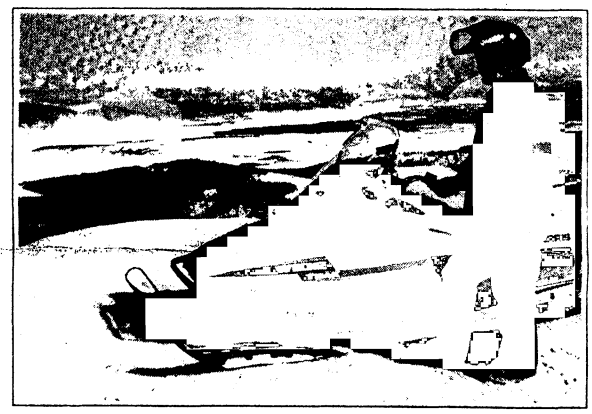


Even Hidden Gully is too easy for "extreme" snowmobilers. [photo by Bruce Tremper]



Warrren Henrie, volunteer observer for the Southwest Montana Avalanche Center, shows off his new snowmobile. The new machines are more powerful and have better traction to allow people to travel even farther into avalanche territory. [photo by Karl Birkeland]

Lionhead, west of West Yellowstone, Montana is a favorite spot for snowmobilers. The slope behind these snowmobilers has been the site of two recent avalanche incidents, including a fatality in January of 1990. [photo by Karl Birkeland]

SNOWMOBILERS—*cont'd from previous page*

Snowmobilers comprise a significant segment of the backcountry use in southwest Montana and a large portion of our avalanche incidents. In the 1990-91 season we had 10 avalanche incidents involving 12 people. Of those 12 people 50% were snowmobilers. In addition, slides triggered by snowmobilers were much larger than the skier-triggered slides, and these were the slides that nearly killed some people.

Snowmobilers are a problem in our area and I have wondered how best to reach them, and what sort of conditions seemed to be the most dangerous to them. The following is a chronicle of the more major snowmobile-related avalanches in the past three seasons in southwest Montana, followed by the trends I have seen in these accidents, and the efforts of the Southwest Montana Avalanche Center to try to improve snowmobiler safety.

Snowmobile-Triggered Avalanches

Lionhead, January 1990—near West Yellowstone, Montana

Two snowmobilers on a guided snowmobile tour were playing on a steep (35-degree-plus) treeless slope when one of them became stuck. They triggered the avalanche when the other rider came over to help. They were both caught and one person ended up buried with only his hand above the snow and was dug up within 15 minutes. The other man was completely buried, and unfortunately no one in the party had avalanche beacons, shovels, or probes. His body was recovered several hours later from under three feet of snow by a search dog flown in from Bridger Bowl Ski Area. Both victims ended up about 10 feet downhill from their respective machines, and both machines were partially buried. Big Sky Ski Area, located 30 miles north of the accident site, had reported strong southwest winds and significant avalanche activity earlier that week.

Daisy Pass, February 1990—near Cooke City, Montana

A snowmobiler went up the side of the pass and took a sweeping turn down a steep (35-45 degree) slope. It fractured 1 to 8 feet deep, and the resultant avalanche swept the person and his machine down the slope. He hung on for most of the ride, and ended up totally buried just a few feet from his machine, which had one ski sticking out of the slide. Fortunately his helmet and full face shield protected his face from becoming packed with snow. His friends, who were digging around his machine, heard him yelling and dug him out using their helmets. This slope had been loaded to the hilt by strong wind, and the snow around the slope was quite variable in strength. The weakest areas consisted of a moderately hard wind slab lying over the top of fist hardness faceted crystals.

Picket Pin Mountain, January 1991—west of Nye, Montana

Three experienced snowmobilers headed out on a backcountry ride into the Absaroka Mountains. One man became stuck while trying to cross the bottom of a large bowl. When his brother came out to help him the whole bowl released. The slide was 2 to 7 feet deep, 1200 feet wide, and ran 1000 vertical feet. The two men were near the bottom of the slope when the slide was triggered, and they were pushed down, swept through some trees, and buried with only their fingers sticking out of the snow. The third snowmobiler, who was not caught only because she had not quite made it to the slope yet, quickly located the first person and dug him out with her fingers, and then found and dug out the second person in a long ordeal. One of the victims had a punctured lung. The three people all rode out in difficult conditions on one snowmobile. When interviewed, one of the victims said that he thought there was "no way that area could slide" because it was "so flat." The slope angle in the starting zone varied from 37 to 42 degrees, and the slide consisted of wind deposited snow lying on top of a weak mid-pack layer of small faceted crystals. This was the first of several avalanches that ran on this same weak layer over the course of the next month in southwest Montana.

Heather Lake, January 1991—south of Bozeman, Montana

Six snowmobilers who prided themselves on going where others would not go went for an afternoon ride. One of the riders told me that they liked to tune up their machines like racers, and in the spring they would put metal studs on their tracks so they could go straight up ice covered chutes. These guys were hardcores and proud of it—not the sort of folks you would find on packed trails. While playing in a high bowl, two of the snowmobilers became stuck right next to each other. As they tried to pull their machines around they triggered an avalanche that was 900 feet wide, 2 to 4 feet deep, and ran 1000 vertical feet. One person, a former junior ski patroller, began to swim after being hit by the avalanche. The other person had seen an avalanche video only the week before and also began to swim. When the slide stopped, both had only finger tips above the snow, and both were buried near their machines. Their friends quickly dug their faces out of the snow, but the snow around them hardened so fast that one person reported that he was unable to move his toes inside his boots by the time he was completely dug out. Again, this accident was preceded by strong wind, and several similar slopes in the region had slid naturally the previous day. The slide consisted of new snow and wind slab, and slid on the same mid-pack layer of small-grained faceted snow that the Picket Pin slide ran on, but about four weeks later.

Lionhead, December 7th, 1991—near West Yellowstone, Mt.

This article was ready to be sent off when some snowmobilers triggered yet another large avalanche. This avalanche was triggered on the same slope as the one that killed a person in January 1990 (see above). Southwest Montana had been receiving ridgetop winds averaging 30 mph out of the west and northwest for about a week. On December 6th a storm hit, and a SNOTEL station to the south of Lionhead reported 1.1 inches of water in the new snow by 4:00 A.M. on the 7th. Winds continued out of the west and northwest. On December 7th, with the storm still in progress, a group of snowmobilers headed out on a Pearl Harbor Day ride they would remember. Windswept conditions on the ridgetops allowed easy travel high on the ridge. At the top, five of the snowmobilers decided to drop off the gentler, windward side of the ridge. The remaining two riders tightened their helmets for the ride off the steep (42 degree) east-facing, windloaded side. The first rider zoomed over the edge and out of sight, and the second followed shortly. When rider number two came over the top of the breakover he could see his buddy getting tumbled in the avalanche below. He didn't have much time to watch, however, because he quickly flew over the top of the 3 to 4 foot fracture, landed on the steep

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Above:
Two brothers triggered this large avalanche as they snowmobiled across the lower part of the bowl. One of the brothers ended up in the hospital with a punctured lung. The other brother commented that he 'never thought that area could slide.' [photo by Chuck Martin]

Right:
One of the brothers caught in

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Classifieds

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rocks that were exposed by the slide, and had to ride the rocks down the slope behind the avalanche. When the slide stopped, rider number one was buried to his chin. His helmet had been ripped off his head, but his head had miraculously remained attached to his body. His machine was buried slightly downhill from him. It took about 3 to 4 hours to dig out the person and his machine with a screwdriver. The victim's only injury was a twisted knee. The slide pulled out the entire ridge line, roughly 1/2 mile wide, and ran 800 to 1000 vertical feet. Some of the slide consisted of the roughly two feet of new and windblown snow, while much of the slide ran 3 or 4 feet deep to the ground on mature faceted crystals.

Trends Observed in Snowmobile-Triggered Slides

This was not meant to be a complete anthology of snowmobile related avalanches. I think that such a study would be beneficial; with enough data and snowmobiling experience, a person might be able to come up with some "Safe Snowmobiling" protocols for travel in avalanche terrain (much like Brad Meiklejohn's "Safe Skiing" guidelines in the December 1990 issue of *The Avalanche Review*). The sample size I am working with here is so small that much of what I have concluded may have limited usefulness. Still, we have to start somewhere. I think that when we look at the above avalanches (and information on others that was provided by the Colorado Avalanche Information Center and the Alaska Mountain Safety Center) there are some definite trends emerging:

(1) Snowmobile related avalanches are on the increase.

Of 27 snowmobile accidents in the Colorado Avalanche Information Center database, 30% happened since 1988. This could be due in part to better reporting of accidents, but I think there is more than that going on. More people are snowmobiling and more are getting into the backcountry. Most importantly, the equipment is getting better and better. The word from some of the snowmobilers in this area I have talked to is that the equipment now is a quantum leap above what you could have gotten your hands on in 1986. You can now get a machine with a long track that rides low to the ground and has an incredible amount of power. It's pretty much like taking one of the hot new motorcycles and sticking skis and a track on it. When you add new suspension and track designs to the picture, it's not to hard to imagine just how easy it would be for that motorized sled to climb up your favorite avalanche path.

(2) Many snowmobilers involved in accidents have limited avalanche education.

The best sign of the lack of education and awareness of snowmobilers is the large number of snowmobile-triggered avalanches that involve more than one person. It seems that the rule, rather than the exception, is for more than one person to be caught in a particular avalanche. In several of the recent avalanche accidents in Alaska the victim has actually been sitting at the bottom of the slope while his partner above triggered the slide. In one of those cases the victim was buried in a gully 34 feet deep. Three of the five accidents I discussed above involved more than one person, and all of the "multiple victim" slides involved stuck snow machines. Of three snowmobile accidents discussed in *Snowy Torrents* (1972-1979 by Williams and Armstrong), two involved more than one person and at least one stuck machine, while the third was a person who broke off a cornice.

What is one of the first things we try to teach in avalanche classes? *Only expose one person to the potential danger at a time.* Say you are skiing a slope one at a time and your friend makes the critical mistake of taking the big headplant. Do you wait for your buddy to get it together and get out of the way? Or do you go down and headplant next to him/her and both thrash around like beached fish for a while? This is perfectly analogous to the snowmobiler who, seeing a friend stuck up on a steep slope, races up to help while the two of them and their idling 500-pound machines flail around. It is difficult to put more stress on a slope than that.

For the most part, snowmobilers have been out of the loop in terms of avalanche education. In some cases this has been due to the fact that many snowmobilers did not want the education. A well-organized and advertised avalanche course in Anchorage geared toward snowmobilers in the late 1977 attracted only one person. This is changing—a recent Alaska Mountain Safety Center workshop for snowmobilers drew 50 interested participants in Anchorage, and the local avalanche centers are all starting to target snowmobilers more in their advisories and educational efforts.

However, while we are in the process of trying to get snowmobilers educated, many of them currently have little awareness of the danger of avalanches, few have any avalanche education, and even fewer carry avalanche rescue equipment such as beacons or shovels. We need to make an extra effort to help snowmobilers "catch up" in terms of avalanche education and awareness.

(3) Many accidents take place after wind events.

After talking to others, I'm not so sure this is a general rule, but many of the avalanches triggered by snowmobiles I have seen in southwest Montana do happen after wind events. Snowmobiles are big pieces of machinery (often 500 pounds or more), and without a reasonably strong layer to travel on, snowmobiling through the backcountry can be miserable business. Most of us are skiers, and we crave new snow. Of course the weight of that new snow can increase the snowpack instability, and when the conditions are set up right we worry about skiers triggering slides in their constant quest for powder. But, for the most part, we don't have to worry about snowmobilers as much during the same time we classically worry about skiers. Since it's hard even to travel across the snow when it is too deep, it's going to be even harder to try to get to the top of an avalanche starting zone. Of course we can't ignore the danger to snowmobilers during this time because it may still be possible to drop in from above, or undercut a slope. One only has to look at the latest avalanche accident in this area (Lionhead on December 7th, 1991) to see that snowmobilers aren't always triggering slides just by climbing up slopes. But, around here, it seems that the snowmobilers are more likely to get surprised after a big wind event has left a hard surface for them

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Who Do You Call?

24-hour Regional Avalanche Information

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Washington Cascades and Olympics (Seattle)	(206) 526-6677
OREGON	
S. Washington Cascades and Mt. Hood Area (Portland)	(503) 326-2400
CALIFORNIA	
Lake Tahoe/Donner Summit Area (Truckee)	(916) 587-2158
Central Eastern Sierra (Mammoth Lakes)	(619) 934-6611
IDAHO	
Smokey, Sawtooth, and Pioneer Mtns. (Ketchum)	(208) 622-8027
UTAH	
Sundance/Mt. Timpanogos Area (Provo)	(801) 374-9770
Tri-Canyon Area (Salt Lake City)	(801) 364-1581
Park City Area (east of Tri-Canyons)	(801) 649-2250
Mt. Ogden south to the Tri-Canyons (Ogden)	(801) 621-2352
North Wasatch (Logan)	(801) 752-4146
La Sal Mountains (Moab)	(801) 259-7660
MONTANA	
Northwest Montana Rockies (Whitefish)	(406) 257-8606
South Central Mountains (Bozeman)	(406) 587-6981
Southern Mountains (Cooke City)	(406) 838-2495
WYOMING	
Teton, Wyoming, and Wind River Mtns. (Teton Village)	(307) 733-2664
COLORADO	
Colorado Rockies (Denver/Boulder)	(303) 236-9435
Colorado Rockies (Fort Collins)	(303) 482-0457
Colorado Rockies (Summit County)	(303) 668-0600
Colorado Rockies (Colorado Springs)	(719) 520-0020
Colorado Rockies (Vail)	(303) 827-5687

AVALANCHE EDUCATION DIRECTORY

Sierra Wilderness Seminars
Certified Avalanche I (Basic), March 5-8, 1992, and Certified Avalanche II (Advanced), March 9-10, 1992, taught by Norm Wilson, avalanche consultant. Courses will be held in Lassen National Park (Basic) and on the slopes of Mt. Shasta (Advanced). Call, write, or fax: Sierra Wilderness Seminars, Inc., P.O. Box 707, Arcata, Calif. 95521, tel 707-822-8055 (outside Calif. 1-800-648-5650), fax 707-822-8081.

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Education Directory
To place a listing about your upcoming course(s) or workshop(s) in

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to get high up in the starting zones. As a result, several of the snowmobile-triggered slides that I have seen are large hard slab releases.

(4) Are snowmobiles more likely to trigger the "sweet spot"?

This suggestion may be more controversial than some of the above observations. For one thing, at this point we don't know exactly where on a slope to find the "sweet spot," or zone of localized shear weakness. An interesting aspect of these snowmobile-triggered slides is that many of the slides appear to be triggered from areas on the slope that are significantly weaker in total snowpack strength (You could think of this as total resistance or total RAM hardness of the snowpack). In each of the slides discussed above, the avalanche appeared to be triggered from a rock band. Snowpits dug on the flanks of these slides indicated that snow over these rock bands was significantly shallower and weaker than adjacent areas. It makes sense that snowmobiles may be more likely to find these weaker areas because they are the places a snowmobile is most likely to get stuck. If a snow machine was racing up a starting zone, just barely keeping on the surface, hitting one of these weaker areas might be the reason the snow machine bogged down and became stuck in the first place. Since a snowmobile might be more likely to get stuck in a weaker part of the slope, it is not so surprising that stuck snowmobiles are often precursors to avalanches. Now, because of the nature of snowmobiling, we have a situation where snowmobilers may be prone to finding a weak spot on a slope, getting stuck there, and then applying a maximum amount of disturbance in that area.

What To Do

The solutions to the problem of snowmobile-triggered avalanches are pretty straightforward. It's unlikely that we can eliminate them (just as skiers continue to trigger slides), but hopefully we can minimize the number of slides and victims. The main thing that needs to be done is to raise the level of avalanche education and awareness among snowmobilers. In our region we have been trying to target snowmobile groups for seminars, and when accidents do occur we have been cooperating with the media so that the accident gets some coverage, thereby increasing awareness among all snowmobilers. We are also working with snowmobile shops to try to get the word out and get snowmobilers to use the local avalanche advisory. With the advisories themselves, an effort has been made to include the concerns of snowmobilers (e.g., when conditions make travel difficult and easy) and warn them of times when the hazard for snowmobilers may be highest (e.g., the combination of a hard snow surface for traveling and unstable conditions). We also try to continually drive home the ideas of exposing only one person to the hazard at a time and carrying proper rescue equipment.

Making all this work requires me to get out on snowmobiles occasionally, and evaluate the hazard from the standpoint of a snowmobiler. Just as skiing on the snow seems to be the best way to forecast for skiers, snowmobiling allows you to think like a snowmobiler, anticipate the problems they face, and the experience the snowpack from their perspective. Although I've ridden a snowmobile to some places I never thought snowmobiles would be able to go, I still don't think I will try to tackle Hidden Gully anytime soon. But, hopefully our efforts here are beginning to help give some "avalanche sense" to many of those "extreme" snowmobilers who would still consider a hill climb up Hidden Gully to be

Above :
Large groups of snowmobilers are increasingly common. [photo by Frank Grover]

Left :
Two snowmobilers triggered this slide near Heather Lake south of Bozeman, Montana. The two were buried near this hole with just their hands above the snow, and were dug out by their partners. [photo by Karl Birkeland]