

Snow and Avalanches in Utah

Annual Report 2001-2002



Forest Service Utah Avalanche Center

In partnership with:

Friends of the Forest Service Utah Avalanche Center
National Weather Service
Utah Division of Comprehensive Emergency Management
Salt Lake County
Utah State University
Utah State Parks and Recreation



Cover photo: A monster avalanche in Mineral Fork about five feet deep and nearly a mile wide. It was a spectacular example of the very large, deep avalanches that occurred throughout the second half of the winter. Photo by Craig Gordon

Copies of this report can be obtained by writing or calling:

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Or view online at:
www.avalanche.org

The Forest Service Utah Avalanche Center—An Overview

Our goal:

Help keep people on top of the Greatest Snow on Earth instead of buried beneath it.

Where do avalanche accidents occur?

Ninety nine percent of all avalanche fatalities occur in the backcountry—areas outside of ski area boundaries where no avalanche control is done. Ski areas and highway avalanche control crews routinely knock down avalanches with explosives before the public arrives each morning. They have done their jobs so well that since 1980, less than one percent of avalanche fatalities have involved general public on open runs at ski areas or on open highways.

What kind of people get caught in avalanches?

Ninety two percent of people killed in avalanches since 1985 have been recreationists, and they are almost always very skilled in their sport. In almost all cases their skill in their sport significantly outpaces their avalanche skills. Looking at the most recent 5 years of national data, nearly twice as many snowmobilers have been killed as any other user group, followed by climbers, backcountry skiers, snowboarders and miscellaneous recreationists such as hikers and snowshoers.

How do people get caught?

In over 90 percent of avalanche fatalities, the avalanche was triggered by the victim or someone in the victim's party. As Pogo says, "We have met the enemy and it is us." Which is actually good, because it means that, 90 percent of the time, we can avoid avalanche accidents through our route finding and snow stability decisions.

In summary, avalanche fatalities occur almost exclusively in the backcountry, almost always involve recreationists, and almost all avalanche incidents can be avoided if we choose.

How we help solve the problem:

We give backcountry travelers the weapon of knowledge. In order to avoid triggering avalanches, backcountry travelers need:

Critical, up-to-date avalanche information.

Our avalanche advisories give the public critical avalanche information they need to make their life-and-death decisions in avalanche terrain and we forecast snow stability and weather trends into the future. Our information helps the public to decide what kind of terrain is safe, what kind is dangerous and we give them useful clues to look for when they venture into avalanche terrain.

The public can access these advisories in the following ways:

- ◆ Recorded telephone message updated each day
- ◆ Live interviews each day on three different public radio stations
- ◆ The Internet
- ◆ Faxes sent out each morning to businesses and Forest Service offices
- ◆ In times of extreme or unusual avalanche conditions, we issue an avalanche warning that reaches all the broadcast and print media as well as NOAA weather radio.

Finally, we “preach the avalanche gospel” as much as possible to the local, national and international media. This season, for instance, several documentaries played on national television including National Geographic and several on the Discovery Channel, PBS and the Weather Channel. The Forest Service Utah Avalanche Center staff is featured in most of these documentaries.

Avalanche education:

We teach about 50 free, basic avalanche awareness classes each season. These not only give the public an overview of the avalanche problem, but also some basic avalanche skills. These classes encourage the public to take a more involved avalanche class offered by the private sector.

Our Philosophy

Just because people hear the information doesn't mean they listen. Therefore, we try to make the advisories entertaining so that people will remember what they hear and enjoy the experience enough to use the advisories regularly. We try and use all the standard tools of effective writing and speaking such as using active voice, first person, personal examples and stories to illustrate points, humor where appropriate and reading the bulletins in a natural voice, like talking to a friend. The recorded bulletins are informal, chatty and funny, yet informative.

We believe local forecasters do a much better job than distant forecasters.

Local people know local conditions better. They can get out in the mountains every day, they see weather and snow out their window and they talk with people on the street about it. Because of this, we believe that local people should issue avalanche bulletins for local areas, as long as they have the avalanche skills to do so. For this reason, four crews of avalanche forecasters operate in Utah, one in Logan, another in Salt Lake City, one on the Manti Skyline and a fourth in Moab.

We believe in a strong field-based program.

Avalanche forecasting is just as much art as science. And because of this, computers never have, and most likely never will, be able to forecast avalanche hazard as well as an experienced and skilled human being. Avalanche forecasting works best when the forecaster has an intimate, daily connection to the snowpack. We notice that the longer we spend in an office, the more out of touch with the snowpack we become. Therefore we always put in one or more field days before our forecasting shift, and we seldom have more than two forecast days in a row.

This is our philosophy and it seems to be working. More people access the FSUAC bulletin each season than any other avalanche advisory in North America, and the number keep increasing by an average of 20 percent per year. The numbers of people going into the backcountry keep increasing exponentially, yet the death rate has risen more slowly. We also see an increasing demand for avalanche education and information, not only by Utahans, but also by the national and international media.

We are very passionate about our work because it's more than a job, it saves lives.

A look Under the Hood

The UAC is operationally separated into four entities:

- Bear River drainage (Logan area – northern Utah and southeast Idaho)
- Wasatch Mountains (Ogden, Salt Lake, Park City and Provo area mountains)
- Manti Skyline (Fairfield Canyon – Wasatch Plateau)
- La Sal Mountains (near Moab)

Greg Johnson heads the Logan operation with Spencer Logan as an assistant. Spencer is employed by Utah State University. In past years, Mike Jenkins of Utah State University ran the Logan center on a part time basis. For the past two seasons, Greg Johnson, a Forest Service employee ran the center, supported partially by Olympic funds. We hope to find funding to continue the Forest Service operation of the Logan center in the future

In Moab, Eric Trenbeath heads the center after being an assistant for the past couple seasons. The Moab office is located in the Moab Ranger District on the Manti-Lasal National Forest.

The Manti Skyline (Wasatch Plateau) avalanche forecast was issued for weekends-only by Craig Gordon and Eric Trenbeath. Funding for this program comes from a generous grant from the National Recreation Trails Program administered through Utah State Parks. Craig and Eric work part time as snowmobile avalanche educators and part time as forecasters for the Manti Skyline. In its second full season of operation, it continues as a very successful program.

Last, but not least, the vast majority of the backcountry use occurs in the Wasatch Range of northern Utah. A staff of seven full time workers covered the Ogden, Salt Lake City, Park City and Provo area mountains—arguably the most heavily used mountain range in the U.S. Bruce Tremper, in his 16th season, is the Director. This season, Tremper spent most of his time working on Olympic-related avalanche issues while Evelyn Lees oversaw the day-to-day operations. Although Bruce Tremper spends most of his time in the Wasatch operation, he offers technical oversight to all three operations to insure consistency in quality. The rest of the very experienced Salt Lake staff include: Evelyn Lees, Tom Kimbrough and Carol Ciliberti, plus, Ethan Greene and Drew Hardesty worked the past two seasons under Olympic funds. This season, using Olympic funds, we hired Evan Stevens as a contract computer programmer for our office and doubled as a valuable second person in the office to help out during the morning crunch time. Unfortunately, at the end of the season, Carol Ciliberti accepted a forecaster position with the National Weather Service in California so she will not return for next season. Also, with the loss of Olympic funds one additional position will have to be cut for next season.

All are Forest Service employees under the Wasatch-Cache National Forest. The Salt Lake office is co-located with the National Weather Service at the Salt Lake International Airport.

Lastly, a private, nonprofit group, the Friends of the Utah Avalanche Center, contracts a number of "volunteer" observers, who are reimbursed for their expenses at around \$10.00 per day. They also hire the intrepid Bob Athey as a full time backcountry observer.

The Utah Avalanche Center is a Forest Service program under the Wasatch-Cache National Forest and the Manti-La Sal National Forest, in partnership with Utah State University, the State of Utah Department of Public Safety, Division of Emergency Management, Salt Lake County, the National Weather Service and private contributions through the Friends of the Utah Avalanche Forecast Center.

The public can access the bulletins in the following ways:

Telephone:

Salt Lake City - (24 phone lines)	(801) 364-1581
Logan (multi-line PBX system at Utah State University)	(435) 797-4146
Park City (multi-line PBX system at Park City Resort)	(435) 658-5512
Ogden (multi-line PBX system at Weber State University)	(801) 626-8600
Provo (multi-line PBX system at Brigham Young University)	(435) 378-4333
Alta (multi-line PBX system through the Town of Alta)	(801) 742-0830
Moab (single phone line)	(435) 259-7669
Manti Skyline (courtesy of Utah State Parks)	(800) 648-7433
Snowmobile hotline (courtesy of Utah State Parks)	(800) 648-7433

Radio Stations (live on-air reports each morning around 8:00 am)

KRCL 91 FM
KPCW 92 FM
KCPW 105.7 FM

Internet:

<http://www.avalanche.org>
<http://www.wrh.noaa.gov/Saltlake>
<http://www.csac.org>

Fax:

We operate an automated fax distribution of the bulletin for selected businesses and Forest Service offices that post a hard copy for the public to read.

To contact our office: (801) 524-5304 (phone)
(801) 524-4030 (fax)
e-mail: uafc@avalanche.org

How we Generate Avalanche Advisories

We often think of ourselves as natural detectives. We gather as much information as possible, and then we communicate our analysis to the public. Each day we look at weather, talk to ski area avalanche control programs, helicopter ski companies, highway control programs and volunteers, but our most important source of information comes from us, from our up-close-and-personal work with snowpack. Last, but not least, we regularly travel into the mountains, where we not only get our best information, but we see our theories tested in an unequivocal way, when our customers recreate in avalanche terrain.

We split our time more or less equally between the mountains and the office. With our staff of five people, we have a rotating schedule in which one person sits in the driver's seat in the office as the forecaster for that day while the others either head into the mountains to look at snow, work in the office on various education or computer projects or take their scheduled days off.

Field Day:

A typical "field day" might begin at 6:00 in the morning when we wake up, listen to our trusty NOAA weather radio, get on our home computer and look at the data from all the automated weather stations in the mountain. Like everyone else, we call our own avalanche advisory to get the latest information. Then we jump in the car or on the bus and head for the mountains.

We usually travel on skis and we use a snowmobile to access more remote areas. We usually travel with a partner using all the usual safety equipment like electronic avalanche beacons, shovels, probes, belay rope and radios. We seldom have a regular patrol area, but we simply go to the area that concerns us the most, or to a place that we know is representative, where we can look at snow on a variety of aspects, elevations and terrain types. We almost always go into the backcountry--meaning areas outside ski area boundaries where no avalanche control is done. We put climbing skins on our skis and huff-and-puff to the top of a mountain, take off the skins, ski down into another valley, put the skins back on again, go to another ridge, and so on.

And yes, it can certainly be dangerous if you don't know what you're doing. It takes years of experience and training to be an accomplished avalanche forecaster, not to mention to be able to do it safely. Most of our staff have degrees in some kind of physical science such as meteorology, geology or engineering, three staff members have master's degrees and two are working towards their PhD. We also have a number of years experience doing avalanche control at ski areas, plus, we all are accomplished mountaineers with many decades of accumulated mountain experience. Finally, we all stay in top physical condition so we can efficiently cover lots of terrain.

We gather information from many different places in many different ways. For instance, we dig snow pits on several different slopes to get a good feel for the distribution pattern of snow stability. A snow pit, like the name implies, is about a 5 foot (1.5 meter) hole in the snow we dig and then we do a variety of stress tests to determine the stability of the snowpack. We also look at the crystallography of the various layers, and measure

temperatures and sometimes density. This isn't nearly as complicated or time-consuming as it seems, as we usually spend no more than 15 minutes in a single snow pit. We would rather dig several quick pits in several areas than do one detailed pit in several different areas because once we figure out what kind of avalanche dragon we're dealing with, we want to know the distribution of the pattern so we can communicate the pattern to the public.

We also test the snow in other ways, such as sawing off cornices, which bounce down the slope, keep close track of the pattern of recent avalanches and we always pay very close attention to the present snow surface because it's much easier to map a layer of snow when it's still on the surface than after it's buried by the next storm. Finally, when we get home, we leave a detailed message on our answer machine in the office, which the forecaster will hear early the next morning. We also fax a written version of our observation, including the snow pit profiles, so that the forecaster has less to write down the next morning. Finally, we often call the person who will forecast the next day and talk to them in more detail, making sure not to call after bedtime, which is 8:00 pm, since they have to be up by 3:00 am the next morning.

Office:

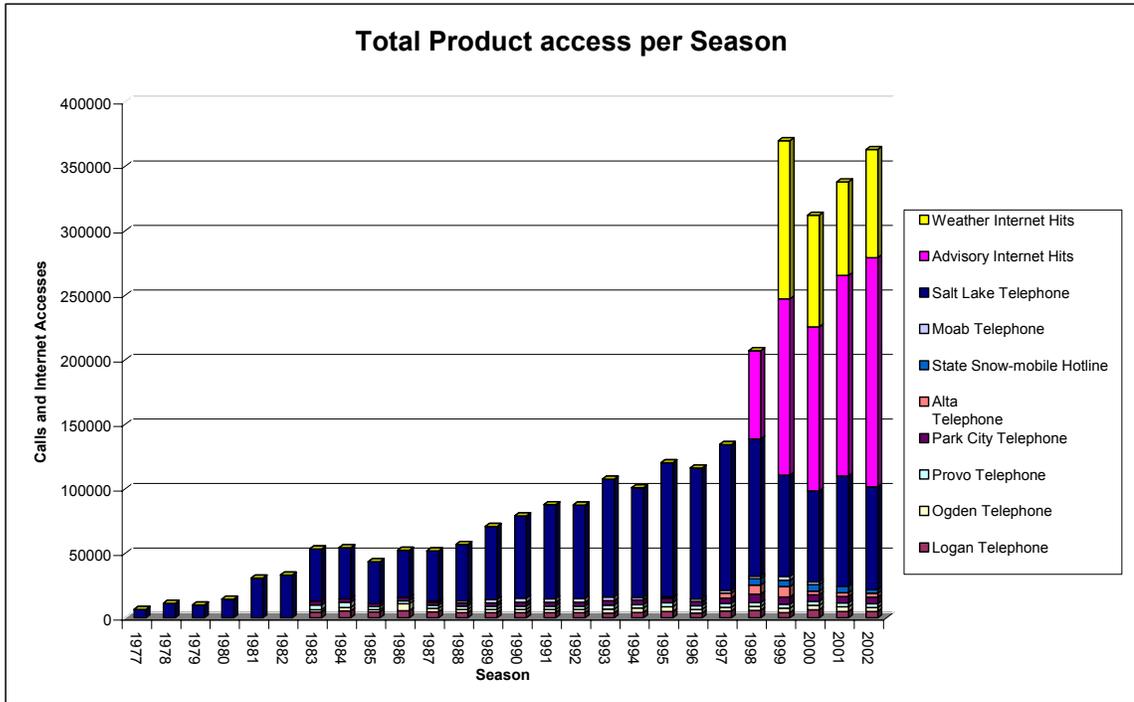
The office days are brutal. We usually arrive at our office, co-located with the National Weather Service near the Salt Lake Airport, around 4:00 am--earlier on big storm days. There's only one avalanche person in the office, so the pressure and time constraint is intense.

First, the lead weather forecaster for the National Weather Service briefs us on the general weather setup and then we jump on the weather computers ourselves and type up a detailed mountain weather forecast that goes onto the Internet by 6:00 am. Then, we check our answer machines and write down all the field observations not only from our staff, but from our army of volunteer observers, ski areas, helicopter skiing companies and highway control programs. After that, we furiously kick into high gear and write backcountry avalanche advisories customized for five different zones in northern Utah, record those advisories into six different answer machines, each one customized for its area, do three live radio interviews, all while trying to answer the phone from ski areas calling to leave observations or talk about avalanche hazard. The recorded advisories are out by 7:30, and by 8:15 am, when we're done with the last live radio interview, we finally collapse with relief, take that bathroom break we've needed for the last couple hours and take a walk outside and watch the sun rise and hope that our information is accurate. An average of 800 people call the avalanche recording and twice that number get it over the Internet, most of them head into the backcountry to test our theories, sometimes with their lives.

Then it's lunch time, just when most people are eating their breakfast. After lunch, we start answering phones, collecting data, updating clipboards and just catching up. Finally, by 10:00 am we start the whole process again to put out an afternoon update, which is usually finished by about noon to 1:00 pm. Then our day is done. We head home and get some sleep.

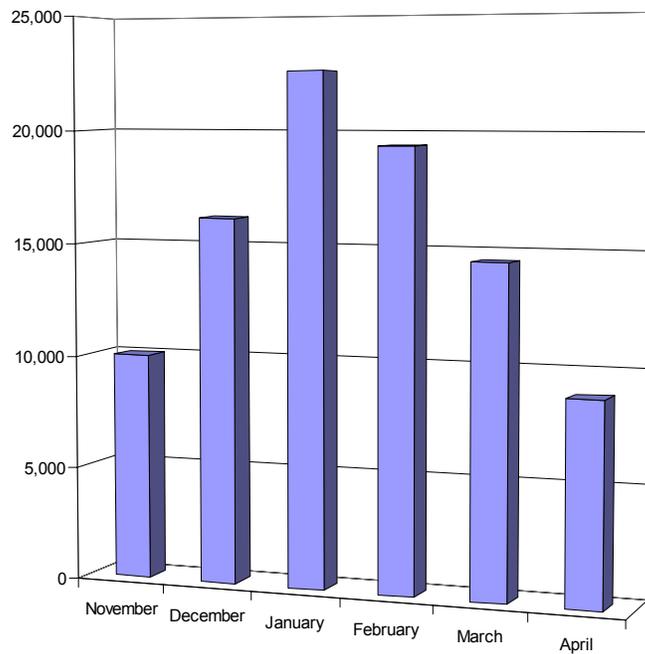
Season Highlights

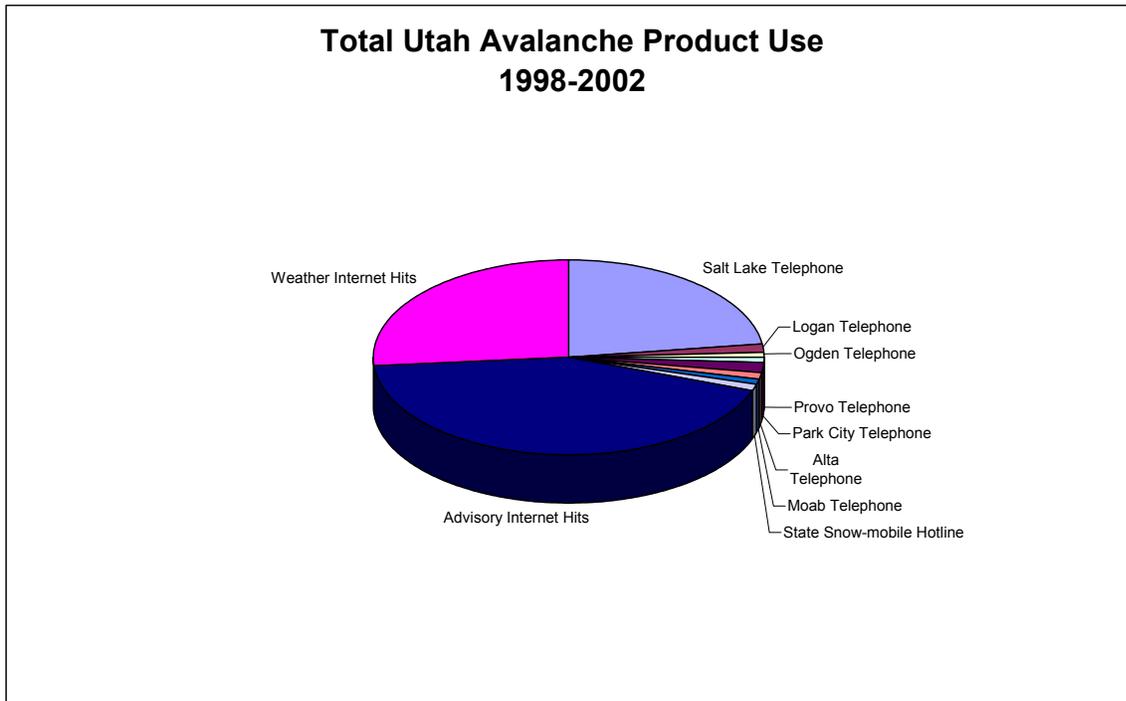
- The long awaited Olympic Winter Games were a smashing success. Although a number of different agencies and entities went through years of planning and preparation for bad weather or dangerous avalanche conditions, the weather and snowpack cooperated with high pressure and stable snow.
- Three avalanche fatalities occurred during the 2001-02 season, a backcountry skier in the Uinta Mountains and two snowboarders in the backcountry near the Brighton resort. This is slightly less than the recent average of four avalanche fatalities per season and much less than the six fatalities from last season.
- An unusually persistent weak layer continued to produce very large and dangerous avalanches for much of the season. This instability produced some of the largest avalanches seen in many areas. Although there were a number of very close calls, only three avalanche fatalities occurred.
- Media interest in avalanches continued at its high level. The Utah Avalanche Center staff conducted two interviews on national television, seven off-camera interviews on national TV, 21 national print interviews, 12 local television interviews, two national radio interviews, two local radio interviews and 30 local print interviews.
- It was another very active year for avalanche incidents and accidents with 92 reported unintentional human triggered avalanches in the backcountry, 32 people caught 9 partial burials, 5 total burials, 4 injuries and 3 deaths.
- Preparations for the Olympic Winter Games produced a legacy that will help avalanche forecasting efforts for years to come. Projects include: significant improvements to the web site including terrain maps, photographs of recent avalanches, information for media and a simplified icon-based advisory. Other projects included the implementation of a Swiss nearest neighbors program for avalanche forecasting, creation of a number of state-of-the-art Powerpoint lessons for avalanche education and informational brochures and trailhead displays.



Use of UAC products continues to rise despite a relatively dry year and less backcountry use because of the Olympics. As Internet access of the products increases, call counts decrease.

Average number of calls to UAFC advisory 1994-2001





Season History – Wasatch Range

Early Season

This was the season of feast and famine, long dry periods punctuated by strong storms. The biggest feast of the winter was the first one, appropriately beginning on Thanksgiving Day. After a very dry fall, storm clouds gathered and Alta received over 30 inches of snow on Thanksgiving Day. The storm provided a double punch and the holiday weekend ended with the Cottonwood Canyons getting what became known as the “100 inches in 100 hours.” With world media attention focused on Utah for the Winter Olympics, there could not have been a better start to the season. The last week of November continued stormy. The month ended with the Alta Guard station totaling 150 inches of snow and 14.5 inches of water.

December

Early December continued wet with small storms arriving regularly. The big Thanksgiving storm produced many avalanches but by mid December the snow pack became quite homogeneous and very stable. The storms tapered off and the Christmas holidays were mostly dry with only a few dustings to freshen up the conditions. December totals at Alta were 82 inches, with 7.6 water content. It was the best beginning of winter that most anyone could remember. But then everything changed.

January

In avalanche work, as in human history, seemingly minor events can have major consequences when projected into the future. This year the minor event occurred on January 6 in the form of a warm and moist storm that plastered the snow surface with a rain or rime crust. This crust sat undisturbed on the surface in increasingly colder temperatures for

a week, allowing the strong temperature gradients to metamorphose the snow around the crust into a very weak, faceted snow layer. This layer was unusually persistent and continued to produce stupendously huge avalanches for most of the season.

Minor snowfalls in mid January buried the crust and a large storm beginning on January 27 initiated a significant avalanche cycle. As backcountry travel increased a few days after the storm the first serious human triggered avalanches of winter began. On January 31, a ski patroller and avalanche worker from The Canyons resort triggered a slide in the backcountry of the western Uinta Mountains that killed him and his dog. January added 100 inches of snow to the Alta Guard numbers, with 7.66 water.

February

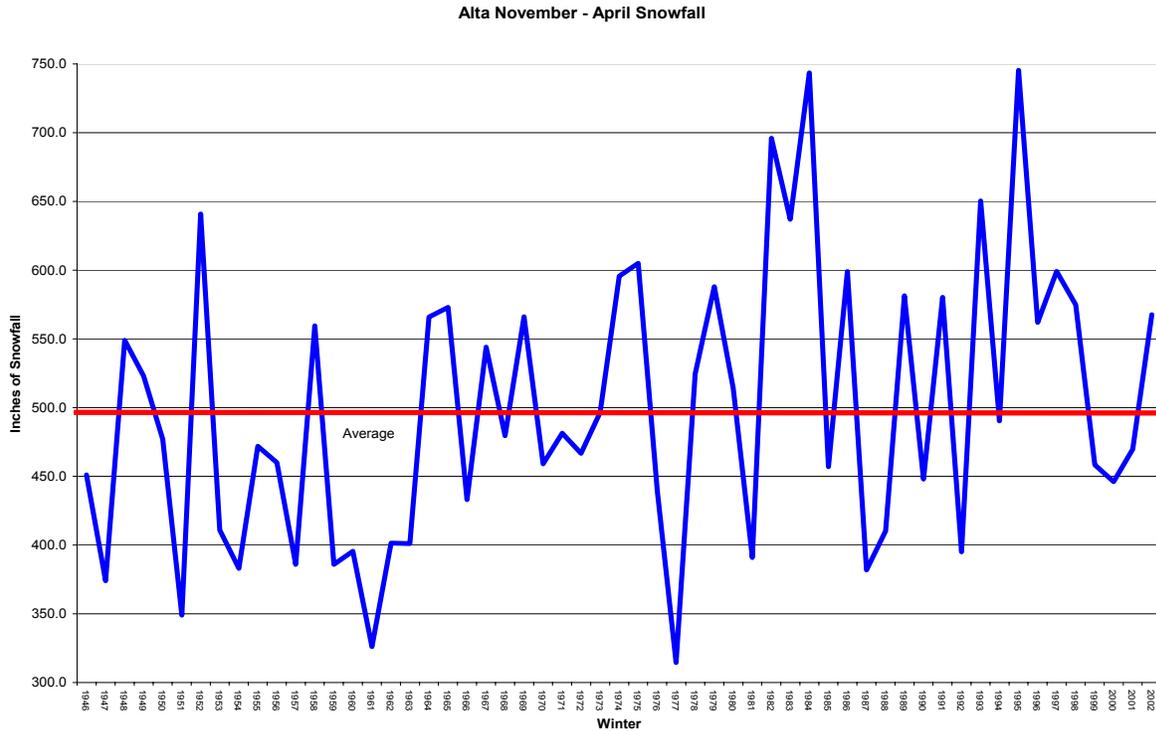
February, the month of the long-anticipated Olympic Winter Games, was thankfully dry. No big storms delayed Olympic events, snarled traffic or closed canyon roads. Even the opening and closing ceremonies came off without weather problems despite threatening cold fronts. While the weather and snow pack gave few problems for the avalanche control teams at the venues, the backcountry was a different story. Human triggered slides with several close calls occurred throughout the month. A Snowbird patroller was injured in the backcountry on February 17 and a snowmobiler barely survived a burial in the Uinta Mountains. All of these avalanches ran on the January 6 crust, which would become a pattern for the rest of the winter. The Alta Guard Station recorded a paltry 55 inches of snow for the month.

March

Utah avalanche workers were acutely aware of the potential for another large avalanche cycle on the dreaded January weak layer. All we needed was more snow but, conveniently, the snow didn't arrive until after all the visiting athletes and media had departed. Several days of snowfall beginning on March 12 started another round of avalanches on the fateful January crust. Some of these slides were huge, breaking 4 to 8 feet deep and 300 to 2,000 feet wide. One of these deep releases caught and killed two snowboarders in the backcountry near the Brighton Ski Area. Numerous close scrapes involved skiers and snowmobilers triggering large, and sometimes huge, backcountry avalanches. One of these skier-triggered slides on the northwest face of Gobbler's Knob was large enough that it was visible from miles away in Salt Lake City. By the end of the month, warming spring temperatures changed the type of avalanches from dry to wet but faceted the January layer remained a player as the most common weak layer. The month was fairly wet with 142 inches of snow recorded at the Guard Station.

April

April began as March had ended, hot and dry. Wet slides continued to release naturally, especially when overnight temperatures remained above freezing. Finally, after three weeks without new snow and the day after we issued its last advisory, the storms returned. A very strong cold front arrived on April 15th with near hurricane velocity winds. The storm knocked down trees, signs and power poles all over Utah and filled the air with choking dust. In the next week, 42 inches of snow fell on top of the chocolate brown layer of dust. Backcountry recreationists had their last fling with some of the best powder of the season on mostly stable snow. Then, finally, spring arrived. Amazingly, the resorts in Little Cottonwood Canyon ended up above normal for the season while virtually the rest of the state suffered under yet another drought year with around 70 percent of normal for most of northern Utah and around 40 or less percent for the rest of the state.



Season History – Logan Area Mountain – by Greg Johnson

November and December

Winter started with a series of intense storms in the northern Wasatch similar to the Wasatch Range. The mountains went from patches of snow on November 21 to an average snowpack depth of 65 inches by December 7th. Relatively strong winds accompanied the series of storms, which kept the avalanche danger either considerable or high. The storm snow quickly settled out and we were blessed with a snowpack without any weak layers for at least the next week. High pressure brought in light winds and very cold temperatures until about the 15th when we got a quick shot of snow. We received a report of a skier triggering a size 3 avalanche (on a scale of 1-5) on Sherman Peak. The rest of December and into early January was benign. While the Cache Valley was locked up in deep freeze, the mountains stuck above the inversion and remained very pleasant. We reported the avalanche danger never rising above moderate, while excellent recreation conditions existed.

January

On January 7th a warm moist storm created a crust on the snow surface, which would set the stage for the rest of the winter. It only took about a week until we all started to realize the snowpack had decided to turn dangerous. A classic facet / crust scenario was playing out. After the crust formed we received about 18 inches of new snow that settled

into a 12 inch slab. Cold temperatures caused a layer of faceted crystals to form under the crust very quickly and facets were starting to form above it as well. As the slab slowly thickened and the facets got weak the avalanche danger slowly crept up. The balance was finally tipped by about the 23rd and the facet / crust interface became active to human-triggering. On Jan 28th a strong storm brought about 12 inches of snow and strong southwest winds. This storm was unusual because the Cache Valley picked up a record 24 to 36 inches. We issued an avalanche warning along the entire Wasatch Front. The facet / crust interface had a dangerous load and a handful of natural avalanche occurred. An extremely cold air mass moved into the area on the evening of the 30th. Mountain temperatures ranged from 10°F to 40°F below zero, which preserved storm instabilities.

February

February was not very exciting with only about 3 feet of total new snow. People did trigger avalanches on occasion when snow did fall and/or the wind blew. The lack of snowfall and below normal temperatures continued to develop the weak faceted snow in the lower half of the snowpack and especially around the January crust. At the same time, the lack of snowfall allowed snowmobilers to access an enormous amount of terrain and track it out. Many locations that are usually very prone to human-triggered avalanches resembled more of a ski area. This is probably why there were very few reported avalanches were snowmobilers normally ride.

March

Arctic air resided over much of the intermountain west for the first week of March. Near record low temperatures occurred on the 3rd. On March 8th we issued an avalanche warning but perhaps was a little over stated considering only 10 inches of snow fell. Nonetheless, the January facet/crust was still down in the snow and still active. Unlike the central Wasatch, we did not see an avalanche cycle. However, on the night of the 12th an intense storm put down up to 2 feet of snow. We issued an avalanche warning for areas north of I-80 before the storm had materialized for the real dump down south. Once again an expected widespread natural cycle never happened, but conditions remained ripe for human-triggering.

Spring came with the official start of spring. Temperatures shot up above freezing and the sun was out in full Utah force. No deep slab avalanches were reported or observed, but we did have a widespread wet cycle in the surface snow. Above normal temperatures remained without a snap back to winter until the avalanche center shut down on April 6th. By this time mountain temperatures rose to near 70 degrees and we had already lost 3 ft of our snowpack.

Summary

The winter of 2001 2002 was characterized by below normal temperatures and snowfall. As a result, the deep slab instability from early January was preserved and very weak, but the load of new snow never came quick enough to have a widespread natural avalanche cycle. However, human-triggered avalanches did occur and, no doubt, many more occurred than we heard about.

Season History – La Sal Mountains – by Eric Trenbeath

October

First snowfall of the season put a few inches on the ground. The ensuing high pressure nearly melted all of it and we rejoiced with the hopes that for once, we will be spared from our usual depth hoar instabilities.

November

After a dry start, and with the mountains almost totally bare, we all had cause to give thanks when a Thanksgiving storm arrived leaving 18" of new snow on the ground at the Geyser Pass Trailhead (GPTH) with up to 2' at higher elevations. The wet trend continued for the following week and the mountains received another 18" of snow at the GPTH.

December

An instant base with continued doses of snow characterized the first half of the month making for some of the best early season snow conditions in years. The mountains picked up 8" with moderate winds on the 5th, prompting a danger rating of Considerable. We noticed new snow, sensitive soft slab avalanches. Seven inches fell over the course of the following week. Ten inches on the 15th again prompted a danger rating of Considerable and again, we observed more new snow avalanches. This brought the total at GPTH to 40", a depth not reached again until March.... On December 20th, the first of many upcoming winds wreaked havoc and the early season party appears to be over. Wind drifting resulted in the development of stiff, hard slabs in exposed terrain, and we rated the avalanche danger at Considerable in these areas. The mountains received only scant amounts of snow the latter part of the month, but they certainly freshened up the snow conditions.

The snowpack began to take on the character of extreme variability that stayed with us throughout the season. Strong winds scoured many South and West facing aspects to near the ground while loaded areas maintained a depth of 4'-5'. Faceted grains began to develop in shallow, shady areas.

January

High, dry, and windy conditions summed up January, with only light and infrequent snows coming to occasionally freshen up the conditions. Three inches fell on the 4th, 3" on the 16th, 4" on the 20th, 2" on the 22nd, and finally, between the 28th and 29th, a foot of snow falls at GPTH prompting a Considerable avalanche danger rating. Unfortunately, storm totals from this one are very location dependant and other areas receive only 6"-8" of snow. We observed little avalanche activity.

Variable continued to describe the snowpack with shallow areas showing gradual deterioration and facet growth while deeper areas maintained remarkable strength in the lower pack. However, the deeper areas exhibited alarming, upper level weaknesses with easy shears in the form of facets between thin wind slabs and crusts.

February

Conditions went from bad to worse as things got even drier and windier. On February 8th A Southwest wind gusted over 50 mph, which striped out southwesterly facing slopes down to

the ground and completely destroyed the snow surface in any other exposed terrain. Wind transported snow tipped the scales on some NE aspects resulting in natural, hard slab releases that averaged two feet deep. The weakness was the troublesome layer of facets between wind crusts in the upper pack. A trace of snow fell on the 15th and corn conditions appeared briefly on SE aspects on the 16th. A promising-looking storm system on a SW flow stalled out on the 17th and we only got a couple of inches out of it. The system then strengthened and we managed to squeak out 6"-10" over the next few days. We finished up with a bleak, 57% of average snowpack.

The variably weak snowpack began to put us on edge as mountainous regions all around us, from the San Juan's to the Wasatch Plateau begin to produce large avalanches. Snow pits and stability tests showed either a crumbling house of cards, or the continued presence of an easy and well-defined upper, mid level shear in areas where facets had not completely taken over. A tour on the 25th showed widespread collapsing and cracking, and bottomless faceted grains in shady areas. We noticed a large natural into old snow on a NE aspect.

March

Hopes for making up our snowpack in March didn't really materialize though we did receive a few small storms. The mountains received 4" of snow between the 1st and 2nd. Eight inches fell on the 8th, bringing snow stake totals back up to 40" for the first time since December. Strong winds, and more snow in the forecast seemed to be the right recipe for our weak snowpack to finally fail, and we raised the avalanche danger to High. Then the storm quit as quickly as it began and avalanche activity was confined only to new snow. Meanwhile, the Wasatch Plateau went through a major avalanche cycle with natural full depth releases up to 1000 feet wide. Snow continued to trickle in on the La Sal Mountains with 5" between the 11th and 14th, 2" on the 15th, and another 4" by the 18th. None of these storms produced enough weight to trigger a full depth cycle though new snow avalanching was frequent. By the end of the month, warm daytime temperatures with good overnight freezes, brought on a corn cycle and a much needed dose decent skiing conditions.

April

After a brief corn cycle, April saw a rapid disappearance of our thin snowpack, and by the first weekend most south and west facing aspects melted out.

Season History – Manti-Skyline – by Craig Gordon

November

A couple of early season storms brought limited amounts of snow to the upper elevations in early November. As is usually this case, we issue a general informational advisory in an attempt to get our users geared up for the upcoming season and to start thinking about avalanches.

A vigorous storm system moved into the region on Thanksgiving Day and by the 25th strong winds and heavy snow prompted us to issue an avalanche warning for the region. While the Skyline didn't receive the copious amounts of snow like it's neighbors in the Cottonwood Canyons, we fared pretty well with storm totals of close to 6 feet. The snowpack went from zero to hero in the matter of 4 days.

December

Several smaller storms rolled in throughout the month however, in between these snow storms the range experienced a number of strong and erratic wind events that wreaked havoc with the snowpack.

January

The powder party was over and several more strong wind storms created an amazingly uneven distribution of snow depths and strengths in much of the upper elevation terrain. While clear skies, cold temperatures, and small storms made for a month of recycled powder, I kept reminding the local users that the weakening snow surface would lead to avalanches once winter returned from its sabbatical. By the end of the month these weather conditions began to weaken the lower layers of the snowpack as well.

February

The month started off with a small storm that deposited 8 inches of snow and coupled with strong winds, this combination sent the region into a sporadic, natural, hard slab, avalanche cycle. While “pockety” in nature these slabs ran on weak facets close to the ground and were a sign of things to come when the right load was applied to a fragile snowpack. Another strong wind storm on the 8th loaded slopes in some unusual places and I mentioned atypical loading patterns on the advisory for the weekend of the 9th/10th. However, two snowmobile-triggered avalanches occurred on the 9th, which resulted in partial burials. Fortunately both riders were excavated in a timely fashion and they sustained no injuries. The month ended with the usual spit and sputter of small storms, though no significant load to really clean things out. Throughout the month the snowpack weakened substantially, especially at lower elevations and in areas that had less than about 3’ of total snow. The advisories began to sound like a broken record as I hammered the message of Armageddon-like avalanches should it ever snow again.

March

Finally, a storm system moved into the area on the 8th depositing 20 inches of snow with 2.5 inches of water. Strong pre and post-frontal winds accompanied this system and while visibility remained marginal at best. When it finally cleared, we saw large natural avalanches in some very unusual places. While I felt as though we were out of the woods in terms of natural activity, the advisory issued on the 9th called for a “considerable” danger of human triggered avalanches. The 9th dawned clear and my partner Eric Trenbeath and I were scheduled to teach an avalanche awareness class to the local search and rescue organization. However, before meeting with the group a drive around the region revealed just what we had anticipated. As my partner put it “the place peeled apart”. We could see many, natural, hard slab avalanches throughout the range with crowns averaging 3 feet in depth. Several paths ran close to the ground and were up to 1000 feet wide. This “in your face” sign of instability wasn’t enough to deter some riders and snowmobilers triggered five avalanches over the weekend. Two riders were completely buried, one of them for 20 minutes. Both were recovered unscathed.

While many of the major paths had run during this cycle, due to the spatial variability of the snowpack, there were still plenty of slopes that remained in a suspended state waiting for the right trigger to come along. On March 14th another 18 inches of snow fell prompting us to issue an avalanche warning for the area.

While the snowpack seemed to be adjusting to all the added weight, the advisories continued to warn of the possibility of triggering a deep, hard slab avalanche. While isolated in nature, I mentioned the most likely places to find these conditions would be in steep rocky terrain or on slopes that did not slide during the March 9th avalanche cycle. Sure enough, on the 24th two snowmobile triggered avalanches occurred on steep, rocky slopes that didn't slide during the March 9th cycle. One rider was completely buried for 5 minutes with his helmet poking out of the snow. While he was recovered quickly he did sustain some minor injuries.

April

The weekend of April 13th brought an end to our regularly scheduled advisories and the snowpack is suffering severely from unseasonably warm temperatures and marginal refreezes.

As always, we issue an informational year-end update to assist the public with clues so they can make their own snowpack stability assessment after the regular advisories end for the season.

The Skyline forecast is just one tool we use to educate the snowmobiling community. Over the course of the season we also provide free avalanche awareness talks and field sessions. Target groups include snowmobile clubs, local search and rescue groups, as well as private and government entities. This year 552 individuals have attended these classes.

Utah Avalanche Incidents and Accidents

It was yet another active year in Utah.

The fateful weak layer forms on January 6th.

The season of avalanche accidents began in earnest on what turned out to be an auspicious date for all avalanche workers in Utah—January 6th. On this Sunday, what became known as the “January 6th crust” was created when a very warm, wet air mass produced rain nearly to 9,000' and a rime crust above that elevation. The following day on the advisory, Drew Hardesty said “Mark this day on your calendar.” Rain is rare in Utah's mountains in winter and as the old avalanche adage goes, “unusual weather produces unusual avalanches.”

Rain crusts often create a persistent weak layer within the snowpack but not for the reasons most people think. After colder weather returns, rain crusts (and sometimes rime crusts) often concentrate temperature gradients around them and create layers of weak, faceted snow on both the top and bottom of the crust. Thus, it's the associated weak snow that continues to produce avalanches, not necessarily the slippery nature of a hard crust itself. Often these layers are quite persistent in time but this particular weak layer was astoundingly persistent and it continued to produce very large and very dangerous avalanches throughout the season.

On this fateful Sunday, a party of experienced backcountry skiers headed up the Y Couloir—a low elevation, steep chute in Little Cottonwood Canyon. As the rain arrived, the rapidly-wetted new snow disgorged down the couloir catching one woman and injuring her arm. Luckily, they suffered no other injuries.

Backcountry skier killed in the Uinta Mountains

During the second half of January various backcountry travelers triggered about a dozen large avalanches in the backcountry on the January 6th crust, which caught people on three different occasions. Finally, on January 31st, the inevitable happened—the first fatality occurred on that fateful layer.

The death of Brian Roust shook the avalanche community to its core because Brian was not only a fellow avalanche worker, but he was very experienced and cagy. Yes, Brian fit the description of the typical avalanche victim as he was male in his late 20's and was very skilled in his sport. But he did not fit the profile in that he was a very experienced avalanche worker who had patrolled at Park City and was a route leader at the Canyons Resort at the time of the accident. Not many avalanche professionals die in avalanches.

Brian was skiing in one of his favorite backcountry areas on the Thousand Peaks Ranch, which is private land in the western Uinta Mountains in the Weber River drainage east of Oakley. At least three different parties were skiing in the area and one party of four had skied in the area the day before. As the party of four skied one bowl, Brian and his partner skied an adjacent bowl with his two dogs. The party in the other bowl triggered a large avalanche some distance away from their ski track but no one was caught. Brian and his partner saw this avalanche occur and were on their way back up to the top to regroup with others and talk about the situation.

Brian, a notoriously fit backcountry skier, was out ahead of his partner as they climbed. When Brian neared the top of the slope, he triggered the avalanche that killed him. We do not know yet whether he was going up or down when he triggered the avalanche. The avalanche carried Brian and his dog down the slope and buried them.

Brian's partner and members of the other party searched the debris with avalanche rescue beacons. The first beacon they found was loose in the snow and not attached to anything—which was a beacon that Brian had attached to his dog and the avalanche had apparently stripped off. The searchers found Brian when they located the second beacon, buried 4 feet deep and he was apparently dead from the trauma of hitting trees on the way down.

We do not know whether Brian called the avalanche report before heading out, although the Uinta Mountains are outside our forecast area. On that day, Tom Kimbrough's forecast prophetically called the conditions "tricky and dangerous" and that the avalanches "break unexpectedly above you and wider than usual."

On the same day, an experienced ski patroller triggered an avalanche in the backcountry of Cardiff fork, and rode the avalanche about 1000 vertical feet.



Looking down from the fracture line of the avalanche on Windy Ridge triggered by the victim.

Many more close calls

In yet another accident involving an experienced avalanche worker occurred on February 17th when two Snowbird ski patrollers were skiing in Mary Ellen, a backcountry area adjacent to Snowbird. One of them triggered a hard slab avalanche that swept him over cliffs, fracturing both arms. He was not buried. Snowbird ski patrol quickly responded and he was flown out by helicopter.

On February 18th, a snowmobiler was buried in the Wolf Creek in the Uinta Mountains with just one hand sticking out.

On February 21st a backcountry skier in Banana Days triggered an avalanche on top of his other touring partners with one person caught

In an extremely close call, on Saturday, February 23rd, a snowmobiler from Sandy triggered an avalanche that buried him in the Current Creak area east of Heber. He was high marking a slope when he triggered a 1-2 feet deep, slab, which completely buried him. Of the five in the party, two were wearing beacons, which unfortunately did not include the victim. As the party searched the debris, they luckily heard his snowmobile still running beneath the debris. When they dug out the snowmobile they found the victim near his sled buried 5 feet deep. He remained in the hospital for several days in critical condition and eventually recovered. They did not call the avalanche advisory before heading out.

Two close calls in the Manti Skyline

Two very close calls occurred in two days on the Manti Skyline (Wasatch Plateau near Fairview). The first was on March 9th when two snowmobilers were high marking the same slope and they triggered an avalanche with the fracture propagating above the upper rider. The upper-most rider outran the avalanche but the avalanche caught his friend at mid slope and buried him with just his hand sticking out. His partner spotted his hand and dug him out in about five minutes. Everyone in the group carried beacons and shovels.

The second, extremely close call happened the following day when five riders were high marking some steep, heavily wind loaded bowls in the Potters Pond area of the Manti Skyline. They stopped for a break at the bottom in what they thought was a relatively safe area. One rider took off his helmet and gloves while the other riders lined up nearby. One last rider high marked the slope above them and triggered a monster avalanche with a slab fracture 1500 feet wide and 4-5 feet deep. The rider was able to ride off the slab and three of the riders at the bottom—with their machines still running—were able to ride out of the way, but the avalanche completely buried the one person with their helmet off, who could not get back on his snowmobile in time.

Luckily, he thrust his hand upward before the avalanche came to a stop. Although his beacon was faithfully transmitting, he had inadvertently left it in the car that morning. The rest of the riders searched the debris with their beacons but did not pick up a signal. In a final stroke of luck, one of the searchers stepped on the hand of the victim, which was barely under the snow surface. They quickly dug him out with a total burial time of about 20 minutes. He was blue and not breathing but he started breathing on his own when they extricated him. Neither group had checked the advisory before heading out.

Two snowboarders killed near Brighton Resort

Richard Jones, 19 and Allen Chatwin, 18, died in a large avalanche they triggered off of Pioneer Ridge, a backcountry area west of Brighton Ski Resort. Twelve young snowboarders rode the Crest lift at Brighton and proceeded past the ski area boundary to Pioneer Peak to build some jumps in the Dog Lake area. As the two victims traversed a very steep, 50-degree slope just below the ridge, they triggered a 300 foot wide, 2-8 feet deep hard slab that took out the entire bowl. Luckily, all of the other snowboarders were off to the side at the time. No one in the party carried any beacons although they did have several shovels with them for building jumps. Ski patrollers from Alta and Brighton responded and located the victims using avalanche rescue dogs. They had both died from asphyxiation.



Looking upwards toward the fracture line of the avalanche triggered by snowboarders on Pioneer Ridge, west of Brighton Ski Area. The two victims were traversing the upper slope when they triggered the avalanche.

The rest of the season remained very dangerous with some of the largest avalanches of the season—and in some cases the largest avalanches anyone had ever seen—occurring in the second half or March. Although three more people were caught, including one snowboarder buried to his shoulders, no one else died.

National Trends in Avalanche Fatalities

As of this writing, 32 people have died in avalanches in the U.S. This nearly eclipses the record of 33 established just last year. Usually several climbers die each spring in avalanches in the big mountains of the Pacific Northwest or Alaska, so we expect that fatalities this season will overtake last year's record. Looking at the graph of avalanche fatalities in the US by year, the numbers continue their relentless march upward with no sign of abating. We all wish our stock portfolios looked like this. It's fair to say that avalanche fatalities have become an epidemic.

We don't have to look far to find the cause of the epidemic. When we separate out the snowmobiler fatalities by year, the graph jumps exponentially in recent years. This season—so far—18 snowmobilers have died in avalanches, which shatters the previous record of 15 just last season. In the past 5 years, snowmobilers have accounted for twice as many fatalities as any other group.

Why is this?

Quantum leaps in technology in the past 10 years have allowed snowmobilers to access nearly any kind of terrain that a skier can and they can access that terrain right after a storm when the snow is most unstable. Almost anyone, regardless of their athletic ability or avalanche training, can quickly and easily access dangerous avalanche terrain. Snowmobilers can cover as much as 100 times the amount of terrain in a day as a skier. Thus, if instabilities exist, snowmobilers often find them.

Sales of snowmobiles have increased dramatically in recent years and snowmobiling has become the primary form of winter recreation in most mountainous areas of the West. Places that were completely empty 10 years ago are now regularly tracked-out. Because snowmobiles are a relatively new addition to avalanche terrain, most snowmobilers know very little about avalanches. Few snowmobilers in Utah carry beacons or shovels or have taken an avalanche class.

What can we do about it?

Most avalanche centers were created to provide critical information to backcountry skiers and climbers, who led the fatality statistics at the time. As snowmobilers have populated virtually every non-wilderness mountain range in the West, avalanche centers have to not only continue to provide information to the traditional users—skiers, snowboarders and climbers—but to expand into additional areas and adapt to a completely different user group. Most avalanche centers have done a heroic job of adapting avalanche courses and advisories to snowmobilers but one glance at the fatality graphs and it's clear that we are losing the battle.

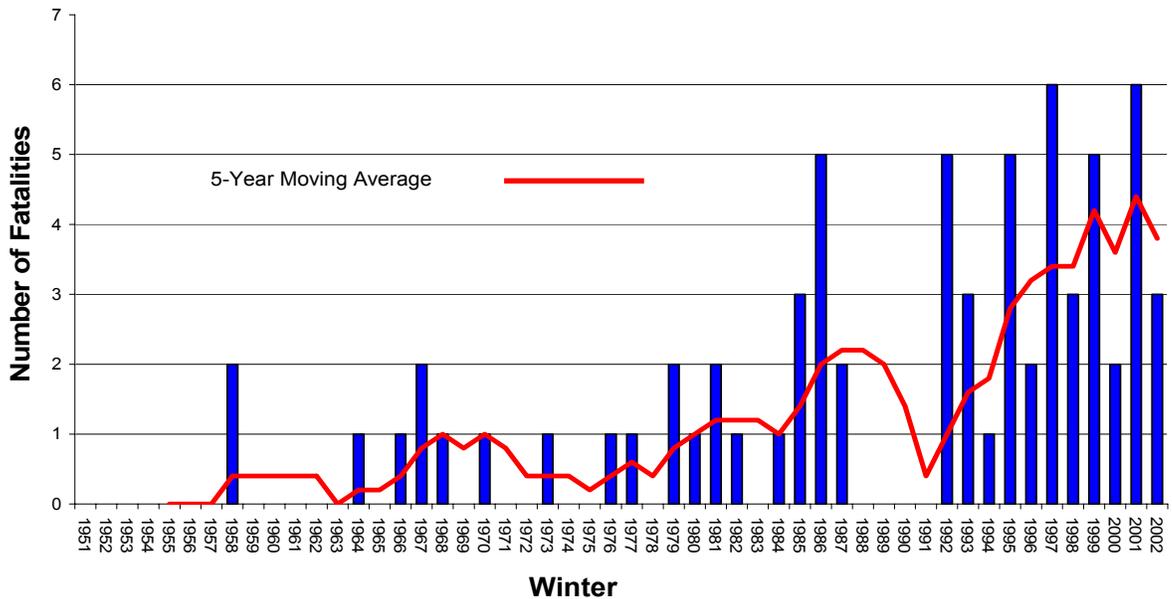
Funding for most avalanche centers has remained static for many years. Forest Service recreation budgets seem to remain static as well with little apparent hope of increasing Forest Service efforts towards the avalanche problem. Many avalanche centers, including Utah, have successfully applied for grants from State off-road recreation funds. Efforts to find funding from within the snowmobile manufacturing community have so far seen little success, both in Canada and in the U.S. Presently, outside of the Forest Service, the American avalanche community has little national leadership, mostly because there is so little national money. From the perspective of our staff—people who

work hard to keep people alive in the backcountry—the situation looks frustratingly bleak.

We can only hope that the snowmobile community takes a hard look at itself and decides that it needs to become financially involved in the problem. We have seen this happen with every other user group through the years, ski areas, climbers, backcountry skiers, and most recently, snowboarders. Each group has had to learn about avalanches the hard way and each group has eventually stepped up to the plate and taught themselves about avalanches and found the money to combat the problem. We in the Utah Avalanche Center presently lack the resources and stamina to fight the battle ourselves, but we are more than willing to lend our expertise and leadership in expanding avalanche programs into the snowmobile community if funding becomes available.

Data for the following graphs and additional graphs can be viewed at www.avalanche.org and click on Salt Lake.

Avalanche Fatalities in Utah 1951-2002



Incidents and Accidents 2001-02

This list includes only unintentional human triggered avalanches in the backcountry.

Date	Location	Details	Triggered	Caught	Partially Buried	Totally Buried	Injured	Killed
11/21/01	Cardiac Bowl	Left Chute	1					
11/21/01	Cardiac Bowl	Keyhole/Little Superior Bowl	2					
3/22/01	Alta (closed)		1					
11/23/01	Grizzly Gulch		1					
11/23/01	Albeon Basin		1					
11/23/01	Upper Days Fork	remotely triggered	3					
11/23/01	Tony Grove	remotely triggered	2					
11/27/01	Tony Grove	remotely triggered	1					
11/28/01	Brighton Backcountry	snowboarder triggered	1					
11/29/01	Flagstaff		1	1				
12/4/01	Dutch's Draw	wind drift	1					
12/14/01	Primrose Cirque		3					
12/15/01	Olympus Cove	snowboarder triggered	1	1				
12/16/01	Whiskey Peak	snow machine triggered (near Monte Cristo)	1					
12/23/01	Grizzly Gulch		2					
12/25/01	Wolverine Cirque	shallow wind slab	1					
12/30/01	Wooley Hole		1	1				
1/6/02	Y Couloir		1	1			1	
1/7/02	Benson and Hedges Couloir		1					
1/16/02	Flagstaff	snowboarder triggered	1	1				
1/18/02	Silver Fork		2					
1/22/02	South Monitor		1					
1/22/02	Chablis Bowl	triggered 15' below crown face	1	1				
1/24/02	Raymond		1					
1/24/02	Raymond	remotely triggered by skier	1					
1/24/02	Twin Lakes Pass	remotely triggered by skier	1	1				
1/24/02	Meadow Chutes	remotely triggered by skier	1					
1/24/02	Mineral Fork		1					
1/25/02	West Monitor	carried 200'	1	1				
1/25/02	Grandview Peak		1					
1/24/02	Gobblers Knob		2					
1/23/02	Bald Mountain (Unita Mtns)	snow machine triggered	1					
1/23/02	Elizabeth Pass (Uinta)	snow machine triggered cornice fall	1					
1/29/02	Twin Lakes Pass	snowboarder triggered	1					
1/29/02	American Fork	remotely triggered	1					
1/30/02	Ben Lomand Peak	remotely triggered from below	1					
1/30/02	James Peak	several remotely triggered slides	1					
1/31/02	Windy Ridge (Uinta Mtns.)	Backcountry skier killed	2	1		1	1	1
1/31/02	Cardiff Fork	Reed-Benson Ridge	1	1	1		1	
2/1/02	Silver Fork	Davenport Hill	1					
2/17/02	American Fork Twin	Snowbird Patroller carried over a cliff	2	1			1	
2/18/02	Wolf Creek (Uinta Mtns.)	Snowmachiner buried with one hand out	1	1	1			
2/21/02	Chablis Bowl	1 remote and 1 sympathetic	2					
2/21/02	Banana Belt	1 skier triggered slide onto his touring party	1	1	1			
2/21/02	Clayton Peak		1					
2/22/02	Bald Mountain (Unita)	snow machine triggered	1					
2/23/02	Tower Peak	snowmobiler buried for 20 min	1	1		1		
2/24/02	Hallway Coulior		1					
2/24/02	Duchesne Ridge (Uinta Mtns.)		1	1				
2/25/02	Mineral Fork	1 skier caught and carried	1	1				

Avalanche Incidents and Accidents, continued:

3/2/02	Mineral Fork	ski cut with no results then skier released with a second sympathetic release	1	1				
3/4/02	Silver Fork	skier carried 100'	1	1				
3/4/02	Dromedary Peak		1					
3/4/02	Dromedary Peak		1					
3/3/02	Four Eagles (Uinta Mtns.)		1					
3/5/02	Four Eagles (Uinta Mtns.)		1					
3/5/02	Alexander Basin	Depth Hoar Bowl	1					
3/7/02	Silver Fork	1 skier caught and carried	1	1				
3/9/02	West Monitor	triggered by kicking cornice	1					
3/9/02	Cardiff Fork	Holey Toledo	1					
3/9/02	Wasatch Plateau	"Big Drift"	1					
3/9/02	Wasatch Plateau	1 snowmobiler buried with one hand out for 5 min	1	1	1			
3/10/02	Wasatch Plateau	1 snowmobiler buried with one hand out for 7 min, forgot to turn beacon on	1	1	1			
3/10/02	White Pine	skier caught and buried up to his neck	1	1	1			
3/10/02	Wilson Drainage		1	1				
3/13/02	Lower Mineral Fork	triggered from skin track after 1 run	1					
3/14/02	Brighton, 10,321		1					
3/14/02	Western Uinta Mtns.		1					
3/14/02	Butler Fork	triggered from 33 deg ridgeline	1					
3/16/02	Dog Lake near Brighton	triggered by out-of-bounds snowboarders	1	3		2		2
3/16/02	Cathrine's Pass		1					
3/17/02	Sound of Music (Dewy's)	remote triggered	1					
3/18/02	Gobblers Knob	Cabin Run - triggered from the flank on 33 deg slope, crown ~ 2000'	1					
3/19/02	Elizabeth Pass (Uinta Mtns.)	snowmobiler buried to shoulders	1	1	1			
3/19/02	Patsy Marly		1					
3/16/02	Provo Mountains		1					
3/27/02	Twin Lakes Pass	1 skier caught and carried	1	1	1			
3/29/02	Reynolds Peak	1 skier caught and carried	1	1				
3/31/02	Rip's Ridge (Park City Ridgeline)	1 skier caught and carried	1	1				
3/31/02	Wasatch Plateau	Seeley Canyon	1	2	1	1		
		Total	92	32	9	5	4	3

Avalanche Fatalities in Utah 1958-2002 - By Activity

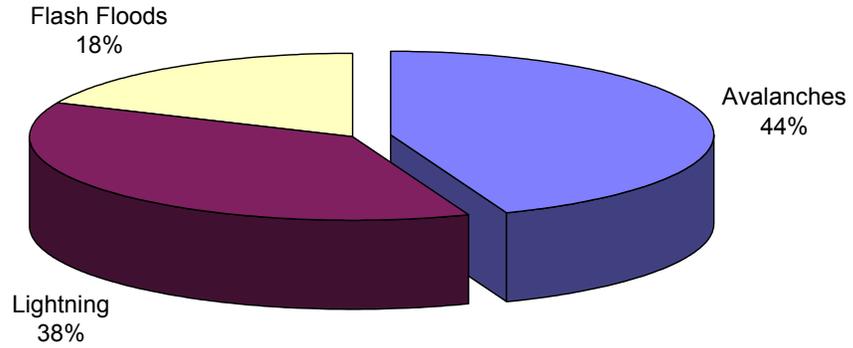
Date	Deaths	Sex	Location	Activity	Skier	Climber	Snow boarder	Snow mobiler	Other Recreation (snowshoe, hiker, hunter)	Worker	Resident
9-Mar-58	2	Males	Snowbasin	Rescuer						2	
29-Mar-64	1	Male	Snowbasin	Worker						1	
31-Dec-65	1	Male	Park City	In-bounds skier	1						
12-Feb-67	2	Males	Pharoah's Glen	Climbers		2					
19-Feb-68	1	Male	Rock Canyon	Hiker					1		
29-Jan-70	1	Male	Alta	In-bounds skier	1						
29-Jan-73	1	Male	Park West	In-bounds skier	1						
6-Jan-76	1	Male	Alta	Out of bounds skier	1						
3-Mar-77	1	Male	Snowbird	In-bounds skier	1						
19-Jan-79	1	Male	Helper	Worker						1	
2-Apr-79	1	Male	Lake Desolation	Backcountry skier	1						
11-Jan-80	1	Male	Evergreen Ridge	Out of bounds skier	1						
1-Feb-81	1	Male	Cardiff	Hiker					1		
1-Mar-81	1	Male	Millcreek	Backcountry skier	1						
22-Mar-82	1	Male	near Park West	Backcountry skier	1						
2-Jan-84	1	Male	Superior Peak	Backcountry skier	1						
22-Feb-85	1	Male	Near Powder Mountain	Backcountry skier	1						
19-Mar-85	1	Female	Park City	In-bounds wet slide	1						
13-Nov-85	2	Males	Sunset Peak	Backcountry skiers	2						
6-Jan-86	1	Male	Provo Canyon	Backcountry skier	1						
17-Feb-86	1	Male	Big Cottonwood Canyon	Backcountry snowboarder			1				
19-Feb-86	1	Male	Alta	In bounds skier	1						
20-Nov-86	1	Male	Sugarloaf, Alta	Hiker in unopened area					1		
15-Feb-87	1	Male	Twin Lakes Reservoir	Backcountry skier	1						
25-Nov-89	1	Male	Tony Grove Lake, Logan	Backcountry skier	1						
12-Feb-92	4	3-M/1-F	Gold Basin, La Sal Mtns	Backcountry vskiers	4						
1-Apr-92	1	Male	Mineral Basin, near Snowbird	Backcountry skier	1						
16-Jan-93	1	Male	Sundance (closed area)	Backcountry skier	1						
25-Feb-93	1	Male	Pinecrest, Emig. Cyn.	Backcountry skier	1						
3-Apr-93	1	Male	Wolverine Cirque	Backcountry skier	1						
18-Feb-94	1	Male	10,420 Peak, B.C.C.	Backcountry skier	1						
7-Nov-94	1	Male	Snowbird (pre-season)	Backcountry skier	1						
14-Jan-95	2	Males	Ben Lomond, near Ogden	Snowmobilers				2			
23-Jan-95	1	Male	Midway	Resident killed in roof slide							1
12-Feb-95	1	Male	Gobbler's Knob, B.C.C.	Backcountry skier	1						
2-Feb-96	1	Male	Solitude patroller	Worker						1	
27-Mar-96	1	Male	Maybird Gulch, L.C.C.	Backcountry skier	1						
7-Dec-96	1	Male	Bountiful Peak	Snowmobiler				1			
26-Dec-96	1	Male	Flagstaff Peak	Backcountry snowboarder			1				
11-Jan-97	3	Males	Logan Peak	Three campers					3		
25-Jan-97	1	Male	Provo Canyon	Climber		1					
17-Jan-98	1	Male	Near Coleville	Snowmobiler				1			
18-Jan-98	1	Male	Sanpete County	Snowmobiler				1			
26-Feb-98	1	Male	Near Weber State	hiker (possible suicide)					1		
7-Nov-98	1	Male	Snowbird (pre-season)	Snowboarder			1				
2-Jan-99	2	Males	Wasatch Plateau	Snowboarders			2				
29-Jan-99	1	Male	Mt. Nebo	Snowmobiler				1			
6-Feb-99	1	Male	Little Willow Canyon	Hiker					1		
11-Jan-00	2	M/F	Squaretop	Out of bounds Skiers	2						
14-Dec-01	1	Male	Willard Basin	Snowmobiler				1			
27-Feb-01	1	Female	Near Canyons Resort	Out of bounds Skier	1						
10-Mar-01	2	Males	Uinta Mtns near Oakly	Snowmobiler				2			
28-Apr-01	2	Males	Stairs Gulch, BCC	Climbers		2					
31-Jan-02	1	Male	Windy Ridge, Uinta Mtns.	Backcountry Skier	1						
16-Mar-02	2	Males	Pioneer Ridge near Brighton	Out of bounds Snowboarders			2				

Total 69
62 Males, 4 Females

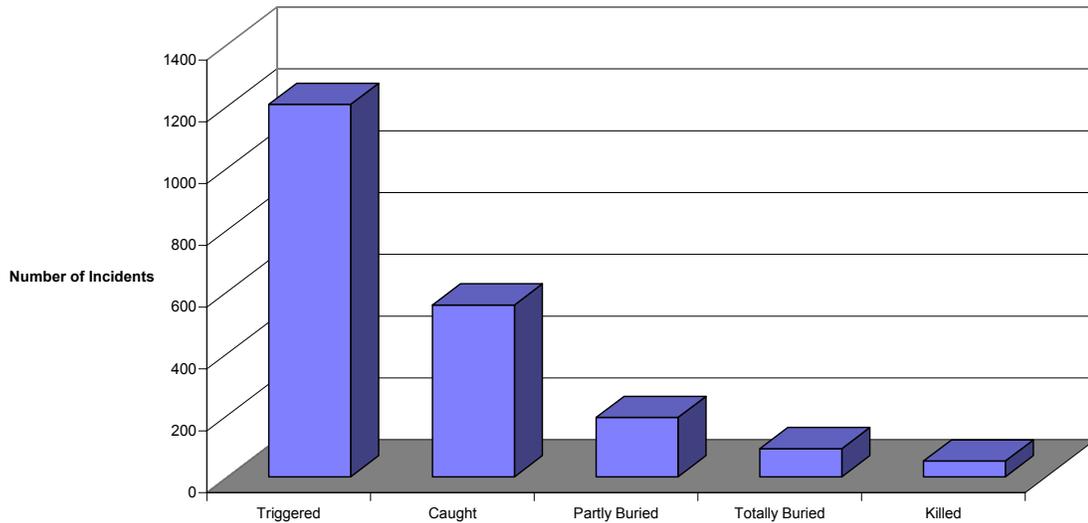
Shaded areas indicate greatest concentration of fatalities.

1958 season - Present	34	5	7	9	8	5	1
Past 10 seasons	11	3	6	9	5	1	1
Past 5 seasons	4	3	5	6	5	0	0

Utah Deaths by Natural Hazard 1951 - 2001



Avalanche Incidents in Utah 1985-2002



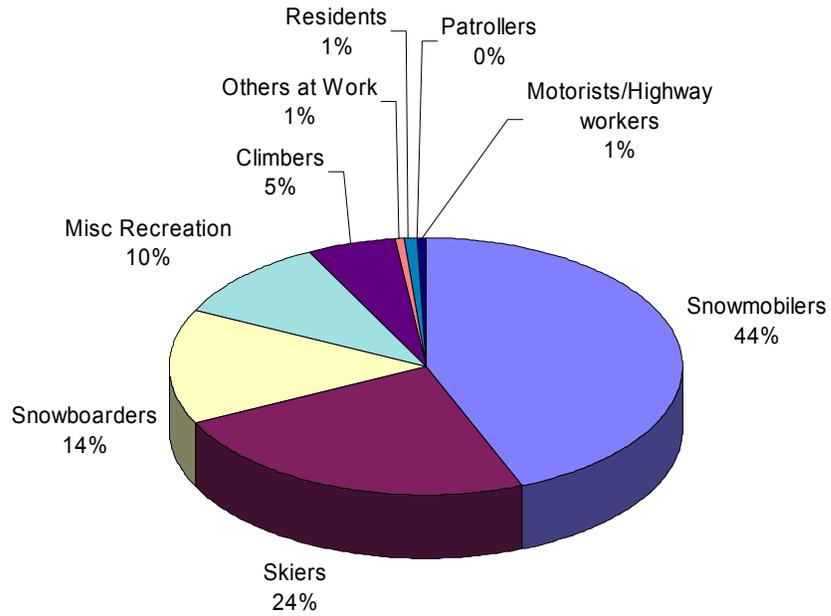
Avalanche Incidents in Utah 1951-Present

Season (year ending)	Triggered	Caught	Partly Buried	Totally Buried	Killed
1951					0
1952					0
1953					0
1954					0
1955					0
1956					0
1957					0
1958					2
1959					0
1960					0
1961					0
1962					0
1963					0
1964					1
1965					0
1966					1
1967					2
1968					1
1969					0
1970					1
1971					0
1972					0
1973					1
1974					0
1975					0
1976					1
1977					1
1978					0
1979					2
1980					1
1981					2
1982					1
1983					0
1984					1
1985	79	39	15	6	3
1986	66	27	12	5	5
1987	50	18	6	3	2
1988	39	6	1	1	0
1989	64	9	1	0	0
1990	65	34	14	2	0
1991	46	19	7	1	0
1992	76	27	14	9	5
1993	65	29	9	5	3
1994	74	42	5	3	1
1995	79	31	7	9	5
1996	51	15	3	2	2
1997	84	62	37	9	6
1998	96	57	17	8	3
1999	68	48	19	7	5
2000	42	22	8	9	2
2001	161	71	17	12	6
2002	104	37	95	4	3

Total 1951- present	1309	593	287	95	69
Total 1985- present	1205	556	192	91	51
Average - past 15 seasons					2.7
Average - past 10 seasons					3.6
Average - past 5 seasons					3.8

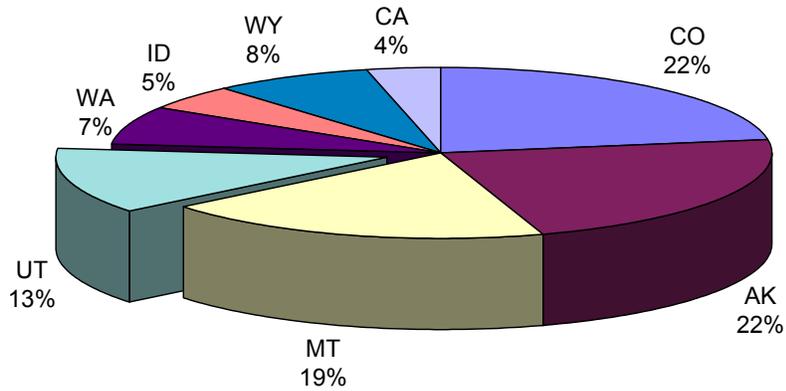
**U.S. Avalanche Fatalities by Activity
1996-2002**

146 Total Fatalities

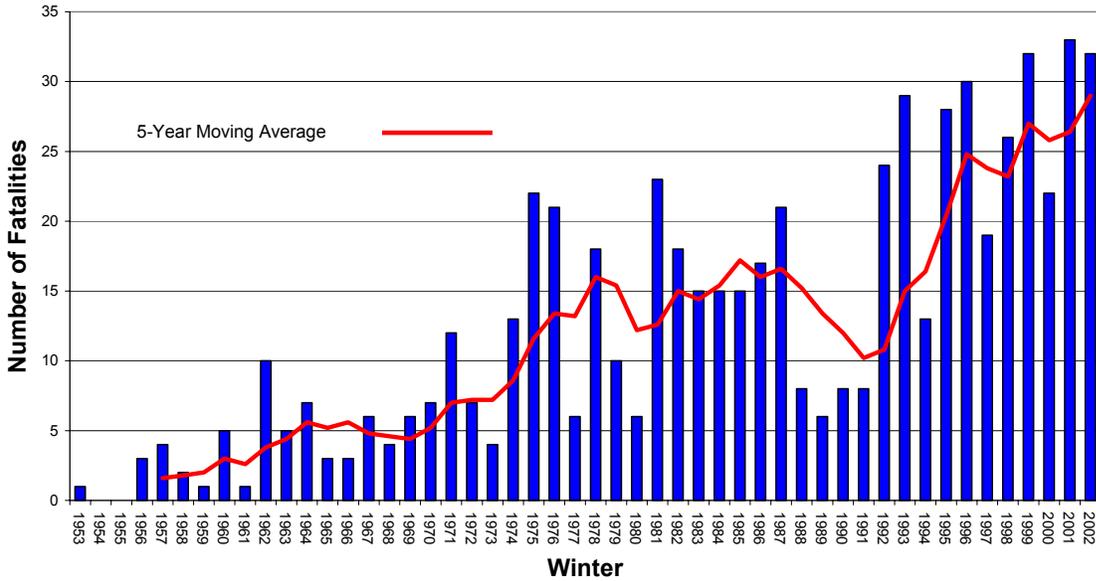


U.S. Avalanche Fatalities by State 1996-2002

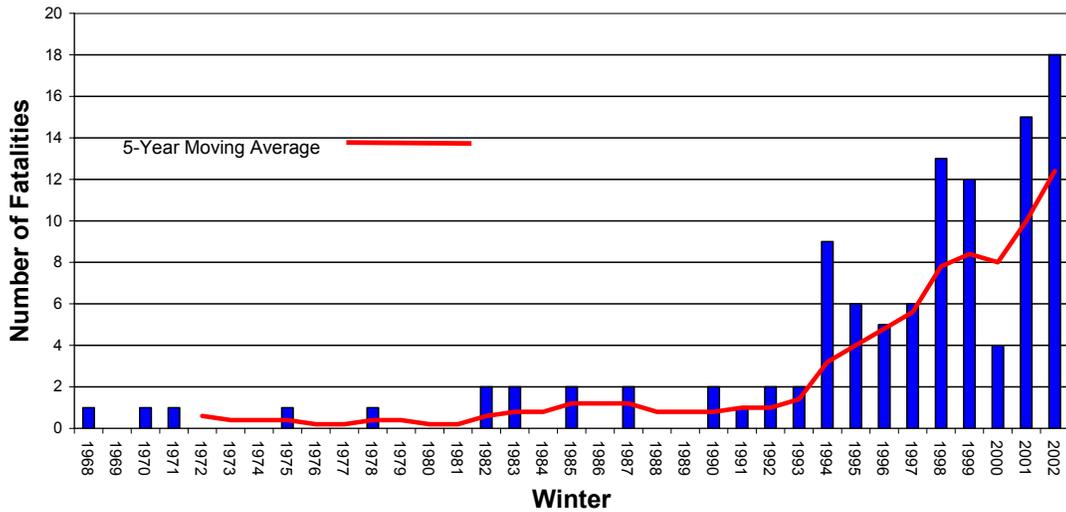
(N = 143)



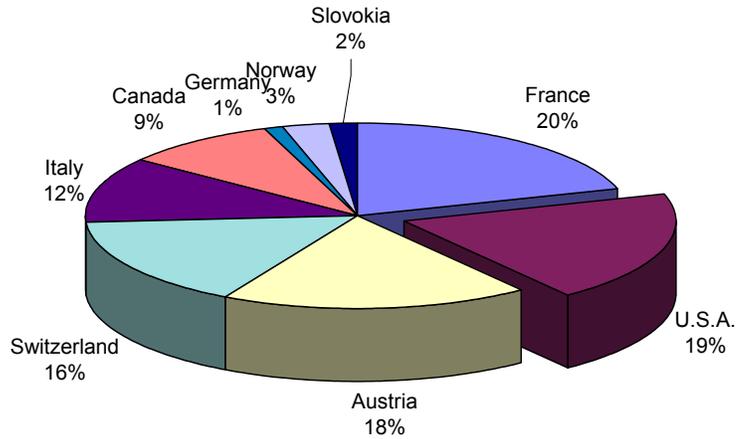
U.S. Avalanche Fatalities 1950-2001



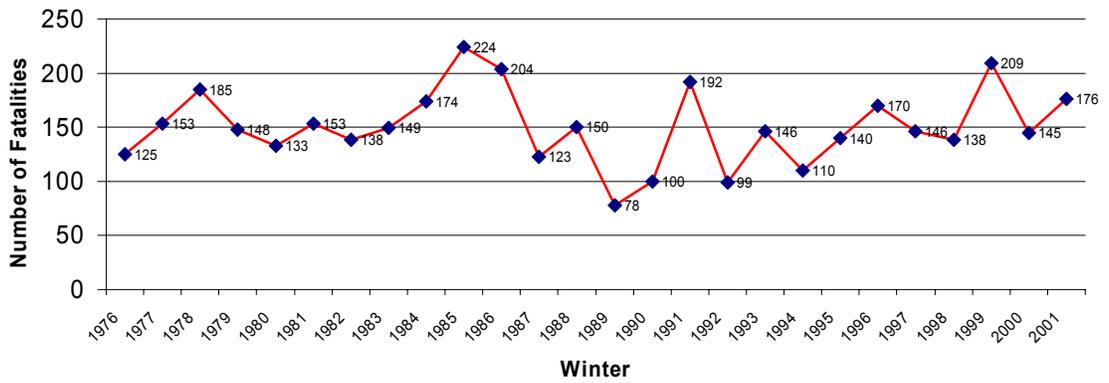
U.S. Snowmobile Avalanche Fatalities by Year 1968-2002

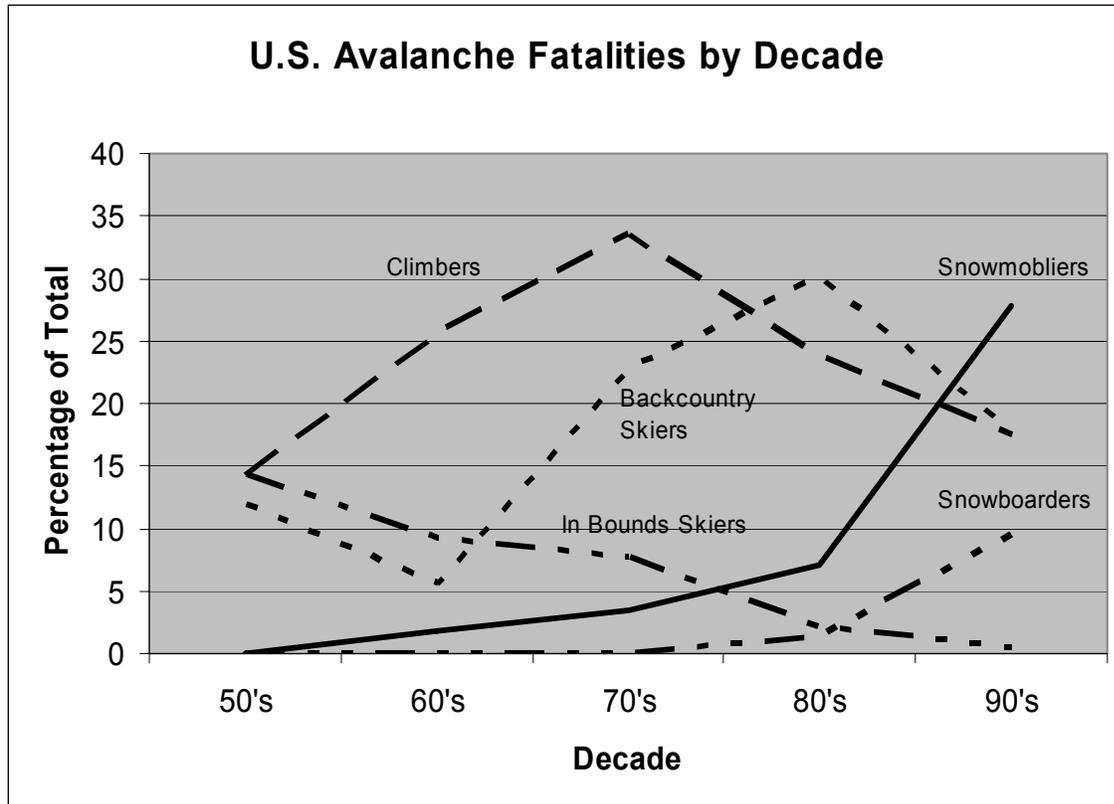


Avalanche Fatalities by Country - 1991-2001 (N=1477)



World Avalanche Fatalities 1976-2001





Avalanche Education

Although the Utah Avalanche Center continues to be committed to avalanche education in Utah, the Olympic Winter Games took up much of our time and we had to cut back on our usual heavy load of avalanche classes. Nevertheless, we still managed to teach 46 classes to 1989 people.

This season, we finally made the full transition from slides to Powerpoint. Although the transition required a hefty amount of time to scan slides and transfer our lectures into the computer, we utilized our additional staff for the Olympics to finally complete the job. Having made the painful transition, the UAC staff love the new technology. It offers a number of advantages. We can:

- Pre-assemble several different versions of each talk, customized for each user group and customized for length and complexity. No more duplicating slides or tearing apart talks, rearranging slides and loading them back into trays.
- Share out talks and images with other staff members as well as other avalanche centers. In the past, duplicating slides was prohibitively expensive and time

consuming. Now we can e-mail them, post them on the web or mail them on a CD.

- Annotate images with text and draw arrows and lines on photographs instead of pointing with the laser pointer. We can also animate lines, drawings or images.
- Show video clips of what we are trying to illustrate, which is an extremely powerful tool. We can also show video sequences of avalanches in motion at the beginning of talks on the big screen instead of on a small TV screen.
- Assemble our talks at home on our own computers instead of getting blurry eyes over the light table at work and borrowing slides from each other.
- Take photographs with our digital cameras the day of a talk and show it to the audience that same night.
- Easily grab images off the Internet or e-mail images or talks to each other.

In short, we found the transition to be somewhat painful and expensive but now we are reaping the rewards of less work and being able to utilize a very powerful tool.

Education takes many forms besides the traditional class. Much of our education this year focused on other ways of reaching people. For instance, we added photos and maps to our web forecast, photo galleries of recent avalanches, installed informational trailhead displays and allowed users to have the forecast automatically e-mailed to them every day.

For a third year, Craig Gordon focused on the snowmobile education program, partially funded by a National Recreation Trails Program Grant administered through Utah State Parks. He continued to develop snowmobile-specific talks. Craig also wrote a very educational series of articles in Snowscoop—a snowmobile publication. He has done an excellent job of building a rapport with the snowmobile community, introducing avalanche knowledge and technology.

Goals for next year include reaching out towards snowboarders, by facilitating avalanche education for middle and high school age kids. We also want to find a way to reach out-of-bounds skiers and boarders, as an increasing number of accidents have occurred these past few seasons when skiers and boarders leave ski area boundaries. The trailhead information displays should help with this problem if ski areas can post them at backcountry access points.

UAC Avalanche Education 2001-02

Date	Staff	Event	No. people
Summer	Tremper	Several classes for Olympic Public Safety Personnel	40
9/29/01	Gordon	Utah Snow show	65
10/28/01	Tremper/Lees	National Avalanche School	190
11/12/01	Gordon	Blaster's School - NSP	130
11/14/01	Gordon	Private Snowmobile Club	33
12/1/01	Lees/Tremper	REI Avalanche Awareness	200
12/5/01	Trenbeath	Grand County Search and Rescue	27
12/7/01	Trenbeath	Color Country Snowmobile Association, Brian Head, Utah	23
12/10/01	Trenbeath	Grand County Winter Strike Team	13
12/11/01	Kimbrough	AAI Level II	10
12/11/01	Hardesty/Kimbrough	Black Diamond Avalanche Awareness	75
12/12/01	Tremper	Wasatch Mountain Club	100
12/12/01	Gordon/Trenbeath	USFS Team Leadership-Ephraim	12
12/13/01	Johnson	Beacon Instruction	8
12/18/01	Gordon	USFS Timpanogas Cave, Pleasant Grove District	25
1/2/02	Gordon	Private Snowmobile Club	19
1/3/02	Lees/Athey/Kobernik	UAC Level 1 Refresher	8
1/7/02	Tremper	Uinta NF Leadership Team	10
1/7/02	Gordon	Snowflakes Snowmobile Club	33
1/8/02	Tremper	REI - Science of Avalanches	120
1/9/02	Kimbrough	Avalanche Awareness	8
1/11/02	Trenbeath	Fishlake National Forest	25
1/14/02	Tremper	Wasatch SG All employees Meeting	60
1/15/02	Gordon	Point Power Sports Snowmachine Talk	100
1/17/02	Tremper	Park City Avy Awareness	50
1/17/02	Johnson Logan	Cache Country SAR	25
1/18/02	Trenbeath/Medara	Moab Information Center	37
1/19/02	Gordon	Timpanogas Ridge Runners Snowmachine Club	20
1/19/02	Trenbeath/Medara	Moab Information Center	30
1/23/02	Johnson	Logan Ranger District	15
1/24/02	Johnson, Logan	Basic Avalanche Awareness	19
1/25/02	Trenbeath	Carbon County Recreation	13
1/26/02	Trenbeath	Carbon County Recreation	10
2/10/02	Tremper	Olympic training for FEMA	150
3/8/02	Trenbeath/Gordon	Sanpete County Search and Rescue	15
3/9/02	Trenbeath/Gordon	Sanpete County Search and Rescue	12
3/15/02	Greene	University of Utah	10
3/26/02	Gordon	Avalanche Awareness, Brighton	60
1/19/21	Staff	Friends of UAC Level 1	25
1/15,16/02	Greene	American Avalanche Institute Level II	40
1/18,19/02	Tremper/Johnson	Evanston, WY SAR, Fire, USFS District Snowmachine Avy Awareness	30
1/24-26/01	Greene	USFS	2
3/16,17	Hardesty,Kobernik,Arm	Univ. Utah Basic Awareness	20
3/24,25	Greene/Kimbrough	National Ski Patrol Level II PCMR	10
3/7,9,10	Hardesty, Athey, Kobe	Univ. Utah Basic Awareness	20
3/8-11/02	Greene	AK Mtn Safety Center Level 1	30
5/5-10/02	Hardesty	NOLS AK Level II	12
	46 Courses	Total	1989

Media Contacts



International Sports Broadcasters filming an avalanche piece featuring Forest Service Utah Avalanche Center Director, Bruce Tremper. ISB supplied the program to countries throughout the world and it played on shuttle busses and in hotels in Utah during the Olympic Winter Games. The Weather Channel also ran an avalanche story at intervals during the Olympic Games featuring Bruce Tremper.

Our goal was for avalanches to NOT be part of news coverage for the Olympic Winter Games. Happily, this turned out to be the case, but not necessarily from any of our efforts. With high pressure and stable snow, avalanches dutifully stayed in the background and the number of our national media contacts actually decreased somewhat from last season. We had only two interviews on national television, seven off-camera interviews on national TV, 21 national print interviews, 12 local television interviews, two national radio interviews, two local radio interviews and 30 local print interviews.

Although we had only two national television interviews, both of them received very wide distribution. For instance, International Sports Broadcasters were in charge of distributing the Olympic video feed to everyone in the world outside of the United States. An avalanche piece played regularly throughout the world and on many of the shuttle busses for the Olympic Winter Games. Second, an avalanche piece for the Weather Channel played at regular intervals throughout the Games. Bruce Tremper appeared on both of these programs.

Quotes from our staff also appeared in a number of other national publications including National Geographic Adventure, Outside Magazine and Science News Magazine the Boston Globe, Denver Post and the Baltimore Sun and Seattle Times. A radio interview about avalanches aired on National Public Radio. In addition, information provided from our staff appeared in NBC Nightly News, CBS News, Japanese and German television programs, Time Magazine and Newsweek Magazine.

As always, we work regularly with the usual round of local media including all four television news programs and all the local newspapers in northern Utah.

In preparation for the Olympic Winter Games, we developed a much more detailed media packet, which includes frequently asked questions, a simple avalanche primer, staff biographies, photos and graphics. This media packet will continue to help with media contacts in the future.

We know that our avalanche information regularly reaches only a small portion of the population and on our modest budget, the only realistic way to educate a wider audience about avalanche hazards is to use the media. Because media contacts are so important in our business, we have made them a priority by developing media packets and regularly sending the UAC staff to media training.

Because he deals with media so much, Bruce Tremper wrote an article for The Avalanche Review titled, "Winning the Media Game" in which he outlines effective strategies for dealing with media. He will also present the paper and give a talk to the national meeting of avalanche centers in the fall of 2002.

UAC Media Contacts 2001-02

Date	Staff	Agency	Subject	National or International Television Interview	National or International Television Information	National or International Print Media	Local Television Interviews	National Radio Interviews	Local Radio Interviews	Local Print Interviews
6/4/01	Tremper	Salt Lake City Magazine	Terms for different kinds of snow							1
6/22/01	Tremper	Ogden Standard Examiner	Olympic Avalanche Preparations							1
8/2/01	Tremper	Ogden Standard Examiner	Olympic avalanche forecasting							1
8/9/01	Gordon	Ogden Examiner	"Corn Snow"							1
8/16/01	Kimbrough	Salt Lake Tribune	Current avalanche hazard							1
8/24/01	Kimbrough	Salt Lake Tribune	Avalanche Danger							1
9/17/01	Kimbrough	Salt Lake Tribune	Avalanche Danger							1
10/3/01	Hardesty	Park City Record	Day in the life of a forecaster							1
10/3/01	Hardesty	Provo Daily Herald	Avalanche Danger							1
10/9/01	Tremper	Ogden Standard Examiner	General article about avalanches							1
10/21/01	Hardesty	Deseret News	Avalanche Danger							1
10/22/01	Hardesty	Park City Record	Avalanche Danger							1
10/23/01	Ciliberti	Deseret News	Avalanche Danger							1
11/1/01	Trenbeath	Powder Magazine	Ski Touring in the La Sals			1				
11/1/01	Trenbeath	Sports Guide	Ski Touring in the La Sals							1
11/25/01	Hardesty	Deseret News	Avalanche Danger							1
11/28/01	Tremper	Sports Guide	Article about Utah Avalanche Center							1
11/28/01	Lees	Tooele Transcript	Avalanche Danger							1
11/29/01	Greene	Salt Lake Tribune	Avalanche Danger							1
11/29/01	Greene	Salt Lake Tribune	Avalanche Danger							1
12/1/01	Tremper	Deseret News	Double snowboarder fatalities							1
12/2/01	Tremper	Salt Lake Tribune	Double snowboarder fatalities							1
12/2/01	Trenbeath	Moab Happenings	MLSAC Open For Season							1
12/4/01	Gordon	Salt Lake Tribune	Avy Fatalities							1
12/7/01	Greene	Salt Lake Tribune	Persistent Weak Layer							1
12/11/01	Hardesty	Tooele Transcript	Oquirrh's Avalanche							1
12/14/01	Tremper	Channel 13 TV	Double snowboarder fatalities				1			
12/14/01	Kimbrough	KPCW Science Friday	Avalanche Phenomena						1	
12/17/01	Tremper	Deseret News	End of season article							1
12/27/01	Kimbrough	Ogden Examiner	Avalanche Danger							1
12/27/01	Tremper	Baltimore Sun	General article about avalanches			1				
1/1/02	Tremper	National Geographic Adventure	Featured in a how-to article on avalanches			1				
1/7/02	Tremper	Travel Channel	Big avalanche disasters			1				
1/7/02	Tremper	National Geographic Adventure	Avalanche Beacons			1				
1/8/02	Tremper	Worst Case Scenario	Avalanche questions		1					
1/8/02	Tremper	Outside Magazine	Rising avalanche fatalities			1				
1/11/02	Tremper	National Geographic Adventure	Hot avalanche tips			1				
1/22/02	Tremper	NOW Networks	Avalanche questions		1					
1/23/02	Tremper	Channel 5 TV	Interview during Olympic Media Summit				1			
1/28/02	Tremper	Baltimore Sun	Interview during Olympic Media Summit			1				
1/31/02	Tremper	Boston Globe	Interview during Olympic Media Summit			1				
1/31/02	Tremper	National Geographic Radio Expeditions	Training Olympic security personnel					1		
1/31/02	Kimbrough	Denver Post	100 inch storm			1				
1/31/02	Trenbeath	Moab Times Independent	Avalanche Class Report							1
2/1/02	Kimbrough	Outside Magazine	Avalanche Danger			1				
2/1/02	Tremper	Weather Channel	Interview on avalanches	1						
2/2/02	Kimbrough	Channel 5 -SLC	Avalanche Danger				1			
2/2/02	Tremper	National Public Radio	Interview about avalanches					1		
2/2/02	Trenbeath	Inside Outside Magazine	Avalanche Awareness			1				
2/3/02	Hardesty	Channel 5 -SLC	Avalanche Danger				1			
2/5/02	Hardesty	KSL radio	Avalanche Danger						1	
2/5/02	Tremper	Time Magazine	Public safety for the Olympics			1				
2/5/02	Hardesty	KSL Channel 5 - SLC	Avalanche Danger				1			
2/7/02	Tremper	Channel 5 TV	Avalanche Fatality				1			
2/8/02	Tremper	International Sports Broadcasters	General avalanche interview - played on television stations throughout the world	1						
2/14/02	Tremper	Channel 4 TV	Avalanche Fatality				1			
2/14/02	Trenbeath	Moab Times Independent	Avalanche Awareness and Water Report							1
2/15/02	Tremper	Channel 2 TV	Avalanche Fatality				1			
2/27/02	Tremper	Denver Post	Olympic Avalanche Dangers			1				
2/28/02	Trenbeath	Moab Times Independent	Avalanche awareness and Water Report							1
3/11/02	Tremper	NBC TV	Information on Olympic Avalanche Dangers		1					
3/13/02	Greene	NBC	Olympics		1					
3/13/02	Tremper	Boston Globe	Olympic Avalanche Dangers			1				
3/13/02	Greene	Boston Globe	Olympics			1				
3/15/02	Kimbrough	CBS	Olympics		1					
3/17/02	Tremper	Science News Magazine	General article about avalanches			1				
3/17/02	Tremper	Seattle Times	General questions about avalanches			1				
3/17/02	Tremper	German TV	Greatest Snow on Earth		1					
3/17/02	Tremper	NHK TV, Japan	Olympic Avalanche Dangers		1					
3/17/02	Tremper	Channel 2 TV	1/2 hour show on snowmobile safety				1			
3/20/02	Tremper	Montana State University	Olympic Avalanche Dangers			1				
3/21/02	Tremper	Schnectady NY newspaper	Olympic Avalanche Dangers			1				
3/27/02	Tremper	Newsweek Magazine	Rising fatalities among snowmobilers			1				
4/1/02	Tremper	Channel 5 TV	Double snowboarder fatalities				1			
4/15/02	Tremper	Channel 2 TV	Double snowboarder fatalities				1			
4/19/02	Tremper	Channel 5 TV	Avalanche conditions				1			

Total 2 7 21 12 2 2 30

Total Contacts 76



Trailhead displays of avalanche information were erected at many of the popular trailheads throughout northern Utah.

Olympic Avalanche Preparations

Avalanches are a daily part of life in Utah and the Olympic Winter Games bought an increased urgency to Utah's avalanche preparations, especially for the Forest Service Utah Avalanche Center (UAC). With the influx of visitors during the Olympics, we wanted to be prepared for an influx of people recreating in the backcountry during the Games. We also wanted to be prepared for a major winter storm and any avalanche-related problems.

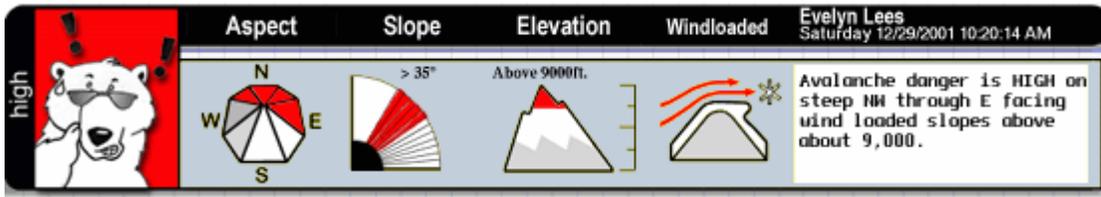
Outreach to Olympic Visitors

We assumed that most Olympic visitors probably did not know about the services provided by the Forest Service Utah Avalanche Center and many have little knowledge of avalanches, so the challenge was how to reach this diverse group with critical information before they can get themselves in trouble in the backcountry. During the Olympic Games, the UAC faxed their forecasts to hotels, ski shops, ski resorts and Forest Service offices. We prepared interpretive avalanche information displays for many of the popular trailheads in northern Utah and we created avalanche information brochures and distributed them widely.

In addition, International Sports Broadcasters was in charge of distributing video feeds to all non-NBC affiliates throughout the world. ISB produced a feature on the Forest Service Utah Avalanche center, which played on all busses that transport Olympic visitors to the venues as well as in many hotels.

Additional staff and products

To handle the expected increase in demands for services, the UAC doubled its staff and provided twice-daily avalanche advisories are available during the Olympic Winter Games instead of the usual morning-only advisories. In addition to the usual "long" advisory we have created a one-page, icon-based advisory, which is a shortened summary of avalanche conditions with easy-to-interpret icons that tell the public exactly where they can expect to find avalanche danger.



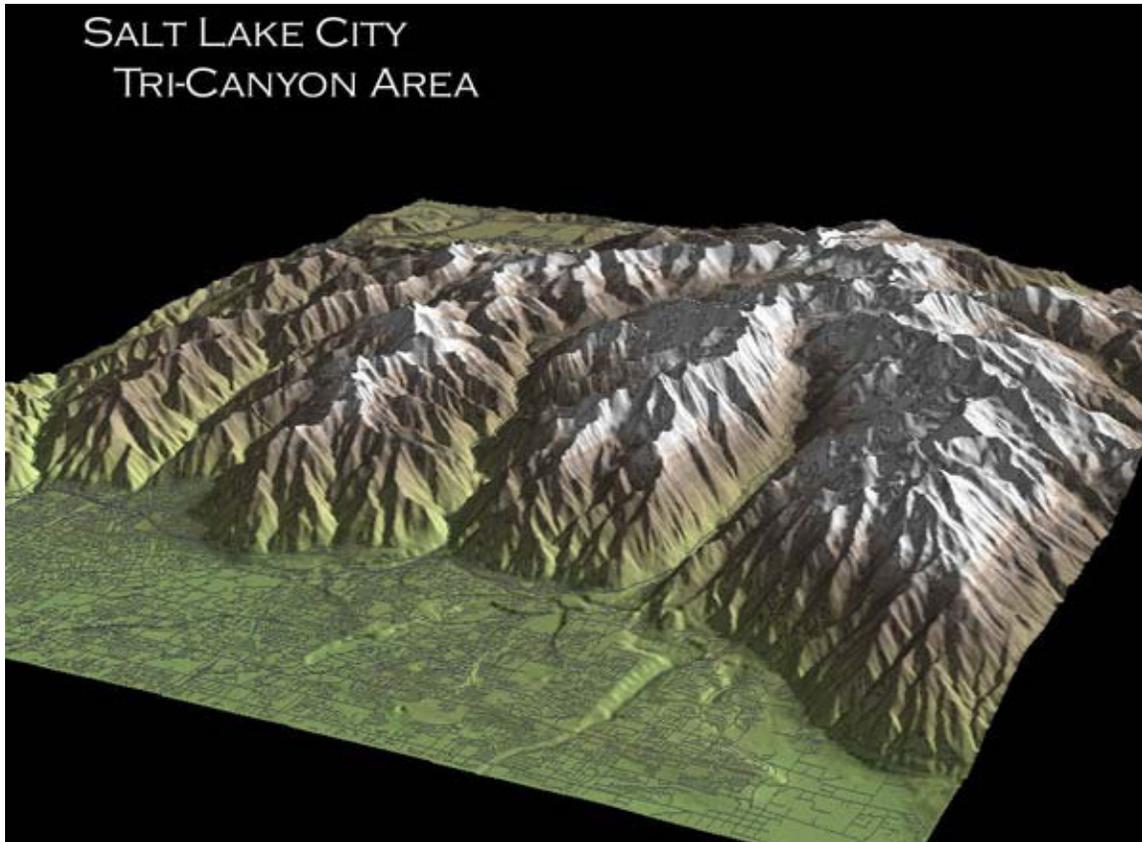
This icon bar is imbedded in forecasts that show avalanche danger at a glance.

Upgraded web site

We upgraded the web site (www.avalanche.org and click on Salt Lake City) by adding GIS maps of the most popular terrain with links to automated weather stations and photographs of what the terrain looks like as well as photos of recent avalanches. We added a detailed list of automated weather stations in the mountains with graphs of the most recent 24 hours of data. Finally, we created avalanche education primers for both the public and media were created lists of avalanche classes available.

GIS Display of Terrain

We developed a GIS display of terrain in the Salt Lake area mountains for display on the Internet. This included 3-D displays of the terrain, names of various drainages and avalanche paths, automated weather stations, links to photographs of the terrain, and links to accident descriptions.



Photos of recent avalanche activity

The UAC created an archive of photographs of avalanche activity that occurred throughout the season with detailed descriptions of the activity or accidents. We posted these photos usually within a day or two of when they occurred. The photo page proved to be extremely popular with the public. It's one thing to talk about a "recent avalanche that was four feet deep and 300 yards wide that took out trees," and entirely another to see graphic photographs of it. People can see exactly how large it was, where it was and see in no uncertain terms, that it would be un-survivable. We received more complimentary calls and feedback from the public on the photos page than nearly anything else we have done in years. Although it is rather time consuming for our staff, already stretched thin, we plan to do our best to keep it up in the future, despite the post-Olympics staff cutbacks.

Swiss computer software

The UAC partnered with the Swiss government to use Swiss state-of-the-art avalanche forecasting software called the "nearest neighbors model." This computer model uses the current snowpack and weather conditions and searches through the past 15 years of data to find the closest matches (nearest neighbors) in the past and it displays the kind of avalanche activity that occurred on those days. The Swiss Federal Institute for Snow and Avalanche Research generously donated the software and adapted it for our data.

Working with public safety personnel

Security officers patrolled the perimeters and buffer zones of Olympic venues and some of these patrol routes border uncontrolled backcountry avalanche terrain. The UAC

worked with the Utah Olympic Public Safety Command to teach avalanche classes and to produce a 15-minute avalanche safety video that security personnel watched in their pre-Olympic orientation training.



Teaching avalanche classes to public safety officers before the Olympic Winter Games

Working with media

Media has always had an intense interest in avalanches and we expected media interest during the Olympic Winter Games to be intense, especially if avalanche conditions took a turn for the worse. In the past, the UAC staff were featured on a number of national and international television documentaries about avalanche including those produced by National Geographic, Discovery Channel, PBS and most of the national network news programs. We developed media packets for both print and television including frequently asked questions, lists of still photo sources, video sources and avalanche graphics.

In the fall before the Olympics, we organized an Olympic Avalanche Media Summit to field questions about avalanche preparations by all the avalanche entities in Utah including the Forest Service, the Utah Department of Transportation and Snowbasin. Several national print media and the local media covered this event.

The Forest Service sponsored a couple different media events called "Buried Alive" in which we invited the media to ski areas where they could be buried in a small snow cave while avalanche rescue dogs located them with scent and dug them out. One event occurred at Snowbasin and another at Snowbird. About five print media and five television media attended each one.

During the Olympic Games, the Weather Channel, International Sports Broadcasters and NHK TV in Japan featured the Forest Service Utah Avalanche Center in their

stories. National Public Radio featured the UAC staff on a story about increased avalanche accidents in the backcountry. A number of national print media did stories on the UAC including the Boston Globe, Baltimore Sun, Science News Magazine, Seattle Times and we were interviewed for general avalanche information by Time Magazine, Newsweek Magazine, National Geographic Adventure Magazine, Outside Magazine and NBC News.

Budget

For the past several seasons we have been both blessed and cursed by the looming presence of the Olympic Winter Games. Thanks to the generous and far-sighted financial support from John Hoagland, the Director of the Forest Service 2002 Planning Team, we had a healthy shot of extra money in the program, which allowed us to do a number of innovative programs most of which will remain as a legacy after this Olympic year. It was also a bit of a curse as it made our program much more complex to administer. In northern Utah, for instance, we not only had to keep track of nine people instead of our usual four, but we had to supervise and implement a number of complex, new programs.

Next season, we will drop back to a staff of four in Salt Lake City. In addition, we hired Greg Johnson to run the Logan center partially funded with Olympic funds and next season the Logan program may die entirely unless we can find some grant money. As we transition from feast to our customary famine, we will likely also have to drop a number of the computer projects we implemented for the Olympic Winter Games including the icon-based advisory, the Swiss Nearest Neighbors program, updates to the GIS display of terrain and the luxury of having an extra person in the office to help answer phones. There will simply not be enough money or personnel to keep them going.

The budget numbers below reflect the total cost of avalanche forecasting in northern Utah including funds from the private, non-profit group, Friends of the Utah Avalanche Center (FUAC). FUAC raises around \$40,000 per season and they spend most of that amount on their own and outside of the Forest Service. Only a portion of that money is transferred to the Forest Service for salaries. FUAC hires one contract backcountry observer and several "volunteer" observers, who are reimbursed for their expenses at \$10.00 per observation. They also spend money on avalanche education in Utah.

FY 2002 Budget - Wasatch and Bear River Ranges

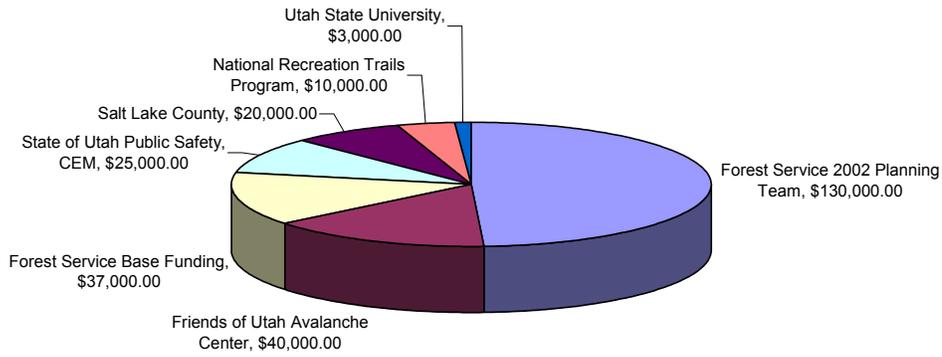
Where the Money Comes From

Forest Service 2002 Planning Team	\$130,000.00
Friends of Utah Avalanche Center	\$40,000.00
Forest Service Base Funding	\$37,000.00
State of Utah Public Safety, CEM	\$25,000.00
Salt Lake County	\$20,000.00
National Recreation Trails Program	\$10,000.00
Utah State University	\$3,000.00
Total	\$265,000.00

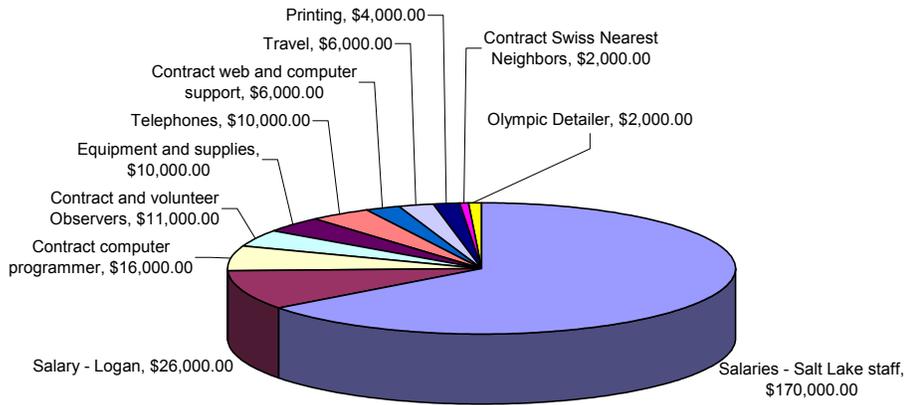
Where the money goes

Salaries - Salt Lake staff	\$170,000.00
Salary - Logan	\$26,000.00
Contract computer programmer	\$16,000.00
Contract and volunteer Observers	\$11,000.00
Equipment and supplies	\$10,000.00
Telephones	\$10,000.00
Contract web and computer support	\$6,000.00
Travel	\$6,000.00
Printing	\$4,000.00
Contract Swiss Nearest Neighbors	\$2,000.00
Olympic Detailer	\$2,000.00
Total	\$263,000.00

Where the Money Comes From



Where the Money Goes



Appendix

Snowfall at Alta 1945 - Present

Season	November	December	January	February	March	April	Total
1944-45	---	57.0	19.5	67.0	---	57.0	
1945-46	109.0	83.0	84.5	50.0	69.0	55.5	451.0
1946-47	69.0	63.0	61.0	53.0	68.0	60.0	374.0
1947-48	118.0	80.0	46.0	66.0	165.0	74.0	549.0
1948-49	71.0	160.0	132.0	58.0	97.0	5.0	523.0
1949-50	39.0	137.0	133.0	34.0	109.0	25.0	477.0
1950-51	60.0	66.0	112.0	58.0	53.0	0.0	349.0
1951-52	67.0	156	115.0	105.0	163.0	35.0	641.0
1952-53	44.0	65.0	112.0	40.0	93.0	57.0	411.0
1953-54	50.0	107.0	54.0	57.0	101.0	14.0	383.0
1954-55	37.0	53.0	134.0	129.0	60.0	59.0	472.0
1955-56	86.0	112.0	103.0	72.0	33.0	54.0	460.0
1956-57	36.0	50.0	86.0	41.0	97.0	76.0	386.0
1957-58	74.0	79.5	83.5	131.5	80.0	111.0	559.5
1958-59	38.0	47.5	81.0	107.0	84.5	28.0	386.0
1959-60	22.0	39.5	59.0	155.0	92.0	28.0	395.5
1960-61	75.0	40.0	1.0	62.0	113.0	35.0	326.0
1961-62	46.0	82.5	86.0	110.0	35.0	42.0	401.5
1962-63	31.0	17.0	85.0	39.0	93.0	136.0	401.0
1963-64	55.0	53.0	108.0	68.0	183.0	99.0	566.0
1964-65	95.0	141.0	150.0	66.0	44.0	77.0	573.0
1965-66	69.0	69.0	73.0	103.0	70.0	49.0	433.0
1966-67	53.0	84.0	168.0	72.0	61.0	106.0	544.0
1967-68	22.0	131.0	39.0	84.0	70.0	133.5	479.5
1968-69	87.5	132.6	113.0	148.0	35.0	50.0	566.1
1969-70	56.0	70.0	103.5	60.5	79.0	90.0	459.0
1970-71	79.0	142.0	58.0	73.5	87.0	42.0	481.5
1971-72	64.5	159.0	94.5	45.0	47.0	56.6	466.6
1972-73	----	122.0	64.5	77.0	124.0	109.0	496.5
1973-74	90.9	128.2	104.5	91.0	45.0	136.0	595.6
1974-75	25.5	146.5	104.0	88.0	151.0	90.0	605.0
1975-76	94.0	67.0	74.5	69.0	93.0	42.0	439.5
1976-77	13.5	17.0	50.5	73.5	129.0	31.0	314.5
1977-78	53.0	106.5	99.5	92.5	85.0	88.0	524.5
1978-79	62.5	96.0	78.5	86.0	71.0	94.0	588.0
1979-80	79.5	27.0	143.0	112.5	123.0	29.0	514.0
1980-81	40.0	34.0	73.0	82.0	110.0	52.0	391.0
1981-82	47.0	184.0	143.0	85.0	164.0	73.0	696.0
1982-83	66.0	165.0	75.5	68.0	150.0	112.5	637.0
1983-84	143.5	244.5	42.0	104.0	85.0	124.5	743.5
1984-85	112.5	105.0	44.0	61.5	99.5	34.5	457.0
1985-86	132.0	62.0	56.0	112.7	100.0	135.7	599.0
1986-87	73.0	12.3	96.0	73.0	104.0	23.5	381.8
1987-88	30.0	91.0	105.1	39.75	115.5	29.0	410.3
1988-89	172.5	124.5	70.75	97.5	64.75	52.0	581.5
1989-90	76.0	49.0	107.5	100.5	84.0	31.0	448.0
1990-91	109.5	91.0	82.8	49.7	110.9	136.3	580.2
1991-92	133.4	57.2	41.8	85	50.1	27.5	395.0
1992-93	118.8	119.2	165.3	102.9	63.0	81.2	650.4
1993-94	40.7	64.85	122.7	134.05	47.2	80.8	490.3
1994-95	205.9	73.8	199.7	56.3	128.9	80.7	745.4
1995-96	57	53	187	104	82	79	562
1996-97	78.3	164.8	141.5	91	53.8	69.7	599.1
1997-98	46.3	81.8	128.9	156.6	92.3	69	574.9
1998-99	76.5	43.1	105.3	98	46.5	89	458.4
1999-00	30.0	97.0	100.0	119.5	84.0	15.5	446.0
2000-01	88.0	71.0	66.2	79.5	53.0	112.0	469.7
2001-02	137	86.1	100.9	53.4	142.2	48.1	567.7
Average	73.0	91.3	95.6	83.0	90.1	66.2	499.6
Maximum	205.9	244.5	199.7	156.6	183.0	136.3	745.4
Year of Max	94	83	95	97	64	91	95

Telephone Access											
Season	SLC 3-minute	SLC 5-minute	Salt Lake Telephone	Logan Telephone	Ogden Telephone	Provo Telephone	Park City Telephone	Alta Telephone	State Snow-mobile Hotline	Moab Telephone	Total Calls
1977	6,522	0	6,522	0	0	0	0	0	0	0	6,522
1978	11,258	0	11,258	0	0	0	0	0	0	0	11,258
1979	9,924	0	9,924	0	0	0	0	0	0	0	9,924
1980	14,469	0	14,469	0	0	0	0	0	0	0	14,469
1981	30,736	0	30,736	0	0	0	0	0	0	0	30,736
1982	33,099	0	33,099	0	0	0	0	0	0	0	33,099
1983	40,355	0	40,355	4,357	1,890	3,671	3,042	0	0	0	53,315
1984	39,647	0	39,647	5,300	2,725	4,076	2,577	0	0	0	54,325
1985	32,476	0	32,476	4,652	1,706	2,276	2,386	0	0	0	43,496
1986	36,535	0	36,535	5,469	5,464	2,292	2,562	0	0	0	52,322
1987	38,841	0	38,841	4,693	2,587	2,518	2,121	0	0	0	50,760
1988	39,614	4,020	43,634	4,000	2,500	2,500	2,500	0	0	0	55,134
1989	48,488	8,033	56,521	4,000	2,500	2,500	2,500	0	0	1,100	69,121
1990	52,898	10,947	63,845	4,000	2,500	2,500	3,000	0	0	1,693	77,538
1991	62,814	10,160	72,974	4,000	2,500	2,500	3,000	0	0	2,811	87,785
1992	62,429	9,970	72,399	4,000	2,500	2,500	3,000	0	0	3,216	87,615
1993	79,248	12,136	91,384	3,676	3,034	3,134	3,419	0	0	2,763	107,410
1994	71,880	13,204	85,084	4,110	3,500	2,610	3,663	0	0	3,000	101,967
1995	90,052	13,770	103,822	4,879	3,746	3,000	3,640	0	0	2,842	121,929
1996	89,965	11,529	101,494	3,729	2,744	2,813	3,338	0	0	1,794	115,912
1997	113,069	0	113,069	5,215	3,000	3,000	4,000	4,000	0	1,056	133,340
1998	106,267	8,579	106,267	5,797	3,000	3,000	6,500	7,000	5,000	2,000	138,564
1999	78,391	0	78,391	3,950	3,500	3,000	5,680	8,000	5,000	2,000	109,521
2000	61,744	8,939	70,683	6,250	3,500	3,000	5,000	3,000	5,000	2,000	98,433
2001	76,089	9,385	85,474	5,000	3,500	3,000	5,000	3,000	5,000	3,000	112,974
2002	71,762	7,765	79,527	5,000	3,000	3,000	5,000	3,000	5,000	2,000	105,527

Rounded off numbers are conservative estimates based on past numbers because no call counters exist.

Internet Access							
Season	Logan Advisory	Manti Skyline advisory	Moab Advisory	Advisory			Total Hits Statewide
				Salt Lake NWS server*	Salt Lake CSAC server*	Salt Lake avalanche.org hits *	
1998			3,500	50,000	15,000		68,500
1999			4,559	108,948	23,148		136,655
2000	32,888		4,559	78,750	10,864		127,061
2001	28,000	8,519	9,418	36,349	11,989	61,155	155,430
2002	30,000	10,168	8,596	35,000	8,062	85,760	177,586

Mountain Weather				
Season	NWS Server	CSAC Server	Avalanche.org	Total
1998				
1999	113,139	9,489		122,628
2000	84,750	1,787		86,537
2001	59,603	5,271	7,587	72,461
2002	60,000	348	23,539	83,887

* NWS = National Weather Service server
 * CSAC = Cyberspace Snow and Avalanche Center server
 * Avalanche.org is the official web site of the American Avalanche Association