

**UTAH AVALANCHE FORECAST CENTER  
ANNUAL REPORT  
1988-1989**



**U.S. FOREST SERVICE WASATCH-CACHE NATIONAL FOREST  
N.O.A.A. NATIONAL WEATHER SERVICE  
337 N. 2370 W. SALT LAKE CITY, UT 84116  
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## TABLE OF CONTENTS

Season Highlights .....	1
Introduction .....	2
Changes This Season .....	2
Season History - Northern Wasatch Mountains.....	4
Season History - La Sal Mountains.....	7
Budget and Fundraising.....	8
Avalanche Accidents .....	9
Pattern Distribution of Avalanches.....	14
Volunteer Observers .....	14
Avalanche Education .....	16
Appendix	
Tables .....	18
Samples of Avalanche Advisories.....	22
Samples of Avalanche Warnings.....	25
Samples of Mountain Weather Forecasts.....	26
Samples of Letters of Support.....	30



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## Season Highlights

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The winter of 1988-89, the ninth season of operation for the Utah Avalanche Forecast Center (UAFC), was successful in many respects. Some of the highlights of the season were:

- \* No avalanche fatalities or injuries occurred in Utah. For the first time since the 1970's, two consecutive winters have elapsed without an avalanche fatality in Utah.
  - \* The total number of calls to our recorded avalanche, and mountain weather hotline increased dramatically. We received 66,521 calls, an increase of 20% over previous years. This averages over 400 calls per day with a record 1,061 calls in one day in Salt Lake City alone.
  - \* After two winters of below average snowfall, 1988-89 was, in most respects, a normal winter. The snowfall was near average for most reporting stations with Alta receiving 581.5 inches--20 percent above average. The snowpack throughout the range was relatively deep, strong, and stable.
  - \* Very few avalanche accidents occurred in the backcountry. Although a total of 64 incidents of human encounters with avalanches were reported to us, only 9 people were caught in backcountry avalanches, and of these only 1 was partly buried. In contrast, for the first time in recent history, more avalanche accidents occurred within ski area boundaries and on highways than in the backcountry. In these areas, 14 people were caught, 7 were partly buried and 2 were completely buried. There were no serious injuries or deaths.
  - \* Our educational efforts reached over 2,000 people through avalanche slide shows, workshops, and seminars. Local, state, and national news media contacts allowed us to reach an additional audience of several million.
  - \* We increased the amount of information given to the public by increasing the length of the daily recorded avalanche advisory from 2 minutes to 2.5 minutes, and providing a detailed 5 minute recording.
  - \* This season, we began providing a detailed mountain weather forecast tailored specifically for the community of avalanche workers, available through computer bulletin board access.
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## Introduction

People, snow, and mountains are the three ingredients which combine to create avalanche hazard. Perhaps no other place in the country equals the Wasatch Mountains for the degree in which these three factors combine to form the avalanche hazard which exists here. Well over a million people live, work, travel, and play in Utah's mountains, while as many as 10,000 avalanches per year occur around them. In a quote from Dr. S.A. Ferguson in the "Avalanche Review":

*"...if we were able to do a per capita study on those exposed to avalanche danger versus those caught in avalanches, I bet you would see that Utah has an incredible safety record compared to any other state. ...Quite frankly, I believe that an impressive avalanche knowledge is what keeps the fatal statistics in Utah as low as they are."*

The Utah Avalanche Forecast Center remains committed to providing the information to keep everyone safely on top of "The Greatest Snow on Earth", not buried beneath it.

The Utah Avalanche Forecast Center was established in 1980 as a cooperative venture between the USDA Forest Service and the NOAA National Weather Service. The purpose of the program, as originally outlined, was "to advise the public on a daily basis of existing snow and avalanche conditions in the backcountry of the Wasatch Mountains adjacent to Salt Lake City. With data collected from a network of mountain observers, as well as the UAFC staff, an estimation of current and future snow stability could be made available to the public to allow backcountry travellers to make informed decisions".

While the primary mission of the UAFC remains unchanged, the program continues to expand in response to demand. For example, the forecast area, originally limited to the Tri-Canyons, now includes the entire Wasatch Front, from Spanish Fork Canyon north to the Utah-Idaho border. We now give dozens of talks, lectures, and workshops each season in an attempt to bring quality avalanche education to Utah. And the UAFC is the network center for much of the avalanche-related work in the Wasatch Mountains, facilitating the sharing of information which helps to make Utah's safety record so impressive.

The avalanche problem in Utah is exceedingly complex. Highway U-210 in Little Cottonwood Canyon has the highest avalanche hazard index of any highway in North America. The backcountry of the Wasatch Mountains frequently resembles a ski area, with ski tracks on every visible slope. On any given weekend day, you can find several thousand people enjoying the backcountry of the Wasatch Range on skis, snowboards, snowmobiles and on foot. The Utah Avalanche Forecast Center is constantly seeking new ways to stay at the forefront of avalanche forecasting to keep Utah one step ahead of avalanche disaster.

## Changes This Season

### New Mountain Weather Forecast

The most significant change in UAFC operations came in the form of a new way of getting our mountain weather forecast to the community of avalanche workers. Through the use of the Datacol computer bulletin board maintained by the Rivers Forecast Office, we can now send our forecasts out via computer. Ten of the Fifteen cooperators in the program can now use a phone modem to retrieve our forecast and other National Weather Service products.

This network saves us the numerous hours on the telephone which we used to spend reciting the forecast to each interested party. Our new forecast proved very popular with everyone who used it. It provided them with the detailed weather information they require, and they can have a hard copy of the forecast which they can post and refer to throughout the day. We issued these forecasts at 630 AM, with an afternoon update before 3 PM.



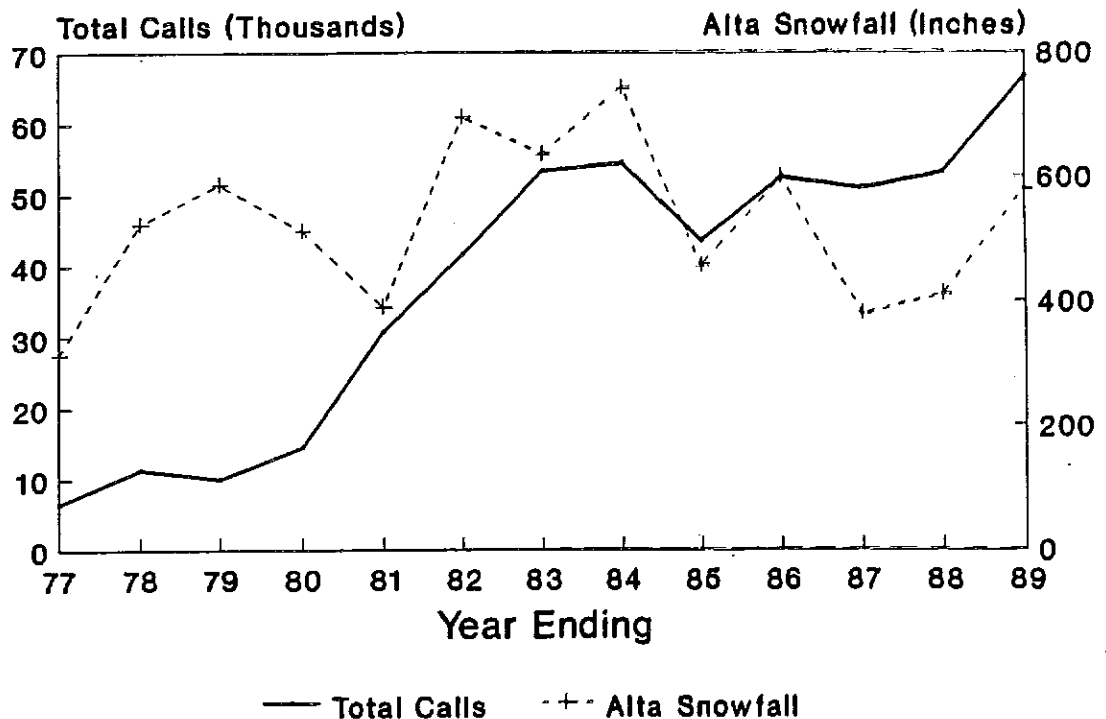
**Call Count Takes a Sharp Rise**

This year, the number of telephone calls for recorded snow, avalanche, and mountain weather information jumped dramatically to a total of 66,521 for the period from November 1 to April 30. We received an average of 400 calls per day, with as many as 1,061 in Salt Lake City alone on December 26th.

The rise in the total number of calls is an increase of nearly 25% over any other year. Several factors are responsible; first, we have seen before that the call rate is closely related to the snowfall rate. Since this was a winter with at or above normal snow amounts, we expected the call rate would exceed that from at least the last two low snow years. Second, we advertised the phone number for the detailed 5 minute recording, previously only used by our cooperators and enterprising backcountry users who discovered it. Because of this, the total number of calls for the 5-minute recording doubled from previous years. However, even taking these factors into account, the call rate continues to climb. The general trend is a rising one and we must assume that demand for our recorded avalanche advisories will continue to increase.

While we do not have call counters on the message machines located outside of Salt Lake City, we feel that a conservative estimate of 2,500 calls for each of the outlying areas is reasonable based on previous years when call counters were used. Actually, we suspect that both Park City and Logan may be around 5,000 calls per season, but without hard data, we will use the more conservative estimate. Call counters for the new recording machines we use in these areas are not commercially available but next season, we plan to manufacture something that will work. The use in Ogden is likely the second lowest, with Provo seeing the least amount of use. There seem to be very few backcountry users in the Provo area, despite excellent terrain and access.

## Calls versus Alta Snowfall



*The number of calls to our recorded avalanche advisory plotted with the annual snowfall at Alta. Notice that in the short term, the call rate tends to follow snowfall. However, the general trend is for increasing number of calls. This season is 20% above any previous year.*

### Reduction of Staff

We continue to use radio station KPCW to spread our message to the Park City area, and this remains a popular program with listeners in that area.

One thing we would like to know is: what is the correlation between the number of backcountry users versus the number of calls to our recorded avalanche advisory. In other words, for every call to the avalanche recording, how many people will be using the backcountry. If we can establish a relationship, it would be a convenient index of day by day winter backcountry use. Next season, we would like to entice volunteers to conduct a survey like this

Following the departure of Al Soucie, the UAFC was left with only 3 full-time avalanche professionals. Al, a snow ranger from the Forest Service Salt Lake District Office, worked for the UAFC two days per week, (the UAFC funds part of the snow rangers' salary on three Forest Service Districts within the forecast area). Unfortunately, Al's position was filled with someone who, although had suitable avalanche skills, was only planning on staying for only one season, thus it was not worth our effort to train him. The bottom line is that we lost a very capable part time avalanche forecaster who was not only a valuable field person, but was someone who could handle an office forecast shift. Certainly, we will miss Al's talents, but most importantly the reduction of staff means an additional strain on the UAFC staff to take up the slack.

We hope that our close cooperation with the Salt Lake District Snow Rangers will continue in future years and that the person filling the position will possess acceptable avalanche skills and commitment to help us in our forecasting duties.

### New Office

We completed our move into a new office at the end of the 1987-88 season, and this year put it to the test. While we are less than 100' from our old location in the National Weather Service Forecast Office, our new location is a significant improvement, with a much larger space and a quieter working environment.

### The La Sal Avalanche Forecast Center

This season, the Moab Ranger District of the Manti-Lasal National Forest started an avalanche forecast center for the La Sal Mountains. Mark Yates and his partner Craig Bigler contracted the avalanche forecasting services. Their first season was very successful. A summary by Mark Yates appears on the following pages.

### More Information

The user survey we conducted at the end of the 1987-88 year gave us much useful information. Primarily, the survey told us that the people who use our service would like more information. This year we did exactly that by increasing the length of our recorded advisory from 2 to 2.5 minutes, and by providing a 5 minute detailed recording. The latter, previously reserved for avalanche workers, became very popular, receiving 8000 calls during the season, twice the number in prior years.

Late in the year we were able to add two additional telephone lines to our Salt Lake 2.5 minute recording, bringing the total to seven. We have also added one phone line which will allow us to have two lines for the 5 minute recording. These changes should help alleviate some of the clogging and busy signals which many people complain about.

## Season History - Northern Wasatch Mountains

The 88-89 snow and avalanche season wasn't bad. Maybe not a vintage year but sufficiently robust to keep one's interest, at least through the main part of the season. After a superb beginning and a fine middle portion, the final third faded somewhat.

**November**

When an avalanche forecaster dreams of a perfect start to a winter, this season's start is what they dream of. Beautiful, late summer weather lasted through October 31 and then changed abruptly, so there wasn't a thin layer of snow sitting on the ground, getting progressively weaker, to provide an unstable base. This season, after months of dry weather, rain began with the first day of the month, changed to snow on November 10, and began to pile up rapidly.

The Avalanche Dragons emerged from a long summer's hibernation on the 12th, with the first human triggered slide of the season. It was not a serious incident, but we were again warned that early season can be a dangerous time in the Wasatch.

All month, one storm after another pounded the Wasatch. Density changes and surface hoar that formed during short breaks kept us on our toes, but avalanche activity was confined to the most recently deposited snow.

There was one particularly thankful skier enjoying his turkey on Thanksgiving evening. That afternoon, he had barely survived a scary ride on the back of the Dragon, near Park City. He was strained through the aspens and was under for most of the ride, but popped out on top at the bottom, minus his ski poles.

Avalanche activity peaked on the 27th, with a storm that dropped almost 3 inches of water. Powder skiing was excellent through out this period, with increasingly good cover and a mostly stable snowpack. By November 30, there was 60 inches on the ground at the Alta Guard Station and the 172 inch snowfall total was a November record. After two drab winters, the Wasatch Powder Pigs were back in hog heaven.

**December**

As if the Weather Gods were watching the calendar, on the first of December, the storms shut off. Clear, cold nights began to raise the dreaded specter of surface hoar and faceted snow in the upper levels of the snowpack. After two weeks without new snow, we were ready to hear the dragon's roar with the next storm. The stage was now set for the Christmas Storm, which began on December 19.

By the afternoon of the 21th, we issued an avalanche warning and none too soon, as that night, North Ogden Pass was closed by a slide and a sheriff, driving down the Powder Mountain road was pushed off into the ditch.

Widespread avalanches continued on the 22nd and on the 23rd, we had perhaps our closest scrape of the winter. An intense storm cell moved into the mountains shortly before dawn, causing heavy snowfall that snarled traffic on the Little Cottonwood road. Rapid sustained loading of over 4 inches per hour caused several paths to avalanche down onto the already stranded cars. A Utah Transit Authority bus was knocked off the road along with several cars. At least one car was completely buried along with a bus passenger who stepped outside at the wrong time. Several cars were damaged, but miraculously, no one was even injured.

Storms and also our avalanche warnings continued through December 26, but the clearing weather didn't end the avalanche problems. Control work continued to release large slides, five to eight feet deep... slides that a backcountry skier would have little chance of surviving. We continued to issue strongly worded advisories and kept our fingers crossed, but our mostly "avi-wise" Powder Pigs kept their ambitions under control, skied conservatively, and there were no incidents.

**January**

Five days into the new year, the January storm began. Although not as large as the Christmas Storm, the additional loading triggered some large slides. Aggravated by surface hoar, these were deep releases into the snow that had weakened in early December, occasionally stepping down all the way to the ground.

The jaws of the White Dragon snapped on January 8, but once again came away empty, when a backcountry skier triggered a large slide but was able to grab a tree on the way down. He was not sure whether anyone else was involved so the Red Pine Backcountry Rescue Group flew in to do a search. We were reminded of the hazards of rescue work, when the helicopter's tail rotor hit the snow, disabling the ship, which then had to sit in the middle of a major slide path for almost a week.

With the season now almost half way through, we could hardly ask for a better winter. Total snow depth at the Alta Guard Station had reached 90 inches, there had been lots of great skiing and interesting avalanches, and yet no one had been killed or injured. Unfortunately, the best part of the winter was now behind us.

The traditional January thaw arrived with warm, stable weather and the Wasatch avalanche workers got a much needed break for the rest of the month.

**February**

February began with a small storm and the arrival of the "Polar Express". The storm was preceded by strong Southwest winds that color coded the snowpack with a tan layer of dust which provided a convenient index in our snowpits for the remainder of the winter.

Following this storm, a massive intrusion of very cold Arctic air pushed across the Canadian border, accompanied by 60 mph canyon winds. These winds brought the Avalanche Dragons down into Suburbia when a spontaneous release off a 100 foot high fault scarp deposited 6 feet of debris on a residential street in Centerville. Fortunately, this occurred during the night and no people or poodles were involved. Several mail boxes narrowly escaped certain death.

Boreas continued to rule the Western states for the next several days. Of our mountain stations, Solitude Ski Area recorded the lowest temperature of the winter, at -33 degrees, on the fifth.

Before the end of the month, however, it wasn't cold, dry dragons that were stirring up trouble but rather, warm, wet ones. Warming temperatures on the 25th and 26th saturated the shallow, weak North facing snowpacks, below 7,000 feet, with melt water, producing numerous spontaneous slides. These were very visible to the general public, as almost every road in the Wasatch Mountains, from Logan to Provo, was closed for a period of time. Some of these were impressive, such as the one on the ski trail in Mill Creek Canyon, which left 10 feet of debris, spanning 100 feet and containing several large trees. The debris still had not melted out by June 1st.

**March**

March came in as a blustery, showery lion with lots of roaring but no real bite, and exited without changing character. Some precipitation was recorded at the Alta Guard station on all but seven days, but with only 65 inches of total snowfall, the month was well below average. Warmth was perhaps the most characteristic feature. Except for a cold snap at the beginning of the month, above average temperatures were the rule.

March 4 and 5 could win top honors for the best weekend of the season in the backcountry. Saturday dawned clear with about 14 to 20 inches of new snow with the heavy stuff on the bottom and light fluff on top. With a stable snowpack, droves of backcountry skiers headed for their favorite radical runs. On Saturday afternoon, Gobbler's Knob--one of the more inaccessible areas--had almost 75 sets of tracks. By Sunday, even the feared Broad's Fork and Stairs Gulch, had been trashed by grinning Powder Pigs.

Avalanche activity for the month was confined to the rather small amounts of new snow. March 19 was the most active day, with numerous slides about a foot deep, including several that nipped at the heels of the backcountry skiers.

**April**

The March weather continued for a few days into April but then a strong ridge built over the western region and the balance of the month was dry with unseasonably warm temperatures. Despite the snowpack ingredients for excellent corn skiing, too many nights without freezing temperatures made good corn somewhat hit and miss. The general stability of the snow pack confined avalanche activity to loose snow sluffs, although by the end of the third week, with temperatures continuing to warm, we were starting to worry about wet slab releases.

This concern faded as the last storm of the winter season moved in on the 25th. Temperatures dropped and two feet of new snow put the Wasatch back into winter for a few days.

After beginning with a good wallop in November and continuing through the first part of January, the weather never really delivered a hard punch after mid-season. November and December produced snowfall totals well above average. February was a little above average while January, March and April fell below the mark. At 581.5 inches total snowfall at the Alta Guard Station, the year finished almost 100 inches above normal although most stations ended up exactly average. Maximum total depth on the ground was recorded on April 4th with just over 100 inches. A seasonal history chart appears in the Index.

# The La Sal Avalanche Forecast Center

by  
Mark Yates

## Introduction

The 1988-89 season marked the debut of the La Sal Avalanche Forecast Center. In response to an increased in winter backcountry recreation in the La Sal Mountains, the Moab Ranger District of the La Sal National Forest created the La Sal Avalanche Forecast Center. The Center is funded, equipped and administered on the district level under Ranger Raymond Carling and Recreation Specialist Pat Spahr. Myself along with my assistant Craig Bigler are on a personal services contract which totals around \$10,000 per season. The Center provides a recorded phone message, updated every evening, with detailed information on avalanche conditions, mountain weather, snow, recreation and road conditions, running from mid November to mid April. The number is (801) 259-SNOW.

This new service is part of a community cooperative effort to expose the unique winter recreation opportunities of the Sa Sal Mountains to the public. Cooperators include:

1. Grand County, who provides plowed access all season to 9,600 feet in the central and highest massif.
2. County Travel Council, responsible for extensive advertising.
3. Soil Conservation Service, providing access to remote telemetry station.
4. Utah Avalanche Forecast Center in Salt Lake City, who provide invaluable consultation and direction.
5. Several individuals and businesses.

Support and satisfaction during the first season has been high from all interested and involved parties, as use and the positive response have been far greater than anyone's expectations. Further details regarding the cooperative, user statistics or the Center's inception are available by contacting Pat Spahr at the Moab District Rangers office.

The La Sal Mountains are an alpine island rising abruptly out of the surrounding redrock canyons and mesas. Mt. Peale, at 12,721 feet, being the highest peak of the range as well as the entire Colorado Plateau, is over eight and a half thousand feet higher than Moab. Geologically, they are a laccolithic intrusion that was forced up through and between the overlying layers of sedimentary rock. Subsequent erosion and glaciation has exposed and carved this intruded material into beautiful peaks and cirques.

The upper elevations of the range are similar in character, weather and avalanche potential to the San Juan Mountains of southwest Colorado. They offer excellent backcountry winter recreation of all kinds, with terrain suitable for all types and levels of skiing, including steep expert ski mountaineering. What makes the La Sals unique are the expansive views of the surrounding canyonlands and distant mountains, as much as 125 miles away.

The Forecast Center has a fully instrumented electronic analog weather station at the snow study plot near 10,000 feet elevation. This station records snow amount, water content of precipitation, wind direction and speed, and ambient air temperature. The site is checked nearly every day of the winter season. We also access—via computer—remote weather station located north and south of the range, operated by the Soil Conservation Service.

The typical winter pattern for this area is the Pacific Cyclone Belt with brings cold fronts out of the northwest. These are typical of cold fronts in that a strong south to southwest wind precedes them; then heavy, relatively dense snow accompanies the frontal passage along with winds shifting to the northwest to north, falling temperatures and diminished windspeeds. Clear skies with strong temperature inversions often occur between storms.

## Season History - La Sal Mountains

This season, fall was dryer than normal with almost no snowfall until an unsettled pattern November 8-30 provided the season's first real snowfall. A relatively large storm cycle occurred from December 18-28, dropping over 3 feet of snow at 10,000 feet elevation. January and February saw several smaller systems with breaks between, culminating in a good dump March 2nd and 3rd. Throughout the season, the snowpack stayed near average, climbing above average in early March.

Spring was unusual in that the second week of March, temperatures climbed to record-breaking highs with steady southerly winds. The many storms which hit the Wasatch and Colorado during this period missed the La Sals entirely. After the early March storm, almost no precipitation and above normal

temperatures continued nearly to the end of April, causing the snowpack water content to sink way below average for the end of the season. (See the accompanying seasonal history chart for more details.)

This season's snowpack and avalanche history was consistent with a our typical shallow, continental snowpack with the inherent temperature gradient weaknesses. Southwesterly winds regularly transported snow and loaded northeasterly exposures, causing varying degrees of instability, with natural activity usually occurring during the loading periods. Instability persisted in some packets for long periods of time. Southerly exposures remained more stable, both above and below timberline. the main concern this season was the mid November snowpack at and below timberline. It turned completely into depth hoar on all but the southerly aspects. Avalanche conditions became serious when this was heavily loaded during the Christmas storm cycle producing extensive natural avalanche activity. Instability persisted because of this layer for much of the winter. Later in January, a mid-pack faceted layer began forming on the same exposures, again causing deep slab potential. This year, the majority of the natural avalanche failed on one of these weak layers. The extreme warming in early March introduced free water causing loose snow slides on all aspects and a lot of wet slab activity on northerly exposures. This wet upper layer then froze forming a strong supportive slab with stable conditions for the remainder of the season. A

## Budget and Fundraising

The UAFC continues to be cash funded entirely by the USDA Forest Service, with an operating budget of \$66,000. We continue to receive in-kind support from the National Weather Service (NWS) in the form of office facilities, telephone lines, long distance telephone services, and access to weather forecasting equipment, products, and NWS forecasters. We feel this contribution from the NWS is very significant, and that to duplicate the services they provide in the private sector would cost several hundred thousand dollars.

The budget for the UAFC has remained relatively unchanged for the past five years, and is in fact smaller than in previous seasons. When compared to the budgets of the other two regional avalanche centers located in Seattle and Denver, the UAFC really stands out. Although we are by far the most heavily used avalanche center in North America, the operating budget is one half that of either Seattle or Denver.

There are several reasons for this budgetary discrepancy. First, the USDA Forest Service is the sole financial contributor to the UAFC, while in the case of the other avalanche centers, the Forest Service is one of many contributors because they provide services to numerous agencies who are willing to pay for these services. In the case of the Northwest Avalanche Center (NWAC), they perform avalanche and weather forecasting for the Washington Department of Transportation, as well as the National Park Service. The Colorado Avalanche Information Center (CAIC) receives financial support from the ski resorts and the Colorado Department of Highways because the CAIC provides weather information and avalanche expertise.

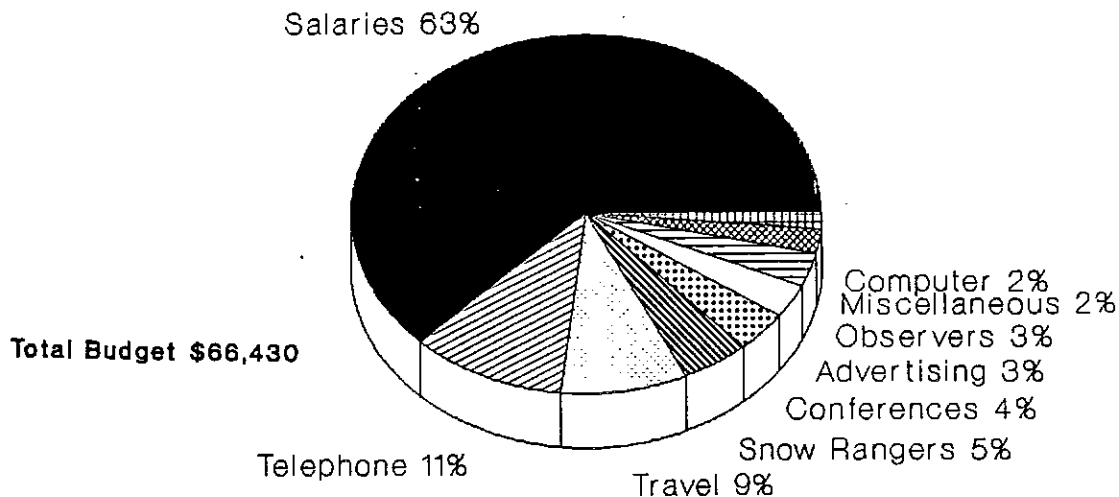
The situation in Utah is much different. The UAFC came late to the world of avalanches, as avalanche work had been going on in the Wasatch Mountains, particularly at Alta, since the 1930's. The primary function of the UAFC at the time of its formation in 1980 was to provide the public with information about avalanche conditions in the undeveloped backcountry. The developed ski resorts and highways already had well-established programs to deal with avalanches.

However, increasing demands on the UAFC over the years, has forced the program beyond the bounds of its original charter. We spend a large portion of each day talking with the snow safety personnel at each ski area, helicopter ski companies, numerous State and Federal agencies and the news media. In addition to providing these agencies with a customized mountain weather forecast, we exchange avalanche and snowpack observations with others in the avalanche community.

There is no question that in a field such as avalanche forecasting, the sharing of information works to the benefit of everyone. We are very fortunate to have many excellent avalanche professionals in the Wasatch Mountains, and that is one of the reasons the safety record here is so good. We feel that the UAFC plays a key role in the exchange of information, and without such a network, the number of avalanche accidents and fatalities could be much higher.

We also feel other opportunities exist to form financial partnerships with some of the agencies which benefit from our services. We continue to actively pursue these and we hope that within a year we will have something to show for our efforts.

# Utah Avalanche Forecast Center Budget Breakdown



## Fundraising

This year, the UAFC made some progress in diversifying our funding. Learning the trade of fund raising has been a difficult step for avalanche forecasters. Our first step was a fund raiser organized for us by a group known as the Friends of the Forecast Center. This event, held at a local club, was an overwhelming success in that over 200 people came and supported us not only verbally but financially to the tune of approximately \$3,000. More importantly, we made contact with a number of people who can help with additional fund raising.

Many of donations continued to arrive in the office after the fundraiser accompanied by numerous flattering letters of appreciation. There is no question that we enjoy exuberant praise, loyalty and support from our user group.

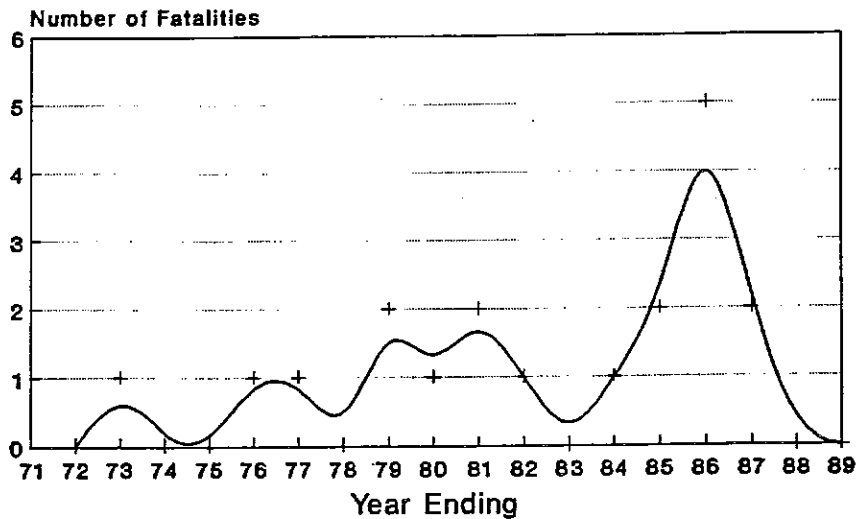
We are currently in the process of printing an informational brochure about the UAFC which will be useful in future fund raising efforts. We will continue to pursue contacts with various State, Federal and private entities.

## Avalanche Accidents

Once again, we completed a winter season without any avalanche injuries or fatalities in Utah, while nationwide there were 7 avalanche fatalities. For the first time since the early 1970's, two consecutive winters have elapsed without avalanche deaths in Utah.

Through the 1980's, the national avalanche fatality rate has risen to 17 per year, while an average of two avalanche-related deaths per year occurred in Utah from 1980-1987. With increasing winter use in the Wasatch backcountry, we projected that the number of avalanche accidents and fatalities would continue to rise. However, the fatality rate for Utah in the 1980's has actually declined to an average 1.5 deaths per year. We feel that our recorded avalanche advisories and education programs are an important reason for the improved safety record.

## Avalanche Fatalities Utah 1971-89



*A smoothed curve of avalanche fatalities by year. Notice the general trend since 1972 has been an increasing number of avalanche fatalities each year, however the number has dropped to zero for the past two seasons.*

### Controlled versus Un- controlled

This season a very interesting phenomenon occurred: More avalanche accidents occurred within ski area boundaries and along highways where avalanche control is done than in the backcountry where the only defense against avalanches is one's routefinding and snow stability skills. If we look at the history of avalanche accidents, in the old days before avalanche control and avalanche zoning, most accidents happened when avalanches came crashing down on defenseless villagers below. Then, with the advent of avalanche control and avalanche zoning, these types of accidents dramatically decreased, and for the past 20-odd years, the vast majority of avalanche accidents worldwide have been from backcountry skiers and climbers. This has also been true in Utah but this year, for the first time in many years, we are back to more accidents happening in developed ski areas and on highways than in the backcountry.

Is this just a random event, or could it be the increased avalanche skills of backcountry travelers, combined with the increased accuracy and credibility of our avalanche advisories, have started a trend in Utah?

For example, a total of 64 backcountry avalanche incidents involving people were reported to the UAFC this winter. Of these, 9 people were caught in avalanches, and only one was partially buried.

If we include accidents from ski areas and highways, a total of 23 people were caught in avalanches in Utah. Of these, 9 were backcountry skiers, including one helicopter skier, 6 were working ski patrollers at the resorts, 7 were lift skiers, and 1 was standing outside a stuck bus. Of the 23 caught in slides, 8 people were at least partially buried, and of the 8, only two were totally buried. In addition, a total of 13 vehicles were struck and partially buried by avalanches along Utah's highways. Of these, only 4 vehicles were totally buried, with some damage to the vehicles.

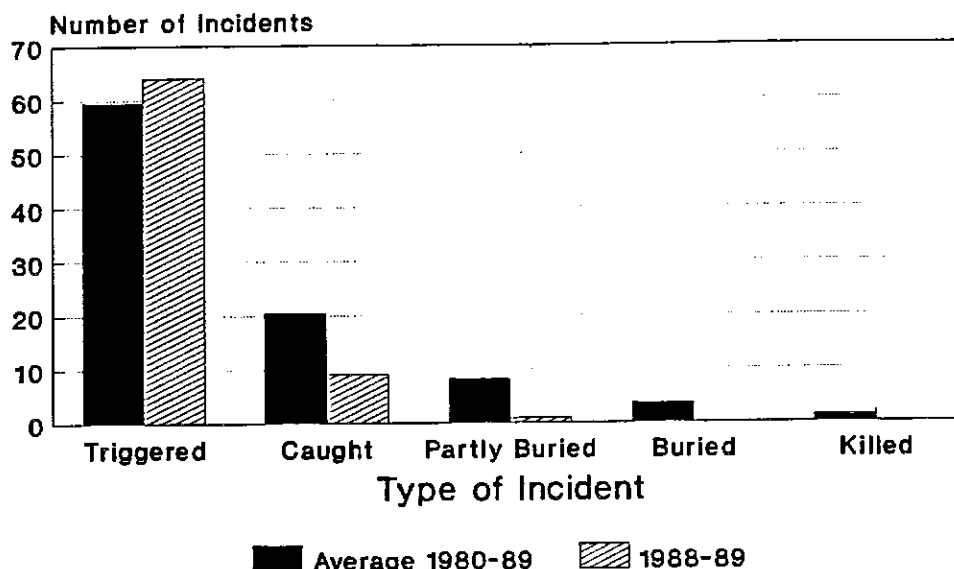
There were very few serious incidents in the backcountry, as only one backcountry skier was partially buried. Some of the more serious avalanche incidents took place along the canyon roads, most notably on Utah Highway 210 in Little Cottonwood Canyon in late December. At that time, 10 cars and trucks and one Utah Transit Authority bus were struck by avalanches. The bus and 4 of the cars were knocked off the road, the four cars and a bystander were buried, and 6 other vehicles were partially buried on the road. Several of the cars did sustain damage, but miraculously no one was hurt or killed. If the snow had been of a higher density, it is very likely the outcome would have been more serious.



AVALANCHE INCIDENTS IN CONTROLLED AREAS VERSUS UNCONTROLLED AREAS.

	BACKCOUNTRY	DEVELOPED SKI AREAS AND HIGHWAYS
CAUGHT	9	14
PARTLY BURIED	1	7
TOTALLY BURIED	0	2

## Avalanche Incidents by Type 1980-89 Average versus 88-89



*A plot of backcountry avalanche accidents by type. This plot does not include accidents which occurred at developed ski areas or along highways. This season, more avalanche accidents occurred in developed areas than in the backcountry.*

### Accidents Versus Hazard Rating

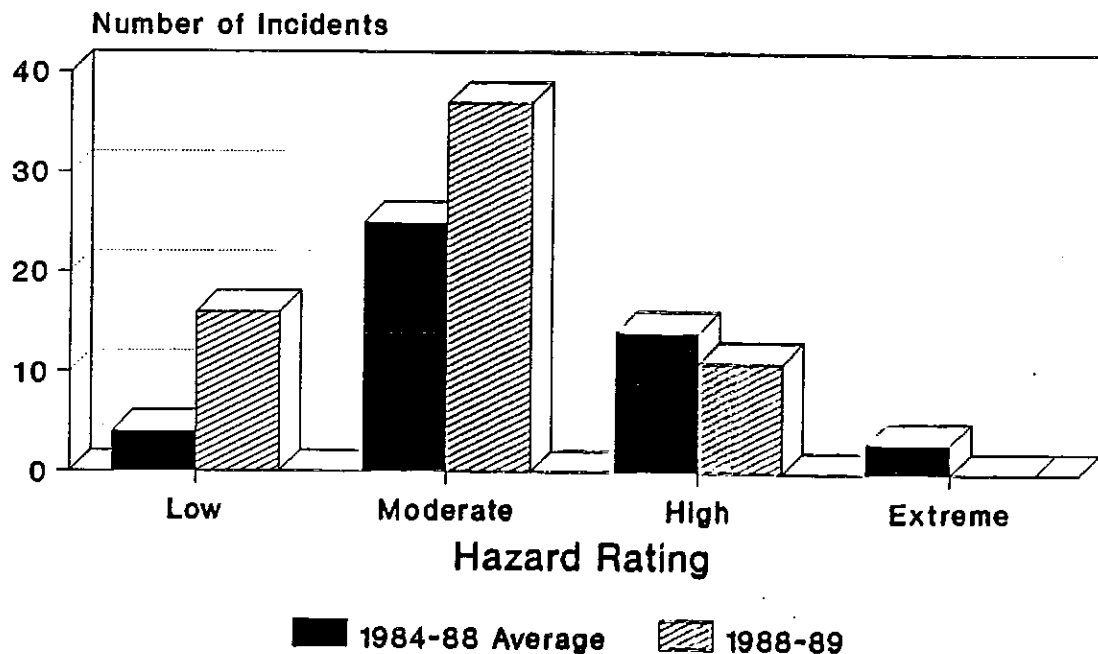
Once again, we see the largest number of avalanche incidents in areas where we had rated the avalanche hazard as moderate. This is no surprise, as moderate hazard areas have a maximum interaction between people and avalanches. That is, the skiing is often the best soon after a storm before the snow stabilizes; and people avoid the backcountry areas rated as high or extreme hazard. What is surprising is the number of human-triggered avalanches in areas we rated the hazard at low (16 with 4 people caught). Although most of these incidents were small slides triggered intentionally, probably the balance of them occurred in radical terrain visited only when we rate these areas as low hazard.

In recent years, we have moved away from a generalized, conservative style of avalanche forecast, and attempted to provide information which is as specific and accurate as possible. There is a tradeoff here. Generalized, more conservative forecasts are probably safer from a liability standpoint, but they suffer from the standpoint of credibility. Our philosophy is that the more accurate and detailed the information, the more useful it is to backcountry travelers, and hence, less avalanche deaths. But back to the tradeoff: the more credible we become, the more people rely on us for their stability evaluations and when we are wrong--as we inevitably will be on occasion--the more likely people will get into trouble.

For example, there were two days in particular this season when the snow was more unstable than we expected, and on those days there were 5 and 7 avalanche incidents respectively. Fortunately, all persons involved escaped unharmed. These incidents highlight the degree of accuracy which people have come to expect from the UAFC.

Solutions to this problem may include: 1) have a larger staff to get more information from the backcountry, 2) put a disclaimer in the avalanche advisory such as, "this forecast is only a guideline and the ultimate responsibility for your safety lies in your own routefinding and snow stability decisions." or 3) generalize our forecasts and to err more on the conservative side. Of these choices, the last one is the least desirable from the standpoint of saving lives.

## Avalanche Incidents Number versus Hazard Rating



*A graph of the number of avalanche incidents versus the hazard rating we used to describe the area where the incident occurred. Once again, the most avalanche incidents occur in areas rated as moderate hazard. This is because the maximum interaction between people and avalanche occur in areas rated as moderate hazard. Few avalanches occur in low hazard areas; and people tend to avoid areas rated as high or extreme. People perceive moderate as meaning safe.*

## Accident Summary 1988-89

### Utah Avalanche Accidents, 1988-89

Date	Location	Details
11/11	Mt. Timpanogos	1 backcountry skier caught
11/12	Mt. Timpanogos	1 backcountry skier caught
11/24	Scott's Bowl	1 backcountry skier caught, partially buried, lost equipment
12/15	Alta Ski Resort	3 patrollers caught in separate incidents
12/22	Powder Mtn. Road	1 vehicle caught, partly buried
12/22	Snowbasin Ski Resort	1 ski patroller caught
12/23	Little Cottonwood Canyon	10 vehicles, 1 person, and 1 bus caught 1 person totally buried, 4 cars totally buried, 1 bus and 6 cars partially buried
12/24	Brighton Ski Resort	1 patroller caught
12/24	Park West Ski Resort	1 patroller caught, partially buried
12/25	Little Cottonwood Canyon	1 Vehicle caught, partly buried
12/27	Brighton	1 backcountry skier caught
12/30	Snowbird Ski Resort	1 lift skier caught
1/7	Alta Ski Resort	3 lift skiers caught, 1 totally buried
1/8	Peak 10,420'	1 backcountry skier caught, lost equipment
1/9	Powder Mtn. Ski Resort	1 lift skier caught and partially buried
1/14	Park West Ski Resort	1 patroller caught
2/21	Day's Fork	1 backcountry skier caught
3/19	Brighton Ski Resort	1 lift skier caught, partially buried
3/20	Cardiac Ridge	1 helicopter skier caught
3/27	Hogum Fork	1 backcountry skier caught
4/2	Day's Fork	1 backcountry skier caught
4/18	Alta Ski Resort	1 lift skier caught

### AVALANCHES REACHING NORTHERN UTAH HIGHWAYS, November 1988-April 1989

LOCATION	DATES	COMMENTS
Little Cottonwood Canyon	11/26, 12/23 12/25-26, 2/4 2/20	14 cars and one bus and one bystander caught in slides on 12/23, 12/25. 4 cars and bus knocked off road, 4 cars and one person buried, 6 cars partly buried.
Powder Mountain Road	12/22	One car caught and partly buried, road closed by 9' of debris.
North Ogden Pass	12/22, 2/23	Road closed for one month following 12/22 slide.
Ogden Canyon	1/6, 2/1, 2/23	Closed by numerous wet 2/25 slides on 2/25.
Provo Canyon	12/23, 2/3	

Sundance Approach Road	2/24	
Logan Canyon	2/21, 2/25	Closed by numerous wet slides on 2/25.
Big Cottonwood Canyon	2/25	

## Avalanche Warnings

We issued the first avalanche advisory of the season on November 12th, and the last one on April 23rd, for a total of 249 advisories on 162 days. Avalanche warnings were issued on 9 days, with one warning period lasting 6 days (Dec. 21-26). During the season, we recorded avalanches on 85 of 162 days. A total of 3190 avalanches were reported to us, of which 686 were avalanches which were observed in the backcountry. (We estimate about 10,000 avalanches occur annually throughout the Wasatch Range.)

The statistics show an interesting point: that the number of avalanche warnings issued each winter has declined since the inception of the UAFC. Rather than being a reflection of a change in avalanche conditions over the years, this reflects a change in our understanding of the purpose of warnings. During the early 1980's, an avalanche warning was issued whenever a high avalanche condition existed anywhere. In recent years, we have been breaking the forecast area down into smaller sections to more precisely define the existing instabilities. For example, if a high avalanche hazard exists only in one particular type of terrain, say on north facing 35 degree slopes above 10,000', we would likely not issue an avalanche warning. Currently we reserve avalanche warnings to periods when a widespread unstable condition exists, generally on all slopes, and especially when a special hazard exists during a weekend or holiday, when many people use the backcountry who don't normally call our forecast.

## Pattern Distribution of Avalanches

Last season, we plotted avalanche incidents by aspect and found that the majority occurred on north through east facing slopes. Was this because the snow is more unstable on those slopes or is that where the skiing is the best? To answer that question, this season, we plotted avalanches--not avalanche accidents--by aspect. As you can see from the graphs on the following page, the same relationship exists. Thus, we can conclude that the majority of avalanche accidents occur on north through east facing slopes because the snow is more unstable there, not because there's more people. We assume that the instability is because of both faceting metamorphism (because of temperature gradients) as well as wind loading of snow by prevailing westerly winds.

In plotting reported avalanches versus elevation, we see that the higher you go, the more likely you'll find an avalanche. This isn't too surprising because higher elevations have both more snow and more exposure to the wind than in lower elevations.

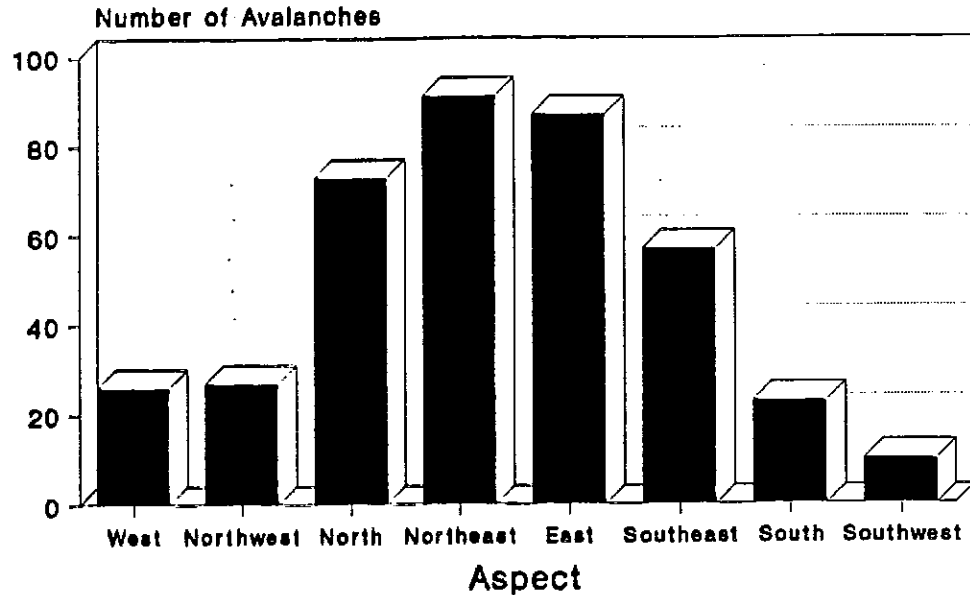
## Volunteer Observers

Once again, we successfully used our network of backcountry observers to gather avalanche and snowpack information from the outlying areas. This very effective program provided us with over 150 backcountry observations at a cost of only \$1360--by any measure, an extremely efficient use of taxpayers dollars. This year, we trimmed the program to a smaller group of skilled observers. Two individuals in particular, Kevin Kobe and Greg Dollhausen, have proven to be excellent field workers, providing us with quality information on a regular basis.

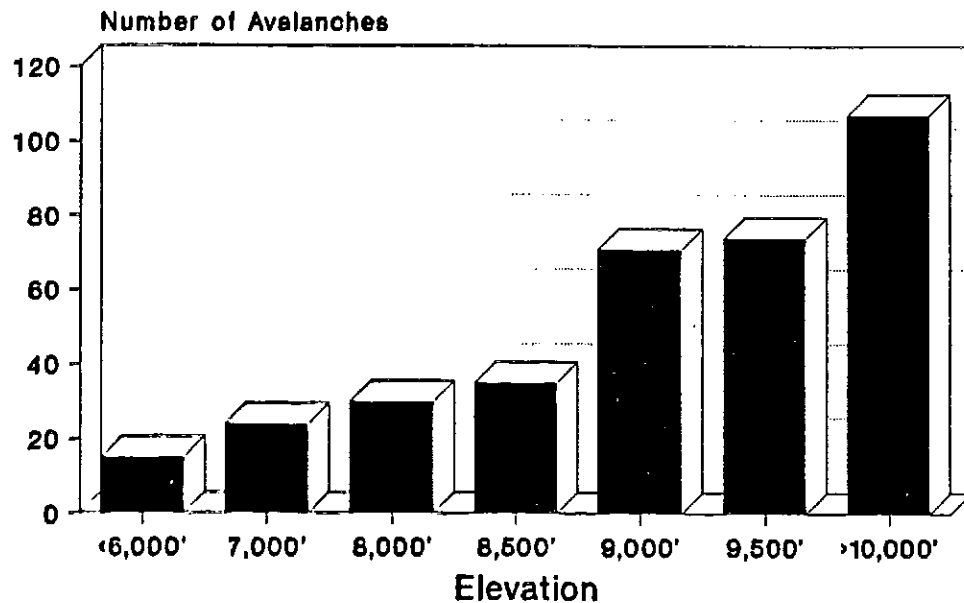
Most of those participating in the volunteer program received \$10 per observation through an approved Services Contract. However, one observer, Greg Dollhausen, worked on a monthly contract, providing the UAFC with 10 or more observations per month for \$100 per month.

Despite repeated attempts to solicit volunteer observers from the Provo area, we have had no luck whatsoever. This area continues as a relative blind spot in our network.

## Avalanche Frequency by Aspect Wasatch Range 1988-89



## Avalanches Versus Elevation Wasatch Range, 1988-89



*In the above graphs, we plotted the number of avalanches for which we had reliable data against both aspect and elevation.*

Volunteer Observers	OBSERVER	NOV	DEC	JAN	FEB	MAR	TOTAL
	<u>LOGAN</u>						
	KEVIN KOBE	1	9	10	7	5	32
	BRYAN DIXON	3	2	2	1	2	1
	RON STAGG	1	4	7	2	2	16
	LARRY ROGERS	0	0	0	1	0	1
	<u>OGDEN</u>						
	BRIAN SMITH	2	2	2	2	1	9
	BRAD BODILY	1	1	2	1	3	8
	JOHN PHELPS	1	3	2	1	3	10
	<u>SALT LAKE</u>						
	GREG DOLLHAUSEN	10	10	10	10	10	50
	TOTAL 1988-89	19	31	35	25	26	136
	TOTAL 1987-88		33	31	33	37	134

## Avalanche Education

Avalanche education has always been an important function of the UAFC. We feel that avalanche educated people can make better use of the information which we provide and can therefore make safer decisions. We have always used the recorded avalanche advisories as an educational tool to help the public to better understand snow, avalanches, and mountain weather. In addition, each year we receive numerous requests for educational talks and slide shows, most of which we have time to fulfill. During the 1988-89 season, We gave 23 different talks, lectures, seminars, and workshops attended by over 2,000 people on topics ranging from general avalanche awareness to specific subjects such as avalanche trauma and avalanche dynamics.

Various private entities along the Wasatch Front provide many avalanche classes. However, many of these educators are not avalanche professionals, and the material is often out-of-date or incorrect. We feel that we occupy a unique position to provide quality avalanche education, and that it is an important role of the UAFC. However, it has become increasingly difficult to keep up with the many requests for education because of time restraints, and more often than we like, we have to turn down the requests. We feel that with additional funding and staffing, the UAFC could provide the quality avalanche education which Utah needs.

## EDUCATION EFFORTS BY UAFC PERSONNEL, 1988-89

DATE	PERSONNEL	GROUP	TOPIC	ATTENDANCE
10/14	TREMPER	INTERNATIONAL SNOW SCIENCE WORKSHOP	BACKCOUNTRY USER SURVEY	500
11/11	MEIKLEJOHN	BLASTER'S CLINIC	AVALANCHE TRAUMA	200
11/11	TREMPER	BLASTER'S CLINIC	CONTROL STRATEGIES	200
11/29	MEIKLEJOHN	PARK CITY SCHOOLS	AVALANCHE AWARENESS	100
12/15	MEIKLEJOHN	WASATCH BACKCOUNTRY RESCUE/BRIGHTON HIGH	SNOWBOARDER SAFETY	25
12/15	TREMPER	WBR/ROWLAND HALL	SNOWBOARDER SAFETY	22
12/20	KIMBROUGH	SLC GRADE SCHOOL	AVALANCHE AWARENESS	55
1/4-3/20	STAFF	UNIV. OF UTAH	SNOW DYNAMICS FIELD WORK	25
1/14	TREMPER	WASATCH MTN CLUB	AVALANCHE AWARENESS	100
1/14-15	MEIKLEJOHN	CANYONLANDS FIELD INSTITUTE	INTRO TO AVALANCHES	11
1/20-22	MEIKLEJOHN/ TREMPER/ KIMBROUGH	ALASKA MOUNTAIN SAFETY CENTER	INTENSIVE BACKCOUNTRY WORKSHOP	24
1/24	TREMPER	UNIV. OF UTAH	AVALANCHE MECHANICS	25
1/25	TREMPER	CHEAP SPORTS	AVALANCHE AWARENESS	7
1/25	MEIKLEJOHN	UTAH STATE UNIV.	AVALANCHE AWARENESS	40
1/26	KIMBROUGH	BYU PROVO SKI CLUB	AVALANCHE AWARENESS	30
1/27-30	TREMPER	ALASKA MOUNTAIN SAFETY CENTER	LEVEL I AVALANCHE WORKSHOP	30
2/9	TREMPER	MONTANA STATE UNIV.	AVALANCHE FORECASTING	60
2/10	MEIKLEJOHN	UTAH STATE UNIV.	AVALANCHE FORECASTING	14
2/21	MEIKLEJOHN	EDITH BOWEN LAB	AVALANCHE AWARENESS	175
3/10	TREMPER	NATIONAL SKI PATROL	LEVEL II COURSE	100
3/13	TREMPER/ MEIKLEJOHN/ KIMBROUGH	USDA FOREST SERVICE SUPERVISOR'S OFFICE	AVALANCHE AWARENESS/ AVALANCHE FORECASTING	35
3/14	TREMPER/ MEIKLEJOHN/ KIMBROUGH	GREEN PARROT CLUB	HISTORY AND OPERATION OF THE UAFC	200
3/17-20	KIMBROUGH	ALASKA MOUNTAIN SAFETY CENTER	BACKCOUNTRY WORKSHOP	40
5/2	TREMPER	JUDGE HIGH SCHOOL	AVALANCHE AWARENESS	25
TOTAL				2,043

In addition to these efforts, there were 15 articles in the local, state and national newspapers about the Utah Avalanche Forecast Center, and 10 local radio and television interviews with UAFC staff. Local radio station KRCL aired a 1 minute Public Service Announcement for the UAFC twice a day through the winter. Also, we talked with numerous media, lawyers, and researchers seeking information about avalanches. In many cases we also mailed packets of information to them.

## Appendix

### MONTHLY CALL RATE FOR SALT LAKE CITY 2.5 MINUTE RECORDING ONLY

	NOV	DEC	JAN	FEB	MAR	APR
1979-80	714	1,514	4,274	2,967	3,389	1,313
1980-81	2,200	4,800	6,257	7,277	6,887	3,135
1981-82	1,761	6,879	8,522	5,485	6,361	3,416
1982-83	2,741	6,804	7,614	7,731	9,911	5,339
1983-84	3,216	10,708	7,073	7,032	5,983	4,396
1984-85	2,827	5,704	5,260	8,399	7,122	3,021
1985-86	4,119	4,703	6,298	10,628	6,225	3,706
1986-87	3,903	3,911	10,022	8,201	8,364	3,406
1987-88	2,390	6,534	10,201	7,297	9,208	3,780
1988-89	6,200	11,484	8,603	9,678	9,051	3,472

### YEARLY CALL TOTALS

SLC 2.5 min	SLC 5 min	Logan	Ogden	Provo	Park City	All
1976-77	6,522					6,522
1977-78	11,258					11,258
1978-79	9,924					9,924
1979-80	14,469					14,469
1980-81	30,736					30,736
1981-82	33,099					41,610
1982-83	40,355	4,357	1,890	3,671	3,042	53,315
1983-84	39,647	5,300	2,725	4,076	2,577	54,325
1984-85	32,476	4,652	1,706	2,278	2,386	43,498
1985-86	36,535	5,469	5,464	2,292	2,562	52,322
1986-87	38,841	4,693	2,587	2,518	2,121	50,760
1987-88	39,614	4,020	(2,500)*	(2,500)*	(2,500)*	(2,500)*53,000
1988-89	48,488	8,033	(2,500)*	(2,500)*	(2,500)*	(2,500)*66,521

\* These are conservative estimates based on previous years.



	CALLS	ALTA SNOW
1976-77	6,522	314.5
1977-78	11,258	524.5
1978-79	9,924	588.0
1979-80	14,469	514.0
1980-81	30,736	391.0
1981-82	41,610	696.0
1982-83	53,315	637.0
1983-84	54,325	743.5
1984-85	43,498	457.0
1985-86	52,322	599.0
1986-87	50,760	378.0
1987-88	53,000	410.3
1988-89	66,521	581.5

## BACKCOUNTRY AVALANCHE INCIDENTS

YEAR	TRIGGERED	CAUGHT	AT LEAST PARTLY BURIED	TOTALLY BURIED	KILLED
88-89	64	9	1	0	0
87-88	39	6	(1)	(1)	0
86-87	50	18	6	3	2
85-86	66	27	12	5	5
84-85	79	39	15	6	2
83-84	M	24	M	M	1
82-83	M	M	15	M	0
81-82	M	M	M	M	1
80-81	M	M	M	M	2
79-80	M	M	M	M	1
78-79	M	M	M	M	2
77-78	M	M	M	M	0
76-77	M	M	M	M	1
75-76	M	M	M	M	1
74-75	M	M	M	M	0
73-74	M	M	M	M	0
72-73	M	M	M	M	1
71-72	M	M	M	M	0

\* In the following tables, the term hazard categories is used. In our forecasts, we often use several different hazard categories on any particular day to rate different types or terrain according to aspect, elevation and slope steepness. The hazard ratings used in these tables represent the hazard rating in the area at that time, or the highest hazard rating used each day.

#### BACKCOUNTRY AVALANCHE INCIDENTS 1988-89

HAZARD*	TRIGGERED	CAUGHT	AT LEAST PARTLY BURIED	BURIED	KILLED
LOW	16	4	0	0	0
MODERATE	37	1	0	0	0
HIGH	10	4	1	0	0
HIGH W/WARN	1	0	0	0	0
EXTREME	0	0	0	0	0
-----					
TOTALS	64	9	1	0	0

#### INCIDENTS BY HAZARD CATEGORY\*

	LOW	MODERATE	HIGH	EXTREME
4 YEAR AVERAGE 1984-88	4	25	14	3
1988-89	16	37	11	0

#### SUMMARY OF FORECAST HAZARD RATINGS

The numbers represent the number of days each season the hazard category was used. Since the advisories often use several hazard ratings for different types of terrain according to aspect, elevation and slope steepness, the hazard assigned to each day is the one used to describe the most hazardous type of terrain that day.

#### HAZARD CATEGORY\*

YEAR	LOW	MODERATE	HIGH	EXTREME WARNING DAYS	EXTREME DAYS	TOTAL
80-81	49 28%	73 42%	47 27%	6 3%	32	178
81-82	92 48%	67 35%	31 16%	3 2%	34	195
82-83	61 36%	81 48%	22 13%	4 2%	25	168
83-84	69 39%	83 48%	20 12%	1 1%	16	173
84-85	52 30%	90 52%	30 17%	2 1%	17	174
85-86	44 28%	82 53%	25 16%	4 3%	19	155
86-87	33 19%	81 47%	55 32%	3 2%	14	172
87-88	73 44%	54 33%	37 23%	0 0%	8	164
88-89	67 41%	54 33%	41 25%	0 0%	9	162
9 YEAR AVERAGE	60 35%	74 43%	34 20%	2 1%	19	169

NUMBER OF DAYS EACH HAZARD CATEGORY WAS USED *							
	Low	Moderate	High	Extreme	Warning Days	Days with Avalanches	No. Aval..
NOVEMBER	5	6	7	0	1	12	43
DECEMBER	14	6	11	0	6	14	70
JANUARY	14	9	8	0	0	13	94
FEBRUARY	8	14	6	0	2	16	224
MARCH	13	11	7	0	0	16	171
APRIL	13	8	2	0	0	14	84
-----							
TOTAL	67	54	41	0	9	85	686

## RELATIVE FREQUENCY OF AVALANCHES BY ASPECT AND ELEVATION

N	NE	E	SE	S	SW	W	NW
73	91	87	57	23	10	26	27
<6000'	7000'	8000'	8500'	9000'	9500'	>10,000'	
15	24	30	35	71	74	107	

\* *In our forecasts, we often use several different hazard categories on any particular day to rate different types of terrain according to aspect, elevation and slope steepness. The hazard ratings used in these charts represent the hazard rating in the area at that time, or the highest hazard rating used each day.*

## Samples of Avalanche Advisories

ZCZC SLCWRKSNW SLR  
TTAA00 KSLC DDHHMM

GOOD AFTERNOON, THIS IS BRAD MEIKLEJOHN WITH THE BACKCOUNTRY AVALANCHE AND MOUNTAIN WEATHER ADVISORY FOR SATURDAY, JANUARY 7, AT 4:30 PM. THIS FORECAST IS SPONSORED BY THE US FOREST SERVICE AND THE NATIONAL WEATHER SERVICE.

FROM MY COMFORTABLE SEAT, IT LOOKED LIKE A GOOD DAY TO BE IN THE OFFICE. BRUTALLY COLD IS THE WORD FROM EVERYBODY EXCEPT MY PARTNER BRUCE, WHO CALLED IT A WARM

MONTANA SPRING DAY. IN UTAH, A HIGH OF 5 DEGREES IS ALMOST UNHEARD OF. THE WINDS CONTINUED TODAY AT 20-30 MPH ALONG THE RIDGES, AND LIGHT SNOW FELL, WITH 1-2" IN MOST AREAS EXCEPT THE OGDEN MOUNTAINS WHERE 7" FELL. NEW SNOW TOTALS SINCE THURSDAY ARE 18-36".

THE WORD FROM THE BACKCOUNTRY IS THAT THE TRAILBREAKING IS A REAL SLOG, AS THE COLD SNOW IS SOMEWHAT STIFF. THERE IS ALSO A DENSER LAYER SANDWICHED IN THE MIDDLE OF THE NEW SNOW WHICH MAKES THE SKIING A BIT TRICKY. THE BEST SKIING SEEMS TO BE IN SHELTERED AREAS.

THE COLD TEMPERATURES ALSO MAKE THE AVALANCHE DRAGONS A BIT SLUGGISH TODAY. COLD TEMPERATURES OFTEN MAKE THE SLAB DEPOSITS A LITTLE RELUCTANT TO MOVE, AND THERE WAS NOT A TREMENDOUS AMOUNT OF AVALANCHE ACTIVITY TODAY. HOWEVER, THERE WERE SEVERAL LARGE SLIDES ON HEAVILY WINDLOADED SOUTHEAST FACING SLOPES, UP TO 4' IN DEPTH. ONE OF THESE SLIDES BROKE DOWN TO AN OLD CRUST LAYER FORMED A FEW WEEKS AGO.

AT THE PRESENT THERE IS A MODERATE HAZARD OF HUMAN-TRIGGERED AVALANCHES ON ALL SLOPES WITH RECENT ACCUMULATIONS OF WIND DRIFTED SNOW. THIS MEANS THERE ARE LOCALIZED AREAS WHERE YOU COULD TRIGGER A LARGE AVALANCHE, AND THE MOST LIKELY PLACES WOULD BE EAST AND SOUTHEAST FACING SLOPES STEEPER THAN 35 DEGREES ABOVE 9000'. THE AVALANCHE HAZARD IS LOW IN ALL OTHER AREAS, BUT THERE MAY BE A FEW PLACES BELOW 8000', ESPECIALLY ON NORTH FACING SLOPES, WHERE YOU COULD TRIGGER AN AVALANCHE THAT COULD BE UP TO 3' DEEP.

FOR THE MTN WX, THE MAIN MESSAGE FOR TONIGHT AND SUNDAY IS MORE OF THE SAME. THE COLD, MOIST, AND UNSTABLE FLOW WILL REMAIN OVER THE WASATCH, BRINGING US MORE LIGHT SNOW AND COLD TEMPERATURES. WE WON'T SEE MUCH NEW SNOW OVERNIGHT, ANOTHER 2-4", AND LOW TEMPERATURES WILL BE 0 TO 5 BELOW. WINDS WILL CONTINUE ALONG THE RIDGES AT 15-30 MPH FROM THE NORTHWEST, AND HIGHS AT 8000' WILL APPROACH 12 DEGREES AT 8000'. LOOK FOR WARMER TEMPERATURES ON MONDAY.

IF YOU WOULD LIKE MORE DETAILED INFORMATION CALL 364-1591.

WE WOULD APPRECIATE HEARING ABOUT ANY SNOW OR AVALANCHE CONDITIONS YOU SEE OUT THERE, SO GIVE ME A CALL AT 524-5304. (1-800-662-4140).

BRUCE WILL UPDATE THIS FORECAST BY 7:30 SUNDAY MORNING

THANKS FOR CALLING

MEIKLEJOHN

ZCZC SLCWRKSNW SLR  
TTAA00 KSLC DDHHMM

GOOD MORNING, THIS IS BRAD MEIKLEJOHN WITH THE BACKCOUNTRY AVALANCHE AND MOUNTAIN WEATHER ADVISORY FOR THURSDAY, APRIL 6, AT 7:30 AM. THIS FORECAST IS BROUGHT TO YOU BY THE FOREST SERVICE, THE NATIONAL WEATHER SERVICE, AND YOUR FINANCIAL SUPPORT.

BETWEEN HELICOPTER CRASHES, DIESEL SPILLS, AND AVALANCHE DEATHS, THE MOUNTAINS DON'T SEEM LIKE A VERY SAFE PLACE TO BE. YOU WON'T BE MISSING VERY MUCH IF YOU DON'T GO INTO THE BACKCOUNTRY TODAY, AS THE APRIL SUN TURNED ALL THE SNOW THAT FELL EARLIER IN THE WEEK INTO HEAVY SLOP.

THERE WAS ANOTHER AVALANCHE FATALITY IN COLORADO ON SUNDAY NEAR LOVELAND PASS. THE VICTIM WAS NOT WEARING A BEACON, AND IT TOOK THE REST OF THE PARTY HALF AN HOUR TO FIND HIM AND DIG HIM OUT WITHOUT SHOVELS. THIS IS THE 8TH AVALANCHE FATALITY TO OCCUR IN THE U.S. THIS WINTER. FORTUNATELY, IT HAS BEEN OVER TWO YEARS SINCE THERE WERE ANY DEATHS HERE IN THE WASATCH.

THERE WERE ALL KINDS OF WET, POINT RELEASE AVALANCHES YESTERDAY AS THE SUN BEGAN TO LOOSEN THINGS UP. THESE WERE ON ALL KINDS OF DIFFERENT SLOPES, INCLUDING NORTH-FACING ONES, AND A FEW WERE BIG ENOUGH TO BURY YOU. THERE WILL BE MORE OF THESE TODAY, AND THEY WILL GENERALLY FOLLOW THE PATH OF THE SUN AS IT MOVES FROM EAST TO WEST. THERE IS A BIT OF A CRUST THAT WILL HOLD THINGS IN PLACE FOR A WHILE, BUT ONCE THAT IS MELTED, WE WILL SEE THE SNOW START TO MOVE. WHILE MOST OF THESE SLIDES WILL BE SMALL, THE HAZARD WILL BE GREATER IF YOU ARE IN A STEEP, NARROW GULLY.

THE AVALANCHE HAZARD WILL RISE FROM LOW TO MODERATE BY 11 THIS MORNING, ESPECIALLY ON STEEP SOUTHEAST, SOUTH AND SOUTHWEST FACING GULLIES ABOVE 8000'. THERE MAY BE A FEW REMAINING AREAS AT HIGH ELEVATIONS WHERE YOU TRIGGER A SLAB AVALANCHE, AND THESE WOULD BE ON NORTH AND EAST FACING SLOPES ABOVE 10,000' STEEPER THAN 40 DEGREES.

THE MOUNTAIN WEATHER SHOULD STAY SUNNY AND WARM ALL THE WAY THROUGH THE WEEKEND AS HIGH PRESSURE ALONG THE COAST GRADUALLY SHIFTS EASTWARD. NORTHWEST WINDS AT 15-30 MPH WILL CONTINUE TO KEEP IT COOL ALONG THE RIDGES, WITH HIGHS AT 10,000' NEAR 40, WHILE 8000' HIGHS WILL REACH 50-55. OVERNIGHT LOWS SHOULD BE IN THE MID 30'S TONIGHT.

IF YOU WOULD LIKE MORE DETAILED INFORMATION, CALL 364-1591.

IF YOU HAVE ANY INFORMATION ON SNOW OR AVALANCHE CONDITIONS, YOU CAN GIVE ME A CALL AT 524-5304. (1-800-662-4140).

I WILL UPDATE THIS FORECAST BY 4:30 PM

THANKS FOR CALLING.

MEIKLEJOHN  
NNNN

ZCZC SLCWRKSNW SLR  
TTAA00 KSLC DDHHMM

HELLO, THIS IS BRUCE TREMPER WITH THE BACKCOUNTRY AVALANCHE AND MOUNTAIN WEATHER ADVISORY FOR SATURDAY, DECEMBER 24, AT 7:30 AM. THIS FORECAST IS SPONSORED BY THE US FOREST SERVICE AND THE NATIONAL WEATHER SERVICE.

IT WAS A WILD DAY YESTERDAY. LITTLE COTTONWOOD CANYON GOT ABOUT 30 INCHES OF NEW SNOW IN A 24 HOUR PERIOD, BIG COTTONWOOD CANYON 15 - 27 INCHES AND ABOUT 10 INCHES OUTSIDE OF THE COTTONWOOD CANYONS. THIS MAKES FOR ABOUT 6 FEET OF NEW SNOW IN THE LAST 4 DAYS. SPONTANEOUS NATURAL AVALANCHES RAN INTO THE BOTTOM OF LITTLE COTTONWOOD CANYON OFF THE SOUTH FACING SLOPES YESTERDAY MORNING WITH SOME CLOSE CALLS BUT NO INJURIES. PROVO CANYON WAS ALSO CLOSED BY A SLIDE NEAR DEER CREEK RESERVOIR. AND TWO DAYS AGO, A COUPLE OF ROADS WERE BURIED BY SLIDES IN THE OGDEN AREA. ALTHOUGH VERY FEW PEOPLE HAVE HAD THE PATIENCE TO TRUDGE THROUGH THE DEEP SNOW AND BLIZZARDS IN THE BACKCOUNTRY, THERE HAVE BEEN LOTS OF REPORTS OF SPONTANEOUS AVALANCHES THERE TOO ON SLOPES THAT FACE ALMOST ALL DIRECTIONS FROM 7,500' TO 10,000' ELEVATIONS ON SLOPES AS SHALLOW AS 33 DEG.

AS YOU MAY HAVE GUESSED, WE ARE CONTINUING THE AVALANCHE WARNING FOR THE NORTHERN WASATCH MOUNTAINS FROM SPANISH FORK CANYON TO THE UTAH-IDAHO BORDER. A HIGH AVALANCHE HAZARD EXISTS ALL SLOPES ABOVE 7,000' STEEPER THAN 30 DEG. HUMAN TRIGGERED AVALANCHES ARE LIKELY AND SPONTANEOUS AVALANCHES ARE POSSIBLE. IF YOU DON'T HAVE GOOD ROUTEFINDING AND SNOW STABILITY SKILLS, YOU SHOULD AVOID CROSSING OR TRAVELING BENEATH ANY SLOPE STEEPER THAN ABOUT 30 DEG. SO TODAY WOULD BE A GOOD DAY TO GO TO A SKI AREA OR DO SOME LAST-MINUTE CHRISTMAS SHOPPING.

MOUNTAIN WEATHER:

IT LOOKS LIKE SANTA WILL NEED RUDOLPH TONIGHT BECAUSE WE'RE GOING TO CONTINUE TO GET SNOW AND STRONG WINDS. THIS MORNING, PRECIPITATION IS ALREADY STARTING, AND THE SNOW AS WELL AS THE SOUTHWEST RIDGETOP WINDS SHOULD INCREASE THROUGHOUT THE DAY UNTIL THEY'RE BLOWING ABOUT 30-50 MPH TONIGHT AND SNOWING HARD. THIS SHOULD CONTINUE THROUGH THE NIGHT WITH A COLD FRONT PASSING CHRISTMAS MORNING PROBABLY BEFORE YOU OPEN YOUR PRESENTS AND THERE'S A GOOD CHANCE OF SOME FIREWORKS TO. THEN, WINDS SHOULD DECREASE AND TURN WESTERLY WITH MUCH COLDER AIR. WE ARE EXPECTING ABOUT A FOOT OF NEW SNOW IN THE MOUNTAINS BY CHRISTMAS BUT MOSTLY IN AREAS LIKE SUNDANCE AND PARK CITY. TEMPERATURES TODAY SHOULD BE NEAR 10 DEG ON THE RIDGETOPS AND IN THE UPPER TEENS AT 8,000', THE LOW TONIGHT NEAR 10 AND THE HIGH ON CHRISTMAS ALSO NEAR 10. WE SHOULD CONTINUE TO GET SOME COLD NORTHERLY AIR TILL ABOUT THURSDAY.

IF YOU WOULD LIKE MORE DETAILED INFORMATION CALL 364-1591.

IF YOU HAVE ANY INFORMATION ON SNOW OR AVALANCHE CONDITIONS PLEASE CALL US AT 524-5304. (1-800-662-4140)

I'LL UPDATE THIS FORECAST BY ABOUT NOON.

THANKS FOR CALLING

TRERMPER  
NNNN

## Samples of Avalanche Warnings

ZCZC SLCSABSLC CSW  
WOUSOO KSLC DDHHMM

UTAH AVALANCHE FORECAST CENTER  
NATIONAL WEATHER SERVICE, SALT LAKE CITY, UTAH

0700 HRS MONDAY FEBRUARY 20, 1989.

AN AVALANCHE WARNING IS IN EFFECT FOR THE SALT LAKE AREA MOUNTAINS INCLUDING LITTLE COTTONWOOD, BIG COTTONWOOD AND MILL CREEK. ONE TO TWO FEET OF NEW SNOW HAS FALLEN IN THE PAST 24 HOURS ACCOMPANIED BY HIGH WINDS FROM THE NORTHWEST.

WIDESPREAD AREAS OF HUMAN TRIGGERED AVALANCHE POTENTIAL EXIST TODAY ON ALL SLOPES ABOVE 8,000' STEEPER THAN 30 DEGREES. THESE WIND SLABS COULD BE 1-4 FEET THICK AND BE VERY SENSITIVE TO HUMAN TRIGGERS.

THIS ADVISORY DOES NOT APPLY TO AREAS OUTSIDE THE TRI CANYON AREA OR TO DEVELOPED SKI AREAS OR STATE HIGHWAYS WHERE AVALANCHE CONTROL IS NORMALLY DONE.

RECORDED AVALANCHE INFORMATION FOR THE NORTHERN WASATCH MOUNTAINS IS AVAILABLE BY CALLING IN THE SALT LAKE AREA 364-1581.... IN PARK CITY 649-2250...IN LOGAN 752-4146...IN OGDEN 621-2362...IN PROVO 374-9770 TO CONTACT OUR OFFICE...524-5304.

TREMPER

UTAH AVALANCHE FORECAST CENTER (USDA FOREST SERVICE/NATIONAL WEATHER SERVICE)  
NNNN

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ZCZC SLCSABSLC CSW  
WOUSOO KSLC DDHHMM

UTAH AVALANCHE FORECAST CENTER  
NATIONAL WEATHER SERVICE, SALT LAKE CITY, UTAH

07:30 HRS, SATURDAY, DECEMBER 24, 1988.

AN AVALANCHE WARNING IS IN EFFECT FOR THE NORTHERN WASATCH MOUNTAINS FROM SPANISH FORK CANYON TO THE UTAH-IDAHO BORDER.

ONE TO THREE FEET OF NEW SNOW HAS FALLEN IN THE LAST 24 HOURS ACCOMPANIED BY STRONG WINDS FROM BOTH THE SOUTHWEST AND NORTHWEST. WIDESPREAD AREAS OF UNSTABLE SNOW EXIST ON ALL SLOPES ABOVE 7,000' STEEPER THAN 30 DEGREES. SEVERAL SPONTANEOUS LONG-RUNNING AVALANCHES HAVE OCCURRED IN THE BACKCOUNTRY. HUMAN TRIGGERED AVALANCHES ARE LIKELY AND SPONTANEOUS AVALANCHES ARE POSSIBLE. BACKCOUNTRY TRAVELERS WITHOUT GOOD SNOW STABILITY AND ROUTEFINDING SKILLS SHOULD AVOID CROSSING OR TRAVELING BENEATH SLOPES 30 DEGREES OR STEEPER.

THIS WARNING DOES NOT APPLY TO DEVELOPED SKI AREAS OR STATE HIGHWAYS WHERE AVALANCHE CONTROL IS NORMALLY DONE.

RECORDED AVALANCHE INFORMATION FOR THE NORTHERN WASATCH MOUNTAINS IS AVAILABLE BY CALLING IN THE SALT LAKE AREA 364-1581.... IN PARK CITY 649-2250...IN LOGAN 752-4146...IN OGDEN 621-2362...IN PROVO 374-9770 TO CONTACT OUR OFFICE...524-5304.

TREMPER

UTAH AVALANCHE FORECAST CENTER (USDA FOREST SERVICE/NATIONAL WEATHER SERVICE)  
NNNN

# Samples of Mountain Weather Forecasts

ZCZC SLCWRKMTN SDC  
TTAA00 KSLC DDHHMM

UTAH AVALANCHE CENTER MOUNTAIN WEATHER ADVISORY  
TUESDAY, JANUARY 10, 1989  
0600 HRS

RECENT AVALANCHE ACTIVITY:

JAN 8

SKIER TRIGGERED SLIDE, PEAK 10,420, NE, 40 DEG, 3-4' CROWN SEVERAL HUNDRED YARDS WIDE.

SKIER TRIGGERED SLIDE, IVORY FLAKES, E-SE, 35 DEG, 3-4' CROWN 300 FEET WIDE

RELEASED TO DEPTH HOAR.

SKIER TRIGGERED SLIDE, NEAR DESOLATION LAKE, N, 47-30 DEG, 2' CROWN, 500' WIDE, RELEASED ON STELLARS-ULTG-SH BELOW NEW SNOW.

SKIER TRIGGERED SLIDE, N. SHOULDER OF RENOLDS, E, 50' WIDE.

SEVERAL NATURALS NOTICED E-NE, 40 DEG, NEAR PARK WEST.

WEATHER SYNOPSIS:

WE'LL GET A BIT OF A BREAK THIS MORNING BUT BY AFTERNOON WINTER WILL BE BACK, WITH A COLD FRONT COMING THROUGH ABOUT DARK. THE MAJOR PRECIP PERIOD WILL BE TONIGHT. THE LOW LOOKS LIKE IT WILL CLOSE OFF IN THE SOUTH AND CUT OFF MOST OF THE SNOW BY DAYLIGHT WEDNESDAY. INCREASING CLOUDS, WIND, AND SNOW TODAY, SNOW TONIGHT, CLEARING WED. NEXT STORM: SATURDAY.

FREE AIR (10,000')	TODAY	TONIGHT	TOMORROW
WIND DIRECTION	260	290>320	360>60
WIND SPEED	20-40	20-30	10-20
TEMPERATURE	30	15	20

(8,000')

TEMPERATURE	35	20	25
SNOW DENSITY	12	10	8
CLOUD COVER	BRK>OVC	OVC	OVC>BRK
CLOUD ELEVATION	12-15	8-10	10-14
WEATHER	>S-	S	S-

QUANTITATIVE PRECIPITATION FORECAST (INCHES OF SNOW):

	TODAY 5PM-5AM	TONIGHT 5AM-5PM	TOMORROW 5PM-5AM
SNOWBASIN/POWDER MTN	T-2	4-8	T-2
PARK WEST	T-2	4-8	T-2
PARK CITY/DEER VALLEY	1-4	4-8	T-2
SOLITUDE/BRIGHTON	T-2	6-12	T-2
ALTA/SNOWBIRD	T-3	8-14	T-2
SUNDANCE	1-4	4-8	1-3

SORRY, NO CAMPBELL DATA THIS MORNING.

KIMBROUGH  
NNNN



ZCZC SLCWRKMTN SDC  
TTAA00 KSLC DDHMM

UTAH AVALANCHE CENTER MOUNTAIN WEATHER ADVISORY

FRIDAY, FEBRUARY 3, 1989  
1300 HRS.

WEATHER SYNOPSIS:

SNOW HAS CONTINUED THIS MORNING IN MOST AREAS, HEAVIEST IN THE PROVO MTNS, AND LIGHTEST IN THE LOGAN MTNS. SO FAR THE WINDS HAVE BEEN PRETTY LIGHT, AND IT'S A GOOD THING BECAUSE THERE IS SO MUCH LIGHT SNOW AROUND.

THE MAIN PICTURE IS THAT IT WILL CONTINUE TO SNOW FOR THE NEXT 36 HOURS. THERE WILL BE PERIODS OF LIGHT SNOW AND SOME PERIODS OF HEAVY SNOW. IF YOU ARE PLANNING FOR CONTROL, I WOULD SAY IT LOOKS LIKE AN EARLY MORNING.

LOOKING AT THE SATELITE PICTURE, THERE IS ANOTHER BAND OF MOISTURE HEADED OUR WAY THAT HAS BEEN PRODUCING HEAVY SNOW ACROSS CENTRAL NEVADA. THIS IS EXPECTED TO BRING ANOTHER DOSE TO THE WASATCH TONIGHT AND EARLY SATURDAY. SNOW IS EXPECTED TO CONTINUE THROUGH THE DAY ON SATURDAY, BUT SHOULD BE LIGHTER.

THE WINDS MAY INCREASE AS THE NEXT SHORT WAVE TROUGH MOVES INTO THE AREA. THE MAIN FLOW CONTINUES TO BE WEST-SOUTHWEST.

THE UPPER LEVEL LOW IS BEGINNING TO MOVE EASTWARD SLOWLY, AND WILL BE CENTERED DIRECTLY OVERHEAD BY LATE SATURDAY. WE HAVE BEEN SAVED FROM THE EXTREME COLD WHICH IS JUST OVER THE BORDER IN WYOMING. THE ARCTIC BOUNDARY DOESN'T EVER SAG OUR WAY, SO THE COLD WILL ONLY SEEP IN.

SUNDAY WILL BE COLD WITH SNOW SHOWERS, AND MONDAY WILL REMAIN COLD AND PARTLY CLOUDY.

THE OVERALL PATTERN SHOWS A FULL-LATITUDE BLOCKING HIGH IN THE EASTERN PACIFIC. THE GENERAL RULE OF THUMB FOR THESE FEATURES IS IF THEY LAST FOR THREE DAYS, THEY WILL LAST FOR TWO WEEKS. THIS IS A GOOD THING FOR THE WASATCH, AND WINTER MAY BE HERE FOR A WHILE.

FREE AIR (10,000')	TODAY	TONIGHT	TOMORROW	TOMORROW NIGHT
WIND DIRECTION (DEG)	220-270	220-270	220-270	250-290
WIND SPEED(MPH)	15-30	15-30/40	15-30	10-20
TEMPERATURE(F)	10	0	7	-5
(8,000')				
TEMPERATURE (F)	15	5	13	0
SNOW DENSITY(%)	6	6	6	6
CLOUD COVER	OVC	OVC	OVC	OVC
CLOUD ELEVATIO	6-8K	6-8K	6-8K	8K
WEATHER	S-,S	S,S+	S,S-	S-

QUANTITATIVE PRECIPITATION FORECAST (INCHES OF SNOW):

	TODAY 5AM-5PM	TONIGHT 5PM-5AM	TOMORROW 5AM-5PM
SNOWBASIN/POWDER MTN	6-8	4-6	T-2
PARK WEST	6-8	4-6	T-2
PARK CITY/DEER VALLEY	6-8	4-6	T-2
SOLITUDE/BRIGHTON	8-10	4-6	T-2
ALTA/SNOWBIRD	8-12	6-8	2-4
SUNDANCE	6-8	4-6	T-2

MEIKLEJOHN  
NNNN

ZCZC SLCWRKMTN SDC  
TTAA00 KSLC DDHHMM

UTAH AVALANCHE CENTER MOUNTAIN WEATHER ADVISORY

MONDAY, MARCH 6, 1989  
0600 HRS.

WEATHER SYNOPSIS:

OH MY HECK! YESTERDAY THE SNOW REALLY WENT TO HECK IN A HANDBASKET WITH THE WARMING TEMPERATURES. THIS MORNING, THE RAIN-SNOW LINE SEEMS AROUND 8,000' AND SOME VERY LIGHT PRECIP HAS FALLEN OVERNIGHT AT MOST STATIONS FROM .01 WATER TO .43. THERE'S A BAND OF CLOUDS STREACHING IN A VERY STRAIGHT LINE ACROSS S. IDAHO AND DIPPING INTO NORTHERN UTAH AND COMING FROM OFF THE CALIFORNIA COAST. THIS BAND WILL AFFECT MOSTY NORTHERN UTAH AND S. IDAHO WITH PROBABLY MORE PRECIP FALLING IN THE LOGAN AREA THAN IN THE SLC MOUNTAINS. SKIES SHOULD BE MOSTLY OVERCAST BUT THERE MAY BE SOME CLEAR PATCHES MOVING THROUGH AT TIMES. THERE'S NOT MUCH DYNAMICS INVOLVED ONLY OROGRAPHIC PRECIP FROM WARM MOIST AIR PLUS WINDSPEEDS PLUS MOUNTAINS. WE'LL PROBABLY GET ABOUT 3/10 INCHES OF WATER PER 6 HOUR PERIOD IN FAVORED LOCATIONS FOR THE NEXT COUPLE OF DAYS. PRECIP RATES AND WIND WILL RISE AND FALL WITH IMBEDDED DISTURBANCES WHICH ARE VERY HARD TO PICK OUT OF THE STREAM SO FORECASTING THESE IS VERY TRICKY AT THIS TIME. BEST GUESS FOR PULSES IS ONE EARLY TONIGHT AND ANOTHER SOMETIME TOMOROW. THIS PATTERN LOOKS STUCK FOR ABOUT 5 MORE DAYS.

FREE AIR (10,000')	TODAY	TONIGHT	TOMORROW
WIND DIRECTION (DEG)	270	260	260
WIND SPEED(MPH)	15-30	15-30	15-30
TEMPERATURE(F)	32	28	32

(8,000')	TODAY	TONIGHT	TOMORROW
TEMPERATURE (F)	38	28	41
SNOW DENSITY(%)	GLOP (12-17%) -----		
CLOUD COVER	VAR OVC-BKN	OVC	OVC
CLOUD ELEVATION	7-18K	7-18K	7018K
WEATHER	R-/S-	R-/S-	R-/S-

QUANTITATIVE PRECIPITATION FORECAST (INCHES OF WATER):

	TODAY 5AM-5PM	TONIGHT 5PM-5AM	TOMORROW 5AM-5PM
SNOWBASIN/POWDER MTN	T-.3	T-.3	T-.3
PARK WEST	T-.3	T-.3	T-.3
PARK CITY/DEER VALLEY	T-.3	T-.3	T-.3
SOLITUDE/BRIGHTON	.1-.4	.1-.5	.1-.5
ALTA/SNOWBIRD	.1-.4	.1-.5	.1-.5
SUNDANCE	.1-.3	.1-.3	.1-.3

TREMPER

Date	Time	Snowbird			Logan Peak		
		Dir	Spd	Temp	Dir	Spd	Temp
890305	600				262	17	14
890305	700	259	20	14	271	18	14
890305	800	261	24	14	272	17	14
890305	900	264	20	14	283	18	14

890305	1000	268	19	18	301	17	15
890305	1100	260	15	23	309	15	17
890305	1200	259	13	32	293	10	19
890305	1300	248	15	37	277	9	20
890305	1400	253	15	39	244	13	22
890305	1500	256	16	33	231	18	20
890305	1600	256	18	30	245	18	22
890305	1700	268	27	31	250	18	21
890305	1800	292	44	28	256	21	22
890305	1900	265	23	26	249	23	22
890305	2000	264	22	27	233	25	21
890305	2100	268	22	27	223	29	19
890305	2200	267	21	28	224	34	19
890305	2300	267	24	28	237	26	23
890306	0	263	22	28	250	23	24
890306	100	263	18	29	267	19	24
890306	200	268	15	30	275	18	25
890306	300	272	15	32	269	16	25
890306	400	273	10	31	258	16	27
890306	500	270	0	32	252	15	25

Date	Time	Park City			Alta		
		Dir	Spd	Temp	Dir	Spd	Temp
890305	600	270	12	13	277	9	14
890305	700	271	12	14	283	10	14
890305	800	261	13	17	279	12	14
890305	900	258	11	23	285	8	14
890305	1000	258	9	25	291	5	16
890305	1100	263	8	28	279	5	18
890305	1200	247	5	39	268	4	22
890305	1300	251	4	39	295	5	25
890305	1400	255	5	37	279	6	27
890305	1500	258	8	36	295	9	25
890305	1600	244	9	32	291	10	22
890305	1700	246	11	28	290	10	23
890305	1800	268	11	26	285	15	27
890305	1900	273	7	26	292	13	26
890305	2000	255	4	25	287	12	24
890305	2100	230	5	24	285	17	24
890305	2200	252	5	24	285	15	23
890305	2300	257	5	23	285	15	24
890306	0				287	14	25
890306	100	277	9	26	281	2	25
890306	200	262	9	26	275	1	25
890306	300	257	8	26	285	1	25
890306	400	259	10	26	278	1	25
890306	500	257	8	26	283	1	24

NNNN

## Samples of Letters of Support



*Howard L. Garber, M.D.*

EMERGENCY MEDICINE

February 21, 1989

Dale Bosworth  
Forest Supervisor  
Wasatch Cache National Forest  
8230 Federal Building  
125 South State  
Salt Lake City, Utah 84138

Dear Mr Bosworth:

I am a regular subscriber to the Utah Avalanche Forecast. This letter is written because of my appreciation for their expertise and public service. I am one of several thousand other back country skiers who use the forecast center on a daily to weekly basis. Not only does this service save lives and provide public education, but it adds to one's security and enjoyment by removing some of the personal risk involved in predicting avalanches. This service enables many people to safely use public lands. The Forest Service should be proud that Bruce, Brad and Tom are operating under the Forest Service umbrella. I have attended some of their volunteer lectures at night.

The Avalanche Forecast center deserves generous funding and additional funding when necessary. While Forest Service budgets are limited and all areas of resource management are not funded as the Forest Service would like, it would be my hope that in your budgets you give special attention to the forecast center. Given its visible community service, it is an opportunity for the Forest Service to ~~show~~ <sup>shine</sup> in the public's eye.

*Howard L. Garber M.D.*

Howard L. Garber, M.D.  
3926 Feramorz Drive  
Salt Lake City, Utah 84124



UTAH STATE UNIVERSITY • LOGAN, UTAH 84322-6700

Edith Bowen Laboratory School  
Telephone (801) 750-3085

27 February 1989

Brad Meiklejohn  
Utah Avalanche Forecast Center  
337 North 2370 West  
Salt Lake City, UT 84116

Dear Brad,

Thank you very much for your excellent presentation on avalanche safety and the natural history of avalanches. You were really great with the kids!! Our students are still talking about your presentation, and have displayed a real interest in avalanches in our area. We are planning a field trip to visit one of the avalanche sites up Logan Canyon later this year.

We had a fun time on Thursday on our cross country skiing field trip on the Thursday following your presentation. We were able to locate several avalanche chutes in the Wellsvilles, and the students understood that there was no avalanche danger at Sherwood Hills!

Again, thank you for your support of elementary education in Cache Valley. I realize its a long drive to Logan; I appreciate your time and effort in putting this all together. I will be sure to write a letter to the Forest Supervisor of Wasatch-Cache National Forest regarding continuing support for educational outreach programs through your agency/office. As Education Chair for Bridgerland Audubon Society, I will also add your name/Avalanche Forecast Center to our resource directory. Hope that is okay with you.

Take care. I hope we will have an opportunity to meet again in the future.

Sincerely,

Karen Matsumoto-Grah  
Dissemination Specialist

March 26, 1989

Dear Forecasters and Friends,

Thanks for providing such a great service. During several trips to SLC this winter, I was able to ski many fantastic back-country areas. I had great skiing days in Cardiac Bowl, the Meadow Chutes, Silver Fork and Maybird, plus a few other places. With your funny and educational forecasts, I was able to venture forth with at least some knowledge to protect me from "the White Dragon". Please accept my contribution; it's cheap insurance. Keep up the good work.

Sincerely,

*Stu*

Stuart Ait  
5024 E. Mulberry Dr.  
Phoenix, AZ 85018

10 N. Wood Ave, #424  
Linden, New Jersey 07036  
March 28, 1989

Avalanche Forecast Center  
337 N 2370 West  
Salt Lake City, UT 84116

Thank you all so much for your work in helping us to safely enjoy skiing in the Wasatch.

Your reliable and friendly backcountry reports are one of the main reasons we keep coming back to Salt Lake year after year.

*Snowplow*

Kenneth Roberts

## Newspaper Articles

# Avalanches Swamp Canyons, Close Roads

By Tim Fitzpatrick  
Tribune Staff Writer

The third major storm of the week proved to be too much Friday as the snow-laden Wasatch Mountains cut loose with a series of avalanches, including one in Little Cottonwood Canyon that tipped over a Utah Transit Authority bus and pushed a car off the road.

The storm dropped up to 34 inches in the mountains and clogged virtually every road in the area Friday morning and closed several canyon highways. Most were reopened in the afternoon so that holiday travelers could finish their trips before the week's fourth storm hits Saturday evening.

No one was injured in any of the slides, although two people were in the car that was swept off the road near the White Pine slide area Friday morning.

"They're fine, no problem... Nobody got buried," said Salt Lake County Sheriff's Sgt. Joe Patience. He said those two and the 12 or so people in the tipped bus were taken back to Snowbird while the U.S. Forest Service shod down other potential slide areas in the canyon, which remained closed all day.

Sgt. Patience said at least four slides crossed the highway in Little Cottonwood between Little Pine and Snowbird, and the canyon was strewn with abandoned cars.

One avalanche slid into the Inn at Snowbird near the resort's entry No. 2, but no damage was reported, Sgt. Patience said.

Another slide temporarily blocked traffic in Provo Canyon near Deer Creek Reservoir about 7:30 a.m., and the North Ogden Pass road east of Ogden was closed by an avalanche early Friday.

It was too much of a good thing for the Little Cottonwood ski resorts. Both Alta and Snowbird did not open their lifts Friday because of the high avalanche danger.

And for much of the day the resorts had "inter-lodge" restrictions in effect, meaning people were instructed to stay inside except to move from one building to another.

The Utah Highway Patrol reopened the highway through the



Bruce Redd decides to be a Santa who moonlights on the side Friday as he uses a snow blower to tackle 3 to 5 inches

of snow in the Salt Lake Valley. There's still more to come for the holiday weekend as another storm is expected.

canyon at 7:20 p.m. after the road had been sanded and plowed.

In the valley, UTA buses operated normally with a few isolated delays. "We're on snow routing on some of the routes at higher elevations," said UTA spokesman Ray Miller.

Big Cottonwood and Parleys

Canyons were closed during the height of the storm Friday morning, but both were reopened by early afternoon.

Holiday travelers are advised to finish their trips before sunset Saturday. The next storm, the fourth major storm in a week, will begin in the afternoon in the

mountains and after dark in the valleys, according to National Weather Service Meteorologist William Alder. It is expected to continue through Christmas morning.

Both a winter storm warning for motorists and an avalanche warning for back-country skiers re-

main in effect through the weekend.

"This will be every bit as big as anything we've had all week," he said. "The whole state should see some white out of this one, even the Lake Powell area."

It will be preceded by

See B-2, p. 33

## LaSal Mountains boast new weather center

By Vicki J. Barker  
Deseret News correspondent

MOAB — A new weather center in the LaSal Mountains offers daily reports on snow and avalanche conditions as part of a burgeoning community winter recreation program.

The LaSal Avalanche Forecast Center began operating late last month to provide updated information on weather, road and cross country ski-trail conditions and avalanche hazards, by recorded message at 259-SNOW.

Craig Bigler, a member of the Canyon Country Skiers club, said in a news release last week that the avalanche and mountain weather forecasting is being provided as part of a program coordinated by the Moab Chamber of Commerce to promote year-round recreation in the area.

The weather center was proposed last year and

funding was provided by the Forest Service to get the operation going in time for 1988-89 winter skiing.

"Our mountains offer ski terrain as good as any in the Wasatch Mountains, snow as good as the Colorado mountains and panoramic views of red-rock canyons unsurpassed anywhere in the world," said Mark Yates, who staffs the station on a contract basis with the U.S. Forest Service.

The LaSal Mountains rise to nearly 13,000 feet southeast of Moab and are accessible via a loop road that connects U.S. 191 south and the scenic Colorado River road, U-128 north of Moab.

Also as part of the program, Grand County will regularly plow the LaSal Mountain Loop Road and Geyser Pass to accommodate mountain-bound motorists.

The LaSal weather station is set up with electronic monitors to record temperature, humidity,

wind speed and wind direction.

Yates, 33, has begun making daily treks into the mountains, measuring snowfall, snow depth and density. As part of his routine, he digs snow pits to determine changes in snow stability.

He compiles new forecasts each evening for the following day, suggesting safe places to ski. He also instructs callers where to get information on guides, lodging and other services in Moab.

If callers need further information, they are instructed to call his home at 801-259-8984, where Yates' wife, Mary, does her best to answer questions.

She said she has confidence in her husband's ability to avoid danger himself when in the mountains. He is an Outward Bound instructor and received training from the American Avalanche Institute.

# Avalanche blocks Logan Canyon road Saturday

By RaeAnne Thayne  
staff writer

*The Herald Journal*  
February 27, 1989

Motorists trying to get through Logan Canyon Saturday got an unpleasant surprise.

U.S. 89 through the canyon was closed for about two and a half hours while state road crews cleaned up after an avalanche that covered both lanes of traffic.

John Duersch, station supervisor of the Utah Department of Transportation road shed in Logan Canyon, said the slide occurred around 3:40 p.m. Saturday, on the dugway close to Mile Marker 388.

The road shed crew had first-hand knowledge of the slide. The avalanche came down on one of the state's own trucks. The driver was not injured, Duersch said. He did not know the amount of damage to the truck.

Crews spent the afternoon putting the snow into loaders because a guard rail at the site prevented them from pushing it off the side.

One witness said on the downhill side of the avalanche about 60 cars — many of them carrying Pepperidge Farm employees on their way to a Beaver Mountain ski party, were held up. On the uphill side, the witness said, over 200 cars had to wait.

Saturday marked the first time this season that a weather-related incident caused the canyon to be closed, Duersch said.

Later that evening, he said, a rock slide near the site of the avalanche closed one lane of traffic and did "considerable" damage to one vehicle.

He said several slides fell in Logan Canyon Saturday, but no others made it onto the road.

"A number of them came down and blocked the river," he said. "When that happens, we leave them alone and the river just goes around or under the snow. We don't bother them unless the water cannot go around the snow."

Bruce Tremper, director of the Utah Avalanche Forecast Center, said the avalanche hazard is now moderate because of the colder temperatures Sunday evening.

That cold spell refroze the snowpack, he said, but a prolonged spell of warm weather could result in increased avalanche danger by about Wednesday.

Climbing temperatures and precipitation during the weekend caused minor flooding along areas of the Wasatch Front and also snowslides in the mountains east of Ogden and in Utah County, National Weather Service officials said Sunday.



Photo courtesy of Farrell Thurston  
Avalanche debris blocks the road near the dugway in Logan Canyon.



Jim Johnson/Herald Journal  
Mishel Bugbee (left) and John Stockman enjoy the sunshine in Logan.



# Folks Shovel Out As More Storms Cut Path for Utah Magna Driver Dies as Flurry Of Crashes Blankets State

By Tim Fitzpatrick  
Tribune Staff Writer

Utahns dug out after the last snowstorm Thursday and braced for the next one as dreams of a white Christmas showed their nightmarish side.

A Magna man was killed Thursday morning after he lost control of his car on icy 2100 South at 3200 West. Kenneth R. Davis, 59, was westbound when his car slid off the road and rolled over, according to Utah Highway Patrol Trooper Ben Lang.

Mr. Davis, who was not wearing a seat belt, was partially ejected, but he was still pinned under the vehicle. After he was extricated from the car, he was transported to Pioneer Valley Hospital, where he died. The highway patrol said the accident is still under investigation.

And a Weber County sheriff's sergeant was hit by an avalanche early Thursday as he drove near Powder Mountain ski resort east of Ogden, but he escaped unharmed. The 2:20 a.m. slide caught Sgt. Mike Shupe in the Upper Valley area about a half mile from the ski area during a driving snowstorm.

"I was just driving down the road when it appeared my headlights went out," Sgt. Shupe said. "I thought maybe the power went out, so I tried my side lights and they still worked. Then I realized I was in the middle of an avalanche and the snow had covered up the lights."

When the slide stopped, his Chevy Blazer was still on the road, but it was stuck in the compacted snow. He radioed for help and caught a ride down the mountain with a snowplow driver. The vehicle was removed later in the day.

"Luckily, it wasn't a big one," the sergeant said, adding that several years ago a road department worker had been caught by a slide in the same place that buried a road grader.

The slide closed the road to Powder Mountain, so the resort did not operate Thursday, but the road was reopened in the late afternoon, the dispatcher said.

Authorities around the state were swamped with traffic accident investigations in the wake of the heavy storm, which left major highways and small roads equally littered with abandoned snowbound cars.

Wednesday's snowstorm and Thursday's aftershocks dropped 3 to 7 inches in the valleys and up to 2½ feet in the mountains, according to National Weather Service Meteorologist William Alder, and a repeat performance is expected early Friday.

"It should last in the mountains until Friday night," Mr. Alder said. "In the valleys it will stop around noon."

He estimated the storm will drop another 2 to 4 inches in the valleys and 1 to 2 feet in the mountains. "We could have some locally heavier amounts in some areas," especially Little Cottonwood Canyon, he said.

"The resorts have a tremendous amount of snow for this time of year, and we're just going to keep adding to it," he said.

Another storm of about the same potential is expected to hit about the time Santa Claus takes to the skies Christmas Eve. "It will be comparable to Friday's storm, maybe even a little stronger," he said.

Bruce Tremper, director of the Utah Avalanche Forecast Center, said an avalanche warning is in effect for back-country skiers in northern Utah mountains through the weekend. "There's a lot of unstable snow out there that people should be warned about."

The snow has been relatively light powder, but the amounts have been heavy enough that the water content is still quite high, he said. "There are widespread areas of human-triggered avalanche potential."

The highest danger exists on slopes above 8,000 feet and steeper than 35 degrees.

Mr. Tremper said there haven't been any reports of avalanche-related injuries, "but there's been a few [ski] patrolmen taking rides."

## No Utah avalanche deaths

Associated Press

Utah ended its second consecutive winter without any avalanche-related fatalities, due in part to a stable snowpack, avalanche forecasters said.

"It has been a good year," said Brad Meiklejohn of the Utah Avalanche Information Center. "It has been over two years since we had a fatality."

The center aired its final tape-recorded telephone message on avalanche hazards Sunday. During the past season, the center received a record 62,500 calls for the recording which provides information for back-country travelers from Logan to Provo. The previous record number of calls was 50,000.

Meiklejohn, who shares forecasting duties with two others at the center, said the weather pattern this winter was largely responsible for the safe season.

"This has been the most stable snowpack we have had for the past three or four years. We had a number of people taking short rides but no burials. Through the end of March, Alta had 500 inches of snowfall, and that is above the 44-year average of 483," he said.

This year there were no periods of extreme hazard, but the center issued warnings on nine days. During Christmas, warnings were issued six days in a row, Meiklejohn said.

## Snowstorms Create Great City Skiing

By Craig Hansell  
Tribune Sports Writer

On the heels of the biggest snowstorm in Salt Lake City in the last five years, there is plenty of snow for urban cross country skiing.

Instead of waiting for the suddenly deep snowpack to settle and back-country avalanche conditions to stabilize, take skis out to a park and enjoy kicking and gliding closer to home.

"We had about 40 skiers here Tuesday," said Pioneer Trails State Park Ranger Mike Roach. "Some of them are even hiking up the hills and skiing the powder. We groom about 2½ miles of track and we also have a one-fourth mile oval track."

Pioneer Trails is a good spot for novice and intermediate skiers to enhance their skiing without driving far from home. There is no track fee.

While Pioneer Trails caters to cross country skiers with the packed track, most Salt Lake City Parks are also good touring areas for skiers without the time to travel to the backcountry or one of the established ski touring centers. Although there isn't an official trail packed at Jordan River State Park, skiers are using the jogging trail from the Fairgrounds to 1060 North.

For skiers who want to broaden their horizons beyond Reservoir or Liberty parks, in addition to the ski touring centers there are two tracks being set at Rockport Reservoir State Park. The fee at Rockport is \$3 per car for day use. Wasatch Mountain

State Park, in conjunction with the Homestead, is setting 10 kilometers of cross country ski track and the track fee is \$3 a person.

Wasatch Mountain State Park is the hub for the state's snow grooming operation for snowmobile trails to Park City and Tibble Fork. Although the grooming is to make the area nice for snowmobiles, it is also good for cross country skiing.

The U.S. Forest Service usually packs the Beaver Creek Trail, above Kamas on the Mirror Lake Highway.

"We went up after the last storm and groomed part of it but we broke the axle on the groomer and probably won't finish until we get the machine repaired the first of next week," said Ardean Anderson with Kamas Ranger District. "We have about 20 inches of snow. The trail should be good. We had about 10 couples go up Tuesday."

After trying the close-in city-park touring, the lure of longer tracks offered by Solitude Nordic Center, Jeremy Ranch Cross Country Ski Area and Park City's White Pine Ski Touring Center will add spice to your mix of ski terrain. It is easy to see how Utah's more accomplished cross-country skiers can mentally loose themselves skating and gliding along the miles of well-groomed track.

A day of skiing in the park might just spark your interest for competition in one of next month's Utah Winter Games cross country ski races or the Wasatch Citizens Series.

Utah Avalanche Forecast Center Director Bruce Tremper examines a slab, or layer, of snow.

# Measuring avalanche danger

By John J. Wise  
Utah outdoors editor

**BEAVER MOUNTAIN** — Alpine and nordic skiers alike can ski safely here. The risk of avalanche on the groomed slopes of this family-owned ski area are slim to nothing, says the director of the Utah Avalanche Forecast Center.

But not every skier wants to ski on safe snow — areas where the potential for avalanche is considered low. Some skiers, particularly back country nordic enthusiasts, actively seek risks when they head into the snow-covered mountains, says center director Bruce Tremper. Much of the same terrain that is prone to avalanche — north-facing slopes steeper than 30 degrees — also offer some of the best skiing.

"People call us all the time wanting to know where the most 'gnarly' skiing is," Tremper said explaining the center's recorded telephone message that provides updated information on general avalanche conditions. Many callers, however, call for the information to avoid the risk and danger a avalanches pose.

Still there are other winter recreationists — less skilled cross-country skiers and snowmobilers in particular, Tremper said, who head into the mountains unaware, and frequently unprepared to identify or avoid avalanche hazards. For the most part, they are lucky: an average of 2.5 lives are claimed each year by Utah avalanches, he said.

Although the avalanche potential on Beaver's groomed slopes is low to nil, the snow that accumulated above Harry's Dream lift this winter made for good pit-digging conditions. Last week Tremper dug a snow pit to evaluate the snow pack in terms of its potential to slide, to avalanche.

Snow pits, as the name implies, are holes dug into the snow.



*'You don't need any fancy tools or instruments. With a snow saw and shovel you can test the strength of snow and the likelihood of avalanche all in about 10 minutes.'*

— Bruce Tremper

Sounds simple, Tremper said, but a little digging around can yield basic information that just about anyone can use to judge the potential for avalanche. With a little effort, a little time and a few basic tools, just about anyone can dig a pit, and dig up some useful information while they're at it.

Without going into a bunch of technical jargon about snow dynamics, temperature gradients and snow crystal formation, Tremper said back country recreationists should begin with a basic checklist to assess avalanche potential.

— First, is the area steep enough to slide? Generally speaking, slopes steeper than 30 degrees are considered avalanche prone.

— Second, is there a slab, or distinct layer of stronger snow on top of a weaker layer? If there is no distinct slab, there's little chance it will slide, Tremper said.

Judging the slope doesn't require a pit, but to observe the layers and to determine if they are weak or strong can easily be ascertained with a little digging.

"You don't need any fancy tools or instruments. With a snow saw and shovel you can test the strength of snow and the likelihood of avalanche all in about 10 minutes," Tremper said.

The first step is to dig a pit as deep as you like and large enough to accommodate roughly two skiers. After the pit is dug and one



Logan Ranger District Technician Mike Van Horn (above), digs a snow pit at Beaver Mountain, while Tremper (left photo) looks on.

Photos: Pete Schropp

See **AVALANCHE** on page 10