

## UTAH AVALANCHE FORECAST CENTER

### 1985-86 ANNUAL REPORT

#### I. WEATHER AND SNOWPACK SUMMARY

The winter of 1985-1986 will long be remembered by all involved in avalanche work in Utah. The death and destruction which occurred in the Wasatch Mtns. is unparalleled in any winter since the 1930's.

Snow fell on several occasions in October, but warm temperatures had melted all the snowcover by early November, except for that which lay on shaded slopes at upper-elevations. These remaining snowpacks were gradually weakened by temperature gradient metamorphism. Light rain or a period of riming began a brief snowfall on Nov. 5, forming a thin crust with 1-2" of overlying snow. This snow, and a subsequent snowfall, underwent TG weakening until snow began to fall on Nov. 10.

The Utah Avalanche Forecast Center began forecast operations on November 11, just as the avalanche season got off to a running start. Heavy snows accompanied by strong SW winds deposited over 3' of snow from Nov. 10-13., and on the 13th, the first accident of the year occurred. Two experienced tourers died in a large slide in the Sunset Peak area between Brighton and Alta. This large soft slab avalanche failed on the recrystallized weak layer overlying the thin crust.

This deeper snowpack instability persisted into Dec., as heavy snows continued. By the middle of Dec. however, the snowpack had become quite deep, and all avalanche activity was within newly fallen snow. As this problem was mitigating, a new one was rapidly developing. The stormy weather of the early season was replaced by fine weather through the New Year, and with it came weakening of the snowpack in the form of surface hoar and upper-level temperature gradient crystals.

In early Jan., it became apparent that the snowpack was in a dangerous state. On the 6th of Jan. a storm of 6-12" produced vigorous avalanching on the buried weak layers, and such a slide claimed the life of another experienced tourer in Water Hollow of the South Fork of the Provo River Canyon. Snowfall through much of January was light, but the snowpack produced a continued uneasiness with sporadic deep releases and the ever-present sounds of collapse. WHOOMP!

February was an exciting month. Snow fell on every day until the 25th, with the greatest amount in the period from the 13th to the 23rd. The "Valentine's Massacre" brought 8-10' of dense snow to the Wasatch, accompanied by rain and high winds. Falling on an already-fragile snowpack, this major Pacific storm created extreme avalanche conditions, with large, destructive, natural slabs to depths of 15'.

During this period, 2 deaths occurred by avalanche. The first was a young, unprepared snowboarder who triggered a slide

near the Guardsmen's Pass Rd. in Brighton on 2/17/86. The second was a young alpine skier at Alta who was caught by a large natural avalanche which came off of Sugarloaf Peak and ran across the intermediate run the person was skiing on 2/19/86. Other avalanche related damage included:

- 2/13 \$2 million home at Sundance destroyed
- 2/13 Huntington House at SnowBasin hit and damaged
- 2/13 4 cars buried and slightly damaged at Alta
- 2/17 Bridal Veil Falls visitor center destroyed and Provo Canyon road damaged as the snow-blocked Provo River overran its banks
- 2/17 5 cars trapped, 2 cars buried, and nearly 100 people stranded at Powder Mountain

In addition, power lines were broken, roads were blocked, and acres of mature timber were cleared out of slide paths which hadn't run as large in recent memory.

The Utah Avalanche Forecast Center issued warnings on 11 consecutive days during this period, with either high or extreme avalanche conditions prevailing. The public information recording call rate exceeded 600/day, and press coverage included local and national media. As a result, backcountry travel was severely curtailed, and further tragedy was avoided.

Clear weather continued into the first week of March, allowing the snowpack to settle and stabilize, and producing good corn skiing. With only a few isolated exceptions, all avalanche activity in the next few weeks was direct-action, and a period of good, relaxed powder-skiing and avalanche forecasting ensued.

Greater than normal precipitation and lower than normal temperatures in April, prolonged the spring melt. Nearly 3 ft of new snow fell on April 25 and 26 and caused a series of very sensitive surface slabs. Thick, buried weak layers formed in January were still present in the snowpack but the spring thaw proceeded so slowly that deep slab releases remained sporadic at best.

While mistakingly believing that spring was just around the corner, another 5 ft of snow fell between May 4-9. Backcountry avalanche warnings were issued on May 8th and 9th as widespread surface instability was creating many soft slab avalanches. A snowboarder triggered a slide on May 9th on "Snowboard Alley" but was unhurt.

154 avalanche forecasts were issued beginning on November 11, 1985 until April 13, 1986. Weekend forecasts were issued after April 13 until May 16th when a spring statement was left on each recording until district offices began their summer campground messages. Below is a summary of forecasts issued from Nov. 16 - Apr. 13. Compared to previous years we see a slight drop in the number of low hazard days and a slight rise in the number of extreme hazard days.

TABLE 1. SUMMARY OF FORECAST HAZARD RATING

HAZARD	83-84	TOTAL	84-85	TOTAL	85-86	TOTAL
LOW	69	39%	52	30%	44	28%
MOD	83	48%	90	52%	82	53%
HIGH	20	12%	30	17%	25	16%
EXTREME	1	1%	2	1%	4	3%

## II. AVALANCHE ACCIDENTS

### A. Season Summary.

Intensive reports on an incident in the Logan area mountains, which caught but did not hurt a skier, and an incident in the Brighton area (which trapped several snowboarders on Feb. 2 and prompted the nick-name, "Snowboard Alley") were also completed. Copies of these reports were sent to the Westwide Avalanche and Mountain Weather Network in Denver and are also on hand in the UAFC files.

Figure 1 shows the number of backcountry avalanche incidents reported to the UAFC plotted against the highest avalanche hazard rating issued that morning. There were 39 reports of backcountry travellers inadvertently triggering avalanches. 15 more people who triggered slides were caught and rode with the avalanche. 7 others who triggered and were caught became partly buried. 5 were totally buried and killed. In all there were 66 backcountry avalanche incidents reported to the UAFC which involved people.

Figure 1 shows that all of the avalanche related deaths occurred on days rated as high or extreme. Figure 1 also shows that more people are involved in backcountry avalanches during days of "moderate" hazard. This may be because more people enter the backcountry during moderate hazards when avalanches are still possible. Although many skilled backcountry travellers intentionally trigger slides to test stability there are others who are inexperienced in recognizing the lingering areas of instability during moderate hazard periods who are unexpectedly involved in avalanches. There was a concentrated effort by UAFC personnel to educate the public on what to watch out for during all hazard periods and to emphasize the fact that all avalanches are potentially dangerous.

### B. Fatalities.

Each of the five avalanche related deaths were investigated and reports sent to the Westwide Avalanche and Mountain Weather Network in Denver:

November 13, 1985 - 2 male backcountry skiers on Sunset Peak between Brighton and Alta, 24 and 29 yrs old.

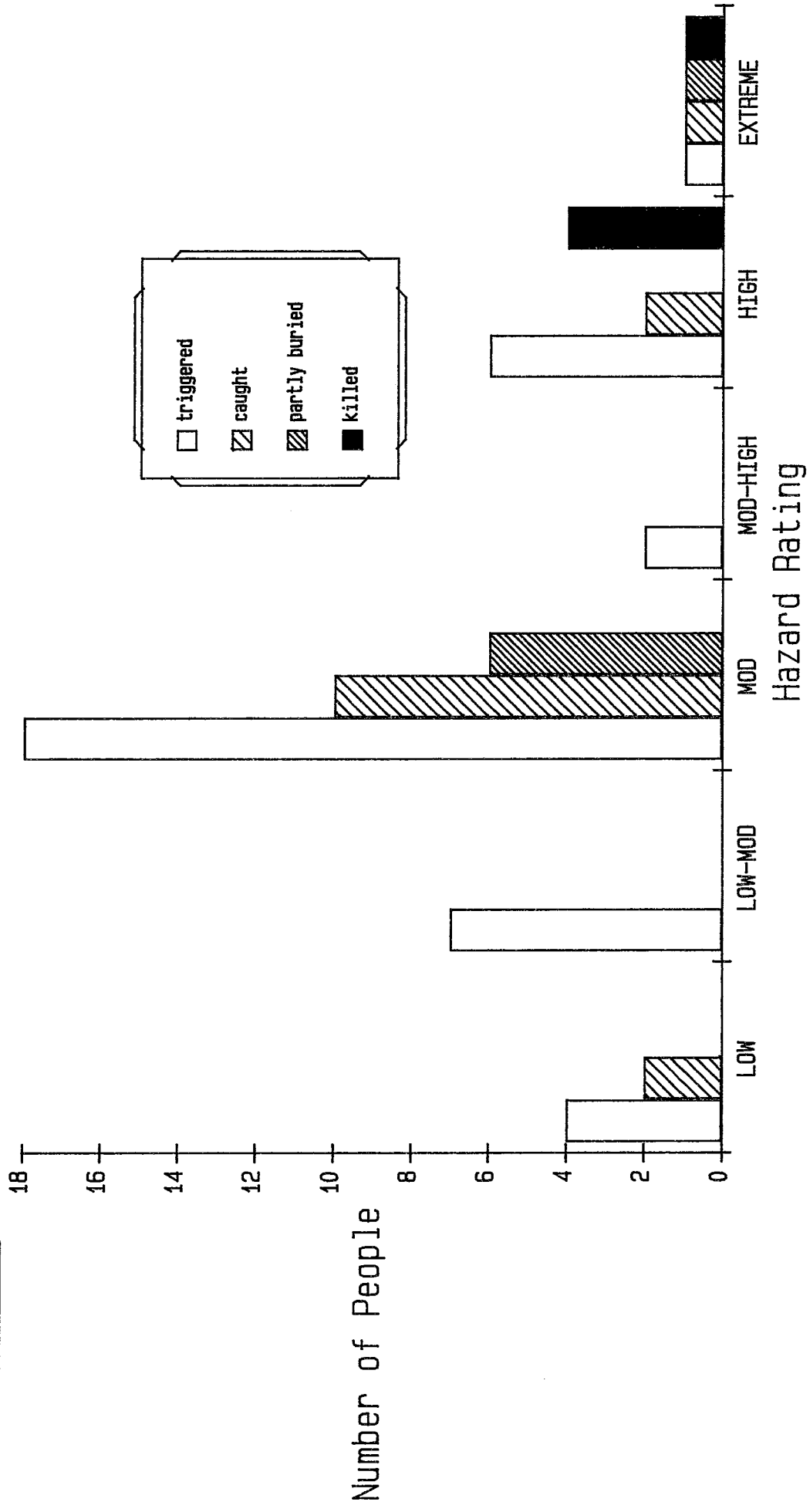
January 6, 1986 - 1 male backcountry skier in Water Hollow, South Fork of the Provo River Canyon, 33 yrs old,

February 17, 1986 - 1 male snowboarder on "Snowboard Alley" near Brighton, 18 yrs old,

February 19, 1986 - 1 male downhill skier on Devil's Elbow in Alta Ski Area, 16 yrs old.

UTAH BACKCOUNTRY AVALANCHE INCIDENTS  
(1985/86 SEASON)

Figure 1



The 1985/86 season was the deadliest winter in Utah since the Bingham Canyon avalanche disaster in 1926 killed 40 people. Figure 2 shows the number of avalanche related fatalities in Utah since the first recorded avalanche in 1860. This graph is separated into three sections; the first is during Alta City's boom of logging and mining, the second includes a slower period of mining, the third marks the beginning of skiing.

197 people have been killed by avalanches in Utah since 1860. (If we include the 60 rumored to have been killed in Alta City in 1874 by a combination of avalanche and fire, this total reaches 255). Even without including the unsubstantiated disaster in 1874, avalanches kill more Utahans than any other natural hazard. Figure 3 shows that most fatal avalanches occur during January and February.

Since 1980 Utah has averaged 2 avalanche fatalities per year. If this fatality rate continues for the next 4 years, we can expect the number of fatalities during the 1980's to reach 20, far higher than most previous decades and far higher than any other state in the union.

Most of the modern avalanches kill backcountry skiers but we are also experiencing an alarming increase in fatalities within developed ski areas. Table 4 shows the activity of each victim since 1940.

TABLE 4. ACTIVITY OF AVALANCHE VICTIMS

	R	BCW	BCS	DSA	
1940-49			2		R - travelling on roads
1950-59	1		1		BCW - backcountry walker
1960-69		3	1	1	BCS - backcountry skier
1970-79	1		1	4	DSA - within developed ski
1980-86			8	4	area (including "out
					of bounds" skiers)
TOTAL	2	3	14	9	

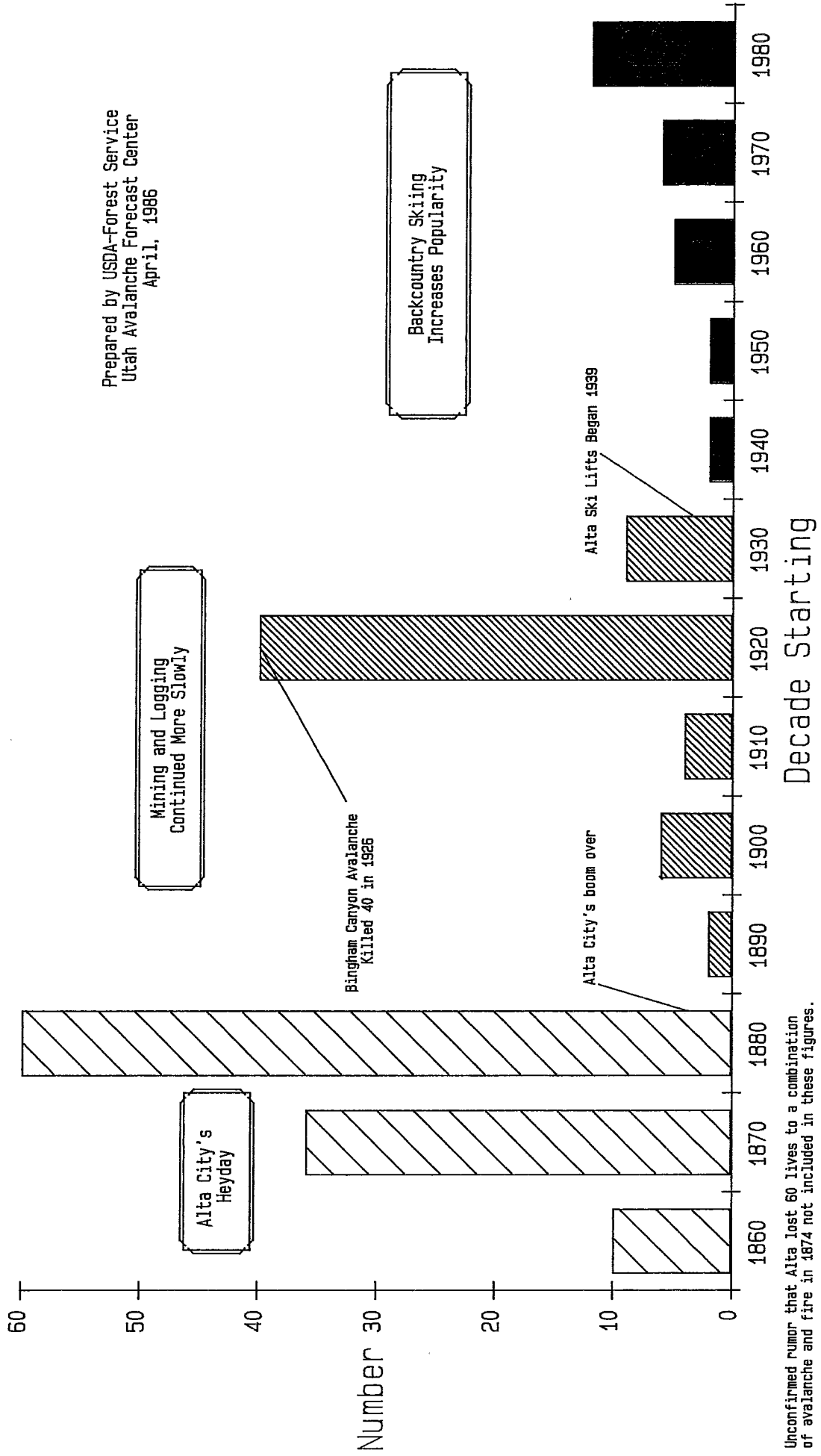
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Many backcountry users believe this increase is because of the increasing number of backcountry skiers. Others believe it is because of the greater knowledge and ability of skiers who are more willing to take risks, or to test the limits of their skills and knowledge. One suggestion that the increase in avalanche fatalities is related to a wetter climate in Utah during the past several years is unlikely because the number of avalanches is not necessarily different than other years but the number of people exposing themselves to avalanche hazards has increased.

Three of the avalanche fatalities this season occurred when backcountry travellers were taking unnecessary chances and they triggered the slide that killed them. Two of these were experienced backcountry skiers and accompanying parties felt they knew enough to be more cautious with the recognized hazard. One of these three was an inexperienced snowboarder who felt he could "out race an avalanche or dig himself out if caught." Accident

Figure 2

# UTAH AVALANCHE FATALITIES (1860-1986)



Prepared by USDA-Forest Service  
Utah Avalanche Forecast Center  
April, 1986

Alta City's Heyday

Mining and Logging Continued More Slowly

Bingham Canyon Avalanche Killed 40 in 1926

Alta City's boom over

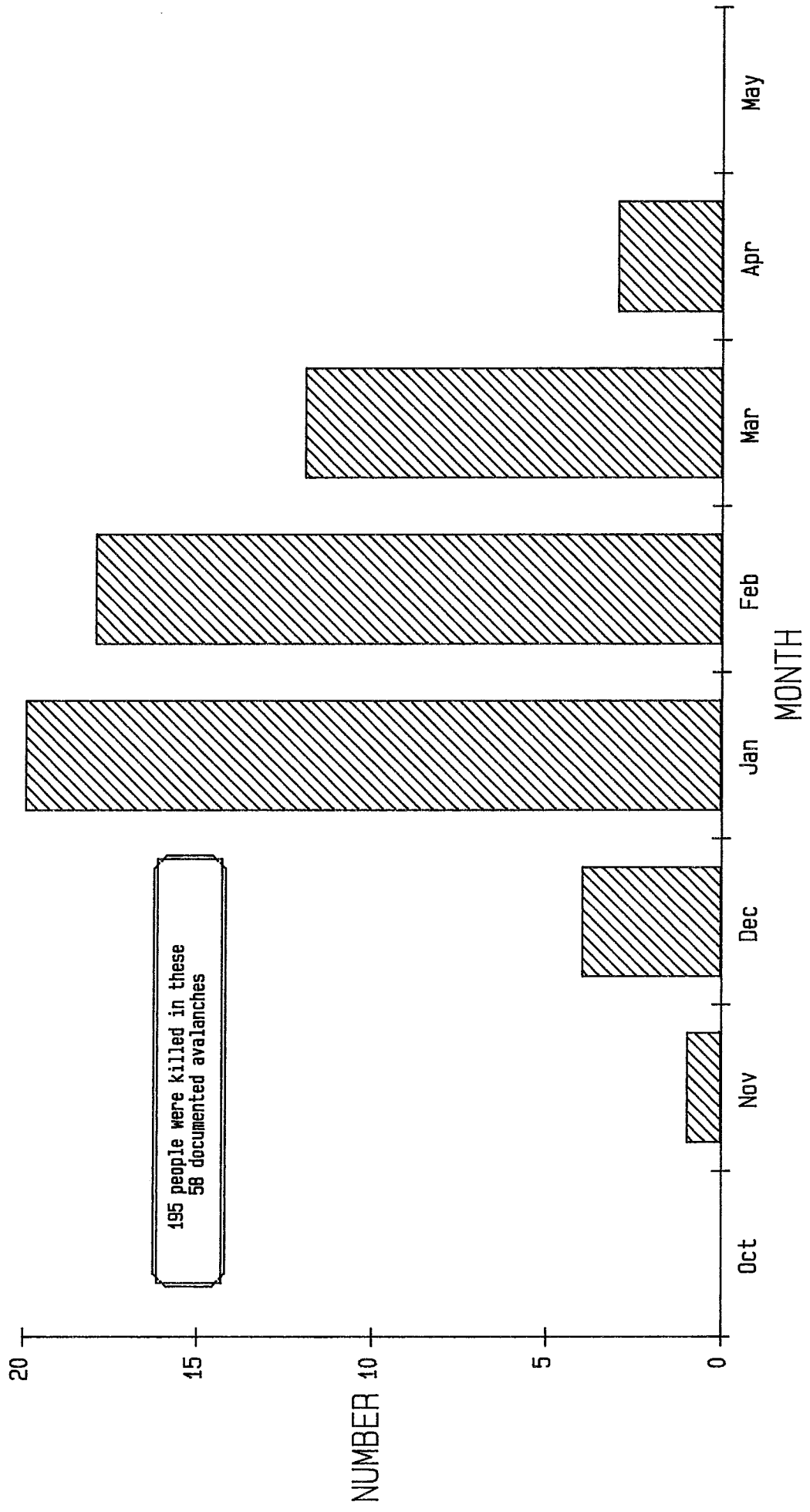
Alta Ski Lifts Began 1939

Backcountry Skiing Increases Popularity

Unconfirmed rumor that Alta lost 60 lives to a combination of avalanche and fire in 1874 not included in these figures.

Figure 3

FATAL AVALANCHES BY MONTH  
(1860-1986)



summaries on each of these incidents concluded that they were avoidable.

Two of this season's avalanche deaths occurred when avalanches came down upon unsuspecting skiers. One, in the backcountry, occurred when a skier triggered a slide from above, thinking a fallen skier at the base of the slope was cleared. Unfortunately the fallen skier was swept into a tree by the avalanche and killed. (The skier who triggered the slide was also killed, as mentioned in the previous paragraph). Another fatal accident occurred within a developed ski area. It was a massive precipitation induced event which ran further and larger than anticipated burying the victim under 10 feet of snow and broken timber.

### III. UAFC USER SURVEY RESULTS

In an attempt to provide a better service to our user population, the staff of the Forecast Center conducted a phone survey to determine the levels of skill, knowledge, and understanding of the individuals using the service.

40 calls to the SLC public recording were randomly intercepted over a period of one month, and each person was asked to respond to 16 questions. In addition to the 40 people interviewed, several others hung up when they realized they had reached a "real" person. All those interviewed were very cooperative; many were interested to know more about the Forecast Center, and expressed gratitude for the service provided.

90% of those surveyed were male, 10% female, of ages ranging from 8-43, with an average age of 29 yrs. 66% said their preferred backcountry activity is cross country skiing, 27% said downhill skiing, and 7% said snowboarding. No calls from snowmobilers or other users were intercepted.

28% of those interviewed call the 364-1581 on a daily basis, 3% said 5-6 days a week, 33% said 3-4 times a week, 23% 1-2 week, 5% said they called on weekends only, 10% said they call less than once a week, and several persons were calling for the first time. 46% of the respondents said they go into the backcountry 2-3 days a week, 31% said they went on weekends only, while 23% said they went two times a month or less. 54% said they do not ski outside of the Tri-Canyon area, while 46% said they did. Other areas of use include the Park City area, Uintas, the Stansburys, and the Provo area.

51% rated themselves as expert skiers, 41% said intermediate, and 8% said they were beginners. 85% said they ski slopes of 20-25 degrees, 70% said they ski slopes of 30-35 degrees, 43% said they ski slopes steeper than 35 degrees, and 12% said they did not know how steep the slopes they ski are. 53% said they had had some formal avalanche training, while 47% said they had not. Training ranged from multi-day AAI courses to one day lectures.

87% of the callers were interested in hearing both avalanche and mountain weather information on the recording, while 10% were



only interested in mountain weather, and 3% were only interested in avalanche hazard information. 87% said they felt the forecast was just right in terms of content and terminology, while 5% said they felt the forecast was too general and 8% said it was too advanced. 100% of the callers felt the avalanche information was accurate, and several commented that they "hoped it was".

Of those surveyed, 55% said that the Forecast Center is their only source of information, while 45% said they use other sources, including ski patrols, discussion with more knowledgeable friends, and snowpits on their own.

72% said they go into the backcountry during Moderate hazard conditions, 25% said they go when a High hazard exists, and 8% go very cautiously when an Extreme hazard rating is issued. Perhaps the most revealing question was, "What does a Moderate Hazard mean to you?" The answers ranged from "moderate probability", or "moderate sized avalanche", or "moderate risk," but on the whole, most people were aware that the need for increased caution was implied, especially in those areas emphasized in the discussion.

29% of those interviewed said they had been involved in an avalanche at some point in their lives, while 71% said they had not. Of those who said they had been involved in slides, most were only sluffs, and only a few said they were partly buried, while several said they had participated in rescue operations.

The data reveal some interesting things. It is no surprise that most of our users are male, but it would be nice to close this ratio a bit. The average age of our user is close to that shown by Armstrong (Avalanche Review, Vol.4, #2) in her depiction of the modern avalanche victim, who is, on the whole, a male of 27 yrs.

The newest and fastest growing segment of the backcountry population is the snowboarder community. While statistics show some use of the UAFC by this group, unfortunately the level of awareness of this group was raised most significantly through the death of a snowboarder. A continued effort must be made to reach this group to prevent further tragedy. In addition, the UAFC continues to receive little use from the snowmobile community.

On the whole, our user population is composed of skilled and knowledgeable individuals who enter the backcountry frequently and who maintain continuity in their awareness of avalanche conditions. While not all of our users have had formal training, most understand the interconnectedness of mtn. weather and avalanche conditions, and have at least a general grasp on avalanche terminology. Awareness of the observer number is also increasing, as several of those interviewed mentioned that they called it as well.

It is encouraging to see that everyone thinks that the avalanche information is accurate, but at the same time we all know we have been wrong at some time. We must continue to emphasize that we provide "an informed opinion", not the gospel on avalanches. Over half of those surveyed said that the UAFC is their only source of information; we must work to encourage

people to do their own forecasting, especially since so many are out pushing it in marginal conditions.

The hazard classifications continue to be a problem, especially the "Moderate" rating. We have seen how many accidents happen under a Moderate rating, and as can be seen from the survey results, a high percentage go skiing under a Moderate rating. We must continue to work to clarify this very hazy term, not to scare people away from the backcountry, but to ensure that they understand that an avalanche occurring under Moderate conditions is as dangerous as one under High hazard.

UAFC personnel spent a considerable amount of time discussing hazard rating terminology. It was felt that the current terminology was consistent with the recognized instability. However, we determined that it is necessary to include the size and potential harm of expected avalanches to better distinguish avalanche hazard. In addition, we are using stronger wording to express the fact that most avalanches, whether they occur during a low hazard or an extreme hazard, can hurt or kill individual travellers.

GENDER

M	90%
F	10%

AGE

28.8 YRS

BACKCOUNTRY PREFERENCE

Cross-country skiing	66%
Downhill skiing	27%
Snowboarding	7%
Snowmobiling	0%

CALL RATE OF USERS POLLED

Daily	28%
5-6x/week	3%
3-4x/week	33%
1-2x/week	23%
Weekends only	5%

BACKCOUNTRY USE OF CALLERS POLLED

Daily	0%
4-5x/week	0%
2-3x/week	46%
Weekends only	31%
2x/month or less	23%

SKIING ABILITY

Beginner	8%
Intermediate	41%
Expert	51%

<u>SLOPES SKIIED</u>		
20-25 degrees		85%
30-35 degrees		70%
>35 degrees		42%
Don't know		13%

<u>AVALANCHE TRAINING</u>		
Yes		53%
No		47%

<u>INTEREST IN CALLING</u>		
Avalanche Hazard Information		3%
Mountain Weather Information		10%
Both		87%

<u>IS UAFC YOUR ONLY SOURCE OF INFORMATION?</u>		
Yes		55%
No		45%

<u>IS THE AVALANCHE FORECAST</u>		
Too General?		5%
Too Advanced?		8%
Just Right?		87%

<u>DO YOU FEEL THE AVALANCHE INFORMATION ACCURATE?</u>		
Yes		100%
No		0%

<u>DO YOU GO INTO THE BACKCOUNTRY DURING</u>		
Moderate Hazard?		73%
High Hazard		25%
Extreme Hazard		7%

<u>DO YOU GO OUTSIDE OF THE TRI-CANYON AREA?</u>		
Yes		46%
No		54%

<u>HAVE YOU EVER BEEN INVOLVED IN AN AVALANCHE?</u>		
Yes		29%
No		71%

#### IV. CALL RATE

An examination of the call rate data (Table 2) shows an overall increase in calls since last season, yet not as high as previous seasons. We did have a marked increase in media coverage this season over previous seasons. However, many backcountry travellers remarked on their extra caution and desire to stay within developed ski areas because of the early season fatalities, then the poor snow conditions during mid-winter, and

finally because of the extreme hazards during February. All these factors could have kept the call rate down.

The remarkable increase in the Logan public number should be noted. Seasonal calls in Logan doubled this year over the last three years. There was a concerted effort by UAFC personnel to work in the Logan area mountains on a weekly basis. Also there was an increase in snow, weather, and avalanche information coming to the center from local tourers. This made for more accurate and meaningful avalanche reports and combined with an increase in local avalanche awareness, a more popular avalanche information service ensued.

TABLE 2. SEASONAL CALLS TO UAFC INFORMATION

<u>INFORMATION PHONE</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
SIC Public	40,355	38,408	32,476	36,535
SIC Observer	<u>4,357</u>	<u>5,300</u>	<u>4,652</u>	<u>5,469</u>
SIC Total	44,712	43,708	36,701	42,004
Ogden Public	3,671	4,076	2,278	2,292
Provo Public	3,042	2,577	2,386	2,562
Logan Public	<u>1,890</u>	<u>2,725</u>	<u>1,706</u>	<u>5,464</u>
Area Total	53,315	53,086	43,498	52,322

Figure 4 shows the UAFC call rate on the SIC public number plotted against call rates from the three other regional avalanche centers. It is rewarding to see that more people call the Salt Lake avalanche information number than any other. This is more than likely because the mountains are so close to Salt Lake and the amount of backcountry use is great.

Population figures shown on Figure 2 are from 1982 statistics and do not include outlying suburbs.

The number of callers in Denver may be misleading because they maintain several other information lines in towns closer to the mountains and it is suspected that their total call rate matches Utah's.

Although the population of Seattle and outlying districts is similar to Denver, the number of backcountry skiers is far less. This is reflected in fewer callers to their backcountry avalanche information line.

Alaska simply has fewer people and fewer backcountry users than other states. Therefore, use of their backcountry avalanche information service is less.

Some indication that the number of callers increases when precipitation in the mountains increases was tested by plotting daily calls on the SIC number with 24-hour snowfall at Alta in Figure 5. Clearly minimum daily calls occur after long dry periods. For instance, December 25th showed only 45 callers

willing to interrupt their Christmas after 17 days of dry weather.

Many peaks not associated with precipitation coincided with weekend days. Maximum calls in February exceeded 600 per day during an intense period of avalanching. Over one hundred callers continued each weekend day through the end of April and on into May. 298 calls were recorded on the SLC number on April 26 after 1 1/2 feet of new snow fell in the mountains.

Monthly call rates on the SLC public recording were also compared with previous seasons in Table 3. It is felt that more calls in November reflected the fact that 2 backcountry users died on November 13th well before the start of a typical season. Fewer calls in December reflect the dry weather period (whereas December of 1983-84 was much wetter than normal). January, March, and April seem consistent with previous years. February showed an increase in callers over previous years because of the number avalanche fatalities, the intensity of avalanche activity, and the record precipitation.

TABLE 3. MONTHLY CALL RATES

YEAR	NOV	DEC	JAN	FEB	MAR	APR
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	6,255	3,706

Average calls between November 11, 1985 and April 13, 1986 on the SLC public number was 225 per day.

## V. EDUCATION

Much of the purpose and value of a regional avalanche information center relies on the public awareness of avalanche hazards. In addition, as people learn about the avalanche phenomenon they, in turn, contribute knowledgeable information to the avalanche center thereby improving the content and accuracy of each daily forecast. All the education and interaction between the general populous and the avalanche center improves public safety. Therefore the UAFC staff is dedicated to raising the educational level of the general public along the Wasatch Front, both through daily avalanche advisories and through direct contact with interested groups and individuals.

Approximately 27 group talks were conducted this season concerning some aspect of avalanches. The following is a list of organizations requesting speakers from the UAFC:

- U. of Utah's wilderness courses, Basic Avalanche Seminar, Geology/Geophysics Dept., and Geography Dept.,
- Powder Mountain and Deer Valley's ski patrols,
- Park City's National Ski Patrol,
- the American Avalanche Institute's pro course at Alta and backcountry short course at Park West,
- LDS Life Flight,

Figure 4

PUBLIC USE OF AVALANCHE INFORMATION  
(Calls on 24-hour Recordings)

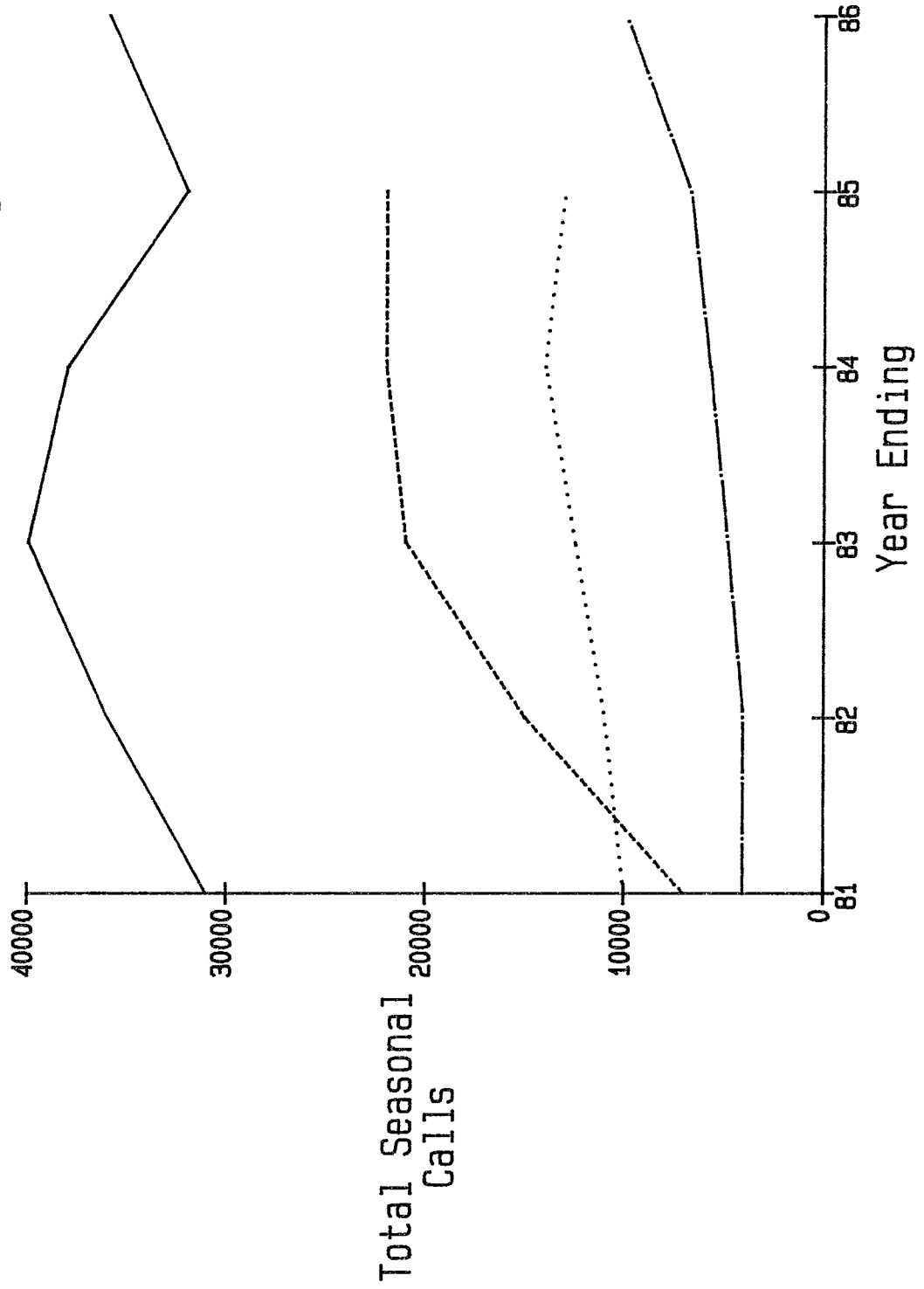
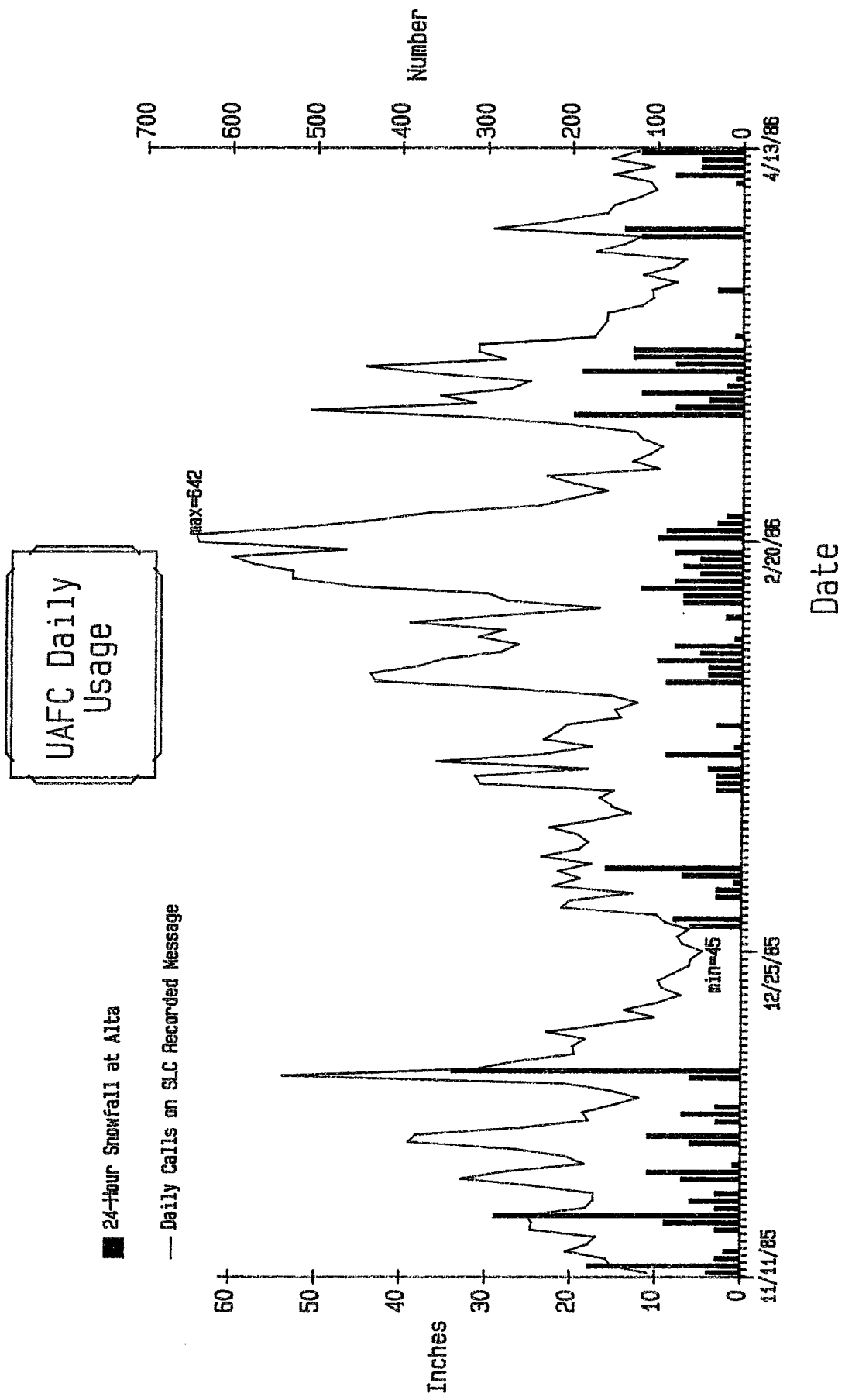


Figure 5



Army Special Forces,  
Hansen Mountaineering of Provo,  
Wasatch Mountain Club,  
Utah Museum of Natural History,  
Brighton Touring Center,  
radio talk shows on KUER, KRCL, KTALK, and NPR,  
PBS (documentary to be broadcast fall of '86).

Over 1400 individuals attended these lectures, not including the radio audience. Each of the lectures had specific topics or purposes. Some major topics requested included: snowpit analysis, route finding, avalanche awareness, avalanche forecasting, and avalanche mechanics. Additionally UAFC personnel talked generally about avalanches in the Wasatch. A new topic requested this season was about avalanche safety during helicopter rescues because of the growing need for helicopter evacuation.

In addition radio, television, and newspaper interviews with UAFC staff continued throughout the winter. The public avalanche information service was advertised in most special stories about avalanches. At least 34 separate newspaper articles this winter concentrated on avalanche hazards including 2 editorials. A special feature was written about the UAFC for the Intermountain Region "Forest Service News".

## VI. INSTRUMENTATION

Four new developments occurred this season in remote mountain weather observations in addition to the regular remote stations at Alta, Snowbird, and Solitude:

1. Campbell Scientific developed software for the UAFC so we could access and archive data from their experimental station at 9800 ft atop Logan Peak. The Logan Peak unit has a radio retrieval system that cannot be added to the NWS automatic interrogation program. Although wind information was sporadic because of often rimed and broken wind sensors, other sensors worked well and this season we were able to get 24-hour information from the Logan Peak. This information was shared with the NWS and greatly improved our service in the northern mountains.

2. Park City Corporation purchased a Campbell micrologger to access wind direction and speed, temperature, and precipitation from Tri-County peak at 10000 ft. This location is well above surrounding ridges and provided good free-air data for the northern tri-canyon area. The data were added to the NWS automatic interrogation program and provided weather and avalanche forecasters with 24-hour information.

3. The UAFC purchased a Campbell micrologger and helped install it at Sundance Ski Area at 8700 ft atop their new chair lift, on an eastern ridge of Mt. Timpanogous. There were several manufacturer errors and the system never got fully operational. However, those malfunctions have been fixed and the ski patrol director, John Pickup, is testing the unit at his home this summer. Everything seems to be working well and the unit should provide 24-hour information next season. The location at



Sundance will greatly improve the UAFC observations in the Provo area.

4. A snow-height sensor, designed and built by Duain Bowles while he was employed by the UAFC, was installed at the Snowbird snow study plot this year. This sensor helps determine snow settlement and has been operating most of the season. Correction factors for temperature are needed to make the information useful and this has yet to be added automatically.

## VII. PERSONNEL

This season administrative duties were moved from DI to the Wasatch-Cache supervisor's office and Frank Grover became the UAFC supervisor.

The program manager and forecaster, Ferguson traded duties with two other full-time forecasters, Soucie and Meiklejohn throughout the main part of the avalanche season. Each forecaster spent 2 days a week in the forecast office composing and disseminating daily avalanche forecasts. Three days each week were spent in the field, gathering snowpack information, exchanging information with mountain observers, and maintaining the communication link between observers, ski areas, and backcountry tourers. Some help with instrumentation and observation methods was also provided by UAFC personnel. A fourth forecaster, Lambrose, filled in one day each week at the forecast center and contributed field observations.

Each forecaster also investigated and produced extensive reports on separate avalanche incidents. All gave talks to various groups on avalanches.

## VIII. UAFC OPERATIONS

An IBM/PC was put to full use this season and streamlined much of the operational chores within the office. The following are some highlights:

1. A 20 MB cartridge disc was added so all computer tasks are now easily implemented with a main menu of simple commands. Each menu command begins a small program that searches for the correct file, implements the correct function, automatically retrieves and stores information, and returns to the main menu.

2. Communication with other computers was improved; data can now be automatically sent and retrieved to and from the NWS AFOS computer system, a reliable link was established with the FS FLIPS computer system, automatic programs were implemented to interrogate each remote ridgetop micrologger, and an easy transfer program was designed to send weather and snow data to mountain located computers (e.g., the UDOT PC at Spruces Guard Station).

3. Files were established to store backcountry avalanche information, avalanche forecasts and warnings, and daily weather observations.

4. NWS forecasters routinely use the UAFC computer when UAFC personnel are out of the office and will be using our established link with FLIPS for their fire weather forecasting.

Because the volume of data coming into the UAFC is increasing each season, the value of the computer is also increasing. One improvement which is vital for near-future operations is automatic plotting of data. Each forecaster now looks for patterns and trends in the mass of numbers presented each day. This task is cumbersome and takes away from time needed for a complete assessment of the avalanche situation. Seeing the numbers plotted in useful and revealing formats will greatly improve the accuracy and value of avalanche forecasts.

## IX. ADVERTISING

In the past several years our main effort to advertise our local call numbers for our recorded forecasts has been by distributing cardboard displays which hold the small stickers with the local recording number. These displays were mainly distributed in the major touring and skiing equipment stores along the Wasatch Front and at most of the ski areas. All these stores were recontacted at the beginning of the season and supplies replenished.

This effort has seemed adequate and we feel we are reaching most of the backcountry skiing population. However, we seem to be missing contact with a large population of backcountry users, for example, snowmobilers and snowboarders.

The rash of snowboard accidents in Utah this winter is cause for concern. The Brighton Touring Center put on a free seminar especially for snowboarders that drew 30 young people. UAFC personnel discussed the need for a quick and slick video production on snowboarding and avalanche hazards that could be distributed through the local junior and senior high schools. An initial attempt at working with a local producer was futile. Most of these kids still go out unprepared get into trouble. A strong effort should be made during the 1986/87 season to let this group know of the UAFC service.

An avalanche in Canada claimed the life of 4 snowmobilers this season. With the large number of snowmobilers in Utah, we can only anticipate an accident of equal magnitude in this state. Offers have been made to speak at local snowmobile clubs and UAFC personnel have gone to snowmobile trailheads to speak with backcountry users...all to no avail.

To reach groups outside of the close-knit backcountry skier population, a more creative approach to advertising UAFC services may be needed. One simple suggestion would be to have the avalanche information numbers published in the weather section of local papers. This is done in other states and is very effective.

Another suggestion is to hold a brief seminar for outdoor writers and radio and TV reporters and forecasters at the beginning of each season to inform them of the magnitude of the

avalanche problem in this state so they can intelligently report on current conditions and/or problems.

Since UAFC personnel are not media experts it would be of great value to work more closely with the expertise already available in the Forest Service public information group, who have an established rapport with public media services. In this way we could make sure that avalanche warnings and the avalanche information number get broadcast on a regular basis.

#### X. OBSERVERS

This season the UAFC sent \$3,000 each to the Logan District and to the Ogden districts for avalanche observations. Sporadic observations came from both areas all winter. The Ogden district contacted the UAFC only a couple of times. Although the Logan district provided more consistent observations, much of the emphasis by the snow ranger was in the downhill ski area and in flat, low elevation snowmobile terrain. Many times observations of avalanches came several days after the occurrences and were too late to be included in our daily forecast. Most of the relevant information from the higher elevation avalanche starting zones came from casual skiers who have extensive knowledge of avalanche conditions in the Logan area and from ski patrollers in the Ogden area.

There are a number of people travelling in the backcountry would provide valuable information to the UAFC if they had some incentive. It would be well to take advantage of the volunteer program more consistently in the future.

Observations from ski areas continued to be excellent in many areas and fell down in others. It was a constant struggle for UAFC personnel to communicate the need for consistent and accurate information. Each ski area seems to have their own way and establish their own timing for observations, which may or may not coincide with weather and avalanche forecasting needs elsewhere. A stronger lead role in standardizing observation procedures may be needed in the future.

#### XI. MOUNTAIN WEATHER FORECASTING

Many of the local Utah avalanche forecasters (UAFC, UDOT, and ski areas) concur that their forecasts greatly depend upon the 6 to 12 hour mountain weather forecasts. Because the NWS is a multidisciplinary organization, the best mountain weather forecast available is the generalized zone forecast that is not always pertinent to site-specific avalanche forecasting. An attempt was made this season to employ a designated mountain meteorologist for the the Northern Wasatch Mountains.

During the summer of 1985 Ferguson worked with John Stratton of Snowbird Corp., and Bill Alder, MIC of the NWS, and addressed a letter to all ski areas, UDOT, FAA, Utah Transit, and Weber

County Roads, proposing the establishment of a mountain weather forecaster. Each organization was asked if they supported the idea and if they were willing to contribute \$1,500 to \$4,000 (the amount depending upon their use) each season.

There was a mixed response. However, there was enough support to guarantee nearly \$30,000 in salary, with office space and equipment donated by the NWS and UAFC. The next task was to locate an administering agency. Both the NWS and the USDA-FS claimed it would be inappropriate to add another category onto their personnel roster. The Utah Ski Association was interested in administering the position but were worried about liability and scratched the idea. The UDOT seemed willing to employ a mountain meteorologist but only for Little Cottonwood Canyon and were uninterested in a cooperative venture. One suggestion, which was not pursued, was to contact the Utah State Department of Natural Resources. They are losing much of their funding for weather modification programs and since micro-meteorology in the mountains is closely linked to weather modification, they may be interested in administering the position if it was financially supported.

At this time Snowbasin, Snowbird, and UDOT are all looking at hiring their own mountain meteorologist because they all realize the strong need for better mountain weather forecasts. It would be cheaper and more valuable in the long run if they all cooperated with a centralized meteorologist. Unfortunately, no agency is willing to take the lead role in improving mountain weather forecasts within Utah, even though it would greatly aid operations and improve winter safety on FS land, county and state roads, state parks, tourist resorts, and mountain communities.

## XII. CONCLUSION

Although the 1985/86 season produced deadly and devastating avalanches, it was a good year for the Utah Avalanche Center. Public use and input remained strong. Praise for our services came from backcountry users, other local avalanche forecasters, and the media. The new forecaster, Brad Meiklejohn, proved to be a valuable addition to our staff because of his backcountry skills, his avalanche knowledge, and his methods of easy communication. Improvements in instrumentation and computerized operations were substantial. As mountain use and development continues at a rapid pace in Utah, the UAFC looks forward to another season of service.