

# **Snow and Avalanche**

**Colorado Avalanche Information Center**

## **Annual Report 2002-03**



**Colorado Geological Survey  
Division of Minerals and Geology  
Department of Natural Resources  
Denver, Colorado**

# Executive Summary

**Mission:** The Colorado Avalanche Information Center promotes safety by reducing the impact of avalanches on recreation, industry, and transportation in the State through a program of forecasting and education.

**Administration:** The Center is a program of the Colorado Geological Survey, Division of Minerals and Geology, Department of Natural Resources.

**Funding:** The Center is funded by Severance Tax and cash-funded by grants and donations. In FY 02-03, total revenues were \$555,860.

**Housing:** The CAIC head office is at the National Weather Service in Boulder. Offices for CDOT operations are in Silverton, Pagosa Springs, Carbondale, and the Eisenhower Tunnel. The Summit County Avalanche Office is in Breckenridge.

**Staff:** Total staff was 13 ... 4 forecasters and 1 outreach coordinator at the head office in Boulder, 3 forecasters at Silverton, 1 at Pagosa Springs, 1 at Carbondale, 2 at the Eisenhower Tunnel, and 1 at the Summit County Avalanche Office.

**Avalanche events of 2002-03:** Seasonal snowfall was above normal in the northern mountains, but was below normal in the central and southern mountains. As usual, the mountain snowpack was shallow, sugary, and very weak through February. A big storm hit the Front Range on March 17-20 and brought record snowfall, some long-return avalanches, and damaging avalanches. A total of 2,418 avalanches was reported to the Center (12% above the average of 2,160). Avalanche Warnings were posted on 19 days. 91 people were reported caught by avalanches and 14 were injured (above average). There were 6 avalanche deaths (normal). Property damage was estimated at \$163,500.

## **Dissemination of forecasts via hotlines, internet, e-mail, fax, and radio broadcasts:**

- |   |                |
|---|----------------|
| ▪ Estimated calls to the CAIC hotlines:                                 | 28,226         |
| ▪ E-mails to observers and Friends of the CAIC:                         | 293,000        |
| ▪ Faxes to observers and media:   | 5,000          |
| ▪ Visits to our website forecast page:                                  | 280,780        |
| ▪ Total send outs (rounded):  | <b>607,000</b> |
| ▪ Additionally, 11 radio stations broadcast our hotline messages daily. |                |

**Media contacts:** As Colorado's spokes-agency for avalanche matters, we received or initiated 217 contacts with broadcast and print media.

## **Public education and outreach:**

- We presented 92 avalanche seminars to 3,689 people.
- Our web site generated 937,413 hits for avalanche information (up 38%).
- We publish our newsletter, *The Beacon*, three times a year for Friends of the CAIC

# Funding and Budget

For FY 2002-03, funding came from severance tax and from donations, grants, and contracts as listed below. Additionally, in-kind support is listed.

<b>State</b>	<b>\$413,821</b>		
CDOT contract for services	266,000	<b>Other Donors</b>	<b>\$36,020</b>
CDOT grant	22,000	BCA Avalanche Jam	10,000
Parks, Snowmobile Fund	2,000	Jeff Lebesh	10,000
Severance Tax Fund	123,821	Koessler Foundation	3,000
		Colorado Snow & Avalanche Workshop	2,100
<b>Federal</b>	<b>\$24,000</b>	REI	2,000
US Forest Service	24,000	Loveland Corn Fest	1,483
		Mountain Outfitters, Breckenridge	1,067
<b>Local Government</b>	<b>\$6,253</b>	Curt Dale Memorial Fund	1,025
Summit County	1,500	Eldora DoJoe	1,000
Town of Breckenridge	1,200	Community Fund of Boulder	950
Town of Frisco	1,000	A Basin Beacon Bowl	889
Eagle County	1,000	Mountain Chalet, Colorado Springs	500
Town of Dillon	500	Tenth Mountain Hut Association	500
Town of Silverthorne	250	People Productions	484
Town of Telluride	150	Fort Lewis Outdoor Pursuits	400
Summit County District Court	653	Harold & Charlotte T.	300
		Speakeasy, Breckenridge	202
<b>Ski Resorts</b>	<b>\$32,801</b>	Book sales	120
Colorado Ski Country USA	20,000		
Aspen Skiing Company	2,001	<b>Total Funding</b>	<b>\$555,860</b>
Vail Resorts	2,000		
Breckenridge	2,000	<b>Estimated In-kind Support</b>	<b>\$100,000</b>
A Basin	1,500	National Weather Service	40,000
Winter Park	1,500	Field observations	30,000
Steamboat	1,500	CDOT	20,000
Copper Mountain	1,000	Hotline sponsors	10,000
Keystone	1,000	<b>Grand Total</b>	<b>\$655,860</b>
Monarch	300		
<b>Friends of the CAIC</b>	<b>\$31,520</b>		
<b>Avalanche Seminars</b>	<b>\$11,445</b>		
Colorado Mountain Club	3,100		
Colorado School of Mines	1,320		
BOEC & Summit Huts	1,044		
Bent Gate	1,020		
Summit County Rescue	1,000		
Monarch Powder Cats	683		
Ft. Collins Mountain Shop	630		
Keystone Science Center	573		
Telluride Avalanche School	550		
Steamboat Ski Haus	525		
Mountain Rescue - Aspen	360		
Eastern Mountain Sports	240		
Buena Vista Snowmobile Club	151		
Boy Scout Troops	75		
Clear Creek County	54		
Backcountry Skiers Alliance	40		
City of Arvada	40		
Geological Society of America	40		

# Operations

**Administration:** The CAIC is a program of the Colorado Geological Survey.. The Center is cash-funded by grants and donations and from the Severance Tax Operational Fund.

**Housing:** The CAIC central office is with the National Weather Service in Boulder. For CDOT forecasting operations, the Center maintains offices in Silverton, Pagosa Springs, Carbondale, and the Eisenhower Tunnel. For backcountry forecasting in Summit County, the Center established a new office in Breckenridge called the Summit County Avalanche Office.

**Season:** From November-April, the Center is fully operational seven days a week and is staffed with 13 forecasters/educators. From May-October, the Center is closed and three staff members provide administrative and other necessary services.

**Purposes:** The purposes of the Center are to:

- monitor the changing weather, snow cover, and avalanche conditions in the Colorado mountains (see Data Sites below);
- provide mountain weather and avalanche risk information to the public, via recorded hotline messages and via the Internet and e-mail (see Section VII);
- warn of dangerous avalanche conditions by issuing Avalanche Warning Bulletins via the NOAA Colorado Weatherwire and news media (see Section VII);
- provide the Colorado Department of Transportation weather and snowpack data for reducing avalanche hazards along mountain highways (see Section IX);
- provide avalanche education through slide talks, seminars, videos, publications, and media contacts (see Section VIII);
- be the focal point and spokes-agency in state government for all avalanche matters;
- provide specialized forecasts and consulting to sponsoring agencies;
- investigate all significant avalanche accidents (see Section VI);

**Staffing and Duties at the Main Office:** Personnel for the 2002-03 season were Knox Williams (Director), Nick Logan (Associate Director), Dale Atkins, Scott Toepfer, and Halsted Morris. The Center was manned daily from 4:30 am to 3:30 pm, from opening day on November 8, 2002, until closing on April 21, 2003.

The forecasters are responsible for:

- monitoring mountain weather, snow, and avalanche conditions;
- logging all incoming data from observers;
- evaluating field data and National Weather Service data;
- making daily snow stability evaluations and forecasts;
- updating public hotlines daily;
- issuing forecasts for five highway areas daily;
- issuing and terminating Avalanche Warnings when warranted;
- initiating or responding to calls from the news media;
- handling special requests from sponsors/clients.

**Highway Forecast Offices:** The CAIC maintains four mountain offices to provide specific forecasting and training services to CDOT maintenance personnel. Section IX

# Operations

gives details of this program. These offices are operational from November 1 to May 15, with forecasting services available earlier or later as needed.

- **Silverton:** This office is staffed by forecasters Andy Gleason, Jerry Roberts, and Aleph Johnston-Bloom, who coordinate the forecasting for the CDOT avalanche reduction program along US 550 from Coal Bank Hill to Red Mountain Pass, Colorado 145 over Lizard Head Pass, and Colorado 110 along Cement Creek.
- **Pagosa Springs:** This office is staffed by forecaster Mark Mueller and provides forecasting for the avalanche reduction program along US 160 over Wolf Creek Pass, US 50 over Monarch Pass, and Colorado 17 over Cumbres and La Manga Passes.
- **Eisenhower Tunnel:** This office is staffed by forecasters Lee Metzger and Stu Schaefer and is the forecast center for CDOT's avalanche reduction program in District 1. The primary area of responsibility is the I-70 corridor from Georgetown to Vail, US 6 over Loveland Pass, and US 40 over Berthoud Pass. Outlying areas of responsibility are Colorado 82 over Independence Pass and Colorado 14 over Cameron Pass.
- **Western Slope:** This office is in Carbondale and is staffed by forecaster Rob Hunker. It is responsible for forecasting for Colorado 133 over McClure Pass, Colorado 139 over Douglas Pass, and Colorado 65 on Grand Mesa.

## **Satellite Backcountry Offices**

- **Summit County Avalanche Office:** The CAIC established a new office in Breckenridge to provide local forecast services to Summit County. Brad Sawtell was the newly-hired forecaster who staffed this office, with support provided by Mike Zobbe.
- **Crested Butte Avalanche Center:** The CAIC entered into an agreement with the staff of the Crested Butte Mountain Guides to provide local avalanche forecast services for the Crested Butte area. The CAIC provides about 40% of the funding needed to maintain this local service.

**Data Sites:** The Center maintains a network of observation sites for providing weather, snowpack, and avalanche data to the forecast office. Altogether there are about 35 manned sites, 20 of which are ski areas and the remainder are highway and backcountry sites. The Center has long supported a contract observer at Gothic, and this year began a network of back-country observers. The Highway Forecast Offices maintain and access data from remote weather stations, and also use the NRCS Snotel sites.

**Education:** One mission of the Center is to provide avalanche education opportunities to citizens, tourists, and avalanche practitioners. We do this through talks and field seminars. Halsted Morris is the CAIC's Training Coordinator and chief instructor. All staff members teach classes throughout the year to meet demand for this important safety training. Additionally, forecasters maintain frequent contact with news media personnel

# Operations

to give broad (and accurate) coverage of current avalanche conditions. Such news stories both inform and enhance avalanche education with the public. Section VIII details our efforts toward public education and safety.

***Publications and Web Site Outreach:*** The Center publishes avalanche-related articles and produces videos as need and opportunity arise. Section VIII details this year's publications. Our web site generated 937,413 visits for avalanche information. [Note: We do not use the misleading and inflated number commonly called "hits" (there were 15 million), because it contains multiple counts. For example, if a visitor goes to a page with 5 photos on it, it counts as 6 hits.]

***Friends Association:*** The Center manages a grassroots support group called "Friends of the CAIC" which totaled 735 members in 2002-03. For an annual donation of \$30 or \$45, the Friends receive three issues of *The Beacon* newsletter and receive the daily forecast via e-mail once or twice a day. This program raised \$31,520 for the CAIC in 02-03.

# Weather and Avalanche Synopsis

If an approaching winter could ever cause Colorado anxiety, the winter of 2002-03 was probably the most cautiously anticipated winter ever. Four previous drier-than-normal winters had been followed by the driest summer on record. A moderate El Niño formed in the spring of 2002 did nothing to help the situation. Statewide Colorado was gripped in its worst drought in 107 years of recorded history. By studying tree rings climate researchers from the University of Colorado determined stream flows in parts of the Front Range to be at their lowest since 1685. The Blue River north of Silverthorne experienced was one of its five driest years since 1569. Reservoirs were at their lowest levels ever and water restrictions were in place across the state. In a state where winter storms and snow are important not only for avalanches and recreation, it is the critical source for water. These storms will bring the next summer's water, and for a thirsty state all eyes nervously watched the calendar. Half a year later the winter of 2002-03 will go in the history books as one of the most memorable winters on record.

Why the anxiety? Certainly there was the drought, but also there was an El Niño. Although no strong correlation exists between El Niño and Colorado's winter weather, NOAA's climate forecasters in their season outlooks gave a nod to the Southern half of the state for a slightly better chance for a snowy winter. Debate raged about how snowy the early winter might be, but the climate forecasters agreed that the mid winter would be dry and the spring wet. The experts got it right, well kind of. They were spot on with when the snows would fall but missed badly with where the snows fell.

In terms of snow and avalanches the winter of 2002-03 revealed distinct personalities of feast or famine depending upon location and the timing of the season's storms. The seasonal snowfall totals ranged from above well-above normal in the Northern Mountains<sup>1</sup> to near normal in the Central Mountains<sup>1</sup> to well-below normal in the Southern Mountains<sup>1</sup>. This winter—like most winters—the dry months were offset by snowy months. In the Northern Mountains some exceptional storms brought exceptional snowfalls and of course, unusual avalanches. In the Southern Mountains even the snowy months could not make up for the short months and the snow famine continued.

## Snowfall

Several late October storms brought good snows to all mountain areas. After a dry previous winter and an even drier summer expectations for a snowy winter ran high.

In November the storms continued to track across the Northern Mountains with abundant snows. Even the Central Mountains benefited and received normal to slightly above normal snows; however, the Southern Mountains were left out. Snowfall ranged from 193% of normal at Loveland to 50% at Wolf Creek Pass.

<sup>1</sup> The geographical regions called northern, central, and southern mountains of Colorado are used extensively in this report. The Northern Mountains extend from the Wyoming border to a line from Denver to Hoosier Pass (just south of Breckenridge) to Glenwood Springs, as the southern boundary. This boundary roughly follows the I-70 corridor but dips south in the area of Breckenridge to include the Ten Mile Range. The central mountains extend south from the Denver-Hoosier Pass-Glenwood Springs line to a southern boundary line from Pueblo to Montrose. The southern mountains lie between this Pueblo-Montrose line and the New Mexico border.

# Weather and Avalanche Synopsis

Snowfall in December was a mixed bag across all mountain areas. At most sites snowfall was below to well-below normal, although a few sites like Steamboat, Monarch Pass, and Telluride saw above normal snowfall. It seemed that luck was the more significant factor for snowfall rather than elevation, aspect, or region. Snowfall varied tremendously over short distances. Snowfall ranged from 117% to 43%.

In January hopes for a snowy winter soured when the storms stopped coming. A typical El Niño pattern—the infamous split flow—was firmly entrenched. All mountains languished in dry and mild conditions, but the winter’s bias continued for snows to favor the Northern Mountains and not to favor the Southern Mountains. Snowfall ranged from 93% to 16%.

By mid February the storm track was back and the hopes of a snowy winter were renewed when snowfall for all sites but Red Mountain Pass (95%) and Aspen Highlands (80%) were well above normal. Snowfall for all other sites ranged from 108% to 184%.

March would be a watershed month (so to speak) in determining whether the winter would improve or worsen the drought. It did both. The trend of feast in the North continued while in the South the fast persisted. Snowfall in the Northern Mountains was above normal. Thanks to the big upslope storm Front Range snowfall amounts at several sites was more than 150% of normal. At Bear Lake monthly snowfall was a whooping 280% of normal!

In Colorado outside of a few spots (namely Buffalo and Wolf Creek Passes) 24-hour snowfalls of 12 inches or more are infrequent, happening only 2-3% of the time. Snowfalls of more than 24 inches are very rare. During the March storm several sites broke 24- and 48-hour snowfall records when more than 50-70+ inches of snow fell over two days. It was the greatest storm to hit the Front Range since 1933.

Elsewhere in March the trend of wet in the north but turning drier going south continued. Snowfall in the Southern Mountains was well below normal. In the Northern Mountains the drought was busted. In the Central Mountains the drought was unchanged, but in the Southern Mountains conditions only worsened. Snowfall ranged from 115% to 68%.

In April the pattern of the previous month continued as winter-like weather continued to make appearances in the Northern and Central Mountains. Late in the month Nature blasted parts of the Northern Mountains with an encore snowfall performance. Locally around Summit County, the Park Range near Steamboat, and in the Front Range another 30-40+ inches of snow fell in 24 hours. Despite all the action in the north the famine continued in the south. In the Southern Mountains spring was firmly entrenched and little snow was recorded.

Table 1 below shows monthly and seasonal snowfalls for all sites that regularly reported data to the Avalanche Center this year, and presents the percent-of-normal totals for December–March. The trend of the snowy north and drier south is evident, even during this short four-month period. Nearly all Northern Mountain sites hit or exceeded their long-term averages. Two anomalies in the Central Mountains also stand out. First, Monarch benefited during the monster-March-upslope storm, so snowfall was above normal. Second, is the low



# Weather and Avalanche Synopsis

snowfall at Aspen Highlands. We feel this number is suspect and that snowfall was underreported.

Only a few sites have long-term snowfall records for the six months of November–April. The trend of snowy in the north and drier in the south persisted over the longer time period. In the Central and Southern Mountains the addition of the relatively snowy November and April helped to increase the percent-of-normal values; however, values remained in the 70-85% range.

	Nov	Dec	Jan	Feb	Mar	Apr	Total Dec-Mar	% of Normal	Total Nov-Apr	% of Normal
<b>Northern Mountains</b>										
Arapahoe Basin	79.0	24.0	35.0	54.0	102.0	70.0	215.0	115%	364.0	128%
Bear Lake (RMNP)	56.0	14.5	24.5	63.5	119.5	21.5	222.0	138%	299.5	125%
Beaver Creek	68.2	39.8	29.5	73.5	74.2		217.0	96%		
Berthoud Pass	66.2	32.2	35.0	61.0	110.8	52.2	239.0	115%	357.4	114%
Breckenridge	67.5	26.0	33.0	66.5	76.5	74.0	202.0	100%	343.5	
Copper Mountain	71.0	31.0	40.0	75.0	83.0	87.0	229.0	121%	387.0	
Eldora	46.0	31.2	28.8	60.4	108.0		228.4			
Keystone	40.5	20.5	20.0	44.5	66.0		151.0	90%		
Loveland Basin	93.0	41.5	53.5	84.5	124.0	85.0	303.5	132%	481.5	
Loveland Pass	62.8	18.0	27.5	49.0	91.1	55.2	185.6		303.6	
Steamboat		69.0	45.0	79.5	52.0	57.0	245.5	100%		
Vail	76.2	51.8	40.1	80.5	77.2	71.0	249.6	97%	396.8	
Winter Park	71.6	52.0	37.6	68.1	114.2	63.0	271.9	107%	406.5	112%
<b>Central Mountains</b>										
Aspen Highlands	44.1	21.1	12.9	35.8	36.3	39.4	106.1	62%	189.6	79%
Aspen Mountain	34.2	34.2	15.8	47.2	59.4		156.6	93%		
Aspen Snowmass	48.0	34.0	16.8	60.4	69.2		180.4			
Crested Butte	44.0	28.0	18.5	64.0	40.0		150.5	90%		
Gothic	51.0	29.5	18.0	84.0	42.5	53.0	174.0	72%	278.0	82%
McClure Pass	35.5	32.5	16.0	49.0	37.5	27.0	135.0	78%	197.5	85%
Monarch	38.0	47.0	22.0	84.0	92.0		245.0	129%		
<b>Southern Mountains</b>										
Durango Mountain	27.5	33.5	9.6	51.6	41.2		135.9	77%		
Red Mountain Pass	39.8	26.0	17.7	46.5	42.5	35.0	132.7	65%	207.5	70%
Telluride	27.6	42.7	23.2	61.7	53.2		180.8	96%		
Wolf Creek Ski Area	28.5	48.5	10.5	92.0	55.0		206.0	82%		
Wolf Creek Highway	23.0	41.0	10.0	79.0	46.0	22.0	176.0		221.0	

**Table 1      2002-03 Snowfall (inches)**

# Weather and Avalanche Synopsis

## Avalanches

This winter a total of 2,418 avalanches were reported to the Center from November to May. This number is 12 percent above the average of 2,160. Table 2 shows the monthly distribution of avalanches and accidents.

Heavy snows in late October and November resulted in a benign snow cover in the first half of the season. The snowy month—at least for the Northern Mountains—meant numerous direct-action avalanches, so November's total of 148 avalanches was slightly above normal.

A general lack of snow in December and January resulted in very few avalanches; 267 and 398 respectively. The lack of mid-winter snows slyly turned the snow cover sinister and weak. In many areas thick layers of near-surface facets and surface hoar formed and where the snow cover was shallow the entire pack turned to depth hoar. The missing avalanche ingredient was the slab.

Abundant February snows formed slab conditions and resulted in 739 avalanches (above normal); and in terms of snowfall, hope for a normal winter. In March steady snows and an additional 738 avalanches fell across the state, but there were differences in where and when the avalanches fell.

From mid February to mid March the snowpack teetered on the brink of avalanche. In the Central and Southern Mountains the danger stayed at considerable for weeks. Natural avalanches were infrequent, but occasional triggered releases—whether caused by explosives or body weight—were large. (In the Northern Mountains several days of strong winds during the first days of March resulted in huge avalanches that released many slopes above timberline. Although the avalanches were not very deep entire mountainsides and cirques released. Many of these avalanches in and around the Summit County area were more than one mile across, and sometimes involved paths that had run earlier in the season, namely Buffalo Mountain above Silverthorne and Frisco.) In the Central and Southern Mountains just when the snow would start to stabilize another small storm would add more weight and stress. Dangerous slab avalanche conditions continued to build as no single storm or series of storms was enough to send the snow crashing down the mountains. February and March was an extraordinary period of instability in the Central and Southern Mountains, but it will be a monster upslope-storm that smothered much of the Northern Mountains at the end of the March that will be best remembered.

Toward the end of March a mammoth stationary storm overwhelmed the Front Range with 5-9 feet of snow in just over three days! (In February 1986 and 1993, and January 1996, monster storms produced similar snows but over much longer periods of 9-14 days.) This exceptional storm resulted in exceptional avalanches in exceptional places. Widespread avalanches were reported from the very edge of the foothills all the way to the Continental Divide. In the canyons west of Denver and Boulder loose snow avalanches were in the thousands, simply too many to count. Both slab and loose snow avalanches were running in places no one had ever witnessed or expected. Hardest hit was the Front Range from Denver, northward into Wyoming and all the way west to the Continental Divide. Record snows fell

# Weather and Avalanche Synopsis

in a storm that its magnitude had not been experienced in at least 70 years. Tens of thousands of people were stranded at home, at work, and in towns along the highways when snow and avalanches choked hundreds of miles of roads and highways.

In the wake of the big storm the Front Range was left with a very deep and stable snow cover. For the first time in years late-season deep-instabilities did not exist, however. Elsewhere the other mountain areas were not so lucky. In April deep instabilities persisted throughout most of the Central and Southern Mountains, but with no major storms or serious warm-up, reported avalanches were few. Only 116 avalanches were recorded.

Even the record dump in the Northern Mountains near the end of the April resulted in few avalanches. Relatively warm conditions at the start of the storm and with little wind the new snow adhered well to the old snow. The new snow quickly stabilized. Only by mid May did winter ease its grip allowing fair weather and warm temperatures back to the mountains.

Midwinter weak layers pummeled by February through April storms resulted in a busy avalanche season. The number of avalanches and avalanche warning days was far above normal; however, deaths were average. The big March storm was extraordinary and resulted in extraordinary avalanches. Unlike the last big-snow winter of 1995-96 when avalanches caused some property damage, the winter of 2002-03 saw a significant number of structures damaged, even more than in the winter of 1985-86.

## *Avalanche Accidents*

Table 2 shows the monthly listing of avalanches and of avalanches involving people and property in 2002-03. During abundant-snow winters the number of avalanches increases and so too does the number of structures damaged. A record number of structures were struck, but fortunately the actual damage loss was surprisingly small. The estimated damages of \$163,500 was the most since 1995-96.

During the winter of 2002-03 the number of people caught (91) was above the previous 10-year average of 68. This increase can likely be attributed to the abundant early season snows that attracted powder hounds. The 31 people partly buried were far above the 10-year average of 15; however, the 11 buried was right on the average. The six people killed matches the 10-year average.

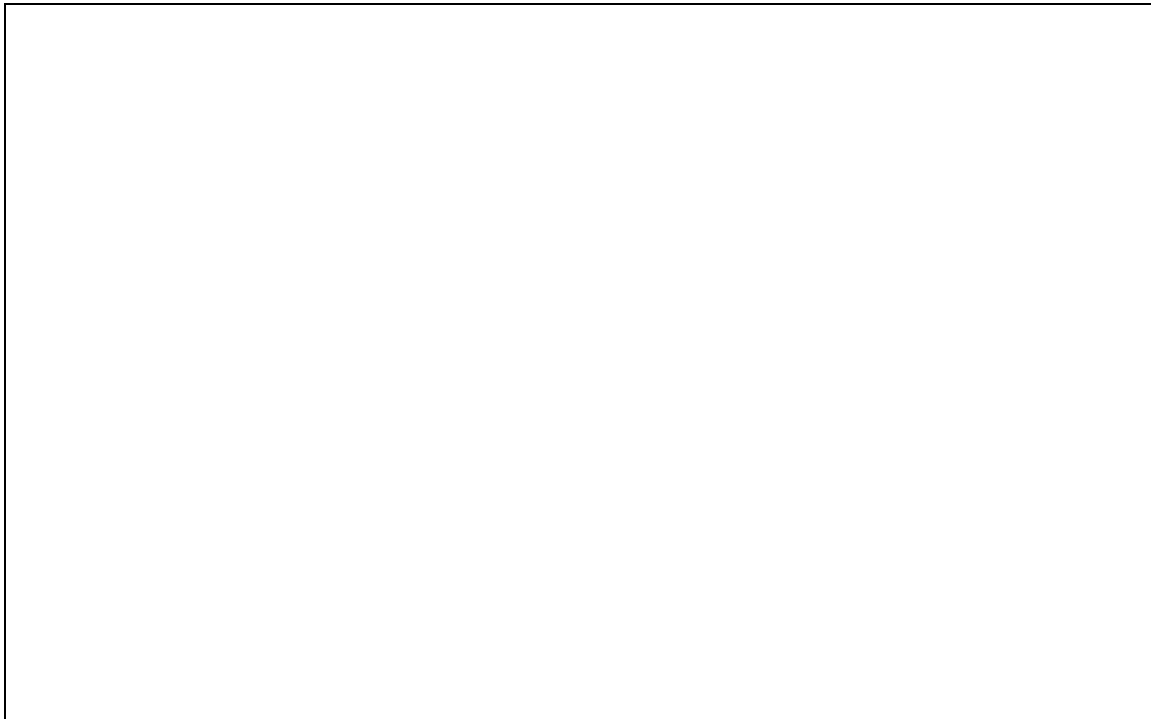
Using the 3-year moving average to smooth out the peaks and valleys in the data, Figure 1 represents a 17-year look at the number of people caught and killed in avalanches each winter. Interestingly, the number of victims caught has increased dramatically. This is to be expected as Colorado has seen its population increase by well over one million new residents; however, the number killed has stayed steady. This demonstrates that the Center's avalanche forecasting and education efforts are having an impact.

# Weather and Avalanche Synopsis

**Table 2      2002-03 Summary of avalanches and accidents.**

	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>TOTAL</b>
Avalanches Reported	148	267	398	739	738	116	12	2418
Accidents Reported								
people caught	12*	6	20	18	24	7	4	91
people partly buried	4	0	5	8	12	0	2	31
people buried	2*	0	2	4	3	0	0	11
people injured	3	1	3	3	4	0	0	14
people killed	0	0	0	2	4	0	0	6
vehicles caught (inc. snowmobiles)	1	0	1	3	11	0	0	16
property sites damaged	0	0	0	0	7	0	0	7

\*November's totals include 2 people caught and 1 buried in October.



**Figure 1. Colorado's accident trend in the last 17 seasons.**

# Education

Education is essential to reducing avalanche accidents thus public education is a key component of the Center's mission to saving lives. Our education objective is achieved through the following means.

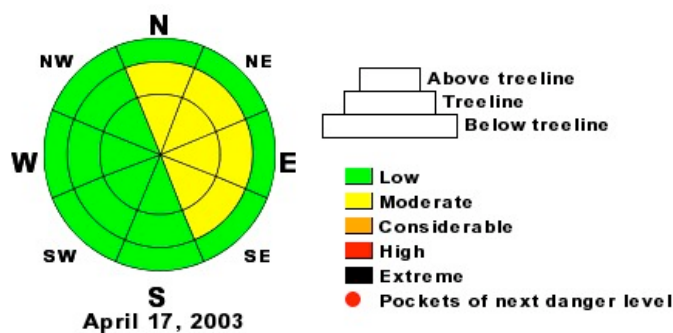
**Avalanche courses:** Last winter the Center staff taught 92 courses to some 3,689 people.

**Professional conferences and education:** The Center's staff spoke at national and international conferences and avalanche schools. In October Andy Gleason presented a technical paper at the 13<sup>th</sup> biennial International Snow Science Workshop in Penticton, British Columbia. Dale Atkins co-authored a presented paper. Atkins was a guest lecturer for the Icelandic Search and Rescue Association. In late May Atkins presented a technical paper on avalanche rescue to the 31<sup>st</sup> International Search and Rescue Conference in Reno, Nevada. Additionally, Mark Mueller Executive Director of the American Avalanche Association. Andy Gleason serves the Board of Directors as the secretary. Halsted Morris coordinates advertising for the organization's venerable newsletter *The Avalanche Review*. Jerry Roberts serves as coordinator for certification of educators, and Atkins serves as the chairman of the search and rescue committee.

**Professional conferences and education:** The CAIC continues to produce accident slide sets and rescue videos were again available and used by avalanche educators throughout the United States.

**Publications:** Dale Atkins published an article on the role of risk perception in avalanche accidents in the newsletter of Wilderness Medical Associates. He also has an article in press on avalanches in the United States and world in the summer issue of the National Ski Patrol's *Ski Patroller*. Atkins and Halsted Morris have short article in press about avalanche transceivers for the newsletter of The American Avalanche Association.

**Web site:** New this year to our public avalanche forecasts was the addition of the innovative Avalanche Danger Rose, a quick, visual representation of the backcountry avalanche danger. The Rose represents both slope aspect and elevation, and the colors represent the danger ratings for those slopes and elevations. The 3-nested circles represent elevations. Response by users has been overwhelmingly positive.



**Northern Mountains**

Figure 2. An example of the Avalanche Danger Rose showing the danger is generally low except on north through southeast aspects near and above treeline where the danger is moderate. The colors in the graphic correspond to the international danger colors.

The Center's web site had 379,542 visits and looked at a total of 937,413 pages. The most popular page is the avalanche and mountain-weather forecast page (280,780 visits).

## Forecasting for Colorado's Highways

The CAIC contracts with CDOT to provide daily forecasts of avalanche potential along Colorado's highways, and six of the CAIC's staff is dedicated to this job. The following table shows the impact of avalanches last season.

<b>Forecast Office</b>	<b>Inclusive Highways</b>	<b>Natural Avalanches</b>	<b>Triggered Avalanches</b>	<b>Total</b>
Silverton	US 550 Ouray to Coal Bank Pass; US 145 Lizard Head Pass; CO 110 (Silverton to Gladstone)	154	401	<b>555</b>
Eisenhower Tunnel	US 40 Berthoud Pass; US 6 Loveland Pass; I-70 Georgetown to Vail CO 82 Independence Pass	19	81	<b>100</b>
Pagosa Springs	US 160 Wolf Creek Pass US 50 Monarch Pass; CO 17 Cumbres and La Manga passes	38	11	<b>49</b>
Western Slope	CO 133 McClure Pass CO 139 Douglas Pass CO 65 Grand Mesa; CO 24 Tennessee Pass; CO 82 Aspen-Basalt; I-70 Glenwood Canyon	11	9	<b>20</b>
			<b>Total</b>	<b>724</b>