

Snow and Avalanche

Colorado
Avalanche
Information
Center

Annual Report
2004-05



Battleship Avalanche racing toward the
photographer on Red Mountain Pass,
January 9, 2005
(Photo: Jerry Roberts)

Colorado Geological Survey
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, Department of Natural Resources.

Funding: The Center is funded by Severance Tax and cash-funded by grants and donations. In FY 04-05, total revenues were \$581,442.

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

Staff: Total staff was 13 ... 5 forecasters and 1 outreach coordinator at the head office in Boulder, 2 forecasters at Silverton, 1 at Pagosa Springs, 1 at Marble, 2 at the Eisenhower Tunnel, and 1 at the Summit County Avalanche Office.

Avalanche events of 2004-05: Seasonal snowfall was generally below normal in the Northern Mountains (75-111%), but was above normal in the Central Mountains (88-133%) and Southern Mountains (120-155%). Large storms were confined to the Central and Southern Mountains. A total of 2,985 avalanches was reported to the Center (30% above the average of 2,293). Avalanche Warnings were posted on 32 days (above average). There were 76 people reported caught by avalanches (6 above average) and 10 were injured (3 above average). There were 5 avalanche deaths (1 below normal). Property damage was estimated at \$103,500.

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

- E-mails to observers and Friends of the CAIC: 287,640
- Faxes to observers and media: 6,100
- Visits to our website forecast page: 288,826
- Total send outs: **582,566**
- Additionally, 11 radio stations broadcast our hotline messages daily.

Media contacts: As Colorado's spokes-agency for avalanche matters, we received 209 contacts from broadcast and print media.

Public education and outreach:

- We presented 92 avalanche seminars to 3,787 people.
- Our web site generated 649,524 visits for avalanche information (up 16%) resulting in millions of hits.
- We publish our newsletter, *The Beacon*, three times a year for Friends of the CAIC.

Funding and Budget

For FY 2004-05, funding of \$581,442 came from severance tax and from donations, grants, and contracts as listed below. Additionally, estimated in-kind support is listed.

State	\$436,092		
CDOT contract for services	288,400	Mountain Rescue - Aspen	280
CDOT grant	22,000	Colorado 14ers Initiative	200
Parks, Snowmobile Fund	2,000	Eastern Mountain Sports	185
Severance Tax Fund	123,692	DU Alpine Club	55
		Mile Hi Snowmobile Club	50
Federal	\$24,000		
US Forest Service	24,000	Friends of the CAIC	\$39,399
Local Government	\$8,000	Other Donors	\$27,903
Summit County 03-04	1,500	BCA Avalanche Jam	4,977
Summit County 04-05	1,500	Corn Harvest 2005	2,996
Town of Breckenridge	1,200	Colorado Snow & Avalanche Workshop	2,710
Town of Frisco	1,000	Vail Valley Foundation	2,500
Town of Telluride	900	Eldora DoJoe	2,125
Summit County District Court	650	Community Fund of Boulder	2,000
Town of Dillon	500	Corn Harvest 2004	1,700
Boulder County	500	Colorado State Parks	1,590
Town of Silverthorne	250	A Basin Beacon Bowl	1,296
Ski Resorts	\$31,301	USFS Leadville	1,100
Colorado Ski Country USA	20,000	National Ski Patrol	1,000
Aspen Skiing Company	2,001	A Basin Enduro	929
Vail Resorts	2,000	Alpen Solutions	640
Breckenridge	2,000	EKW Memorial Fund	500
Winter Park	1,500	Ortovox USA	500
Steamboat	1,500	Tenth Mountain Hut Association	500
A Basin	1,000	Fort Lewis Outdoor Pursuits	400
Keystone	1,000	Butch Weaver	250
Monarch	300	Clear Creek County	100
		Curt Dale Memorial	50
		San Juan Mountain Mustard	40
Avalanche Seminars	\$14,747	Total Funding	\$581,442
Colorado Mountain Club	3,200	Estimated In-kind Support	\$140,000
Colorado College	1,578	National Weather Service	60,000
A Basin Level I	1,200	Field observations	40,000
Silverton Avalanche School	1,181	CDOT	30,000
Colorado School of Mines	1,060	Hotline sponsors	10,000
Summit County Rescue	1,000		
Mountain Shop, Ft. Collins	935	Grand Total	\$721,442
High Mountain Institute	879		
Steamboat Ski Haus	715		
Outward Bound West	610		
Keystone Science Center	467		
Beaver Creek Ski Patrol	442		
Friends of Berthoud Pass	360		
Telluride Avalanche School	350		

Operations

Season: From November-April, the Center is fully operational seven days a week and is staffed with 13 forecasters/educators.

Purposes: The purposes of the Center are to:

- monitor weather, snow cover, and avalanche conditions in the Colorado mountains;
- provide mountain weather and avalanche risk information to the public, via recorded hotline messages and via the Internet and e-mail;
- warn of dangerous avalanche conditions by issuing Avalanche Warning Bulletins via the NOAA Colorado Weatherwire and news media;
- provide the Colorado Department of Transportation weather and snowpack data for reducing avalanche hazards along mountain highways;
- provide avalanche education;
- 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;

Staffing and Duties at the Main Office: Personnel for the 2004-05 season were Knox Williams (Director), Nick Logan (Associate Director), Dale Atkins, Scott Toepfer, Spencer Logan, and Halsted Morris. The Center was manned daily from 4:30 am to 4:30 pm, from opening day on November 11, 2004, until closing on April 24, 2005. The Center was open from November 1-11 and on April 25 to May 21 on an as-needed basis, and issued daily bulletins also as needed.

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.

Education: 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.

Publications and Web Site Outreach: The Center publishes avalanche-related articles, safety brochures, and produces videos as need and opportunity arise. Our web site generated 649,524 page visits for avalanche information.

Friends Association: The Center manages a grassroots support group called "Friends of the CAIC" which totaled 812 members in 2004-05. Member's benefits include daily e-mails and newsletters.

Highway Forecast Offices: The CAIC maintains four mountain offices to provide specific forecasting and training services to CDOT maintenance personnel. These offices are operational from late October to mid May.

- ***Silverton:*** This office is staffed by forecasters Jerry Roberts and Mark Ridders, and Interns Susan Hale and Mark Rawsthorne, who coordinate the forecasting for the CDOT avalanche reduction program along US 550 from Coal Bank Hill to Red Mountain Pass and on Colorado 145 over Lizard Head Pass.
- ***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, Colorado 65 on Grand Mesa, and spring forecasts for the opening of Independence Pass.

Backcountry Offices

- ***Summit County Avalanche Office:*** The CAIC maintains this office in Breckenridge to provide local forecast services to Summit County. Brad Sawtell is the forecaster in 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 30% of the funding needed to maintain this local service.
- ***Steamboat Avalanche Zone:*** Art Judson is the contract forecaster for this northern-most area of the Colorado mountains. Art has identified and mapped the significant avalanche paths and has developed an observing network to provide timely and reliable data.

Weather and Avalanche Synopsis

Gone for over a year, a petulant El Niño returned during the summer of 2004. Though the El Niño was relatively weak there were hints that this El Niño might get stronger. Would it be stronger? Avalanche workers did not have to wait long for an answer. An active sub-tropical storm track took aim on the southwestern US. Mountain snows started in September and kept coming in October.

By the end of the season, the term “variable” best described the winter of 2004-05. It was a winter of flip-flops. Dry months were off set by snowy months; cold months by warm months. Like many winters—including 2003-04—the winter of 2004-05 produced great variability of weather, snowfall, snowfall depths, and avalanches from mountain region to mountain region, season to season, and sometimes all within the same month.

Winter arrived early—late September—and stayed chilly and snowy right through October. By early November dreaded split-flow brought drier conditions, but storms returned by the end of the month making for a snowy month. High pressure dominated for most of December and led to the formation of weak snow surface layers that would cause problems with future snows. The end of December saw the first in a series of powerful storms arrive that would eventually smother the entire southwestern US during the next two weeks. Favored by southwesterly flow, deep, heavy snows—5 to 9+ feet—fell at higher elevations and overwhelmed the Southern and Central Mountains resulting in tremendous avalanches while the Northern Mountains received only light snows. Atypical for January was the rather significant and widespread rain that fell during the two-week storm. The very warm southwest flow meant rain for most sites below 8,000 to 9,000 feet. The storms’ wake left behind a strong and stable snowcover. Unfortunately, a two-week dry spell with spring-like and unseasonably warm conditions resulted in significant near-surface facets and surface hoar that would cause problems with future snows.

February was unsettled with frequent but generally light snows that created shallow unstable slabs and numerous close calls. It was not until the end of the month and in early March that the slabs became thick and sinister. Triggered avalanches were frequent, and with the January weak layers now buried deep, some avalanches were deep, wide, and long runners. The trend of weak system after weak system continued through the first half of March before spring-like weather arrived, but it was only a tease. Winter came roaring back at the end of the month with snow and cold. April was another month of flip-flops as the seasons continued to clash: one week snowy and cold, the next week sunny and warm. Winter held on during the first week of May before retreating. Typical, mild spring-like weather—warm days and cold nights—persisted through the middle of the month, but an unusually strong warm-up struck in mid month. The intense warm-up lasted only for a few days, but the damage was done resulting in a significant wet-snow avalanche cycle and several serious accidents. Seasonal temperatures persisted through the end of the month, but just when one was ready for summer, winter returned. In a rude display of might, winter returned during the first two weekends in June. The northwest storm track favored the Northern and Central Mountains with cold, wind, snow, and avalanches.

As typical in most years the timing of the season’s storms produced a deceptive snow cover that revealed two distinct avalanche personalities of strong and weak that flip-flopped back and forth.

Different this winter was that the usual deep instabilities from depth hoar did not exist in many mountain areas. This winter the most serious weak layers for most mountain areas were found in the middle of the snowpack, the result of several prolonged mid-winter dry spells. The exceptions were in most of the Northern Mountains where snowfall lagged and deep instabilities persisted.

By season's end snowfall totals in the Southern and Central Mountains were well above normal while the Northern Mountains were below or near normal snowfall (table 1). The number of reported avalanches was far above normal; the number of accidents was near normal, but deaths (5) were below the long-term average (6) (table 2). A number of properties were damaged; despite the heavy January snows property damage was surprisingly low (\$103,500).

Table 1 2004-05 Snowfall (inches)

	Nov	Dec	Jan	Feb	Mar	Apr	Total		Total	
							Nov-Mar	% Normal	Nov-Apr	% Normal
Northern Mountains										
Arapahoe Basin	33.6	30.1	35.7	34.0	40.0	47.6	173.4	75%	221.0	78%
Bear Lake (RMNP)	42.1	19.0	39.5	33.5	34.2	38.0	168.3	86%	206.3	87%
Beaver Creek	53.0	39.5	69.6	56.9	68.6		287.6	102%		
Berthoud Pass	37.7	37.0	43.6	41.1	60.0	69.8	219.4	86%	289.2	94%
Breckenridge	49.0	49.0	46.0	59.5	70.0		273.5	111%		
Copper Mountain	43.0	40.0	45.0	46.0	60.0		234.0	101%		
Keystone	25.0	19.0	28.0	51.0	45.0		168.0	86%		
Loveland Basin	46.0	41.0	50.5	40.0	61.0	54.0	238.5	85%	292.5	84%
Loveland Pass	33.0	34.0	36.2	29.6	51.4		184.2			
Steamboat	55.0	34.5	52.5	48.5	63.0		253.5	91%		
Vail	49.5	44.2	65.3	56.5	53.2	46.8	268.7	86%	315.5	
Winter Park	23.7	44.3	42.5	43.1	56.8		210.4	66%		
Central Mountains										
Aspen Highlands	41.0	23.0	78.0	52.0	28.0		222.0	107%		
Aspen Mountain	26.1	20.4	51.2	45.9	34.1		177.7	88%		
Aspen Snowmass	57.0	30.0	83.0	70.0	42.0		282.0	110%		
Gothic	70.5	32.0	96.5	83.5	55.5	36.5	338.0	118%	374.5	113%
McClure Pass	55.5	32.1	86.0	57.9	42.5	25.5	274.0		299.5	111%
Monarch	81.5	35.5	87.0	45.5	57.0	46.0	306.5	133%	352.5	
Southern Mountains										
Durango Mountain	48.7	26.1	105.2	54.0	49.2		283.2	135%		
Red Mountain Pass	68.0	32.8	97.2	59.8	64.2	42.2	322.0	130%	364.2	126%
Telluride	64.1	23.2	79.6	62.2	55.4		284.5	120%		
Wolf Creek Ski Area	60.0	30.0	147.0	111.0	75.0	53.0	423.0	136%	476.0	129%
Wolf Creek Highway	51.0	33.0	128.0	98.0	57.0	32.0	367.0	155%	399.0	142%

Table 2. 2004-05 Summary of Avalanches and Accidents

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	TOTAL
AVALANCHES REPORTED	10	521	392	1072	451	284	226	24	5	2985
AVALANCHE ACCIDENTS										
People caught	7	4	4	10	15	27	2	3	4	76
People partly buried	1	0	2	4	4	5	0	1	0	17
People buried	0	1	0	2	2	6	1	1	0	13
People injured	1	1	0	0	4	2	0	1	1	10
People killed	0	0	0	1	0	2	1	1	0	5
Vehicles caught*	0	0	0	1	0	0	0	0	0	1
Properties struck	0	0	0	5	0	0	0	0	0	5
(* Does not include snowmobiles)										

Public 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 3,787 people.
- **Professional conferences and education:** The Center's staff was busy attending and presenting at national and international conferences and avalanche schools. These include the 2004 International Alpine Rescue Commission's annual meeting in Poland, and the 14th biennial International Snow Science Workshop in Jackson, WY. Additionally, Mark Mueller serves as the American Avalanche Association's Executive Director, and Dale Atkins chairs the Search and Rescue Committee.
- **Avalanche Education Materials:** For the 17th season avalanche accident slide sets (PowerPoint™) and rescue videos were again available and used by avalanche educators throughout the United States.
- **Publications:** Both Knox Williams and Dale Atkins were active in the creation and review of the American Avalanche Association's *Snow, Weather, and Avalanches: Observational Guidelines for Avalanche Programs in the United States*. In addition to technical papers to be published in the proceedings of the ISSW 2004 by Atkins and Spencer Logan, Atkins authored and co-authored two articles in the National Ski Patrol's *Ski Patroller Magazine*. Scott Toepfer continues to write and edit the three issues of *The Beacon Newsletter* with contributions from the CAIC staff.
- **Web site:** The Center's web site had 649,524 visits for avalanche information. The most popular page is the avalanche and mountain-weather forecast page (248,389 visits).

Avalanches and 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 are dedicated to this job. Table 3 shows the impact of avalanches this season on Colorado's mountain highways. It lists the number of natural and explosive-triggered avalanches that reached the roadways. Note that most of the natural avalanches that reached highways occurred when the highways were closed because of significant avalanche danger. Avalanche debris covered some 30,785 feet of roadway centerline.

Table 3. Avalanches reaching Colorado highways (does not include bank-slips).

Forecast Office	Inclusive Highways	Natural Avalanches	Triggered Avalanches	Total
Silverton	US 550 Ouray to Coal Bank Pass; US 145 Lizard Head Pass; Colo. 110 (Silverton to Gladstone)	107	149	256 (22,695' of CL covered)
Eisenhower Tunnel	US 40 Berthoud Pass; US 6 Loveland Pass; I-70 Georgetown to Vail Colo. 82 Independence Pass	7	147	154 (1,310' of CL covered)
Pagosa Springs	US 160 Wolf Creek Pass; US 50 Monarch Pass; Colo. 17 Cumbres and La Manga passes	39	8	47 (3,770' of CL covered)
Western Slope	Colo. 133 McClure Pass; Colo. 139 Douglas Pass; Colo. 65 Grand Mesa; Colo. 24 Tennessee Pass; Colo. 82 Shale Bluffs, Snowmass Canyon; I-70 Glenwood Canyon	28	47	75 (3,010' of CL covered)
			Total	532