

# Snow and Avalanche

## Colorado Avalanche Information Center Annual Report 2005-2006



A slab avalanche in First Creek near Berthoud Pass that released on a dust layer, deposited in mid February (photo: Bruce Edgerly).

Colorado Geological Survey  
Department of Natural Resources  
Denver, Colorado



# Table of Contents

Executive Summary 1

<b>FUNDING AND BUDGET</b> .....	<b>2</b>
Table 1. Funding sources. ....	2
Figure 1. CAIC funding sources. ....	3
<b>OPERATIONS</b> .....	<b>3</b>
<b>WEATHER AND AVALANCHE SYNOPSIS</b> .....	<b>6</b>
SNOWFALL .....	6
AVALANCHES .....	8
AVALANCHE ACCIDENTS.....	9
Table 2. 2005-06 Snowfall (percent of normal).....	7
Table 3. 2005-06 Snowfall (inches).....	8
Table 4. 2004-05 Summary of Avalanches, Danger Days, and Accidents.....	9
Figure 2. Colorado’s accident trend for the last 12 years. ....	10
Table 5. Colorado avalanche accidents, 2004-05 (bold indicates fatal accident).....	11
<b>DETAILED WINTER SUMMARY</b> .....	<b>12</b>
OCTOBER.....	12
NOVEMBER.....	12
DECEMBER.....	13
JANUARY.....	14
FEBRUARY.....	15
MARCH.....	16
APRIL.....	17
<b>INFORMATION ACQUISITION</b> .....	<b>19</b>
DAILY WEATHER, SNOWPACK AND AVALANCHE DATA.....	19
WESTWIDE AVALANCHE NETWORK .....	19
ACCIDENT INVESTIGATIONS .....	20
<b>FORECAST DISSEMINATION</b> .....	<b>21</b>
PUBLIC HOTLINES.....	21
E-MAIL TO FRIENDS, OBSERVERS AND FORECASTERS .....	21
WEB SITE .....	21
RADIO BROADCASTS .....	22
NOAA HAZCOLLECT .....	22
NEWS MEDIA.....	23
SEARCH AND RESCUE ASSISTANCE .....	23
<b>PUBLIC EDUCATION</b> .....	<b>24</b>
AVALANCHE COURSES .....	24
Figure 3 Public Forecast Dissemination .....	22
Figure 4. Avalanche education for last 10 years.....	25
Table 6. Avalanche Courses and Seminars, 2005-06 .....	26
PROFESSIONAL CONFERENCES AND EDUCATION .....	30
AVALANCHE EDUCATION MATERIALS .....	30
PUBLICATIONS.....	30
WEB SITE .....	30

# Table of Contents

<b>FORECASTING FOR COLORADO’S HIGHWAYS</b> .....	<b>31</b>
Table 7. Avalanches reaching Colorado highways (does not include bank-slips). ....	31
Silverton Forecast Office.....	32
<i>Weather Synopsis</i> .....	32
<i>Snowpack and Avalanche Highlights</i> .....	36
<i>Activity on Highway Avalanche Paths</i> .....	38
<i>Road Closures</i> .....	39
PAGOSA SPRINGS FORECAST OFFICE.....	40
<i>Weather Synopsis</i> .....	40
<i>Snowpack and Avalanche Highlights</i> .....	42
<i>Activity on Highway Avalanche Paths</i> .....	42
<i>Road Closures</i> .....	43
<i>Accidents</i> .....	43
EISENHOWER TUNNEL FORECAST OFFICE.....	44
<i>Weather Synopsis</i> .....	44
<i>Snowpack and Avalanche Highlights</i> .....	47
WESTERN SLOPE FORECAST OFFICE.....	51
<i>Weather Synopsis</i> .....	51
<i>Snowpack and Avalanche Highlights</i> .....	52
<i>Activity on Highway Avalanche Paths</i> .....	54
<i>Accidents</i> .....	55
<i>Independence Pass</i> .....	55
<b>SEVERANCE TAX PROJECTS</b> .....	<b>56</b>



# **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 Avalanche Center is a cash-funded State agency, and 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 05-06, total revenues were \$610,829.

**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 (Andy Gleason filled in for Dale Atkins part way through the season), 2 forecasters at Silverton, 1 at Pagosa Springs, 1 at Marble, 2 at the Eisenhower Tunnel, and 1 at the Summit County Avalanche Office.

**Snowfall and avalanches of 2005-06:** Seasonal snowfall was above average in the Northern Mountains (100-120%) with Steamboat having an exceptional year (147% of normal). Snowfall was above average in the Central Mountains (115-140%). In the Southern Mountains, large March storms offset little snow at the beginning of the season, and the snowfall for the season was normal (90-105%). A total of 1,521 avalanches was reported to the Center (34% below the average of 2,293). Avalanche Warnings were posted on 6 days (well below average). 35 people were reported caught by avalanches (35 below average) and 3 were injured (4 below average). There were 4 avalanche deaths which is below the average of 6 per year. The only property damage reported was to snowmobiles and that was minor.

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

E-mails to observers and Friends of the CAIC: 246,100

Faxes to observers and media: 6,100

Visits to our website forecast pages: 404,760

Total send outs: **656,960**

Additionally, 11 radio stations broadcast our hotline messages daily.

**Media contacts:** As Colorado's spokes-agency for avalanche matters, we received 121 contacts from broadcast and print media.

Public education and outreach:

We presented 116 avalanche seminars to 4,183 people.

Our web site generated 821,068 visits for avalanche information (up 20%)

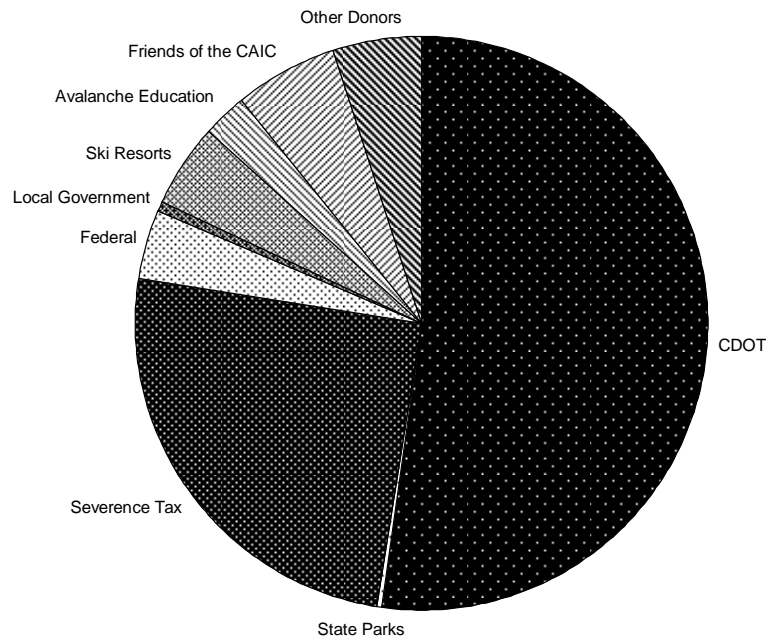
We published our newsletter, *The Beacon*, three times for Friends of the CAIC.

# Funding and Budget

For FY 2005-06, funding of \$610,829 came from severance tax and from donations, grants, and contracts as listed below. Estimated in-kind support is also listed.

**Table 1. Funding sources.**

<b>State</b>	<b>\$472,602</b>	<b>Avalanche Education cont.</b>	
CDOT contract for services	\$297,052	Friends of Berthoud Pass	\$500
CDOT grant	\$22,000	Copper Mountain	\$400
Parks, Snowmobile Fund	\$2,000	Mountain Rescue Aspen	\$300
Severance Tax Fund	\$151,550	EMS Classes	\$120
		Mountain Chalet	\$100
		Mile Hi Snowmobile Club	\$50
<b>Federal</b>	<b>\$24,000</b>		
US Forest Service	\$24,000		
		<b>Friends of the CAIC</b>	<b>\$34,210</b>
<b>Local Government</b>	<b>\$3,606</b>		
Town of Breckenridge	\$1,300	<b>Other Donations</b>	<b>\$31,198</b>
Town of Frisco	\$1,000	Avalanche Jam	\$12,515
Town of Telluride	\$1,000	Corn Harvest	\$5,178
Summit Co District Court	\$306	Vail Valley Foundation	\$2,500
		Colo Snow and Aval Workshop	\$2,250
		Koessler Foundation	\$2,000
<b>Ski Resorts</b>	<b>\$29,668</b>	A-Basin-Wet Slab Study	\$2,000
Colorado Ski Country USA	\$20,000	Arapahoe Basin - Beacon Bowl	\$1,682
Breckenridge	\$2,000	Alpen Solutions	\$870
Aspen	\$1,500	Eldora DoJoe	\$780
Steamboat	\$1,500	New Belgium Scavenger Hunt	\$577
Arapahoe Basin	\$1,000	York Pig Roast	\$496
Copper Mountain	\$1,000	Wolf Creek Backcountry	\$150
Winter Park	\$1,000	People Productions	\$100
Keystone	\$1,000	Records-Johnson Family Fndtn	\$100
Snowmass	\$668	ScottyBob Handcrafted Skis	5 pair skis
<b>Avalanche Seminar Donations</b>	<b>\$16,545</b>		
National Avalanche School	\$4,170	<b>Total Funding</b>	<b>\$610,829</b>
Colorado Mountain Club	\$3,300		
Arapahoe Basin - Level I	\$2,700	<b>Estimated In-kind Support</b>	<b>\$155,000</b>
Silverton Avalanche School	\$1,265	National Weather Service	\$60,000
Mountain Shop Class	\$1,000	Field observations	\$40,000
Summit County Rescue	\$1,000	CDOT	\$40,000
Ski Haus	\$840	Hotline sponsors	\$15,000
High Mountain Institute	\$800		
		<b>Grand Total</b>	<b>\$766,829</b>



**Figure 1. CAIC funding sources.**

## ***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, Marble, and the Eisenhower Tunnel. For backcountry forecasting, the Center maintains the Summit County Avalanche Office in Breckenridge.

**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, the Internet, and e-mail (Section VII “Forecasts Dissemination”);  
 warn of dangerous avalanche conditions by issuing Avalanche Warning Bulletins via NOAA HazCollect and news media (see Section VII “Forecasts Dissemination”);  
 provide the Colorado Department of Transportation weather and snowpack data for reducing avalanche hazards along mountain highways (see Section IX “Forecasting for Colorado’s Highways”);

provide avalanche education (see Section VIII “Public 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 (see Section VI “Information Acquisition”);

### **Staffing and Duties at the Main Office**

Personnel for the 2005-06 season were Ethan Greene (Director), Nick Logan (Associate Director), Dale Atkins, Andy Gleason (who filled in for Atkins mid season), Scott Toepfer, Spencer Logan, and Halsted Morris. The Center was manned daily from 4:30 am to 4:30 pm, from November 14, 2005, until closing on April 23, 2006. The Center was open from November 1-13 and on April 24 to May 31 to issue bulletins when necessary and forecasted in Summit County through May.

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 gives details of this program. 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 Ann Mellick. They 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, staffed by forecaster Mark Mueller, 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. Other areas of responsibility include Colorado 14, Cameron Pass and Colorado 91, Fremont Pass.

Western Slope: This office is in Marble 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. Outlying areas of responsibility are Colorado 82 over Independence Pass.

### **Backcountry Offices**

**Summit County Avalanche Office:** The CAIC maintains this office in Breckenridge to provide forecast services in and around Summit County. Brad Sawtell is the forecaster in this office.

**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.

**Roaring Fork Avalanche Center:** The CAIC has a strong working relationship with this newly-formed forecast office in Aspen. Snowpack observations are exchanged on a regular basis, and some monetary support was given to its operation to get it started and to provide timely and reliable data to the CAIC.

**Education:** Halsted Morris was the CAIC's Training Coordinator. All staff members teach classes throughout the year to provide avalanche safety training. 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.

**Friends Association:** The Center manages a grassroots support group called "Friends of the CAIC" totaling more than 700 members in 2005-06.

## ***Weather and Avalanche Synopsis***

Fall snows started building the snowpack in early October. By the end of the month there were patches of snow several feet deep. The CAIC's early season forecasts often contain a phrase similar to "if there is enough snow to ride, there is enough snow to slide." That proved true, as the first avalanche reported to the CAIC caught one skier (Table 4). An early November avalanche near Berthoud Pass caught and killed a backcountry snowboarder.

Heavy snowfall in the Northern Mountains began in early November and continued through December. This built an unusually stable snowpack, and decreased avalanche activity. In spite of the stable conditions, all three fatal avalanche accidents occurred in the Northern Mountains during this period.

Snowfall decreased in January and remained below normal for the rest of the season. At the season's end, the drier months balanced the plentiful snows, and season totals were slightly above normal. In February, a layer of dusty snow fell state-wide this contributed to a rapid, early summer melt as the dirty snow returned to the surface.

In the Central Mountains, November snowfall was near normal. December and January brought heavy snowfall. As the snow accumulated, so did reports of avalanche activity. February was a dry month in the Central Mountains, but big storms returned in March and April.

Winter was slow in coming to the Southern Mountains. November snows were extremely sparse, with 25-70 percent of normal snowfall. Snowfall increased in the northern San Juan Mountains in December and January, but it would not be until huge storms in March that the southern San Juan Mountains would receive much snow. The March storm was one of the largest on record for Wolf Creek Pass.

### ***Snowfall***

Table 1 below shows monthly snowfall as a percent of normal for most sites that regularly reported data to the Avalanche Center this year. Table 2 shows monthly and seasonal snowfalls in inches for all sites that regularly reported data to the Avalanche Center this year.

**Table 2. 2005-06 Snowfall (percent of normal)**

<b>Name</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>Normal Nov-Mar</b>	<b>Normal Nov-Apr</b>
Arapahoe Basin	161	243	96	70	69	41	123	108
Bear Lake (RMNP)	120	174	110	74	79	39	108	96
Beaver Creek	83	122	132	88	81	NA	100	NA
Berthoud Pass	158	164	110	83	97	39	121	101
Breckenridge	129	166	132	122	91	NA	127	NA
Copper Mountain	NA	NA	NA	NA	NA	NA	NA	NA
Keystone	138	162	142	74	82	NA	118	NA
Loveland Basin	NA	NA	NA	NA	NA	NA	NA	NA
Loveland Pass	NA	NA	NA	NA	NA	NA	NA	NA
Steamboat	243	158	132	84	134	NA	142	NA
Vail	130	154	110	111	91	NA	117	NA
Winter Park	89	126	90	77	101	NA	96	NA
Aspen Highlands	102	175	210	76	147	NA	139	NA
Aspen Mountain	105	146	199	55	88	NA	118	NA
Aspen Snowmass	87	185	162	57	130	NA	119	NA
Gothic	107	180	162	46	106	80	117	112
McClure Pass	NA	NA	NA	NA	NA	NA	NA	106
Monarch	133	212	154	50	110	NA	127	NA
Durango Mountain	NA	NA	NA	NA	NA	NA	NA	NA
Red Mountain Pass	55	141	130	41	151	75	105	101
Telluride	27	121	145	55	127	NA	95	NA
Wolf Creek Ski Area	64	64	97	43	226	NA	103	93
Wolf Creek Highway	26	64	82	39	234	76	93	90

**Table 3. 2005-06 Snowfall (inches)**

<b>Name</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>Total Nov-Mar</b>	<b>Total Nov-Apr</b>
Arapahoe Basin	70.2	103.2	45.0	31.1	35.3	21.7	284.8	306.5
Bear Lake (RMNP)	43.2	57.1	44.0	31.5	36.2	16.0	212.0	228.0
Beaver Creek	48.0	64.0	68.0	49.0	53.0	17.0	282.0	299.0
Berthoud Pass	74.6	81.0	58.0	39.9	56.0	29.2	309.5	338.7
Breckenridge	59.0	78.0	70.0	56.0	49.0	24.0	312.0	336.0
Copper Mountain	NA	NA	NA	NA	NA	NA	NA	NA
Keystone	42.0	63.0	61.0	27.0	38.0	21.0	231.0	252.0
Loveland Basin	NA	NA	NA	NA	NA	NA	NA	NA
Loveland Pass	59.0	77.0	43.0	30.0	26.0	21.0	235.0	256.0
Steamboat	83.0	105.0	95.0	49.0	64.8	16.3	396.8	413.0
Vail	75.0	93.0	73.0	64.0	61.0	32.0	366.0	398.0
Winter Park	58.5	76.5	59.5	44.2	67.7	17.3	306.4	323.7
Aspen Highlands	45.0	65.0	72.0	32.0	75.0	NA	289.0	289.0
Aspen Mountain	40.6	55.1	74.9	24.0	44.7	20.7	239.3	260.0
Aspen Snowmass	46.0	67.0	84.0	32.0	76.0	NA	305.0	305.0
Gothic	55.0	90.0	96.5	30.0	63.0	37.0	334.5	371.5
McClure Pass	29.5	62.0	54.0	28.0	84.0	28.5	257.5	286.0
Monarch	51.5	83.5	73.0	24.0	61.0	18.5	293.0	311.5
Durango Mountain	NA	NA	NA	NA	NA	NA	NA	NA
Red Mountain Pass	26.0	58.5	63.8	20.5	90.5	32.0	259.3	291.3
Telluride	13.1	47.7	65.4	25.9	73.4	NA	225.5	225.5
Wolf Creek Ski Area	37.0	35.0	61.0	28.0	160.0	21.0	321.0	342.0
Wolf Creek Highway	11.0	21.0	46.0	21.0	121.0	33.0	220.0	253.0

### ***Avalanches***

This winter 1521 avalanches were reported to the Center (Table 3). This is far below the average of 2293.

Little early season snowfall in the Southern Mountains reduced avalanche activity in November and December. The shallow snowpack set the stage for a busy January in the Southern Mountains. High winds and very little snow in February consolidated the snowpack in most locations. In March, record amounts of snow separated by periods of warm weather led to several avalanche cycles. Large avalanches ran to the ground in areas where the weak, early season snow was not consolidated. Activity in April slowed dramatically as warm temperatures melted out many of the avalanche paths.

When winter came to the Central and Northern Mountains, it brought lots of snow. Instead of the typical shallow, weak snowpack, the season started with a deeper and stronger snowpack. Big storms at the beginning of December made for an active and exciting start to the month. Smaller storms through the month formed wind slabs, keeping backcountry travelers on their toes. Many of the weak layers between the wind slabs quickly strengthened. In January and February the

snowpack was unusually stable for Colorado, and there were few avalanches. A thick layer of dust, picked up by winds over northern Arizona, was deposited through Colorado on February 14-15. Facets formed around the dust layer were a problematic weak layer through March.

### **Avalanche Accidents**

Table 4 lists all reported avalanche accidents this winter. Fatal accidents are in bold. Avalanche Center personnel try to investigate all fatal accidents (see Section VI). February, March, and April are remarkable for the lack of avalanche accidents. The snowpack in the Northern and Central Mountains was relatively strong and stable. In the Southern Mountains, a thin snowpack reduced the amount of terrain backcountry users could access, and probably reduced the number of users in the backcountry.

Both the number of people caught and the number of fatalities were below average (Figure 1). Over the last 13 years, on average 66 people are caught in avalanches in Colorado, though the number of people caught varies greatly from year to year. This past winter, only 35 people were caught, most of them in the first half of the winter. No avalanche related structural damage was reported to the Center. This winter, there were four avalanche fatalities, in three different accidents. On average there are six avalanche related fatalities in Colorado a year.

**Table 4. 2004-05 Summary of Avalanches, Danger Days, and Accidents**

	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Totals</b>
<b><u>Avalanches Reported</u></b>									
Northern Mountains		94	261	96	55	120	76		702
Central Mountains		34	158	48	37	55	12		344
Southern Mountains		9	86	197	49	106	28		475
State wide		137	505	341	141	281	116	0	1521
<b><u>Avalanche Accidents</u></b>									
People caught	1	5	12	10	3	4	0		35
People partly buried	1	3	7	6	2	1	0		20
People Buried	0	2	3	2	0	0	0		7
People injured	0	2	0	0	1	0	0		3
People killed	0	1	1	2	0	0	0		4
Vehicles caught	0	0	0	0	0	0	0		0
Properties struck	0	0	0	0	0	0	0		0

Figure 1 represents a 12-year look at the number of people caught and killed in avalanches winter. During some seasons the number of people caught increased dramatically. This is to be expected as some winters the snowpack develops as a much weaker structure, and Colorado's population has swelled by well over one million new residents. However, the number killed has stayed steady. This demonstrates the Center's avalanche forecasting and education efforts are having an impact.

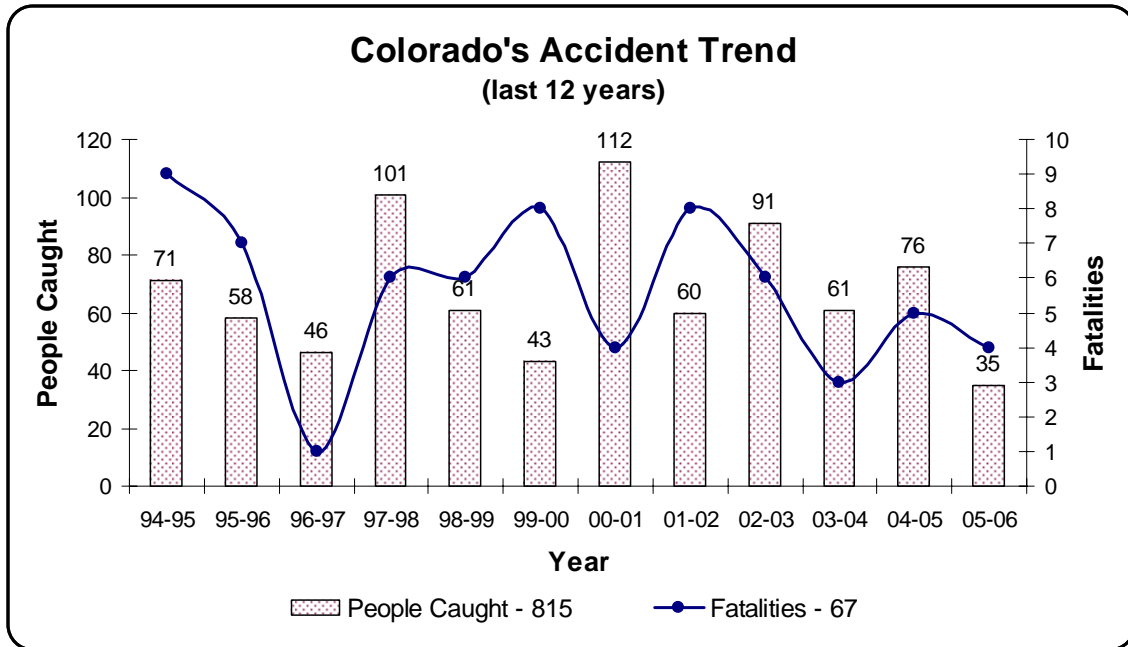


Figure 2. Colorado's accident trend for the last 12 years.

During the winter of 2005-06 the number of people caught (35) was only 50% of average. The 20 people partly buried were above the 10-year average of 16, and the 7 buried were below the average of 11. The number killed (4) was below average.

Table 4 lists all reported avalanche accidents this winter. The fatal accidents are in bold text. Avalanche Center personnel try to investigate all fatal accidents. Reports for all fatal accidents and many non-fatal avalanches are made available to the public on the CAIC web site.

The first avalanche fatality in the United States for the 2005-06 season was near Berthoud Pass on November 6. The CAIC was issuing intermittent early season forecasts prior to the accident. A month later, a group of skiers was caught in the same avalanche path. The second fatal accident in Colorado was late December, when bad weather forced two climbers to retreat from an attempt on Torreys Peak. In the poor visibility, the pair strayed into the bottom of an avalanche path. The final fatal accident in Colorado was January 1, when two snowmobilers were killed in an avalanche south of Cameron Pass. The avalanche caught seven riders, and the death toll could have been much higher.

**Table 5. Colorado avalanche accidents, 2004-05 (bold indicates fatal accident).**

<b>Date</b>	<b>Location</b>	<b>Description</b>
<u>October</u>		
28	Schofield Pass, Crested Butte	1 backcountry skier caught and partially buried.
<u>November</u>		
2	Purple Ridge, Crested Butte	1 backcountry skier caught and injured
6	Mines Peak, Berthoud Pass	1 backcountry snowboarder caught, buried, and killed
17	Telluride Ski Area	3 Ski patrollers caught, partially buried, 1 injured
16	Trico Peak, Red Mountain Pass	1 dog caught, buried, and killed
<u>December</u>		
3	Aspen Ski Area, out of bounds	1 snowboarder caught and partially buried
3	Aspen Ski area	1 ski patroller caught, fully buried
4	Red Mountain Pass	1 skier caught and partially buried
4	Carbon Peak, red Mountain Pass	1 backcountry snowboarder caught and partially buried
4	Telluride Ski Area	1 ski patroller caught and partially buried
4	Telluride Ski Area	1 ski patroller caught and partially buried
4	Mines Peak, Berthoud Pass	3 backcountry skiers caught, 1 buried, 1 partially buried, 1 not buried
22	Mount Kelso	2 hikers caught, 1 partially buried, 1 fully buried and killed
24	Peak 8, Ten Mile Range	1 (or 2) backcountry skiers caught, partially buried
<u>January</u>		
1	Trap Park, Cameron Pass	7 snowmobilers caught, 5 partially buried, 2 buried and killed
5	Cement Creek, Silverton	1 snowmobiler caught and partially buried
27	Coal Bank Pass, San Juans	1 snowboarder caught and partially buried
28	Breckenridge Ski Area	1 ski patroller caught
<u>February</u>		
4	Graysill Mountain, San Juans	1 ski guide caught and partially buried
4	Uneva Peak, Gore Range	1 backcountry skier caught
27	Steamboat Springs	1 child injured in roof avalanche
<u>March</u>		
9	Loveland Pass	1 backcountry snowboarder caught
9	Mount Emmons, crested Butte	1 backcountry skier caught
19	Flattop Peak, Rocky Mtn. Nat'l Park	1 climber caught, partially buried
21	Ophir	1 dog caught, buried, and killed
24	Arapahoe Basin Ski Area	1 skier caught

This synopsis has presented a general and statistical overview of the 2005-06 winter season. For a more detailed description of events, please turn to the next section, the Detailed Winter Summary.

# ***Detailed Winter Summary***

## **OCTOBER**

In early October the snowpack over the higher elevations began to build across Colorado. As is normally the case, much of the October snows melted at the lower elevations, but became faceted and weak near and above treeline. This led to the first reported avalanche that ran on October 28<sup>th</sup> near Schofield Pass. Ironically, this was also the first avalanche accident of the season as one backcountry skier was caught and partially buried in it. Two days later on October 30<sup>th</sup> two skiers were caught in a slab avalanche on Mount Baldy near Crested Butte. One was buried to his waist and the other to his chin but they were otherwise unharmed.

## **NOVEMBER**

Our first month of avalanche forecasting started with weak high pressure. Enough snow had already fallen across the Northern and Central Mountains that a number of backcountry skiers were out exploring potential descents.

Such was the case on November 2<sup>nd</sup> when one member of a party of two triggered a relatively small but destructive soft slab avalanche on Purple Ridge near Crested Butte. A short time later a lone backcountry skier skied passed this slide, and entered a slope of similar aspect and triggered another slide. This avalanche broke 1 to 1.5 feet deep ran some 2,200 vertical feet. The man was carried most of this distance and luckily came to a stop on a bench just before the avalanche careened over a large cliff to the valley floor. He sustained a separated shoulder and numerous cuts and bruises. His wife called the Crested Butte Avalanche Office later in the day to report that her husband had almost been killed in a big slide.

A weak cold front passed through the Northern and Central Mountains on November 5<sup>th</sup>, which brought 7-9" of snow to the Summit County area, and 2-4" to the Gothic and Aspen areas. Moderate to strong west winds accompanied the new snow near and above treeline. This combination created wind slabs on north through east aspects near and above treeline across the Northern Mountains. One of these hard wind slabs was triggered by a snowboarder on Mines Peak near Berthoud Pass. The snowboarder, buried about three feet deep, had left his beacon in the car. He was found about 2 hours later by a probe strike but too late to save his life.

A stalled closed low off the coast of California finally kicked eastward on November 10<sup>th</sup> and migrated into central Nevada. By the 11<sup>th</sup> it had moved into the Four Corners area and brought good snows to all mountains. Gothic reported 10.5" on the 12<sup>th</sup>, Copper Mountain 9", and Red Mountain Pass 6". The next storm system raced in on the tail of the last, with 9" new reported on the 14<sup>th</sup> from Ashcroft, just south of Aspen. Arapahoe Basin and Copper Mountain both reported 8" of new snow.

These two quick storms opened the door for more slide activity. On November 16<sup>th</sup> a skier triggered a shallow slide near Trico Peak in the San Juan's. The skiers escaped unscathed but one dog was killed. On November 17<sup>th</sup> three ski patrollers at Telluride were caught in a soft slab avalanche while doing early season boot packing. The slide ran 200 vertical feet and stopped in



dense timber. One patroller was shallowly buried and another was buried to his waist. One suffered several broken ribs. This was the last avalanche incident in November.

A blocking high pressure system stalled over the Great Basin until November 26<sup>th</sup> when a series of weak storms beat the system down. November would end on a snowy note. The last 4 days of the month brought 9" of new at Arapahoe Basin, and a very pleasant 43" at Steamboat in the Northern Mountains. In the Central Mountains 15" fell at Aspen during this time and Gothic reported 7.5". Snow in the Southern Mountains was still sparse, but Telluride reported more than 10" to fill out the month.

In October and November 89 slides were reported from the Northern Mountains, 34 in the Central Mountains, and 9 in the San Juan's. There were four avalanche incidents which caught six people. Four people were partly buried, two were buried, and one snowboarder was killed.

## **DECEMBER**

A Rex Block along the west coast would keep Colorado in a strong west to northwest storm track for the first week of December. Heavy snows and strong winds prompted Colorado's first avalanche warning of the season on December 3<sup>rd</sup>. Forty avalanches had been triggered by ski area personnel and CDOT crews by the first day of the warning. Snowfall amounts ranged from 2-4 feet as winds raged into the 50's and 60's. The avalanche warning was allowed to expire on the 5<sup>th</sup>. During the first 4 days of December nine people were caught in slides. This looked to be a very busy month. As the Rex Block broke down, high pressure moved overhead as week two of December began. Cold temperatures slowly moderated and avalanche crews caught up after the first big storm of the season.

As week two drew to a close the next storm moved on shore. This storm would bring light snowfall amounts across Colorado, but things were building up for the next storm cycle. Wind had been the one constant this season, creating deep hard and soft slabs.

On December 22<sup>nd</sup> two high school students from Colorado Springs were attempting a winter climb of Grays and Torreys peaks when strong winds and bad weather forced them to turn back. A large natural avalanche from well above their trail on Kelso Mountain struck and buried one of the hikers 5 feet deep. The survivor had no rescue gear and was forced to hike out for help. An avalanche dog and handler from the Breckenridge ski area were flown through horrendous winds and, once on scene, quickly found the young man. He had been buried for about 3 hours and died of asphyxiation.

From December 20<sup>th</sup> to the 23<sup>rd</sup> 45 avalanches had been reported along the northern Front Range. Many of these were explosive triggered, some ran naturally. New snow certainly had contributed to this cycle but the overwhelming culprit was the strong winds with gusts into the 60's. Snow continued to fall in areas favored by northwest wind flow. However, the San Juan's had been in the doldrums for most of the winter which would continue into March.

In the Northern Mountains 264 avalanches were reported in December. There were 158 slides reported from the Central Mountains, and across the San Juan's around 100 avalanches were

reported. In all, there were nine avalanche incidents which caught 12 people. Of the 12 people caught seven were partly buried, three were totally buried and one person was killed.

## **JANUARY**

January did not start on a good note. On New Years Day seven snowmobilers were caught in a slide near Cameron Pass. Five of the men were partly buried and two were buried and killed. To date the pace of avalanche activity and accidents did not bode well. Backcountry observations told of weak snow at the base of the snowpack for most mountain areas. Early season snows and persistently strong winds had created dangerous slab avalanche traps across Colorado and this recent accident highlighted the problematic conditions.

This situation was starting to change, though, particularly in the Northern and Central Mountains. When forecasting for avalanches in a continental climate, trends toward stability rarely shows rapid strengthening. But a strengthening snowpack was knocking at the door which our climate-trained minds had a hard time accepting, especially given the harsh start to the winter. Historically, January leads us into the busiest avalanche period of the year. But oddly (and fortunately), the January 1<sup>st</sup> incident was the last serious accident we would see through the rest of the season.

The storm that closed out 2005 was over the plains as the first sunset of 2006 fell across Colorado. Some good snows were reported New Years morning from the Southern Mountains with 10" at Coal Bank Pass, though only 4" at Vail. On the night of the 2<sup>nd</sup> many overnight low temperatures barely made it into the low 30's. A strong, warm, dry, south-westerly flow moved warmer desert air into the San Juan's for a very spring-like feel. A persistently stable atmosphere remained entrenched across the Southern Mountains and strong winds were the best they would get on the 4<sup>th</sup> and 5<sup>th</sup>. But blowing snow increased the avalanche danger and brought on a flurry of 10 slides, both triggered and natural in the western San Juan's.

What snow fell the first week of January favored the Northern Mountains. Winter Park saw 5.5", and Arapahoe Basin reported 3" new on the morning of the 4<sup>th</sup>. By January 5<sup>th</sup> colder temperatures and a favorable jet stream location upped the snowfall totals across the Northern and Central Mountains. Steamboat added 6" at their top station, and Winter Park another 3.5" before high pressure moved in later on the 5<sup>th</sup>. There were 32 avalanches reported in the Northern and Central Mountains on the 5<sup>th</sup>.

The short lived high pressure gave way on the 8<sup>th</sup> as a series of weak Pacific systems began to track across the Northern Mountains where there was 6" of fresh snow at Rocky Mountain National Park, 5" at the Eisenhower Tunnel, and in the Steamboat zone amounts ranged from 10-12" by the 9<sup>th</sup>. The Central Mountains remained active too as Aspen and Snowmass both reported 9" on their morning report. In the Southern Mountains the Monument observation site on the north side of Red Mountain Pass reported 10". But further south and east Wolf Creek Pass had only a trace of the white stuff.

The next storm in the series began on the night of the 11<sup>th</sup> when the storm track returned to the Northern and Central Mountains. In Breckenridge 3" of new snow were reported on the morning of the 12<sup>th</sup> and Sunlight, near Glenwood Springs, reported 5". Another 4" were reported from

Breckenridge on the 13<sup>th</sup> and Monarch Pass got 5” additional. The consistent snowfall for the first couple of weeks in January, along with the snow from late December, was gradually starting to form a stronger cap over the weak layers at the bottom of the snowpack.

A high pressure ridge to the west of Colorado kept the mountains under a persistent northwesterly wind flow until the end of the month. This is a weather pattern which primarily favors snowfall in the Northern and Central Mountains, but if strong enough can also benefit the north side of the San Juan Mountain in locations such as Telluride and the Monument snow study site on Highway 550.

Even when weather models showed promise for a southern-tracking storm normally favoring the San Juan’s, the system invariably tracked further north, leaving the southern third of the state in a dry slot. On the 13<sup>th</sup> Beaver Creek recorded 4.5” of fresh snow, Sunlight 5” new, Telluride 2”, but Wolf Creek Pass was left high and dry. Five days later Copper Mountain called in 7” and Wolf Creek Pass was skunked again. Telluride, on the more northern side of the range limped in with a meager ½”. Another 6” of new would fall at Winter Park overnight on the 18<sup>th</sup>, but again down south only 2” fell at Durango Mountain Resort.

A brief, but welcome, reversal of fortune showed up on the 25<sup>th</sup> as a closed low was finally able to maintain a moist southwest flow and bring good snows across the Southern Mountains. Wolf Creek Pass was rewarded with 9.5” of fresh snow on the morning of the 26<sup>th</sup>. But this would be the exception, rather than the rule until the spring snows of March.

With the consistent winds and new snow, avalanche observations were nearly constant. Near the halfway point of the month a pattern surfaced. Early winter had seen a lot of deep slide activity and the second half saw mainly direct action avalanches during storms.

There were 349 avalanches reported this month and four avalanche incidents caught 10 people. Six of these ten were partly buried, and, as mentioned, two were killed on January 1<sup>st</sup>. When broken down the Northern Mountain zones reported 86 slides, 66 in the Central Mountains, and 197 were reported from the Southern Mountains.

## ***FEBRUARY***

February proved to be an interesting month for weather, but remained tame for avalanches. It started out with a weather ripper as a strong Pacific storm on a west-northwest flow pummeled the state. By the 2nd over a foot of snow was reported from Copper Mountain, Vail, Breckenridge, and even the usually-skunked Lake City area in the San Juan’s. Some sites across the state would get 2-3 feet of snow over the first three days of the month.

The new snow came in with fairly strong winds and some avalanche activity did occur, though less than expected. On the 4th, one snowcat guide was caught in a soft slab avalanche and buried to his waist. Another backcountry skier was caught in a slide on Uneva Peak in the south end of the Gore Range. A brief respite on the night of the 3rd was followed by two weak storm systems on the 4th and 6th which produced only trivial snowfall amounts. A very strong high pressure system then planted itself over the state for the next 9 days. During this time the snowpack would gain more strength, and avalanche activity would all but shut down. One of the more interesting weather phenomenon’s of the season moved into the state late on Valentines Day afternoon. It

was first seen across the San Juan's and later that night it crept into the Central and Northern Mountains. A strong jet stream raced across the desert southwest, picked up enormous amounts of dust and dirt and spread it, along with snow, across Colorado. Several inches of new snow fell over the next few days. Wind speeds averaging in the 40 mile-per-hour range were not unusual and gusts into the 80's were reported from the San Juan's and Summit County. By the afternoon of the 15th winds would peg over 100 miles-per-hour near Red Mountain Pass. The new snow combined with the strong winds and dust left a "Pintoed" look to the snow surface. This was clearly visible by the time the storm finally cleared out on the 20th. Some avalanche activity was reported during this wind and snow cycle too, but most often the winds were so strong that slabs were scoured away rather than deposited.

High pressure would gradually re-build over the Great Basin and Colorado for the next several days. This brought increasingly warm temperatures that peaked on the 27<sup>th</sup> and 28<sup>th</sup> and sparked a cycle of roof avalanches. One of these in Steamboat Springs caught and buried a three year old boy while walking a short distance behind his mother. He was buried for several minutes outside of a school. Fortunately, several bystanders including his father who worked at the school, were able to pull him out from under the hard chunks of ice and snow with only minor cuts and bruises.

The warm overnight temperatures on the 27<sup>th</sup> also helped spur a fairly active wet slide cycle across the Northern and Central Mountains. Colorado Highway 91 over Fremont Pass, Highway 40 over Berthoud Pass, and I-70 west of Vail Pass and at the Eisenhower Tunnel all had short closure periods due to avalanche debris onto at least one lane of the road. Highway 50 over Monarch Pass was closed in both directions for a time due to several wet slides that buried the pavement with several feet of wet snow. The biggest avalanche of the cycle, though, plummeted down an infrequent path known as the Finger on the west side of Loveland Pass and closed both lanes of Highway 6. Many of these slides resulted in combination with the mid-month dust event. It also remained warm enough that rain was reported from the San Juan's on the afternoon of the 28<sup>th</sup>.

In all, there were only three avalanche incidents that caught three people this month. These three were buried, including the three year old who was the only person injured (head lacerations), for what is usually one of the busiest avalanche months in Colorado.

## **MARCH**

March brought a dramatic change in the weather pattern. For most of the winter the predominant flow from the northwest had favored the Northern and Central Mountains. This was now beginning to swing to a very moist southwest flow. Wolf Creek Pass plow operators earned their money as record snowfall was measured at our CDOT study site. Many of our other southern mountain sites reported similar high numbers for March.

A deep closed low over the Gulf of Alaska and a strong ridge of high pressure over the Great Basin were teasing Colorado with an early taste of spring as the first week of March developed. This weather pattern spun warm air into the Southern Mountains which helped their snowpack gain much needed strength.

This early shot of spring closed out on the 7<sup>th</sup> as a series of strong storms began battering areas favored by the prevailing southwest flow for the next week. Coal Bank Pass got a whopping 75” of snow with a water equivalent of 5.3”, and Wolf Creek Pass reported 71” at 4.1” of water from this storm. With the snow came strong winds with gusts into the 90’s reported from Red Mountain Pass northward to Summit County. Given the strong winds and blowing snow, the old snowpack structure, and copious amounts of new snow, the last avalanche warning of the season was issued for the San Juan’s on March 10<sup>th</sup>. It was dropped on the 13<sup>th</sup>, but winter weather was not through with Colorado yet.

The brief lull in the action lasted only 24 hours as snowfall resumed on the 15<sup>th</sup>. A series of quick moving spring like convective storms would play hit and miss across the state until the 23<sup>rd</sup>. The moist flow continued to hit those areas favored by the southwest (and sometimes easterly upslope) flow. The next short lived high pressure ridge hung around until the 26<sup>th</sup> when snow was again reported across Colorado from the New Mexico to Wyoming borders.

A return to warm temperatures from the 23<sup>rd</sup> to the 25<sup>th</sup> caused a number of wet avalanches. The most active area was the San Juan’s where the snowpack was not quite as strong as the Northern and Central Mountains. The return to snowfall on the 26<sup>th</sup> brought an end to the wet slide activity, but eventually March would exit like a lamb.

It was a big month for snowfall, especially in the Southern Mountains. At Wolf Creek Pass more snow fell than in the previous four months combined *by nearly two feet*. Not to be out done, McClure Pass reported measurable precipitation on 19 of 31 days. Even with all the snow and wind, only 265 avalanches were reported in March. Of these, 118 fell in the Northern Mountains, 55 in the Central Mountains, and 92 were reported from the Southern Mountains. Of these, there were five avalanche incidents that caught four people but only person reported as partly buried, and one dog was killed.

## **APRIL**

The month of April turned out to be a fairly dry month with less than average precipitation reported for all mountain areas. It also saw, with only a few exceptions, little in the way of avalanche activity. Only six days with measurable precipitation were recorded on Red Mountain Pass, and seven at McClure Pass through the 21<sup>st</sup> when observations ended.

April is also the month the CAIC starts to loose incoming data, but there were a few weather events of note. In Summit County, warm temperatures on the 4<sup>th</sup> set off a rash of small wet slides with over 20 reported around the I-70 corridor through Tenmile Canyon. April was again a windy month in the San Juan’s. On the 5<sup>th</sup>, wind gusts exceeded 100 miles per hour for four straight hours, maxing out at 124 mph at the Eagle weather station near Red Mountain Pass. These winds ushered in the biggest storm of the month with a total of 19.5” of snow recorded at Coal Bank Pass. Then a big warm-up on the 12<sup>th</sup> and 13<sup>th</sup> pushed temperature highs into the upper 40s and lower 50s near treeline across the state. As expected, a number of wet slides ran in the San Juan’s. Some fracture lines were up to 3 feet deep.

Winter held its last hurrah as temperatures plummeted on the night of the 17<sup>th</sup> as the weather gods played Doctor Jekyll and Mister Hyde. After high temperatures in the low 50s on the 17<sup>th</sup>, the mercury plummeted to lows in the single digits. Spring-like weather ended our daily public

forecasts on April 23<sup>rd</sup>. Although there were 115 avalanches observed through the 23<sup>rd</sup>, there were no reported avalanche incidents. Most of the slides were in the Northern Mountains where 75 were spotted. Only 12 avalanches were reported from the Central Mountains, and Southern Mountain observers called in 28 events.



# ***Information Acquisition***

## ***Daily Weather, Snowpack and Avalanche Data***

The Avalanche Center relies on incoming data to make accurate assessments of current avalanche stability, and to make mountain weather and avalanche hazard forecasts. There are three main sources of these data—the Colorado Observer Network, CAIC remote weather stations and National Weather Service products.

**Colorado Observer Network:** the Center has established a network of about 35 manned observation sites in the Colorado mountains. Twenty-one sites are developed ski areas, from which snow-safety personnel report current weather, snowpack and avalanche data. The remaining sites are highway, heli-ski, and backcountry sites from which volunteers or contract observers report to the Center.

**Backcountry Observers Network:** During the past 6 seasons Scott Toepfer has managed a small group of nine backcountry travelers dedicated and contracted to providing the Center with avalanche and snowpack observations. During the course of their recreational travels the observers gather information and data and send it to the Center before the next forecast day. This network supplies the Center with information and data found away from sites within our Colorado Observer Network.

**Remote Weather Net:** The Center has established a network of remote, high-elevation weather stations. The eight stations are located on Kendall Mountain, Red Mountain, Lizard Head, Molas, Wolf Creek, Loveland, Berthoud, and McClure passes. Forecasters can access stations via computer modem giving forecasters real-time data any time during the day or night or via the Internet forecasters can monitor hourly summaries. Forecasters can also access similar stations located at several ski areas.

**National Weather Service:** Avalanche Center staff have access to all products and expertise of the NWS staff. Computerized weather maps, satellite imagery, radar data, and radiosonde data are all available from the state-of-the-art AWIPS workstations. Also, available are information from manned and remote weather stations, and written analyses and forecasts. Additionally, discussions with NWS forecasters in interpreting data and products are an immense help.

## ***Westwide Avalanche Network***

As a cooperative member of the Westwide Avalanche Network ([www.avalanche.org](http://www.avalanche.org)) the Center serves as a repository for avalanche accident data for the United States. Information on avalanche accidents is stored in a database maintained by the Center. The accident data is used by Center personnel on a real-time basis and also for later analysis. Trends in accidents, relationships between survival and burial times and depths, and types and methods of rescues are essential information to be passed along to snow scientists, search and rescue teams, and the public. The Center's web site, lectures, field seminars, media contacts, and publications by Center personnel are some of the methods for disseminating this information.

Additionally, the Center responds to about 30 requests a year for raw or tabulated data. These requests come from the ski industry, the US Forest Service, universities and secondary schools, snow researchers, consultants, and lawyers.

### ***Accident Investigations***

Avalanche Center personnel try to investigate all significant avalanche accidents and fatal accidents. This winter the Center staff investigated several accident sites and interviewed witnesses. In addition to visiting sites and always when circumstances prevented a visit, the Center staff spoke with law enforcement officers, coroners, and rescuers to learn more about the accident. Timely information is used for current stability evaluations while other information is often used for future educational purposes. When serious accidents occurred the Center was quick to post information about the accident on the Center's web site.



## ***Forecast Dissemination***

Following are the means by which the Center disperses information on mountain weather, avalanche, and snowpack conditions.

### ***Public Hotlines***

Data from about 35 field-observation sites are used to prepare forecasts for six hotlines in Colorado. Generally hotline counts have slowly decreased because an increasing number of people who are now getting the forecast off of the CAIC Web site, and are receiving e-mailed forecasts through Friends of the CAIC. Thus, hotline records have not been continued.

However, the Summit County/Vail hotline has continued to be very busy. More than 21,600 calls were placed to this hotline in 2005-06, an increase over the previous winter by more than 3,000 calls. This hotline serves a high elevation region historically known for many avalanches and accidents. With the significant amount of snow that remained there this spring it continued to be a high use area. Thus, the hotline continued to be updated through May and it got an additional 700 calls for current information.

### ***E-mail to Friends, Observers and Forecasters***

Some 246,060 forecasts were sent via e-mail this season. These went to the Friends of the CAIC, to CAIC observers and highway forecasters.

### ***Web Site***

The Center's Web site ([www.geosurvey.state.co.us/avalanche](http://www.geosurvey.state.co.us/avalanche)) consists of 20+ different pages, which include forecasts, statistics, accident accounts, photos, basic avalanche information, and links to other sites. This season the site had 325,723 visitors who made 821,068 visits over the course of the winter. They made individual 3,106,343 page views. The most popular are the daily forecast pages for the Northern, Central and Southern mountains, which received 404,760 hits by the end of May.

Much work will go into the Web site this summer. There will be a new look and greater functionality, especially the forecast page, for visitors to the site next winter.

Figure 2 below shows CAIC's product dissemination growth from our outlets. Note that hotline use has declined as web site use has increased significantly.

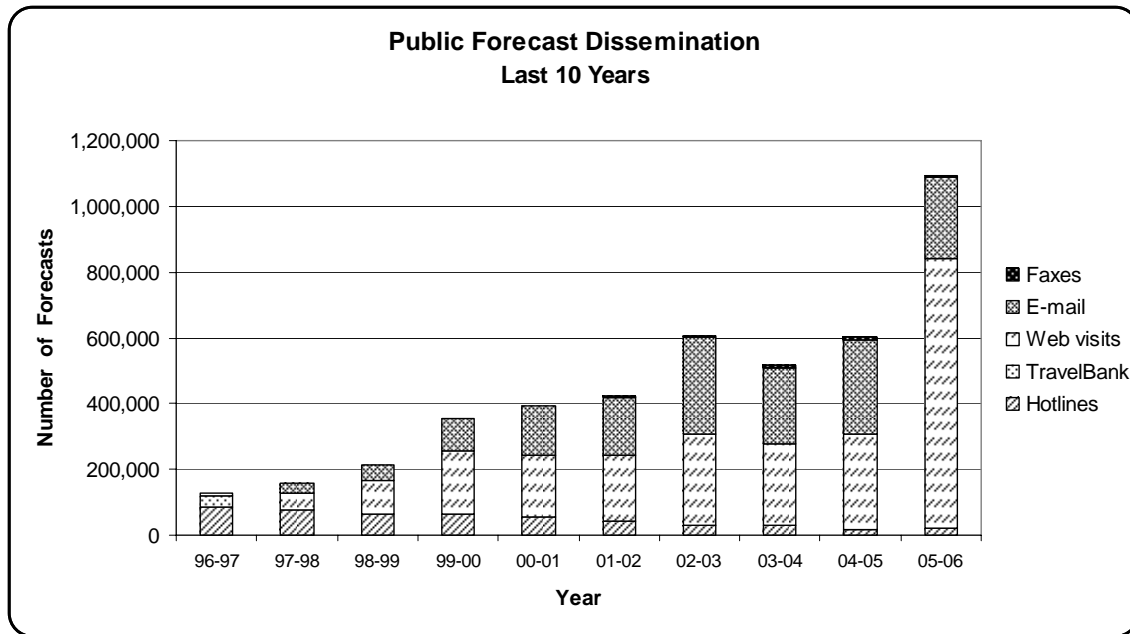


Figure 3 Public Forecast Dissemination

### Radio Broadcasts

The Avalanche Center continues to provide information to the public via radio. This is especially beneficial to regions where long distance telephone calls to an avalanche hotline would be inconvenient and costly. Some stations broadcast our message daily and others have been most helpful by broadcasting Avalanche Warnings and Special Avalanche Advisories when necessary. Some stations that convey our bulletins include public radio KVNF-FM in Paonia, KOTO in Telluride, KVMF in Vail, KFMU in Steamboat, and KYSL-FM in Frisco.

### NOAA HazCollect

When the avalanche danger is rated high or extreme, CAIC forecasters issue Avalanche Warning bulletins daily until the danger subsides. An Avalanche Warning Termination Bulletin is then issued. Special Avalanche Advisories are issued when the avalanche danger could increase significantly if a storm forecast verifies. These bulletins are transmitted to the news media via the National Oceanic and Atmospheric Administration (NOAA) through the HazCollect program which distributes various local and national warnings, including avalanche danger bulletins.

This winter the first Avalanche Watch was issued as early as November 14 when a strong storm system moved through the Northern Mountains. The next Watch came on the afternoon of December 3<sup>rd</sup>, and by later that afternoon the first Avalanche Warning of the season was issued for the Northern and Central Mountains. It was terminated on the 5<sup>th</sup> when the snowpack began to stabilize after some 2-5 feet of snow fell and strong winds drifted it into avalanche starting zones. Five Avalanche Watches were issued in January, but none of these developed into a warning. February was relatively quiet and only one Avalanche Watch was issued. The second, and last, Avalanche Warning went into effect early in the morning on March 10<sup>th</sup>. It was issued for the San Juan Mountains and lasted through the 12<sup>th</sup>. The last bulletin of the season, an

Avalanche Watch, was issued on May 15<sup>th</sup> for all Colorado mountains. This was due to increasing spring temperatures and the threat of wet snow avalanches above 11,000 feet.

### ***News Media***

Avalanche-related incidents involving people, property, highways or unusual mountain weather draw the public's and the media's attention. This winter the Center had some 120 contacts with television, radio, newspaper, and magazine reporters.

### ***Search and Rescue Assistance***

The Avalanche Center provided assistance to the Colorado search and rescue community numerous times during the winter. In addition to providing detailed mountain weather and avalanche forecasts the Center also provides technical assistance on search and rescue missions. The Center's staff worked with local law enforcement, rescue teams, and county maintenance crews to reduce the risk to rescuers and other workers.

## ***Public Education***

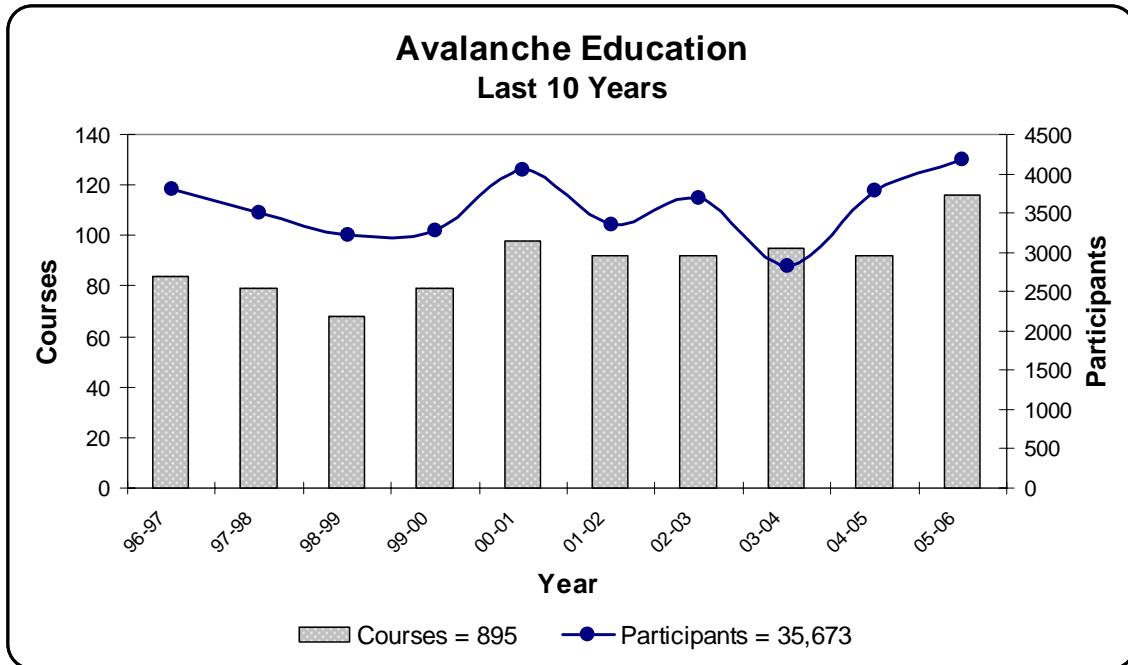
Education is essential to reducing avalanche accidents thus public education is a key component of the Center's mission to saving lives. All CAIC forecasters are involved in education programs. Our education objective is achieved through the following means.

### ***Avalanche Courses***

Demand for avalanche education has increased significantly in recent years. By the end of the season the Center staff had spoken at 116 different courses or seminars to some 4,183 people. This was the most ever courses taught in a season, and the second highest number of participants. Below, Figure 3 shows the CAIC's avalanche education for the last 10 years, and Table 5 lists all of the programs presented by CAIC staff this winter.

The courses vary from 1-hour seminars to multi-day classroom and field workshops. The scope and content varied from a simple overview of avalanche hazard and awareness to multi-day programs covering mountain meteorology, avalanche terrain recognition, the Colorado snowpack, methods of safe winter travel, and survival and rescue techniques. Students this winter included backcountry enthusiasts from the public, professional ski patrollers, search and rescue volunteers, law enforcement officers, snow-cat ski guides, members of ski and snowmobile clubs, the Colorado Mountain Club, Boy Scout troops, journalists, law enforcement officers, air ambulance crews, the USFS, and specialized training for the Colorado Department of Transportation (CDOT).

Through our agreement with CDOT the Avalanche Center staff provides specialized training to CDOT winter maintenance personnel on avalanche awareness, rescue, safety precautions, and avalanche reporting.



**Figure 4. Avalanche education for last 10 years.**

**Table 6.** Avalanche Courses and Seminars, 2005-06

MONTH	DAY	INSTRUCTOR	GROUP & LOCATION	TYPE	STUDENTS	PREP TIME	DRIVE TIME	MAN HOURS
Sept	13	SL	CU students, Boulder	hydrology	28	4	0.5	1
Oct	11	HM	Friends of Berthoud Pass, Denver	avalanche awareness	125	3	1	2
Oct	19	EG, BS	CSAW, Copper Mountain	professional seminar	175	47	6	7
Oct	22-28	DA, NL	National Avalanche School, Snowbird, UT	Level 1	200	32	18	60
Oct	26	HM	Friends of Berthoud Pass, Denver	avalanche awareness	44	0	1	2
Oct	29	EG, HM	Mountain Shop, Ft. Collins	myths of avalanches	5	1	2	1
Nov	2	DA	Alpine Rescue Team, El Rancho	avalanche awareness	43	4	2	2.5
Nov	7	NL	Keystone Ski Patrol, Keystone	patroller school	75	2	1.5	1.5
Nov	9	DA	Colorado Mountain Club, Golden	weather & avalanche	56	1	1.5	1
Nov	9	HM	Colorado Mountain Club, Golden	learn from accidents	43	4	1	2
Nov	9	NL	Channel 9 Winter Weather Seminar, Denver	avalanche awareness	130	2	2	1
Nov	11	EG	14'er World	avalanche awareness	100	0.5	1	0.75
Nov	15	HM	Friends of Berthoud Pass, Boulder	avalanche awareness	93	0	1.5	2
Nov	16	HM	Colorado Mountain Club, Golden	avalanche awareness	76	0	1	2
Nov	17	HM	Jefferson County Open Space	avalanche awareness	55	0	0.5	2
Nov	18	EG	Roaring Fork Avalanche Center, Aspen	avalanche awareness	50	0.5	4	0.75
Nov	18	MM	Poncha Springs	avalanche awareness	7	10	0.5	3
Nov	19	HM	Nat'l Ski Patrol instructors, Loveland Ski Area	RECCO demo	12	0	2	0.5
Nov	21	MM	CDOT, Pagosa Springs	highway workers	12	3	6	5
Nov	29	DA	US Ski Team doctors, Beaver Creek	avy medical aspects	64	8	8	1
Nov	29	HM	Eastern Mountain Sports, Denver	avalanche awareness	10	0	1	2
Nov	30	DA	Alpine Rescue Team, El Rancho	avalanche awareness	41	2.5	2	2
Dec	1	RH	CDOT, Montrose	highway worker	15	3	4	2
Dec	2	RH	Mesa County Search & Rescue, Grand Junction	avalanche awareness	53	3	5	1.5
Dec	2-4	HM	Colorado School of Mines, Golden & Ike Tunnel	Level 1	6	4	5	14
Dec	5	BS	Boy Scout Troop 8362, Buena Vista	avalanche awareness	30	1	2	2
Dec	5	HM	Friends of Berthoud Pass, Winter Park	avalanche awareness	45	0	3	2
Dec	6	DA, HM	Excel Energy, Frisco	avalanche awareness	57	2	2.5	4
Dec	6	HM, DA, SL	Loveland Ski Area	RECCO/beacons	3	0	6	5
Dec	6	RH	CDOT, Gypsum	highway worker	3	3	4	2

Table 5 Continued...

MONTH	DAY	INSTRUCTOR	GROUP & LOCATION	TYPE	STUDENTS	PREP TIME	DRIVE TIME	MAN HOURS
Dec	6	BS	Breckenridge Ski Patrol, Breckenridge	ski patroller school	20	2	1.5	2
Dec	6	HM	Colorado Mountain Club, Golden	CMC instructors	18	2	1	3
Dec	7	EG	Mountain Shop, Ft. Collins	avalanche awareness	40	5	2.5	2
Dec	7	MM	CDOT, South Fork	highway worker	13	2	2	5
Dec	7-8	BS	Keystone Science School, Keystone	snow metamorphism	12	5	4	16
Dec	10-11	BS, HM, DA	Summit County Rescue Group, Frisco/Vail Pass	S&R BC Short	120	5	8	30
Dec	11	SL	Rocky Mountain Rescue Group, Boulder	transceiver clinic	25	0.25	0.5	1.5
Dec	13	HM	Eastern Mountain Sports, Denver	avalanche awareness	30	0	1	2
Dec	14	JR, MR, SH, AM	CDOT, Silverton	highway worker	24	4	0.25	10
Dec	15	JR	Ridgway State Park	avalanche awareness	35	2	3	2
Dec	15	RH	CDOT, Grand Mesa	highway worker	19	3	5	2
Dec	16	JR, MR, SH, AM	CDOT, Rico	highway worker	19	4	1	10
Dec	17	MM	Community Center, Pagosa Springs	avalanche awareness	12	2	0.5	2
Dec	17	HM, AG	Colorado Mountain Club, Ike Tunnel	CMC instructors	9	0	2	16
Dec	17	DA	Rock Mountain Rescue Group, Boulder	transceiver clinic	23	0	0.5	1
Dec	19	RH	CDOT, Gypsum	highway worker	6	3	4	2
Dec	17-19	ST, MZ	Summit Huts, Francie's Cabin	Level 1	18	2	1	24
Dec	28	MM	CDOT, Pagosa Springs	highway worker	9	2	0.5	4
Jan	2-5	BS	High Mountain Institute, Leadville	Level 1	6	6	4	33
Jan	3	RH	CDOT, Hanging Lake GWS	highway worker	13	3	3	1.5
Jan	4	HM	Mile High Snowmobile Club, Denver	avalanche awareness	40	2	0.75	2
Jan	5	RH	CDOT, McClure Pass	highway worker	11	3	1	3
Jan	7-30	JR, MR, AM	Prescott College, Silverton	forecaster course	4	10	16	158
Jan	6-8	EG, HM	Colorado Snowmobile Association, Grand Mesa	BC short course	37	3	8	16
Jan	6-8	ST	Telluride Avalanche School, Telluride	Level 1	30	6	14	24
Jan	8	DA	Rocky Mountain Rescue Group, Boulder	transceiver clinic	10	0	0.5	1
Jan	12	DA	Loveland Ski Patrol, Loveland Ski Area	Level 2 classroom	15	1.5	1.5	1.5
Jan	13-14	HM	Mountain Rescue Association, Aspen	BC short course	111	3	7.75	8
Jan	13-14	NL	Ski Haus, Steamboat Springs	BC short course	70	5	5	12
Jan	15	ST, MZ	Summit Huts, Francie's Cabin	BC short course	18	0	3	8
Jan	17	HM	Colorado Mountain Club, Colorado Springs	avalanche awareness	67	0	4	2

Table 5 Continued...

MONTH	DAY	INSTRUCTOR	GROUP & LOCATION	TYPE	STUDENTS	PREP TIME	DRIVE TIME	MAN HOURS
Jan	17	SL	Copper Mountain	avalanche safety	23	0	3.5	0.5
Jan	17	JR	Ouray Public School, Ouray	avalanche awareness	50	0	2	2
Jan	18	MM	CAIC, South Fork	avalanche awareness	17	2	2	2
Jan	19	HM	Eastern Mountain Sports, Denver	avalanche awareness	11	0	1.5	2
Jan	20-22	ST, MR, SA, AM	Silverton Avalanche School, Silverton	Level 1	100	12	14	40
Jan	21-22	HM	Loveland Ski Patrol, Loveland Ski Area	Level 2	10	1	4	10
Jan	24	MM	CDOT, La Manga	highway worker	12	2	2.5	4
Jan	25	BS	Beaver Creek Ski Patrol, Beaver Creek	advance patroller sch	12	1	2	9
Jan	25	RH	CDOT, Montrose	highway worker	37	3	5	1.5
Jan	25	EG	Mountain Shop, Ft. Collins	BC short, classroom	52	3	0.5	3
Jan	26	HM	Mountain Chalet, Colorado Springs	avalanche awareness	12	0.5	4	2
Jan	27-29	MR, SH, BS, AM	Silverton Avalanche School, Silverton	Level 1	100	12	24	40
Jan	28-29	EG, HM, SL	Mountain Shop, Cameron Pass	BC short, field day	40	0.5	10	24
Jan	30	RH	CDOT, Montrose	highway worker	22	3	4	1.5
Jan	31	EG	Colorado Mountain Club, Golden	avalanche awareness	37	3	2.5	3
Jan/Feb	31-1	HM-JR-MM-MR-SH	CDOT advanced training, Silverton	CDOT advanced	40	14	18	44
Jan	31	BS	Summit County Public Schools, Frisco	awareness, 5th grade	19	1	1.5	1.5
Feb	2	HM	Colorado Mountain Club, Golden	avalanche awareness	37	0	0.5	3
Feb	3-5	EG, JR, MR, SH, AM	Silverton Avalanche School, Silverton	Level 2	70	24	12	46
Feb	4	NL, ST, BS	Beacon Bowl, Arapahoe Basin Ski Area	transceiver clinic	75	0	3	24
Feb	4	HM	Colorado Mountain Club, Jones Pass	awareness, field day	17	0.5	2	8
Feb	5	HM	Colorado Mountain Club, Jones Pass	awareness, field day	17	0.5	2	8
Feb	5	ST	Babes in the Backcountry, Breckenridge	intro to BC travel	20	0.25	0.5	1
Feb	7-9	HM, BS, NL	Arapahoe Basin Ski Area, Arapahoe Basin	Level 1	21	4	12	32
Feb	8	HM	Colorado Mountain Club, Golden	advanced terrain sch.	16	4	0.5	2
Feb	8	JR	Ridgway Public School, Ridgway	avalanche awareness	30	0	2	2
Feb	8	BS	Rocky Mountain Outdoor Center, Buena Vista	avalanche awareness	28	1	2	1.5
Feb	10-11	BS	Rocky Mountain Outdoor Center, Buena Vista	BC short course	7	2	3	15
Feb	13	EG	AAIRE, Empire	Level 2 instructors	25	2	2	2
Feb	13	EG	Diamond Peaks Ski Patrol, Ft. Collins	obs and accidents	25	0	0.5	1.75
Feb	14	BS	Crested Butte Mountain Guides, Crested Butte	Level 3	6	0	3.5	6

Table 5 Continued...



MONTH	DAY	INSTRUCTOR	GROUP & LOCATION	TYPE	STUDENTS	PREP TIME	DRIVE TIME	MAN HOURS	
Feb	14-18	ST	National Avalanche School, Telluride	Phase 2, field	20	0	12	24	
Feb	15	HM	Colorado Mountain Club, Golden	human factors	16	2	0.5	2	
Feb	16	HM	Eastern Mountain Sports, Denver	avalanche awareness	2	0	1	2	
Feb	16	AG	Boulder Outdoor Center, Boulder	avalanche awareness	20	2	0	1	
Feb	17	HM	CO Orthopedic Trauma Symposium, Westminster	doctor's awareness	120	3	2	0.5	
Feb	17	HM	Colorado School of Mines, Golden	BC short, classroom	9	0	0.5	3	
Feb	18	AG	University of Colorado, Niwot Ridge	awareness/mechanics	9	2	2	1.5	
Feb	20	MR	Prescott College, Silverton	BC short, classroom	10	0	0	2	
Feb	20	HM	Boy Scout Troop 536, Littleton	avalanche awareness	21	0	1	1	
Feb	21	RH	CDOT, Glenwood Springs	highway worker	27	1	2	2	
Feb	20-21	NL, BS	Copper Mountain Ski Patrol, Copper Mountain	Level 2, classroom	12	3	2	2	
Feb	23	HM	New Vista High School, Boulder	BC short, classroom	8	0	1	2	
Feb	23	HM	Cub Scouts Pack 50, Evergreen	avalanche awareness	20	0	1	0.75	
Feb	23	JR, SH	Mankato State & N'm AZ universities, Silverton	BC short, classroom	20	0	0	2	
Feb	25	SL	Rocky Mountain National Park, Estes Park	Lyceum Series	84	5	3	1	
Feb	27	HM	Colorado Mountain Club, Golden	avalanche awareness	49	4	0.5	2.5	
Mar	3	BS	Copper Mountain Ski Patrol, Copper Mountain	Level 2, field day	12	0	2	6	
Mar	3	ST	Colorado Mountain Club, Jones Pass	CMC field day	32	0	2	8	
Mar	4	ST	Colorado Mountain Club, Jones Pass	CMC field day	21	0	2	7	
Mar	9	NL	Keystone Center, Keystone	"Future of Summit"	28	2	1	2.5	
Mar	9	MR, AM	Ridgway Public Schools, Ridgway	avalanche awareness	20	2	2	1	
Mar	24	BS	Breckenridge Rec Center, Breckenridge	wet snow awareness	28	4	1	2	
Apr	8	SL	Rocky Mountain National Park, Grand Lake	avalanche awareness	27	1	5	1.5	
Apr	14	MM, RH	Colorado Geological Survey, Denver	CDOT programs	40	2	9	1.5	
<b>TOTALS</b>					<b>Courses = 116</b>	<b>4,183</b>	<b>356</b>	<b>389</b>	<b>876</b>

EG=Ethan Greene; NL=Nick Logan; AG=Andy Gleason; DA=Dale Atkins; ST=Scott Toepfer; BS=Brad Sawtell; SL=Spencer Logan; HM=Halsted Morris  
MZ=Mike Zobbe; LM=Lee Metzger; SS=Stu Schaffer; RH=Rob Hunker; MM=Mark Mueller; JR=Jerry Roberts; MR=Mark Ridders  
SH=Susan Hale; AM=Ann Mellick

## ***Professional Conferences and Education***

The Center's staff has always been active professional members in the American Avalanche Association. The tradition continues as Mark Mueller serves as the organization's Executive Director, and Dale Atkins chairs the Search and Rescue Committee.

## ***Avalanche Education Materials***

For the 18<sup>th</sup> season avalanche accident slide sets (PowerPoint™) and rescue videos were again available and used by avalanche educators throughout the United States.

## ***Publications***

The Center staff contributed articles for nearly every issue of *The Avalanche Review*. Dale Atkins contributed several articles on emerging rescue technologies. Andy Gleason wrote about "Particle Image Velocimetry", applying high-tech methods to study the behavior of snow as it is loaded. Susan Hale described the 2004 avalanche cycle in the San Juans in "Avalanches and Monkey Business." In "Fourth and Ten" Halsted Morris discussed a new method for practicing beacon searches. Brad Sawtell explained a new analogy for avalanche education in "Assessing Stability: Interpreting an Unconscious Patient." A photo taken by Spencer Logan was a finalist in the First Annual Photo Contest.

## ***Web Site***

The Center's web page ([www.geosurvey.state.co.us/avalanche](http://www.geosurvey.state.co.us/avalanche)) provides avalanche and weather information useful to novices and experts alike. In addition to the popular daily forecast page Internet surfers can get information, pictures, and graphics on all sorts of avalanche and weather related topics. During the past season there were 325,723 cyberspace visitors who visited 821,068 times and made a total of 3,106,343 page views. The avalanche and mountain-weather forecast pages continued to be the most popular with 404,760 visits during the winter. The Northern Mountain forecasts were viewed 238,806 times, the Central Mountain forecasts viewed 81,134 times, and the Southern Mountain forecasts viewed 84,820 times.

## Forecasting for Colorado's Highways

This section contains information and statistics on the CAIC highway forecasting program for the 2005-06 season. Detailed weather and avalanche information for each of the four highway forecast offices can be found in their specific summaries below.

Table 6 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. Some 11,944 feet of roadway centerline was covered by avalanche debris this winter.

**Table 7. Avalanches reaching Colorado highways (does not include bank-slips).**

<b>Forecast Office</b>	<b>Inclusive Highways</b>	<b>Triggered Avalanches</b>	<b>Natural Avalanches</b>	<b>Total</b>
Silverton	US 550 Ouray to Coal Bank Pass; US 145 Lizard Head Pass; Colo. 110 (Silverton to Gladstone)	105	38	<b>143</b> (7,684' of CL covered)
Eisenhower Tunnel	US 40 Berthoud Pass; US 6 Loveland Pass; I-70 Georgetown to Vail Colo. 82 Independence Pass	48	41	<b>89</b> (2,060' of CL covered)
Pagosa Springs	US 160 Wolf Creek Pass; US 50 Monarch Pass; Colo. 17 Cumbres and La Manga passes	12	18	<b>30</b> (840' 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	31	36	<b>67</b> (1,360' of CL covered)
			<b>Total</b>	<b>329</b>

## **Silverton Forecast Office**

The Silverton Forecast Office has completed its 14<sup>th</sup> winter monitoring and forecasting avalanches for more than 100 slide paths along the US 550 corridor from Coal Bank Pass on the south end to Ouray on the north end. Additionally, this office is responsible for avalanche forecasts along Colorado 145 (Lizard Head Pass) and Colorado 110 (Silverton to Gladstone).

The forecasters work closely with plow drivers who contribute valuable storm data and slide observations to help formulate the forecasts. Training, including procedures for avalanche rescue and personal safety, is provided to CDOT workers and others. Forecasters Jerry Roberts and Mark Ridders prepared daily evaluations to keep CDOT apprised of avalanche conditions in their region. Interns Susan Hale and Ann Mellick provided invaluable help gathering data, making avalanche observations, teaching avalanche classes, and working on computer and weather station projects.

### **Weather Synopsis**

#### **November**

A few relatively small storms in October left snow only on high, shady aspects at the beginning of November. What little snow that didn't melt out or blow away formed a thin, weak base for November snow to fall on. The month was characterized largely by cold high pressure, but small amounts of snow accumulated during four storms (see totals below), generally on northwest storm flows. There were many periods of high winds with a peak gust of 95mph on the 14<sup>th</sup> recorded at the Eagle weather station.

#### **December**

December was a relatively dry and inactive month for the San Juans Mountains. A northwest flow dominated the weather pattern that brought 13 days of measurable, but light, snowfall due to a persistent ridge of high pressure that pushed storms into the northern and central mountains. Windy conditions were also added to the equation. As one traveled south, storm boards and SNOTEL sites had considerably less snow.

#### **January**

Snow study sites showed 13 days of measurable snowfall during January. Most of the weather continued on a northwest flow so the snowpack on our north side of the forecast area got close to average. South side study sites (except Lizard Head Pass) remained well below average. With the exception of one 17-inch storm in the Uncompahgre Gorge north of Red Mountain Pass, storms in January didn't produce significant snowfall. The San Juans were getting "nickled and dimed" throughout the month. Consistently high average-and-peak-gust winds were the story this month, and this contributed to a mix of stripped and loaded upper avalanche starting zones for the highway, and in the backcountry in general.

#### **February**

A storm that began on January 29<sup>th</sup> continued into the beginning of the February. Thus, the month began with enough snowfall that avalanche control work called for on Red Mountain Pass. High pressure and cold temperatures dominated the second week. The third week was cloudy and unsettled but storms produced little snow. The highlight of this unsettled period was sustained strong winds and a gust to 108 mph was recorded at the Eagle weather station. Strong

winds stripped the peaks and created windslab and/or wind-affected snow at all elevations. The remainder of the month was dry with warm days and cold nights until the last day of the month. Throughout the day and into the evening of the 28<sup>th</sup>, unseasonably warm weather brought rain to elevations as high as 10,800 feet.

### **March**

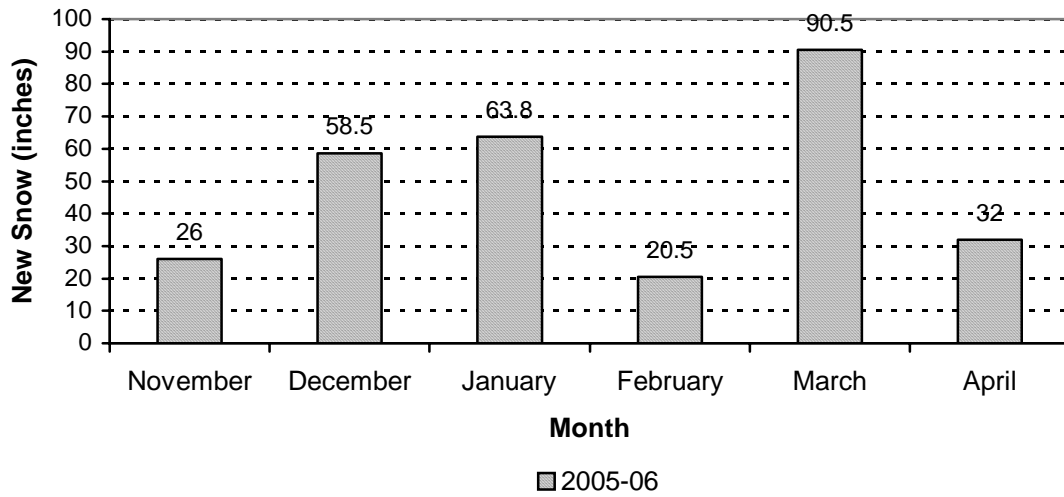
March started with a warm rain event but turned out to be the snowiest month this season. The first week was dry, but warm southwest storms kept the forecasters occupied for much of the remainder of the month. Overnight on the 8<sup>th</sup> a strong, moist system that started on a southwest flow then shifted to the northwest provided good snowfall to all sites. That storm was followed quickly by another potent system that came in on the 9<sup>th</sup> and continued into the 13<sup>th</sup>. High winds gusting into the 80s brought significant snowfall that favored the south side of the forecast area. Coal Bank Pass was the big winner for this storm with a snow/water total of 75 inches and 5.3 inches respectively. A good convective storm began on the 17<sup>th</sup> which brought over an inch of water to all but one of the study sites. This month's final storm began on the 28<sup>th</sup> and continued to the 30<sup>th</sup>. It had strong winds, warm temperatures, relatively high density snow, and periods of high precipitation rates.

### **April**

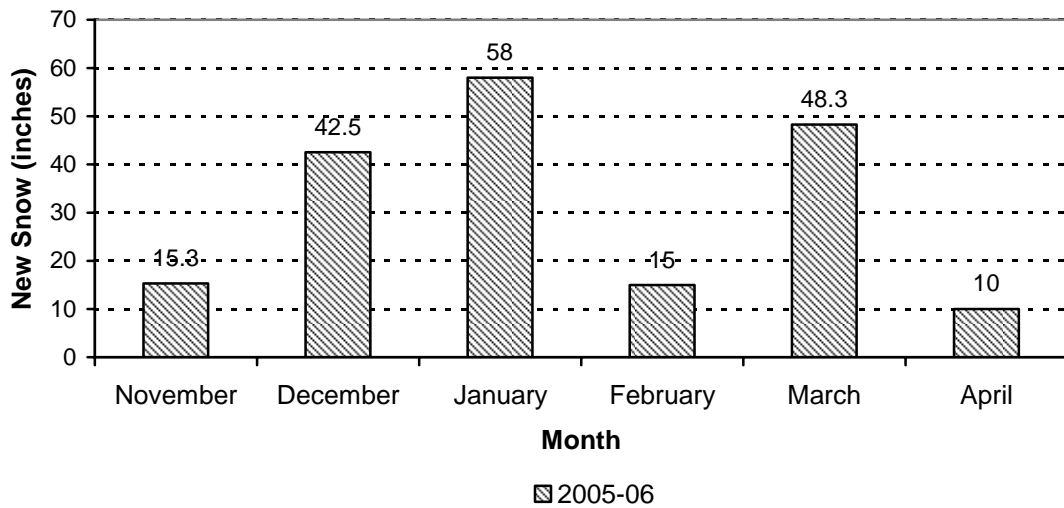
April was relatively warm and dry. There were only 6 days with measurable snowfall. Temperatures were above the seasonal average with record highs reported by the National Weather Service. We measured temperatures as high as 70 degrees F in the Uncompahgre Gorge and in the low 40s at the Kendall and Eagle weather stations at 13,000 feet. The prevailing flow was now out of the south-southwest. Like the months before it, April was windy and the 5<sup>th</sup>, winds howled for 4 hours with gusts above 100 mph. The peak gust, recorded at the Eagle station, was 124 mph! This raging storm system was the only one that forced avalanche mitigation for the month. It came in warm, with rain before it cooled overnight, and left up to 19.5 inches of snow with 1.8 inches of water equivalent on Coal Bank Pass before it died. Rainfall started again late in the evening on the 15<sup>th</sup>, but this time it spread north to all of the passes before turning to wet snow around midnight. Total snowfall up high resulted in only a few wet inches but in Silverton it rained all night with intense thunder, lightning and high winds. The latter half of the month was dry, relatively calm, and mild.

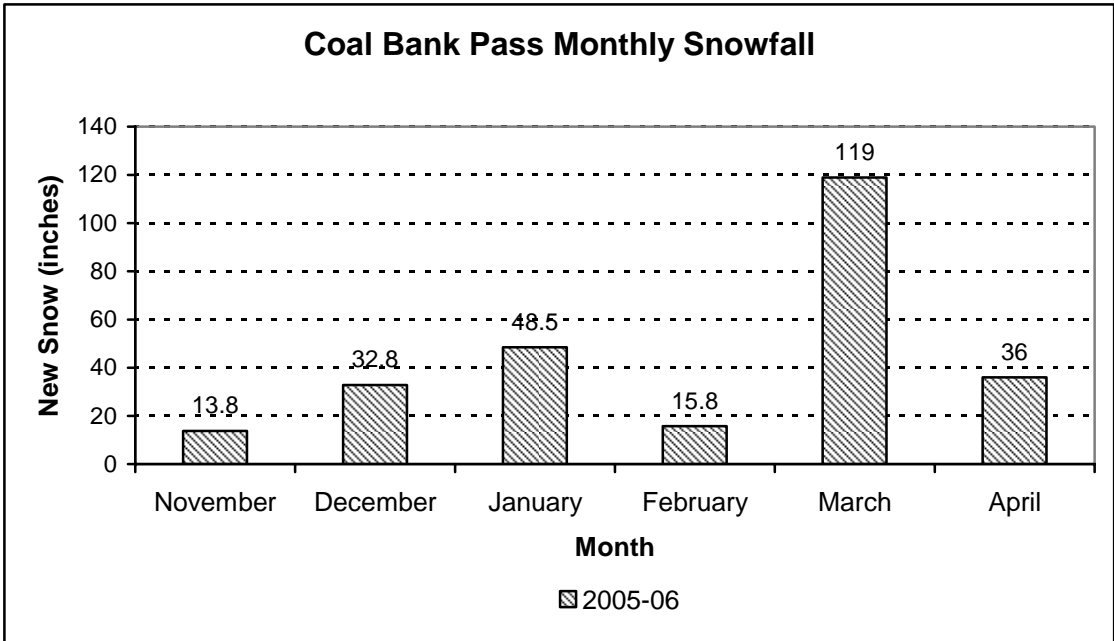
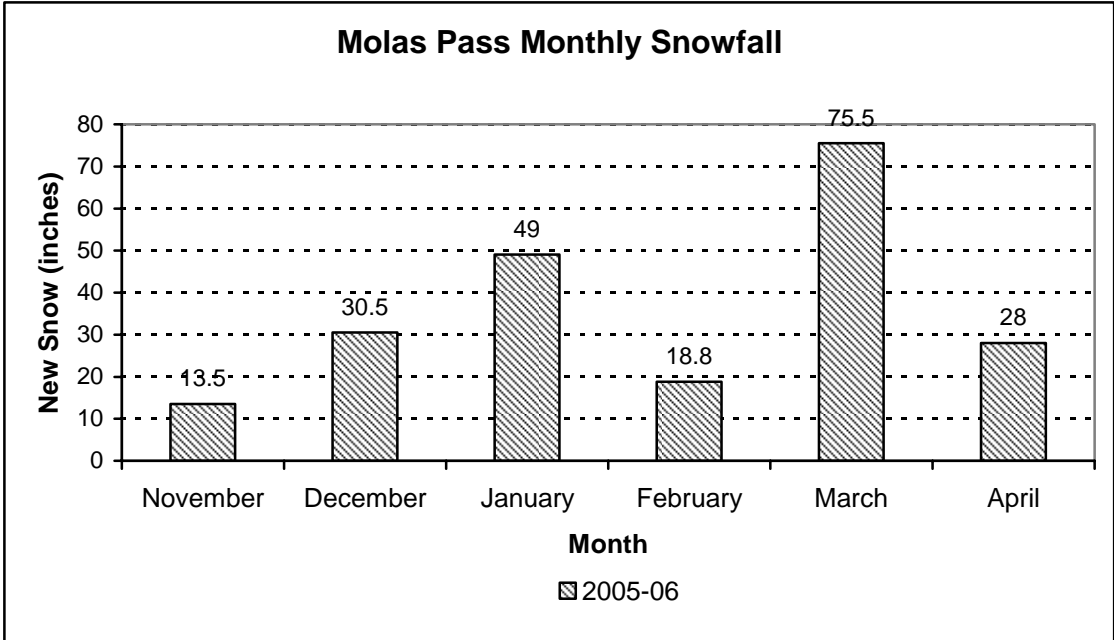
The graphs below show monthly snowfall amounts for each of the snow study plots.

### Red Mountain Pass Monthly Snowfall



### Monument Monthly Snowfall





<b>Station</b>	<b>Total snowfall</b>	<b>Total water equivalent</b>	<b>Comments</b>
Red Mountain Pass	291	27.6	67% of average at season's end*
Monument	189	16.3	39% of average at season's end*
Coal Bank Pass	265	24.9	49% of average at season's end*
Molas Pass	215	20.7	59% of average at season's end*
Gladstone - Hwy 110	252	22.6	n.a.
Lizard Head Pass**	n.a.	n.a.	41% of average at season's end*

\*All data based on SNOTEL yearly averages.

\*\*All data not available due to no observer at the Matterhorn Ranger Station this season.

## **Snowpack and Avalanche Highlights**

### **November**

Early in the month southern exposures were effectively burned out, but other aspects held a thin, weak snowcover. The thin snowpack and fairly cold temperatures encouraged classic San Juan faceting and depth hoar development. High winds kept many areas scoured but drifted pockets above timberline formed significant wind slab. Two skier-triggered avalanches were investigated in the first half of the month. These involved 3-to-5-foot-deep fracture lines. The wind slab broke to the ground on weak facets from October snows. Unfortunately one of the slides killed a dog. The mountains had a highly variable snowpack that posed little hazard to the highway but multiple hazards to the backcountry user.

### **December**

During December, many of the starting zones above treeline were stripped of significant snow on all aspects due to high winds. Snow in the areas above treeline that had snow was mostly wind slab overlaying weak, faceted snow. Below treeline the snowpack varied in depth and strength depending on aspect. Snowpits showed a generally thin and weak snowpack with no significant slab and little tension. Warmer temperatures at the lower elevations had a generally stabilizing effect on the snowpack. However, melt-freeze crusts on sunny aspects created potential bed surfaces for future snowfalls, and a good medium for the growth of faceted snow grains above and below these crusts. Unseasonably warm temperatures over Christmas left a very thin, widespread weak ice lens topped with a layer of graupel snow that could be a potential bed surface for future avalanches.

### **January**

The snowpack continued to be relatively weak on most aspects and elevations. Deep weaknesses persisted on all aspects with classic San Juan depth hoar at and near the bottom of the snowpack. There was no significant or widespread natural avalanche cycle this month. On the southerly aspects there were thick, strong crusts with faceted snow between layers, but natural avalanche activity was confined to the upper snowpack. On the northerly paths, natural avalanches were been observed to run to ground due to the weak basal snow. East and west aspects are in between. There were some crusts, but these were relatively weak and were combined with a mixture of slabs and faceted snow. Most of the paths were able to absorb the consistent but



relatively light snow loads they received. All of the avalanche mitigation was on Highway 550 north of Silverton on paths below treeline.

### **February**

The month began with new snow that created unstable conditions on Red Mountain Pass. The road was closed February 2<sup>nd</sup> at 10:45 pm due to natural activity in the Blue Point group as well as in the Brooklyns. Warm temperatures shrunk and solidified the snowpack thereafter. A very significant wind event out of the southwest on the 15<sup>th</sup> and 16<sup>th</sup> coated the San Juan snowpack with Utah's dust. Wind averages were as high as 61 mph for a few hours. This stripped the peaks and created wind slabs at all elevations. The wind deposited a dust layer on top of the near surface facets that formed during the preceding period of high pressure. The rain-on-snow event on the last day of the month caused several relatively small, natural, wet-loose slides to run. While these slides were mostly limited to the upper 10cm of the snowpack (there was one wet slab, Jackpot, with a 1-foot crown), three slides produced enough debris to put snow 1-2 feet deep by 110 feet along the centerline of Highway 550.

### **March**

The month began with warm, spring-like conditions, especially below treeline on all but the northerly aspects. Solid crusts had formed on all sunny slopes, though colder, faceted snow persisted within the pack at the higher elevations. With the increasing sun angle, even northerly aspects received decent amounts of solar radiation. The rain event at the first of the month, while worrisome at first, seemed to help solidify the snowpack. An isothermal snowpack was found only at low elevations on thinly covered sunny slopes.

There was a return to winter-like conditions over the last three weeks of the month. Most of the storms were characterized by relatively warm temperatures and high density snow that settled quickly. Warm temperatures between storms created crusts on all sunny aspects, but especially below treeline. These warm temperatures also caused periods of wet-loose avalanche activity.

Most natural slab avalanche activity during March occurred as the result of rapid loading and was confined to new snow layers. One significant natural slide occurred on the 20<sup>th</sup> when the King Mine hit the road south of Silverton. Near the end of the month natural and triggered avalanches were observed that ran to the ground and had fracture lines up to five feet deep.

At the end of the month the snowpack was closer to average than at any other point this season. However, we had not turned the corner from winter to spring snow conditions. On all aspects, especially above treeline, there was still cold, weak snow and questionable interfaces, particularly at dust layer(s). Below this month's snow, which had by now consolidated into a relatively strong mid/upper pack, sunny aspects had a matrix of crusts, some over an inch thick, that were intermixed with cohesionless facets (some moist) and vertical ice bodies in places. The facets were rounding but not necessarily bonding. Deep weaknesses persisted on northerly aspects. We were left with a complex, transitional snowpack as April loomed on the horizon.

### **April**

April's snowpack continued to shrink throughout the month without producing significant wet avalanches. Overall there were many warm days with good overnight freezing which kept the wet cycle to a minimum. Some relatively small wet-loose slides ran on sunny aspects, but only three affected the highway. However, some larger deep slabs ran naturally to the ground in the

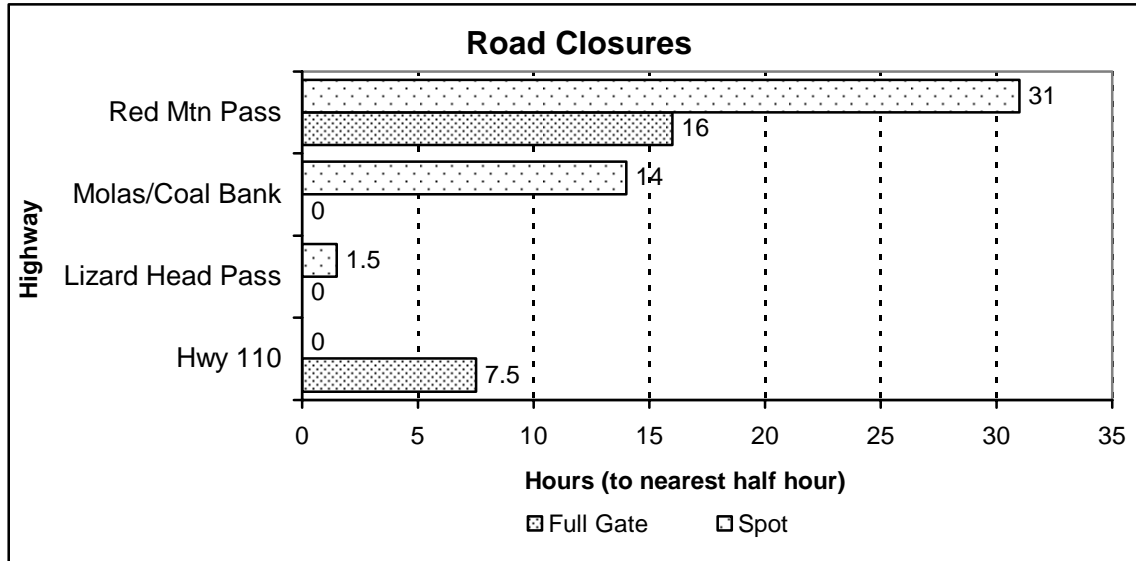
backcountry on cold, northeast aspects above timberline. Before the end of the month most paths were burned out and didn't have enough snow to reach the highway.

### Activity on Highway Avalanche Paths

<b>Highway</b>	<b>Triggered Did not hit road</b>	<b>Triggered Hit Road</b>	<b>Triggered debris on centerline</b>	<b>Natural</b>	<b>Natural debris on centerline</b>
Hwy 550 RMP	103	92	5,598'	37	1,271'
Hwy 550 Molas/Coal Bank	38	12	755'	1	20'
CO 145 Lizard Head Pass	7	1	40'	0	0
CO 110 Gladstone	4	0	0	0	0
<b>Totals</b>	<b>152</b>	<b>105</b>	<b>6,393'</b>	<b>38</b>	<b>1,291'</b>

## Road Closures

The following graph shows relative road closure times. Full gate closures close the highway for extended periods due to dangerous avalanche conditions. Spot closures are shorter and are for avalanche mitigation while avalanche paths are being shot.



## Accidents

There were no avalanche accidents involving CDOT or public vehicles on the highways this winter.

## ***Pagosa Springs Forecast Office***

This office is located in Mark Mueller's home in Pagosa Springs and staffed by Mark. Mark has completed his 13<sup>th</sup> winter of forecasting for US 160, Wolf Creek Pass; US 50, Monarch Pass; and Colorado 17, Cumbres and La Manga passes. Highway avalanche advisories were issued from November 15<sup>th</sup> until April 28<sup>th</sup>.

### **Weather Synopsis**

Snowfall was below average this winter. Monarch enjoyed early winter snow with a very snowy December. At Wolf Creek Pass, half of the winter's total snowfall fell in the month of March. Conditions at Cumbres/La Manga were similar to Wolf Creek.

#### **November**

Snowfall was well below average at the southern passes with only 11 inches falling at Wolf Creek which was 23% of average. Snow began to fall at Monarch in the latter half of the month and snowfall was above average.

#### **December**

Dry conditions persisted at the southern passes, but Monarch enjoyed a very snowy month. The predominant northwest flow was very favorable for Monarch and the rest of Colorado, but not favorable for the southern passes.

#### **January**

All passes were about 75% of average and several storms slipped through the persistent northwest flow to bring some much-needed snow to the southern passes.

#### **February**

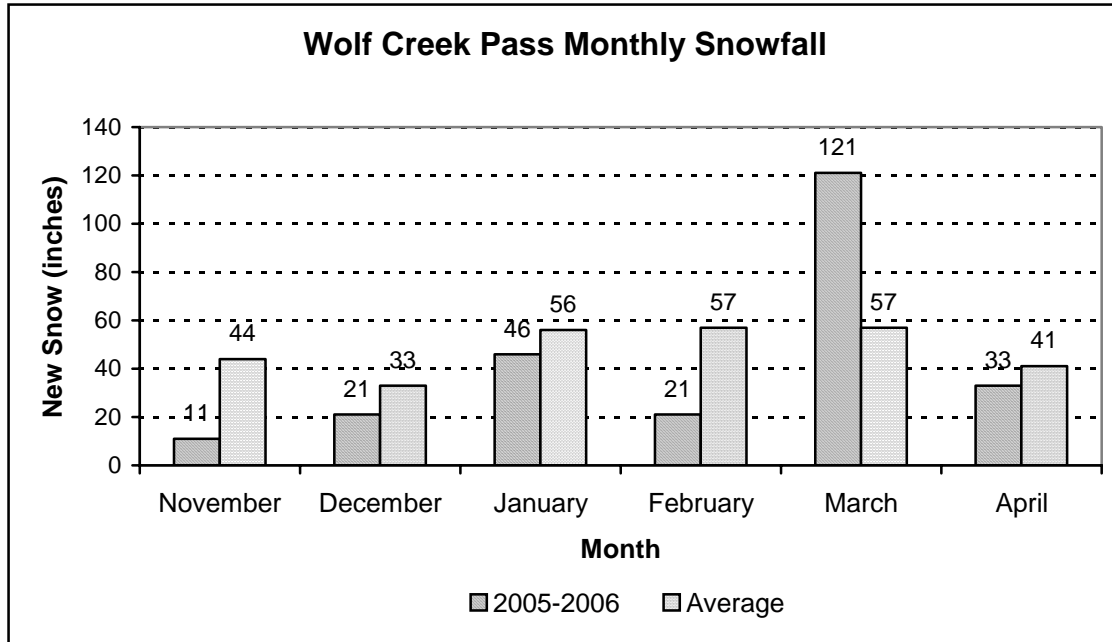
This was generally a dry month at all passes. Very high winds on the 16<sup>th</sup> and 17<sup>th</sup> created a dust layer that affected snow surface conditions and created a potential weak snow layer. Warm temperatures at month's end caused an earlier than normal wet snow avalanche cycle.

#### **March**

March was a dramatic turn around for the east San Juans as record snowfall was measured at Wolf Creek during the month. A storm from the 8<sup>th</sup> through the 13<sup>th</sup> was one of the biggest events observed and can be compared to the storm cycles of February 1993 and January 1997. Temperatures were cold, winds were strong, and snow densities were light.

#### **April**

Dry conditions returned after some snowfall early in the month. Snowfall was only 75% of average at all sites.



### Total Snow and Water Equivalent (Inches)

Station	Total snowfall	Total water equivalent	Comments
Wolf Creek Pass	253"	22.8"	89% of the 12 year average

### Snow Water Equivalent (inches)

Site	Nov	Dec	Jan	Feb	Mar	Apr*	Total from Oct. 1 & Percent of Average
Wolf Creek Pass <sup>1</sup>	1.4"	2.5"	3.4"	2.3"	8.9"	4.2"	22.8" (from 11/1)
Wolf Creek Summit <sup>2</sup>	1.1"	2.6"	3.9"	2.5"	10.5	5.8"	31.8"/83%
Wolf Ck Access <sup>3</sup>	M	M	3.9"	2.8"	10.2	4.7"	29.5"/81%
Cumbres Pass <sup>4</sup>	1.1"	1.9"	3.6"	2.0"	6.9"	2.9"	22.5"/78%
Monarch Pass <sup>5</sup>	2.3"	4.3"	2.1"	0.7"	2.3"	1.9"	15.5"/86%

\* As of April 29.

<sup>1</sup> Wolf Creek Pass study plot at top, north side

<sup>2</sup> Wolf Creek Pass Snotel site at Wolf Creek summit, south of the highway, 11,000 ft

<sup>3</sup> Wolf Creek Pass Snotel site at Wolf Creek Access, 10,200 ft

<sup>4</sup> Cumbres Pass Snotel site NW of Cumbres Pass, 10,040 ft

<sup>5</sup> Monarch Pass Snotel site NW of Monarch Pass, 10,760 ft

## **Snowpack and Avalanche Highlights**

An early winter thin snowpack, typical of Colorado, rapidly evolved into a fragile structure that avalanched easily when sufficient snowfall overburden was added. At Monarch this occurred in early December, while at the southern passes isolated avalanching began with snowfall in late January. But widespread avalanching along the highways never really developed because sufficient overburden came later in the winter when natural stabilization had already taken place.

### **November**

A thin early season snow cover rapidly changed into a fragile structure which is typical at Monarch Pass, but less common at Wolf Creek and Cumbres passes.

### **December**

Widespread avalanching occurred at Monarch Pass when high density new snow fell on a mostly-faceted snowpack. This cycle was the biggest in terms of debris on the highway in many years. Persistent dry conditions at the southern passes continued.

### **January**

The fragile snowpack gained some strength during January. Explosive testing at Monarch Pass confirmed these observations, while at Wolf Creek isolated, large avalanches occurred as snowfall overburden increased stress on the fragile early-season structure.

### **February**

Snowpacks at the passes gained some strength during another dry month. Extended clear periods caused the snow to evolve into a fragile structure of faceted grains near the surface. A wind storm mid month deposited a dust layer on the snow throughout Colorado. This dust layer enhanced faceting on the snow surface by absorbing additional sunlight. Above freezing temperatures at month's end caused isolated medium sized wet snow avalanches at Monarch Pass.

### **March**

The month started quietly enough, but the second week saw an intense snowstorm that brought significant snowfall to all passes. This one, however, finally favored Wolf Creek Pass with 71 inches of snowfall and 4.1 inches of water content. Cumbres Pass was also favored with abundant snow. Natural avalanches were large and widespread in the backcountry, but the highway paths only saw isolated activity because a considerable amount of bare ground was showing prior to the storm's onset. Snowfall continued through most of the month, setting at 14 year record for March at Wolf Creek with 121 inches snowfall.

### **April**

Snowfall was below average again. However, a modest storm that dumped 13 inches of snow with 1.6 inches of water during the first week caused isolated but large natural avalanches in the Wolf Creek backcountry. Avalanches along the highways remained small and isolated. The spring melt progressed quietly with no significant wet snow avalanches observed or reported.

### **Activity on Highway Avalanche Paths**

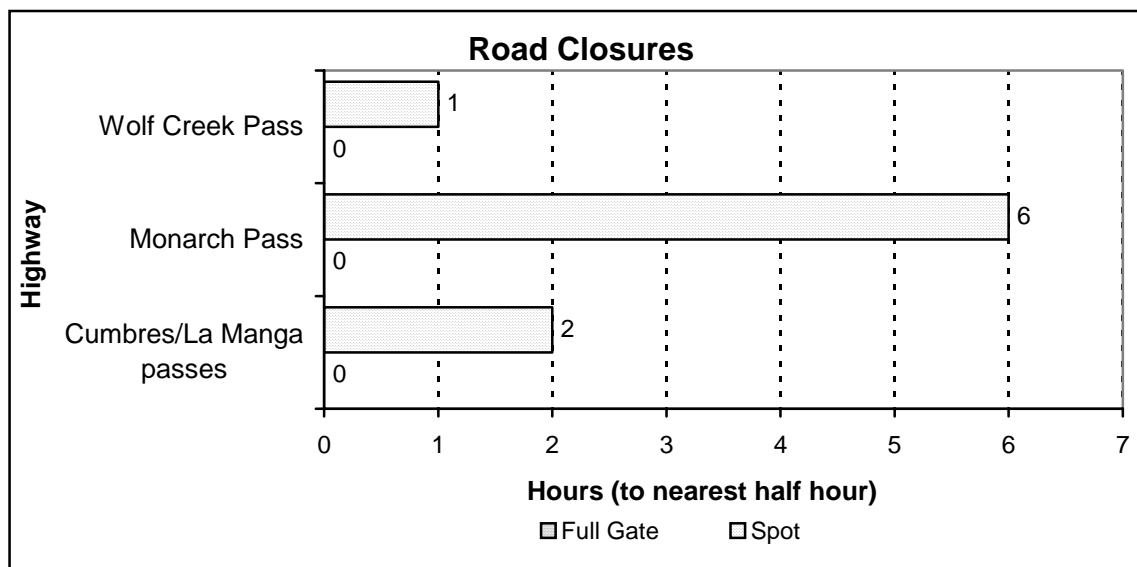
<b>Highway</b>	<b>Triggered Did not hit road</b>	<b>Triggered Hit Road</b>	<b>Triggered debris on centerline</b>	<b>Natural Hit Road</b>	<b>Natural debris on centerline</b>
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Hwy 160 Wolf Creek Pass	12	0	0	3	60'
Hwy 50 Monarch Pass	25	12	420'	15	360'
CO 17 Cumbres & La Manga	3	0	0	0	0
<b>Totals</b>	<b>40</b>	<b>12</b>	<b>420'</b>	<b>18</b>	<b>420'</b>

### Road Closures

The following graph shows road closure times. Full gate closures can close the highway for extended periods due to dangerous avalanche conditions. Spot closures are for shorter periods of time to allow for avalanche mitigation work.



### Accidents

No accidents or incidents involving CDOT maintenance workers or the traveling public occurred during the 2005-2006 avalanche season.

## ***Eisenhower Tunnel Forecast Office***

This was the 13th season of operation for this forecast office. It is normally housed in the CDOT engineers building (Road Control) at the west portal of the Eisenhower Tunnel. However, due to construction there this winter it was temporarily relocated to the east side of the tunnel in the dispatch room. Forecasters Lee Metzger and Stu Schaefer staff this office. The forecast area, CDOT Region 1, includes US 40, Berthoud Pass; US 6, Loveland Pass and Interstate 70 from Georgetown to Vail. Cameron and Independence passes are monitored when required. Snowfall and weather data are gathered daily from snow study plots located at Road Control, Berthoud Pass, Loveland Pass, Vail Pass and the highway shop near the Arapahoe Basin ski area.

### **Weather Synopsis**

#### **November**

November was quite busy in Region I. Snow totals were well above average and storms came fast and furious. November snows fell on old snow on northerly aspects, and fell on bare ground in starting zones facing south. Storms this November were very consistent throughout Region I and did not favor any one area.

#### **December**

December saw a continuation of heavy snows. All the study plots in Region I received over 70 inches of snowfall. Records for Road Control, Q12 on Berthoud Pass, and Vail Narrows saw monthly snow accumulations near, or over 200% of normal. Measurable amounts of snow fell on 25 of 31 days in December.

#### **January**

The Eisenhower Tunnel snow stake recorded near average snowfall in January. Berthoud Pass was slightly above average and Loveland and Vail passes were slightly below average. Snow was recorded on 17 days at every site. Hourly average wind speeds in the upper 20's was common, and there were gusts over 70 mph. A westerly wind flow dominated the month.

#### **February**

February began with cold temperatures and more snow which prompted the closing of Loveland Pass due to avalanche hazard. However, this scenario did a fast turn around and by mid-month stable snow conditions prevailed. A red dust layer deposited during a snow storm February 17<sup>th</sup> provided poor bonding for subsequent snows. Strong, consistent afternoon breezes also left localized deposits of wind slab which continued to slide on the dust layer.

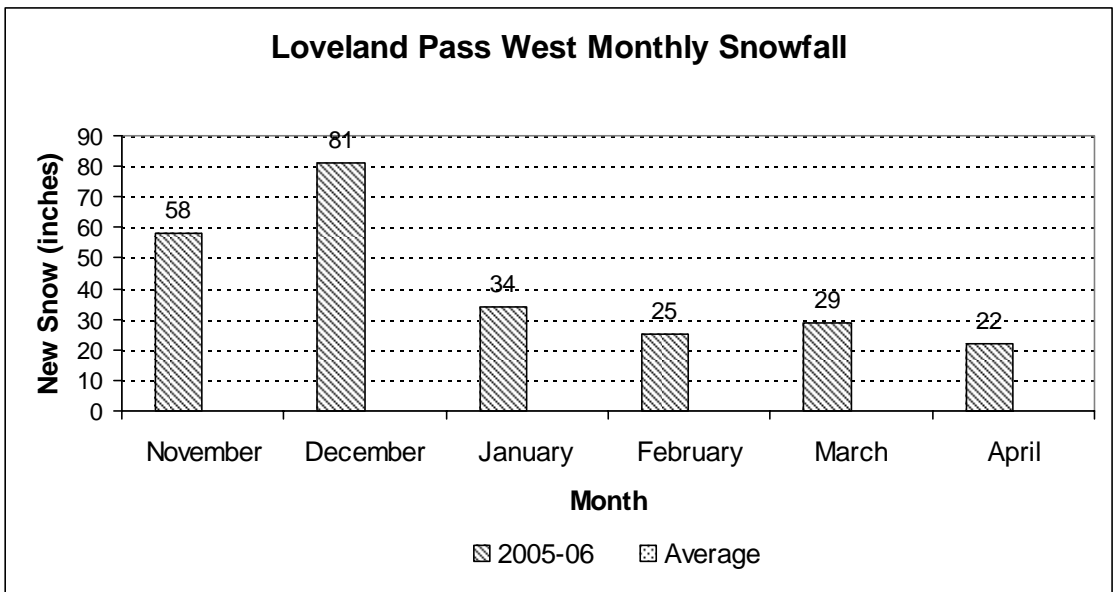
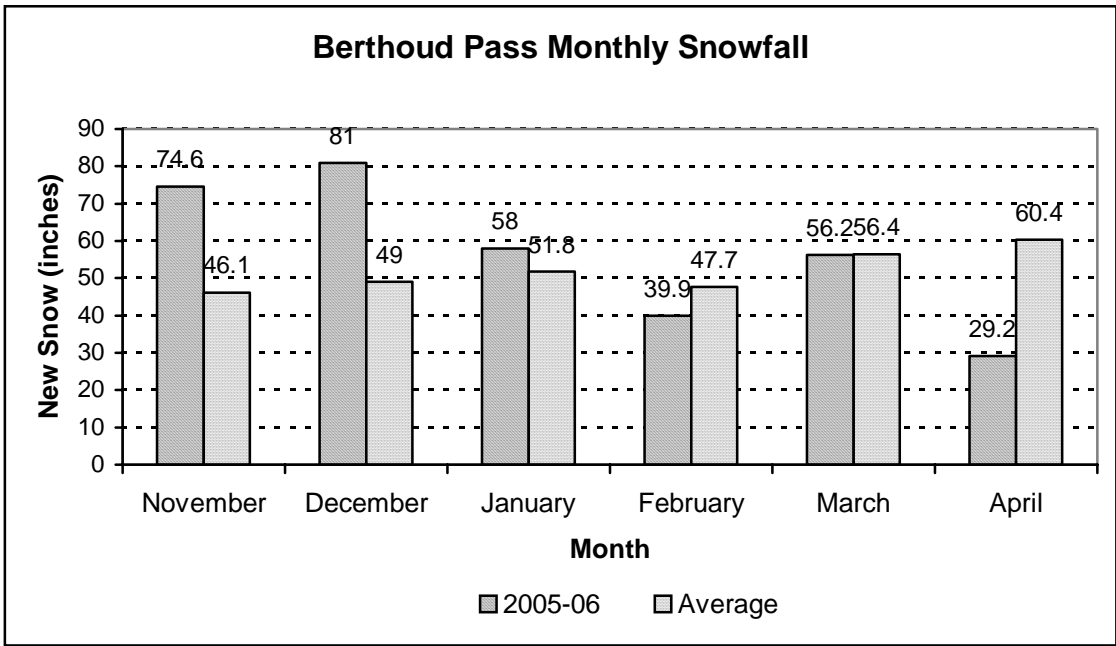
#### **March**

March saw only light snowfall this winter and only one of the snow study plots got average snowfall. Winds also were light and the month began with a 6 day period of very warm weather and the first wet slide cycle of the season. Snow was recorded on 16 of 31 days but 24-hour accumulations were small.

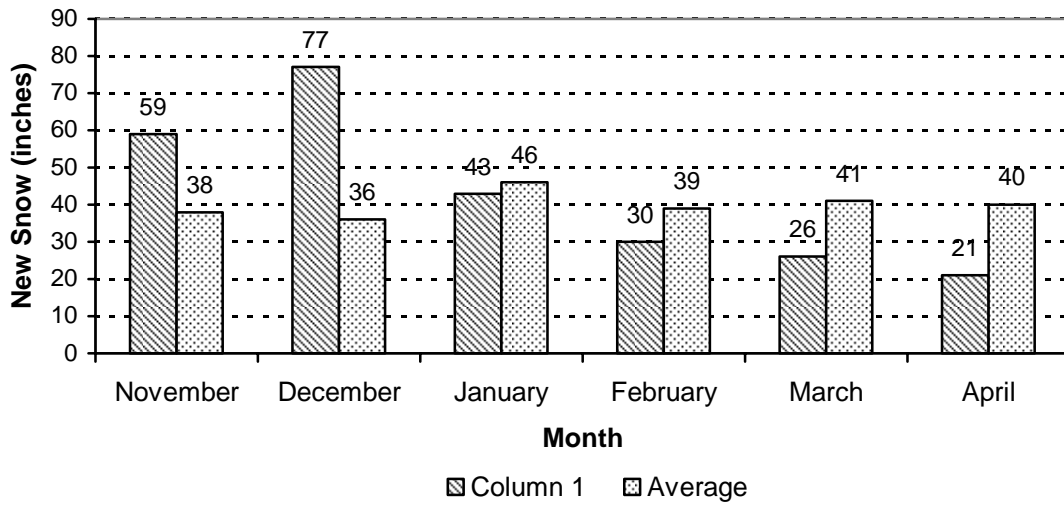
#### **April**

April temperatures were again very warm and snowfall was light—only about 50% of average. This resulted in some wet slides and a significant reduction in snow volume. Snow at Snotel sites dropped over 30% since March.

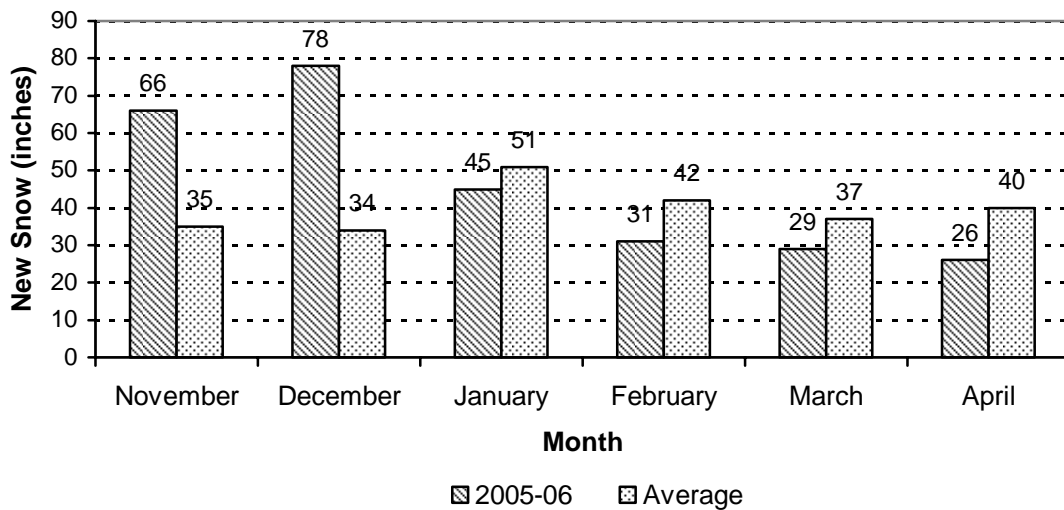


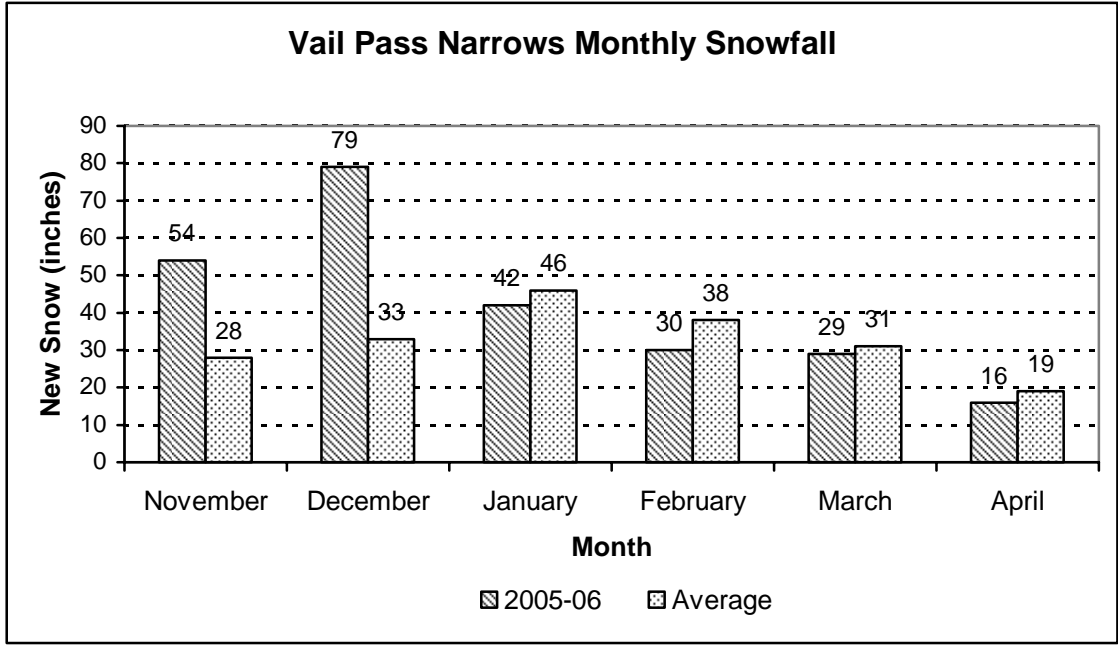


**Loveland Pass East Monthly Snowfall**



**Road Control Monthly Snowfall**





**Total Snow and Water Equivalent (Inches)**

Station	Total snowfall	Total water equivalent	Comments
Berthoud Pass	338	28	109% of average
Loveland P. West	250	19	
Loveland P. East	255	21	105% of average
Road Control	272	21	113% of average
Vail Pass Narrows	250	20	128% of average

**Snowpack and Avalanche Highlights**

In November very heavy snowfall on bare ground, and on patches of faceted, shallow snow on the shady aspects, resulted in a rapidly accumulating and weak snowpack where avalanches released readily. December continued this trend with much more snow buildup and a lot of avalanche activity. But by month's end the snowpack was markedly different from the early season pack and avalanches began to run in various upper snow layers. Weaknesses were becoming complex and could be found anywhere within the snowpack. A strong mid-pack layer then developed and the snow became quite stable into early spring. Beginning in January snowfall began tapering off dramatically and the last three months of the season saw below average accumulations. Avalanches in the last half of the season had diminished in number and were related to two primary causes: the February dust layer which created widespread and continuing weaknesses into late March, and a strong, steady southwest flow which brought warm weather and several wet avalanche cycles.

## **November**

The first storm of the season on the 5th and 5th was only 1 inch deep and bonded well on most aspects, but the north aspects failed easily when tested. Another storm rolled through from the 12th through the 19th which left 2.5 inches of water equivalency on the weak north-facing slopes and avalanching became widespread. On November 14th Berthoud Pass and I-70 were closed for both avalanche danger and hazardous driving conditions when snowfalls reached six inches per hour for a short period and initiated a large bank release at the Eighty slide path which caught a motorist and snow plow in snow 3 feet deep on US 40. One backcountry fatality also occurred on the 6th on Mines Peak.

## **December**

Cold temperatures and high winds, together with significant snowfalls, put stress on November's snowpack. This contributed to a number of avalanches, both triggered and natural. Early on, slides initiated on weaknesses distributed throughout the snowpack. But by month's end the activity was limited to higher strata deposited by winds atop various thin faceted layers and old surface hoar. On the 12th, the Little Professor was triggered by a skier on the east side of the starting zone. This large windslab came out immediately adjacent to a vertical line of 105 mm Howitzer bomb craters from a control mission on November 10th. The skier wasn't caught.

## **January**

Snow continued to gain strength in January and avalanches were limited the upper snowpack. Layer upon layer of windslab in the starting zones resulted in a very strong pack which was being skied in its steepest and deepest places without incident. Helicopter control work failed to release any big slides.

## **February**

Between the 1st and the 21st, control efforts brought down a number of moderate-size triggered releases in the Seven Sisters. A lengthy warm-up started wet slides running late in the month and on the 27th, Happy End, a south facing path that had not run since 1978, released naturally which forced a brief closure on Loveland Pass for debris removal.

## **March**

This is normally one of the heaviest snow months of the year in Region I but that did not hold true in 2006. With below normal snowfall, a strong mid-pack, and only meager accumulations per storm, very little avalanche activity occurred. There was, however, a very large amount of snow in the starting zones as extensive melt-freeze action began.

## **April**

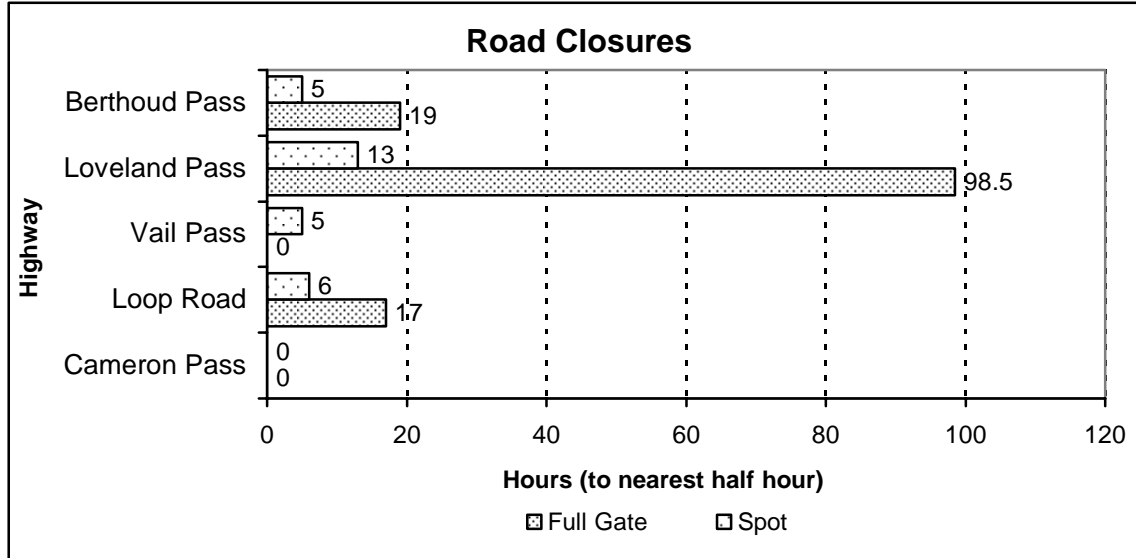
The snowpack has been strong throughout the month but was melting fast at month's end. There was wet slide activity but in numbers and amounts that were less than expected. Slides affected the road only on Vail Pass where the shallow snow caused one partial closure of a lane on I-70 when wet snow releases began. Traditional areas prone to wet slides, such as in Tenmile Canyon, ran as well but the slides were not as large as in years past.

### Activity on Highway Avalanche Paths

<b>Highway</b>	<b>Triggered Did not hit road</b>	<b>Triggered Hit Road</b>	<b>Triggered debris on centerline</b>	<b>Natural</b>	<b>Natural debris on centerline</b>
US 40 Berthoud Pass	11	11	7x730	13, all were bank releases traveling less than 100' v.	4' deep x 250'. In spite of the small amt. of snow these banks caused us a lot of trouble.
US 6 Loveland Pass	86	30	8x980	4, 2 were moderate size wet slides	3x60', most of it from Happy End.
I-70 East	2	0	0	0	0
I-70 West	15	6	0	34	4'x70'
Loop Road	14	1	7x40	10, all were small slides	0
CO 14 Cameron Pass	0	0	0	0	0
<b>Totals</b>	<b>128</b>	<b>48</b>	<b>7.5x1750</b>	<b>41</b>	<b>4x310</b>

## Road Closures

The following graph shows road closure times. Full gate closures can close the highway for extended periods due to dangerous avalanche conditions. Spot closures are for shorter periods of time to allow for avalanche mitigation work.



## Accidents

One car was caught in a bank slide on February 5th at milepost 238.2 on Berthoud Pass but no one was injured. The maintenance crew pulled the car out of the bank. Lee and Stu responded and the road was left open. As a precaution the Stanley and Eighty were shot next day.

## **Western Slope Forecast Office**

The Western Slope Avalanche Forecast Office, based in Marble, provides avalanche forecasts to Region 3, Maintenance Section 2, for four highways in the Central Mountains, and for the opening of Independence Pass in the spring. State Highway 133 over McClure Pass near Marble is the primary area of responsibility, with additional forecasting for Highway 139 over Douglas Pass, Highway 65 on Grand Mesa, and U.S. Highway 24 at Battle Mountain. Other highway areas include Glenwood Canyon on I-70, Twin Lakes section of CO 82, Slumgullion Pass and the BC Bar Canyon near Lake City on CO 149, and Fremont Pass on CO 91. Avalanche forecaster Rob Hunker is in charge of this office which just completed its 12<sup>th</sup> season of operation.

### **Weather Synopsis**

Snowfall on the Western Slope was a little above average this season with SNOTEL precipitation on McClure Pass 111% on 4/21/06.

#### **November**

The first 11 days of the month were warm and dry. The first of only two November storms deposited 18.5 inches of snow from the 11<sup>th</sup>-14<sup>th</sup>. Then it was dry again until the 27<sup>th</sup>. A four day end-of-the-month storm deposited another 9 inches. There were no unusual wind events.

#### **December**

There were 16 days of measurable precipitation on McClure Pass. There was a very cold period from the 4<sup>th</sup>-9<sup>th</sup> when low temperatures dropped below 0 degrees F. This was followed by a warm period from the 22<sup>nd</sup>-26<sup>th</sup> with lows near freezing. There were no unusual wind events, but northwest winds on Grand Mesa stripped snow from the starting zones.

#### **January**

Like December, there were 16 days of measurable precipitation on McClure Pass. But the perception was that it snowed all the time, especially on Battle Mountain. There was a brief cold period with temperatures in the single digits from the 20-23<sup>rd</sup>; otherwise temperatures were warmer than normal. Again, there were no unusual wind events.

#### **February**

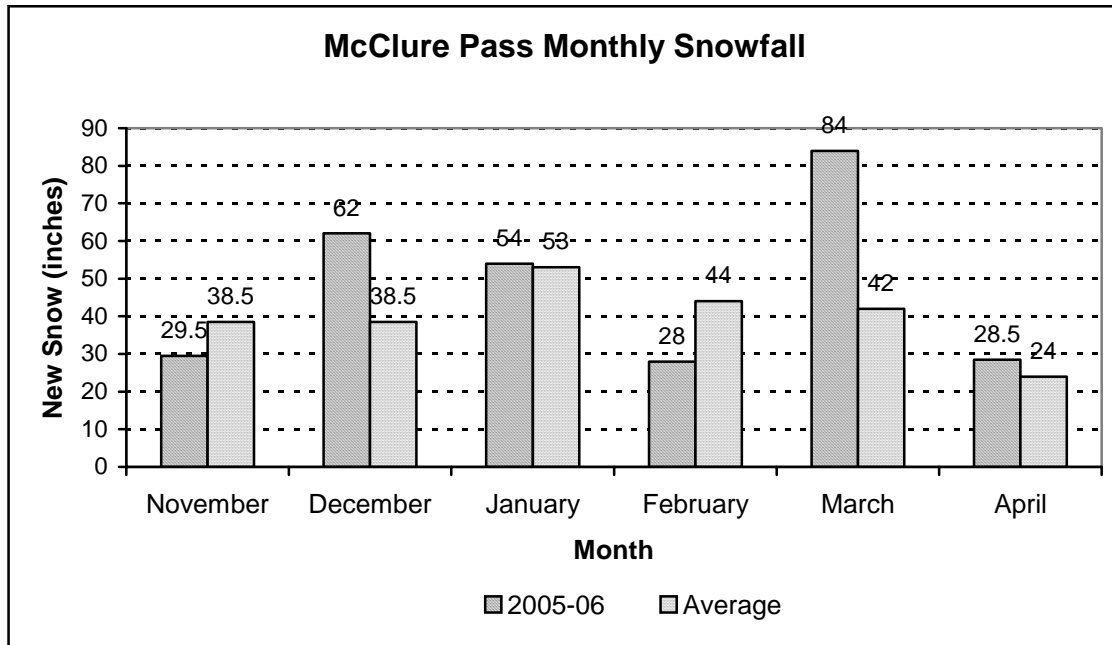
On McClure Pass it was cold and dry with only 7 days of measurable precipitation. On the 15<sup>th</sup> the strongest winds of the season blew through the region with gusts of 42 mph on McClure. This wind also brought in a 2 cm-thick dust layer which was absorbed by a moist snow surface. There was a very rapid warm-up on the 27<sup>th</sup> and 28<sup>th</sup>. Air temperatures topped out in the mid 40's, with lows above freezing, in the mid 30's. There was also rain.

#### **March**

After very warm air temperatures at the beginning of the month, it cooled to normal. The storm track shifted from the northwest to the southwest and the result was copious amounts of snow with 19 measurable days of precipitation. This was the 2<sup>nd</sup> highest recorded amount of snow on McClure Pass in the last 12 years, surpassed only in 1995. There were three multi-day storms. A 7-day storm from the 7<sup>th</sup>-14<sup>th</sup> was the largest which dumped 47 inches of new snow.

**April**

There were 7 days of measurable precipitation through the 21<sup>st</sup> of the month. High temperatures were in the 50's for 10 days. It was very windy on the 17<sup>th</sup> with gusts in the 40's.



**Total Snow and Water Equivalent (Inches)**

Station	Total snowfall	Total water equivalent	Comments
McClure Pass	285.5	22.	111% of average at season's end
Grand Mesa		22.5	94% of average at season's end
Battle Mountain			average at season's end
Douglas Pass			little below average at season's end

**Snowpack and Avalanche Highlights**

There were very few avalanches this season. The snowpack consisted mostly of mixed grains without significant depth hoar formation; unusual, but 2 years in a row. The snowpack on Battle Mountain was the strongest observed in the last 12 years. There were two avalanche days on McClure Pass; 1 avalanche day on Battle Mountain; no avalanche days on Douglas Pass; and 12 avalanche days on Grand Mesa. Grand Mesa had five road closures with three control missions.



There were 2 avalanche days on CO 149 outside of Lake City. All avalanches were small (size D1.5-D2.5).

### **November**

Battle Mountain, McClure and Douglas passes did not have a snowpack before the 12<sup>th</sup> of the month, and snow after that mostly melted out by the 26<sup>th</sup>. The storm beginning on the 27<sup>th</sup>, which essentially continued into December, deposited a permanent snowpack base for the winter with stable conditions. Grand Mesa was a different story. Early October snows there, and mid-November snow did not melt out on northerly aspects. With a shallow snowpack and cold temperatures overnight the kinetic metamorphism process prevailed and weakened the snow near the ground.

### **December**

Kinetic metamorphism was dominated during the first half of the month at all sites developed faceted, cohesionless snow throughout the entire snow depth. Later, with a change to warm air temperatures near and above freezing, the midpack facets rounded and a soft midpack slab of mixed grains formed to cap the basal depth hoar underneath. Weight from additional and ongoing light intensity new snow was absorbed by the snowpack without avalanches. While the main area of concern for avalanche hazard to the highway was on Battle Mountain due to so much new snow during the month, no failures occurred.

### **January**

The snowpack structure was simple this month. The basal depth hoar began to round and bond; a mixed grains midpack was gaining strength and capping the basal layer without any shear/load failures. The few avalanches during the month occurred in the surface layer, but by and large the surface layers were void of any significant weakness. This was the story for all snowpacks in the region. Of note, the Battle Mountain snowpack gained considerable strength during the month, to the point it was the strongest snowpack ever observed at the study site during the 12 years of measurements taken from this forecast office. Avalanches across the highway on Grand Mesa, both natural and triggered, were very small and deposited only 2-3 feet of snow on the centerline.

### **February**

February saw a return of kinetic metamorphism and the mixed grains in midpack lost strength. A strong wind event mid month scoured some aspects and loaded others with hard crusts, and windblown dust from the desert added yet another layer. The simple snowpack structure of January was gone. By the end of the month the snowpacks in the region were highly variable and saw a significant decrease in stability, along with the quality of the ski experience. No avalanches occurred until the last day of the month when a widespread wet avalanche cycle put snow across the highways (see the graph below). This was an unusually early wet avalanche cycle for this time of the season.

### **March**

Very warm air temperatures for the first seven days of the month settled and stabilized the snowpack. With equilibrium metamorphism now the predominate process, the weak layers of the midpack began to disappear, but no strong midpack slab developed. Avalanches during the month on Grand Mesa involved just the storm snow layers without deep releases.

**April**

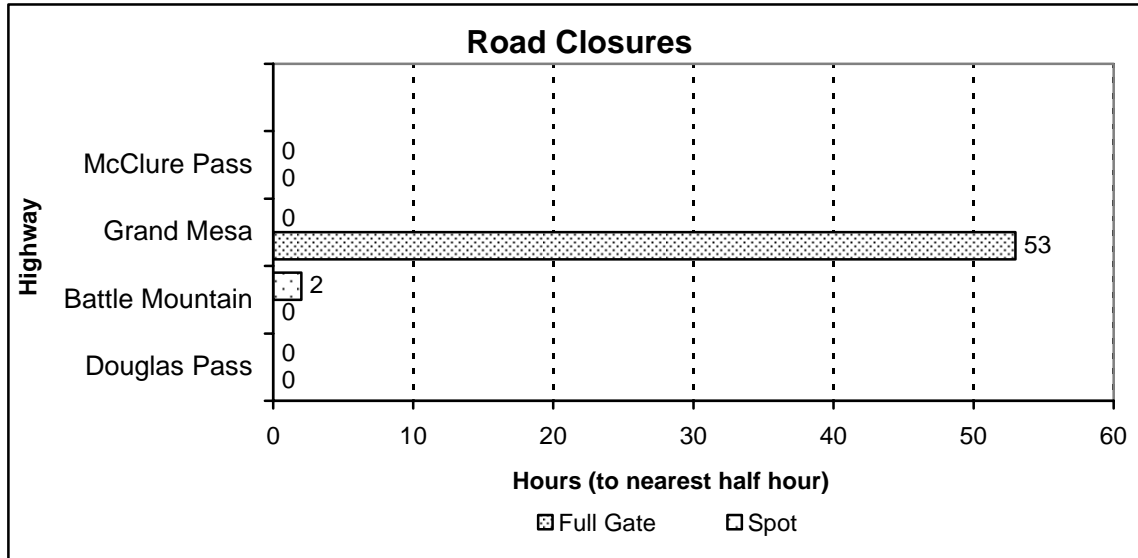
The snowpack on McClure Pass was 96% of average on the 21<sup>st</sup>. Due to the wet avalanche cycle at the end of February and the warm air temperatures of March, the snowpacks stabilized at all areas. There were no wet avalanches during the month, which was unusual.

**Activity on Highway Avalanche Paths**

<b>Highway</b>	<b>Triggered Did not hit road</b>	<b>Triggered Hit Road</b>	<b>Triggered debris on centerline</b>	<b>Natural</b>	<b>Natural debris on centerline</b>
McClure Pass				2	100
Grand Mesa	29	31	1200	20	580
Battle Mountain				3	150
Douglas Pass					
CO149 Lake City				10	500
CO91 Fremont Pass				1	30
<b>Totals</b>	<b>29</b>	<b>31</b>	<b>1200</b>	<b>36</b>	<b>1360</b>

## Road Closures

The following graph shows road closure times. Full gate closures can close the highway for extended periods due to dangerous avalanche conditions. Spot closures are for shorter periods of time to allow for avalanche mitigation work.



## Accidents

There were no avalanche accidents involving CDOT or private vehicles on the highways this winter.

## Independence Pass

As of May 3rd, the snow water content on the west side of Independence Pass was 71% of average; on the east side 66% of average. Forecasts for the plowing and opening of Independence Pass continued through May 23<sup>rd</sup> and a control mission was held on May 24<sup>th</sup>. This was later than normal due to uncooperative spring weather. By then helicopter support was unavailable and the decision was made to place trunk lines of explosives along key areas of the cornice. This method proved to be successful and brought snow to the highway. It was a good learning process should a similar situation occur again.

## ***Severance Tax Projects***

Severance tax is paid by the producers of oil, gas, coal and a few minerals, and goes into an operational account to be used for (among other things) the legislative charge of mitigating geologic hazards, which includes avalanche hazards.

We use severance tax to help fund several projects that improve our forecasts and expand our outreach. Some have immediate results in the form of a product, while others are ongoing projects that are critical to the success of the CAIC. Here are brief descriptions of the projects.

**Web Database (Project leader, Dale Atkins):** This is a multi-year development project. With the help of an outside contractor, we have created a web database into which field observers can enter their data directly. This has reduced the volume of hand-written data that would later have to be digitized. Users can generate reports from the database.

**Backcountry Observers Network (Project leader, Scott Toepfer):** This is an ongoing program to bring in additional field data. We contract with 5-6 observers in key backcountry areas for collecting and sending data to the CAIC forecast office in Boulder. We trained each and provided computer software for plotting snow profiles. The data add detail and accuracy to our daily hotline messages.

**Avalanche Education (Education Coordinator, Halsted Morris):** This was Halsted Morris' fifth year coordinating the education outreach program for the CAIC. Halsted personally taught 37 avalanche courses, and assigned other classes to available CAIC staff. This helped us meet the public's demand for avalanche education and reduced the teaching load of the forecast staff. The CAIC taught 116 classes attended by 4,183 people, 500 more than the 2004-05 season.

**Web Site Maintenance (Project leader, Dale Atkins):** The CAIC website is an important asset, for it makes thousands of people aware of the services and products that we provide. We use Severance Tax funds to maintain and improve our web site to make it a valuable outreach service. This year there were 325,723 visitors, who visited the web site 821,068 times, totaling 3,106,343 page views.

**Backcountry Offices & Programs (Project leader, Ethan Greene):** The CAIC maintains the Summit County Avalanche Office, a backcountry forecast office located in Breckenridge. In addition, the CAIC partners with the Crested Butte Avalanche Center to bring it under the umbrella of the CAIC. We work closely with the Roaring Fork Avalanche Center in Aspen.