



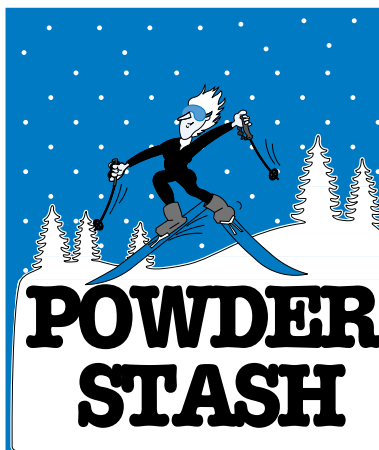
# THE Beacon

*"If one wants to avoid avalanche danger, one should stay in bed, and make sure the house is not in an avalanche path."*

—Andre Roch

**A**s you pick up this issue we are heading down the road to spring or summer depending on your elevation. As usual our winter was full of excitement, dry spells, big storms, smiles and tragedy. Early season forecasts had called for a winter with near-normal temperatures and precipitation. The jury is still deliberating the final verdict with the given evidence. After a very hard and fast start to the winter, we seemed to play a constant game of catch-up just to try to stay at an average snowfall. In January south aspects in the San Juans were brown, dirt roads had turned to sheets of ice due to the rapidly melting snow. Mid-winter seemed more like spring. That was all about to change.

In February and March, Colorado was thrown into a maelstrom of snow and avalanches like we have not seen for a long time. Some of our storms during late winter were measured in feet, not inches. As exciting as that can be for weather and avalanche forecasting, it also meant some long hours in the field and in the office



by Scott Toepfer

for our CAIC crew. Some of the avalanche activity reached historic proportions, and it was truly a wonder to have seen this. Unfortunately, these types of events can come at a great cost to the people, the economy, and winter activities in Colorado.

In this last issue of *The Beacon* for the 2002–03 season, Knox Williams examines the amazing storm that struck the Front Range on March 17–20 with such intensity that people will be talking about it for years, if not decades.

We also have an article from Jonathan Thompson, the editor of the *Silverton Standard & the Miner*, one of Colorado's oldest newspapers. Silverton has a long history of snow and avalanche research. Jonathan's article profiles Chris Landry, who now continues Silverton's tradition in avalanche research at the Center for Snow and Avalanche Studies.

Our last piece is by Brad Sawtell, the lead at the new Summit County Avalanche Office.

Have a safe spring, and we look forward to reporting to you again next season. ❄

To the friends of the CAIC,

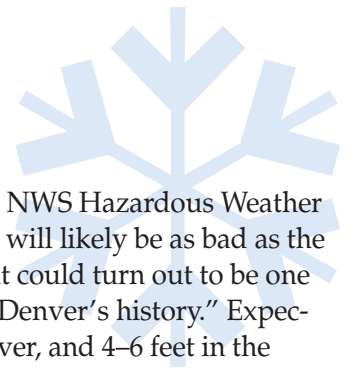
On behalf of Governor Owens I want to extend a special thanks to the Friends of the CAIC. Your support provides a unique and welcome way to sustain this important awareness and safety program. I also congratulate the center for 20 years of professional excellence.

*Greg Walcher, Executive Director  
Department of Natural Resources*



# Our Perfect Storm

by Knox Williams



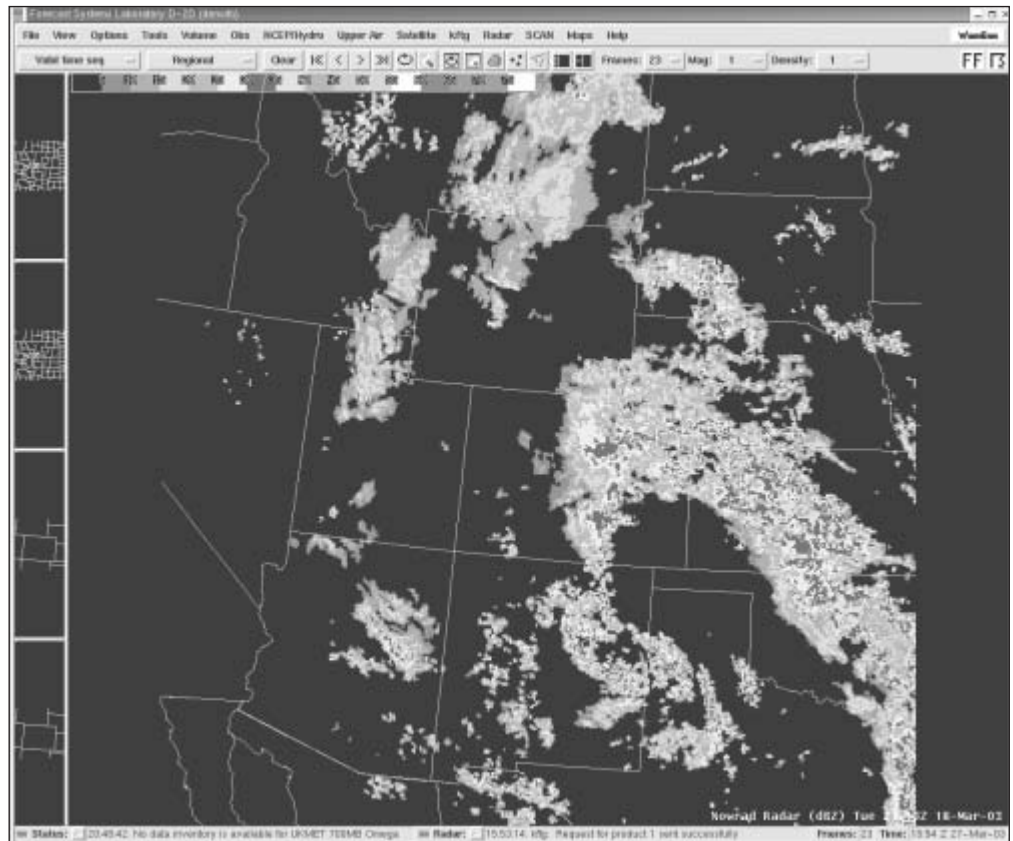
It takes a blend of perfect timing and perfect ingredients to make a storm like the one that came together over Colorado on March 17–20, 2003. It takes deep moisture and a sustainable fetch to pump that moisture in from a distant source. It takes a favorable wind field to concentrate the inflow, and finally it takes lift to trigger the process. Because it's so hard to synchronize these ingredients, the "big ones" are rare. On Tuesday, March 11, National Weather Service forecasters in Boulder saw that the extended computer weather model placed a deep low-pressure center southeast of Colorado on March 17–18 and mentioned this in their Hazardous Weather Outlook discussion. A southeast location is where a storm center must be for the big Denver dumps. But good forecasters know better than to get excited about a future "computer" storm, for all the ingredients are seldom actually there when the future arrives.

But the computer model the next day, and the next, and the next all showed the same storm. Enthusiasm began to build among the NWS forecasters and the Avalanche staff. By the 15th and 16th the excitement was palpable: this was going to happen!

Here was the scenario: a deep, saturated closed low (so called because the pressure lines were complete ovals, indicating a circular wind field) would track across southern Colorado and establish itself in SE Colorado. As it moved over the mountains, it would generate lift and produce generous snowfall. Once east of the mountains, it would stall and sit stationary for almost 2 days, all the while pumping in copious moisture from the Gulf of Mexico. This stream of saturated air would swing counterclockwise around the low pressure center, lift when carried on east winds over the gently rising plains of eastern Colorado, and then slam into the Front Range. Cold air pouring into the system from the north would help wring out every available snowflake.

## Sunday

On Sunday, March 16, the NWS Hazardous Weather Outlook stated, "This storm will likely be as bad as the October 1997 blizzard, and it could turn out to be one of the heaviest snowfalls in Denver's history." Expectations were 1–3 feet in Denver, and 4–6 feet in the mountains and foothills. Boldly, I forecasted similar amounts for the Front Range. It was the height of Spring Break, and many students and families would return home (late) with stories of epic snowfall!



Radar image from the National Weather Service showing the feed of moisture coming from the Gulf of Mexico and slamming into the Front Range of Colorado at 2:15 p.m. on Tuesday, March 18, 2003.

## Monday

On Monday morning, March 17, it was snowing throughout the mountains. In the northern mountains, 3–8" had fallen; in the central mountains, 2–3"; and in the southern mountains, 5–11". Rain began midmorning in northeast Colorado, so that one by one, the dominoes were lined up, ready to start their chain reaction.

Mountain snows intensified in the afternoon as the upper low moved overhead. At the same time, severe weather broke out on the eastern plains. Heavy thunderstorms, hail, and tornadoes in Byers, Bennett, and Aurora! This can't be March! Rain turned to heavy, wet snow in the foothills and mountains.

## Tuesday

Tuesday dawned with 18–20" of new snow at Eldora, A Basin, Loveland Basin, Berthoud Pass, Winter Park, and Bear Lake in Rocky Mountain N.P. It was snowing 2–3" per hour. Visibility ended at your ski tips. I issued an avalanche warning at 7:50 am. CAIC forecaster Dale Atkins looked at our database of historical avalanches along the I-70 corridor and saw the potential for avalanches in unusual places. He sent an e-mail to the Clear Creek Sheriff's Office to warn of avalanches in and around the towns of Georgetown and Silver Plume.

The battle was on at ski resorts and along highways to stay ahead of the onslaught. It was an un-winnable battle. Loveland Pass went down first, closed by bank slides too numerous to count, and one big release. More vital arteries were also at risk—I-70 and Berthoud Pass. Bank slides were becoming a serious problem on Berthoud, plus there was the bigger worry posed by the Stanley slide, a large and dangerous avalanche path. CDOT had recently cleared snow from the starting zone of the Stanley, and CAIC forecasters Lee Metzger and Stu Schaefer thought it could stand 36" of snow before it would run large enough to hit the highway. But 36" was child's play for this storm. At the Henderson Mine at the foot of Berthoud Pass, 18" fell in 3-1/2 hours. Lee ordered the road closed late in the day. Stanley ran wall-to-wall that night.

I-70 from Denver to the Eisenhower Tunnel was under siege. It was simply too many miles of 4-lane being smothered by too much snow, and was closed that night. During the night a large avalanche came off of Bard Peak and hit the highway. The last time it had run this far was March 1948—55 years ago! That night, three small slides caused minor damage to houses in Georgetown and Silver Plume—events that have not happened in decades.

Late afternoon at Eldora, an avalanche released above the Shelf Road (access road) and put a large pile of snow on the road, deep enough to bury a car. Rescuers converged on the site, probed the debris, and confirmed that no cars were in it. Then, more avalanches hit several cars that had stopped on the snow-blocked road. The area was evacuated, and 250 people would spend the night at Eldora's lodges.

Meanwhile back at the CAIC, forecasters watched the satellite and radar screens that showed a continuous stream of moisture from Texas across Oklahoma into

Colorado. It was unbroken for 500 miles and all aimed at Colorado's Front Range—promising heavy snow for the next 24 hours.

Denver International Airport had closed during the day when it became impossible to maintain runways for flights and to keep the airport road plowed. Then the roof fabric tore under the load of heavy snow, forcing a section of the terminal building to be evacuated.

In all, thousands of travelers and employees would be stranded at DIA for several days. Other roofs would soon collapse in cities and towns along the Front Range.

## Wednesday

Before dawn on Wednesday, March 19, CAIC highway forecaster Lee Metzger was on road patrol on I-70, which remained closed, to see what avalanches had come down and to plan control missions. He was getting face shots in his orange pickup as he drove alone down the deeply drifted interstate. From the Tunnel to Idaho Springs, he counted 30 bank slides that had put avalanche snow onto the inside lanes and had to skirt the mounds of debris. Some slides had blocked the frontage road completely in places. Radio traffic told him that several slides were down in Clear Creek Canyon, blocking Highway 6. And Highway 119 to Blackhawk had slides on the road, while multiple avalanches blocked Highway 119 through Boulder Canyon, cutting off transportation between Boulder and Nederland. Of course, Loveland Pass and Berthoud



Workmen shoveling the roof of the Winter Park lodge on Wednesday, March 19th.

(Photo courtesy of [skiwinterpark.com](http://skiwinterpark.com))

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## Our Perfect Storm

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Pass remained closed. Highway transportation had stopped altogether. And it was still snowing 3" per hour.

The ski resorts of Eldora, Winter Park, Loveland Basin, and A Basin struggled to plow parking lots and keep lifts running. Power outages were common; A Basin, for one, lost all power and was unable to open. Eldora could not run its lifts due to the amount of snow—so it was back to the bar and another game of cribbage for the 250 people stranded in the two lodges. There would be no rescue today. Loveland Basin did not open; every approach road to that ski area was closed, choked by snow or blocked by avalanches. And there was no traffic coming out of Denver. Gas stations in mountain towns ran dry, and grocery store shelves were bare.

Storm totals by Wednesday morning were 55" at Eldora; Bear Lake in Rocky Mountain National Park, 59"; Loveland Basin, 59"; Berthoud Pass, 64"; Winter Park, 68"; A Basin, 44"; Breckenridge, 26"; Copper Mountain, 30"; and Vail, 21". As you can see, snowfall decreased dramatically west of the Front Range. This is typical of all east-wind upslope storms, with most of the snow falling on the east slope of the Front Range. Northeast winds were averaging 15–20 mph, and gusting to 40. The CAIC continued its avalanche warning, calling the danger extreme—a danger rating that is seldom used. No one could see into the backcountry, but we fully expected numerous and large avalanches to be running.

A few patches of blue sky appeared Wednesday afternoon. Was the storm dying? Not just yet, but it was a sign that maybe the worst was over. Still though, it was a chance for CDOT to roll out its guns to start its counterattack on the highway avalanche paths that were chock-full of snow. The first shots into paths on Loveland Pass released absolutely nothing—not what we expected. Did we overestimate the avalanche danger? Had the new snow been so heavy that it was stuck solid? Probably not. Maybe the force of nature was reluctant to show its true face just yet.

Back in the Avalanche Center, we had two forecasters working the phones, logging field data, and watching the storm as it played out. We were particularly keen on looking for breaks in the weather, which would signal the first chances to launch rescue and avalanche control missions.

The first sign was the radar picture that showed the end of the long feed of Gulf moisture into Colorado.

The storm had lost its lifeblood and probably could not sustain itself through the night. It was time to plan Thursday's control and humanitarian missions.

### Thursday

CDOT flew its first helicopter mission early in the morning of March 20. Explosives dropped into the Silver Cloud avalanche path just west of Silver Plume produced a monster avalanche. It ran across all four lanes of I-70. When the powder cloud settled, there was a massive debris field, littered with a forest of broken trees, that covered the Interstate 5–10 feet deep and 300 feet wide. CDOT was worried: if other avalanche paths reacted the same, I-70 would be closed several more days while crews cleared the highway. Fortunately though, the other avalanche paths that were hit later in the day ran small or not at all.

CDOT then flew its helicopter to aid Eldora. Explosives released numerous slides that ran across the Shelf Road. After lengthy plowing, the road was opened, and the stranded skiers began the caravan to freedom.

I-70 reopened late on March 20, and one by one, other highways opened. Many mountain towns would remain isolated for another day or two, and residents with long driveways would not dig out for a week.

### Aftermath

Snow totals for the 4-day storm were: A Basin, 56"; Eldora, 66"; Bear Lake, 69"; Berthoud Lodge, 73"; and Winter Park, 77.5". The two greatest snowfalls recorded were 83" at Cabin Creek near Georgetown and 87.5" at Fritz Peak near Rollinsville. The official reading at Stapleton-Denver was 31.8"—making it the second largest snowstorm in Denver history. (The largest was 90 years ago when 45.7" fell on December 1–6, 1913.)

Approximately 200 avalanches were recorded by the CAIC, but these were just the few that were obvious along highways and roadways, in and near towns and ski resorts, and in viewable backcountry sites. Some were historic avalanches in paths that had not run so big in more than 50 years. Many avalanches certainly ran in the middle of the storm, only to be hidden forever by the relentless snowfall. Many paths probably ran several times during the storm. The forest damage this summer will help tell the story.

Two final big avalanches released days later. At 2:02 a.m. on Sunday, March 23, an avalanche came off Pendelton Mountain near Silver Plume, destroyed a forest, flew airborne off cliffs, destroyed power lines, damaged Silver Plume's water treatment plant, dusted

the historic buildings of the Johnny Bull Mine, buried 500 feet of the frontage road, dammed Clear Creek, and blew across I-70 as an airblast. Then a few days later, a major avalanche destroyed the Chasm Lake shelter below the East Face of Longs Peak in Rocky Mountain National Park. The shelter had stood since 1931.

For most residents and captive tourists, the storm was an awesome and memorable event. Most of us will be telling stories for years to come. For many, it brought problems that ranged from being snowbound to disrupted plans and property loss. For a few, it brought tragedy. And for those who work in the snow business, it brought a story worth writing. ❄️

Members of the Rocky Mountain Rescue Group take a break after digging out cars buried in avalanches along the road to Eldora Ski Area.



## Center for Snow and Avalanche Studies

by Jonathan Thompson

*(This article first appeared in the Silverton Standard & The Miner on November 15, 2002)*

**S**now. That's the focus of the most recent addition to Silverton's ever-growing research and education industry. Last month, the Center for Snow and Avalanche Studies (CSAS) quietly established an office in the old Miners Union Hospital here.

Eventually, the Center will "contribute to the understanding of how avalanches happen" and help water managers deal with drought by focusing on the alpine snow system as a whole, according to proponent Chris Landry. Realization of Landry's lofty goals is still a long way off for the fledgling organization, however.

Landry, a soft-spoken man who seems more comfortable in the world of statistics and snow than he does in the human realm, is currently the Center's proponent, visionary, and only employee. With initial funding from the American Avalanche Association and from his own pockets, Landry has set out to create an organization unlike any in the country.

### The Concept

The CSAS will not be the only center devoted to studying snow and avalanches, but it will be the first such center to look at the snowpack as a system affected on many levels by many factors.

Landry explains it like this: "Traditional snow science, which has enabled forecasters to function and make a significant difference, has plateaued and needs a complementary research approach that looks at snowpack as a system on multiple levels and scales."

In the past, snow science has focussed increasingly on the interactions between individual grains of snow—it

has been zooming in on the microscopic world. Landry, along with many of his snow science colleagues, believe it is now time to zoom back out and look at the bigger picture.

On a certain level, this type of approach is already happening. Experienced avalanche forecasters, according to Landry, "acquire a sophisticated capacity to think about avalanches as part of a larger system." They combine the hard weather and snowpack data with observations and conclusions that come on a more intuitive, and highly complex, level. The result is that forecasts are often made in a way that, to an outside observer, seems to rely on some sixth sense that is difficult for the forecaster to quantify or articulate.

This mysterious ability is not mystical, according to Landry, it is actually the forecaster taking a systems approach to forecasting—an approach that has yet to be taken by snow science itself.

"In a sense," said Landry, "we're just trying to catch up with what somehow really experienced forecasters are able to do."

Although the Center will not issue hazard warnings or do any forecasting of its own, the data it collects and knowledge it fosters will benefit forecasters everywhere, including those in the Silverton Avalanche Forecast office just across the hall from Landry's.

But the Center is not all about avalanches, it's also about that increasingly crucial resource: water.

Fifty to 80% of municipal and irrigation water in the West comes from the alpine snowpack in places like the

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## Center for Snow and Avalanche Studies

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San Juan Mountains. Understanding the alpine snowpack system, then, is “of prime importance to how we live in the West,” said Landry.

Silverton and the San Juan Mountains is a natural location for the Center. Aside from the unique (and avalanche-prone) snowpack here, Silverton also has a “great deal of synergy” with the Mountain Studies Institute, the Avalanche Forecasters for Highway 550, and the high numbers of researchers and students already coming here to look at snow. If Landry’s vision comes to fruition, the Center will eventually be a resource for all kinds of snow science as a data management headquarters and its scope will reach far beyond the San Juans.

### Chris Landry

Landry, who moved to Silverton from Bozeman, Montana to start the Center, is no stranger to snow.

“Snow has been a constant current running through my life,” he said last week as a substantial winter storm began its assault on the region. Landry is considered one of the pioneers of extreme skiing—his 1978 ski descent of the East Face of Pyramid Peak near Aspen is considered an extreme skiing landmark. He coined the term, “If you fall, you die.”

It was self-preservation as a backcountry skier that first drew Landry into avalanche forecasting. He pursued every “non-institutional” educational opportunity he could find, and eventually became a respected expert in the field. In 1991 he was hired on as a forecaster at the Yule Creek Marble Quarry in Marble, Colorado.



Tom Painter digging a snowpit last February in Senator Beck Basin. This is one of the proposed study sites for the Center for Snow and Avalanche Studies based in Silverton.

“That was definitely a learning experience,” noted Landry, explaining that he was responsible for a three and a half mile road in hazardous terrain and was not able to use explosives to control the slides because they were in a wilderness area. In spite of the challenge, the “pure forecasting and avoidance program” resulted in no disasters or casualties during Landry’s eight year tenure.

During that time, Landry “spent a lot of time thinking about avalanches.” He developed a new snow stability test and, after the quarry went bankrupt and he lost his job, he headed to graduate school at Montana State University in Bozeman. While there, he worked with some of the best in the business such as Bob Brown, Karl Birkeland, and Kathy Hansen. With Birkeland, Landry co-authored what many believe will become one of the defining theories of avalanche behavior.

### In the Short Term

“That’s the grand vision,” said Landry of his goals for the Center, “but we’re a long way from there.”

During this first year, Landry will mostly be in organizational mode. He will be working to build interest in the concept amongst the snow science community, working on establishing a permanent research infrastructure, and working with the over 100 college faculty and students that will be coming here this winter for snow-oriented field schools.

At this time, field schools from University of Colorado, Minnesota State, Northern Arizona University, Southwest Texas State, and Southern Illinois University are planning on visiting Silverton for varying time spans this winter.

“I’m thrilled to be here,” said Landry. “It’s really exciting. ❄️”

## Loss of a Friend

**On January 20, 2003, Vernon Lunsford, a Friend of the Colorado Avalanche Information Center was lost in a tragic avalanche accident in British Columbia. That avalanche claimed six other lives. Vernon lived in Littleton and had been a friend of the CAIC for a number of years. In February Knox was able to talk with Vernon’s father and had the opportunity to express his condolences to him and to Vernon’s wife. Vernon was very active in the outdoor lifestyle as a climber and backcountry user. He will be missed by his family and many friends. ❄️**

# Summit County Avalanche Office (SCAO) Says Thanks!

by Brad Sawtell, SCAO Forecaster/Educator

We have just completed our first season at the SCAO. The SCAO was created for a couple of reasons. First, Summit County frequently leads the state in avalanche accidents (when Pitkin County doesn't steal that dubious distinction). Secondly, Summit County has a large number of CAIC "Friends", who help support the CAIC and rely on good forecasts. And third, the CAIC wanted to generate more accurate forecasts from the field as well as increase education with the hope of reducing the number of accidents and deaths in the Summit County area.

Funding the SCAO was the first hurdle. A large portion of the funding came from a grant by the Koessler Foundation. Other dollars came from the CAIC's budget, generated in part from the Department of Natural Resources Severance Tax Operational Account. The Breckenridge Outdoor Education Center and the Summit Huts Association donated the needed office space. The Summit County Rescue Group also agreed to continue supporting the Avalanche Hotline (970-668-0600). A series of fundraisers generated the additional funds needed to run the SCAO.

The first event was also the biggest. Ket McSparin, owner of Mountain Outfitters in Breckenridge, agreed to host a slide show titled, "Women on Everest". Two Summit County locals, Jodi Thompson and Kim Clark, who attempted to climb Mt. Everest as part of an all women's team, presented the show. The audience packed the store. Food and drinks were also provided.

Alan Henceroth at Arapahoe Basin organized the second event called the "Beacon Bowl." Activities at this event included a beacon search competition, snow pit analysis, and a raffle. The prizes were awesome. Backcountry Access and New Belgium Brewery also sponsored the event.

Colorado Mountain College and the Speak Easy Theater sponsored the third event. We held a bake sale and presented a free movie, "Downhill Racer", starring Gene Hackman and a young Robert Redford. All of the baked goods were donated from over a dozen bakeries around the county.

Additionally, the SCAO forecasters (Nick Logan, Brad Sawtell, Scott Toepfer and Mike Zobbe) all have taught avalanche classes over the course of the winter. These classes ranged from free beacon clinics to avalanche awareness classes throughout the county. A couple of the staff members also taught multi-day classes at Francie's Cabin south of Breckenridge. As of this writing, our outreach and increased awareness seems to be working. The SCAO remained open till the end of April. For the 2003-04 season we intend to be up and running next November. We hope you find the extra updates on the 970-668-0600 hotline on Monday, Wednesday, and Friday afternoons to be helpful. Give it a call any time during the winter. The SCAO would not exist without your support and the support of the above-mentioned people. Thanks! ❄️

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## Renewal Notice (or recruit a Friend)

Yes, I will join the Friends of the Avalanche Center. Enclosed is my donation of:

- \$30\*, which gives me a CAIC window decal (if I am a new Friend), *The Beacon* newsletter, the Avalanche Wise booklet, and a morning forecast by e-mail.
- \$45\*, which gives me all the stuff above, plus an afternoon forecast sent by e-mail.
- Please accept my additional donation of \$\_\_\_\_\_\*
- I'm a renewing member.
- I'm a new member. Please send a CAIC decal.

\* Your donation may be tax deductible and your canceled check is your receipt.

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Please mail this form & your check payable to "CAIC" to: Colorado Avalanche Information Center • 325 Broadway, W51 • Boulder, CO 80305

**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.

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