

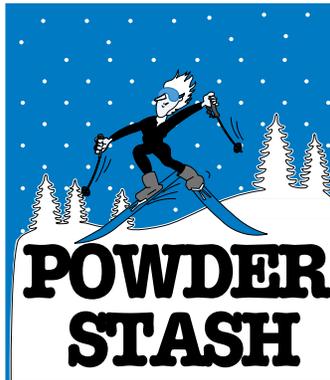


THE Beacon

It was a great summer for hiking, biking, climbing, and building. Fortunately I was at least able to take advantage of one of these activities. Thunderstorms seemed to be few and far between. Seemed like I woke to bright sunshine almost every morning. Dust and smoke were the biggest weather issues we dealt with for the three months of summer. As we know, summer traditionally leads into fall, which means the first day of winter is not far off. I am sure we are all hoping for a big one. We could really use it.

Actual observations have aligned with scientific evidence to prove we have just suffered through one of the worst droughts since the 1500's. Connie Woodhouse, a paleoclimatologist with NOAA, took tree ring samples on Grand Mesa and near Dillion, Kremmling, and Steamboat Springs, and her data suggest this may be the fourth worst drought period since 1539. This has not been good news for Colorado. Well above average temperatures combined with below average precipitation made for a terrible fire season. There were days when just one small spark would ignite a large conflagration. We really need snow this winter. So if you have any favors to call in, put this one at the top of your list.

The avalanche center, with the help of Backcountry Access, was able to pull off a raucous fund-raiser in Golden at the American Alpine Center in early September. We were all overwhelmed by the show of support at the event that night. All of the staff at the CAIC were super excited to see so many people there, and we hope you found it to be a great way to gear-up for the coming winter. When I first approached the folks at BCA a couple of years ago about trying to do an event like this, I have to admit, in my wildest dreams, I did not see such a grand combination of fun. Fresh Alaskan salmon, live bluegrass music, a lobby full of most excellent silent auction items, and cold beverages from New Belgium Brewery. I really don't think we can offer enough thanks to all those who helped us pull this off. It was a wonderful evening. I hope we can match it next September.



by Scott Toepfer

There have been a few long-term weather forecasts popping up this fall. We do look to be entering a weak to moderate El Niño period. In the fall 1997 issue of *The Beacon*, Knox reviewed 20–30 years of snowfall data for 10 mountain sites. In that review there was a trend toward a drier winter. But during the weaker El Niño's there were some above average snowfalls. If you have saved your past issues of *The Beacon* the article is worth checking out.

In this issue of *The Beacon* we are very lucky to have Nolan Doesken grant us an interview. Nolan is Colorado's assistant state climatologist. I can only imagine how

busy he has been the last six months or so. Nolan has provided us with a wellspring of information about Colorado's climate. I think you will find this piece very interesting.

Also on tap is an article by Dale Atkins and Knox Williams on rescue choices. It has been awhile since we have looked at all the rescue gear available to us, and Knox and Dale will look closely at what is available at your local outdoor shops. Lastly Knox will take us through "What's New at the CAIC for the 2002–2003 season."

Finally, I wanted to thank Knox for helping me get this issue to press as I have been far too busy with my house project to have ever gotten this issue to bed without his help. Thanks a million, boss. ❄



Our "Friend" Ellen H. slices and dices some spring corn in Cunningham Gulch. (Photo: Scott Toepfer)

Nolan Doesken: Mr. Colorado Climate

An Interview by Knox Williams and Scott Toepfer

In the wide world of weather wizards, Nolan Doesken stands out ... literally. You see, he stands about six-five and is as nice as he is tall. He loves to talk about the weather, and he knows more about Colorado climate than anyone. So naturally *The Beacon* wanted to talk to him to get his take on the weird weather that has settled over Colorado recently. Is it weather or is it climate?

Q: For the record, Nolan, please give your preferred title or any other way that best identifies you and your position.

I am a research and outreach climatologist at the Colorado Climate Center within the Department of Atmospheric Science at Colorado State University. I have been the Assistant State Climatologist here since 1977.

Q: Can you tell us a little about the Colorado Climate Center and about your job?

Our office was established back in 1974 shortly after NOAA abolished their federally funded program of State Climatologists. We inherited an entire library of historic weather data from across the state including original records dating back to the 1870s. We all have a bit of "historian" in us. In fact, you can call me a weather historian.

We are a small office with limited staff — two full time positions. We are located on the foothills campus of Colorado State University very near to one of the dams that creates Horsetooth Reservoir. Much of what we do revolves around weather data. Our office is a local archive of hardcopy and electronic weather data collected all across the state. We primarily utilize data from the National Weather Service, but we also operate our own network of observations to serve local agricultural interests.

What do we do with all the data? Part of our mission is continuous monitoring of statewide climatic conditions and sharing that information with a wide variety of users across the state. We have published a newsletter since 1977 that describes the highlights of each month in terms of temperature and precipitation patterns, departures from average and significant events — heat waves, blizzards, flash floods, hail storms, drought and everything in between. This newsletter has grown to become a quarterly magazine entitled "Colorado Climate." Snow is a big part of the climate of Colorado, but only a part.

This year we have been swamped with information requests about drought. Indeed, based on over 100 years of consistent data, 2002 is standing out as one of the worst individual drought years in recorded history and one of only a couple to ever encompass the entire state at the same time. Drought is the most challenging and stressful situation that we deal with, and probably has the greatest economic impact statewide of any weather phenomenon we deal with.

Q: What path brought you to this position?

I loved watching and experiencing weather changes as long as I can remember. When I started grade school I already was an eager young meteorologist, even though I had no idea what that name meant. I especially enjoyed keeping records on temperatures, precipitation and storms. With the help of my father's journals, I was able to track the yearly changes in rain, snow, and temperatures. For me, that was great fun. I didn't really think or plan to earn a living doing that — it seemed too much like fun than a job. When college came along (University of Michigan) my advisor told me that climatology was a dead field and not to pursue it. I followed his advice and took the courses to pursue other areas of atmospheric science, but climatology was really my love. It was mostly good luck that I was able to get an entry position here at the Colorado Climate Center 25 years ago. I was from Illinois and knew very little about this area, but I was an eager learner willing to start with a low salary. It has all worked out very nicely.

Q: Let's talk about Colorado's climate and the data you have to work with. What mountain areas of Colorado have the best historical records?

Pikes Peak had the first high-elevation weather records in Colorado. Signal Service personnel were assigned year-round duty up there from 1873 until the late 1880s. It was a dreaded assignment, but brought a lot of early tourism to Colorado as reports of amazing phenomenon reached the media of the urban east coast and attracted many adventurers to hop on the trains and head west. There are journals written by some of those early observers that make for fascinating reading. A book was written a few years ago that assembled many of the highlights of those journals. Gradually, beginning in the 1880s, volunteer observers were recruited all across Colorado. Some of our earliest mountain weather records came from mining camps that no longer exist. We don't have many high mountain weather stations with a long and consistent history, but most mountain communities have had cooperative weather stations going for many years. Some of the longest records come from places like Silverton, Gunnison, Crested Butte and Aspen.

Q: What sites in Colorado have the highest snowfall?

The wettest area of Colorado, in terms of mean annual precipitation, is found along a small strip near the Continental Divide east of Steamboat Springs where precipitation averages over 60 inches per year with close to 50 of those inches falling in the form of snow. Given a typical snow to water ratio of 13-to-1, that makes close to



Nolan explaining to a young friend that it's okay to keep weather records.

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650 inches of snow up around Buffalo Pass, if anyone were there to measure it. The snowiest individual years have been observed in places like Wolf Creek Pass in southwest Colorado. The recently closed weather station at the CDOT facility on the east side of Wolf Creek Pass reported 838 inches of snow in the winter of 1978–79. Averages in southwest Colorado are a bit lower, though, since they are also prone to periodic very dry winters like the one they just experienced in 2001–02.

Q: Give us a list of some Colorado weather records, such as highest and lowest temperatures, heaviest snowfall in 24 hours, heaviest rain in 24 hours, largest snowstorm, greatest seasonal snowfall, and any others you can think of.

Colorado's hottest temperature is often reported as 118 F at Bennett. That report is recorded by an official observing site – but is untrue. We use 114 F as the state record. Both Las Animas and Sedgwick have recorded that value. Colorado's coldest temperature was measured in the seemingly unlikely spot of Maybell in northwest Colorado on February 1, 1985, when they hit -61 F. We did verify that reading. The more traditional icebox is Taylor Park, however, which consistently registers the most subzero temperatures. They have reported -60 F on at least two occasions.

A controversial record that still stands is the greatest snowfall in a 24-hour period. The Silver Lake weather station (no longer active) west of Boulder recorded 75.8 inches of snow in 24 hours back on April 14–15, 1921. That record remains the U.S. record — still inching out huge snows reported in the Cascades, Sierras, and on the Tug Hill Plateau of upstate New York.

Q: There is a strong interest in using El Niño and La Niña cycles to forecast weather patterns around the United States. What do you think of this idea? Is it a breakthrough in seasonal forecasting?

The most successful long-lead seasonal climate forecasts issued to the public in 1996 and 1997 (National Weather Service Climate Prediction Center) were based on statistical and physical relationships found between U.S. weather patterns and various characteristics of the El Niño Southern Oscillation. This has become the standard for attempting long-lead (several months in advance) forecasts of precipitation and snow anomalies in Colorado and the rest of the U.S. Unfortunately, the skill of these forecasts is not as good in the central Rockies as some other portions of the country.

Q: El Niño is the ocean-weather phenomenon that has gotten wide media coverage. Are there other physical phenomena that climatologists are studying that may ultimately improve long-range forecasting?

El Niño, maybe because of the catchy name and the many interesting phenomena associated with it, gets most of the attention. But in reality there are many other aspects of ocean currents and oscillations in the Pacific that probably affect our weather. The North Pacific Oscillation, also called the Pacific Decadal Oscillation, has been getting increasing attention. There are some interesting relationships that have been found for Front Range

snowfall with an Atlantic Oscillation. Seems like it should not be a factor, but it is correlated. There is always the question, of course, of whether the correlations are meaningful and helpful in making successful forecasts.

Q: The water outlook for Colorado this fall is bleak. Do you see continued drought, or a winter with generous snowfall?

After looking at weather patterns here for 25 years, I have become increasingly confident that I don't know what the next season will bring. We have not seen two consecutive extremely dry (less than 60% of average) winter seasons in Colorado since we have instrumental records. My gut feeling is that a portion of the mountains will have a pretty good winter while other parts of the state will not. It is very common in winter for northern and southern Colorado to be out of phase with each other. That is what I expect this winter. Based on El Niño correlations, we should bet that southern Colorado will have the best snows this winter — especially in the first half of the season. But I'm not totally convinced.



Nolan training the next generation of weather watchers.

Q: Can winter weather be forecasted by looking at the previous summer or fall?

People have looked at every possible combination in hopes of finding some tricks for forecasting the coming winter. But what our data show us is almost no correlation at all between summer and fall weather and what happens the following winter.

Q: The trend in recent years is toward fewer man-made observations and more automated weather stations. Is this leading to better or worse climate data?

It is definitely leading to more data that is easy to access. This is so different than just 10 or 15 years ago when only a few of us had ready access to data. Temperature is easy to automate and most data are reasonably accurate. However, you need to know the exact location of the station before you can interpret the results well.

Then there is precipitation. Despite decades of efforts by brilliant engineers, the accurate, representative and consistent measurement of things so simple as snow density and water content remains elusive. I've taken weather observations for years and I will be the first to tell you that I appreciate automation when it's dark, cold, and the weather is boring. But when it comes to measurements of precipitation, snowfall, snow density, etc., I'll take data from a trained human observer over an automated station any day.

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Nolan Doesken

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Q: How long have you lived in Fort Collins? And tell us about your family.

I have 25 years under the belt now here in Fort Collins working for the Colorado Climate Center. I moved here near the end of the infamous snow drought of 1976–77. We've been warning folks that drought is a part of life here and that drought like that would return. This year we got a taste of it.

My wife, Kathy, and my kids, Gail and Joel (teenagers) all love to ski and snowboard. However, I am not a skier. Growing up, I played too much basketball and have had years of bad knees.

Q: We understand about the knees. Nolan, are there other things you would like to tell the readers of *The Beacon*?

I might just mention that the Colorado Climate Center is a source of information that anyone can tap into. We have a Web site where historical climate information for Colorado can be accessed ... <http://climate.atmos.colostate.edu>.

We also publish the quarterly magazine called Colorado Climate. You can check out the educational non-profit magazine on our Web site, or call our office to check on subscriptions (970-491-8545). We cover everything from climate extremes and historical events to current thinking on topics like global warming and everyone's favorite topic — El Niño.

Finally, we make use of volunteer weather observers to help us monitor the climate of Colorado. We currently have an on-line network of nearly 500 citizens of all ages who report precipitation each day as a part of the Community Collaborative Rain and Hail Study (CoCo RaHS). We are always looking for more folks who share our enthusiasm for precipitation. To check out the project go to our Web site at ... <http://www.cocorahs.com>.

If you want to become a part of this community effort, click on "Join Us." Up to this point we have concentrated our efforts here along the Front Range I-25 corridor, but we are spreading our wings and adding new volunteers in all parts of the state.

Q: Lastly, where do you think the science of climatology will lead weather forecasting in the future?

I could take a crack at that question but I would rather not. Climatology already does a great job of showing us the daily, seasonal and year-to-year averages, variations and extremes that characterize our weather patterns. We all think we want a precise forecast — but half of the fun of looking forward to each new season is the excitement that uncertainty brings. To tell you the truth, I like not knowing exactly what lies ahead, but rather just having a good picture (based on history) of some of the possibilities.

Well said. If we could predict the future, we'd probably be very rich but very bored. Thanks for enlightening us about Colorado's climate. And please, make it snow. ❄️

Rescue Choices

by Knox Williams and Dale Atkins

In the last five years, technology has come to the aid of anyone looking for avalanche rescue gear. There are several new devices on the market designed to help save your life if caught in an avalanche. We'll discuss four here: the beacon, the rescue ball, the AvaLung, and the airbag. Should you buy one? Should you buy them all?

This article will help you make those rescue choices. But first, a sobering fact: since beacons have become widely used in the last 30 years, more people wearing beacons have died by avalanche than have survived. The stats don't lie: of 106 people wearing beacons and buried in an avalanche, only 39 have lived — a survival rate of 37%. Why, you rightly ask, is this gadget not doing its job? And if it doesn't, are any of them worth buying?

Beacons

Perhaps you took an avalanche course, and your instructor convinced you to buy a beacon because it would improve your odds of surviving an avalanche. You spent good money and have practiced hard to get fast with this thing. Now you learn that the statistics are against you. At first you think, "I don't want to hear this." But at second thought, this is exactly what you need to hear. There are reasons more people with beacons die than live when buried in an avalanche. Understand them and you will be better off.

Beacons absolutely do their job, and that is to let a searcher find a buried victim. But as we learned above, "finding" may not mean "saving." There are at least three reasons for this. First, beacons won't help if the victim has sustained serious injury. Second, deeply buried victims cannot expand their chests to breathe. And third, uncovering a victim often takes longer than locating him or her, and the elapsed time of burial is too long.

Still, beacons sometimes save lives, and that is reason enough to wear one. They reduce the search time, and that is always a good thing. Statistics show that only about 26% of buried victims survive without beacons, while 37% survive with them. Don't give up that extra 11%.

BUY? NOT BUY? Yes, definitely. Practice until you are good, then practice some more. Insist that all your traveling companions have beacons and are as practiced as you. One last piece of advice: ski as though you do not have one.

DIGITAL OR CONVENTIONAL? Digital beacons process the signal and actually do some of the decision-making for you. Therefore, they are more intuitive and easier to use for novices, but the drawback is a shorter range, which has shown not to be all that important in time trials.

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Old hands seem to prefer conventional beacons, partly because of the longer range, and partly because that is what they have mastered in their professional careers. We give a slight nod to digital beacons.

Avalanche Ball

This item came on the U.S. market last year and is distributed by the K2 Company. It is a spring-loaded plastic ball that you wear in a pouch. When you release it by yanking on a ripcord, it instantly expands to about 15 inches in diameter. It remains attached to you by an eight-meter cord and floats on top of the snow, thereby giving rescuers a visual spotting of where you are buried.

The avalanche ball is an improvement of the avalanche cord that was popular in the 1950's and 60's, before beacons made them obsolete. If everything goes according to plan, this is probably a pretty good locating device. But we have no data (other than tests with dummies) to verify its effectiveness. You've probably already thought of what can go wrong, what if you can't pull the ripcord? What if the ball is hidden in vegetation? What if the ball comes to a stop on top of the snow but then is buried by a second wave of snow?

K2 Avalanche Ball.
(Photo courtesy of K2 Snowboarding)



BUY? NOT BUY? No, not yet. Let's get more data on how well these things actually perform. Until then, rely on your beacon. (Although, be our guest if you choose to listen to that voice telling you to have redundant rescue systems. And be sure to tell us how well it works.)



Tracker DTS avalanche beacon. (Photo courtesy of Backcountry Access)

AvaLung™

This device was invented and patented by a Denver doctor, is marketed by Black Diamond, and has been on the market for three years. Its purpose is to allow you to breathe if buried in an avalanche. Often avalanche victims are able to breathe beneath the snow, but in time they poison themselves by re-breathing exhaled carbon dioxide. The AvaLung™ prevents this from happening by taking fresh air from one side of your buried body and dumping the spent air on the other side.

Here's how it works. The original AvaLung™ was incorporated into a small vest. The newest version, introduced last winter, resembles a bandoleer that is worn over the shoulder and on the outside of your parka. If caught in an avalanche, you must get the breathing tube in your mouth. If buried, you breathe through the tube. The extra time can be a lifesaver, giving rescuers time to locate (with a beacon or avalanche ball, perhaps) and uncover you.

The science behind it is sound, and it performed very well in tests. Buried volunteers were able to breathe up to an hour before carbon dioxide levels became critical. Without the AvaLung™, asphyxiation can occur in as little as 10–15 minutes.

Two big questions arise: First, can you get the tube in your mouth and keep it there during the turbulence of an avalanche? Second, will you be able to even expand your chest while trying to breathe when deeply buried?

The AvaLung™ is so new that we have almost no data on it, other than controlled tests. However, there has been one documented survival (a heli-skier in Canada) of a buried victim wearing the AvaLung™, and a couple of anecdotal reports of burials. Our problem with it is that it comes into play too late in the

AvaLung II™. (Photo courtesy of Black Diamond Equipment)



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Rescue Choices

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sequence of an avalanche accident ... getting caught, taking a ride, getting buried, trying to breathe. However, once in your mouth, the AvaLung™ does ensure an open airway that allows you to breathe, something that many buried victims never get a chance to do when their mouths and nose pack full of snow.

BUY? NOT BUY? When the AvaLung™ first appeared we thought it to be a device best used by ski patrollers and guides, who anticipate risky situations beforehand and put the tube in their mouth before taking a ski cut or descent. However, the newest version — lighter, smaller, and half the price of the original — shows real promise for the average backcountry skier, snowboarder, or snowmobiler. Promise us you will always put the tube in your mouth before getting onto a suspect avalanche slope.

Rather than rely on something to help you breathe after being buried, wouldn't it make more sense to not get buried

in the first place? This question is a great segue into our final rescue device.

Airbag

The ABS System is a European device that is intended to keep you from getting buried, and early results show that it really works. The airbag is incorporated into a backpack. If you are caught in an avalanche, you yank the ripcord and the airbag instantly inflates. This gives you flotation that greatly reduces the chance of getting buried, and it gives you a little padding to bounce off of trees.

Airbags have been used for about a dozen years in Europe. The results are outstanding: there have been 44 documented survivors, all of whom ended up on the surface. There has been but one death, and that occurred in an unusual circumstance in which the victim survived the first avalanche, but being partly buried and immobile, was buried by a second avalanche.

The airbag goes to the heart of the matter: totally buried victims die in avalanches (about 70% of the time). If you stay on the surface, you have an excellent chance of survival.

They are not foolproof (what if you cannot pull the ripcord?), but their performance in real avalanche situations shows great promise.

BUY? NOT BUY? Airbags will be available in the U.S. this winter and will be marketed by Life-Link. Once you get a chance to demo an airbag, we say buy one.

Parting Words of Wisdom

Technology has improved and widened your rescue choices, but technology should never be viewed as a substitute for knowledge and common sense. Rescue gear can give you the final edge to surviving an avalanche encounter, and that means you must have it and know how to use it. But it's always best to avoid the encounter in the first place with good decision-making and route finding.

Think "knowledge first, gear second." And don't forget your shovel. ❄️



ABS Avalanche Airbag System inflating.
(Photo courtesy of Life-Link)

What's New at the CAIC?

by Knox Williams

We like to keep you informed of what's going on with the CAIC, so here are some events and additions taking place this fall and winter.

First, the **Avalanche Jam** took place on September 6 at the American Mountaineering Center in Golden. It was the first major fundraiser in the history of the CAIC. Many of you attended this fundraising street party on a warm Friday evening in Golden, and we thank you. Backcountry Access of Boulder sponsored the event, and we have them to thank for putting all the pieces together — the site, the wrangling with the Town of Golden, the Kodiak Island Salmon Bake, the Ogallala String Band, the booths, the silent auction, the gear giveaways, the New Belgium beer, and the fun. More than 500 people attended, and it raised more than \$10,000 for the CAIC.

Second, the **Colorado Snow and Avalanche Workshop** was held on October 16 at Keystone. The CAIC sponsored this one-day workshop for avalanche professionals in and around Colorado, with the purpose of providing a professional development seminar, along with a chance to talk with fellow snow pros. Five speakers presented topics of local interest, and Dale Atkins of the CAIC gave a workshop on a new Web-based data entry and storage system. About 100 people attended. We hope to make this a biennial event for avalanche practitioners and serious backcountry folks.

Third, the CAIC is opening a new satellite office this winter in Breckenridge — the **Summit County Avalanche Office**. Summit County is the highest-use backcountry region of Colorado, and it has some of the greatest avalanche potential. This local office of the

CAIC can gather more data, offer more detailed hotline messages, and generally promote safety to better serve the needs of those backcountry users. Local funding will help sustain this office.

Fourth, we also are bringing the **Crested Butte Avalanche Center** into the fold. The CBAC has been around for several years providing hotline messages for the locals. By merging with the CAIC, the CBAC will get a boost that will help it provide improved daily service. Funding to do this will come from the CAIC and local businesses and fundraisers.

Fifth, the CAIC will add a **danger rose** to its Web site forecast page. A danger rose is a graphical display of the backcountry avalanche danger, with the danger being shown by elevation and aspect. You can go to our Web site and click on an area of the Colorado mountains to bring up the danger rose for that area. The text of our hotline message will also be available, of course, so that you can get the details of what's going on with the backcountry snowpack.

As the winter progresses and you have a chance to hear or meet the people in our local offices, and you have a chance to use the danger rose, we'd like your comments on how it's working. If we can improve it, we will. After all, we are working for you. ❄️



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, WS1 • Boulder, CO 80305

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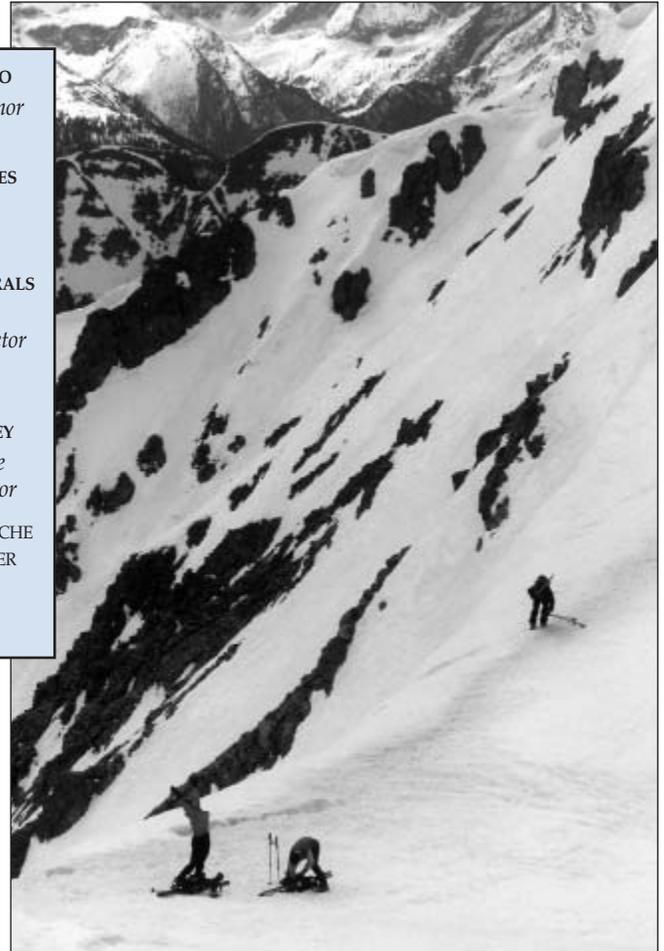
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So many options
from the saddle
between Grand
Turk and Sultan.
(Photo: Scott
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