

NAC 2003 / 04 Season Roundup

Utah Avalanche Center

Like most of the West, we had a relatively relaxing year with a predominately stable snowpack. Despite this, we had four fatalities in two different incidents. Both occurred during large snow or wind storms with rapidly changing avalanche conditions. In contrast to the past several seasons, snow began early and never let up until mid winter, giving us a deep, stable snowpack without depth hoar; always something to celebrate in the western U.S. It snowed nearly every day of November and December; piling up 170 percent of normal snow for November and 164 percent for December. It was some of the finest powder on top of some of one of the most stable snowpacks any of us could remember.

Christmas brought a whopper of a snowstorm, which dumped 3-4 feet of snow in the valley and 5-6 feet in the mountains over three days. The day after Christmas, my Subaru plowed a deep trough through billowing, light, unbroken snow as it barely made the journey across town at 3:30 am to put out the forecast for the day. It was the second largest snowstorm ever recorded in Salt Lake and nearly brought the town to a standstill. For several days afterwards, most streets remained unplowed and many areas went without power. Unless people shoveled twice per day for three days, parking spaces and sidewalks remained hopelessly buried until spring.

The day after Christmas, in the Aspen Grove area in the Provo area mountains, despite an avalanche warning in effect, 14 different people were playing in the runout of one of the largest avalanche paths in Utah. The natural avalanche descended nearly 5,000 vertical feet, catching six people and completely burying three snowboarders in their early 20s. The debris covered an area the size of 11 football fields to a depth of 10-25 feet. In a gruesome event that dominated the media for a number of days, one body was recovered with a probe line two days after the accident and the other two bodies melted out in spring.

The snow spigot turned off for most of January, which allowed choking smog to build up in the valleys while extensive layers of near-surface faceted snow and surface hoar formed in the mountains. The February storms teased us along as none of them added enough of a load to send us into a major avalanche cycle. But finally, on February 26, a big wind storm overloaded many slopes and on a low elevation slope just on the outskirts of Park City, a snowshoer visiting from Houston triggered a small avalanche in a narrow, wooded, low-elevation gully and was buried about four feet deep without a beacon. Local residents just a few hundred yards down the road responded and recovered him but it was too late.

March is usually the snowiest month of winter for Utah, but other than one storm in the first week, nearly no snow fell all month. Combined with record high temperatures, the mountain snowpack not only lost a record amount of snow in March, but it lost an incredible 400 percent more than any previous March on record. April was disappointing as well and both months finished with a little over half the average snowfall for the month. Thus, the season ended with a whimper.

We finished the season with four fatalities—slightly over average—but we recorded only 56 unintentional human-triggered avalanches in the backcountry, which is nearly half our yearly average of 100. Demands for our products continue to grow rapidly and we are approaching a million annual accesses, including all of our Web hits, automated e-mails of avalanche advisories, and calls to the recorded telephone advisory.

—Bruce Tremper

Southeast Alaska Avalanche Center

We had a good winter in Southeast Alaska this year with a long season, plenty of good snow, quite a few avalanches and some scary near-misses, but no fatalities. We did have an unusually warm and lengthy Pineapple Express thaw period from mid-January through mid-February, and spring arrived about four weeks early. The rapid spring warming produced a significant region-wide cycle of large and fast, skier-triggered wet sluffs, glide avalanches and big wet slabs. Cornice breaks triggered 0.5 to 1.5 meter deep wet slabs.

The city and borough of Juneau formally adopted an avalanche-response plan, an important first step toward a voluntary buyout of the affected properties. With 62 houses, one hotel, two sections of expressway, two sections of state highway, a number of back streets, and a boat harbor in the main urban avalanche zones, we have the largest potential avalanche disaster in North America. Thanks to disaster coordinator Cheryl Easterwood, the city has done more to address the problem in the last few years than it has in the previous 20 years.

Our center had no operating budget at all this year, so our program was limited. Director Bill Glude volunteered all his time except when he was actually teaching courses, and student intern Kent Scheler volunteered all his time as well. Local searchdog group SEADOGS provided a grant to cover basic expenses such as supplies and utilities, and a grant from the Skaggs Foundation will cover accounting assistance and a Web site overhaul this summer.

Despite the lack of funding, we offered a full slate of courses and taught 622 people—24% in field courses. We had to discontinue the snowpack-update program, but still conducted regular fieldwork and served as the community and media source of avalanche information.



Janet Kellam's dog Dottie supervises excavation of the thick January surface hoar. Photo by Janet Kellam

The weather station at our Fish Creek Knob research site, operated jointly with the University of Alaska Southeast, spearheaded by Kent Scheler, and supported by a number of local business and community entities, went on the web with current data and archives available in graphic format. It stayed online for most of the winter, until the radio modem died and we were unable to donate any more time or equipment to the project. We are moving the weather station into the Eaglecrest ski area this summer for easier maintenance and better reliability.

We continued work on our two main research projects this season: development of a sized-block snow test and snow temperature probe studies. We also continued field observations on melt-layer recrystallization and some related phenomena, which are common sources of the major avalanche cycles in our area.

—Bill Glude

Sawtooth National Forest Avalanche Center

The Sawtooth National Forest Avalanche Center (SNFAC) began posting Snow and Avalanche Information on November 5, 2003. A total of 127 advisories were issued, with the end of operations April 5, 2004. User numbers increased again this season in spite of a late start for daily advisories, several extended dry spells and an early season end with the warm spring. Advisory accesses showed an increase of 36% over last year. Direct links were provided to www.avalanche.org and to the avalanche advisories from Boise and Pocatello National Weather Service pages, Idaho NRCS SNOTEL and Idaho Department of Parks & Recreation (IDPR) Web sites. Avalanche class numbers grew thanks to additional funding from grants and partnerships, including regional snowmachine classes funded by IDPR.

Snow Conditions: 2003-2004 proved to be a winter with prolonged periods of good powder conditions but some significant instability. Early season depth hoar persisted until late December. A series of Christmas storms followed by a deadly New Year's storm created a stable, homogeneous snowpack. We received little new snowfall until late January, then we developed a deep slab instability after several snowstorms.

During the New Year's storm, which recorded precipitation rates of up to 4" snow/hour, two people were killed and five others survived when a wind-loaded slope released above a cabin near Fairfield, Idaho. The family dog was miraculously found alive, eight hours later, having been shoved into the fireplace and up the chimney as the snow filled the first floor rooms of the cabin. Several homes in the city of Ketchum were hit by slides with minor damages occurring. Intense rates of snowfall on pre-existing light density snow and strong winds were responsible for the avalanche activity, not depth hoar. A ski instructor was reported missing within the Sun Valley ski area only to be found by an avalanche dog 2 ½ days later, buried in a tree well type situation on an open ski run. He appeared to have died of asphyxiation and his death was not avalanche related.

A dry, cool January produced widespread near-surface facets and surface hoar in two persistent layers that were buried approximately 1-foot and 3-feet deep by February storms. Numerous unexpected human-triggered avalanches occurred beginning the 20th of February. Increasingly larger slides were reported triggered each day until February 28 when a snowmachiner was killed while highmarking in the Apollo Creek drainage of Baker Creek. By late February, most backcountry travelers became ultra-conservative and very few were venturing onto steep slopes. Persistent shears within the snowpack and a strong wind event (65mph Baldy, 116mph Soldier Mtn) added to the conservative thought pattern. March 7, a skier triggered a fairly large slide on a steep slide path above the Williams yurt in the Sawtooth Mountains, lost his gear, but was only partially buried. The last three weeks in March brought record setting warm temperatures and very good spring snow conditions at mid to upper elevations, but produced isothermal conditions, bare slopes and avid bicyclers at lower elevations.

The last week in March, we were thrilled to have Dr. Thomas Wiesinger from the Swiss Federal Institute visit Ketchum, the NAC and the SNFAC for several days. It was a great opportunity to exchange forecasting techniques and ideas and to discuss contemporary avalanche issues as we spent time in the office and in the field. Our only disappointment is that the visit was so brief.

Staff: Janet Kellam returned for her eighth season with the avalanche center, Greg Johnson completed his second season and two new forecasters joined the team. Jake Amadon worked part time as a new forecaster and instructor for the SNFAC and part time as a guide with Sun Valley Heli-Ski. Jeff Halligan, recently relocated as a Recreation Specialist from the Payette National Forest and Avalanche Center, was able to forecast one day a week and help teach classes.

Media: Extensive media attention on the local, regional and national level brought avalanche awareness to hundreds of thousands of people. Newspaper articles in the Wood River Valley, Twin Falls, Boise, Idaho Falls, Mountain Home and even the *New York Times* were based on press releases and interviews with SNFAC staff. Radio stations throughout southern Idaho produced specials on avalanche awareness. Boise, Twin Falls and Sun Valley television stations all did avalanche awareness specials and produced a number of news programs about the Fairfield cabin fatalities. Forecaster Greg Johnson appeared in a news clip on Tom Brokaw, MSNBC, ABC affiliates and the *Today* show after the New Year's fatalities. *National Geographic Explorer* has released a new film and a Web site about avalanches and interviewed our staff. Wood River Valley's KECH radio provided countless community service and news broadcasts about current avalanche danger and the contact numbers for the daily advisories. —Janet Kellam



The Fairfield cabin and slide path, New Year's, 2004. Photo by Janet Kellam

The U.S. Forest Service Mt. Shasta Avalanche Center

2003-2004 was the sixth season for the Mt. Shasta Avalanche Center as a type II regional avalanche center. The snow started to fly around the beginning of November with a total of 70" of snow for the month. We began issuing avalanche statements twice a week from November 19 up until the start of December. Then from December 1 through April 20, 2004 we produced a daily advisory by 7am.

The storms started to line up for December and we consistently received 3-6" of snow totaling up to 104.5" of snow and 11" of H2O by the end of the month, according to the weather station in the Old Ski Bowl on the southside of Mt. Shasta at 7600'.

We had a fairly large and widespread natural avalanche cycle in the early morning of December 14. Most of the slides occurred above treeline and ran on a weak layer of graupel provoked by 20" of new snow and gusts of up to 70mph, (1.39" of SWE). Crown faces were 1-3 feet deep and breaking up to a quarter-mile wide. Some slides ran over 1,000' with 8-10' of deposition. One climber triggered an avalanche right before Christmas Eve. He was wandering around in a storm on Green Butte ridge above a known avalanche path called Sun Bowl. Fortunately he triggered the avalanche on top of the ridge and it did not take him for a ride. The crown was 2' high, 200' wide & it ran approximately 500'.

The New Year started out with a bang! We measured 22" of new snow in 23 hours starting New Year's Eve. Temps were averaging a cool 13F during that time with very little fluctuation. This storm produced a class 4 slide in Avalanche Gulch, which is a SW/W aspect. The width of the starting zone and depth of the crown was unknown. Eric and I estimated the starting zone originated left and right of the Heart in Avalanche Gulch at around 13,200' on an approximately 36-degree slope. The runout was 5,600 vertical feet below with the toe of the deposition zone at 7600', which is an impressive three miles away from the starting zone! The debris was over 25-30' deep with the air blast from the avalanche scattering Shasta Red Fir boughs as far away as 500' from the deposition area.

The rest of the month was fairly quiet until Jan 24th when we received 2" of snow overnight with W/NW winds blowing 44-70mph by mid morning. Some natural slides ran and several small slides were remotely triggered during this wind event by skiers and snow machiners.

February was an active month with over 109.5" of snow and plenty of avalanche activity. There were five human triggered slides reported with no injuries or fatalities. In one of these incidents, the individual who triggered the slide took a 600' ride with no injuries and was able to stay on top. He did lose some equipment and it was reported as a 20'-wide slide on a 40-degree NW aspect. A number of large naturally occurring avalanches ran on a variety of aspects and elevations. One slide in the Avalanche Gulch area had a 5 to 8'-crown face and wrapped from south to northwest. Starting at 10,460 feet, the slide ran approximately 3,000 vertical feet and 2 linear miles with deposition 20 to 30-feet deep.

March was a relatively quiet month for precipitation but exciting for winds and warm temps. The temps hovered in the mid 30s to high 50s at 7,600 feet. The winds recorded at 8,000' during the beginning of the month were cranking well over 100mph from the NW. It seemed most of our snow on the upper mountain was transported to McCloud and beyond. The stripping, as well as the warm temps, left some of the well known landmarks such as the Heart in Avalanche Gulch at 12,000' bare down to the rocks.

Some wet slide activity occurred during the last week of March. Of note, snow survey totals at 7,900' on the south side of Mt. Shasta showed that the beginning of March was at 150% of average for snow. By the end of March snow totals had dropped to 115%, although SWE was 134%. Typically, March is a big month for snow accumulation, not a loss. Daily advisories ended April 20 and we continued to do weekly avalanche statements until the end of the month. Overall, it was pretty quiet with only 13" of snow and light winds.

The Crystal Ball: In the future we would like to continue to expand our program in education, weather information, and the forecast area. We would like to continue to receive more education pertaining to the unique weather phenomena that occurs on Mt. Shasta. We would also like to expand our snowmobiler educational programs. We look forward to the winter ahead, and in continuing to provide a professional and quality product for the public.

We want to give a BIG THANKS! We feel very fortunate to have such great support from the Friends of the Mt. Shasta Avalanche Center. They threw another great fundraiser called the "Snowball" that produced over \$7,000 to be used for more weather telemetry and rescue caches. Many businesses locally and from out of the area donated prizes, beverages and food.

Thanks to the National Avalanche Center for their support and guidance. All the observers deserve a huge pat on the back for their invaluable information. Medford NWS did a good job of providing us with weather information. Brenda Graham from the USFS Fire Weather Forecast Center in Redding, CA gave us invaluable guidance and meteorological education. Special thanks to Dept of Water Resources for the excellent weather telemetry and help in installation, and to Dave Trevisan and Mike Hupp for continued support and faith in the avalanche center. Last but not least, enormous thanks go to our patient and beautiful wives for putting up with early mornings and long hours. —Matt Hill

Northwest Weather and Avalanche Center

Very heavy snow began in late November, which gave a good start to the season. Snowfall of 15-25 inches in 24 hours was seen on many different days at different sites in late November. Thus, the NWAC began regular winter forecasting services on the 24th of November.

Steady storm cycles continued through December and into early January. We saw heavy snowfall the night of 13-14 December, with 1-2 feet accumulating at most sites west of and at the Cascade crest. Particularly heavy snow was seen again on January 7 with a 20-30" snowfall in 24 hours at Paradise and Timberline. Two snowshoers survived a miraculous 24 hours of burial near the Mt. Baker ski area from December 12-13, but their third member died of hypothermia. On December 13, a snowshoer was caught and buried under a large boulder at Snoqualmie Pass and rescuers needed a week to find her body. Then on December 17 a snowmobiler highmarking near Blewett Pass triggered a large avalanche, which buried and killed him. He was the only one in his group without a transceiver.

Storm cycles were heaviest in the south Cascades but also more intermittent during mid January to late March. In late January, 10-20 inches of 24-hour snowfall was common. On January 31 two snowmobilers were buried 2- and 5-feet deep in a triggered avalanche in the central Cascades, and both were rescued using transceivers. Another fairly heavy storm cycle was seen the third week of February with 5-10 inches of 24-hour snowfall persisting from the 16th to 19th. This apparently caused a buried surface hoar layer to become reactive in the vicinity of Stevens Pass, where several slab avalanches were triggered and one person received face injuries when an avalanche carried him into a tree. Another 5-15 inches of 24-hour snowfall occurred over several days in early March. A snowmobiler was killed on March 5 while highmarking near Snoqualmie Pass. He was wearing a beacon, but was buried 8-feet deep in avalanche debris. Two other lucky snowmobilers survived an avalanche they triggered near Stampede Pass on March 6. One was buried upside down with his feet showing and the other nearly completely buried but with a bit of glove showing.

Major dry and mild periods led to a quiet end to winter during the remainder of March and early April. The NWAC ended full forecasting services on April 11. A reminder that the avalanche season is not over in the spring came on April 26. A person snowboarding by himself near the Mt. Baker ski area was killed when he was caught by a small wet-snow avalanche and partly buried upside down in a bergschrund.

We had 23 days through the winter with warnings or special statements, which is slightly below the annual average of 26 for the last 10 years. There were five avalanche fatalities (two snowshoers, two snowmobilers, one snowboarder) in the Cascades this season, which is the most since the winter of 1996/1997 when five people also died. As usual, it was amazing that other close calls didn't result in more fatalities. We had over 2-million Internet hits to our weather station data and over 620,000 hits to our forecasts. With the help of our intrepid volunteers we provided about 25 avalanche-awareness presentations to various groups. Our avalanche center, opposed to many others, leaves any additional avalanche courses to the private sector.

One thing that still amazes me about this operation is that we maintain or help maintain about 40 mountain weather stations in the Olympics and Cascades. This continues to get gradually easier with equipment upgrades and the elimination of long line runs between data loggers and sensors. Another upcoming NWAC office project is to revise the NWAC Web site and move it to the avalanche.org server system.

The Friends of the Northwest Weather and Avalanche Center (FOAC) continues to do a great job supporting our efforts. The FOAC hosted their annual Snowbash party

Continued next page ➡

NAC ROUNDUP

continued from previous page

last fall and held several film events through the winter. The FOAC and the NWAC began a Web-based Northwest Snowpack Information Exchange where backcountry enthusiasts can exchange snow-stability information. Although the Exchange only began in February, many people used it by the end of the season. In addition, the FOAC plans to revise their Web site and the Exchange for 2004/2005.

For a more detailed annual report visit our Web site at www.nwac.us.

—Garth Ferber

Payette National Forest Avalanche Center

Thanks to early season snows in west-central Idaho, the Payette Avalanche Center started forecasting on November 21, 2003. We issued advisories three times a week and operated until the end of March, producing our last advisory March 31. We created about 50 advisories, primarily on Wednesday, Friday, and Saturday. The Avalanche Center utilized four paid and two volunteer forecasters. The advisories were distributed using the internet and a multi-line phone recorder. This was the first year using a new Web site paid for by the Friends of the Payette Avalanche Center, which allowed us to post our own advisories and utilize remote access. This was a real highlight for the forecasters. Before, we had to go through a Forest Service Web master and often were unable to post advisories when the Forest's system was shut down for maintenance. (This happens often on Friday afternoons or holidays). We also added a counter to the site and had 7,801 hits for the season.

The Center put on five classroom and two field sessions of basic avalanche awareness instruction, and participated in instructing two level I avalanche courses. One of the awareness courses was taught in Boise, the rest in McCall. The two level one courses were taught near Cascade, Idaho. Idaho Department of Parks & Recreation partnered on a snowmachiners avalanche class and some advisory sponsorship. IDPR is keen about the avalanche programs and is committed to pursuing some long term goals for class promotion and attendance.

The challenges remained the same: we struggle with meeting increasing demands for avalanche education and maintaining remote weather stations throughout the season.

—Jim Fitzgerald

Idaho Panhandle National Forest Avalanche Center

The first week in December, the Idaho Panhandle National Forest Avalanche Center began issuing advisories with 5 feet of snow in the mountains. Snowfall had been consistent after the first dustings arrived in early November, and winter came on with a bang around the middle of December. The St. Joe Range and the St. Regis Basin developed problem layers early in the season due to rainfall, which formed crusts and faceted layers. Natural slides as well as human triggered avalanches started off the season in these areas. The crust/facet layers were responsible for several human-caused avalanches reported to the IPNF avalanche center. One involved a group of snowmobilers in the St. Regis Basin and the other was a group of several skiers touring in the Copper Lakes basin. Colder temperatures to the north meant snow instead of rain crusts in the Selkirks and Cabinet Mountains. Buried surface hoar began to accumulate in the pack around the end of December and became a hazardous weak layer by the beginning of January. Also during the early part of January, IPNF areas experienced a drastic cold snap that lasted a little over one week. The cold was due to the weather coming predominantly from the north and making it feel even colder were strong northerly winds. Most often these cold snaps just bring cold temperatures but this one brought quite a bit of low-density snowfall. It is rare to get much snow during single-digit temperatures in the Panhandle. We were completely surprised to see significant snow accumulations in spite of the mercury dropping to well below zero. Snow loads came gradually and due to the low density of the new snow, not much hazard was associated with the additional loads. As the cold snap ended we became worried about a predicted warming trend. All of our observers and forecasters were in a frenzy. However, the rise in temperatures happened gradually and no widespread avalanche activity occurred.

Through the remainder of January and into February, we had periodic problems with the old crust layers that had developed associated facets and surface hoar. On the 2nd of February, a highmarking snowmobiler triggered a large avalanche in the Selkirk Mountains northwest of Bonners Ferry. Eleven people were witness to the nearly 600-vertical-foot avalanche, but only four were caught and buried by the slide. No one was killed by this large event. We were not notified until several days later by the Glacier Country Avalanche Center, as the snowmobilers were from Kalispell and reported the accident there. Going to the site the following week we noted one of the larger slides seen in this area.

By March we had developed a relatively unstable pack. Numerous layers were present. Surface hoar and facets were located above & beneath different crusts. On the 6th of March we experienced our first and only fatality of the year. We had issued a HIGH danger rating for the weekend with an added expletive, *"The weather that is predicted for the weekend will greatly increase the avalanche danger on a currently unstable snowpack."* One snowmobiler was caught, buried, and killed in an avalanche on an east aspect about 10 miles north of the Schweitzer Ski Area. After this weather event, which temporarily raised the avalanche danger, the rest of March was atypically mild. The snowpack settled out considerably and we had no major concerns the rest of the forecasting season. The last advisory was issued on March 26. On the 5th of April we posted a general spring conditions advisory. The forecast season ended about two weeks early due to the fact that we had not received any appreciable snowfall in the prior month and a half. In the Cabinet Mountains the winter maximum-depth snowpack was recorded on the 8th of March. To the south, the Lookout Pass SNOTEL showed its maximum winter snowpack on the 10th of March. As of this writing on April 19 the Schweitzer SNOTEL was still accumulating snow but only gradually since late March. All other SNOTEL sites for the Panhandle region had a slow but steady decline in snow water equivalent

from mid to late March. A very unusual situation for north Idaho.

Public education classes were conducted on 11 different occasions with a total of about 192 people in attendance. Attendance was generally low for most workshops, including a well-publicized state and federal cooperative event for snowmobilers. After advertising for a month prior to the scheduled date only two participants showed up to a free two-day workshop put on by the IPNF avalanche center and the Idaho Department of Parks and Recreation. This was disappointing. We feel that an avalanche safety representative from the snowmobiling community who is actively engaged in the classes would help, and would be an asset for education opportunities.

—Kevin Davis, Ed Odegaard, Piper Goessel, Tom Sudul, Bob Kasun

Mount Washington Avalanche Center

The season began for the Mount Washington Avalanche Center with our first general advisory avalanche bulletin posted on November 14, 2003. We went from late fall conditions with no snow to full-on winter conditions within a day and a half. With the onset of an early season nor'easter, daily forecasting began on December 6, 2003. We issued a total of 185 advisories in the seven-month season.

Excitement built as New Hampshire was hit with a nor'easter, which dumped 106 cm of snow on Mount Washington in 48 hours. This was followed three days later with 8.1 cm of rain. The snow on the ground survived the deluge of water and four days later a new storm dropped an additional 42 cm of snow. Unfortunately, three days later yet another rainstorm arrived, dumping 10.9 cm of rain. The result was an impressive wet & loose slush avalanche that was ~80 meters wide and ran over 330 meters. The debris covered the floor of the ravine and was littered with snow, rock, dirt, and large boulders. This same storm also produced a slush slide at Wildcat Ski Area which pushed a snowcat into the Gondola shack with slush a meter deep. As we looked back on the season, we pined for the big snowstorms of December which never returned.

In last year's season summary I spoke of the cold temperatures of January. This year topped last! January was the coldest month on record for Mt. Washington with an average temperature of -21C (-6.6F). That doesn't seem bad until you look at the week of January 13 when the low temperature on the summit of Mt. Washington stayed below -40C (-41F) for four days and the average wind speed was 178kph (111mph). January 16 was notable with a temperature of -42C (-44F) and a wind speed of 233kph (145mph). Needless to say we did not dilly-dally in our forecasting field duties that day. Mt. Washington had six days of new record lows (-38 to -45F) in January, 2004.

February and March brought a few small storms but nothing of note until March 26 when we received 3 cm of rain in a 12-hour period. The result was an impressive wet slab slide. The crown face was 2-meters deep and 175-meters long and it ran over 300 meters. This avalanche received a lot of local press due to the onset of spring ski season. It didn't do much for the skiing in the ravine except to make it even more of a challenge. Warm spring temperatures and rain came early to the ravine and our season ended on Memorial Day with the least amount of snow we have seen in years. Mt. Washington ended the winter season 254 cm below normal snow fall. It was a season of extremes.

This year we upgraded our manual snow-plot capabilities with the addition of a new snow plot for Huntington Ravine and new weather instrumentation for our Hermit Lake plot.

We recorded four human triggered avalanches this season (luckily with no injuries) and 57 natural triggered avalanches, though we are confident many cycles went unrecorded since they occurred during storms. In addition to the avalanches noted above, our most interesting period was during the January cold spell when we had a number of avalanches occurring on buried near-surface facets. These buried weaknesses produced avalanches with fracture line depths up to 220 cm.

In addition to the avalanche incidents we had about 20 skiing and climbing accidents and one fatality in the Ravines this year. The Mount Washington Volunteer Ski Patrol (MWVSP), who are all Forest Service volunteers, contributed 174 days (1,740 hours) helping visitors by giving out current safety information, responding to search and rescue events and caring for the injured.

More than 20 avalanche courses were held in the local area. The Mount Washington Avalanche Center staff participated in the field portion of most classes and some of the classroom sessions. Over 350 people attended these courses. This year also marked the second year that we held a special avalanche course for the local search and rescue community. Our Snow Rangers presented numerous educational talks about our program to the local community. Cutler, our yellow Labrador, also had good training opportunities through the winter and is fully operational. Our Web site—www.tuckerman.org—received over 181,000 visits (2.2 million hits!). We are excited to see the increase in numbers of people looking for avalanche and safety information.

The "Friends of Tuckerman Ravine" held their fourth annual "Son-of-Inferno" pentathlon (run-kayak-bike-hike-ski) in April to raise funds for the Avalanche Center and the ravine. The low snowpack made the course a challenge but overall the race seems to have been a success.

Happy for a summertime break, we are secretly longing for a nor'easter to dump lots of snow come fall.

—Marianne Lebermann

Logan, Utah • Bear River Avalanche Information Center

The Avalanche Center in Logan is a regional branch of the Forest Service's Utah Avalanche Center in Salt Lake City. There is only one federally paid forecaster for the center. Tremendous support comes from local backcountry observers and volunteers. Through the Friends of the Utah Avalanche Center-Logan, Dave Kikkert, a graduate student at Utah State University, was able to provide significant operational and technical assistance.

The Logan District lies in the Wasatch-Cache National Forest and a substantial percentage of the active avalanche paths in the region are located within the boundaries of the Wellsville Mountain and Mount Naomi Wilderness areas. There are no ski areas or helicopter guide services that do regular avalanche control work

in the mountains surrounding Logan, so we receive all local observations from those involved in purely backcountry recreational pursuits. We also rely heavily on consistent and frequent early morning communications with the Salt Lake Center for pertinent avalanche observations and accurate weather forecasts.

The 2003-2004 winter season began with a heavy Halloween snowfall in the Logan area mountains that kindled hope among optimists for an end to the lengthy drought firmly gripping the region. Snow continued to fall throughout the first days of November allowing for earlier than normal backcountry access and good powder conditions at high elevations. On Monday, November 10, several inches of dense snow fell on the higher elevation slopes of the Bear River Mountains. The snowfall buried and preserved a weak layer of feathery surface hoar that had formed during a brief period of clear weather over the previous weekend. On Tuesday the 11th, light snowfall was accompanied by an increasing westerly wind. Overnight, the southwesterly wind on Logan Peak reached hourly averages of around 30 mph with 50 mph gusts. It began to transport lots of snow onto upper elevation lee slopes. On Wednesday morning, November 12, despite generally shallow conditions in the Logan area mountains, I released the first of our regularly scheduled avalanche advisories for the season to warn backcountry travelers of the increasing danger of wind slab avalanches

In my view this was the first day of the season that human-triggered avalanches were possible in the region and, as luck would have it, the first and perhaps the most serious avalanche incident of the season took place that very day. On November 12 at around 11:30 am, an extremely experienced snowmobiler and prominent local businessman triggered and was buried by a shallow wind-slab avalanche on a northeast-facing slope near the summit of the 9700-foot Logan Peak. Despite his extensive riding experience in the avalanche-prone terrain surrounding Logan Peak and because of shallow snow conditions, the victim and his party did not carry transceivers or probes and they had not checked the avalanche advisory. Luckily, the snow that covered the rider when the avalanche stopped was fairly light and he was able to clear an air space in front of his face before the deposition set up. It was an even more incredible stroke of luck that without transceivers and probes, the victim's son, who was searching with his feet, found his father just downslope of his partially buried snowmobile. He had been buried under a couple feet of snow for about 10 minutes. Blue and unconscious, the victim was recovered by his frantic party, and when the snow was cleared from around his chest and helmet, he spontaneously began to breath and quickly regained consciousness. When Cache County Search and Rescue met the party at the victim's cabin on the shoulder of Logan Peak, he was happy to have survived and was already recovering from hypothermia.

Snow continued to pile up almost incrementally in the Bear River Range throughout November and into the last month of 2003. By mid-December, the upper-elevation snowpack had become quite varied and complex. At the end of November, rain fell on all but the highest slopes, and a crust of widely ranging thickness formed on many avalanche paths in the region. Sandwiched between the regularly occurring snowstorms, short intervals of dry clear nights resulted in the development of classic thin layers of surface hoar and near-surface facets. On December 14, a productive snowfall added two inches of water to the remote Tony Grove Snotel site and was accompanied by strong southerly winds. The Campbell Scientific weather station on Logan Peak measured wind speeds averaging 30 mph, with gusts in the mid 40s. Clear weather the next day assisted our search for suspected natural avalanches, and our efforts in the Naomi Peak Area were rewarded by the discovery of a large avalanche on a steep, northeast facing slope called Castle Rock. As if to accentuate the dangers of backcountry travel in the limestone-based topography of the region, the avalanche had packed a huge pile of deposition into a vertical, rock-sided sink-hole. The 4-foot-deep and 200-foot-wide crown showed us a weak layer consisting of small faceted crystals that had formed near the snow's surface during a brief clearing in the first week of the month. The weak layer was overlain by two substantial wind-slabs, evenly divided by a distinct rime-crust formed on February 13.

Snow began to fall again in earnest at the onset of the holidays, and with little reprieve. The "Christmas Eve Storm" soon stretched on into the "Third Storm Since Christmas," and then into the "New Year's Storm." On the morning of December 30, after receiving sustained southwesterly winds and almost 80 inches of snow since Christmas, snow-safety personnel at Snowbasin, in the Ogden area mountains, (several miles south of the Logan area mountains), triggered a handful of large and destructive hard-slab avalanches with 2-lb avalancher rounds. In the Logan area, copious holiday snow fell, even at the lowest elevations. Exceptionally heavy precipitation hit the northern Wasatch Front. Between Christmas Eve and January 2, the Snotel site at 8000' on the flank of Ben Lomond Peak picked up 13.2 inches of water. The final weather event, which triggered a huge natural avalanche cycle in



The aftermath of the January, 2004 avalanche cycle in John F. Stevens Canyon where slides struck a train of empty grain cars. The derailed cars were pushed off the railbed in order to speed cleanup in hazardous conditions. *Photo by Darwon Stoneman*

the region, came on New Year's Day in the form of gale-force winds. To our south, the new anemometer on the summit of Mount Ogden recorded southwesterly wind gusts of over 90 mph for several hours, with an incredible 106 mph reading coming at around 5:00 in the evening. Early in the morning of the 2nd, the Forest Service Utah Avalanche Center issued an Avalanche Warning for the backcountry in all the mountains of Northern Utah.

Just after dawn on January 2, I stepped out of the windowless Forest Service office and looked across the snow shrouded Cache Valley at the eastern slopes of the Wellsville Mountains, over 10 miles away. For a few short minutes, I could clearly see the shadows of tremendous, long crown lines stretched across the range below the sharp ridge top. I could see fresh white swaths down low on the opposite bench where deposition from wide-spread and very large hard-slab avalanches had blasted out of the bottoms of narrow canyon funnels and leveled many acres of mature aspen, box elder, and maple trees. In the following days I explored the evidence and destruction brought about by the largest avalanches I had ever seen. The extensive hard-slab avalanches, which ran overnight on the first night of the year, were 4-6 feet deep and up to a half-mile wide. The numerous natural avalanches had nearly simultaneously released on a thin weak layer formed in early December.

A strong high-pressure system set up over the region for most of the remainder of January, and snow cover in the lowlands of Cache Valley helped to create a stubborn and smoggy temperature inversion. While stagnant air remained trapped in the valley, sunshine and clear cold nights played with the snowpack in the mountains. Conditions became quite varied. With slick brittle sun-crusts on sunny slopes, mature surface hoar and near surface facets on shady slopes, and well-developed depth hoar on shallow lower-elevation slopes, we were set up for dangerous conditions in the event of any major storm. Thankfully, when snowy weather returned at the end of January it came in small, almost incremental doses and the snowpack remained intact. On January 30, warm temperatures and rain on lower elevation slopes caused several destructive, natural wet point-release avalanches below the 7000-ft elevation level.

Incremental snowfalls continued into early February, and buried weak layers from the January high-pressure system continued to haunt us. On a daily basis backcountry observers reported heart-stopping collapses. Despite lingering paranoia, the snowpack adjusted to the gradual addition of weight and we were spared from a large avalanche cycle. In mid-February unseasonably warm temperatures again returned to the region. The warmth led to a couple of human-triggered slab avalanches on shallow slopes in southeast Idaho, the east-central Wasatch Range, the southern Wasatch Mountains near Provo, and in the western Uinta Mountains, which forced us to keep our guard up. On February 18 several large wet point-release avalanches descended from steep lower-elevation shady slopes in the Logan area. A couple of soggy avalanches crossed the popular Logan River Trail in lower Logan Canyon, and a few impressive wet avalanches temporarily dammed the Logan River at the Blind Hollow trailhead, about halfway up the canyon.

Winter returned at the end of the month, and a large snowstorm stalled over the region. The last weekend of February brought dangerous soft-slab conditions to mid-elevation slopes in the Logan area mountains. My assistant, Dave Kikkert, remotely triggered a substantial new-snow avalanche (approximately 2-feet deep and 200-feet wide) in the Hell's Kitchen area in Franklin Basin near the Idaho border. Over the weekend, backcountry observers reported directly and remotely triggering similar avalanches throughout the Bear River Range. Fortunately, the warm temperatures of the middle of the month seemed to have locked up the deeply buried instabilities formed during the January high-pressure system, and no avalanches were reported releasing on old weak layers.

The next windy storm hit the Bear River Range just in time for the first weekend in March. The now familiar southwesterly wind picked up strength overnight on Friday the 5th and, as you might expect, it rapidly built big touchy cornices and drifted stiff wind-slabs onto lee slopes with the past few days' worth of fresh snow. There were two very close calls in the Logan Area backcountry that weekend, and several locals, who may have underestimated the forces of winter weather in the northern Utah mountains, are happy to have survived. In a potentially catastrophic situation, early on the morning of March 6, 39 Boy Scouts on an annual weekend winter camping outing were buried by rapidly accumulating wind-drifted snow and cornice falls as they slept in their snow-caves in a drift a few hundred feet from Highway 89 in the Amazon Basin area. There were no injuries; in fact, many of the boys did not know what had occurred until rescue diggers woke them up! On Sunday the 7th, a group of six snowmobilers triggered, survived uninjured, and did not report an avalanche in an area that has recently been closed to wintertime-motorized travel. The crown line of the avalanche, in the upper reaches of the Bunchgrass Creek drainage, was around 3-feet deep and well over 400-feet wide.

The remainder of March was historically dry and warm, and the snowpack rapidly diminished, leaving only upper elevation and shady slopes in the region covered with snow. The weather in March clinched the fact that the six-year drought in the area would continue. In typical spring-like fashion, the high angle of the sun caused the powder snow from storms in late March and early April to quickly turn to the consistency of mashed potatoes, and wet point-release avalanches were common. There was also some isolated soft-slab activity associated with the spring storms, but there were no more human-triggered avalanches or close calls in the region. I released the last regular avalanche advisory for the season on April 9. The Forest Service Utah Avalanche Center in Logan saw a marked increase in public usage this season, with thousands of calls to our avalanche hotline and over 13,000 hits on the Avalanche.org based web site.

—Toby Weed

Glacier Country • Northwest Montana

For northwestern Montana, the winter of 2003-04 started slowly. Precipitation was near normal in October, but temperatures were warmer than usual and consequently snow accumulations lagged behind. Snow accumulations were somewhat below the norm until the later part of January. At this point snow accumulations increased

Continued next page ➤

NAC ROUNDUP

continued from previous page

rapidly within a week's time. For February, snow accumulations were near normal. March brought an abrupt end to winter with higher than normal temperatures and very little precipitation. The past three years, our March and April months had been a time to continue snow pack accumulations. This year it leveled off and early melt transpired.

A generally shallow early season snow pack spelled a relatively quiet winter. It seems the number of backcountry parties who got involved in avalanches were within the norm. A brief but spectacular avalanche cycle affected U.S. Highway 2 and the railroad in John F. Stevens Canyon. This cycle delayed traffic on the highway for a couple of days. Railway traffic was suspended for a time to clear derailments and provide safe work areas. Fortunately, none of the incidents involved fatalities or serious injury.

The avalanche center continued with its normal program of educational classes and twice-weekly avalanche advisories. The non-profit side of the program hosted their third year of level II classes, which they developed and taught with local instructors. They also taught numerous transceiver clinics and a combined Level I and Wilderness First Aid course, and organized an Avalanche Awareness Days program modeled after and in conjunction with Canadian Avalanche Awareness Days. All these were well received. The Web page continues to experience increased use. It not only provides access to our advisories, but it offers a forum for backcountry observation reports. The Forest Service received another substantial Montana Department of Fish, Wildlife, & Parks trails grant for avalanche education. Our plans for next season involve maintaining our programs and serving our area users. —Tony Willits

Gallatin National Forest Avalanche Center



Snowmachiners enthusiastically dig in to an IDPR avalanche class in West Yellowstone, MT.

While GNFAC forecasters were at the National Avalanche School in Reno last October, southwest Montana was hit with record low temperatures and its first snowfall. Trick-or-treaters had to wear down jackets and long johns in order to survive the brutal cold. Thinking this was surely the start of a fantastic winter we rushed home just in time to have the snow stop. And...it didn't start again until December. We were blessed with a thin snowpack and cold temperatures through all of November; a sure recipe for job security.

The depth hoar formed nicely, and then it started to snow. December was the snowiest month of the season with most of it falling the last week of the year. A Christmas

dump dropped 100 inches of snow at Bridger Bowl, a local record. This storm also brought the SWE (snow water equivalent) at most locations to above average. As expected, the November depth hoar couldn't support all this new weight and we experienced many avalanches.

A two-week dry spell during the middle of January promoted a banner crop of surface hoar in the southern mountains. This layer survived long enough to be buried during a storm on January 25-29 and reacted as expected; it avalanched. We issued the season's only avalanche warning as widespread avalanche activity was reported, most of it natural.

February was dry and formed even more surface hoar and near-surface facets. Small storms buried and preserved these, but it wasn't until a snowstorm Feb 23-29 that we had lots of slides. We measured 3-5 inches of SWE falling during this event. A snowmobiler was fully buried and rescued by his partner at the beginning of this storm. Luckily, this was the only complete burial of the winter. Amen.

March came in like a lion, but went out like a lamb. Most of the precipitation occurred during its first week. The deepest snowpack of the season was recorded on March 5-6; 65 inches was measured in the mountains around Bozeman with almost 90 inches in the mountains around West Yellowstone and Cooke City. We kept thinking that winter would return, but spring settled in like an unwanted houseguest. Hot and dry weather prevailed during the last weeks of the month setting record high temperatures. For at least one day, high temperatures at 9,000 feet were above 55 degrees. Wet snow avalanches occurred but were not widespread. We waited and waited for the annual April dump, but it never happened. We quietly put out our 122nd and last advisory on April 10.

We all feel lucky that we had no avalanche fatalities this winter. We were on pins and needles many times expecting our rescue beepers to go off, but they remained silent. We were as busy as ever with education and gave 56 lectures to over 2,800 people. Many people sat in on different classes, so to be fair in our accounting, (especially in light of Enron), we counted 2,098 unique attendees in 43 separate classes. Close to 1,000 people heard our snowmobile lectures, which totaled half of our classes. We were grateful to have Janet Kellam as a guest lecturer and field instructor for our two-day, record-setting attendance snowmobile class in West Yellowstone. Additionally we had Chris Lundy share our teaching burden for the second year in a row. His energy and hard work allowed us to take on almost all teaching requests.

The number of people getting our advisory flattened for the first time. We had 4% growth, still more than a bank CD, but not the double-digit growth of years past. Overall we averaged 1,580 accesses a day through our e-mail service, Web page, phone line and faxes. We also owe a huge debt of gratitude to the Utah

Avalanche Center for loaning us their unused digital voice recorder when ours suddenly died this winter.

SnowPilot is finally up and running with people collecting data on their PDAs. You can check it out at www.snowpilot.org. We received further funding from the Omega Foundation, so next winter we hope to get every avalanche center a newer and faster PDA so folks will actually start using it! —Doug Chabot and Ron Johnson

Chugach National Forest Avalanche Information Center

2004 marked the second full year of operation for the Chugach National Forest Avalanche Information Center, (CNFAIC). A joint effort from Alaska Railroad, Alaska DOT and the Forest Service allowed us to install another weather station in the very popular Turnagain Pass area. The first snows fell on November 11 and the first advisory was posted on November 24.

The Center operates a call-in hotline and a Web-based advisory issued five days a week. Avalanche-education classes started at the Glacier Ranger District in November and finished up at the end of December. From January on, the CNFAIC was lucky enough to once again team up with the Alaska Mountain Safety Center, Alaska Avalanche School; and Snow Dynamics to provide additional avalanche education throughout the rest of the season. The total number of backcountry enthusiasts taking part in formal education was approximately 250. CNFAIC avalanche technicians pursued in-the-field contacts and informal education as often as possible. Snowmachine trade shows and presentations for special interest clubs and groups provided additional educational programs.

The CNFAIC started the season with Jeff Nissman and Carl Skustad staffing the center. On January 22, 2004, our organization and the mountain community lost Jeff Nissman to a tragic accident. Nissman and I were heading to the field for observations when an unexpected roof avalanche at our workcenter broke loose and crushed one of our own. Jeff was an integral part of our small center and had created the Web site so many Alaskans look to each snowy morning. Jeff had worked for the Forest Service for seven years. He led the Glacier Ranger District public use cabins program during the short Alaskan summers when his skis got a brief break. We miss him dearly. Looking toward the future we have hired two new technicians to assist the CNFAIC in 2004-2005. Matt Murphy and Dan Valentine will be very important assets to the center.

As funding seems to be on everyone's mind in this business, it was also on ours. We received a significant earmark this past season. This great opportunity allowed us to upgrade our computers and educational equipment, purchase two new snowmachines and an enclosed trailer, as well as build a weather station and rescue cache. We can only hope this is the start of a trend that all of the avalanche centers will all experience.

The Chugach snowpack started with October snows, then shifted to cold clear weather until mid November. Consequently we were plagued with persistent depth hoar. This is somewhat unusual for the Chugach's coastal snowpack. The large precipitation events in December sufficiently buried this depth hoar and did increase stability. A fairly even distribution of above-average snowfall continued throughout much of the winter season from sea level to high alpine ridges. The most notable instability of the season was due to buried surface hoar, which formed February 26 at alpine elevations on multiple aspects. This weak layer was the factor in some very close calls including several skier and snowmachine triggered avalanches. Outcomes ranged from partial burials to total burials. Thanks to very quick recoveries and good travel practices, no casualties occurred from these burials. The Chugach had only two backcountry avalanche fatalities this season: one snowmachiner was buried from a terrain trap below the slide and one climber killed when a cornice broke.

The CNFAIC is a small center with an ever-growing backcountry group to serve. We could not do the job without the assistance of the Alaska Railroad, Alaska DOT, Alyeska Ski Area, Chugach Powder Guides, Snow Dynamics, Alaska Mountain Safety Center, our Friends Group, and many volunteer observations. Thank you all! —Carl Skustad

Colorado Avalanche Information Center

The CAIC opened for public forecasting on November 7 and the first reported avalanche occurred on November 9 in Rocky Mountain National Park near Long's Peak. Early-season snows fell with high water content, helping to initially develop a strong base.

A mid-November avalanche cycle had all mountain areas of the state experiencing some avalanche activity. The Copper Mountain ski patrol released two large slides on the 18th of November that fell 800- to 1,000-vertical feet and took almost the entire winter snowpack. Later in the month came the traditional November cold snap, then dry conditions with slowly warming temperatures. November snow was well above normal. Of note: in the northern mountains, Steamboat reported 220% of normal, although Keystone, A-Basin and Berthoud Pass were only 100-110%. In the central and southern mountains, Gothic reported 188%, Red Mtn Pass and Wolf Creek were 195%.

A series of weak storms in early December brought on the first avalanche cycle of the month. Telluride and Red Mountain Pass were hit the hardest. The next slide cycle occurred mid month. This storm cycle also favored the Telluride area, but slides reported from Berthoud & Loveland Pass helped verify just how weak the snowpack was in the Summit County and northern Continental Divide areas.

Late December, a couple of days of steady snow and wind and the snowpack became overly stressed, triggering the first major slide cycle of the season. Initial activity was in the San Juans, but by the 30th avalanche activity had picked up statewide. CDOT crews put in some long days as numerous control missions were called for in both the northern and southern mountain highway corridors. The backcountry snowpack was growing weaker. One person was completely buried but was quickly dug out by his friends. For the record, no one was hurt in the avalanche cycles of December.

The leading line for our January 2 snowpack discussion was a quote from the robot in the Space Family Robinson television series of the 1960s: "Danger, danger,



An April avalanche on Berthoud Pass. CAIC photo by Jeff Russell

Will Robinson!" The storm cycle of late December roared into January with large snowfall amounts and strong winds for the central and southern mountains of Colorado. The CAIC issued its first avalanche warning of the season on the 2nd and it extended into the 4th of January. All the major San Juan passes were closed because of natural avalanches and CDOT-triggered slides. Heavy snows the first week of January resulted in the first closure of Wolf Creek Pass for avalanche danger in seven years. Mark Mueller reported, "Every known avalanche path was active and many more than once." Several new avalanches were observed from unexpected places and also reached the highway. Even though the weather turned dry and mild after the 4th, we received daily reports of triggered hard-slab avalanches, many due to mid-pack weaknesses. People triggered several of these slides and a number were triggered by explosives, as avalanche crews worked to catch-up.

The dry and mild weather following the early January avalanche cycle was turning the upper snowpack to faceted grains on the colder aspects, while sun crusts formed on top of faceted layers on the sunny, warmer aspects. These layers would define our avalanche season well into February and March. All that was missing from the dry mid-January was fresh slab; another storm cycle would stress these new, weak surface layers. Right on cue, a series of small storms beginning on the 20th did the trick and triggered the second and last avalanche cycle for January. A couple of noteworthy incidents were reported. The first was near Snowmass in the Elk Range, when a skier triggered a sizable slab from some distance away. The slide was 300-feet wide and ran nearly 1,000-vertical feet. The second was near Red Mountain Pass in the San Juans when a skier triggered a slide from 200 feet away. Observers noted that our snowpack was very tender now that the mid-January weak layers were buried. When people are triggering avalanches from several-hundred feet away, forecasters always take note.

Avalanches were reported almost every day in February. On the 15th the worst avalanche accident of the season to date happened a few miles east of Eisenhower Tunnel. Two people ascending an avalanche path known as Herman A, just north of Interstate 70, triggered a slide that swept them approximately 700-vertical feet into a gully. One person was critically injured. This incident was not a surprise as the snowpack had shown signs of lingering instability for some time. Conditions were such that it was not a matter of *if*, but rather it was only a matter of *when* an accident would happen. February snowfall strongly favored the southern mountains, while the central and northern mountains saw highly variable amounts.

On February 17 a quick warm-up in the San Juans produced the first wet avalanche cycle of the season. Temperatures reached into the mid 30s on the mountain at Telluride and Durango Mountain Resort, and into the 50s in Silverton and Pagosa Springs. In the northern mountains high temperatures were in the middle to high 40s. By the 19th Colorado moved back into the storm track as a series of Pacific systems pounded the San Juans, bringing persistent snowfall through the end of the month. This potent little burst brought on the second avalanche warning of the season. There were some interesting avalanche incidents. One car was struck by a slide on Grand Mesa on the 4th, though no one was injured. An ice climber was caught near the ghost town of Eureka on the 21st and broke his leg. A snowmobiler was buried for 20 minutes on Groundhog Mountain near Dolores on the 23rd, and was found with a beacon and dug out with no injuries. And an avalanche in the Spring Gulch Path near Ophir on the 29th damaged a power line.

March weather started fairly tame, but the run of avalanche activity starting at the end of February continued into March. Though not much new snow fell during this first week, avalanches continued to run. The northern mountains saw the most active early March cycle. The first avalanche fatality of the season occurred on March 10. A snowmobiler highmarking a slide path on Mt. Guyot in Summit County triggered a large slide that overran his location. He was buried about 3-feet deep for an hour and a half before a random probe of a rescue team member located the body.

Warm dry weather would ease the avalanche danger through the second week. However, this warm dry spell was instrumental in a significant melt down—Eldora hit 64 degrees on the 12th! A wet avalanche cycle began on the 18th. This warm-up also played a role in the second avalanche fatality of the season. On the 20th, a 22-year-old climber was swept down 1,600 feet and buried by a wet-slab avalanche on the west slope of La Plata Peak in Chaffee County. One other person was caught in the same slide but escaped serious injury. The wet avalanche cycle was one of the most active Colorado had seen in years. Temperatures in March may have been record highs at some locations, and snowfall was below normal.

Early April brought welcome snowfall, following a March that had been much drier than normal. It also brought the third avalanche death of the season on Browns Peak, just north of Huron Peak, a Fourteener in the Sawatch Range. A snowshoer

triggered a large slide on a west aspect that turned into a wet avalanche lower on the slope. He was buried and killed, while two others escaped being caught. The last reported avalanche incident of the season came from Ski Hayden Peak near Aspen on April 26. Two backcountry skiers were retreating off a slope after snowpit data indicated a very weak layer. Before they could get to a safe spot they triggered a slide catching both, completely burying one. The buried person was quickly dug out with only minor injuries. Public forecasting ended on April 25, though most of our observation stations were closed by mid-April.

—Scott Toepfer

Bridger-Teton National Forest Avalanche Center

October was warm and dry in the Tetons. However, by mid-November there were great powder conditions at mid and upper elevations. Temperatures during December, January and February were well-below average. December was characterized by above-normal precipitation, snowfall and snow depths. Precipitation was below average in January, and well-below average in February and March. Due to the cold temperatures, the monthly snowfall and snow depths were near average in January and February. March was very dry and hot. As the season ended in April snowfall was slightly below normal, snow depths were about 85% of normal and the water content of the snowpack was significantly lower than average.

The season started with a very stable snowpack. Backcountry users took advantage of the situation and were entering active avalanche paths and terrain traps without a second thought. Storm cycles at the end of December and January produced significant avalanche activity, especially at the lower elevations. These events ran on buried surface hoar layers that grew during clear periods in December and January. Temperature inversions enhanced the growth of these faceted layers in the valley bottoms. Ray Azar, a longtime local backcountry skier, guide and Life-Link Backcountry Products employee, died in an avalanche on January 31. Ray liked to ski a large avalanche path on the Pyramid, a 9,660 foot peak in the southern Tetons. On the 31st, in this path, he triggered a large slab that swept him to his death. Ray routinely called the center with observations and humorous stories. He will be missed.

There were few if any dry-snow avalanches during the period of March 10 to mid April. Spectacular wet slides occurred on hot days in outlying areas that had a shallow faceted snowpack. Wet-slide cycles impacted the highways in the Snake River Canyon on February 8 and in the Hoback Canyon on March 9 and 10.

Avalanche education efforts included the development of a course specifically designed for snowmobile guides who were employed by permitted outfitters in the National Forest. This effort was in response to new requirements imposed upon the outfitters by the Forest and a need for a course with a field session that specifically addressed avalanche issues for non-skiing guides. This training was very well received and we learned a lot. Doug Chabot's input and the experience of the Gallatin Center was invaluable. Mark Kozak and Margo Krisjansons helped the center provide this service.

The BTNF continued to expand, in its fourth year in partnership with the State of Wyoming Trails Program. Seven new backcountry weather stations were installed. An Operations and Maintenance Manual for the existing network of remote automated weather stations was completed. Two new snowmobiles are in the process of being purchased and backcountry avalanche paths have been mapped using Global Positioning System (GPS) and Geographic Information System (GIS) technology. This project won a 2004 national achievement award from the Coalition for Recreational Trails in the Education & Communication category. Bob Comey traveled to Washington DC in June to accept this award on Capitol Hill.

Progress continued on the development of an avalanche atlas for the Jackson Hole Mountain Resort and the extension of this mapping into the backcountry. Over 300 slide paths have been mapped with starting zones and delineation of class I-V events. The atlas interacts with our historic weather and avalanche database and is the foundation for the visual display of queries from our GeoWAX nearest neighbor program.

The BTNF avalanche center participated in two infrasonic research projects with Inter-Mountain Laboratories, Inc (IML). Both projects explored the use of arrays of multiple sensors to detect avalanches as they occur. One was funded by a National Science Foundation grant and was conducted at the Jackson Hole Mountain Resort. The other was funded by a Wyoming Department of Transportation research grant and was conducted on the Glory Bowl and Twin Slides paths on Teton Pass. Ernie Scott of IML and Chris Hayward from the Department of Geological Sciences at Southern Methodist University have been working to develop programming that processes the signals from the arrays to determine the size and location of avalanches in near real time. Chris McCollister has been working full time since last June assisting in the development of the data-processing program, and writing programming that collects the data from the sensor arrays and transmits it to a valley computer via spread-spectrum radio frequencies. Jerry Hamann, John Pierre and Robert Kubichek, professors in the electrical engineering department at the University of Wyoming, have also been an integral part of this project. In addition to numerous other tasks, they are using a library of avalanche signals to classify characteristics that will enable computers to identify avalanche events and prevent false alarms. Bob Comey and Ernie Scott have submitted papers regarding this exciting project for presentation at ISSW '04. The knowledge gained this season is being used to redesign sensors and reconfigure arrays for next season's research. It is anticipated that these new sensors and arrays will be installed and operational for the ISSW field trips.

In May and June, the center worked on a local museum exhibit that highlights the history of avalanche science in the valley. It focuses on the early efforts of Juris Krisjansons, Rod Newcomb, John Simms, Gary Poulson, and others in the development of avalanche weather instruments and management programs that lead to the establishment of the center in the early '70s.

The infrasonic projects, mapping projects, Web page upgrades and preparations for ISSW '04 will keep us busy and out of trouble during the summer. We look forward to seeing everybody at ISSW and the avalanche bulletin writer's workshop in September.

—Bob Comey ❄️