detail all the factors influencing the team's actions, the broad outline of the accident suggests that waiting or conducting additional mitigation with the avalauncher prior to putting a team in the complex terrain might have increased worker safety.

19940218 PEAK 10-4-20, EAST OF BRIGHTON, UTAH | February 18, 1994

One backcountry skier partially buried-critical and killed. The skier and his partner were out during High avalanche danger. One skier dropped off a ridge to dig a snowpit, expecting his partner to wait. The slope avalanched.

SITE

10-4-20 is the unofficial name for a 10,420-foot summit a mile east of Brighton at the head of Big Cottonwood Canyon. The pyramid-shaped peak is treed on its southwest and northwest faces but more open on its eastern slopes. The peak's northwest ridge leads up from Brighton to the summit, passing through several open areas and above a steep bowl between 9,600 and 9,800 feet.

WEATHER AND SNOWPACK SUMMARY

During the winter of 1993–94, erratic weather created an unusual snowpack in Utah's Wasatch Mountains. Conditions were more typical of a continental snow climate.

> The snowstorms came in schizophrenic lurches and jerks. A huge storm, then nothing for a month, another huge storm, then nothing for a month—this continued nearly all winter long with the notable exception of February. Thin snowpacks with inconsistent weather strike fear in the hearts of avalanche professionals. Thin snowpacks mean depth hoar.[38]

The sporadic storms were not the only atypical weather event. "On January 4, extremely rare mid-winter rain fell all the way to the highest peaks in the range."[39] A record-setting storm, driven by the area's famous lake effect, followed two days later. Alta recorded 55.5 inches of snow in 24 hours, with a 70-inch storm total. That much snow resulted in an especially widespread natural avalanche cycle, but the slides did not break below rain crust, leaving early-season depth hoar intact underneath.

Steady snowfall between February 7 and 27 created thick slabs that overloaded the early-season depth hoar below the January 4 rain crust. People, explosives, and natural triggers produced avalanches with four- to six-foot crown faces. The UAFC received reports of skier-triggered slides for 16 consecutive days.

> With no shortage of weak underlying layers, avalanche conditions were exceedingly tricky. The patterns of instability were not clear-cut. All aspects and most elevations came into play. There was one card for the backcountry skier to play, and [that] card was slope angle. Few, if any, of the slides released on slopes of less than 35 degrees.[40]

On the morning of February 18, the UAFC reported storm totals of 10 to 16 inches and rated the avalanche danger as "High above about 8,000 feet on slopes steeper than about 35 degrees that have recent deposits of wind drifted snow. North and east slopes have the most widespread concentration of these deposits."[41] The forecast described a slide from the day before that was notable because it did not break in the new snow. Instead, it broke five feet deep on facets below the January 4 rain crust on a wind-loaded, east-facing slope in Big Cottonwood Canyon. Forecaster Tom Kimbrough noted, "If you run into one of these ugly killers, don't expect your beacon to do you much good."[42]

High avalanche danger

ACCIDENT SUMMARY

Layne Mitchell (23) and Mark Mason (19) started from Brighton for 10-4-20 at about 13:00. The pair were longtime friends. Mitchell worked summers for the USFS Salt Lake Ranger District, home at the time to the UAFC and the burgeoning National Avalanche Center. He was not an experienced backcountry skier.

The pair skinned up the peak's northwest ridge. By about 17:00, they were close to 9,900 feet. They had dug one snowpit, and Mason dropped off the north side of the ridge to dig another. At the pit site, Mason felt the slope collapse, and he began to move. He braced himself against the tree and let the debris wash over him.

More than one person on a slope

RESCUE SUMMARY

When the snow stopped moving, Mason yelled for Mitchell. He got no answer. Mason climbed back to the ridge but saw no sign of Mitchell. Mitchell had apparently followed him onto the slope, or stepped too far onto a wind-loaded breakover.

Mason started a beacon search. The open slope near the ridge soon gave way to a very steep, densely treed slope. Mason found Mitchell near the bottom of the debris with one hand out of the snow. Mason dug his partner out from under three feet of debris and started CPR. It had been about 20 to 30 minutes since the avalanche. Mitchell had been "carried 120 feet downslope and strained through thick timber eventually getting caught on a tree."[43]

Terrain trap

After about 30 minutes of administering CPR with no response, Mason skied to a parking area below Guardsman Pass. Some snowmobilers gave him a ride to Brighton Ski Resort, where he alerted authorities. Salt Lake County SAR and Brighton Ski Patrol responded. They located Mitchell's body at 20:39 and returned to the parking lot shortly after midnight. The cause of death was listed as suffocation, though it is likely Mitchell sustained injuries in the avalanche.

AVALANCHE DATA

Investigators concluded that the avalanche initially failed on a thin layer of facets 38 to 40 inches below the surface. The avalanche then stepped down below the rain crust to "a layer of well developed faceted snow just above the ground"[44] and about six feet below the snow surface. Strong south to southeast winds had accompanied the previous night's snowfall, and a large deposit of drifted snow sat near the top of the slope. The slope had an angle of 37 degrees near the ridge but steepened to 40 to 50 degrees lower down. The avalanche broke at 9,860 feet and ran 200 vertical feet. Its crown face was 300 feet wide.

TYPE	TRIGGER	R SIZE	D SIZE	BED	ASPECT	CHARACTER
SS	ASu	4		O	N	DPS

COMMENTS

This party's inexperience likely contributed to the fatality. Neither of the pair listened to the avalanche advisory that day, so they did not learn about the large slide the previous day or the advisory's accurate description of conditions. Mason chose to dig a snowpit on a slope that was way too steep (37 degrees) for the conditions and was above a terrain trap (trees). Mitchell did not remain on the lower-angled, safer terrain at the ridge, putting a second person in the start zone.

The author remembers Mitchell as a lighthearted, dedicated, and energetic co-worker. He left behind a wife and son. His death marked the sixteenth avalanche fatality since the UAFC's beginning in which the victim and their party did not call the advisory recording.

19940221 MARION LAKE, WEST OF ESSEX, MONTANA | February 21, 1994

One backcountry skier caught, carried, and partially buried. The skier hit a snag that broke all the bones in one of his legs. He barely survived the four hours he waited for a medical helicopter to evacuate him.

SITE

Marion Lake (5,915 feet) lies on the east side of the Flathead Range and within the Great Bear Wilderness. Backcountry tourers can reach the lake and the steep slopes above it by skinning up from Essex, an unincorporated community consisting of a railroad switching yard, vacation cabins, and an historic hotel, the Izaak Walton Inn, which has groomed Nordic skiing trails. While the runs above the lake and the trail leading to it are the most popular, riders can also drop north into South Dickey Creek and loop back to Essex via a road that is groomed for Nordic skiing.

WEATHER AND SNOWPACK SUMMARY

Mild, dry weather gave way to snow (rain at low elevations) on the night of February 17. The February 18 backcountry avalanche advisory from the Northwestern Montana Avalanche Information System (now the Flathead Avalanche Center) called for up to 12 inches of additional snowfall over the weekend with light to moderate southwest winds. It described natural avalanches in the same valley as Essex on south-facing slopes and involving "recently fallen snow sliding on a[n] old snow surface comprised of melt-freeze layers."[45] The advisory rated the instability as Moderate, but noted that because of the changing conditions, "the word for this weekend can't help but be caution."[46]

ACCIDENT SUMMARY

On February 21, Ed Schmidt (36), Mike Whalen, David Lederfine, Matt Nelson, and Greg Jenkins skinned up to Marion Lake, planning to continue up to the ridge to the north and ski down into South Dickey Creek and back to Essex. It was a holiday Monday with fresh powder. The skiers carried shovels and probes. All but one had a beacon, and most had avalanche training. At least some in the group had checked the avalanche advisory. They did not dig any snowpits, though Lederfine later stated "we were doing things right, checking the depositions."[47]