

## WORLD CLASS SNOWFALL IN THE SIERRA NEVADA, 1969

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### ABSTRACT

On a State of California snow survey in the Upper Kern River Basin in the Sierra Nevada, 366 cm (144 in, 12 ft) of snow fell in 48 hours, February 22-24, 1969, at the Big Whitney Meadow cabin, 3,048 m (10,000 ft) elevation. This was the maximum intensity snowstorm in my over 30 years experience of field snow surveying in the Sierra Nevada, Afghanistan, and Chile, and ranks with 48-hour totals recorded anywhere in the world.

Some major results – constant shoveling of doorway and roof with my being buried in a slide off the roof, the difficulty of measuring the adjacent Big Whitney Meadow snow course after this massive accumulation, the extreme difficulty of ski travel through this new snow, the encounters with the United States Air Force planes searching for two lost fliers, the arrival at the car at the road-head to find the rear wheels stolen.

### INTRODUCTION

In a 48-hour period on February 22-24, 1969, 366 cm (12 ft) of snow fell at the Big Whitney Meadow cabin 3,048 m (10,000 ft), a State of California snow survey base located in the Kern River Basin of the southern Sierra Nevada just south of Sequoia National Park in California. This prodigious world-class event, measured by two State of California snow surveyors as it occurred, ranks with 48-hour total snow-falls recorded anywhere in the world. In over 30 years experience of active field snow surveying in the Sierra Nevada, Afghanistan, and Chile, this was indeed the maximum intensity snowstorm I personally encountered. Following is description of this extreme event, the experience of the storm and later travel on skis through such massive quantities of new snow.

On average, the southern Sierra Nevada is a region of moderate snowfall, fewer storms, and lesser amounts of moisture than the wetter northern portion of the Range, including the Donner Summit-Lake Tahoe area where snow surveying essentially began with the pioneering efforts of James Church of the University of Nevada in the first decade of the Twentieth Century. However, on some occasions when the storm track over the Pacific Ocean is farther south than usual, an apt expression is that the storm door is open, intense snowstorms may strike the southern Sierra Nevada. In the winter of 1968-1969 the storm door was frequently open, particularly in January and February. The most vigorous single storm of this much-above average snow season occurred in late February on top of an existing deep snowpack. This southern part of the Sierra Nevada is especially important to streamflow forecasting from snow surveying in California. The two major rivers in this region, the Kings and the Kern, are the main direct source of surface water and a significant contributor to ground-water in Fresno, Tulare, and Kern counties in the San Joaquin Valley which since World War II have ranked one, two, three in all of the counties of the United States in the case value of agricultural production.

### PRELUDE TO THE STORM

On the morning of February 22, 1969, two State of California snow surveyors, Murt Stewart and I, left the cabin on Cottonwood Creek, 3,048 m (10,000 ft), in the Owens River Basin on the east side of the Sierra Nevada. We were on what is generally a 9-day trip on skis into the Upper Kern River Basin. Our route was a 16 km (10 mi) trip over Cottonwood pass, 3,353 m (11,000 ft) to Big Whitney Meadow cabin, 3,048 m (10,000 ft) in the Kern Basin. The snow pack was well-above normal from January and early February storms, and the surface snow had not yet consolidated, making travel slow and difficult. The weather report for the area, obtained from our pocket transistor radio, called for intermittent snow showers, "heavy at times." As we began the 305 m (1,000 ft) climb of Cottonwood Pass, the cloud cover largely disappeared, and a blast of cold air came downslope. I offered the opinion – pompously and highly erroneously – that perhaps a cold front was passing overhead with following clear weather; the pitfalls of a little meteorological knowledge.

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The view from the summit changed that opinion abruptly. The cloud cover for many miles to the west was a textbook example of an approaching major storm, a mid-latitude wave cyclonic disturbance. Altostratus and altocumulus clouds overhead lowered to the southwest into dense nimbostratus clouds, with a strong southwest wind. This indicated not intermittent showers, but heavy, prolonged snowfall. We hurriedly measured the snow course just west of Cottonwood Pass, and skied as rapidly as possible to our cabin at Big Whitney Meadow. We arrived just before dusk and spent the next hour digging out the door from previous snowfalls. A major effort was clearing the stovepipe on the cabin roof.

#### Duration of the storm

It began to snow precisely at 6:00 pm, just as we entered the cabin. Unlike many storms, the rate of snowfall was heavy right at the beginning. For the next 48 hours the rate deviated very little from 7.6 cm (3 in) an hour. Our cabin is in a dense grove of mature lodgepole pines, so the southwest wind was moderate, not formidable, allowing a fast buildup of snow on the tree branches. We settled inside the cabin with the anticipation of spending a day or more riding out the storm. The transistor radio brought reports of heavy snowfall along the total length of the Sierra Nevada with predictions of heavy snowfall yet to come.

The windows of the cabin were buried by accumulated snow, so when the lanterns and candles were extinguished, it was totally dark. Upon arising early on the morning of the 23<sup>rd</sup>, I opened the door to a scene of 7.6 cm (3 in) an hour snowfall, and a cascade of several feet of new snow onto the cabin floor. We would not travel anywhere that day. The cabin was cold, about, -7°C (20°F), so building a fire was desirable. Big mistake! The cabin filled very quickly with smoke, the stovepipe had been buried by the snowfall during the night. This meant climbing up onto the steep roof to dig out the stovepipe, a delightful enterprise we had to do several times before the storm was over. That day was spent inside the cabin, sometimes in the dark in sleeping bags to conserve wood and fuel, with occasional opening of the door to observe a world of whirling white, and then to deal with snow rushing into the cabin every time the door opened. Human elimination problems always loom large in major snowstorms, and were particularly pressing with this storm. We did come up with innovative ways to avoid going outside into the storm's full fury that were mutually satisfactory.

Reception on the pocket radio was not available during daylight hours in this mountain location. With nightfall we could hear what was going on outside our stormbound cabin. The storm was widespread, flooding in the lowlands, roads at higher elevation closed by snow. The weather forecasts were for more heavy snowfall. One detailed analysis indicated an intense low-pressure area was traveling from San Luis Obispo on the Coast over the Sierra near Mt. Whitney, directly overhead of us, meaning more cabin time and more difficult travel when the storm abated.

The intensity of the storm had not diminished at all by the evening of that first day, but I was tired of being cabin-bound and decided to experience the storm in its manifest power. I skied the 228 m (250 yd) downhill to the edge of Big Whitney Meadow, an extensive treeless area. Emerging out into the meadow was a wild and brief event. The 7.6 cm (3 in) an hour snowfall was moving parallel to the ground propelled by a 80-96 km (50-60 mi) per hour wind. Visibility was zero, breathing was nearly impossible, survival demanded an immediate retreat into the shelter of the lodgepole pines, with gratitude for still being alive. What living creature could survive out in that open meadow in that wind and snow? While collecting my senses back in the trees, above the howling of the wind, a coyote, probably within 30 m (100 ft) of me, let loose a long, reverberating call. Over the years we often would hear, sometimes see, coyotes in the Big Whitney area, and here was one living through this epic snowstorm along with me. Spontaneously, I replied with a long, reverberating yell, and for the next 15 minutes we serenaded each other. I do not believe the coyote took me for another coyote, but maybe it sensed, as I did, we were kindred spirits in this world of white. The ski back to the cabin was arduous, with sinking mid-thigh depth into the new-fallen snow a portent of travel to come when the storm ended. That night, we heard on the radio of an Air Force fighter plane missing somewhere over the southern Sierra Nevada, with two airmen aboard.

It continued to snow at the same high rate during that second day, February 24<sup>th</sup>. We wondered if it would ever stop. We begin to ration our food intake with the realization we might be in the cabin for days and there were snow survey trips to be taken later in the season. One pastime was going over again the available literature in the cabin, some of which had been there for years, deposited by cabin stockers and summer rangers with dubious literary taste, such pulp magazine gems as "I Was a Streetwalker in Soho," and "Hitler's Nympho-

Brigade," meager fare for two intellectuals. I had brought along a thick paperback of Dostoyevsky's "The Brothers Karamazov," and managed to get through some of it before leaving the cabin after the storm.

#### After the storm

It stopped snowing suddenly at 6:00 pm on the 24<sup>th</sup>, precisely 48 hours after it began. With the snow sampler and the tape, we measured the newly fallen snow at several unobstructed areas just outside the cabin. The average accumulation in 48 hours was 183 cm (6 ft) each 24 hours, 366 cm (12 ft) total in 48 hours. This was indeed more than I had ever experienced before in the time interval and exceeded any amount I remembered being recorded anywhere else. Dawn on February 25<sup>th</sup> brought clear skies and a cold north wind – the storm was over, but some of our problems were just beginning. First priority was measuring the snow course out in Big Whitney Meadow. Travel to the course and along its route was slow and laborious. It took four hours to measure the 10 sample points. Much of the snow survey research in moderate to deep snow indicates the sampler overweighs the water equivalent, as it compresses and picks up additional snow in its path to the ground. Perhaps so, but I have experienced just the reverse in heavy, unconsolidated, new snow, where the sampler pushes the snow away resulting in a lesser water equivalent. This was the case on the Big Whitney Meadow course. It was extraordinarily difficult to get a representative core. Moving from one sample point to the next was a major effort. We could distinguish the depth of the 48-hour snowfall – about 254-280 cm (100-110 in) – definitely more windpacked than the snow around the cabin. The water equivalent of this new snowfall was 30-40 cm (12-16 in).

Back in the cabin late that afternoon, we decided upon further action. Avalanche potential and travel difficulty ruled out proceeding north along our usual 7-day route from Big Whitney Meadow. The feasible option was to return to the road-head over Cottonwood Pass. Another problem was the snow-load on the cabin roof. We had no precise figure on the rated capacity of the roof snow-load, but the prospect of a roof collapse was most unsavory and awkward. Murt decided to break trail away from the cabin, while I went up to the roof to shovel snow. I was on the steep roof for two hours of shoveling. On climbing down, I slipped on the exposed layer of ice next to the shingles, and fell alongside the cabin, completely buried by loose snow. By wildly flailing the shovel, I managed to clear some space around my head for breathing. In this process, I cut a gash in my chin which bled profusely. I continued frantically to free myself with restricted movement of the shovel, spurred on by the harrowing thought of how undignified and unacceptable it would be for an experienced veteran snow surveyor to die in a snow-slide while actually touching the outside wall of a cabin. After what seemed an eternity and near total exhaustion, I did break free and returned to the warm, dry cabin. Murt, who had come back from trail-breaking while I was still on the roof had a fearsome incident on his mission. While attempting a kick-turn, he had fallen with the extreme difficulty of getting back up in the bottomless new snow.

The next morning, February 26, in bright, clear weather, we began our effort to return to the road-head over Cottonwood Pass. How far we would get was most uncertain; the goal was to break trail as far as possible and come back to the cabin. Travel was prohibitively and prodigiously difficult. With 213 cm (7 ft) skis, we sank hip-deep, sometimes waist-deep, in to the loose snow. Each step was a maximum effort. One surveyor would break trail for maybe 23-46 m (25-50 yd), then give way to the other surveyor. The second man had only a slightly easier task than the leader. At times it was less effort to move ahead by facing backwards; it was less difficult to lift the tail of the ski through the heavy snow than the longer upturned front of the ski. There were frequent comments about the exquisite ecstasy of having 20 more skiers along to break trail. In 10 hours we had moved a maximum of 3.2 km (2 mi), much of it across another open meadow, locally called Stokes' Beef Pasture. Fatigue, prudence, and a late hour dictated return to the cabin.

Through this interminable, painful day, we saw and heard numerous planes in the clear skies above, presumably searching for the two lost fliers down somewhere in the southern Sierra Nevada. We wondered aloud why no searchers had noticed our deep tracks and investigated our presence more closely. In the waning twilight and rapidly lowering temperature on our return trip, we were in the open in Stokes' Beef Pasture when suddenly a fighter jet plane obviously saw us and began circling closely overhead. Another fighter jet soon followed. This caused an immediate compulsive and fervent response from me, who, as a combat infantry man in France in World War II had been strafed by German Jabos, or fighter planes. At one point I pointed a ski pole at the circling planes and shouted some vivid epithet. Sweet reason returned with the realization that these fighter planes were friendly and on a noble mission.

The jets were followed in a few minutes by a much larger and slower 4-piston-engine plane, which we correctly assumed was a search-rescue-aircraft. This plane made several increasingly lower passes directly over us, and then released a parachute carrying a metal cylinder. The parachute plowed into the deep snow just a short distance from us. The cylinder contained a radio with instructions on how to contact the crew on the plane – which, with cold hands, we did. The following conversation took place:

Search-and-Rescue: “Are you Air Force personnel?”

Snow Survey: “No.”

Search-and-Rescue: “Oh.” Obvious disappointment. “Then who are you?”

Snow Survey: “State of California snow surveyors on a field survey.”

Search-and-Rescue: “Do you have a safe and warm place to spend the night?”

Snow Survey: “Yes. A well-stocked cabin nearby.”

Search-and-Rescue: “The radio we dropped for you is expensive. Could you carry it out with you and return it to the Air Force?”

Everyone knows that snow surveyors are not only brave, hardy, strong, and resourceful, but always kind, generous, sacrificing, and noble? The answer was “Yes!”

By nightfall we reached the Big Whitney cabin, thoroughly exhausted, this from two veteran snow surveyors in prime physical condition. Next morning, as soon as it was light enough to see, we closed the cabin and began the long, arduous trek over Cottonwood Pass to the Cottonwood Creek Cabin on the east side. Fortunately, the night had remained calm, so our laborious track of the previous day had not been filled with blown-in snow. The first 3.2 km (2 mi) of broken trail went quickly, though much like skiing in a tunnel. The snow from the 48-hour storm had settled significantly, but still meant knee-to-thigh depth over the skis. The 305 m (1,000 ft) climb of Cottonwood Pass brought added exertion and we had to take a longer route to avoid avalanche hazard. It took several hours to measure again the snow course at the Pass, with 28 cm (11 in) higher water equivalent than what we measured prior to the storm. Descending the east side of the Pass was no downhill delight – no sliding of skis in the dense surface snow, only vigorous poling. This brought forth the cross-country skier’s lament that this trip was uphill both ways.

From the eastern base of the Pass, our route to the cabin lay along a 4.8 km (3 mi) stretch of Horseshoe Meadow. In the afternoon, after the strenuous exertion on both sides of the Pass, the Meadow seemed arduous and endless. The clear skies were again filed with search planes, some of which would circle closely over us. In heroic fashion, we were carrying the 7.2 kg (16 lb) radio acquired the previous day and we would try to establish radio contact with the circling planes to no avail. This elicited numerous comments about why didn’t the Air Force inform its searchers that we had been identified as State of California snow surveyors, not Air Force fliers. In mid-afternoon our answer came. A small Cessna plane came overhead, which we immediately recognized as being flown by Bob White, the bush pilot from nearby Lone Pine, who flew safety checks over us while on the Kern trip and who would often drop fresh food to us to augment the tired groceries on the cabin shelves. Aha – fresh meat tonight! Bob White, a highly skilled pilot, would fly directly overhead at low elevation for these drops, and here he came. From the Cessna emerged a bundle with an attached long red ribbon, which narrowly missed my head before burying itself in the snow a few feet away. Another undignified way to end a career as a veteran snow surveyor, besides being buried by a snow slide while touching a cabin wall, was to be struck by a sirloin steak dropped from our safety plane. We eagerly followed the ribbon down to the bundle, but alas, no anticipated food morsels, just a note attached to a rock. Bush pilots, as Bob White, tend to be short and succinct in oral and written expression. This note was in character. In large letters, it said, “Turn off the goddamn beeper on your goddamn radio, you are attracting half the United States Air Force.” Unwittingly, as we did not sense it, the distress signal on our heroic radio was on and was indeed attracting search planes from all over. Murt offered the insightful remark that the line between a hero and an idiot was exceedingly tenuous. Bob White disappeared with no radio contact, and we turned off the beeper.

By nightfall we reached the Cottonwood Creek cabin. The builders of this cabin thoughtfully located it in the windiest stretch of the entire canyon, so the door was generally free from snow – no problem there. But the wind had caused another grievous problem. During the 48-hour storm it blew fine-textured snow through every crack in the roof, the windows, and the walls, leading to a massive block of dense, wind-packed snow covering every nook and most of the crannies of the upper interior of the cabin. This resulted in a constant and plentiful drip of meltwater from this block, which we could not effectively shovel away, when we lit the wood stove for

warmth and cooking. It was sub-zero  $^{\circ}\text{F}$  outside (below  $-20^{\circ}\text{C}$ ) outside. It was truly raining inside all night long.

Early on the morning of February 28, after a most uncomfortable night, we left the Cottonwood Creek cabin in a gathering storm on the last leg of the odyssey back to the car, parked on the alluvial fan of Carroll Creek at the east base of the Sierra at about 1,676 m (5,500 ft) elevation. After a short climb out of Cottonwood canyon it was downhill all the way. The storm, with us all day, brought high winds, uncomfortable to face into, but relatively little snowfall. Most of the route lay along a road, filled with uneven and sometimes massive snowdrifts. Skiing, though downhill, was difficult, tedious, and time-consuming. In late afternoon we reached my car, a 1963 Ford coupe, which we had left at the snow-line on February 21<sup>st</sup>. Now there was about 71-91 cm (30-36 in) of snow in the area. Then came an appalling discovery. Some kindly soul, or souls, had stolen both rear wheels off the car. With just one spare tire, the car was not mobile. So the only recourse was to ski and walk another 6.4 km (4 mi) after this long, tiring day to Murt Stewart's house. There we dutifully telephoned Sacramento to report personal safety and snow course data and took a truck 24 km (15 mi) to the town of Lone Pine, persuaded an auto junkyard dealer to open his shop, and found a suitable spare wheel for the Ford. Back up the alluvial fan, only to have the truck stuck in the snow 273 m (300 yd) from the car. This called for dragging the spare to the car, followed by the exercise of maximum mechanical skill and luck to get a small jack to raise the rear end and put on two wheels. Then I climbed inside and turned on the ignition – absolutely no response. Investigation disclosed that the kindly souls who removed the rear wheels had also helped themselves to the battery and alternator. This evoked the prediction that we would be struck by a meteorite, also self-incrimination for not checking under the hood while dealing with the rear wheel problem. The only option was back to Murt's house to tumble into bed well past midnight.

## CONCLUSION

Thus ended the saga of this world-class snowstorm. Helpful office personnel from the Sacramento office of Snow Surveys towed the car 120 km (75 mi) to Bishop where it was repaired. In the best "The Show Must Go On" tradition, Murt and I crossed 3,658 m (12,000 ft) Bishop Pass on a 3-day snow survey trip with clear weather and hard-surface snow conditions. I made three more trips into the Kern Basin that season on April 1, May 1, and June 1 surveys – in mild weather, complete snow cover, and usually welcome corn-snow surface – just compensation for the February travail. In June an airdrop was necessary to augment the depleted food supply at our February storm-bound Big Whitney cabin. The two Air Force fliers were rescued, safe and found, some miles from the Upper Kern. The precious radio was delivered, safe and sound, to the Search-and-Rescue people, thus verifying the sterling character of the snow surveyors. We identified the perpetrators of the pillaged car caper, local residents, but complex social and political factors made prosecution not feasible. Although some snowdrifts, especially on northeast exposures at high elevation, persisted into succeeding seasons, nearly all of that massive 1969 snow accumulation melted or sublimated during the summer and fall, resulting in the maximum runoff of record, about 100 years, in the Kern Basin. Somewhere between one-quarter and one-third of that record runoff was generated by the storm of February 22-24. Comparing snowfall records is always fraught with problems – the exposure of the site, the qualifications of the observers, how often the measurements are taken (during or after the snowfall), the inclination to exaggeration, the measuring instruments, are all difficulties in making valid comparisons. Published records indicate that this 48-hour snowfall of 366 cm (12 ft) in February 1969, in the Kern Basin of Sierra Nevada is truly a world-class snowfall intensity event, if not a world record. I also ask who is better qualified to measure record snowfalls than veteran snow surveyors?

A final comment on this world-class event: 31 years later, I am still exceedingly glad, even exuberantly so, that I was there to experience directly this wondrous event. There is the deep and profound satisfaction of meeting successfully the demands, challenges, and crises present by this storm. We completed our mission under the most difficult circumstances, without injury or undue delay. Moreover, major snowstorms in high mountains are one of nature's most magnificent and impressive displays. Since I was a small child, I have been a helpless and hopeless weather buff, reinforced by a professional career in Geography. I am eternally grateful I witnessed and participated in this superb snowstorm in February 1969, in the Kern River Basin of the Sierra Nevada.