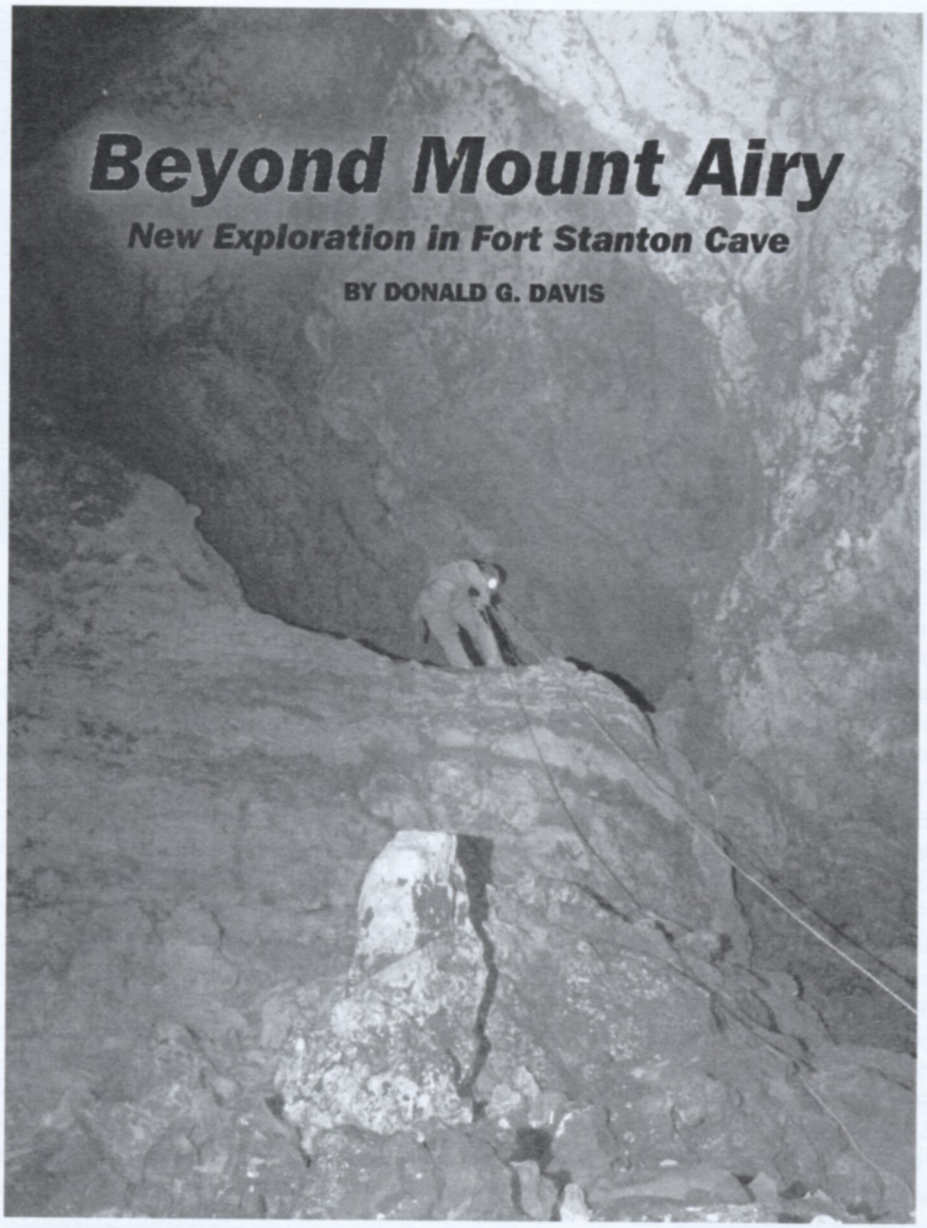


Beyond Mount Airy

New Exploration in Fort Stanton Cave

BY DONALD G. DAVIS

The Fort Stanton expedition scheduled for April 25-May 3, 2009, had been anxiously awaited since the previous year. We hoped that the Snowy River passage – where water had started flowing again in August 2008 after massive rain fell in the area, and was still running in October – would have dried out so that exploration could resume. The winter and spring were dry, and periodic checks of the Government Spring resurgence from October 2008 into 2009, by Steve Peerman and others, showed a steady decline to a near-stable flow of .1 cubic feet per second, giving reason for hope. The first team in on April 25 did find Snowy River dry at Turtle Junction. (A stream-depth data logger showed that the water level there had started dropping sharply December 27 and had disappeared by January 14.)

John Corcoran (expedition leader) assigned two survey teams to return to far Snowy River South on April 25. One included myself, Brian Kendrick, Janice Tucker, Paul Dunlap, and Henry Schneiker, tasked to ascend the Mount Airy breakdown and extend the main passage from SRS302 onward. The other was a technical climbing team – Jon Broholm, Janae Hunderman, Stan Allison, James Hunter, and Roger Harris – to check upper leads at SRS241, 286, and 218 (in approximate order of ease and promising appearance). The teams entered separately, mine at about 9:45 a.m. Near the halfway point at SRS146, there was a slight delay while a new plastic clothes-changing sheet was set at the exit from the Return to Snowy River breakdown room (the original had been washed into the narrow tube downstream, but was fortunately recoverable).

Across Mount Airy

The climbing team passed ours, and were already at work bolting the ledge below SRS286 when we went by. After uncounted hours of travel, we reached SRS302 for the first time since July 5, 2008, and prepared to go up the Mount Airy breakdown slope. As soon as we started onto the rocks, we saw something we hadn't noticed last year: the Snowy River calcite was coming out of several sources among the rubble, several feet higher than the floor in the bedrock borehole at 302.

We also discovered, contrary to our previous impression, that the Mount Airy breakdown was fairly clean, not muddy, so we were able to work our way up it with only a switch to dirty-mode footgear rather than changing all of our clothing. The shot to 303 was 103 feet long up a 22° angle, to a large rock where the chamber began to level off into a gallery up to 50 feet wide, with a collapse dome above. The dome had breached perhaps three yards above the limestone into brittle iron-rich strata that gave a bullseye pattern to the dome and supplied much orange-colored rubble to the floor. There were patches of gypsum (and/or epsomite?) crystals up to two inches long growing from and among these rocks, which were shattered and seamed by evaporite wedging to a degree I couldn't recall from elsewhere in Fort Stanton Cave. Everything seemed angular and unstable, but the slopes were not steep enough to pose an avalanche threat. Patches of dry flowstone and little stalagmites were scattered about.

We soon saw a startling feature on the face of a ledge on the southeast wall. There were several flows up to three or four feet wide, the longest about six and eight feet respectively, of a shiny, glassy substance from black to deep red in color, issuing from beneath a grit slope above. The coating seemed to be a fraction of an inch thick, and checkered on a scale of half an inch to an inch or more with intersecting white welts. The black and red material was semi-transparent to a depth of 1/8 inch or so, and fragments on the scree below showed conchoidal fracture. This display was unlike anything I remembered seeing in any cave in my 52-year caving career. Though slightly resembling "amberat" from pack-rat urine, the deposit is more than 400 feet below the surface, and this region of the cave is

Photo:

James Hunter descending from the climb above SRS286.

Photograph by Roger Harris.

Flows of glassy coating at Bleeding Rock Pass.

Photograph by Henry Schneiker.

without sign or smell of any kind of animals. My best guess, based on the apparent abundance of iron in the rocks of the dome, is that this is some amorphous iron-oxide-based substance. However, Roger Harris suspects that it is gilsonite (pyrobitumen), which, as far as I know, has never been recorded as a cave mineral. (Later in the expedition, he collected a sample for analysis.)

We quickly settled on the name "Bleeding Rock Pass" for the crossing of Mount Airy. Two more 45- and 34-foot shots got us across the high part, and we could see down the far breakdown slope to where bedrock borehole passage resumed going upstream. The Snowy River calcite channel reappeared at the bottom of the slope and vanished southwest, upstream, into dim distance between ten-foot-high mud banks. A 54-foot shot at -32° took us back down to the channel bed.

Several differences began to be apparent between this extension and the previous gallery on the downstream side of Mount Airy. The passage, though still large, was noticeably less high, averaging 20 by 20 feet rather than the 30-or-more-foot height we had been accustomed to. The walls were more drab, being thinly coated with grayish-tan mud; the patchy black manganese-paste coating, ubiquitous along the rest of Snowy River, was no longer to be seen, nor did the floor sediment banks show gravel and sand. And for the first thousand feet of survey, the Snowy River channel stayed more centered between the walls than usual, preventing establishing the survey station locations I preferred – tape flags affixed to ceilings or ledges. At three stations I used my upright pack as a temporary station for lack of better, permanent ones.

In this section, we also encountered a more troublesome practical problem. Before, in all but a very few short reaches of Snowy River, we had been used to the calcite channel being thick and hard enough to walk on without breaking. Here, the calcite was less than an inch thick – often half an inch or less – and strangely cracked, with slanted plates tilted and projecting two or three inches above the general surface in places, suggesting shifting or subsidence of the underlying sediment. We found our footsteps cracking calcite here and there. In some segments, it helped to walk on 30° slopes near the margins, where the calcite seemed more solid and the angle made the floor stronger. In others, there was no way to avoid breakage. The banks were uniformly too steep and high to use plastic bridges across the mud as we had done many times before to bypass previous problem sections. Someone suggested that we call this segment Eggshell Trail.

But after more than a thousand feet, the passage style gradually began to look more familiar. The channel began to meander more, and we had to crawl beneath undercut ceilings a few times, though nothing was unpleasantly low. The general ceiling level seemed to be slowly rising. Best of all, the floor was becoming stronger and less cracked. We mapped on, the passage somewhat sinuous but still trending generally southwest, to station SRS337 about 2,190 feet beyond our starting point. By then it was 4 a.m., and the team decided that we'd done enough. I had scouted about 100 feet ahead to set up the next shot, and could see another estimated 100 feet beyond; the corridor seemed to be monotonously continuing – if anything, larger and straighter than before – but we had to stop somewhere. We had not encountered any more breakdowns beyond Mount Airy. There seemed to be only a slight hint of airflow during our survey (but airflow was weak in the cave during the entire expedition).

Then we were faced by the nearly five-mile trip out, of which someone on the expedition estimated that about two miles were crawling. I had felt good, if not fast, on the way in, and during the exploration. Now I began to feel tired and strained, and had to rest more than I had during previous trips. Near SRS174 in the Underground Railroad, our team split; Brian and Paul went ahead, while Henry, Janice and I tried to nap for half an hour. That worked better for Henry than for me and Janice. We then followed the others. The three in my sub-group reached the surface about 6:15 p.m. April 26 – more than 32 hours after going in. (This, I believe, is my longest non-camping caving trip ever, a strange record to be setting at age 71.)

John Corcoran had plotted the data from Brian's book before I even reached the field house. The profile seems to explain some of the differences in Eggshell Trail. The elevation of the Snowy River channel makes a 10-foot jump from the downstream to upstream side of Mount Airy—much steeper than the almost imperceptible slope of the open channel. It seems that Mount Airy has acted as a partial dam. The collapse occurred when the mud-bearing stream, predating the

Mud island in Eggshell Trail.

Photograph by Henry Schneiker.

Snowy River in trench along Eggshell Trail.

Photograph by Henry Schneiker.

Snowy River calcite, was still active. Mud backed up possibly 20 feet above the bedrock floor level; only 10 feet of that were later trenched, accounting for the lower passage height upstream from the dam. Any gravel and sand have apparently been covered by the backed-up mud. Slower flow above the dam at the present time may also account, by reducing turbulence, for the thinner calcite floor in the affected zone.

If, as I have previously speculated, the manganese coating on Snowy River's walls resulted from backflooding of organic-rich water from the proto-Rio Bonito valley, the elevation jump across the Mount Airy dam may also explain its absence upstream: the outflow side of the dam may have been as high as backflooding extended.

Climbs and Crawls Off Snowy River South

While my team was mapping, the Broholm/Hunderman/Allison/Hunter/Harris climbing team was also working. They first looked at the lead above SRS241, and found they didn't even need technical gear to scramble up to it. Since they did have the gear, they postponed entering that easy lead, and went on to the higher lead above SRS286. They laid plastic sheeting to protect Snowy River from debris, and James Hunter bolted up the ledge that was the crux of the ascent. When he could see above the ledge, however, he saw that the flowstone stripe came from beneath a breakdown choke only a few yards into the lead. The team therefore made one shot up, cleaned the climb, and returned to SRS241. They changed clothing to dirty mode for this exploration.

Ascending a mud slope to the balcony, they found that it went, but was a substantially smaller passage than SRS, averaging about 10 to 15 feet wide and often less than walking height, with a floor of ancient, dried, crumbly mud. At first it went east, southeast and again east, away from Snowy River. However, after nine stations, it curved around and began to go north-northeast, parallel to SRS and about 35 feet higher. They passed through areas festooned with small inactive stalactites, and stalagmites and patches of velvet flowstone on the floor, much like a similarly decorated zone in the nearest segment of SRS. The direction began to converge toward SRS again, aiming suspiciously toward the other big ceiling lead at SRS218. At their 31st station, after mapping 1,576 feet, they considered their scheduled out-time, turned back in going but delicate passage, and left the cave. Their survey had confirmed the first significant side passage in SRS since Turtle Junction. They named this passage Pretty Dirty Things.

After the weakness of the floor calcite in SRS beyond Mount Airy was reported to John Corcoran, he decided to suspend further exploration of the main trunk while trying to devise mitigation methods. In the meantime, loose ends from previous trips continued to be worked on. On April 30, John Lyles, Roger Harris, Tim George and Dennis Worthington returned to inner SRS and mapped up into two of the massive breakdowns through which the original survey had passed at the stream level. The SRF survey, with six new stations, went up across a breakdown dome connecting between SRS281 and 275, the high point being more than 50 feet above the Snowy River channel. They called this the Slab Dome because thin bedrock layers had peeled off the ceiling and shattered into a checkerboard of slabs. This chamber is offset to the southeast of the main trend.

Farther in, starting from SRS298, the Lyles team set ten stations (SRE survey and a blind shot off SRS288) going up into another breakdown complex that is offset to the northwest of the section of SRS between 288 and 300. This reached nearly 100 feet above channel level. SRE's most notable feature was a horizontal orange-red iron-stained bedrock wall layer about four feet thick, which prompted the name Rust Belt Amphitheater. This is probably the same red band that rings the dome above Mount Airy nearby. Unfortunately, neither the Slab Dome nor Rust Belt Amphitheater were found to lead to any ongoing passages, though they added 879 feet to the Snowy River complex.

On May 2, Roger Harris, Ron Lipinski, and Tim George made the first climb into the upper lead at SRS218. This involved creative use of crampons and ice hammers to get up the steep muddy slope. At the top, a low, stalactite-decorated passage, floored with old mud and flowstone, led west and then southwest. They named this Fallen Arrows Corridor after some "carrot" stalactites that had long ago come loose and speared into the floor. After nine shots (495 feet) designated SRJ survey, the passage connected, as anticipated, to the

Eggshell Trail survey team: left to right, Paul Dunlap, Janice Tucker, Donald Davis, and Brian Kendrick.

Photograph by Henry Schneiker.

last station set two days earlier in Pretty Dirty Things. Only one caver traversed the connection shot because the decoration was so delicate. This trip established the first bedrock passage loop yet found along Snowy River South beyond the Mud Turtle connection.

Across the wide gap above SRS218, an extension of the Fallen Arrows Corridor appears to continue about two feet high by five feet wide in a northeasterly direction (the actual passage is much larger but is mostly filled with mud). Reaching that lead will involve traversing a mud-covered ledge that will require protection for both the cavers from the exposure, and for the Snowy River channel from dislodged mud; it was not attempted at this time. I consider this the best remaining side lead off SRS; aside from a small upper hole above SRS200, I know of no obvious openings farther north along SRS where another reconnection would be likely, so it is possible that the water that once followed Pretty Dirty Things/Fallen Arrows Corridor had a downstream destination somewhere other than Snowy River.

However, one other side lead goes somewhere. Also on May 2, John Lyles, Allen Wright, and Jennifer Foote checked a muddy belly-crawl, just above the Snowy River channel, that had been noted to head west off a bend at SRS157. After 15 feet this opened into 120 feet of walking passage that Jennifer reported "closely resembled Mud Turtle passage, with a sinuous mud flow on the floor and sticky mud-cracked slabs on the side." The ceiling height gradually dropped to four feet high, with the passage inclined -5°, to a wall. At the foot of this was a low dig. Using a folding shovel, they dug about 15 feet into a cross-chamber 12 feet wide and four feet high, going into another low dig ahead. John dug a few feet more and could see a chamber of unknown dimensions about five feet farther in. At this point they turned back with 137 feet of survey. This is an unpleasant lead, but is interesting because faint airflow was felt, and it is trending toward the breakdown- and mud-choked end of Lincoln Caverns about 1,000 feet away.

In addition to the exploration teams, a radiolocation team went into Snowy River South and attempted to signal from the Return to Snowy River breakdown room and the summit of Mount Airy, to pinpoint those locations on the overlying surface where Bob Buecher and crew had the receiver. The attempt succeeded at RtSR, but not at Mount Airy (apparently because of equipment failure). There is some offset between the radio and cave-plot locations of RtSR, but the details haven't yet been reported.

Extending Snowy River North

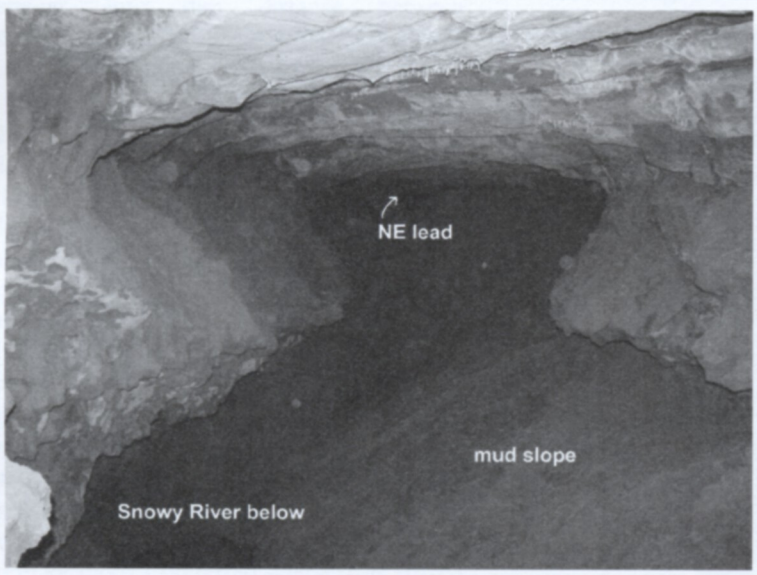
There was also exploration at the downstream end of Snowy River. The original survey had stopped in 2003 at SRN80, where the little Crystal Creek spring issued from under a ledge and meandered across a mud floor extending north into the distance. Further survey had been suspended pending microbiological approval of contact with the water. In the interim years, two floods had passed through Snowy River, and it had become obvious that the downstream section could not be microbially pristine. BLM permission was finally granted this year to go further. Henry Schneiker, myself, Knutt Peterson, Lewis Land, and Talon Newton proceeded to inner SRN on April 29.

I had never been much beyond SRN30 in Snowy River North, so this trip was interesting for me. The passage is rather simple up to SRN36, with the calcite-lined channel running along evenly. At that point there is a change, with large breakdown blocks beginning to appear, and deeper hollows in the floor, with bedrock apparent under the calcite. This is the section called Snowy Rapids. Residual pools of floodwater occupied some of the basins, requiring us to do some touchy hopping across, or walking around steep banks. The calcite gradually thinned and looked muddier, and fields of potholes on the floor testified to former energetic flow when the passage was still being dissolved. Many of these potholes held collections of small water-washed stones, beautifully polished and multicolored when bare, but often calcite-crusted, either in the upstream part of the pothole or throughout.

At SRN76 the original 2003 survey team had changed to dirty clothes and mapped up away from Snowy River through the Lincoln's Bathtub breakdown chamber. We had been asked to survey a tight bypass followed by the stream channel between SRN76 and 79, which had been labeled "too small" in the 2003 sketch. We had to squeeze through crooked but clean corroded slots, but it wasn't really too small, and we connected the lower segment of the loop with little difficulty. Near SRN79, out in large passage again, a seep issued from crevices at the bottom of the Lincoln's Bathtub breakdown slope and ran down a muddy floor about 70 feet to the little dropoff into the Crystal Creek basin, beneath which was the Crystal Creek spring proper.

When it was first seen in 2003, the upper seep was dry, and Crystal Creek flowed as a sinuous stream a foot or so wide on a mud floor 20 to 30 feet across. Now, the basin was a lake two or more feet deep and extending at least 100 feet into the distance. Henry had volunteered to wade into the 57° F. water, wearing shorts, to set another station as far back as feasible. He stepped in, and carefully made his way forward into virgin passage, occasionally having trouble balancing when he trod in particularly soft mud. He eventually passed under the 20-foot-wide natural arch near the far end of the visible passage.

We had known all along that this passage was heading toward the Bonito valley and the Government Spring resurgence only about ¼ mile away, so we didn't expect that it could continue passably much farther north. However, we had hoped that even if the present stream flow sumped under the wall, the large passage might turn east for at least some distance, and in the best-case scenario, have another side passage, like the Metro, come in



Unexplored continuation of Fallen Arrows Passage across Snowy River South above SRS218.

Photograph by Ron Lipinski.

from the south. That was geologically possible, and could in theory yield a major new extension heading parallel to the Metro but farther east.

Unfortunately, we got the worst-case scenario instead. The alcoves we could see faintly from the shore turned out not to hide any bend in the passage. At 115 feet from SRN80, the ceiling simply curved abruptly down below the water, and the open passage ended completely. The floor dropped a few feet into a sump, hidden by the muddied water, into whose muck Henry's tentatively probing feet sank as into quicksand. He set the terminal station SRN81 and came back to us. We now knew that cavers had actually been looking at the end of Snowy River North since 2003, but didn't know it yet. Unless the sump is divable, or some obscure lead has been overlooked, it seems that this part of the Snowy River story has been finished.

Decorated section of Pretty Dirty Things passage.

Photograph by Roger Harris.

Fixing the Metro Survey

Since it was originally surveyed in 2003, the Metro, a big dry phreatic passage going south from SRN13 and undulating up and down close to Snowy River, had seemed to have problems in the way it plotted on the map. The Metro Subway (RH survey), an underpass of the highest part of the Metro conduit, plotted 17 feet too high where it reconnected. Farther south, the Metro plot curved underneath Snowy River South, running west of it between SRS28 and 30, yet there was no evidence that Snowy River water leaked into the Metro during floods. This low point of the Metro plotted as the lowest place in the system – lower even than Government Spring. We would have expected this to put the Metro below the water table. A radiolocation survey in 2005 confirmed that the Metro actually did cross SRS, but around 50 feet farther south than the cave plot showed, and the end station of the Metro plotted almost 100 feet lower than the elevation indicated by the cave radio.

Dennis Worthington examines the rust-red bedrock layer in the Rust Belt Amphitheater.

Photograph by John Lyles.

We felt that we needed to resurvey the first 62 shots in the Metro to resolve these issues. On April 25, Ron Lipinski, Knutt Peterson, Linda Starr, and Sam Bono resurveyed the first 30 shots. The results raised the Metro 22 feet at 1SRN30, and reconciled most of the RH vertical closure discrepancy. On May 1, Ron Lipinski, myself and Ed Peyton returned to the Metro to continue to 1SRN62. Our results showed many vertical-angle conflicts suggesting that the 2003 team had mostly read the percent-grade rather than the degrees side of the inclinometer (apparently their backsight reader was making the same mistake).

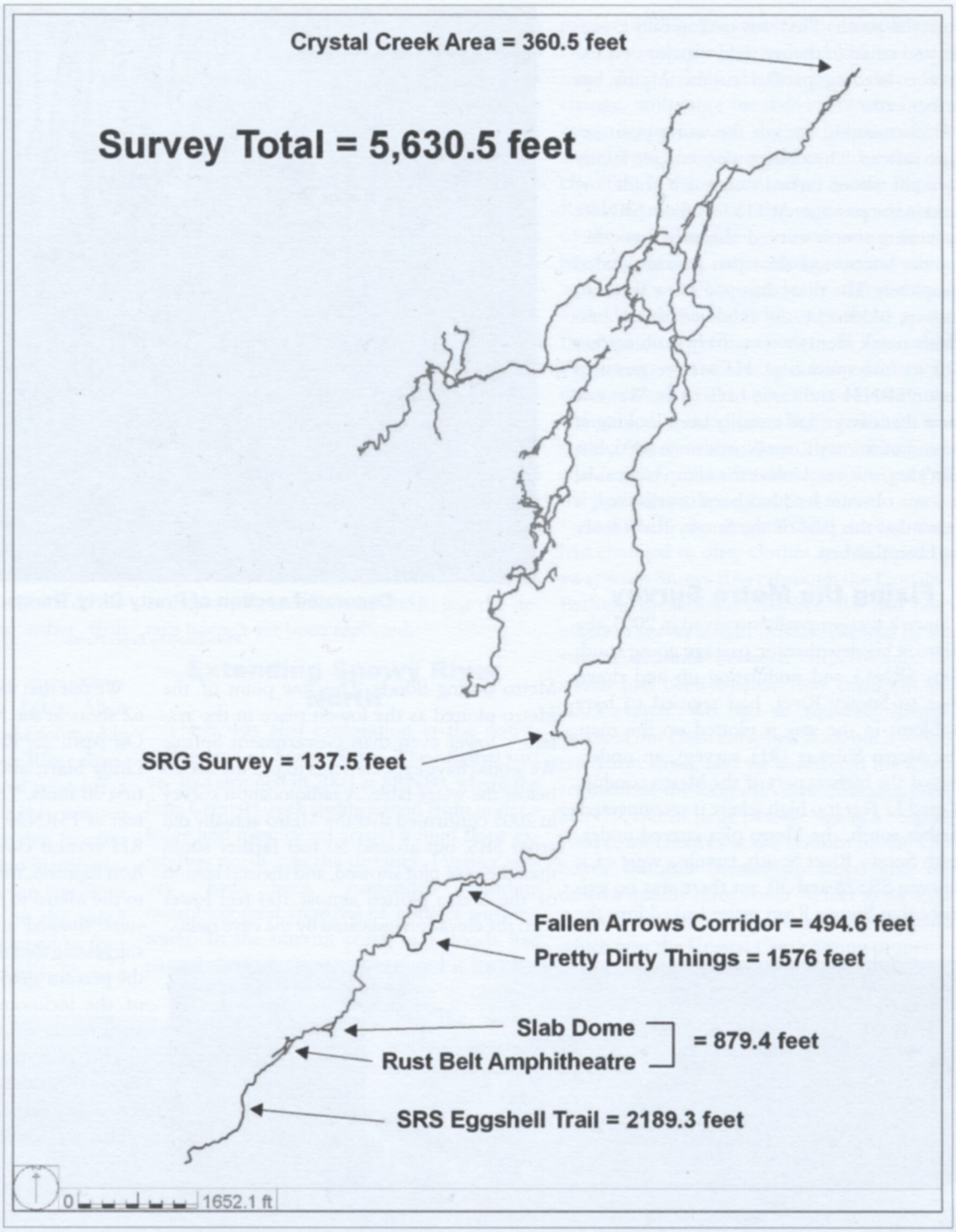
The plot from the completed resurvey shows the Metro at 1SRN62 as 83 feet higher than the original survey's elevation. The Metro still crosses Snowy River, but *over* it rather than under, with about 20 feet of bedrock separation. This makes much better sense. It explains the Metro low point having no Snowy River leakage and being above the water table. Also, siltstones in the Metro ceiling show much higher in the stratigraphy than before, which agrees better with their position elsewhere in the cave. And now the end of the Metro plots within about 15 feet of the radio elevation, which is reasonable for the surveyed length involved.

Drilling the Cave Sediment

Since the 1960s, we have wondered how deep the sediment fill in Fort Stanton Cave is, and whether there was anything but more mud under the surface. A few months ago,

Steve Peerman wrote a proposal to hand-drill test holes in the Main Corridor, and it was approved by BLM. Dr. Fred Luiszer's coring machine (developed for paleomagnetic sampling in Colorado's Cave of the Winds) and some simpler hand augers were brought into FSC for this project.

Two or more holes were drilled in the mud-floored channel in each of several locations between Russell's Crawl junction and Signature Rock. The Twenty Steps holes hit rock at about 20 feet, while the Signature Rock ones bottomed at only four feet. In all locations, hidden beds of sand and/or gravel were found interbedded with finer mud, marking changes in the energy of the water that carried the sediment. Some cobbles are up to three or more inches long, and include igneous rock from outside the cave. Water rose in the holes, reaching about two feet below the surface below Twenty Steps, but nearly to the surface below Signature Rock (little pools had recently appeared naturally in low pockets on the mud floor farther downstream near Skyscraper Junction). Fred obtained one directionally-oriented sample from the bottom of the sediment below Twenty Steps, which is to be tested for evidence of magnetic reversal to see whether the deepest material is older or younger than about 700,000 years.



Line Plot of Fort Stanton Cave, New Mexico – May 2009.

Map by John Corcoran.

The discovery of subsurface water in the Main Corridor sediments raises the interesting question of whether this is also the case in Snowy River. After flood flow stops, residual pools rapidly disappear from Snowy River except where the channel lies on bedrock. This suggests that the Snowy River sediment is relatively permeable, and may have long-lived or even permanent underflow, or at least hidden pockets of saturated sediment in basins. Thus, if wells were to be driven into the sediment along the Snowy River channel, drinking water sources might be established in far-southern SRS. With every extension of SRS, the more useful a base camp would be to keep going. I noticed a suitable-looking prospective campsite in a trough on the silt bank near SRS328-29, and if subsurface water could be accessed there, a major obstacle to camping for facilitating further exploration might be overcome.

The expedition got 1.2 miles of new survey, raising the total passage length to 14.4 miles. Snowy River proper is now about 4.5 miles long. There were other activities both in the cave and on the surface, including continued resistivity surveys to detect hidden passages. ■