

# Lechuguilla Cave Expedition Report

## Far West Expedition

May 25-June 1, 2013

### Summary

This report summarizes the results of a twelve-person expedition to the western branch of Lechuguilla Cave. The expedition was planned and led by Derek Bristol. All objectives were in the Far West portion of the cave with most of the focus on survey objectives in Oz, an area discovered in 2012. Some additional effort was spent surveying leads in the Zanzibar (H35) and Keel Hall (I35) quadrangles, and the Red Lakes area was also resurveyed. The results of the expedition included 10,851.1 feet of total survey; 10,185.3 feet of new survey and 665.8 feet of excluded survey. The expedition added 1.93 miles to the length of Lechuguilla Cave.

### Expedition Goals and Accomplishments

Each goal from the expedition proposal is in italics. A summary of the results follows.

#### PRIMARY GOALS:

1. *Survey horizontal leads in Oz (EKT87-88, EOZ40-46, EKT79-80, EKT89-102).* **Completed**

All of the horizontal leads listed were surveyed to completion. A few new leads were discovered but these are either considered too-delicate, too-tight, or are technical climbs. The leads going north from the EKT87 formation area yielded almost 2,000 feet of very well decorated passage. While a significant amount of survey was accomplished, there doesn't appear to be a significant amount of additional passage remaining in Oz.

2. *Climb and survey vertical leads in Oz (EOZ22, EKT104, EKT80, EKT76, EKT72B, EOZ11, EKT89, EKT99-100, EKT109).* **Partially Completed**

The climbing leads at Yellowstone Falls (EOZ22), the end of the EKT borehole (EKT104), and the northeast end of Munchkinland (EKT80) were ascended and most of the passage at the top of these climbs was surveyed to completion. The only remaining lead is a short technical climb at OF31. Time ran out before completing the other climbs. The short climb at EKT72B was scouted and appears to be just an alcove. The leads at EKT76, EKT89, EKT99, and EKT100 are all good leads that will be a priority on a future expedition. The lead at EKT109 has low potential and will be pursued in the future as time allows.

3. *Rig, descend, and survey pits in Oz (EOZ22, EOZ7, EOZ11).* **Completed**

The Yellowstone Falls pit (EOZ22) was descended and led to a vertical fissure complex. This pit was visited by four teams and by the end of the expedition all of the passages below were surveyed to completion. The pit below EOZ7 was descended and found to end quickly in a breakdown choke. The Wizards Elevator pit at EOZ11 led to a series of pits and a very deep and wide fissure that looked like a steeper version of the Great White Way. This appeared to have excellent potential and was expected to connect to known passage below, but after descending almost 500 feet it ended abruptly. There are a few low potential technical climbing leads remaining in this pit complex.

4. *Resurvey and sketch Red Lakes (IG, IGA, IGB, and IGC surveys), and survey any remaining leads (IG3, IGC7, IGA1).* **Completed**

This was done in one very productive day of survey. Rather than relocate old survey stations, the decision was made to simply resurvey the entire area. Everything beyond station IG4 required clean gear and it was possible to travel the entire area without crossing pools. A few leads still remain including a technical climb and a too-tight constriction that opens back up to walking size with airflow at the southern edge of the cave. This lead will require a hammer and chisel to open, but the high potential of this lead may be worth the impact.

5. *Survey the last few leads in Birthday Present and Northern Exposure (IBJ19, IBDJ12D, IBDJ6, IBDA3-13, IBHA5, IBD7). Partially Completed*

A team of small cavers visited this area and surveyed the IBJ19 lead to completion, verified that there was no lead at IBDJ6, and found that a technical climb with 1-2 bolts would be necessary to access the lead at IBDJ12D. The other leads, all in Northern Exposure, were not explored due to a lack of time.

6. *Survey leads in breakdown under Long Haul and Keel Hall (IBB7-35, IBA12N, IBN10-51, IBP4-42, IBEA2, IBE9). Partially Completed*

The leads in lower level passage north of Keel Hall at IBEA2 and IBE9 were surveyed to completion. A few of the leads on the south side of Keel Hall in the IBN survey were investigated but were found to not be leads and have been removed from the lead list. Many leads still remain in the breakdown and boneyard areas under Long Haul and Keel Hall.

7. *Survey remaining leads above and below Mirage Room (IFF7, IN4, IH4, IH10, IM2-14). Partially Completed*

This area was visited and the IFF7 lead was surveyed to completion, and all the leads to the east (uphill) side of the steep fissure in the IM survey were completed. Leads on the west side of the fissure will require a belay and likely connect back to the top of the Mirage Room.

8. *Survey leads in and around Sanctuary (EMH7-29, EMGF10-14, EMG36-48, EMGH27-43). Partially Completed*

The good climbing lead at EMGH27 was investigated and found to end immediately. A few other leads in the EMH and EMHU surveys below Sanctuary were surveyed, but many leads still remain.

9. *Survey leads in Wild Wild West (EYWC, EYWD, EYWE, EYWH, EYWI). Not Completed*

This area was not visited. Since there were a number of lead climbers on the expedition, the decision was made to spend a day scouting the many climbs in Motherlode. Due to the logistics of route finding and clean gear requirements, the trip to Motherlode was kept separate from the survey objectives in Wild Wild West.

#### SECONDARY GOALS:

1. *Survey remaining leads in Kansas Twister (EKT26, EKT17, EKT56-62). Partially Completed*

Many teams passed through Kansas Twister during the week, but very little focus was placed on the leads remaining here. A large lead at the very top of the rigging in the dome, at

EKT57, was surveyed when a series of CR tubes closed a loop from Munchkinland back to the top of Kansas Twister.

2. *Climb and survey vertical leads in Long Haul and Keel Hall (IBA6A, IBA4, IBNI, IO14). **Not Completed***

Climbing leads in Oz kept teams busy for the entire week so the climbs in Long Haul and Keel Hall were not visited.

#### OTHER ACCOMPLISHMENTS:

A few other project activities took place during the week in the areas of study.

1. A number of rigging improvements were made in Kansas Twister. These are detailed in the “Rigging” section of this report.
2. A trip was taken to Motherlode to scout several climbs in the main room. These climbs are documented in the “Climbing” section of this report.
3. Samples of ferro-manganese deposits (FMDs) were collected from several areas in Oz for Dr. Diana Northup.

#### Team

Team members included Derek Bristol (CO, expedition leader, sketcher, climber), James Hunter (NM, sketcher, climber), Stan Allison (NM, sketcher, climber), John Lyles (NM), Abby Tobin (VA, sketcher), Shawn Thomas (NM, sketcher), Adam Weaver (SD), Pete Johnson (CO), Dan Austin (SD, sketcher), Rene Ohms (SD), Jason Ballensky (CA), and Andy Armstrong (UT, sketcher). Eleven of the team members had previous experience in Lechuguilla Cave, though it was the first camping expedition for Dan and Jason, and the first trip for Pete. All of the newer cavers were careful, caved safely, worked hard at accomplishing expedition goals, and exhibited a commitment to teamwork. Dan, Jason and Pete would all be strong contributors to future expeditions. The team worked extremely well together, which is exhibited in the over two miles of high quality survey that was accomplished. This is likely the highest survey total in the post-LEARN era of privately led expeditions.

#### Detailed Daily Reports (trip leaders are underlined)

##### 5-25-2013 (Entering the Cave)

Stan, James, Jason and Adam rigged the entrance and entered the cave at 15:15. Previous trips had reported problems with removing the key from the lock core. As per Joe Davis (Maintenance lock expert) contact cleaner was sprayed in the core and then a slight amount of graphite was placed on the key. The key is now easy to remove and the lock mechanism is working very well. The team arrived in camp at 17:00 (1:45 travel time). A team member slipped in the Deep Secrets area on the flowstone and put a gash in his shin. This area is very slick and requires careful movement to negotiate safely. The team dropped off camp packs at Deep Seas and continued on to the Western Borehole to work on improving the anchor for the Roofus Climb at EY39 (completed by Krejca and Loftin in 2007). A bomber natural anchor was located above the climb and the main rope was threaded around this allowing removal of a single removable bolt (RB) and two tri-cams. The rope is now permanently rigged and safe to climb. Both tri-cams were

extremely corroded with a white pasty substance. The RB, which is mainly made of stainless steel, was still in excellent condition.

Shawn, Abby, Dan and Rene entered the cave at 16:20 and made it to camp by 18:40 (2:20 travel time) without incident.

Derek, John, Andy and Pete entered the cave at 17:00 and made it to camp by 19:00 (2:00 travel time) without incident. Trips were made to the water source and camp was organized. A protocol was developed to help get the first Oz teams out of camp as early as possible each day. This generally allowed all teams to leave camp within about two hours of getting up each morning. All team members were in bed by 23:00.

***5-26-2013 (Oz – Hall of the Flying Monkeys, Oz - Yellowstone Falls, Red Lakes)***

John, James and Adam left for Oz at 7:30. Whistles were brought out to the Kansas Twister dome to use in communicating whether teams were still on rope. The system employed two whistles with each team carrying one. A single blast indicated that a team was getting on rope, or was still on rope, while two blasts signaled when a team was off rope.

Additionally, a log was used at the top and bottom of the roped section to record the times when teams started and ended their climbs. It was found that it takes about 90 minutes for teams to ascend Kansas Twister and about 60 minutes to descend. The whistles were used with mixed success. In most cases proper spacing of teams using timed delays was sufficient to avoid conflicts, and in a few cases the whistles helped, but there was at least one occasion where a team arrived at the top of Kansas Twister before the prior team had finished descending and the whistle blasts of the first team could not be heard. After reaching Oz the team proceeded to the formation lead at EKT87. The trail and changing areas were flagged where shoes must be changed into aqua socks and clothing changed (or cleaned off). Packs should also be covered or changed when visiting this area. The area is very well decorated with soda straws, columns, pool formations and flowstone. The



*James Hunter*

*Long soda straw in Hall of the Flying Monkeys*

passage floor quickly degraded to silt and calcite crusts, and dirty gear was again deployed. At a bend to the left (north), a parallel passage came in from the northwest. This side passage connected to a parallel passage being surveyed by the other team. Station OZ6 was set and used to tie these two passages together. This was coined the “golden spike” station (as with the first

railroad lines crossing the country). One surveyor came from their side in clean gear, and another surveyor in dirty gear, to pass instruments across the clean to dirty transition for the tie shot. The crossover passage, which looks like the upper leg of a triangle on the line-plot, was called Ozatorium. The main passage got dirtier as it gained elevation up a gradual slope and encompassed a rich flowstone cascade on one side. Some small crawl leads near the ceiling were terminal due to chokes or soda straw blockages. A turn to the right led into some dry and wet pool basins with golden flowstone and pool formations. Some dry pool basins had thin shelf-stone edges. No pool fingers were seen. All potential passage was choked beyond station OZ14. Much effort went into changing from dirty back to clean while crawling and stooping through this area across flowstone. With no other leads in the area, the team went to Munchkinland to survey a crawl lead near EKT79. It quickly ended in a low rock flour and gypsum crawl at OZ17. The team started down Kansas Twister at 20:30, and arrived at camp by 22:00. A total of 1011.3 feet of new survey was accomplished.

Shawn, Abby and Andy, along with Derek and Pete, left for Oz at 9:00. At the first rebelay on the natural bridge a rope pad was rigged to the anchor. This rope pad protects most of the natural bridge where the rope makes contact, but there is a short section above the rope pad that is still not protected, and this caused damage to the rope later in the week.

A longer rope pad is needed in the future. A 160 foot x 11 mm static rope that was brought into the cave the previous week was used to replace the older 150 foot rope rigged between EKT48 and EKT9. Accessory cord was also brought and used to properly rig two rope pads to this same rope (just below the anchor at EKT48).

The old 150 foot rope appeared to be in good condition and was

staged in Oz during the week and eventually brought back and left at the Deep Seas camp. The two teams divided at the north end of Munchkinland, and the survey team continued on to the formation area at EKT87. The OA survey designation was started and the team surveyed west, out of the open formation area and up a short, steep flowstone slope to where the passage trend of the lead was defined by walls on both sides. The north wall of the passage was very heavily decorated with abundant soda straws, stalactites, helictites and flowstone. The south wall was a tall slope mostly covered in sediment but occasionally interrupted with stalagmites. The ceiling juncture of this wall contained a high lead near EKT87, but it was difficult to see into this passage. In the lower level passage some small pools were encountered that were easily avoided by traversing around on flowstone slopes. After less than 200 feet, station OA4 was set at a junction with a passage heading north. This was later tied into the passage being surveyed by the other team at OZ6. Survey continued along the main passage trend, which bent south but



*Adam in Hall of the Flying Monkeys*

continued mostly west. A high, dirty lead was noted that would require climbing/scrambling up a wall in dirty mode (this was surveyed on 5-31-13). Opposite this lead, another high lead was visible above a drapery-covered lip fed by a low, wide flowstone-floored passage. Near the base of these leads were areas of purple velvet flowstone. Beyond these leads travel continued on flowstone, and there were more small pools, draperies, and soda straws. The passage soon constricted and became increasingly delicate. The final station, OA8, is in a crawlway where continuing would require crossing a small pool into a passage with corrosion residue (CR) beyond. In the interest of conservation, it is recommended that this lead not be pursued in the future. The main passage was named "Hall of the Flying Monkeys". The north trending passage at OA4 was also extremely well-decorated and contains the largest pool discovered during the survey, which measured up to 20 feet across at its widest point. The pool was bypassed by traversing a flowstone slope and using stalagmites as handholds. Just after this pool, there was red CR exposed in the ceiling of a shallow dome, which potentially contains horizontal leads around its perimeter. However, due to the risk of impacting the pools and flowstone below, as well as the poor potential of this dome (passage heading south would immediately connect to the high drapery lead near the OA4 junction), pursuing this dome as a climbing objective is not recommended. The next survey shot was done through cooperation between the two survey teams to tie into station OZ6. With the area fully surveyed, the team decided to travel to the lead at EOZ46, and after a couple of awkward shots intersected a junction with really nice walking passage heading northeast. Two ceiling fissure leads were noted that ascended into CR tubes. The easiest route to access these leads (which probably connect) is through the southern fissure against the east wall; however, this spot is lined with frostwork which would be impacted by climbing into the fissure. The northern fissure is frostwork-free but looks more exposed and difficult to access. Both of these appear to be mediocre leads, though they should probably be checked eventually. Beyond these fissures, the passage continued northeast as a wide, sediment-floored tube that was quite comfortable.

Unfortunately, the passage suddenly ended after only a couple of shots, with only a too-tight crawl leading further on. The area was named "The Shocker" due to surprise when it ended so abruptly. At the junction just after

EOZ46, a single dead-end shot was all that was needed to finish the passage that headed southwest from that point. The survey was ended and the team traveled to Yellowstone Falls to re-join with the climbing team. All five cavers traveled back to camp together, arriving by midnight. A total of 826.7 feet of new survey was accomplished.

Derek and Pete traveled to Oz with the second survey team and headed to Yellowstone Falls. The first objective was to climb into the large void above the dome-pit. After evaluating several poor



*John with lily pads in Hall of the Flying Monkeys*

natural anchor possibilities it was decided that the safest way to rig an anchor at the edge of Yellowstone Falls for both climbing and descent was to place a two bolt anchor. A pair of Fixe bolts (3-3/4 inches and 3 inches) were placed on the west side of the passage near the edge of the pit and used to belay the climb. Derek led the single pitch climb with only cams and slings and without the need for direct aid. A static 200 foot rope was rigged to a large breakdown block and the team climbed a breakdown slope into the room above. The upper end of this room was covered in flowstone and requires clean shoes to traverse. A large opening into a decorated room above the flowstone slope was observed, but reaching this room would require either a rope toss or direct aid up a steeply overhanging wall. It was decided to descend back to the belay anchor to retrieve survey gear and aqua socks. However, once the team returned to the bolt anchor, the decision was made to first descend the pit at Yellowstone Falls to determine rigging and rope requirements since they had technical climbing gear and the bolt kit. Pete descended this pit, which reached a small room about 60 feet below and continued down another 20 foot fissure along the west side of the room. A short traverse of the canyon at the bottom of this pit complex led to another pit that would require additional rope. The rope into the Yellowstone Falls pit goes over a rounded breakdown block and another rounded edge, so no rope pad or rebelay bolt was used. Later in the week there was obvious damage to the sheath of the rope due to these rub points and a rebelay bolt may be needed if the area is visited in the future. The survey started back at the bolt anchor using EOZ22 as a tie-in and a new designation (OB) was begun. Since the first station into the room above Yellowstone Falls was OB1, the room was named "Kenobi". The far end of the room was blocked by flowstone cemented breakdown. A small side passage was observed going south, away from the main trend of the room. A good sized parallel passage was found on the other side of this crawl with leads going east and west. The survey was taken to the west in walking passage. A high climb was briefly scouted going south at OB9, but would require aqua socks and lead climbing gear to ascend. The survey was ended at OB15 with leads passed at OB11 and 12. The team returned to Yellowstone Falls where the other team had just arrived and they all returned to camp together. A total of 550.9 feet of new survey was accomplished.

Stan, Dan, Rene and Jason left camp at 8:30 and traveled to the Red Lakes area just east of Oasis. This area had been surveyed in the 90's but there were issues with the data, and the sketch notes were either never done, or not drawn to scale.

The decision was made to fully resurvey the area rather than try to relocate original stations with questionable data. Most of the area is flowstone and pools so the team spent much of the day in aqua socks. The old IG, IGA, IGB, IGC, IGD, and IGE surveys were replaced with IG1-31. The



*Stan in Red Lakes*

IGA-IGE surveys were done by Swiss cavers Phillippe Rouiller and Pierre Yves Jeannin and did not include sketches. The old IGAA survey had good detail and it should be able to tie this into the new survey at IG6 (equal to the old IG5).

There were some mud tracks from previous explorers throughout the IG and so it was necessary to be careful and check aqua socks regularly to prevent further spread. It is not necessary to cross Red Lake to access the entire survey area. In general the area is a steeply sloping flowstone floored fissure. The passage alignment is roughly north/south and the fissure slopes down to the west. Between IG11 and IG12 is a flowstone climb that is easy but exposed. From IG14-15 is a short but tricky climb with exposure. This climb should be rigged with 20 feet of webbing around a natural anchor at IG15 for a hand-line in the future. There was a nice pool between IG18-19 that the original survey did not include in sketches. Jason and Stan managed to traverse around the pool using draperies for handholds and lily pads for footholds. The draperies are delicate and the footholds require a long-legged stem. It would be quite easy to fall into the pool on this traverse so great care must be taken. Up a slope past the final station at IG19 is a too tight hole that immediately opens into a large walking sized area. Airflow was felt exhaling at IG19 and even better at the tight hole. Enlarging this constriction would require a 2-3 pound sledge hammer and a chisel and would impact some calcite formations. It would take an estimated 30 minutes of work to enlarge the constriction enough to pass. Due to the location of the constriction on the edge of the cave, the airflow, and the immediacy of larger passage, this is a good candidate for enlargement. Several interesting leads were left in the area. Particularly interesting is the lead at IG26 that would require a tennis ball/cord toss over a bedrock column in a narrow fissure. There is also a frostwork lined climb going up at IG3 in Huapache Highway, and a scooped lead going into break-yard at IG31. The team traveled back to camp, arriving by 19:30. A total of 748.9 feet of survey, including 576.5 feet of replacement and 172.4 feet of new survey was accomplished.

***5-27-2013 (Oz – Yellowstone Falls, Oz – Side Leads, Oz – Munchkinland, Birthday Present)***

Stan, Pete and Jason left camp at 8:15 and traveled to Yellowstone Falls in Oz. They climbed the fixed rope and surveyed the east trending lead at OB6 to a termination with no additional leads. A

50 cc sample of rock flour and ferro-manganese deposits was collected from the floor at OB23 as part of Dr. Diana Northup's permitted research. The climbing lead at OB9 was scouted in aqua socks, but a clay bank and exposure prevented reaching the top. The leads at OB11 and



*James Hunter*

*“The Wizard” in the Munchkinland Borehole*



12 were surveyed to another termination. With this area complete, other than the climbing leads at OB3 and OB9, the team surveyed down the pit at Yellowstone Falls. The rope was first pulled up and some loose gypsum blocks were removed to make the drop safer. At OB42 an 85 foot deep pit that required 100 feet of rope was rigged using a large natural anchor perfectly positioned at the top of the drop. At the bottom the survey went to the west to a dead-end with gypsum rims lining too tight holes in the floor. Green minerals were observed in the gypsum similar to that found in Emerald City. Several going leads were left and the team returned to camp by 22:30. A total of 953.0 feet of new survey was completed.

Shawn, Derek and Andy departed camp at 10:00 and traveled with the climbing team (James and Dan) to Oz. The teams split up near the end of the EKT trunk passage, but worked on objectives that were only minutes apart. A steep corrosion residue (CR) lined tube was surveyed using EKT102 for a tie-in. This led to a few stations going both east and west to terminations. The climb up this lead was steep and slick and a hand-line would have been useful. The constriction to the west at OZ25 could be opened up with a hammer by removing a few bedrock projections. The passage beyond this point continues small for what could be seen, but the potential is low and no airflow was detected. A tight lead goes up to the south between OZ19 and OZ26. This lead requires squeezing up through a pinch into a tiny room covered in white flowstone and formations. None of the team was able to fit through this squeeze but most of the perimeter of the room beyond could be seen but no leads were visible. A smaller caver could fit; however, entering this room from the CR tube would cause substantial impact. Meanwhile, the climbing team had successfully ascended to the lead at EKT104 and left it rigged for survey. The survey was begun into a crawl with thick rock flour covering the floor.

This passage ended after only a few



*Lily pads in Oz*

stations with no remaining leads. With all leads surveyed it was decided to rig a pull-down in order to retrieve the rope. An upper level lead at EKT97 was surveyed until a steep rock flour slope over flowstone was encountered. It was determined that this could not be crossed without causing substantial impact so the survey was ended. It was later discovered that the far side of this slope can be reached by climbing up at EKT93. The passage between EKT97 and 93 is a steeply angled fissure and it's possible that there may be additional passage far up into this fissure, but technical climbing will likely be required. A lead along the south wall, opposite EKT87 at the formation area, had been observed earlier in the day. A somewhat exposed and loose free-climb was made to reach the good looking passage above. Unfortunately this ended just around the first corner. This was surveyed in two shots using EKT87 as a tie-in. The team then traveled back to Munchkinland where the climbing team had started the OF survey designation above the

climbing lead at EKT79. A 50 foot pit below OF5 was rigged with the static rope pulled from the EKT104 climb and a single shot was used to survey across the pit to a large terminal alcove on the far side. A good looking lead was observed high above OF5 to the NW, but would require technical climbing to reach. This lead would be surveyed from a bypass that was discovered later in the week. The area at the base of the pit was scouted in the hope that a horizontal bypass back to Munchkinland would allow de-rigging of the pit, but this was found to end in a too-tight breakdown choke. The survey ended before finishing the passages at the base of the pit due to time. A total of 730.7 feet of new survey was accomplished.

James and Dan traveled to the end of the EKT borehole and James led the technical climb above EKT104. What had appeared to be passage near the ceiling level was found to be an alcove, but a crawl headed east from a middle level. A static rope was rigged off of a ceiling bollard for use by the survey team. The team then traveled to the excellent climbing lead above the northeast end of Munchkinland at EKT79. A

previously unnoticed series of ledges from the west side of the cliff face allowed a traverse to the top of the climb. The OF survey was begun and followed to a cemented breakdown choke at OF11 with going passage on the other side. The teams reunited and traveled back to camp together, arriving at midnight. A total of 753.4 feet of new survey was accomplished.

John, Abby, Rene and Adam left camp at 10:30 and traveled through the Western Borehole and out to Birthday Present via Northern Exposure. Two leads were checked in Birthday

Present. No lead was found north of IBDJ6 (as was indicated in survey notes from Barber on 11-13-2003). The IBDJ12D climb was checked by climbing up behind a flake and across a dome could be seen an open passage that was at least stoop sized with blocks preventing further views. The traverse would need 1-2 bolts to approach from above IBDJ12D with ~30 feet of exposure. Down a few feet near IBDJ12C, there is a hole out to the exposed face of the climb but this requires crawling down feet first with exposure. This might lead to an alternate route that may have a ledge. The lead should be revisited by a climbing team. At IBJ1 an undocumented 2004 lead flag was discovered and surveyed under the wall into IBJ46-47 where it ended. The team traveled down the IBJ survey, through a very tight constriction at IBJ17 that requires crawling on one's side and passing an abrupt turn where leg length is a disadvantage. Tight passages were surveyed with a tie-in at IBJ18. This led up into a darker breakdown chamber with CR. Several routes were pushed through layers of pancake passage, but nothing went far. A final fissure was climbed across and found to complete a loop back to IBJ30. While this area is plotted under the northeast corner of the Keel Hall and is airy, it is separated by a large vertical breakdown component and is not connected by a caver-sized route. The team returned to camp arriving by 19:45. A total of 274.9 feet of survey was completed, 6.5 feet of this was redundant and 268.4 feet was new.



*Snake-dancer helictites in Oz*

**5-28-2013 (Oz – Munchkinland, Oz – Wizards Elevator, Motherlode)**

Jason, Abby, Rene and Adam left camp at 9:30 and traveled to the EKT borehole in Oz. At the northeast end of the Munchkinland borehole, at station EKT80, two leads were surveyed north and ended within 100 feet. The lower of these passages became too tight and the upper lead ended in a dig. A third passage was observed above OZ48, but a technical traverse is required to access it, so this was left for a climbing team. The team traveled to EOZ40 and surveyed the west trending lead across pits that drop back down to the main EOZ survey. This lead ended in two small passages that both became too tight. A lead at EOZ44 was surveyed and a loop back to EKT42 was closed with no other continuing passage. The team then traveled to EKT97 and surveyed a low breakdown area to the north that connected back to EKT94 with no other leads left in the area. This passage has some fragile flowstone formations. The team returned to camp by 21:00. A total of 617.0 feet of survey was accomplished; 35.9 feet of this was redundant and 581.1 feet was new.

Stan, Pete and John left camp at 11:00. Dan was not feeling well from a common cold that many team members were suffering from and wisely opted to remain in camp for the day, which allowed him to recover somewhat. The team traveled to the OF5 pit at the NE end of Munchkinland where approximately 200 feet of passage at the bottom of the pit was surveyed. The pit had well developed siltsicles that were difficult to avoid. At the bottom of the pit were nice aragonite bushes and extremely deep rock flour. The passage became too tight at OF17 with airflow blowing out. The rope at OF5



*Rene in Red Lakes*

was de-rigged for use in the Wizard's Elevator. The OF5 pit is approximately 50 feet deep and requires a 75 foot rope for rigging to a natural anchor. The team traveled to the Wizards Elevator at EOZ11, crossing an exposed traverse at EOZ7. A natural anchor was rigged at EOZ11 using 100 feet of 9 mm Cancord, 25 feet of webbing, and a stainless maillon. The rope barely reached the bottom where a dead-end passage across another pit was surveyed. There are large gypsum rims that are about three feet in diameter in this area. Another natural anchor was rigged at OC1 that requires 60 feet of rope, 15 feet of webbing and a stainless maillon. At the bottom of this pit another dead-end passage was surveyed going east to some gypsum flowers. Yet another deep pit at OC11 drops down a fissure that requires additional rigging and rope. The team returned to camp arriving by 23:50. A total of 711.3 feet of new survey was accomplished.

Andy, Derek, James and Shawn left camp at 11:00 and traveled to Motherlode by the traditional South Winds route. The new rebelay on the rope below Southern Cross needs some work that is detailed in the rigging section. All other ropes to Motherlode were in good shape and the trail is well flagged. Several climbs in Motherlode were scouted using a Disto and bright headlamps.

Many photos were taken to be used in planning the logistics of these climbs. There remains some possibility of continuing passage at the very top of the Motherlode room, but climbing or a remote camera will be needed to be certain. Details of the climb can be found in the climbing section of this report. Travel back to camp was uneventful and the team arrived at 19:00.

***5-29-2013 (Oz – Yellowstone Falls, Oz – Wizards Elevator, Oz – Tatoonine, Keel Hall)***

Jason, Stan and Adam departed camp at 9:15 and traveled to Yellowstone Falls in Oz. A pit traverse was explored and surveyed by rappelling about 10 feet down the pit and then climbing the other side. Beyond the traverse was a tight squeeze leading to a 30 foot down-climb. At the bottom of the down-climb was an up-climb. The up-climb went up about 20 feet and beyond is a 10 foot traverse to another 12 foot pit. The bottom of this final pit ends in a too-tight constriction. A CR coated climb above OB39 was surveyed above the main passage. At the top of the climb

was a tight passage leading to a small room where the survey was ended with passage continuing. A rope was rigging in a pit that led out of this area and provided an easier way to return. While de-rigging the rope at station OB41, the rope was accidentally dropped down the pit and retrieving it would require another rope so this was left for the following day. The team in the Wizard's Elevator could be heard hammering while placing bolts in the afternoon and significant



*Derek Bristol*

*Andy ascending into Tatoonine*

rock-fall was heard in the afternoon. Apparently the Yellowstone Falls Fissure and the Wizard's Elevator fissure are connected but the route is not humanly traversable. This can be seen when looking at the line-plot in profile view. The team returned to camp by 22:40. A total of 617.2 feet of new survey was accomplished.

James, John and Pete left camp at 10:45 with the goal of continuing to rig and survey the Wizard's Elevator. At the third pit in the Wizard's Elevator, below OC11, a 145 foot x 11mm rope was rigged directly around a rock in the passage above the pit with a secondary anchor of a single stainless 3-3/4 in Fixe double wedge bolt placed by hand at the pitch head. The bolt backs up the natural anchor and allows the rope to run more cleanly down the pit. The pit quickly widens to a steep-angled elongated rift with a ledge series and side passages about 30 feet below the anchor. A second 3-3/4 in Fixe double wedge was placed here to avoid rope rub on the ceiling above and also to provide a better hang for the rope below. Two side leads were surveyed at this level. The passage to the east ended in just a few stations. The lead to the west proceeded approximately 75 feet and ended in a breakdown choke with a climbing lead above OC18. Back in the main rift the same 145 foot rope rigged at OC11 was used to continue down the slope until the drop became vertical again. A narrowing of the rift was encountered near the end of the rope,

where the pit continued deeper. A third Fixe double wedge bolt was placed as a rebelay to avoid rub points and allow rigging of another rope. A vertical Disto measurement from this final bolt read 140 feet. A 200 foot rope brought from camp was rigged to this bolt and backed up to the 145 foot rope. A possible horizontal lead went east from this bolt along the fissure but will require technical climbing to explore. The team returned to camp by 23:40. A total of 268.8 feet of new survey was completed.

Derek and Andy left camp with the Wizards Elevator survey team, and once in Oz continued on to Yellowstone Falls where the fixed rope was climbed up into Kenobi. At the flowstone slope the team changed into clean clothes and aqua socks. A stalagmite had been observed just above the drapery covered lip of the overhanging wall about 20 feet above. Initially a throw bag with a rock and 3 mm cord was tossed to the slope above and the stalagmite was easily lassoed. Unfortunately there was too much friction around the base of the stalagmite to allow the throw bag to descend down the other side. A full 20oz water bottle was then attached to the cord and this was tossed over the stalagmite. By flipping the cord it was possible to get the bottle to



*Andy sketching in Tatoonie*

ascended very carefully following a shoe change to avoid knocking clay onto the flowstone below. The top of the room had no continuing passage, but alcoves to the east and west were surveyed to completion. A natural anchor at the top of the room was used to rig a pull-down rappel for better safety and to prevent impact from down-climbing the sediment bank at the top of the climb. A 4 mm cord was left on the natural anchor to allow the rope to pull more easily.

descend far enough to eventually snag it with a loop of webbing. An 11 mm static rope was attached to the cord and pulled back over the stalagmite and rigged to a natural anchor. Great care had to be used to cross the lip of the climb without damaging the many draperies or dislodging the rope. The flowstone slope above the lip was easily climbed and the static rope was re-rigged to a pair of large stalagmites at the top of the slope. The room is extremely well decorated with many columns, draperies, small pools, and a number of snake-dancer helictites. Two small leads remain. One would require a 30 foot technical climb to a small hole in the ceiling, and the other requires crossing a CR lined pool. Both leads are too delicate to access and continuing passage is not certain. The rope was left rigged and the rope was cut to length (approximately 50 feet). The team then traveled to the flowstone climbing lead at OB8. This was climbed in aqua socks with a belay using only natural anchors. The top of the flowstone slope was blocked by a sediment wall that was

During the rappel, where the rope went over the edge of the sediment bank, a large amount of clay was dislodged and this fell onto the flowstone below. Additional sediment was dislodged while pulling the rope. The descent was made safely, but some sediment remains on the flowstone in the upper half of the west side of the room. This was very unfortunate and restoration should be considered on a future expedition. The sediment and flowstone are mostly dry and the area may be effectively restored using a small whisk broom. The team met back up with the Wizards Elevator survey team and all five returned to camp together. A total of 361.8 feet of new survey was accomplished.

Shawn, Abby, Rene and Dan left camp at 11:15 and traveled to Keel Hall. The team followed the IBF survey to lower level passages below the north side of Keel Hall. A lead at IBE9 quickly became tight, twisty, sharp, and nasty. This ended after just a few stations with only grim hammer leads remaining. A couple of other dead-end or too-tight leads were surveyed in the IBE9 area. A lead at IBEA2 was located and quickly became too tight and the survey ended after two shots. The team traveled to the IBN survey break-yard on the south side of Keel Hall to check on the many leads indicated in that area. While scouting some of the closest leads indicated on the map, it was discovered that many were not actually leads at all, and these were documented without conducting any survey. The three following leads were eliminated: IBN59 (dome directly above station) – the ceiling is approximately 10 feet above the station and the “lead” is simply the top of the breakdown block that rests next to the station; IBN59 (~20 feet to the southeast) – this crawl accesses a hole between blocks that connects up to the area around IBN55; IBN60 (~10 feet to the northeast) – this is a cut-around of a pillar that is formed where a low spot in the ceiling (actually a breakdown block) meets another block and IBN60 is on the south wall of this pillar and is underneath the IBN31-32 survey line that crosses over the breakdown above. The team departed for camp and arrived by 19:45. A total of 133.7 feet of new survey was accomplished.

### ***5-30-2013 (Oz – Yellowstone Falls, Oz – Wizards Elevator, Sanctuary)***

Adam, Shawn, Dan and Rene left camp at 9:30 and traveled to Oz where the rope at the Cowardly Lion Traverse was de-rigged for temporary use in Yellowstone Falls. A wear spot was noticed on the first Yellowstone Falls rope and a large butterfly knot was tied to remedy the problem. A note was left at the top of the rope to warn about the knot. The Cowardly Lion traverse rope was rigged at station OB41 and used to retrieve a rope that had been accidentally dropped the previous day. The team continued on to the lead left at OB78 and continued the survey, eventually connecting to a lead at the SW side of Yellowstone Falls, across from EOZ22. With all the leads below Yellowstone Falls complete, the lower pitches were all de-rigged. The 100 foot Cowardly Lion traverse rope was replaced, and the other ropes were returned to the rope cache in Munchkinland at EKT69. Two undocumented leads had been observed in the north wall of the large breakdown collapse opposite the Cowardly Lion traverse. These were found to connect to each other and the OY survey was begun. Initially these passages were of walking size and coated in white gypsum crusts, but the main route quickly became crawling and suddenly transitioned to CR coated tubes. The survey ended due to time at OY17 with passage continuing. The team returned to camp by 23:00. A total of 682.3 feet of new passage was surveyed.

John, Derek, Andy and James left camp at 11:00 and traveled to the Wizards Elevator pit complex. A combination of rigging and surveying continued down the rift as the dimensions became much larger. A 200 foot x 11 mm rope was attached to the bolt below OC19, and the bolt was marked OC20 for a vertical shot. The final pitch used about 170 feet of the rope. This area is quite beautiful, with gypsum crusts and large cuts (appearing like acid eroded canyons or rillenkarren) on the wall that was descended. At the bottom there is horizontal passage with a pulverized gypsum powder floor. This led to a lower level walking passage that is darker with rafts and calcite crusts on small mammillaries along the walls and ceiling. This area is

reminiscent of Hudson Bay without pools. A descending fissure leads to a gypsum blockage that had space below it but requires digging to get through. Airflow was not noted here and this probably shouldn't be enlarged. The walking passage to the east quickly shrinks to body sized and ends in a too-tight airy fissure. The lower portion of this pit complex was named "Between Hope and Doubt". A low potential climbing lead was noted along the west wall of the final rope pitch near OC22. The lead west of OC18 was surveyed under a boulder rubble-filled vertical tube with a talus pile spilling out. While pushing this lead the boulders were seen to have scrape marks without calcification making the area very unstable and dangerous for exploration from below. A technical climbing lead above OC18 remains unexplored. The Wizards Elevator pit complex now has three ropes, and drops to the level of the bottom of the roped slope in Emerald City. It is a



*James descending Between Hope and Doubt*

*Derek Bristol*

significant shaft in the cave, although it appears to have no connection at the bottom. It is rigged with (top to bottom) a 100 foot x 9 mm Cancord tied to natural anchor, 40 feet of 9 mm Cancord with webbing on a natural anchor, 145 feet of 11 mm PMI on a bolt with two more rebelay bolts below. From the bottom bolt another 170 feet is needed to safely reach the bottom. The new 200 foot rope that was used for this final pitch was de-rigged and the team returned to camp arriving by 23:40. A total of 437.0 feet was surveyed; 10.5 feet of redundant and 426.5 feet of new.

Stan, Abby, Jason and Pete left camp at 10:30 and traveled to Sanctuary. North of the Sanctuary room a climbing lead was checked at EMGH27. There is a tight belly crawl that accesses this area, so Stan went ahead while the others waited on the big side of the crawl. After climbing up a 15 foot chimney at EMGH27 it was found to completely end. The current map

shows the lead as a dome which is correct. It is a 15 foot high dead-end dome. The team then dropped down the roped 50 foot deep pit on the west side of Sanctuary. The next lead started at the base of the drop and led to a boneyard area and then to a sloping pancake passage with virgin sediments. A belly crawl pancake was pushed to its end and surveyed using EMH4A-G. Some time was spent checking leads in the EMH8-18 area. This area is quite confusing because there is breakdown and the EMH8 area is on top of the EMH18 area. There appears to be a lead going up near EMH8 but it probably just connects back into Sanctuary. A short fissure passage was found that had been previously scooped and it was surveyed for about 100 feet from the EMH18 side to EMH14. There are still several leads shown on the map in the Sanctuary area that need to be

checked. The team returned to camp by 19:30. A total of 246.7 feet was surveyed; 11.0 feet was redundant and 235.7 feet was new.

***5-31-2013 (Oz – Wizards Elevator, Oz – Munchkinland, Mirage Room)***

Abby, Shawn, Jason and John left camp at 9:15 and traveled to the formation area northwest of EKT87, and returned to the dirty lead at OA4. At the beginning of the passage there is a lot of flowstone and soda straws and this immediately transitions into a white gypsum tube then back to a thick CR fissure. This fissure was climbed and surveyed to a pair of too-tight constrictions. One of these constrictions, heading south at OA19, might be passable by a very small team. A down trending delicate lead with soda straws was left at OA15 and will require full clean gear. This lead appears to reconnect with the main passage. There was also a high lead left at OA10 that is covered in flowstone. This would be difficult to access with a required change from dirty to clean on a ledge, and it appears to lead back to the Hall of the Flying Monkeys. The then team traveled back to the pit near the Curtain at EOZ7 and rigged a 200 foot rope to a natural anchor to drop the pit. There is loose gypsum on slope that requires care, and gypsum blocks have the potential to break about 20 feet down the pit. The pit ends with a breakdown plug and there are a lot of gypsum hair / cave cotton and gypsum beards. It's possible to use a haul system to move a few rocks, which would then allow someone to get through, but it is believed that this simply connects to the fissure in the Wizards Elevator pit complex. Station OC34 had already been used the prior day in the Wizards Elevator, so this first station from EOZ6 was entered into the data as OC34!, but is labeled OC34 in the cave. The team returned to camp by 21:00. A total of 340.8 feet was surveyed; 15.2 feet of this was redundant and 325.6 feet was new.



*Dan Austin*

*Rene in Red Lakes*

Derek, Stan, Andy and Rene left camp at 11:15 and traveled to the OF survey in Munchkinland. During the ascent of the Kansas Twister two rub spots were noted in the rope just below the first rebelay against the natural bridge. One of the wear spots on the rope resulted in exposure of the core so a butterfly knot was tied to isolate the area and the other spot was positioned so that it was on the rope pad. In the OF survey the plan was to do the technical climb above OF5, but a possible dig bypass at OF10 was investigated first. 20-30 minutes work with a bolting hammer succeeded in moving a number of lightly cemented rocks and opened up the blocked route. The lead went ~200 feet and did indeed bypass the climb above OF5. Several CR lined passages were surveyed with the only remaining lead being a short technical climb above OF31. It's not possible



to see into the lead at the top of this short 25 foot dome, but the climb can be done with a few easy aid placements. A vertical shot was taken to the ceiling at OF32 and this is now the high point in Oz and the entire West branch of the cave. The team then traveled to the CR lead at OY17, which led to a pit series after a few shots through thick CR lined passage. Rope and vertical gear was retrieved from Munchkinland and the pits were dropped using a natural anchor near the edge. The rope ended about 15 feet from the bottom of the final drop where the last slick section could be down-climbed. A short horizontal passage led to a loop closure at the top of Kansas Twister to station EKT57. No leads were left in the pit series so the rope was de-rigged before leaving for camp. During the descent of Kansas Twister an effort was made to smooth the rub spot just below the lowest rebelay using the bolting hammer. The rock here is very brittle so efforts to remove nubbins simply resulted in the generation of new edges. There is now less contact between the rope and natural bridge, but the area of wall below the rebelay is somewhat rougher. It is suggested that this be resolved by simply installing a longer rope pad. The second abrasion area on the rope, noted earlier in the day, was now exposing some of the core, so a second butterfly knot was added. This 220 foot rope has seen a lot of traffic during the week and due to the short rope pad on the first rebelay will need to be replaced soon. The team returned to camp by 1:00 on 6/1/2013. A total of 478.8 feet was surveyed; 10.2 feet of this was redundant and 468.6 feet was new.

James, Dan, Adam and Pete left camp at 10:30 and traveled to the Mirage Room via the Western Borehole. The lead going north at IFF7 was surveyed using IFF8-14 and this tied into IFC3 with no other leads. The team then located the fixed rope at IM1 and climbed into the CR coated rift above the Mirage Room. About 20 feet of rope is used in rigging to a natural anchor, and the drop is 85 feet, so about 120 feet of rope is enough. The current rope had ~50 feet of rope on the ground, so it is longer than required, but the rope was in good condition. The lead between IM3 and 4 was found to be too-tight. At least an hour was spent locating IM14. There is a scary, CR coated, fissure traverse from IM2-10 with the Mirage Room visible below. The area around IM14 was surveyed closing two more leads and noting one that is just a pillar. A lead at IH10 is a super tight popcorn fissure that has been scooped and requires a small team to explore. The remaining downward leads should be done with a belay and will likely connect into the top of the Mirage Room. The team returned to camp by 18:40. A total of 105.9 feet of new survey was accomplished.

#### ***6-1-2013 (Exiting the Cave)***

John, Adam, James and Pete left camp at 9:00 and exited the cave at 11:45 (2:45 travel time).  
Stan, Jason, Rene and Dan left camp at 10:00 and exited the cave at 13:00 (3:00 travel time).  
Derek, Andy, Shawn and Abby left camp at 11:00 and exited the cave at 14:15 (3:15 travel time).  
There were no incidents or issues.

#### **Conservation**

- A small amount of urine was accidentally spilled on the intermediate ledge in Kansas Twister at EKT10.
- One team member carried all of their urine out of the cave. As has been typical on previous West branch expeditions, this amounted to approximately 7.5 liters (~16 lbs). Other members of the team carried out what was feasible while keeping pack weight manageable.
- An unfortunate incident occurred when descending from a technical climb above a flowstone covered slope above station OB8, which had been climbed in clean gear. The rope used to rappel the pitch dislodged a significant amount of sediment, which fell to the flowstone

below. This area should be the focus of a restoration effort on a future expedition. Much of the sediment can probably be removed using a whisk broom.

- One team member was observed entering the cave with a dirty helmet. Gear cleaning and decontamination procedures were not followed and a satisfactory explanation and corrective action plan were not provided. This team member has been suspended from further volunteer activities in Carlsbad Caverns National Park.
- A one liter cubitainer (cubie) containing urine was accidentally left in the latrine area. This was discovered by the Fortini/Borer expedition the following week and they graciously carried it out of the cave. It was decided that a brighter headlamp should be used when conducting a final sweep of the latrine and camp area prior to departing on the final day.

### **Science**

- Several corrosion residue samples were collected in Oz for Dr. Diana Northup.
- Many areas with green minerals were observed in Oz, appearing to be similar to those in Emerald City.
- The newly discovered formation areas north of EKT87, including the Hall of the Flying Monkeys, contain a number of unusual and well developed speleothems at a very high elevation in the cave that may benefit from scientific evaluation.
- Unusually deep corrosion residue (ferro-manganese deposits) was observed near OY26-27. These deposits are approximately 8-12 inches deep.

### **Rigging**

- The new rebelay on the rope below Southern Cross needs some work. The webbing is showing some wear from sharp edges. This webbing should be replaced before or on the December, 2013 Bosted expedition. A Spiroll or other rope protector could be used to protect the webbing. Alternatively, a rebelay bolt could be installed.
- The first pit in the Wizards Elevator at EOZ11 is rigged to a natural anchor (boulder) with 25 feet of white webbing and a SS maillon. A 100 foot length of 9 mm Cancord is rigged to the maillon, which barely reaches the bottom. This pit has some loose rock so shelter must be taken when cavers are either descending or ascending.
- The second pit in the Wizards Elevator at OC1 is rigged to a natural anchor (boulder) with 15 feet of white webbing and a SS maillon. A 40 foot length of 9 mm Cancord rope was cut from a 100 foot piece and rigged to this maillon.
- The third pit in Wizards Elevator (Between Hope and Doubt) is rigged with a 145 foot length of 11 mm PMI rope using a gypsum boulder and a single bolt at the head of the pitch. This rope is then connected to a rebelay bolt about 30 feet lower, and another rebelay bolt at the bottom of the rope, which is 150 feet from the bottom of the pit. The final pitch has been de-rigged but requires 170 feet of rope.
- The 200 foot x 11 mm PMI rope that had once been rigged on the lower pitches of Kansas Twister was used to rig the first pitch going both up and down Yellowstone Falls. This was left rigged to a two-bolt anchor at EOZ22 and a natural anchor above at OB1. There is one core shot below the bolt anchor that has been isolated with a butterfly knot. A rebelay should be installed at the first lip below the bolt anchor if further work is done in the area.
- The 230 foot rope on the lower pitches of Kansas Twister suffered two core shots that have been isolated with butterfly knots. A rope pad was installed below the two-bolt rebelay anchor on the first day of the expedition, but the pad was too short to protect against all contact with the cave wall. On the last day of exploration some time was spent trying to

smooth the contact area with a bolting hammer, but a longer rope pad should be brought on the next trip to properly protect the area. The rope will need to be replaced in the near future.

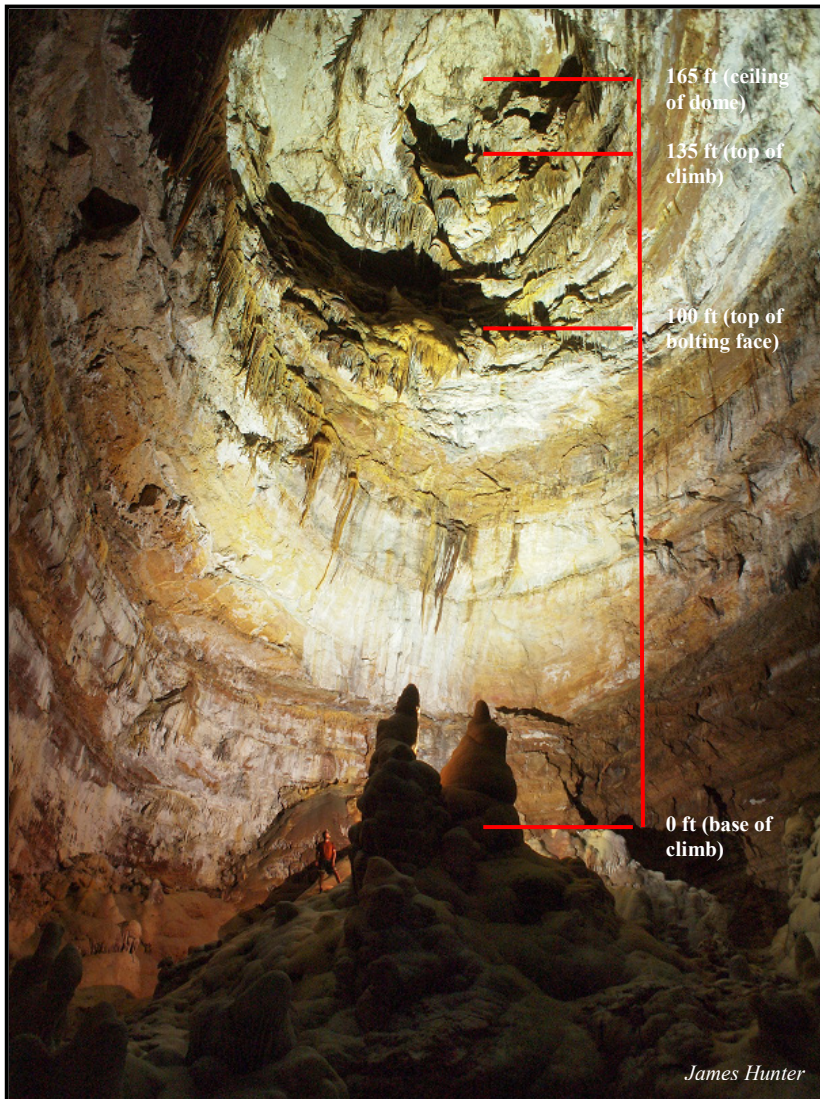
- Two rope pads that were brought into the cave during a day trip in 2012 were fixed to the anchor at EKT48 with 3 mm cord. These protect two edges below the bolt anchor. The rope rigged at EKT48 was also replaced with a new 160 foot x 11 mm PMI rope.
- The old rope previously rigged at EKT48 was later taken to Yellowstone Falls and rigged to fix the climb into Tatooine. This took about 50 feet of the rope and it was cut short leaving 100 feet for use elsewhere. The anchor for the climb into Tatooine is a pair of very solid stalagmites.
- A 30 foot piece of 1 inch webbing that had been left rigged at the EKT104 climb was removed and later rigged to a natural anchor at OF6. This has been left as a hand-line protecting the easy but exposed climb above Munchkinland.
- Climbs and pits at EKT104, OF5, OB8, the lower pits in Yellowstone Falls, OY22, and EOZ7 were all rigged to natural anchors for exploration and then de-rigged once the areas were fully surveyed.
- The C71 traverse rope in the Rift was loosened slightly using the Prusik adjustment on the north end to allow easier chimneying by shorter cavers across the bottom of the traverse.

### **Safety**

- One team member entered the cave while suffering from a bad head cold, believing that the symptoms were due to allergies. 10 of 12 team members eventually became ill with most developing sore throats, coughs and congestion during the course of the expedition. This resulted in one team member opting to stay in camp on one day, and several other team members electing to go on shorter, easier project objectives. While having so many people sick may have impacted morale at times, teams and individuals did a good job of being flexible with team assignments and trip length to allow some rest.
- Some concerns were noted regarding consistently buckling helmet chin straps while traveling over uneven terrain. At times team members had to remind each other about this important safety measure. While helmets are routinely removed in camp and during rest stops for comfort and to allow excess heat to escape, all cavers should keep chin straps buckled and properly adjusted when traveling through the cave.
- There were a number of slips and minor falls, as is typical of any extended expedition; however, no major incidents occurred during the week. There were also no lead falls suffered during technical climbs.
- On a few occasions ropes in Kansas Twister were found to be left off of rope pads. There are now four rope pads rigged in the dome. Cavers were reminded to be sure to reposition ropes on pads after ascending or descending past the pads.
- A pair of whistles were brought into the cave specifically to help in communicating whether teams were on or off rope in Kansas Twister. This approach is only necessary when multiple teams are visiting Oz on the same day. In most cases these worked well and avoided issues with climbers being in the rock-fall zone with other cavers above. On at least one occasion a team returning to camp blew the whistle before getting on rope and heard no response so they began to descend. An earlier team was still descending the final rope and their whistle blasts could not be heard. They managed to get out of the rock-fall zone within 5-10 minutes and fortunately there were no loose rock incidents. Using a 90 minute spacing between teams for ascents and a 60 minute spacing for descents also works well.
- Early in the week some instability was noted in the talus slope through the Curtain at the entry into Oz. Some time was spent moving rocks to widen and stabilize the slope. No further rock movement was noted after this work.

## Climbing

The Motherlode room has a couple of leads a short distance up the walls of the domed room, but the lead of greatest interest is at the very apex of the room. From the lower end of the room the ceiling is well over 200 feet above, but from the top of the flowstone slope it is a climb of roughly 135 feet to a possible lead. Flowstone issues from this lead, but even with the brightest lights it's not possible to determine whether there is continuing passage. The wall is most easily ascended from the highest point on the flowstone slope (labeled as "base of climb" in the photo). The first 20-25 feet may be free climbed or aided with natural placements, but the next 75-80 feet appears to be nearly featureless and overhangs slightly (about 95-100 degree angle). There is a flowstone covered ledge 100 feet above the base of the climb. Draperies hanging from this ledge can be avoided by climbing to the right. Above this ledge appear to be a series of diagonally ascending ledges that likely provide easier free climbing or straightforward aiding up lower angle terrain. The primary concern with undertaking this climb is the potential impact to the flowstone at the base of the route. It's possible that ascending the first 100 feet of the climb could dislodge loose rocks, and even the use of tarps to protect the flowstone may not be adequate.



The lead at the top has uncertain potential.

The top 35 feet of the climb can likely be done with free climbing and clean aid placements.

Direct aid using hand-drilled bolts will be needed to ascend this mostly featureless and slightly overhanging section of wall. Loose rock and debris could possibly impact the flowstone below, even with the use of tarps.

## Lead Lists

### Completed Leads

Completed Leads (Far West Expedition 2013)						
Far West			Directions from Tie-In			
Quad	Area	Nearest Tie-In	Distance (ft)	Bearing	Dimensions	Comments
H35 - Zanzibar	Birthday Present	IBDJ6	?	N	?	per Barber 11/13/03 - no lead found on 5/27/13
H35 - Zanzibar	Sanctuary	EMGH27	15	up		Climbed on 5/30/13 - no lead
H35 - Zanzibar	Sanctuary	EMH4	30	SW		Surveyed with EMH4A-G
H35 - Zanzibar	Sanctuary	EMHU1	25	NW		Surveyed with EMHU1A-D
I35 - Keel Hall	Birthday Present	IBJ1	0	SE		Surveyed with IBJ46-47
I35 - Keel Hall	Birthday Present	IBJ19	0	up	2'x2'	Surveyed with IBJ48-67
I35 - Keel Hall	Keel Hall	IBE9	15	NW		Surveyed with IBE11-20
I35 - Keel Hall	Keel Hall	IBE9	15	NW		Surveyed with IBE21-22
I35 - Keel Hall	Keel Hall	IBEA2	8	S		Surveyed with IBEA22-23
I35 - Keel Hall	Keel Hall	IBN59	10	up		no lead found - top of breakdown block
I35 - Keel Hall	Keel Hall	IBN59	20	SE		no lead found - hole to IBN55
I35 - Keel Hall	Keel Hall	IBN60	10	NE		no lead found - cut-around pillar
I35 - Keel Hall	Mirage Room	IFF7	5	E		Surveyed with IFF8-14
I35 - Keel Hall	Mirage Room - south	IH10	16	NE		connects to IM14 - sketched connection
I35 - Keel Hall	Mirage Room - south	IM14	10	W		connects to IH10 - sketched connection
I35 - Keel Hall	Mirage Room - south	IM14	5	SW		Surveyed with IM15-18
I35 - Keel Hall	Mirage Room - south	IM4	5	SW		No lead - too tight
H36/H37 - Oz	Oz	EKT102	60	SW	10Wx10H	Surveyed with OZ18-26
H36/H37 - Oz	Oz	EKT104	40	S	20Wx10H	Surveyed with OZ27-30
H36/H37 - Oz	Oz	EKT79	20	W	15Wx2H	Surveyed with OZ15-17
H36/H37 - Oz	Oz	EKT80	30	NW	50Wx35H	Surveyed with OF1-36
H36/H37 - Oz	Oz	EKT80	45	N	8Wx10H	Surveyed with OZ47,49-50
H36/H37 - Oz	Oz	EKT80	45	N	5Wx4H	Surveyed with OZ48,51-54
H36/H37 - Oz	Oz	EKT87	40	NE	5Hx20W	Surveyed with OZ1-14, 7A, 8A
H36/H37 - Oz	Oz	EKT87	50	NW	8Wx10H	Surveyed with OA1-9
H36/H37 - Oz	Oz	EKT89	30	N	10Wx2H	no lead - pool with TT breakdown
H36/H37 - Oz	Oz	EKT96	25	W	25Wx20H	Surveyed with OZ31-32
H36/H37 - Oz	Oz	EKT96	25	S	5Wx10H	Surveyed with OZ31-32
H36/H37 - Oz	Oz	EKT97	25	N	10Wx3H	Surveyed with OZ55-63
H36/H37 - Oz	Oz	EOZ11	0	down	18x18	Surveyed with OC1-34
H36/H37 - Oz	Oz	EOZ22	10	W	20x30	Surveyed with OB34-95
H36/H37 - Oz	Oz	EOZ22	10	W	40x10	Surveyed with OB1-33; OZ64-75
H36/H37 - Oz	Oz	EOZ40	20	NW	4Wx12H	Surveyed with EOZ55-59
H36/H37 - Oz	Oz	EOZ44	10	SW	2Wx2H	Surveyed with EOZ60-64
H36/H37 - Oz	Oz	EOZ46	4	NE	20Wx10H	Surveyed with EOZ47-54
H36/H37 - Oz	Oz	EOZ7	0	down	12x10	Surveyed with OC34-OC36

## New Leads

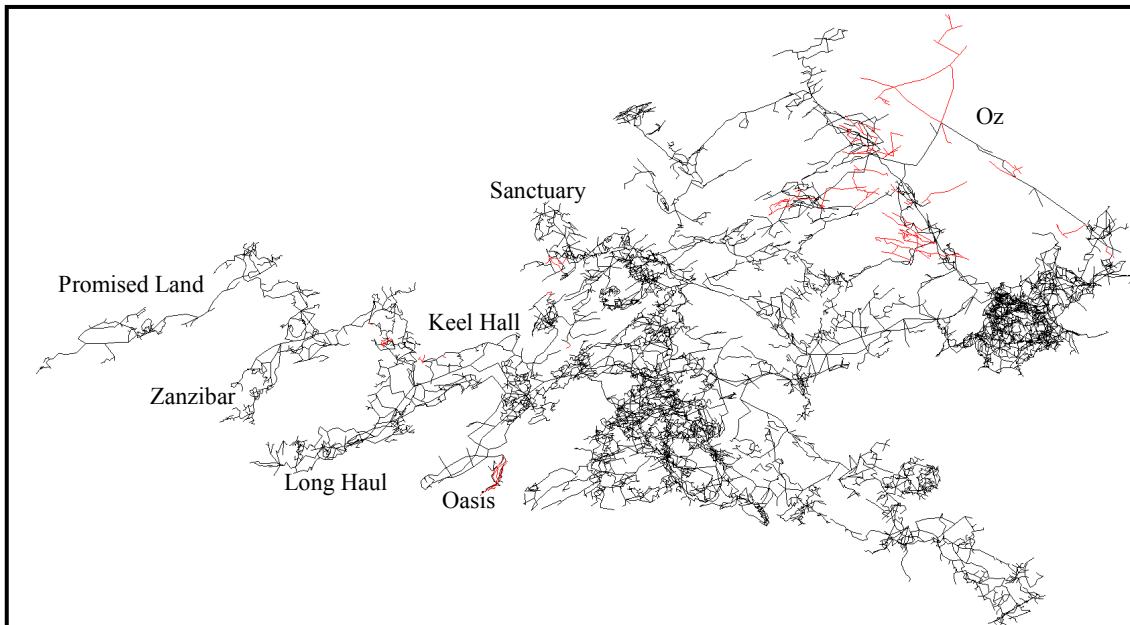
New Leads (Far West Expedition 2013)						
Far West			Directions from Tie-In			
Quad	Area	Nearest Tie-In	Distance (ft)	Bearing	Dimensions	Comments
I35 - Keel Hall	Red Lakes	IG19	10	SW	TT - 2'Hx8"W	chisel lead opens to walking with good air
I35 - Keel Hall	Red Lakes	IG23	15	NE	1Hx3W	crawl continues after 4"pool that blocks, no air
I35 - Keel Hall	Red Lakes	IG26	20	NE	4Hx5W	tennis ball cord toss needed to cross - good
I35 - Keel Hall	Red Lakes	IG3	45	NE	2W	free climbable at bottom, need gear up high
I35 - Keel Hall	Red Lakes	IG31	0	NE	16Hx6W	scoop marks continue and end at chimney down
H36/H37 - Oz	Oz	EOZ50	10	SE		delicate frostwork - may connect to other EOZ50
H36/H37 - Oz	Oz	EOZ50	10	up		CR climb - may connect to other EOZ fissure
H36/H37 - Oz	Oz	OA19	0	S	3Wx1H	very tight CR crawl
H36/H37 - Oz	Oz	OC11	20	up		climb?
H36/H37 - Oz	Oz	OC13	30	down	2x1	small lead in floor marked with flag - not great
H36/H37 - Oz	Oz	OC18	10	up	10Hx10W	technical climbing traverse needed to access
H36/H37 - Oz	Oz	OC19	20	E	10Wx30H	vertical swing to east side of fissure
H36/H37 - Oz	Oz	OC22	20	NW	10Hx10W	technical climb up wall parallel to main fissure
H36/H37 - Oz	Oz	OF31	20	up	6Wx3H	technical climbing lead at very high elevation
H36/H37 - Oz	Oz	OY19	0	W	4Wx3H	CR crawl
H36/H37 - Oz	Oz	OY21	6	SW	4Wx2H	CR crawl
H36/H37 - Oz	Oz	OZ32	0	NW	20Hx15W	continuation of steep fissure - connects to EKT93
H36/H37 - Oz	Oz	OZ32	0	W, up	20Hx15W	upper half of steep fissure - may be separate passage
H36/H37 - Oz	Oz	OZ48	20	up		technical climbing traverse needed to access
<b>Leads Considered Too Delicate and with Low Potential</b>						
H36/H37 - Oz	Oz	OA10	30	NE		too delicate - leads back to main passage
H36/H37 - Oz	Oz	OA15	10	NE		too delicate - leads back to main passage
H36/H37 - Oz	Oz	OA9	15	N		too delicate
H36/H37 - Oz	Oz	OA9	10	NE		too delicate
H36/H37 - Oz	Oz	OZ19	10	SE	1x2	tight, too delicate, low potential
H36/H37 - Oz	Oz	OZ88	30	up	4x4	too delicate - technical climb above formations
H36/H37 - Oz	Oz	OZ68	8	W	4Wx3H	too delicate - CR lined pool
H36/H37 - Oz	Oz	OZ8	25	SE	3x4	too delicate
H36/H37 - Oz	Oz	OZ8A	0	W		too delicate - blocked by soda straws

## Open Lead List (updated: July 18, 2013)

Open Leads (H34, H35, I34, I35, H36/H37)						
Far West			Directions from Tie-In		Dimensions	Comments
Quad	Area	Nearest Tie-In	Distance (ft)	Bearing		
H35 - Zanzibar	Birthday Present	IBDJ12D	20	NE	stooping	technical climb - requires 1-2 bolts for traverse
I35 - Keel Hall	Zanzibar	IBD46	?	down	3'x3'	hole in floor goes 25' - not drawn on map - 12/4/01
I35 - Keel Hall	Keel Hall	EY95	0	up	2Hx6W	technical bolt climb up overhanging wall
I35 - Keel Hall	Keel Hall	IBP21	10	NE	3'x3'	
I35 - Keel Hall	Keel Hall	IBP27	?	?	3'x3'	across drop, not shown on sketch or map
I35 - Keel Hall	Keel Hall	IBP28	12	E	3'x4'	
I35 - Keel Hall	Keel Hall	IBP28	12	W	3'x3'	
I35 - Keel Hall	Keel Hall	IBP4	5	S	1'x2'	grim, down, not drawn on sketch
I35 - Keel Hall	Keel Hall	IBP40	8	N	3'x2'	into breakdown
I35 - Keel Hall	Keel Hall	IBP42	5	W	various	breakdown
I35 - Keel Hall	Keel Hall	IH4	21	SE		
I35 - Keel Hall	Keel Hall	IO14	25	SW	2Hx6W	free climb with runners and belay
I35 - Keel Hall	Long Haul	IBA12N	5	SE		
I35 - Keel Hall	Long Haul	IBA4	20	S		easy chimney climb to aragonite coated fissure
I35 - Keel Hall	Long Haul	IBA4	20	W	4Hx2W	free-climb from left
I35 - Keel Hall	Long Haul	IBA4	20	W	2Hx2W	free-climb from left with exposure
I35 - Keel Hall	Long Haul	IBA4	20	W	10Hx2W	technical climb, 14' up, rope lasso
I35 - Keel Hall	Long Haul	IBA6A	5	S	2Hx4W	technical climb, 11' up, 2 bolts required
I35 - Keel Hall	Long Haul	IBB7	15	NE		difficulty finding in 2012
I35 - Keel Hall	Long Haul	IBB16	5	SE		down to boneyard
I35 - Keel Hall	Long Haul	IBB32	10	SW		to breakdown, not likely to new passage
I35 - Keel Hall	Long Haul	IBB35	5	NW		more breakdown, looks uninteresting
I35 - Keel Hall	Long Haul	IBN1	10	S	2Hx6W	up steep fissure, 13' free climb with exposure
I35 - Keel Hall	Mirage Room	IN4	5	NE		
I35 - Keel Hall	Mirage Room - south	IH10	10	SE		small, steep
I35 - Keel Hall	Mirage Room - south	IM11	7	W		
I35 - Keel Hall	Mirage Room - south	IM13	13	E		
I35 - Keel Hall	Mirage Room - south	IM13A	7	W		down to IF survey?
I35 - Keel Hall	Mirage Room - south	IM2	20	W		down to IF survey?
I35 - Keel Hall	Mirage Room - south	IMA4	10	N		
I35 - Keel Hall	Northern Exposure	IBDA13	5	S		
I35 - Keel Hall	Northern Exposure	IBD7	25	NE		low, #11
I35 - Keel Hall	Northern Exposure	IBDA13	5	NE		
I35 - Keel Hall	Northern Exposure	IBDA13	5	S		
I35 - Keel Hall	Northern Exposure	IBDA3	13	NE		to IBD survey?
I35 - Keel Hall	Northern Exposure	IBDA5	7	N		
I35 - Keel Hall	Northern Exposure	IBDA5	7	NE		
I35 - Keel Hall	Northern Exposure	IBHA5	7	NW		
I35 - Keel Hall	Oasis	EY97	0	up	2Hx6W	technical bolt climb up overhanging wall
I35 - Keel Hall	Oasis	EY97	0	up	2Hx6W	technical bolt climb up overhanging wall
I35 - Keel Hall	Paris, TX	IEA15	0	down	3x2	boneyard, loose rock
I35 - Keel Hall	Paris, TX	IEB117	8	N	2Hx2W	boneyard
I35 - Keel Hall	Paris, TX	IEB32	4	N	1Hx2W	boneyard, very tight
I35 - Keel Hall	Long Haul	IBGA25	5	E	5Hx15W	may go back up to Long Haul
I35 - Keel Hall	Rainbow Room	IBA7E	15	E		
H36/H37 - Oz	Kansas Twister	EKT17	35	up	35Hx10W	Strong free-climbing required. Air.
H36/H37 - Oz	Kansas Twister	EKT26	5	E	2Hx2W	CR coated hole going down. Change of clothes?
H36/H37 - Oz	Kansas Twister	EKT30	25	SW	?	Dangerous climb up into breakdown
H36/H37 - Oz	Kansas Twister	EKT44	10	SE	17Hx2W	Loose rock filled chimney up. No air.
H36/H37 - Oz	Kansas Twister	EKT59	8	SE	3Wx3H	Boneyard crawl
H36/H37 - Oz	Kansas Twister	EKT59	12	up	8x4	Hole in ceiling.
H36/H37 - Oz	Kansas Twister	EKT62	10	NE	8Wx10H	Pit going down - may connect to EKT56.
H36/H37 - Oz	Kansas Twister	EKT56	10	W	12Wx6H	Dome going up - may connect to EKT62.
H36/H37 - Oz	Kansas Twister	EKT56	24	E	2Wx2H	Boneyard crawl
H36/H37 - Oz	Kansas Twister	EKT56	30	E	2Wx2H	Boneyard crawl
H36/H37 - Oz	Kansas Twister	EKT54	15	E	6Wx2H	Loose breakdown choke.
H36/H37 - Oz	Kansas Twister	EKT60	8	N	3Wx3H	Boneyard crawl
H36/H37 - Oz	Kansas Twister	EKT62	5	N	2Wx1H	Tight.
H36/H37 - Oz	Oz	EOZ11	0	up	10x10	Dome technical lead.
H36/H37 - Oz	Oz	EKT72	40	SW	15Wx5H	15' technical climb above EKT72B
H36/H37 - Oz	Oz	EKT72	30	S	15Wx20H	Back of Wizard alcove - 70' technical climb
H36/H37 - Oz	Oz	EKT76	80	NW	20Wx30H	35' technical climb up north wall.
H36/H37 - Oz	Oz	EKT87	50	NW	15Wx40H	May require technical climb to get up ledge.
H36/H37 - Oz	Oz	EKT87	100	SE	20Wx10H	High alcove with formations - technical climb.
H36/H37 - Oz	Oz	EKT92	30	N	6Wx1H	High crawl on north side of small room.
H36/H37 - Oz	Oz	EKT92	15	N	6Wx1H	Low level room was checked and needs survey.
H36/H37 - Oz	Oz	EKT93	15	S	40Wx100H	Steep fissure above main passage - hard free climb.
H36/H37 - Oz	Oz	EKT99	20	W	20Wx20H	Lead behind formations. Clean gear needed.
H36/H37 - Oz	Oz	EKT100	15	SE	15Wx10H	Lead behind white column - climbing and clean gear.
H36/H37 - Oz	Oz	EKT109	15	SE	4Wx4H	15' technical climb up poor quality rock. Poor lead.
<b>Leads Considered Too Delicate and with Low Potential</b>						
H35 - Zanzibar	Nativity Chamber	NB4	8	S		climb over flowstone - too delicate
H34 - Promised Land	Sparadise	N24K	9	N		too delicate and low potential
I35 - Keel Hall	Long Haul	IBQ29	2	W		too delicate - aragonite bushes
I35 - Keel Hall	Zanzibar	IX13	7	NW		too delicate - aragonite bushes
I35 - Keel Hall	Zanzibar	IX13	7	NW		too delicate - aragonite bushes
I35 - Keel Hall	Long Haul	IBGA11	5	SW		too delicate
I35 - Keel Hall	Long Haul	IBGA12	12	N		too delicate
I35 - Keel Hall	Long Haul	IBGA14	10	N		too delicate
I35 - Keel Hall	Long Haul	IBGA15	5	W		too delicate

## Maps

Line plot of Far West with new survey in red.



## Conclusion

The expedition was very successful in accomplishing most of the goals set out in the proposal, resulting in 10,185.3 feet of new cave surveyed, a full resurvey of the Red Lakes area, collection of FMD science samples, and completion of several safe and successful technical climbs. All of this was made possible through the efforts of highly skilled and experienced cavers / surveyors and careful pre-planning of survey objectives and logistics.

Thanks to all of the expedition team members for their drive, humor, flexibility and hard work. James Hunter utilized his extensive experience with lead climbing and rigging to successfully complete several technical climbs and pit descents. John Lyles and Stan Allison provided advice, experience, and knowledge of the cave to help teams navigate to objectives and identify important leads. Thanks to Stan, Shawn, Abby, James, Dan, Andy and Rene for producing extremely high quality sketches.

Finally, thanks to Stan Allison and Shawn Thomas in the Cave Resources Office for providing information, training, gear preparation, and their continued willingness to give opportunities to less experienced Lechuguilla cavers.

Derek Bristol  
Expedition Leader  
July 25, 2013