



Yellow Spur Rope Failure - Beyond the Mission

John Keller

During most of our missions, the Rocky Mountain Rescue Group supports one or more patients who need help getting out of the field. In a much smaller number of missions, the team supports the family and friends of a loved one who has died while recreating in the mountains. And in some cases, our team can support the community in general.

On the morning of June 22, 2010, Joseph Miller fell while leading the second pitch of the Yellow Spur route on the Redgarden Wall in Eldorado Canyon State Park. During his fatal fall, Mr. Miller's rope failed, resulting in a ground fall.

There wasn't much we could do for Mr. Miller. An ER physician who was climbing near Mr. Miller responded to the yells for help and pronounced Mr. Miller deceased at the scene.

Several RMRG members supported the coroner's on-scene investigation that took place in the hours following Miller's fall. Members helped to catalog the gear at the base of the climb and were involved in initial interviews of witnesses. Several photos of both sides of the damaged rope were taken. Two members climbed up a neighboring route and rappelled in to the second pitch of Yellow Spur. They located and photographed a piece of protection still secured in a crack as well as several sharp rock edges that the rope could have contacted.

What followed was a 9 month investigation by RMRG that culminated in the publishing of a 15 page post-accident report in March of 2011 (www.rockymountainrescue.org/osYellowSpurRopeFailure.php).

Investigation

Periodically, the incidents that precipitate our missions warrant some level of investigation and RMRG has made it a regular practice in recent years to support the climbing community by trying to determine the causes of such accidents. With personnel who combine decades of climbing experience with equal amounts of engineering experience in equipment testing at our test tower, the team is well suited for investigations of this type.

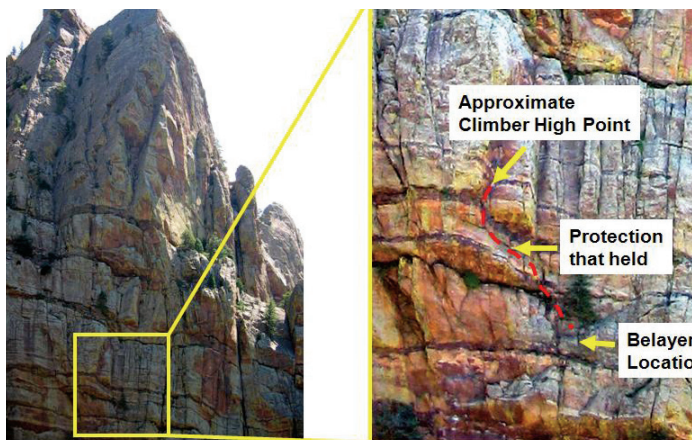
Immediately following Miller's fall, it was clear to those on scene that during the fall the highest piece of protection Miller had placed pulled out of the wall. The next piece of protection

below the "blown" piece held in place, but at some point thereafter – while Miller continued to fall – the rope failed. Failure of a climbing rope is very rare and it was of great interest to the climbing community to understand what had occurred in this situation.

The investigation itself involved interviews with witnesses and the belayer, analyses of the gear and damaged rope, reviews of the statements taken on scene, six different sessions at the RMRG's test tower, and an accident sequence re-creation on the Yellow Spur route itself.

After the accident it was observed that Miller's rope had a mostly clean, smooth cut without much fraying. The primary focus of the rope failure tests was to determine what sort of interaction between rope and rock could create that kind of damage. Determining the mechanism of failure would likely help determine the sequence of events.

In one test a sharp rock dragged across a loaded rope in



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Recent Rescue Story (continued from page 1)

a sawing action created a very similar type of damage: a relatively clean cut with very little fraying. Tests in which a weight was dropped to simulate a falling lead climber with the rope stretched over a sharp edge created a long section of frayed rope prior to failure; a very different type of damage to what we observed. In the end, tests in which a loaded rope swung across a sharp rock (tracing a pendulum) created the type of damage observed in Miller's rope. This information combined with the interviews and re-creation allowed us to propose a probable sequence of events.

Shortly after placing his top piece of protection, Miller fell and that piece pulled out. He fell vertically past a bulge until the rope began to catch his fall. The next piece of protection held, but was off to one side of Miller's trajectory. As the rope pulled tight, Miller swung slightly to the side, dragging the rope over a sharp edge of rock. The rope likely slid along the sharp edge while it was under the highest tension it would see during a fall arrest. The edge severed the rope, and the fall continued to the ground.

How Would Paraloc Do?

Of particular interest to our team is how our rescue rope (laid [non-kernmantle] 12mm static Mamutec Paraloc) would do under similar circumstances. During the testing sessions we placed Paraloc on the same test tower rigs that had caused the climbing rope to fail. In the case of the rope extending over a sharp edge, Paraloc not only survived, but showed only moderate abrasions (as opposed to the climbing rope, which was shredded to its core). However, in the case of a loaded rope following a pendulum across a sharp edge, Paraloc took significant damage. The climbing rope had failed after passing along less than two inches of the sharp edge. Paraloc survived over six inches of sharp edge but was cut halfway through. This is an important result for us to contemplate, for during both scree and vertical evacuations we often move off-line from the anchor with a loaded rope.



Mission Statistics

Steve Dundorf

Our mission volume increased again in 2010 to 149 calls for assistance and an unprecedented 107 field missions.

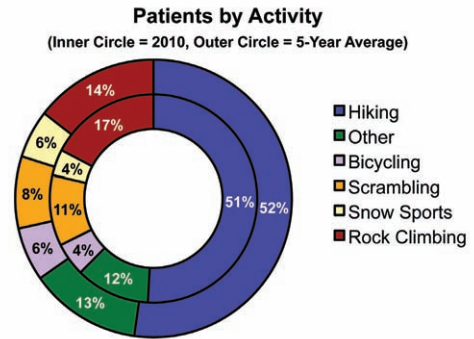
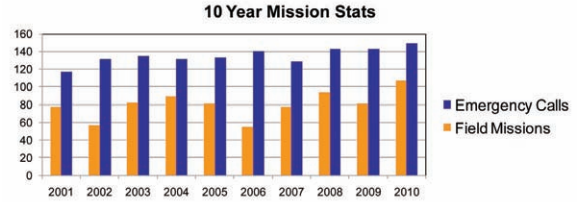


photo: Dave Christenson

RMRG Disaster Response: Flash Flood!

Jeff Sparhawk and Kevin Vranes

The Fourmile Canyon Fire, the most expensive wildfire in Colorado history, burned 167 homes and 6,200 acres. The fire left widespread actual destruction in its wake, but it also left a major potential hazard. The fire consumed the leaves and pine needles that normally capture and hold significant amounts of falling rain, which means that in the coming years all rainfall will immediately hit the soil. Additionally, due to its high burn temperature, the fire charred the soil surface so thoroughly that it became hydrophobic. That is, the soil now tends to shed rainwater rather than absorbing it. Combine these two factors with the vast expanse of burned, unstable trees, and we now have a significantly elevated risk of catastrophic debris flows within and downstream of the burn area.

Historical precedent in Colorado shows that debris flows are common within the first three years after a major wildfire in mountainous terrain. The burned land can absorb moderate rainfall, but slow-moving thunderstorms that can deliver heavy rain are likely to force ash and mud down into stream channels. The Fourmile Canyon area is heavily populated, and the main road serving the canyon runs alongside Fourmile Creek, in most places just feet above the creek bed. While many homes and property are at risk for flooding, the potential is also great for flooding to sever road access from Boulder to Fourmile Canyon, severely impacting emergency response.

Because thunderstorms are common in Colorado's mountains from spring through autumn, Boulder County emergency planners, led by the Boulder County Sheriff's Office, started preparing early for mudslide, debris flow, and flooding potential. Disaster response is one of RMRG's three objectives in the group's mission statement, and the group was involved early in flooding preparations with the Sheriff's Office. While RMRG does not perform water rescues that might occur during a flash flood, there are many events that could occur during flash floods for which RMRG needs to prepare. This includes crossing over engorged rivers, rescuing stranded residents, and searching for residents forced to escape rising flood waters.

This past spring, RMRG volunteers spent countless hours planning and preparing for potential flooding. This included participating in tabletop exercises with Sheriff and county fire units, and participating in a large, multi-agency joint field

exercise. RMRG volunteers spent thousands of hours planning, coordinating, training, problem solving, watching the clouds and weather radar, standing by, and responding to small flood incidents. RMRG's general response plan was simply to stay out of the way of any fast moving water and work around the edges until the water levels receded. But because a very real potential exists for a mass-casualty event spread out over hundreds or even thousands of acres of mountainous terrain, RMRG had to be ready for anything. Flexibility and the availability of a large number of rescuers was key to assisting the public. In true RMRG fashion, the entire membership stepped up and took care of hundreds of tasks to ensure

that RMRG was in the best position to assist with whatever happened.

Fortunately, 2011 did not bring major flooding to the Fourmile area. A number of intense storms narrowly missed the burn area and the resulting flooding was minor. RMRG spent more time training and on standby than fielding into the potential flood area. The long hours and hard work should carry forward and RMRG will once again be ready for the thunderstorms of 2012. The

Fourmile area is expected to be at considerably elevated risk for flooding through 2013.



Photo Courtesy of Daily Camera



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**Rocky Mountain Rescue Group, Inc.
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 Boulder, CO 80306**

Member Profile: Frank Harris

Katie Johnson and Frank Harris

The longtime Boulder resident featured in the 2011 member profile, Frank Harris, remembers learning about the group in the local media in the 1950s and 1960s. In a poignant memory, he recalls that “in the 1950s RMR exploits were more likely to appear on the front page [of the Daily Camera]. I particularly remember the shock of seeing the big front page picture of the 1st Flatiron labeled with an ‘X’ and a dotted line showing where my high school friend had tumbled to his death.”



Though he had a number of encounters with RMRG during his early years in Boulder, it would be nearly five decades before Frank decided to begin training formally with the group, attaining membership in 2008. He has written several unpublished essays about his experiences. In “My second RMRG mission,” he describes the similarities between two missions in which he was involved in 1961 and 2006. Both missions involved searches for missing parties. In the case of the 1961 mission, two of Frank’s friends failed to return as expected from a hunting trip. Frank joined RMRG members to search for his friends by following tracks that were quickly disappearing in the falling snow. The tracks ultimately led to a cliff near some waterfalls. He recalls:

Our flashlight beams followed the indistinct ruts out onto the ledge. This wide shelf sloped toward the creek downward at about 30 degrees and was of course blanketed with deep snow. The tracks ended abruptly in a long slide mark. The trough in the snow went straight down the steep rock and

disappeared over the brink of a cliff and down into a pool of water isolated between two high waterfalls...Just as dawn began to break, one of [the RMRG members] rappelled down the cliff, while the other fellow and I belayed his rope around the tree...A few minutes later the rope tightened again and the climber stuck his head above the lip of the lower cliff where he could yell up to us. He hollered that he had found one hunter. He said the fellow was alive, but nearly frozen. He was huddled on a rock ledge under the overhanging cliff on the far side of the pool. He told us to pull like mad when he tugged twice on the rope. After a few minutes the rope went taut and we hauled as hard as we could on the rope. We had the rope wrapped one quarter turn around the tree and used it as a ratchet. I kept wondering whom we were rescuing and who was presumably dead...

Fortunately, the story had a happy ending, with both missing parties found and eventually making full recoveries. The experience stuck with Frank throughout the years and was brought to mind during an ultimately successful search for a missing 23 year old hiker in February 2006, also in winter mountain conditions.

Frank has recently transitioned from a Support Member to an Auxiliary Member in what he considers to be an RMRG “sabbatical.” He continues to provide valuable service to the group, especially maintaining group electronics and testing rescue equipment at the RMRG Test Tower.



Upcoming Events

In addition to our regularly-scheduled Wednesday meetings and Sunday practices, which are open to the public, our annual winter activities include:

Neptune Mountaineering

Holiday Gift Wrapping

Stop by Neptune Mountaineering in Boulder December 17th (10 am to 6 pm) and 18th (10 am to 2 pm) to get all your gifts wrapped by “expert” wrappers!

See our website at www.RockyMountainRescue.org for all the up-to-date details on these and other events.



Safety Lessons for Climbers

John Keller

All lead climbers accept the possibility of a leader fall. Climbers evaluate and manage the level of risk they are willing to accept. Doing so effectively involves understanding the potential consequences of any fall. As the accident on Yellow Spur has reminded us, rope failure is one of those possible consequences. A number of lessons can be extrapolated from this accident and the findings of the investigation that will help climbers determine when their rope may be at risk and make choices to protect it.

Lead climbers often place protection after passing a ledge in order to help prevent hitting the ledge during a fall. Protection may also be placed in order to prevent falling past the ledge, especially if such a fall would result in the rope running over a sharp edge. Clearly, any ledge with a sharp edge that a leader might fall past represents an extremely high risk factor. However, the rope failure tests done during the investigation suggest two additional factors to consider during such ledge transitions. First, lead climbers should attempt to visualize the geometry of a potential fall past a ledge, and consider whether a potential pendulum effect may result in a tensioned rope moving laterally across the edge. Second, climbers should consider how that geometry could differ given the failure of any piece(s) of protection along the route, possibly leading to the rope coming in contact with nearby sharp edges that may not be directly in line with the initial fall.

In some cases, slings can be used to extend gear to prevent the rope from rubbing along a sharp edge. The use of double ropes will also help to mitigate the risks for climbs where contact with sharp edges is difficult to avoid. In some cases, hazardous situations might best be managed by altering the route in order to avoid the area or even by backing off the route.

Stay safe out there.



photo: Bill May

How Did You Hear About RMRG?

Steve Dundorf

RMRG members were asked how they first heard about RMRG. The result was a pretty diverse set of stories. Here's a few of them:

Cliffhanger

I kid you not, I was trying to find the rescue group that operated out of Boulder, I looked in the phone book and even called the Fire Department but they had no clue what I was talking about. Then the movie Cliffhanger came out and I thought maybe it is under Rocky Mountain Rescue and sure enough...I saw the debut of the movie Cliffhanger and I was at the very next practice.

Troy Duckels (member since 1995)



Photo: Dave Christenson

Career Changer

In April 1996, I quit my engineering job, put everything I owned in a Uhaul, and towed my car to Boulder to take premed classes and change careers to become a medical doctor; I didn't know anyone in Boulder, so slept in the truck for a couple of days while I looked for apartments. I was in the basement of the UMC on campus getting my student ID and saw a flyer on the bulletin board recruiting for RMRG. I decided to go to meetings/practices, as it sounded like a good way to apply my outdoor skills to a purpose. I attended basically all meetings and practices for the next 6 months and was voted into membership. During those 6 months, I discovered that I could fuel my interest in medicine through mountain rescue and decided to change my graduate school aspirations to engineering, eventually completing an MS and Ph.D. in 2003 and 2006, respectively.

Steve Chappell (member since 1996)

From a Land Far Far Away

Back in 1998, I was taking "some time off" from the real world by driving a truck around the Northwest Highlands of Scotland, visiting small towns and selling imported goods from Nepal out of temporary shops set up in the town halls. Each day we would meet all of the townspeople, then at night we would see

them all at the pub. In one particular town, we met a group of young folks who were camping, so we all went back for a bonfire after a night at the pub. I remember the guy who was camping at the site letting all of us know to watch out for the steep drop off; however, it was way dark and no one could see it. One particular girl sitting next to me, either didn't hear or forgot about it, cause she leaned back, lost her balance and seemed to be sucked into the darkness (could also have been the pints). All we could hear was the tumbling - and just when we thought it stopped, we heard more. Finally it stopped and one guy went down to help her and sent me to knock on a door and get mountain rescue. I helped with the evacuation, a caterpillar strategy up the 400 feet she had fallen. This is when I got the Mountain Rescue bug.

Fast forward 6 years or so, and after looking into search & rescue in the Bay area but not joining up, I moved to Boulder, and before I arrived I had discovered RMRG. I went to my first meeting 3 weeks after arriving in town. I would have gone the first week, but the practice was named "Easter Egg Hunt", and I didn't want to crash the party with all the kids and people I didn't know - I thought it was a real Easter party! Knowing what I know now, I would obviously have showed up.

Stephen Price (member since 2005)

Prior Experience

In the summer of 1997 I was leading a group of people up Shavano Peak outside Salida. On the drive down there, I listened to the taped version of "Into Thin Air". It struck me that there were a lot of people on Everest when those events took place that didn't do anything to help, and I decided I never wanted to be one of them. At the trailhead, a Chaffee County Sheriff's Office deputy told us to keep an eye out for two elderly brothers that had gone missing in the area a day or two before. I ran into one of them on the way up, and remembering what I'd decided about helping people in trouble in the mountains, walked the guy out to the deputy at the trailhead. To make a long story short, I spent the rest of the day with Chaffee County SAR and was in the group that found and recovered the body of the other guy who'd taken a 70-80 foot fall. They asked me if I wanted to be a Prospective for their group, but I was living in Wheatridge at the time and figured my response time would be pretty slow to anything around Salida. I figured there was probably a group in Boulder I could join. I didn't know about RMRG at the time and hadn't ever given much thought to how injured people get out of the mountains after an accident before then (other than being carried out by their climbing partner). I thought, if anyplace had a mountain rescue team, it was probably Boulder.

Pat Libra (member since 1998)

We Never Charge for Rescue

RMRG does not charge for search and rescue under any circumstances. Our position is guided by the experience that people's concerns regarding billing can delay and complicate rescue operations. We are members of the Colorado Search and Rescue Board and the Mountain Rescue Association, both of which also oppose billing for mountain search and rescue services. Other agencies may also be involved in patient services and RMRG cannot control billing practices of these other agencies. For more information please see <http://www.RockyMountainRescue.org/Charging4Rescue.php>.

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Recent quotes

"We saw RMRG going up Mt. Shoshone after someone. It was very impressive. We felt we should do something." [note with donation]"

– Ron S., Boulder

"Thanks to Les, Dan, Dave, Steve, Chris for finding us so quickly on Oct 3 when we were lost descending from Rewritten. You saved us from quite an ordeal and we are so grateful. Thank you for all that you do!"

– Jennifer W., Baltimore, MD

"As a local climber, I am very thankful to have a group with your level of dedication and expertise in the area. Thanks to all of you for all your hard work."

– Roger D., Boulder

Just wanted to say thanks for the excellent work yesterday at Heil Ranch. I was the friend with [the woman] who had fallen off her mountain bike and ruptured her patellar tendon (not "just a dislocated knee"). She's doing OK but is going to need surgery asap. You guys were attentive, professional and made her feel better through the whole ordeal."

– Burke F., Boulder



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