

Photographic Essay

Red Rock Canyon and the Valley of Fire

by Douglas B. Sharp*

Twenty-five miles west of Las Vegas, Nevada, the Spring Mountains rise abruptly from the desert, and the Los Madres Mountains branch east in an arc. These uplifts comprise the Red Rock Canyon National Conservation Area, run by the United States Bureau of Land Management (BLM). Red Rock Canyon is west of Las Vegas off Route 160. Driving west, one can see uplifted strata tilted to the north at nearly 40° (Figure 1).

These strata form the Los Madres Mountains, and include the uppermost Bonanza King Formation (Figure 2), a “Cambrian” limestone that overlies the “Jurassic” maroon Aztec Sandstone that forms the bulk of the Calico Hills. A sharp contact exists between the two formations. Turtlehead Mountain is part of the Los Madres Mountains. Towards Las Vegas, the tilted strata reveal “Triassic” and “Permian” sequences. The Triassic strata are the dark purple Chinle Formation and Shinarump Conglomerate, consisting of mudstone, siltstone, sandstone and conglomerate. Beneath them is the Permian Kaibab Formation, consisting of gray limestone with intervals of white gypsum.

One of the best views of the Cambrian limestone atop the Jurassic Aztec Sandstone is at Calico Basin, a turnoff

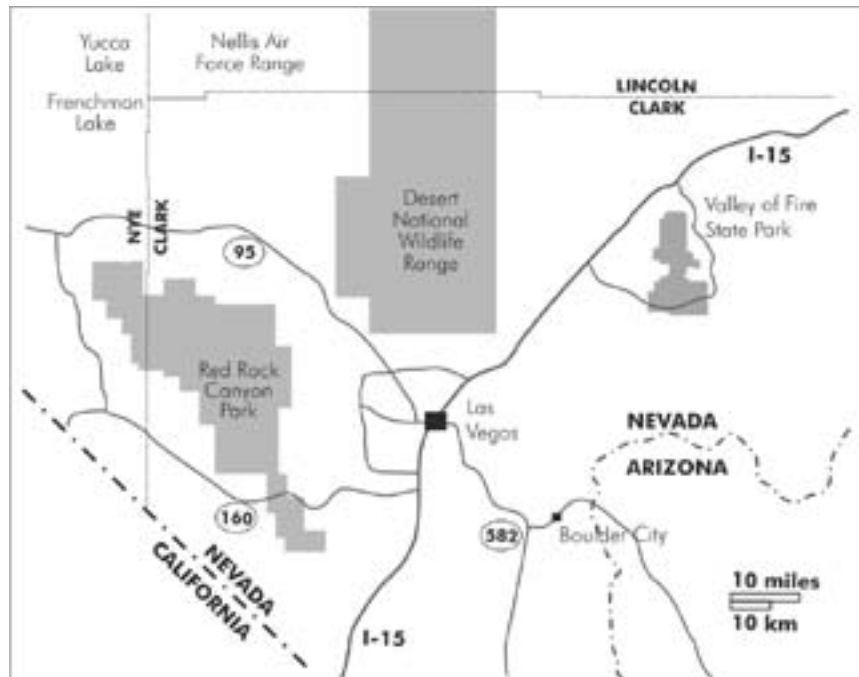


Figure 1. Location map for Red Rock Canyon National Conservation Area.



Figure 2. Bonanza King Formation as seen from Turtlehead Mountain near Calico Basin.

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Figure 3. Limestone-Sandstone sequence as seen from Calico Basin.

just before the park entrance (Figure 3). According to the geologic literature provided by the park, the out-of-order sequence is explained by the Keystone Thrust, a block of strata that was supposedly moved 60 miles from the west over the Jurassic sandstones (Madison, 1990).

The Red Rock Canyon visitors' center affords a grand view of the Calico Hills, directly beneath Turtlehead

Mountain, and the Spring Mountains to the west. The Spring Mountains contain the same out-of-order sequence as the Los Madres, with gray cap rock overlying the colorful sandstone (Figure 4). Beyond the visitor's center is a road that follows a circuit of the area. Along the route, there is a place to stop and explore the Calico Hills, a wonderland of wind and water-carved sandstone that forms a small



Figure 4. Out of order sequence at the Spring Mountains.



Figure 5. Calico Hills Canyon.



Figure 6. Alternating white and red bedding in Jurassic sandstone at Calico Hills Canyon.



Figure 8. Brecciated limestone.



Figure 7. Vertical limestone bedding on the White Rock Trail.

canyon—Calico Hills Canyon (Figure 5). Further along the route is a stop near an old sandstone quarry. The alternating white and red bedding is clearly visible at this stop (Figure 6).

The road proceeds around some switchbacks and just beyond the lookout at the highest point on the road, a turn-off takes you onto a rough gravel road to the trailhead for the White Rock Trail and Bonanza King Trail. White Rock Trail is a 10-mile circuit around a mountain, ending at Willow Creek day use area. The Bonanza King Trail branches off to the right from White Rock Trail to a limestone knoll where the contact between the limestone and sandstone can be approached from above. I walked a good distance by mistake on the White Rock Trail, thinking I was hiking to the Bonanza King Formation, but was rewarded with a marvelous view of a valley, eroded into the Red Rock Sandstone below the white Bonanza King Limestone. At this location, the limestone was almost vertical (Figure 7).

The Bonanza King Trail is shorter, only 1.1 miles long, though a bit steeper up the side of the mountain. From the White Rock parking lot, on Bonanza King Limestone, the path crosses a limestone ridge to the contact between the limestone and sandstone. At that spot, the limestone was brecciated, a sign of fault motion (Figure 8). However, the contact with the sandstone was sharp and no deformation or metamorphism was visible in the sandstone, nor was there any interbedding of the sandstone and limestone layers (Figure 9). There seemed to be a lack of physical evidence for the proposed thrusting except for the breccia, which perhaps reflects local faulting.

Without regional studies by creationists, it will be hard to determine if the Bonanza King Formation was indeed emplaced on top of younger strata. The local field evidence makes me skeptical of the uniformitarian explanation, but more investigation is needed. Whatever the geologic sequence, we understand that violent upheaval and erosion took place as the result of the Flood.

An interesting parallel to Red Rock Canyon is found 75

miles to the northeast at the Valley of Fire State Park, east on Route 159 to the Moapa Indian Reservation off Interstate 15, north of Las Vegas (Figure 1). Near the park, the Muddy Mountains tilt to the south and the bedding is easily seen. The strata there exhibit the same out-of-order sequence as Red Rock Canyon: Cambrian atop Jurassic, Triassic, and Permian. Purkey et al. (1994, p. 72) note: "This geologic similarity has let some geologists to propose that the two ranges were once part of a geologic block before Cenozoic extension pulled them apart." Two other possible explanations are that two different overthrusts produced the same out-of-order sequence 75 miles apart, or that one massive overthrust moved the Cambrian strata 150 miles. Regional



Figure 9. Contact of limestone and sandstone near the White Rock parking lot.



Figure 10. Erosion features in the sandstones at the Valley of Fire State Park.

study will be needed to evaluate the possibilities. The erosion features in the sandstone at the Valley of Fire are more complex than those of Red Rock Canyon (Figure 10).

The Muddy Mountains to the south of the park are composed of the Cambrian limestone, (Fiero, 1998) and are the first geologic features you encounter as you enter the park (Figure 11). Just after the western park boundary, the road descends down the center of a canyon, with a good view of eroded strata on both sides of the road. After the park sign, there is a view showing the contact between the limestone and sandstone. At the foot of the mountain, the red and white sandstone, carved by erosion into grotesque hoodoos, comes into view. The area is noted for this fantastic, eerie beauty and attracts many visitors (Figure 12). In this area an anticline shows Jurassic, Triassic, and Permian rocks in the center, and the older Cambrian rocks are exposed at the top, at the southern edge of the park.

Conclusion

Creationist models such as Catastrophic Plate Tectonics (Baumgardner, 2002) or the Hydroplate Model (Brown, 1995) can accommodate overthrusting. Large-scale tectonic motions are actually more believable in a catastrophic framework than a uniformitarian one. The two matching out-of-order rock sequences at Red Rock Canyon and Valley of Fire are interesting features that would be worth investigating by Flood geologists. Unconstrained by the need to keep the fossils in order, such an investigation might conclude that there was no overthrusting. Stronger physical evidence would be needed. Creationists are not limited to uniformitarian assumptions.

The 150-mile minimum distance the Cambrian strata



Figure 11. Cambrian limestones of the Muddy Mountains.



Figure 12. Hoodoos at the Valley of Fire State Park.

would have to move in the uniformitarian interpretation creates a problem with the dimensions of the thrust sheet. The proposed thrust sheet is ~15,000 feet thick. The amount of force needed to move that mass of rock should cause the rocks to buckle, instead. Reducing the force by pore pressure at the base of the thrust would be more likely in the Flood than otherwise. While the local physical evidence does not appear to support two different overthrusts, creating the same out-of-order sequence in both places, the question remains for further investigation.

References

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- For more information:**
 Red Rock Canyon Geologic History, <http://www.sunsetcities.com/redrockgeology.html>
 Calico Basin/Red Springs, <http://www.sunsetcities.com/Red-Rock-Canyon/red-springs-calico-basin/calicobasin.html>
 Red Rock Canyon, <http://www.redrockcanyon.blm.gov/Resources/geology.asp>
 Red Rock Canyon National Conservation Area, <http://www.desertusa.com/redrock/>
 Nevada Division of State Parks, Valley of Fire State Park, <http://parks.nv.gov/vf.htm>