

Geologic Treasure at the End of the Rainbow

The Lithology, Depositional Environment, Structural Observations and

Geologic History of Rainbow Basin

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Introduction

Rainbow Basin's dry desert landscape hides its geological past of shallow lake beds and streams. Rainbow Basin is located in the United States, Southern California, in San Bernardino County in the Mojave desert, near the city of Barstow. Rainbow Basin includes the rocks of the Barstow Formation. The area mapped is approximately 1 km E-W and 0.5 km N-S approximately centered on the axis of the Barstow Syncline (Figure 1). By understanding Rainbow Basin's geologic past, it can be better understood how our climate and landscape have changed. This paper addresses the lithology, depositional environment, structural observations and the geologic history of Rainbow Basin.

General Lithology and Depositional Environments

The Rainbow Basin area contains a sequence of mudstones, sandstones, limestones and air-fall tuff, aged 19.3-13.4 m.y.o. (Woodburne et al. pg 467). The rocks are part of the overall Barstow formation as described by Woodburne et al (Figure 2). The Tertiary Barstovian Middle member (Tbm) contains interbedded sandstone, layers of mudstone and siltstone approximately 10 m thick and greenish grey colored. The Tbm is visible on the farthest N and S sections of the mapping area. Above the Tbm is the Tertiary Barstovian Upper member (Tbu), with the boundary of the Tbm and Tbu designated at the bottom of the Skyline tuff.

The Skyline tuff varies in size from 10 cm to 5 m thick across the mapped area and is resistant to weathering. The Tbu contains alternating layers of reddish mudstone and limestone layers that are resistant to weathering. It also contains layers of poorly sorted sandstone, Algoma limestone, and poorly sorted conglomerate. The Tbu also contains two distinctive tuff layers. The Mudcrack tuff, named for the mudcrack casts on the bottom of the tuff layer and the Ripplemark tuff, which has ripple marks on the surface and is the youngest layer of the Tbu. As the Tbu is eroded, Quaternary Alluvium is deposited on top.

Structural Observations

The orientation of the rocks is due to the Barstow syncline, which strikes from the west to the northeast and spans the entire mapped area. The northern leg of the syncline dips to the south at an average of 15-20 degrees, with rock beds striking approximately N85W. The Southern leg of the syncline dips to the north with an average dip of 30 degrees, with rock beds striking N85W (Figure 3). Faults are identified through displacement of Skyline tuff and other units of the Tbm and Tbu. Faults strike in approximately NW-SW direction, perpendicular to the fold axis. Faults have an apparent left lateral slip and do not cut through the Quaternary Alluvium.

Geologic History

The depositional environment of Rainbow Basin indicates that it was a lacustrine environment due to its rock types of mudstone, sandstone and limestone. The Tbm shows the first evidence of a lacustrine environment through its layers of sandstone and mudstone. The Tbu begins with a volcanic eruption that caused tuff to fall to the ground over the entire area. Small rivers flowed in and carried sand and silt as shown by the poorly sorted sandstone and conglomerate layers. A shallow lake formed and then dried out. Then another volcanic event deposited tuff onto the muddy lake bed, which is indicated by the Mudcrack tuff. Evidence of a shallow lake is further shown in the algomat limestone and ripplemark layers. After the lacustrine environment dried out, the rock units were folded along the E-W axis and faulting happened. It is unknown as to which happened first, the faulting or the folding. The surrounding areas and the Tbu were then eroded and deposition of the Quaternary Alluvium occurred. Rainbow Basin's depositional environment shows evidence of a shallow lake that repeatedly filled up and dried out.

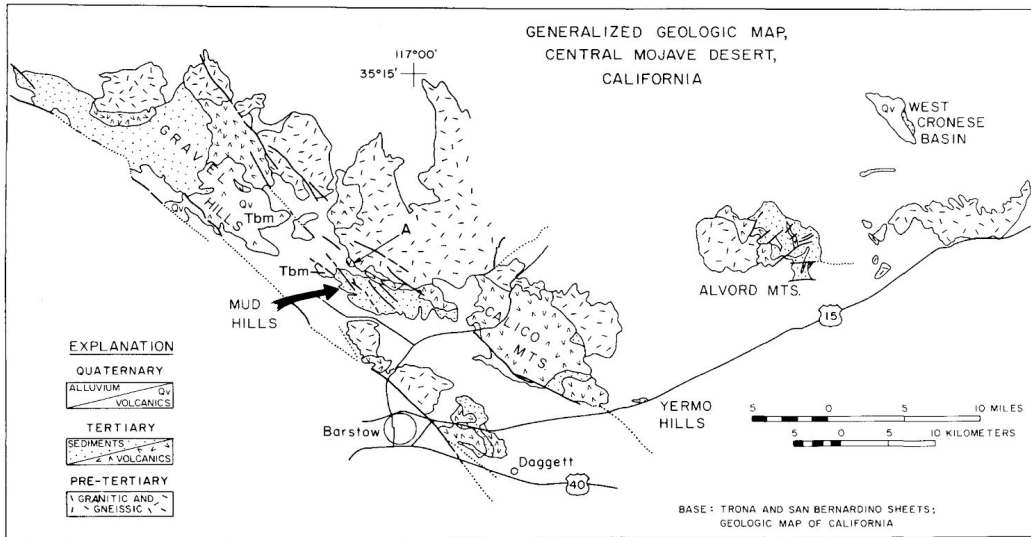


Figure 1. Location of Rainbow Basin (Woodburne et al pg 460). Rainbow Basin is located in the Mud Hills area.

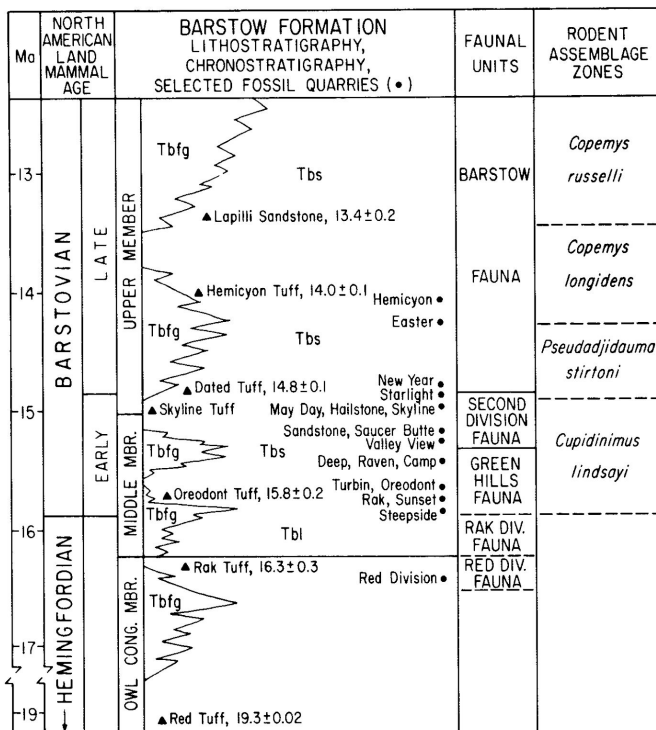


Figure 2. Geochronology of Barstow Formation showing marker beds and ages, faunal units and land mammals (Woodburne et al pg 467).



Figure 3. Picture showing north limb and south limb of the Barstow syncline, showing the dip degree difference from each limb and the direction of the dip. Person for scale.

Figure 4. Large Map of Rainbow Basin Included with Report with cross section

Works Cited

Woodburne, M.O., Tedford, R.H., Swisher, C.C., 1990, Lithostratigraphy, biostratigraphy and geochronology of the Barstow Formation, Mojave Desert, southern California, Geological Society of America Bulletin, v. 102, 459-477.