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Geologic Map of the Southern McDermitt Region 1:24,000, Humboldt County, Nevada

Jorge Crespo¹, Christopher Henry¹, Simon Jowitt^{1,2}, Carolina Muñoz-Saez³

¹Nevada Bureau of Mines and Geology, University of Nevada Reno, Reno, United States, ²Ralph J. Roberts Center for Research in Economic Geology, Reno, United States, ³Earth and Atmospheric Sciences Department, Cornell University, Ithaca, United States

This study presents new 1:24,000-scale geologic mapping of the Thacker Pass area in the southern sector of the McDermitt caldera, northern Nevada, which hosts the largest currently known lithium (Li) resources in the United States. Detailed geologic mapping conducted between 2023 and 2025, combined with thin-section petrography, whole-rock and mineral geochemistry, geophysical interpretation, and high-precision geochronology, provides new lithologic and structural constraints on the distribution and potential origin of Li mineralization within the caldera. These results also offer insights applicable to similar Li-bearing volcanic basins and mineralized systems in the western United States and globally.

The McDermitt caldera, located in Humboldt County, Nevada, formed at 16.39 Ma during eruption of the ~1,000 km³ McDermitt, producing more than 500 m of collapse and extensive intracaldera tuff deposits. The caldera, approximately 40 × 30 km in size, forms part of the Yellowstone hotspot track and lies near the northern termination of the Northern Nevada Rift. The Middle Miocene volcanic activity associated with caldera formation includes the pre-caldera Steens Basalt and intermediate lavas, rhyolitic lava flows, distal ash-flow tuffs, and zoned units of the McDermitt Tuff. Post-caldera volcanism included rhyolite lavas and icelandite eruptions between ~16.38 and 16.08 Ma.

Following caldera collapse, up to ~210 m of intracaldera tuffaceous sediments accumulated, dominated by bedded tuffaceous sandstone, siltstone, mudstone, and tephra with minor conglomerate and limestone. These sediments host stratiform, lithium-bearing clay deposits formed through diagenetic processes in a closed hydrologic system within an alkaline lacustrine environment between ~16.4 and 14.9 Ma. The Thacker Pass deposit represents one of the largest known Li resources globally, with an estimated 66.1 Mt of contained lithium carbonate equivalent. This new mapping clarifies the distribution of sedimentary units, volcanic stratigraphy, and structural controls that influence Li-clay mineralization in the southern McDermitt caldera.