

Timing and Characteristics of Mineralization at the Robinson Porphyry Cu-Mo Deposit, Nevada

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Copper, one of the newest additions to the USGS critical minerals list, has a crucial role in the global effort to reduce atmospheric carbon as part of the transition to greener energy. The Robinson porphyry Cu-Mo deposit, located in White Pine County four miles west of Ely, has consistently since 2005 produced over 70% of Nevada's copper and is the state's only producer of molybdenum, making it an ideal location to study copper and molybdenum mineralization in Nevada. An age of ~110 Ma, based on K–Ar dating, represents the only available temporal constraint; however, the timing of the mineralizing system remains unconstrained. This places Robinson in the late Early Cretaceous, when seafloor spreading rates began to increase, accelerating the Farallon Plate relative to the North American Plate and resulting in higher magmatic volumes and a transition to flat-slab subduction.

The Liberty Pit at Robinson is a large open-pit mining operation composed of a porphyry stock that intrudes into the Pennsylvanian Ely Limestone Formation and the upper member of the Mississippian Chainman Formation, which hosts both porphyry and skarn mineralization. This study focuses on providing updated geochronology and paragenesis for the Liberty Pit, constraining the temporal and geological setting of the Robinson deposit. New zircon U-Pb, trace and rare earth element, and Lu-Hf isotopic data from mineralized and unmineralized porphyry intrusion units combined with Re-Os dating of molybdenite will allow detailed investigation of the timing of mineralization. Oxybarometry on both sets of zircons will provide insights into the redox conditions of the parental magma and mineralization, while andradite versus grossular in the skarn can offer a qualitative assessment of the fluid's redox potential. This new data, combined with petrography, will constrain the timing and geological setting of one of the important porphyry systems of the Great Basin.