

## **Multistage Skarn Formation in the Yerington District: Insights From Garnet Zoning and U-Pb Geochronology**

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The Yerington district, Nevada, USA, hosts complex skarn Cu deposits that have been genetically linked to the porphyry Cu systems. However, an absolute age of skarn formation has not been obtained. This study employs LA-ICP-MS U-Pb garnet dating and geochemical mapping to investigate their origin. Metasomatism created complex garnet zoning but two texturally distinctive garnet types can be identified: early euhedral garnet, and later overprinting garnet that crosscuts the primary garnet. Both types vary in composition from Al-rich to Fe-rich and seem to follow opposing spatial zonation at the district scale. While primary garnet generations vary from grossularitic, proximal to the Yerington batholith, to andraditic, more distally from the intrusion, the secondary garnet overprinting andradite in the more distal exposures is Al-rich, whereas more Fe-rich veins crosscut grossularitic garnet closer to the Yerington batholith. We suggest that the reversed compositional zonation could reflect an inversed fluid flow direction, potentially linked to another magmatic activity. Garnet U-Pb dating indicates the occurrence of various metasomatic stages that can be analytically resolved over a maximum period of ~8 Myr. The primary garnet generally correlates in age with the Yerington batholith magmatism and the associated porphyry Cu deposits. On the contrary, the secondary garnet significantly post-dates the magmatic activity of the Yerington batholith. Interestingly, zircon U-Pb dating of the Shamrock batholith, bounding the skarn-hosting limestone to the South, suggests that the Shamrock magmatism may have sourced the fluids for the late metasomatic events. This link between the Shamrock, presumably barren, and the Cu skarns, disrupts the exclusive relation assumed between skarn formation and the northern Yerington batholith and could have important implications for the final distribution of the Cu ores and their exploration.