

Reactivated Rheological Boundary as a Framework Control on Mineralization in Bare Mountains District, Nevada

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The Bare Mountains of Southern Nevada records four deformation phases spanning Mesozoic compression through Miocene extension, producing polymetallic mineral endowment. Bare Mountains hosts >1.5Moz of gold, complemented by more than a century of fluorite, mercury, and tungsten production. Structural controls on the distribution and diversity of deposits have not previously been integrated into a unified deformation and mineralization history. This synthesis demonstrates that repeated reactivation of a rheological boundary and sharp structural discontinuity at Proterozoic-Cambrian contacts is the primary architectural control on mineralization.

During Sevier compression, the P-C boundary hosted east-vergent, thrust displacement with >50% shortening. During Miocene extension, two phases of accelerated crustal extension caused faulting, reactivation at major contacts and unconformities: an earlier phase (~12.7-11.6 Ma) in the east, affecting the Bare Mountains, and a later western phase (~10.3-8.1Ma). These faults and contacts now create juxtaposition of Proterozoic sediments against Cambrian limestones, or as the low-angle Fluorspar Canyon structural discontinuity. Two N-S-trending district-scale corridors (Sterling-Telluride and Daisy-Reward) show mineralization concentrated where high-angle Tertiary normal faults intersect the rheological boundary. Mineralization records an ~12Ma event N-younging and ~9Ma eastern. Gold at Sterling sits on a thrust contact, elevated where intersected by Cenozoic faults. Gold at Reward is controlled by the Gold Ace fault, a HW splay above the deeper structural discontinuity. Fluorite at Daisy represents lower-temperature lateral migration into carbonates above the rheological boundary. Mercury at Telluride occupies shallowest positions. This vertical zonation of tungsten (deep) through gold, fluorite, to mercury (shallow) records a single hydrothermal system driven by Timber Mountain-Oasis Valley caldera magmatism channeled by the reactivated rheological boundary.

Late extensional reactivation, derived from regional discontinuities provides the primary control on mineralization at Bare Mountains, with intersecting lithologies, rheology, and fracture density governing deposit-scale mineralization. This framework is considered directly transferable to multi-million ounce Merlin-Silicon deposit 8km north.