

Exploring the Tops of Porphyry Systems in the Toodoggone, BC

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The Lawyers–Ranch project in the Toodoggone district of northern British Columbia preserves multiple levels of porphyry–epithermal systems, including both high-sulfidation (HS) and low-sulfidation (LS) epithermal environments. This framework provides a rare opportunity to characterize the uppermost expressions of porphyry systems and their vertical transitions.

At Ranch, gold–silver–Cu HS mineralization is hosted within a well-developed lithocap defined by silicic and advanced argillic alteration (alunite–pyrophyllite–dickite). Geological and geochemical indicators, including gusano textures, diatreme breccias, and elevated molybdenum within the Moly Corridor, delineate a focused hydrothermal upflow zone. These features, together with geophysical anomalies and transitions into sericite- and locally propylitic-altered rocks, are interpreted to represent the lithocap–porphyry transition above a concealed intrusion.

In contrast, 15-km away, Ranch East exposes a >1 km-scale zone of high-temperature inner propylitic alteration at surface, characterized by actinolite–epidote assemblages, magnetite–actinolite veins with albite halos, and associated copper–silver mineralization. These features indicate exposure of deeper levels of a porphyry system.

Regionally, the adjacent Lawyers deposits represent a classic LS epithermal system, spatially and genetically linked to the same magmatic framework. The coexistence of LS and HS epithermal systems with both shallow lithocap and deeper porphyry-level alteration demonstrates preservation of a vertically extensive magmatic–hydrothermal system.

This integrated model provides critical vectors for porphyry exploration beneath lithocaps and highlights the potential for additional concealed intrusions within the Toodoggone district.