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Placer Gold in Colorado: Fingerprinting the Source of Gold in the Alma and Fairplay Districts

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Since the Pikes Peak Gold rush of 1859, the Alma and Fairplay districts of Colorado have produced over 230,000 ounces of placer gold. Despite the historical and economic significance of placer mining in these districts, the provenance of the placer gold remains untested even though several historic lode gold deposits occur upstream in the Mosquito Range. These deposits include the London Mine group on London and Pennsylvania mountains, which is estimated to have produced at least 750,000 to 1,000,000 ounces of gold. To test whether the Fairplay and Alma placer gold could have been derived from the same veins mined at the London Mine group, gold-bearing quartz vein samples were collected and compared to quartz-bearing nuggets from glacial placer deposits on Pennsylvania Mountain in the Alma district and downstream gold from the Fairplay district. Petrographic and cathodoluminescence studies reveal similar quartz textures in vein material and placer samples. Furthermore, the fluid inclusion inventory in vein quartz and quartz within placer gold grains is dominated by CO₂-bearing fluid inclusions, indicating that quartz formation occurred at depths exceeding 5–6 km below paleosurface. The polymetallic character of the veins and their inferred emplacement depth suggest an intrusion-related origin for the gold. In addition, the mineral inclusion inventory of the vein gold and placer gold, as determined by SEM-EDS, are similar. Combined with major element data from electron microprobe and Pb isotope and trace-element analyses by LA-ICP-MS, the vein system of the London Mine group appears to be a likely source of the placer gold. These analyses establish the Alma and Fairplay districts as a rare example of a gold placer linked to an intrusion-related lode system. This interpretation has broad implications because it suggests that placer gold globally may not only be derived from orogenic and epithermal sources.