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# Remote Sensing of the Copper Creek District, Arizona.

## Results from Aster, Airborne Hyperspectral and Field Spectroscopy.

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The Copper Creek area, part of the Bunker Hill District, Pinal County, Arizona, lies on the west side of the Galiuro Mountains, 75 kilometers (45 miles) northeast of Tucson. The district lies in the heart of the southwestern U.S. porphyry copper province, at the intersection of important belts of deposits trending NW-SE (Miami-Globe, Resolution, Ray, Bisbee) and WSW-ENE (Lakeshore, Silver Bell, San Manuel-Kalamazoo, Safford, Morenci).

The district is centred on the Copper Creek granodiorite, the central of three Laramide granodiorite intrusions forming a northwest-oriented cluster. The Copper Creek granodiorite was emplaced approximately 62 million years ago into Precambrian and Paleozoic sedimentary rocks, Late Precambrian diabase, and Cretaceous Glory Hole volcanics. The Copper Creek stock and adjacent Glory Hole volcanics have been intruded by a sequence of Laramide granodiorite, monzogranite, and quartz diorite porphyry plugs and dykes. The district is marked by over 400 hydrothermal breccia bodies, ranging from a few feet to several hundred feet across, which (like the porphyry bodies) are concentrated in two northwest-trending belts. Post-mineral, mid-Tertiary Galiuro Volcanics cover all these rocks on the east and northeast. To the southwest, the district is bounded by a northwest-trending range-front fault which downdrops Tertiary Gila Conglomerate against the Laramide and older rocks.

In 2011 an alteration map was generated for the district using Aster data. The results suggested that alteration around the Copper Creek deposit is zoned, with strong illite and advanced argillic alteration in the western-central part of the project and weaker illite-smectite signatures in the south-east. Propyllitic alteration is mapped exclusively in the northern part of the area.

In July 2015 Hyperspectral imagery (HSI) was acquired over the Copper Creek mining district for Redhawk Resources by SpecTIR LLC using an AISA Eagle/Hawk (Dual) hyperspectral camera system. The campaign was followed up using a Spectral Evolution portable spectrometer.

The results of the HSI analysis and the field spectroscopy corresponded well with the earlier results from the Aster analysis, showing a zoning from low-Al illite in the south-east to high-Al illite and kaolinite (+/- alunite-pyrophillite) in the central zone to chlorite calcite (+/- illite-smectite) in the north-west.