



Biogeochemical expression of uranium mineralisation by Eremophila shrubs in the northern Flinders Ranges - western Lake Frome Plains, South Australia

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A manuscript submitted for the Honours Degree of
Bachelor of Science at the University of Adelaide

October 2009

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Abstract

The widespread shrub species *Eremophila freelingii*, of inland Australia, has successfully expressed elevated U contents in both leaf and twig samples at workings of known mineralisation in the Mt. Painter region, South Australia. Leaf material produced reasonable contrast in U concentrations and good success rate at expressing buried mineralisation with approximately 75% of all samples returning a U concentration greater than or equal to analytical detection limit (DL). A comparison of leaf with twig material from *E. freelingii* makes this study unique. Elements generally occur in higher concentration in twig tissues than leaves, although twigs have a greater tendency to host detrital (dust) inputs. The highest U concentration came from the high-grade historic Hodgkinson U-prospect (0.25% U₃O₈). Overall leaves contained 0.05 – 0.24 ppm U and twigs contained 0.08 – 0.41 ppm U (1.04-5.86 times higher). Twigs also hosted Re up to 266 times the DL when leaves produced values below the DL. Re elevations in leaf tissue is characteristic of the intrusive granites; Pinnacles and Needles. Beryllium is also unique to Hodgkinson and the Pinnacles and Needles sites. A few traditional U pathfinder elements have an association with U in plant tissues including; Y, Ce, La on a regional scale, and more exclusively at Four Mile West. Other elements; Li and Be displayed associations with U in twigs limited to the Hodgkinson prospect. Mineralisation in the Four Mile West sequence occurs in the Eyre Formation (Four Mile U-prospect) and in the Namba Formation (Beverley U deposit). *E. freelingii* displays elevations in U situated over these units at concentrations above the regional biogeochemical average. Other popular commodities, Au and Ag, were present in low concentrations and returned values \geq DL in 25.3% and 57.8% of all samples respectively. The Four Mile West sequence hosts the highest Au concentrations, while the hematite breccias host the elevated Ag results. Elevated Zn concentrations are also characteristic of the hematite breccias. Copper showed high variation (3.12 – 32.02 ppm) in all samples but these results do not appear to be closely associated with geological setting. The wide range of element accumulation *E. freelingii* is able to display would stimulate further research with this species in biogeochemical exploration.

KEY WORDS: Uranium, biogeochemistry, mineral exploration, Eremophila, emu-bush, Flinders Ranges