BOTANICAL METHODS
FOR
MINERAL EXPLORATION
IN
WESTERN AUSTRALIA

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ABSTRACT

The application of vegetation to mineral exploration was investigated in the semi-desert mulga zone of Western Australia. *Acacia aneura* (mulga) dominated the vegetation and was employed in several biogeochemical surveys to locate subsurface copper and nickel mineralisation after successful orientation surveys over outcropping areas.

Copper concentrations in *A. aneura* leaf were adequate for locating cupriferous zones in the Murchison Region. In the Kurrajong Region, *A. aneura* was employed to locate nickel sulphide mineralisation in a terrain of serpentinised and lateritised ultrabasics, characterised by high and variable nickel levels. It was possible to distinguish sulphide mineralisation from lateritic areas by consideration of coincident nickel and manganese biogeochemical anomalies.

A nickel-accumulating variety of the shrub, *Hybanthus floribundus*, was discovered in the Kurrajong Region. Other *Hybanthus* varieties were also found to accumulate nickel, in more southern parts of Western Australia. Plant chemistry studies indicated that nickel was concentrated in the leaf epidermis as a small, water-soluble positively-charged complex. The value of these nickel-accumulating shrubs in locating nickeliferous areas was demonstrated. Preliminary attempts to detect this shrub, from the air, using colour infrared photography were unsuccessful, although the potential of colour film to take advantage of the anomalous yellow colour during the summer season was realised.

Three tree species, *Acacia coolgardiensis*, *A. resinomarginea*, and *A. burkittii*, exhibited pronounced geobotanical relationships. The first two species were restricted to metabasalt and metagabbro ridges, whilst *A. burkittii* characterised calcareous serpentinised pyroxenites. It was found that a usable colour infrared image could not be obtained by vertical aerial photography because of the infundibular growth-form exhibited by this xerophytic vegetation. However the application of this film to photogeology was confirmed.

The possibility of using selenium as a path finder for sulphide mineralisation was investigated. A suitably-rapid instrumental method for the determination of selenium and tellurium was developed and a selenium accumulating tree, *Acacia oswaldii*, was subsequently discovered. A known toxic shrub, *Swainsona canescens*, also accumulated selenium, and the potential of this seleniferous flora in locating sulphides has yet to be demonstrated.

It was concluded that the research embodied in this thesis has indicated the application of botanical methods to mineral exploration in the Eremean Province of Western Australia, and has outlined promising avenues for further investigations.

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