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Genetic analysis for the development of vegetation services and sustainable environmental management

Ecosystem Science

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Project Team

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Program Leader

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Genetic analysis for the development of vegetation services and sustainable environmental management

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Context

Understanding the genetic structure and function of plants is important for their effective utilisation for revegetation, mine-site rehabilitation and provision of ecosystem services, such as hydrological balance, pollination and habitat connectivity.

Aims

Provide genetic information for the conservation and utilisation of plant species for revegetation and rehabilitation. Current work aims to identify seed collection zones for species used in rehabilitation of minesites in the Pilbara and the Midwest.

Progress

- Data analysis for both nuclear and cpDNA markers is complete for eight species in the Pilbara for the identification of seed collection zones, *Petalostylis labicheoides*, *Indigofera monophylla*, *Senna glutinosa*, *Corymbia hamersleyana*, *Acacia pruinocarpa*, *A. hilliania*, *A. spondylophylla* and *Mirbelia viminialis*. Papers on these studies are in preparation.
- A synthesis paper on modelling seed collection and restoration establishment scenarios for *G. paradoxa*, *Melaleuca nematophylla*, *Mirbelia* sp. *bursarioides* and *G. globosa* has been accepted for publication in *Australian Journal of Botany*.

Management implications

- Pilbara seed collection zones - The high levels of genetic diversity and low levels of differentiation within *E. leucophloia* and *A. ancistrocarpa* imply that, for these species, seed resources for land rehabilitation and mine-site revegetation programs can be selected from a wide distributional range within the Pilbara. However, phylogeographic analysis of *E. leucophloia* has identified the Hamersley Range as a historical refugium, so seed collections for rehabilitation of mine sites using this species should be targeted within the Hamersley Range to maximise the diversity of these sites. In contrast, the low diversity and high population differentiation in *A. atkinsiana* indicates that more restricted seed collection zones should be observed.
- *Aluta quadrata* -The significant genetic structure in *A. quadrata* indicates three conservation or management units: Western Range, Pirraboradoo and Howie's Hole. Given the genetic differences, restricted distribution and size of the populations, a precautionary approach should be taken to seed collections. Establishment of restoration populations within gene flow distance of existing populations should be done with seed from the location of that population. However, mixing seed collections from the three locations for establishment of restoration sites located distant to existing populations would be a means of maximising genetic diversity for future conservation.
- Midwest seed collection zones - Genetic analysis of four species has provided a basis for identification of seed collection zones for land rehabilitation and mine-site revegetation programs, with species wide collections for *M. nematophylla* (except for the divergent Murchison River gorge), *G. globosa* and *Mirbelia* sp. *bursarioides*, while three regional seed collection zones were identified for the bird-pollinated *G. paradoxa* that showed limited pollen dispersal.

Future directions

- Four papers will be written, reporting the genetic results for the eight Pilbara species with recommendations for seed collection zones.