

# Provenancing for landscape restoration in the Midwest

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## Background

Practical recommendations for effective seed provenancing regimes for landscape restoration are limited. Restoration that is successful in the long-term is likely to be best achieved with provenancing regimes that acknowledge divergent evolutionary lineages, genetic diversity, historical and contemporary patterns of genetic structure and gene flow. The life history traits of plant species should also be considered, as well as current and potentially altered future ecogeographic conditions at seed source and restoration sites. The Midwest region of Western Australia has significant biodiversity conservation values where extensive mineral exploration and extraction activities will necessitate restoration of considerable areas of highly disturbed land. Successful establishment and long-term persistence of restoration populations is a key objective in this region.

We used an integrated approach to develop provenancing regimes for four foundation plant species required for restoration projects in highly altered post-mining landscapes of the Midwest. *Grevillea paradoxa*, *Melaleuca nematophylla*, *Grevillea globosa*, and *Mirbelia* sp. Bursarioides are perennial species that occur in thicket/shrubland or woodland/thicket communities of banded iron formation slopes and crests. These species are likely to be utilised for landscape restoration across large areas of the region. Genetic data (sequencing of chloroplast DNA regions and genotyping with nuclear microsatellite loci) was generated in order to assess the distribution of genetically divergent lineages and historical and contemporary patterns of genetic structure and gene flow for the study species. Genetic data was integrated with knowledge of species specific life history traits that affect demography and gene flow, and simulation modelling used to develop provenancing regimes that optimise the initial capture and maintenance of genetic diversity through subsequent generations.



Left; *Grevillea paradoxa*. Middle; *Grevillea globosa*. Right: *Melaleuca nematophylla* (flowering, midground) and *Mirbelia* sp. Bursarioides (foreground). Photographs MA Millar.

## Findings

The species showed different patterns of historical and contemporary genetic diversity and structure, that lead to different recommendations for seed sourcing for restoration.

- *Grevillea globosa* showed high contemporary genetic diversity with geographical structure although divergence among populations was low, with only a weak signal of isolation by distance. This implies overall effective genetic connectivity across this species range.

