Progress Report SP 2011-011

Protecting the safe havens: will granite outcrop environments serve as refuges for flora threatened by climate change?

Ecosystem Science

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Project status as of July 11, 2016, 10:32 a.m.

Approved and active

Document endorsements and approvals as of July 11, 2016, 10:32 a.m.

Project Team	granted
Program Leader	granted
Directorate	granted

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Context

Many plant and animal species have survived previous climate change by contracting to dispersed refugia where local climate conditions ameliorate regional changes. Such refugia will likely contribute to the persistence of biodiversity under projected climate change. In south-west Western Australia, the old, highly weathered and flat landscape offers little scope for the biota to migrate to altitudinal refugia during climate change. However, the many granite outcrops (GOs) scattered across the region provide a suite of habitats and conditions not found in the wider landscape and these may ameliorate the impacts of regional climate change.

Aims

- Investigate the potential of GOs and their associated environments to act as refugia in the face of anthropogenic climate change across south-west Western Australia.
- Determine whether topographic and microhabitat features of GOs designate them as refugia.
- Use phylogeographic patterns to determine whether GOs have acted as refugia in the past and are important reservoirs of genetic diversity.
- Determine whether particular environments at the base of GOs are more productive, and whether individual plants in these environments are under less stress than those in the intervening matrix.
- Determine whether plant communities of GOs are more resilient to anthropogenic climate change disturbances than the communities of the surrounding landscape matrix.

Progress

- Continued analysis of patterns of floristic composition in GO plant communities and their relationships with climate, topographic and microhabitat features on outcrops.
- Ecological niche models for the threatened *Ornduffia calthifolia* and the rare *O. marchantii*revealed that under the influence of projected climate change, topography and micro-habitats in the Porongurups will provide refugia for both species, but limits to this capacity may be reached if global warming exceeds 2C. A paper has been prepared and is in review.

Management implications

Identification of areas that can act as refugia under projected climate change enables adaptation and conservation activities to be focused where they will provide greatest benefit in facilitating species persistence and continued ecosystem function.

Future directions

- Complete analysis of the floristic dataset from 17 GOs and model the influence of climate, microclimate and soil depth on GO plant community composition.
- Write journal papers on ecological evidence for granite outcrops as historical and future climate change refugia.