Conservation of plant diversity in wheatbelt nature reserves

Our research on the interacting influences of fire, fragmentation and weed invasion in mallee and mallee-heath is contributing to improved conservation management of remnant vegetation in the the Western Australian wheatbelt.

THE CHALLENGE

Multiple threatening processes

South-west Western Australia is renowned for its floristic richness and levels of endemism, but also for the degree of threat the flora faces.

As in other Mediterranean-climate regions, fire has been an important feature of this landscape for millennia. However, since European settlement, native vegetation has been removed from large portions of the wheatbelt, resulting in a disruption to the patterns and processes of fires.

Because many remnants of native vegetation are small and isolated there are real concerns that prescribed burning, together with other threatening processes, will have undesirable consequences for the native biota. For example, some fire regimes may reduce the resistance of native plant communities to invasion by non-native annuals that are abundant in the surrounding landscape.

On the other hand, there is a danger that biodiversity will be lost regardless, because of a lack of any fire management.

Wheatbelt remnants support remarkable plant diversity; in this case, a range of Verticordia spp. © Carl Gosper and Georg Wiehl

OUR RESPONSE

The wheatbelt fire chronosequence

We are working with the Department of Parks and Wildlife (http://www.dpaw.wa.gov.au) to study the responses of mallee and mallee-heath remnants to fire and weed invasion.

Using satellite imagery, we have characterised current fire regimes experienced by remnants and how these relate to landscape context, and established a fire chronosequence of 40 sites in mallee and 48 in mallee-heath. We have assessed changes in plant species composition and function, vegetation structure, and changes in the vital rates of fire-interval sensitive flora at these sites.

We have also conducted an experiment testing whether fire and fragmentation-related processes interact to reduce resistance of mallee to weed invasion

THE RESULTS

Science informing conservation management

Our findings have important management implications for remnant vegetation in the wheatbelt.

Small wheatbelt remnants (fewer than 100 hectares) experience fire much less often than larger remnants. For this reason, threats to flora from fire regimes differ based on the remnant size, so different management approaches are needed in different size remnants.

In mallee-heath, plant diversity and vigour decline when there are very long intervals (more than 80 years) between fires, so periodic fire is essential to maintain this vegetation community. This is not the case in mallee communities where plant diversity and vegetation structure are resilient to long intervals without fire.

Both mallee-heath and mallee communities have non-resprouting species that do not accumulate a substantial seed bank for at least 25–30 years after fire. These species are vulnerable when there is only a short interval between fires.

Other species in mallee-heath exhibited significant mortality when there are long intervals between fires, as currently being experienced in small wheatbelt remnants. Given the variability in seed production and mortality between populations, sampling these vital attributes prior to fire management activities will improve conservation outcomes.

Although fire in itself had little effect on weed performance, weeds thrived on nutrient-enriched edges of remnants with or without recent fire.

A Banksia follicle opened after fire to release intact seeds © Carl Gosper and Georg Wiehl

Research summaries and findings

Comprehensive summaries of research findings and management implications are contained in the following Department of Parks and Wildlife science information sheets:

- Fragmentation but not fire facilitates weed invasion in mallee (https://www.dpaw.wa.gov.au/images/documents/about/science/pubs/infosheets/sdis010.pdf)
- Ecological effects of creating fuel-modified zones by chaining and burning (http://www.dpaw.wa.gov.au/images/documents/about/science/pubs/infosheets/sdis027.pdf)
- Changes in plant diversity and vegetation structure with time since fire in mallee and mallee-heath (http://www.dpaw.wa.gov.au/images/documents/about/science/pubs/infosheets/sdis033.pdf)
- Using fruit crop and mortality to determine appropriate fire-return intervals (http://www.dpaw.wa.gov.au/images/documents/about/science/pubs/infosheets/sdis039.pdf)
- Plant functional types as a tool for predicting vegetation change with time since fire (http://www.dpaw.wa.gov.au/images/documents/about/science/pubs/infosheets/sdis064.pdf).

Last updated: Last updated: 8 November 2016

Printed from: Conservation of plant diversity in wheatbelt nature reserves (http://csiroaucd1-cdc.it.csiro.au/en/Research/LWF/Areas/Ecosystems-biodiversity/Monitoring-biodiversity/Agricultural-landscape-biodiversity/Fire-weeds-diversity)