Parks Victoria Research Partners Panel
Project Summary Report

Northern Mallee Parks
Geometric Mean Abundance Scenario Testing

Parks Victoria and The University of Melbourne

Background

Fire shapes ecosystems across Victoria and is widely used as a management tool. Parks Victoria manages fires based on the objectives of the *Code of Practice for Bushfire Management on Public Land* (2012): to minimise the impact of major bushfires on human life and communities; and to maintain or improve the resilience of natural ecosystems. A key measure of ecosystem resilience used by Parks Victoria in fire management planning is the geometric mean of species' relative abundance (GMA).

Recent work shows that GMA is a useful biodiversity index because it measures changes in the abundance of multiple species. Defining fire management objectives based on GMA can assist managers in determining whether the vegetation growth stage structure is adequate to maintain habitat for fauna species or whether management interventions such as planned burning are needed to create or protect key growth stages. As a relatively new approach, there is a need to better understand how to use GMA to set fire management objectives in parks and nature reserves.

Aims

The aim of this project was to refine the use of GMA as a monitoring and fire management tool in the Northern Mallee Parks. It addressed three key questions:

1. How sensitive is the optimal allocation of vegetation growth stages based on GMA to the type of fauna data used, the differences between local vegetation types and the number of vegetation growth stages?

2. How does the current distribution of vegetation growth stages in the Northern Mallee Parks compare to the optimal vegetation growth stage structure based on GMA?

3. How does GMA and the distribution of vegetation growth stages in the Northern Mallee Parks differ between 2011 and 2015?

Relevant parks and ecosystems

Murray Sunset NP

Hattah-Kulkyne NP

'Mallee' ecosystems

More information

Contact Parks Victoria on 13 1963

Publications and presentations

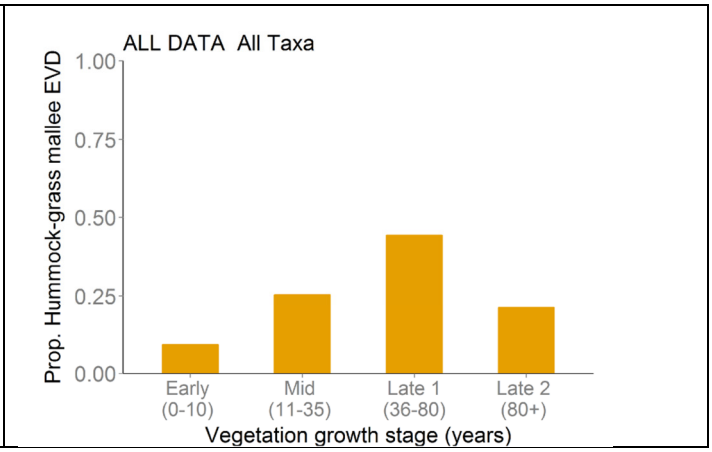
A modified version of this report forms a chapter of Kate Giljohann's PhD thesis. It will be submitted for publication in the peer-reviewed literature in August 2015.

Thesis title: 'Optimal management for biodiversity conservation in semi-arid mallee ecosystems'. School of BioSciences, The University of Melbourne.

Luke Kelly is presenting a summary of this work at the Forest Sciences Centre of Catalonia, Spain in July 2015.

Kate Giljohann is presenting a summary of this work at the ARC Centre of Excellence for Environmental Decisions Annual Conference, Canberra in December 2015.

Prescribed fire in Hummock-grass Mallee, Murray Sunset National Park



Proportion of vegetation growth stages that maximise geometric mean of species' relative abundance for combined vertebrate data sets in Hummock-grass Mallee.

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Results

We explored the use of GMA using three fauna datasets: presence-absence data from the Mallee Fire and Biodiversity Project, presence-only data from a Threatened Bird database and expert estimates of relative abundance from the Future Fauna Occupancy database. Each data set contained different combinations of bird, mammal and/or reptiles species.

The vegetation growth stage structure that maximised GMA for all Hummock-grass Mallee data combined was weighted towards older vegetation. For the classification using four growth stages, the GMA for birds, mammals and reptiles in Hummock-grass Mallee was maximised by proportional allocations of 0-10 years (0.09), 11-35 years (0.25), 36-80 years (0.48) and 80+ years (0.18) vegetation. The vegetation growth stage structure that maximised GMA for all Saltbush Mallee data combined was also weighted towards older vegetation. This result was largely consistent across alternative growth stage classifications.

The optimal GMA solution was sensitive to the type of data and species included in the analyses. Combining multiple data sets is advantageous when there is confidence in the estimates of species responses to fire. The optimal growth stage structure for Hummock-grass Mallee was similar to the observed (current) growth stage structure of the Northern Mallee Parks. In Saltbush Mallee, the observed growth stage structure contained a greater amount of recently burnt vegetation than the optimal solution. Since 2011, there has been a small increase in the amount of recently burnt vegetation.

Implications

Retaining large proportions of vegetation ≥11-35 years will maximise biodiversity in the Northern Mallee Parks. Planned burning strategies should also retain areas of vegetation >80 years post-fire, which is important for several species, and very hard to replace. We recommend using GMA, and the optimisation procedure we developed, to set fire management objectives in the Northern Mallee Parks. This method should be complemented by other measures of biodiversity (e.g. population changes of individual threatened species) and fire regimes (e.g. Tolerable Fire Intervals).

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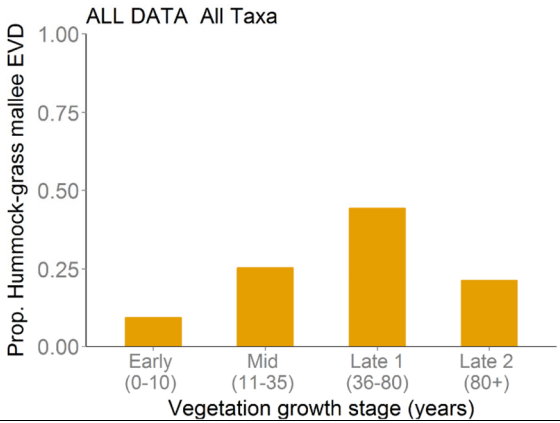

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