Towards a Landscape Conservation Culture: anticipating change in the Tingle Mosaic, south-western Australia

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Introduction

The Tingle Mosaic in south-western Australia includes the wettest and least seasonal part of Western Australia, and harbors an extraordinary diversity of vascular plants, including five species of forest eucalypts endemic to the local region. The co-occurrence of three of these species, commonly known as tingles (Red Tingle—*Eucalyptus jacksonii*, Yellow Tingle—*E. guilfoylei*, and Rates Tingle—*E. brevistylis*), in an area noted for a variety of vegetation types prompted the name 'Tingle Mosaic' (see Wardell-Johnson & Williams 1996). The Tingle Mosaic has long been noted for its outstanding biodiversity values and also has a considerable history of scientific and public interest.

In this paper we introduce the idea of a Landscape Conservation Culture as a new management planning philosophy for the Tingle Mosaic. The approach is being developed through an Australian Research Council Linkage Grant between The University of Queensland, The University of Western Australia and the Department of Conservation and Land Management (CALM).

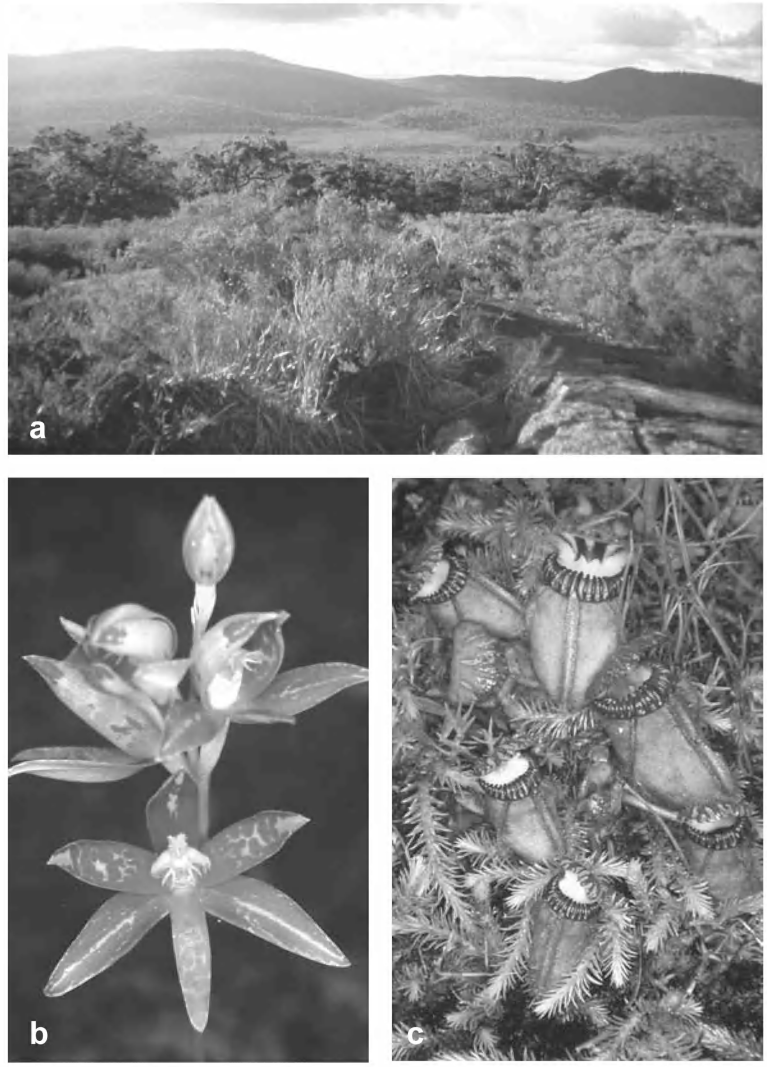
Disturbance, management and research

CALM has overall responsibility for the management of public lands and for the conservation of the state's biota. CALM's mission provides commitment to science-based adaptive management, which includes important components such as evaluation of alternative management regimes and the ability to vary management prescriptions in the light of evidence.

The Tingle Mosaic in south-western Australia encompasses the distributions of five locally endemic forest eucalypts. Top, left to right: (a) E. guilfoylei*, (b)* E. brevistylis*, (c)* E. virginea*, (d)* Corymbia ficifolia*. Photos: G. Wardell-Johnson.*

Clearing, fragmentation and introduced pests and disease have had major impacts in the Tingle Mosaic. The region is also exposed to biotic disturbances (e.g. from *Phytophthora* spp), and fire management there remains contentious (see Burrows & Wardell-Johnson 2003). Several large-scale high intensity wildfires in the region's recent history have prompted examination of alternative fire management strategies.

CALM has recently proposed implementation of a pilot fire mosaic project in the proposed Walpole Wilderness Area (which approximately coincides with the Tingle Mosaic). The project's aim is to use the planned and frequent introduction of fire into the landscape to create a fine-grained mosaic of interlocking patches of vegetation at different stages of post-fire development. Although management assuming a fine-scale mosaic has been advocated (Wardell-Johnson & Horwitz 2000), the efficacy of this approach for the biota has yet to be quantitatively assessed. The reality and stability of vegetation boundaries under different regimes of disturbance is also yet to be determined in south-western Australia.



The Tingle Mosaic is noted for a variety of vegetation types (a) and an extraordinary diversity of vascular plants, including several local endemics such as Thelymitra jacksonii *(b) and* Cephalotus follicularis *(c). Photos: G. Wardell-Johnson.*

Management in a Landscape Conservation Culture

The complexity of conservation management implied by the fire mosaic project, together with the many rare and threatened species and ecological communities in the region, highlights the need for a new approach to ecosystem planning. It will require a change from single species and ecological community recovery plans to multi-species, multi-community ecosystem planning in an adaptive management framework—a change towards management within a Landscape Conservation Culture.

This new approach will rely on:

- an integrated framework to interpret knowledge about natural landscape processes;
- the synthesis of data obtained through biological surveys (at a plot scale) and remote sensing (landscape scale), with spatial data handled through geographic information systems;
- an explanatory modelling approach to test ecological theories and current and proposed conservation policies that interpret data and make model-based predictions of species and assemblage distributions under different disturbance scenarios; and
- a committed and engaged local community.

The research program

The program will draw on extensive floristic and environmental data from several hundred permanently located quadrats in the Tingle Mosaic that were assessed between 1988 and 1992. These data provide an opportunity for integration to define the mosaics within which the CALM fire management project is to be implemented. A digital elevation model to be constructed at a 5 m scale will allow the use of the floristic and environmental data for predictive modelling at various landscape scales. This will allow evaluation of innovative operational fire management and disease spread prevention programs. It will be possible to predict whether different approaches to the management of disturbance are likely to influence biodiversity outcomes.

The program includes two research projects. The first involves developing a model of the floristic composition of the Tingle Mosaic and examining the relationship between functional landscape descriptions and observed spatial and

temporal landscape patterning. It will involve simulations aimed at discovering the best match between observed patterns and functional descriptions of landscapes. Spatial analysis of observed abiotic and biotic data will also be carried out to find the best explanation of ecological processes that produce observable landscape patterns in the Tingle Mosaic.

The second project involves developing and testing alternative species models to predict the distributions of five locally endemic forest eucalypts—the three species of Tingle plus *Eucalyptus virginea* and *Corymbia ficifolia*—and to develop further knowledge of their ecology. Because they are relict taxa within refugial environments (Wardell-Johnson & Coates 1996), climate change may impact their future conservation status which in turn will impinge on the conservation of the assemblages with which they are associated.

Existing quadrat-based environmental and demographic data and distributional data on these species will be used in an explanatory modelling framework to explain spatial variation. Potential changes to distribution and conservation under different changed climatic scenarios will be examined, and other critical or related species may be investigated, and implications for species co-occurrence and future protection considered.

Conclusion

Management efforts to address biodiversity concerns need the support of appropriate ecological theory and empirical evidence of a requirement for change. The approaches being tested in the Tingle Mosaic, including the development of area-class maps at different spatial scales (a considerable innovation over maps depicting homogenous discrete zones) and a regional model of compositional gradients, will facilitate more explicit land management decisions which can be effectively monitored and will allow alternative disturbance regimes for biodiversity conservation to be tested. This will enable a management and policy change away from management based on stable and permanent biotic assemblages and boundaries in conservation reserves. The result may be the development of a Landscape Conservation Culture.

References

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The Grassy Groundcover Research Project – returning complex indigenous grassland communities to agricultural land

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The purpose of the Grassy Groundcover Research Project (GGRP) is to use direct sown seed mixtures to reintroduce complex and persistent grassland communities to agricultural lands. This project stems from and furthers the scope of a series of restoration studies conducted at the University of Melbourne's Burnley Campus over the last several years. This work investigated the use of multi-species seed mixtures to reinstate functional and persistent grassland communities via direct seeding. Results from this earlier work indicated there was considerable potential for broad-scale restoration of herbaceous plant communities using direct seeding.(Gibson Roy, Delpratt *et al.* 2004).

The GGRP is a three-year experimental project funded by the National Heritage Trust and sponsored by several southwestern Victorian Catchment Management Authorities. It is managed in partnership by The University of Melbourne and Greening Australia (Victoria).