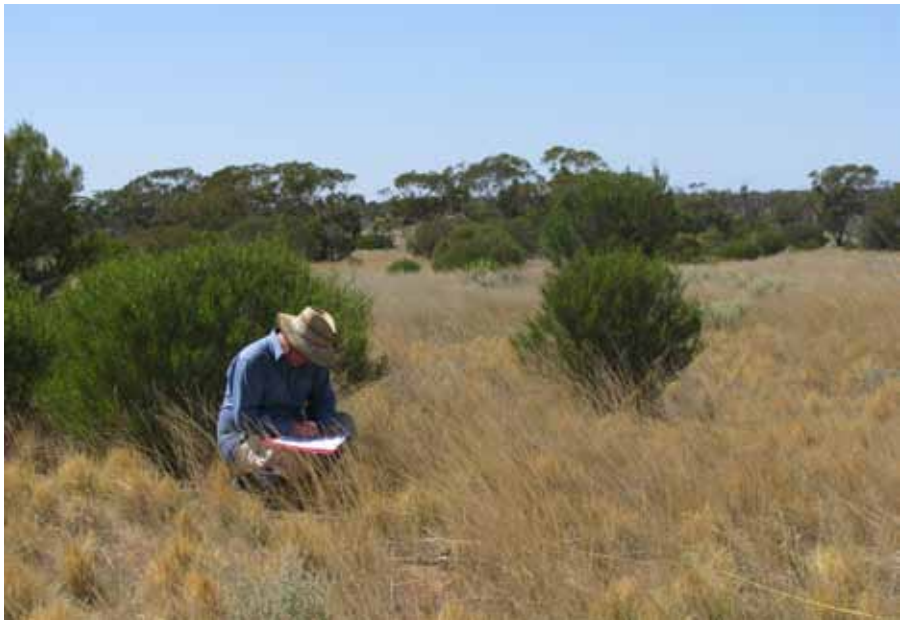
MALLEE CATCHMENT
TECHNICAL BULLETIN

Technical Bulletin # 17

Condition mapping of semi-arid, non-eucalypt woodlands



Above: Arthur Rylah Institute (ARI) scientist recording perennial species composition and abundance (Murray-Sunset National Park). Photo: ARI

This technical bulletin summarises the findings of field research undertaken in summer 2012 to assess the condition of semi-arid woodlands within Murray-Sunset, Hattah-Kulkyne and Wyperfeld National Parks, and Yarrara Flora and Fauna Reserve.

The project aimed to determine the extent and condition of semi-arid woodlands throughout the Victorian Mallee. A better understanding of semi-arid woodland condition will help guide on-ground works such as rabbit control and restoration plantings.

Background

Semi-arid non-eucalypt woodlands are an important part of biodiversity in the Victorian Mallee. These woodlands are dominated by Belah (*Casuarina pauper*), Buloke (*Allocasuarina luehmannii*), Slender Pine (*Callitris gracilis*) and Sugarwood (*Myoporum platycarpum*).

Historically, semi-arid woodlands were extensively cleared for agriculture and used for stock grazing. Timber harvesting also targeted Slender Pine. While the largest remaining stands are now contained within Mallee National Parks

At a glance

- Semi-arid woodlands dominated by Belah, Buloke, Slender Pine and/or Sugarwood occur on public land throughout the Victorian Mallee.
- Surveys were conducted in summer 2012 across 320 sites to investigate the condition and extent of these semi-arid woodlands within Murray-Sunset, Hattah-Kulkyne and Wyperfeld National Parks and Yarrara Flora and Fauna Reserve.
- The condition of the woodlands varied across the study area with many stands in 'average' condition.
- The rate of recruitment for Belah, Buloke, Slender Pine and Sugarwood was generally low.
- This project will help with long-term monitoring of semi-arid woodlands and guide future management.

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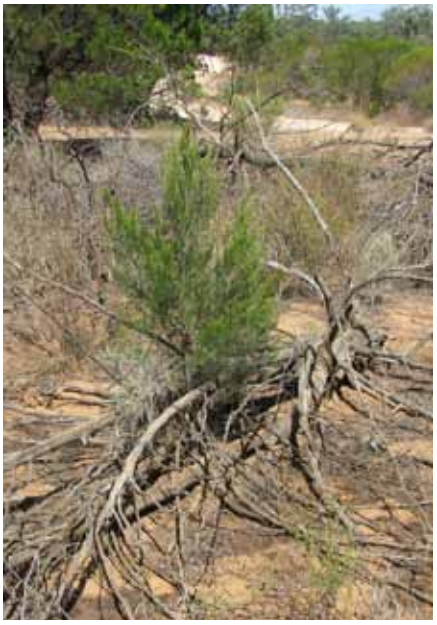
Above: Grazed Slender Pine (Murray-Sunset National Park). Photo: Dylan Osler.



Above: Slender Pine recruitment (Hattah-Kulkyne National Park). Photo: Kate Bennetts.

and Reserves, their long-term viability is threatened by grazing pressure (especially rabbits and kangaroos) and a severe lack of recruitment.

The above average rainfall of 2010/2011 provided a unique opportunity to determine rates of regeneration across semi-arid woodlands. Regeneration of Belah, Buloke, Slender Pine and Sugarwood is sporadic and conditions for both regeneration and subsequent establishment are largely unknown. Successful regeneration of Belah has been observed where water accumulates in low lying areas following heavy rainfall (Westbrooke 1998). Sugarwood regeneration also occurred following the introduction of the rabbit calicivirus in the mid-1990s (Sandell 2002; Sandell et al. 2002). Ongoing regeneration and successful establishment of these species is essential to ensure the long-term survival of semi-arid woodlands. Previous studies have investigated regeneration levels within these woodlands and have also broadly mapped their extent. This project will gather current information on the extent and regeneration within these woodlands which will help to inform management decisions.

Methods

Data collection

Semi-arid woodlands dominated by Belah, Buloke, Slender Pine and Sugarwood were targeted for study within Murray-Sunset, Hattah-Kulkyne and Wyperfeld National Parks and Yarrara Flora and Fauna Reserve in north-west Victoria. A total of 320 rapid condition assessment sites were randomly located within these Parks. The rapid assessment included a one hectare plot with a smaller 100 m^2 quadrat nested in the north-west corner. Information collected included the crown condition of the four target species and tree diameter, number of large shrubs, weed cover, amount of coarse woody debris, perennial species richness and cover, total native cover, bare ground, litter and soil crust cover. Browsing intensity on juveniles/seedlings and adult plants, and rabbit abundance were also assessed.

Ordinated index of condition

An ordinated index was developed to categorise the condition of the surveyed semi-arid woodland stands. Using the information collected during the rapid assessment, each site was given a score between 0 and 100. These scores were then categorised into 'poor', 'average', 'good' or 'high' condition.

Mapping

Most of the information collected has been mapped providing a useful tool for land managers. This includes maps of the distribution and condition of the woodland types, population structure, recruitment and browsing intensity across the study area.

Key results

A total of 153 perennial plant species, 45 weeds and 28 threatened plant species, under the Department of Sustainability & Environment's (DSE) Advisory List of Rare or Threatened Plants in Victoria (2005), were recorded. A new record for Victoria, Desert New Holland Daisy *(Vittadinia eremaea)*, was discovered.

Woodland overview

The 320 rapid condition assessments were distributed across the four semi arid woodland community types: Belah Woodland (64 sites), Buloke-Pine Woodland (74 sites), Pine Rises (dominated by Slender Pine; 80 sites) and Sugarwood Woodland (102 sites). Each woodland type contained a range of scores in the ordinated index of condition. Overall 64 sites were in 'poor' condition, 201 sites 'average', 53 sites 'good' and two sites were in 'high' condition.

Belah Woodlands occur throughout Murray-Sunset National Park and Yarrara Flora and Fauna Reserve and at a few locations in Hattah-Kulkyne National Park. This woodland type has high species richness, relative to the other woodland types, across all vegetation layers (ground, shrub and canopy). Belah Woodland was generally in either average or good condition with fewer sites in poor condition.

Buloke-Pine Woodlands occurred in southern Murray-Sunset, Hattah-Kulkyne and Wyperfeld National Parks. Perennial species richness was variable in these woodlands and generally lower than in Belah Woodlands. Most Buloke-Pine Woodlands were in average condition with few sites in poor and good condition and one site in high condition (at Hattah-Kulkyne National Park).

Pine Rises occur throughout Murray-Sunset, Hattah-Kulkyne and

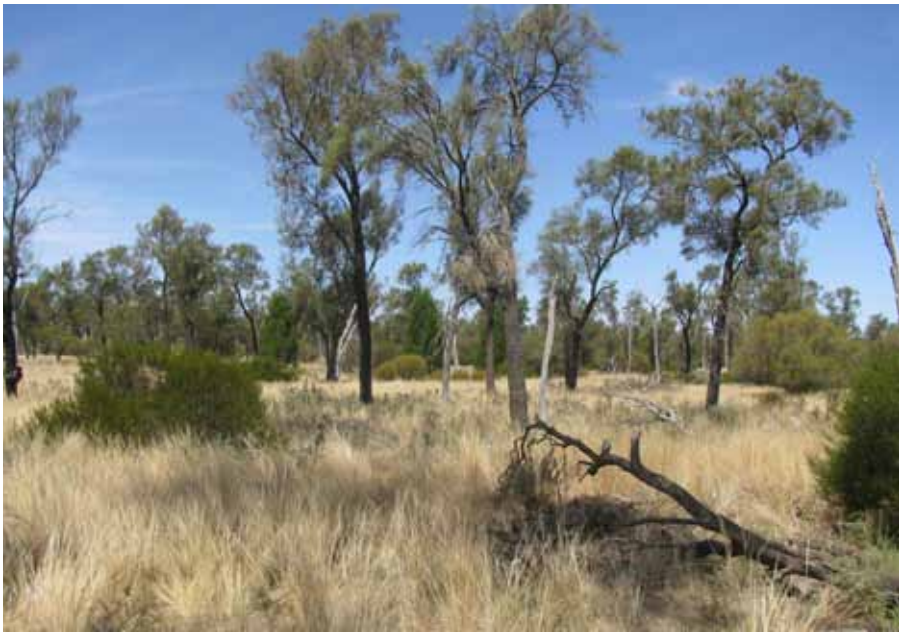
Wyperfeld National Parks but are absent from Yarrara Flora and Fauna Reserve. Perennial species richness was variable, with large shrub richness generally low (< 6 species). Like Buloke-Pine Woodlands, Pine Rises were generally in average condition with fewer stands in poor and good condition. A single stand at Wyperfeld National Park was in high condition. Slender Pine recruitment had occurred at some planted sites within Hattah-Kulkyne and Wyperfeld National Parks, indicating that natural processes can be restored in such situations. These sites were planted in the 1960-80s to revegetate heavily grazed areas.

Sugarwood Woodlands are restricted to north-west Murray-Sunset National Park, particularly north and west of Morkalla. Perennial species richness was similar to the other woodland types and like Pine Rises large shrub richness and density was low. Sugarwood Woodlands were either in poor or average condition, with more sites in average condition.

Recruitment

Recruitment has generally occurred within localised areas of the study area and in some instances had occurred at sites lacking mature or senescent trees. Sugarwood had the highest level of recruitment; recruitment had occurred at 65.5% of Sugarwood sites. Belah had recruited at 57.6% of sites. Slender Pine and Buloke showed lower levels of recruitment. Recruitment had occurred at 26% of Slender Pine and 21.6% of Buloke sites. Rates of recruitment for all four species were generally low, although both Belah and Sugarwood had more sites with recruitment than without. The opposite was true of Buloke and Slender Pine.

Most recruitment has occurred within the last 20 years (and particularly since 1996) which suggests that relatively high levels of total grazing pressure (stock, rabbits, and kangaroos) before that time had inhibited regrowth. While the regenerative response has been of limited extent, it provides evidence that a management strategy of reducing total grazing pressure is generating a benefit.



Above: Buloke-Pine Woodland in Wyperfeld National Park. Photo: ARI.

Browsing intensity and rabbit abundance

Herbivore browsing was generally low overall for both juvenile and adult plants. Mature trees and large shrubs were generally not damaged (290 sites) or exhibited low levels of browsing (30 sites). Cattle Bush *(Alectryon oleifolius* subsp. *canescens)* was the most commonly browsed mature large shrub.

Most (286) sites had no evidence of browsing of juveniles/seedlings. The remaining 34 sites had either low (29) or medium (5) levels of browsing on young plants.

Evidence of rabbits was generally low (92.2% of sites) with fewer sites with medium (7.2%) or high (0.63%) rabbit abundance.

Key recommendations and future works

The development of a database to house ecological information, the ordinated index of woodland condition and mapping of ecological attributes will further our ecological knowledge of these semi-arid woodlands and help target future on-ground management.

Recommendations from this project include:

- Maintain the current control program for rabbits, hares, goats and kangaroos to maintain low browsing levels in Mallee National Parks and Reserves;
- Future weed management should target the newly established species that arise in the landscape and invasive woody species;
- Target restoration efforts to 'average' condition stands. These stands retain some living trees and are likely to retain (struggling and locally threatened) components of woodland diversity.

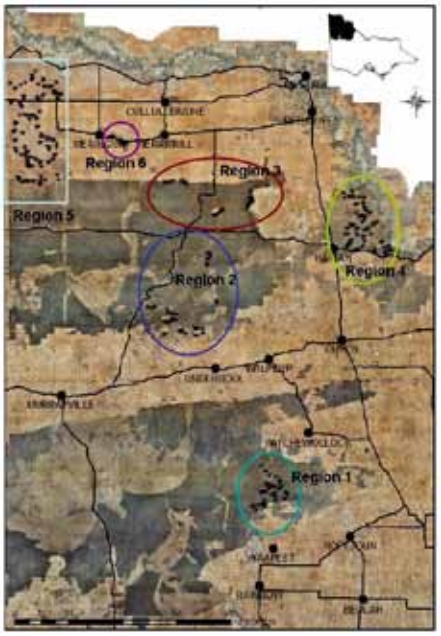
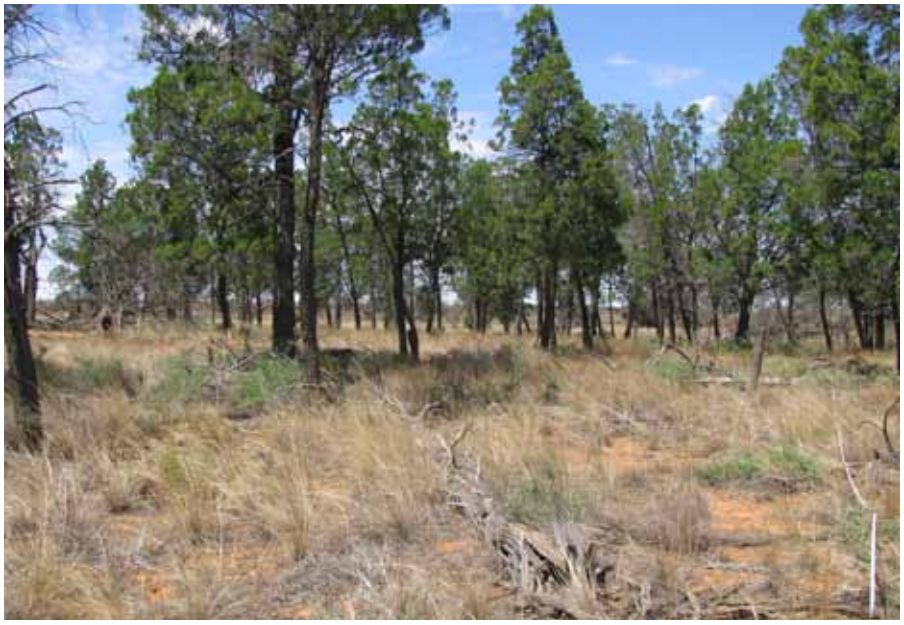


Figure 1. Distribution of rapid condition assessment sites in the Victorian Mallee.



Above: ARI scientist measuring tree diametres. Photo: ARI.

Left: Pine Rises in Hattah-Kulkyne National Park. Photo: ARI.

Regeneration efforts here would assist these struggling fauna and flora to survive locally and help (locally extinct) species to return from other areas;

- Develop idealised condition states for the four woodland types based on real scientific data to guide restoration efforts through information on plant species composition and density. This should also include information on herbaceous species (i.e. annuals), and species dispersibility, that is, which species will or will not require active reintroduction into woodland stands;
- Investigate ways to foster regeneration in the remnant trees and shrubs (e.g. discing at the base of Belah, Buloke, Sugarwood and Cattle Bush to promote vegetative regeneration);
- Implement the Buloke Recovery Plan actions (Cheal et al. 2011);
- Undertake targeted searches for rare or threatened species to gather information on the ecological role of these lost species in community dynamics; and
- Future monitoring should include rapid assessments of a selection of sites representing the different condition states to document management success (or otherwise) and ecological changes across the landscape and the four woodland types.

Acknowledgements

The Mallee CMA engaged the Arthur Rylah Institute for Environmental Research, Department of Sustainabilty and Environment to undertake this study, with funding provided by the Victorian Government and Parks Victoria.

Further information

The information for this bulletin has been taken from 'Mapping of the condition of semi-arid non-eucalypt woodlands in high priority national parks and reserves', a report for the Mallee CMA by Arthur Rylah Institute for Environmental Research.

For further information about the condition mapping project please contact the Mallee CMA on (03) 5051 4377.

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Project Partners

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