MALLEE CATCHMENT
TECHNICAL BULLETIN

Technical Bulletin # 19

Quantifying the impact of land management practices on native vegetation in the Mallee: Phase 3 Linear remnants

Above: Arthur Rylah Institute scientist and Mallee CMA Community Support Officer (CSO) collecting floristic data from a square plot along a transect line in an ungrazed/grazed linear remnant. Photo: ARI.

This technical bulletin summarises the outcomes of the recent project to quantify the impact of stock exclusion fencing on linear remnant vegetation in the Mallee.

This project is the third phase of a monitoring program that began in 2009 to investigate how land management practices impact on remnant vegetation. This project focuses on linear remnants, that is, long narrow patches of native vegetation.

Background

Most native vegetation in the Mallee has been cleared for agriculture (Blakers and Macmillan 1988). The dryland cropping landscape of the Mallee is now one of the most stressed systems in Australia (NLWRA 2001). Much of the native vegetation that remains in dryland cropping areas exists as small and/or linear (long and narrow) patches. Small and linear remnants have a high edge to area ratio: a greater proportion of 'edge' vegetation relative to more protected 'core' vegetation.

At a glance

- A long-term monitoring program was developed to examine the impact of stock exclusion fencing on linear remnant vegetation in the Mallee. The monitoring method was adapted from a previous project;
- In spring 2011, 39 monitoring sites were established and baseline data collected across three treatments: fenced linear remnants on private land (no grazing), grazed linear remnants on private land and long ungrazed linear remnants on public land;
- The findings from this project will help guide future management of remnant vegetation, specifically remnants with a high edge to area ratio.

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mallee catchment management authority

Above: A typical linear remnant in the cropping landscape. Photo: Mallee CMA.

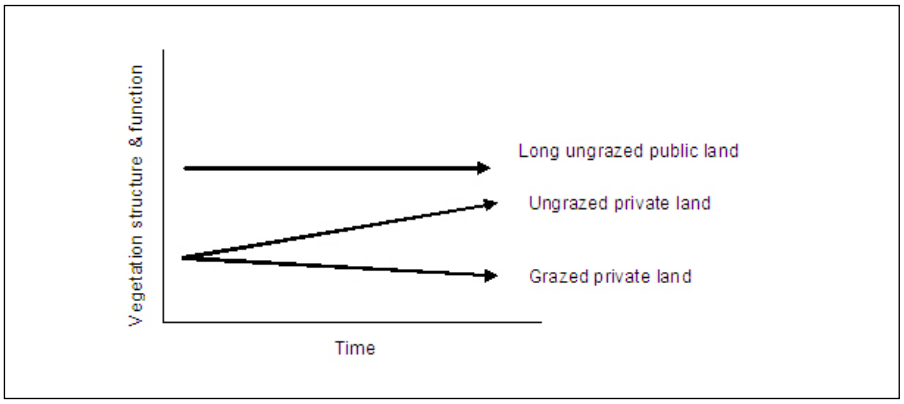

Figure 1: The expected changes in vegetation structure and function associated with removing stock grazing from linear remnants of native vegetation.

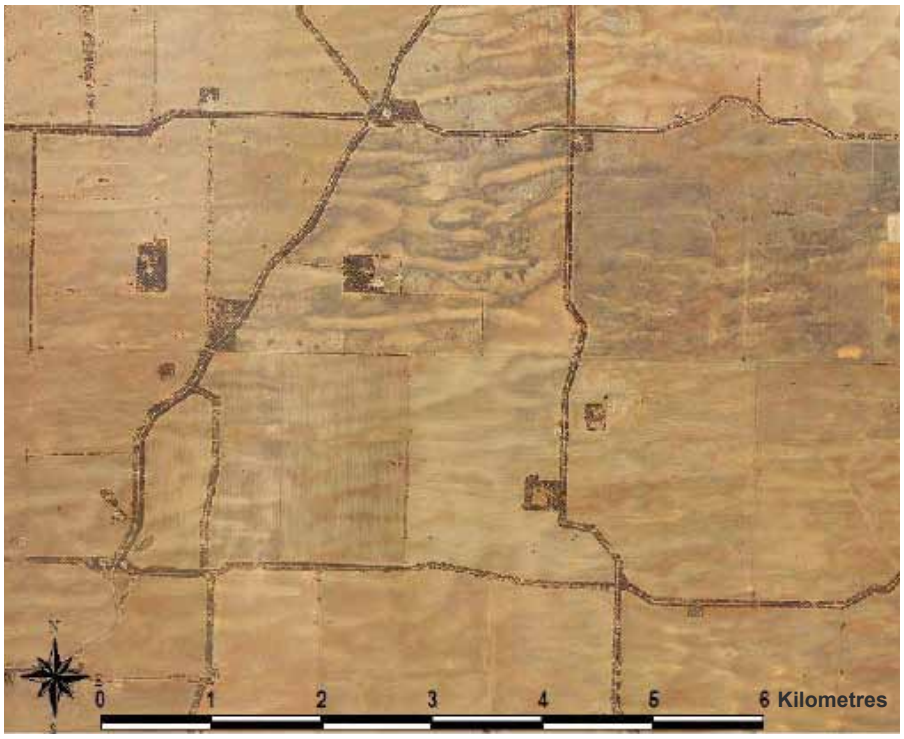

Figure 2. An example of linear remnants in the Mallee dryland cropping landscape.

This exposes these remnants to high levels of weed invasion and nutrient enrichment from adjacent land use.

The Mallee Catchment Management Authority (Mallee CMA) funds on-ground works to increase the quality and extent of native vegetation in the region. These works include stock exclusion fencing to protect remnant vegetation from grazing. Excluding stock reduces soil compaction and is expected to lead to greater cover of native species, which will reduce the amount of bare ground and decrease the risk of erosion, while providing habitat for native animals. Removing stock also reduces the rate of nutrient enrichment from manure and stock feed being added to the soil. However, linear remnants will always be subject to wind carried seed, soil deposition, nutrients and weed invasion from adjacent land use.

Ungrazed remnant vegetation on public land is expected to be in a better condition than grazed remnant vegetation on private land, with this condition remaining steady over time (see Figure 1). As linear remnants on private land are fenced and grazing removed, the condition of vegetation is expected to improve. If grazing continues, the condition of linear remnants is expected to decrease over time.

This project will help the Mallee CMA to better understand and quantify the impact of stock exclusion fencing on linear remnants of native vegetation.

Site Selection

This study involves 39 monitoring sites. There are 13 sites for each grazing treatment: grazed linear remnants on private land, ungrazed linear remnants on private land (these remnants have stock exclusion fencing) and long ungrazed linear remnants on public land. Most linear remnants monitored in this study are unused road reserves and most had crops on each side.

Method

The monitoring method is based on a previous monitoring project (Duncan and Moxham 2010), but has been especially adapted to detect changes in vegetation in linear remnants. The monitoring design of the previous project was too large to fit within small and narrow remnants. Therefore a subset of this design was used. Monitoring was carried out in a 5 x 20 m transect at each linear remnant. Table 1 summaries the components measured at each transect. Measurements for understorey structure were recorded within 30 x 1 m^2 quadrats, which were randomly located within the monitoring transect. Baseline date for this project was collected in Spring 2011.

Key Findings

Analysis of the baseline data indicates only minor effects between private land, grazed and ungrazed sites, and long ungrazed public land sites. Most ungrazed sites on private land have only recently been fenced (between 2006 and 2009) meaning broad changes in vegetation quality are not yet evident.

The main differences detected in the baseline data are that ungrazed sites generally had higher quality vegetation. The long ungrazed public land site had fewer weeds, more large shrubs and logs and a better understorey condition (see Figure 3). These long ungrazed sites also had the highest levels of organic and total carbon in the soil. Ungrazed private land sites had the highest species richness and amount of herbs and grasses. Interestingly, grasses were not abundant in the long ungrazed public land sites. Soils on grazed sites had the highest total nitrogen levels, reflecting the grazing history of these remnants (see Figure 4).

Most ungrazed remnants were fenced through the Mallee CMA incentive programs. Some of the long ungrazed public land remnants that adjoin private land were also fenced through these

Table 1. The components measured as part of the monitoring project.

Monitoring Component	Monitoring Action	Monitoring interval (years)
Canopy Species Cover & Recruitment	Number and size of large canopy trees	5
	Number and size of logs	
	Photos of canopy	
	Recruitment (the amount of seedling and young plants)	
Floristics	Floristic search (all plant species within the monitoring plot identified and their percentage cover estimated)	2
Understorey Structure	The frequency and percentage cover recorded for all plant species, bare ground, litter and soil crust	2
Fixed Photo Points	Photos taken at the same location to record visual changes over time	2
Soil Nutrient Sampling & Analysis	Soils samples were taken and nutrient analysis carried out	2
Habitat Hectares Assessment	An assessment of the overall condition of vegetation	5
Landscape context	For the private land sites, landholders were asked to complete a questionnaire on the management and history of the remnant vegetation, e.g. grazing, fire and wood collection	

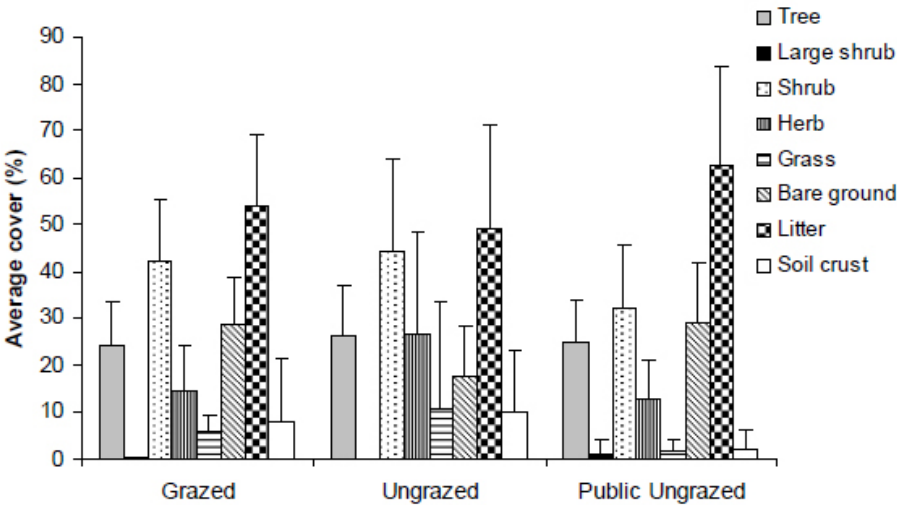

Figure 3. Average percent cover of different components of vegetation for the three treatments: private land grazed and ungrazed and public land ungrazed. The standard deviation is shown.

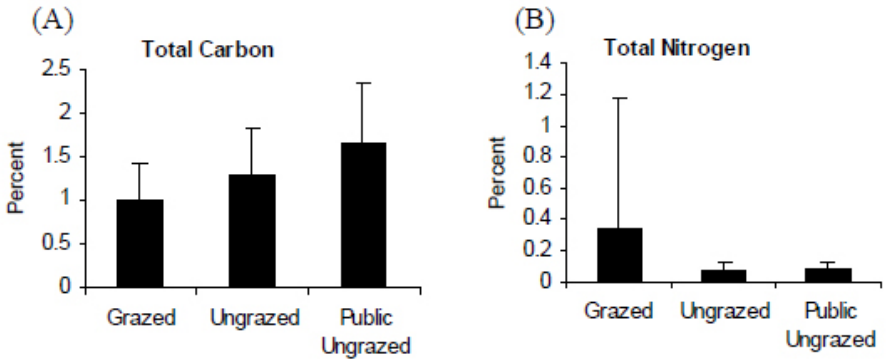

Figure 4. The average percent of (A) total carbon and (B) total nitrogen displayed across the three treatments of private land grazed and ungrazed and public land ungrazed. The standard deviation is shown.

Above: ARI scientist collecting floristic data in an ungrazed grazed linear remnant. Note the paddocks in view on either side of the remnant. Photo: ARI.

Above: An example of linear remnant in the cropping landscape. Photo: Mallee CMA.

programs. The trend for higher condition of vegetation in ungrazed remnants indicates that these incentive programs are helping to conserve native vegetation and associated biodiversity values in the landscape.

Further work

These sites are scheduled to be monitored again in two and five year's time. A comprehensive data analysis can then be undertaken to assess changes in the condition of remnant vegetation.

The monitoring design could also be used in other regions of the Mallee in a variety of situations, for example in native vegetation on roadsides, long and narrow revegetation sites and creek line frontages.

Acknowledgments

The Mallee Catchment Management Authority (CMA) engaged the Arthur Rylah Institute for Environmental Research to undertake this project, with funding provided by the Victorian State Government and the Australian Government's Caring for Our Country Initiative. The project team would like to thank the Mallee landholders who allowed us access to their properties.

Find out more

The information in this bulletin has been taken from '*Quantification of the impact of land management practices on priority remnant vegetation across the dryland Mallee landscape: Phase 3 Linear remnants*', a report for the Mallee CMA by the Arthur Rylah Institute.

For further information about the linear remnant monitoring program or programs to protect remnant vegetation, please contact the Mallee CMA on 03 5051 4377.

References

Blakers, M and Macmillan, L (1988). *Mallee Conservation in Victoria. Research Paper No. 6.* Melbourne, RMIT Faculty of Environmental Design and Construction.

Duncan, M and Moxham, C (2010). '*Quantification of the impact of land management practices on priority vegetation across the dryland Mallee landscape' Monitoring Program.* Arthur Rylah Institute for Environmental Research, Department of sustainability and Environment, Heidelberg. A report for the Mallee Catchment Management Authority.

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Project Partners

Published July 2012