# Managing remnants for improved ecological function in the Wimmera Mallee

***Jodie Odgers,*** *BCG,* ***David Duncan & Claire Moxham,***
*(Arthur Rylah Institute for Environmental Research, DSE)*

## Take home messages

- *The greatest threat to the ecological function of remnants is uncontrolled livestock access. Livestock prevent regeneration of native plants, damage the biological soil crust and increase nutrient levels in a remnant.*
- *Remnant size does matter in terms of basic ecological function – larger remnants are typically under less pressure – but it is not as important as how a remnant is managed. You can make a difference.*
- *Remnants require extended periods (10+ years) without stock access to allow woody plant seedlings to germinate and grow beyond the reach of livestock.*
- *If stock can not be excluded from a remnant and it is needed to fill the feed gap in a drought year, then a short-term high density grazing strategy is recommended.*
- *Targeted tree and shrub planting on the exposed windward side of the remnant will provide a buffer from the wind, protecting the remnant.*

## Background

There is little remnant native vegetation remaining in the Wimmera Mallee, with estimates as low as 5 percent native vegetation cover. The agricultural landscapes of the Wimmera Mallee Bioregions are some of the most 'stressed' landscapes in Australia (NLWRA 2001) as a result of being cleared. Remnants that remain are typically small in size, fragmented, isolated and occur on private land. They are often highly degraded and susceptible to threats such as erosion, weeds, chemical and fertiliser contamination and continuous grazing (Moxham *et al.* 2007).

The Wimmera Mallee Ecosystem Function Project, a two-year project completed in 2007, was developed to address the concerns of landholders and local CMAs as to the long-term survival of remnant vegetation (Duncan *et al.* 2006). The project, a collaboration between ARI, BCG and CSIRO's Sustainable Ecosystems, looked at the current status and ecological function of remnant native vegetation across the dryland cropping landscape, and determined whether they were likely to improve or decline into the future.

The project involved a landscape overview, two major field surveys involving over 70 landholders, a workshop identifying ecosystem services, workshops on how to 'Read the Landscape' and the publication of articles, fact sheets and the 'Glove Box Guide'. This article summarises the main findings of the project over the two years.

## Remnant Management

### *Does size matter?*

The first year's field work showed that smaller grazed remnants were highly degraded as they are more subject to edge effects and stock camping. In larger remnants, the interior is more protected from nutrient dumping by wind, and stock camping pressure is usually spread more evenly over the remnant. The report, 'A landscape overview of ecosystem function in the Murray Mallee and Wimmera Bioregions of Victoria' (available on the Ecosystem Function Project page on the BCG website), indicated that although size does matter in terms of basic ecological function (ie. soil formation and stabilisation, nutrient cycling and water infiltration), size itself is not as important as how a remnant is managed, particularly in relation to stock access.

### *Do remnants recover post grazing?*

The second year of field work focused on remnant management and the potential of a remnant to respond to stock exclusion. The pressures associated with stock grazing include:

- browsing (the removal of plant material and the prevention of new growth);
- trampling and compaction (reduction in soil moisture, destruction of seedlings and the break up and loss of the litter layer); and
- camping (high concentrations of stock manure, intense physical disturbance including the rubbing and ring barking of mature trees and shrubs).

The project team wanted to know what the potential would be for a remnant to respond and recover if stock were excluded from the study remnants. Would basic ecological function increase in remnants once grazing pressure was removed?

## Method

A total of 22 remnants (<30 ha) in semi-arid Buloke, Black Box and Mallee woodland communities were surveyed in the second year. Each remnant had had stock excluded over a known period of time ranging from one to 50 years before present. To understand the remnants past management history, the landholder of each remnant was interviewed. At each remnant biophysical data was also collected including:

- cover and structure of native vegetation
- biological soil crust cover (ie. cover of mosses, lichens, liverworts and algae)
- soil nutrient levels.

## Results

The data confirmed that some aspects of ecological function do return relatively quickly (10-15 years) after stock have been excluded from a remnant. However, the data also showed that there are other aspects of ecological function that are far less resilient.

*Recovery of Vegetation*

In the three woodland and mallee communities surveyed, recruitment was greater in remnants where stock had been excluded for longer (Figure 1). This indicates that time alone is enough to stimulate regeneration of at least some native woody tree and shrub species once stock pressure has been removed. Recruitment in Buloke communities was observed far more frequently than recruitment in Mallee communities. This contrast in regeneration between the plant communities relates in part to the ecology of the dominant tree species – some woody species respond relatively quickly once stock have been excluded.

*Recovery of the biological soil crust*

The ability of the biological soil crust to recover and increase after stock exclusion was a striking response observed in this study. There was a sharp increase in the cover of biological soil crusts with time since grazing (Figure 2). Of significant interest was that after 15 years without stock, the total

cover of biological soil crusts can increase to levels that are comparable with data collected from some of the least disturbed public land remnants in the region. However, the species diversity of the biological crust takes much longer to re-develop with only mosses dominating the sites for the first five years post exclusion. It is not until remnants have had stock excluded for 20 years or more that the cover and diversity of lichens, algae and liverworts appear in greater numbers.

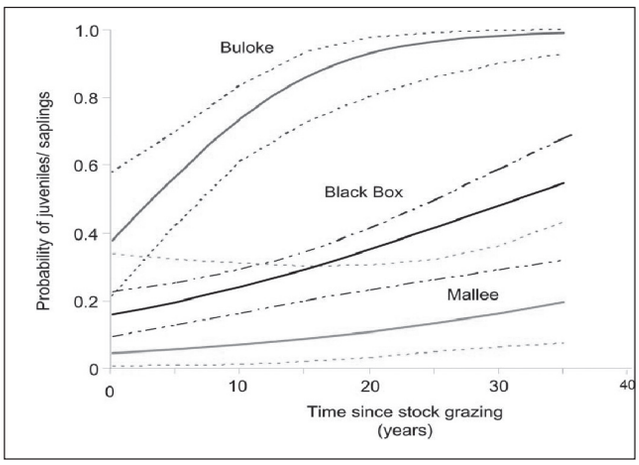


**Figure 1.** Adjusted probability of occurrence of regeneration (woody trees and shrubs) in the three plant communities with time since stock grazing (dotted lines show 95% confidence intervals around the predicted mean).


**Figure 2.** Mean cover of biological soil crust at sites (remnants) with time since stock exclusion. Vertical bars indicate standard error. * There is uncertainty about the date of stock exclusion at this site. The site could have been de-stocked, or only very lightly stocked, for a longer period.

*Soil nutrients*

Contrary to expectations, the soil data showed that the time since stock were excluded from remnants was not related to available soil phosphorus. Neither total phosphorus nor the available phosphorus declined with increased time since stock grazing. This indicates that once enriched, remnants may remain enriched for decades. This result will require further investigation.

## Demonstration sites

Two demonstration sites were established in 2007; one in the Wimmera and the other in the Mallee. The sites trial methods to increase regeneration success and will be used to demonstrate the improvement in vegetation condition after stock exclusion. The sites have been fenced and a 20m-wide native buffer planted on the windward side of the remnant (Figure 3). The buffer planting will cut down the amount of wind blown nutrient, weed seed, chemicals and sediment entering the remnant. It is also hoped that the buffer will provide seed for regeneration and additional habitat for fauna. The sites will provide a visual example of native vegetation management techniques and how a remnant can be best managed for enhanced ecological function into the future.

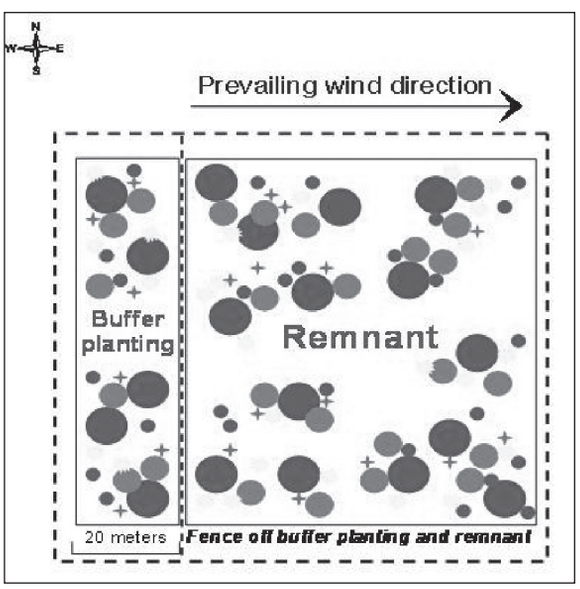


**Figure 3.** A diagram of the demonstration sites that have been established.

## Remnant management recommendations

There are a number of recommendations put forward in the final report 'Effect of stock removal on woodlands in the Murray Mallee and Wimmera Bioregions of Victoria' (Duncan *et al.* 2007). These recommendations may be of assistance in the recovery of remnants and some could be effective for those who may need to graze during drought periods to fill the feed gap. It is recommended that:

1. Stock are excluded from native remnants wherever possible, especially in sites where the ground layer appears to be highly disturbed.
2. When grazing of remnants is required, adopt a sustainable grazing regime:
   - Include a generous period without stock in the remnant management cycle particularly following good rain to allow native plants to regenerate.
   - In a drought year, rest the remnant and exclude all stock if possible. If this is not possible, selectively graze the remnant at a high density (graze for 1-2 months at 10 x the average dry sheep equivalent).
   - In late breaking years, graze for shorter periods of time.
   - Maintain an appropriate level of perennial cover and do not graze to bare earth.
3. Strategically place stock deterrents around individual tree and shrub species. The barrier need only be a large dead branch (or similar structure) on the ground that that will provide sufficient vertical protection (30-50cm). The more barriers placed around a remnant the more likely they are to protect emerging seedlings.
4. Increase available stock shelter through native vegetation plantings in the landscape for future generations.

For these recommendations to be beneficial the responsibilities toward the control of noxious weeds and pest animals will need to be met on each property.

## Conclusion

The Wimmera Mallee Ecosystem Function Project has provided land managers and industry professionals with information to make better decisions in relation to investing in restoration and revegetation programs. The extension program through its articles, fact sheets and 'Glove Box Guide' provides the information and knowledge that enables readers to add value and improve the condition of native remnants in an efficient and inexpensive way that will not threaten the viability of the farming business. Keep in mind that it is not always the size of the remnant that matters. All remnants whether they are less than five hectares in size or bigger than twenty hectares, can add value to the landscape. It is the way that you manage your remnants that matter.

## For more information

Information on the Wimmera Mallee Ecosystem Function project can be found on the project page of the BCG website. www.bcg.org.au/cb_pages/EcosystemfunctionProject.php <http://www.bcg.org.au/cb_pages/EcosystemfunctionProject.php>

## References

NLWRA (2001). Landscape Health in Australia: a rapid assessment of the relative condition of Australia's bioregions and subregions. Canberra ACT, Environment Australia & National Land and Water Resources Audit.

Duncan, D., C. Moxham and J. Dorrough (2006). Improving ecological function in our remnants. BCG, BCG Crop & Pasture Production Manual 2006-2007.

Duncan, D., C. Moxham and C. Read (2007). Effect of stock removal on woodlands in the Murray Mallee and Wimmera Bioregions of Victoria. Heidelberg, Arthur Rylah Institute for Environmental Research, Department of Sustainability & Environment.

Moxham, C., R. Apted and C. Read (2007). Regeneration of native vegetation in the Murray Mallee and Wimmera Bioregions of Victoria. Heidelberg, Arthur Rylah Institute for Environmental Research, Department of Sustainability & Environment.