

**PROCEEDINGS OF THE AUSTRALIAN RANGELAND SOCIETY
BIENNIAL CONFERENCE**

Official publication of The Australian Rangeland Society

Copyright and Photocopying

© The Australian Rangeland Society 2012. All rights reserved.

For non-personal use, no part of this item may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior permission of the Australian Rangeland Society and of the author (or the organisation they work or have worked for). Permission of the Australian Rangeland Society for photocopying of articles for non-personal use may be obtained from the Secretary who can be contacted at the email address, rangelands.exec@gmail.com

For personal use, temporary copies necessary to browse this site on screen may be made and a single copy of an article may be downloaded or printed for research or personal use, but no changes are to be made to any of the material. This copyright notice is not to be removed from the front of the article.

All efforts have been made by the Australian Rangeland Society to contact the authors. If you believe your copyright has been breached please notify us immediately and we will remove the offending material from our website.

Form of Reference

The reference for this article should be in this general form;
Author family name, initials (year). Title. *In*: Proceedings of the nth Australian Rangeland Society Biennial Conference. Pages. (Australian Rangeland Society: Australia).

For example:

Anderson, L., van Klinken, R. D., and Shepherd, D. (2008). Aerially surveying Mesquite (*Prosopis* spp.) in the Pilbara. *In*: 'A Climate of Change in the Rangelands. Proceedings of the 15th Australian Rangeland Society Biennial Conference'. (Ed. D. Orr) 4 pages. (Australian Rangeland Society: Australia).

Disclaimer

The Australian Rangeland Society and Editors cannot be held responsible for errors or any consequences arising from the use of information obtained in this article or in the Proceedings of the Australian Rangeland Society Biennial Conferences. The views and opinions expressed do not necessarily reflect those of the Australian Rangeland Society and Editors, neither does the publication of advertisements constitute any endorsement by the Australian Rangeland Society and Editors of the products advertised.



The Australian Rangeland Society

REGENERATION AND THE EFFECT OF SIMULATED RAINFALL ON SEMI-ARID WOODLANDS IN NORTH-WESTERN VICTORIA

K. E. Callister and M. E. Westbrooke

University of Ballarat, PO Box 663, Ballarat, Vic 3353

Introduction

There is a prevailing concern at the regeneration failure of overstorey species of Belah (*Casuarina pauper*) and Pine-Buloke (*Callitris gracilis-Allocasuarina luehmannii*) woodlands in north-western Victoria. Despite the creation of large conservation reserves, regeneration failure of many perennial species in these woodland types continues to be a major conservation and management issue. With less than 5% of these woodlands remaining in Victoria, they have been targeted as amongst the highest priority for conservation (Traill 1999).

While most vegetation associations in the semi-arid zone have been subject to some level of disturbance, the semi-arid Belah and Pine-Buloke woodlands have been subject to the greatest modification. Large areas have been cleared for cropping, or subjected to partial clearing by ringbarking or chaining for pasture improvement. Introduced animals have grazed remaining areas since the 1860s resulting in degeneration of the original understorey. The remaining trees in many areas are senescent with little or no regeneration occurring (Westbrooke 1998).

In view of the large areas involved there is a need to determine priority areas for intensive rehabilitation and improve the success rate of such efforts. There is a need for greater understanding of the pre-settlement distribution of the semi-arid woodlands, and their current extent and condition. Information on the condition of the woodlands will aid in identifying areas with sufficient resilience to allow natural regeneration to occur. Determining the conditions required for regeneration will assist in validating condition assessment and relating it to vegetation management. This research is essential if these significant communities are to persist in the long term.

Currently research is being conducted to determine:

- the likely pre-European distribution of the Belah and Pine-Buloke woodlands within north-western Victoria;
- the current extent and condition of Belah and Pine-Buloke woodlands within north-western Victoria; and
- the environmental conditions required for natural regeneration to occur within the Belah woodlands.

Study Area

Belah and Pine-Buloke woodlands are distributed over large areas of north-western Victoria. Investigation of regeneration requirements will be conducted within the Murray Sunset National Park, 633,000 ha located in north-west Victoria, about 550 km from Melbourne and 400 km from Adelaide.

The average annual rainfall in the area ranges from 200-400mm decreasing to the north-west, although this can be highly variable between years. Summers are hot with average maximum temperatures reaching 32.8°C, whilst winters are mild with average minimum temperatures down to 4.4°C (BOM 2000). Extensive dunefields dominate the landscape, with soils in the region ranging from sands to clays (LCC 1987).

The overstorey species of Belah woodlands include *Casuarina pauper* (Belah), *Alectryon oleifolius* ssp. *canescens* (Rosewood), *Myoporum platycarpum* ssp. *platycarpum* (Sugarwood), *Callitris gracilis* (Cypress Pine), *Hakea leucoptera* (Needlewood), and *Hakea tephrosperma* (Hooked Needlewood). Relatively undisturbed examples contain a diverse shrubby understorey including species of *Acacia*, *Senna*, *Olearia*, *Eremophila*, *Maireana* and *Dodonaea*.

Methodology and discussion

Use of remotely sensed data is a practical and cost effective method of monitoring change in vegetation condition over large areas such as the Mallee. This study is investigating various methodologies and data sources, including Landsat TM, SPOT, and aerial photography to determine the condition of the semi-arid

woodlands at the regional scale. Information derived from the condition assessment will be vital in determining resilience of the woodlands. This will enable restoration activities and funding to be targeted at those areas with low resilience and hence low capability for natural regeneration.

For regeneration of Belah and Pine-Buloke woodlands to occur it is thought that rainfall events, consisting of two to three years of well above average rainfall, are required. For seedlings to survive during these regeneration periods, not only is sufficient soil moisture required, but protection from grazing appears to be crucial. In few locations have these two events coincided to allow successful regeneration since European settlement (Westbrooke 1998).

To confirm this hypothesis requires either a long term study, waiting up to half a century for the right conditions to occur, or simulation of the regeneration requirements. The latter technique allows a relatively short-term study to gain evidence of the conditions under which regeneration will occur. The current study seeks to simulate the regeneration requirements of Belah woodland by applying water to experimental plots a minimum of six times per year to replicate soil moisture levels of event years. High spring and summer rainfall appears to have occurred during previous event periods, therefore more frequent watering is planned during these seasons. Other contributing factors identified from the literature will also be investigated, including grazing, soil disturbance, fire and seed source.

Protection from grazing will be provided for the majority of the watered plots by a rabbit and kangaroo proof grazing enclosure. To determine the effect of grazing on seedlings and suckers, replicates will also be placed outside the enclosure. Soil disturbance can also effect regeneration, either through increasing water infiltration and retention, eliminating competition or other seedbed effects. Soil disturbance will be performed by scarifying the soil to a depth of seven centimeters.

Fire is also known to be a significant factor in the regeneration of many Australian vegetation communities, therefore a burning treatment will be replicated within the experiment. To ensure an adequate propagule source for significant regeneration to occur, some plots within each treatment will have hand broadcast seed of the major overstorey species applied.

Outcomes

This research is expected to result in a greater understanding of the factors effecting regeneration of the semi-arid woodlands. By developing a technique for condition assessment via remote sensing, information will be made available about the extent, condition and potential for regeneration of these woodlands. This information will assist in managing woodland remnants to maximise regeneration and ensure long-term conservation.

References

- Bureau of Meteorology (BOM) (2000). Climate Averages URL http://www.bom.gov.au/climate/averages/tables/cw_076031.shtml. (Accessed 16/5/00).
- LCC (1987). Mallee Area Review. Land Conservation Council, Victoria. Victorian Government Printing Office, Melbourne.
- Trall, B. J. (1999). Conservation priorities in Victoria. A report prepared by World Wide Fund and Nature and Victorian National Parks Association for A.N.Z. Trustees.
- Westbrooke M. E. (1998). The Ecology and regeneration status of *Casurina pauper/Alectryon oleifolius* ssp. *canescens* (Belah) woodlands in south-eastern Australia. PhD thesis La Trobe University.