PROCEEDINGS OF THE AUSTRALIAN RANGELAND SOCIETY

19th BIENNIAL CONFERENCE

Official publication of The Australian Rangeland Society

Form of Reference

The reference for this article should be in this general form:

Author family name, initials (year). Title. In: Proceedings of the 19th Australian Rangeland Society Biennial Conference. Pages. (Australian Rangeland Society: Australia).

For example:

Bastin, G., Sparrow, A., Scarth, P., Gill, T., Barnetson, J. and Staben, G. (2015). Are we there yet? Tracking state and change in Australia's rangelands. In: 'Innovation in the Rangelands. Proceedings of the 18th Australian Rangeland Society Biennial Conference, Alice Springs'. (Ed. M.H. Friedel) 5 pages. (Australian Rangeland Society: Parkside, SA).

The Australian Rangeland Society

Addressing feed supply and demand through total grazing pressure management in southern Australian rangelands: key issues and opportunities

CM Waters[1, 6] DK Revell[2], R Grant[3], LI Pahl[4], J Reseigh[5] and T Atkinson[1]

[1] NSW Department of Primary Industries, Trangie, NSW, Australia.
[2] Revell Science, Duncraig, WA; University of Western Australia (adjunct), Nedlands, WA, Australia.
[3] Local Land Service Western Region, Cobar, NSW, Australia.
[4] QLD Department of Agriculture and Fisheries, Toowoomba, QLD, Australia.
[5] Rural Solutions, Adelaide, SA, Australia.

[1] Corresponding author: cathy.waters@dpi.nsw.gov.au

Key words: grazing management, kangaroo populations, grazing interactions

Background

Managing grazing pressure through alternative livestock grazing systems has had a long history of research, often with inconsistent results. In Australian rangelands, this inconsistency is partly due to a failure to account for the often substantial additional grazing pressure from unmanaged native and feral animal populations.

The presence of unmanaged grazing animals can result in the demand for forage being much greater than supply even in well managed livestock systems, and adversely impact soils and vegetation. Here, investment in total grazing pressure (TGP) management strategies is likely to be financially and environmentally beneficial. However, periods of TGP stress occur irregularly and unpredictably, be managed in a disaster rather than strategic context, and occur in a fragmented and adversarial policy environment. Consequently, the management of TGP has progressed little over past decades.

This project, which is a partnership between four states (QLD, NSW, SA and WA), will provide Meat and Livestock Australia with an RD&A Investment plan for TGP management in southern Australian rangelands. A cross-jurisdictional, cross-sector approach involves pastoralists, researchers, extension agencies, policy developers and NRM bodies. This approach also allows information gaps and perspectives to be gathered at regional and national scales.

While there has been a body of past research and reviews of TGP we intend to develop a contemporary plan for future investment by MLA, informed by science and practice. A number of key areas form the basis for the review:

- National and regional trends in density (number/land area) of herbivore species
- Industry and other stakeholder perceptions on trends in herbivore density and TGP management
- Relationships between TGP and livestock production; dietary interactions between herbivore species, feed quantity and animal interaction; implications for resource condition, social impact and animal welfare risks.
- Range of management practices and tools for TGP management

We provide initial insights into

(i) the uncertainty in herbivore density
(ii) an approach to assess the interactions between vegetation and herbivores and thresholds where non-domestic animals compete with livestock for the feed-base
(iii) examples of ways in which industry is practically undertaking management of TGP

Examples of scenarios that will be investigated by this project are provided below.

Herbivore density

Knowledge of temporal and spatial changes in herbivore density is fundamental to decisions on TGP management. There is currently no national body reporting on changes in total grazing pressure, possibly because the State use different methods are monitor different species of herbivore. Data that is collected is primarily used to set quotas for kangaroo management, goat industry preparedness or pest management. While data is generally publicly available, inconsistencies in data collection mean interpretation of broad national trends is difficult, but some regional trends within states can be observed. These trends show that population densities of kangaroos have recently increased in most parts of western NSW but are decreasing in some areas of Western Australia. For example, there were 3M kangaroos in western NSW in 2009, and this steadily increased to >7M in 2016. At a minimum, monitoring is undertaken annually (varying between states) so currently no temporal or spatial information is available at a scale that can inform management at the pastoral property scale, nor is there an understanding of the density thresholds that result in an imbalance between feed supply and demand.

Interactions between vegetation and herbivores

Published data on herbivore feed demand combined with sensitivity analyses can be used to quantify the balance between feed supply and demand, and help to focus R&D priorities. An example set of scenarios are summarised below to quantify the relative impact of herbage biomass, the density of herbivores and the DSE (dry sheep equivalent) value of a kangaroo.

(a) 1,000 ha grazed with cattle (400 kg dry cows) or sheep (45 kg dry ewes)

(b) Herbage biomass 500 kg DM/ha, ME 7 MJ ME/kg DM (poor quality, dry season herbage)

(c) Only 60% of the paddock grazed (50% utilization)

(d) 200 days of grazing

Without additional grazing pressure from kangaroos, 50% of herbage biomass would be consumed over 200 days by either 76 cattle or 590 sheep. We calculated the number of kangaroos (DSE 0.44) needed to reduce the duration of grazing by 10% (to 180 days) to be 135 kangaroos (13.5 kangaroos km-2 or 31 DSE km^{-2}). If the kangaroos DSE value was higher (0.70) the duration of grazing would be reduced by a further 11 days.

Reducing the duration of grazing by 11 days is equivalent to a reduction in starting biomass of only 48 kg DM/ha, from 500 to 452 kg DM/ha. Predicting biomass to within 50 kg DM/ha is an unreasonable expectation in rangelands, showing under this scenario that the kangaroo DSE value is a relatively small issue compared to accurately quantifying herbage biomass. A reduction in feed availability from 500 to 300 kg DM/ha, with no adjustment of TGP requires a reduction in the duration of grazing by 40%, from 180 to 108 days. Alternatively, returning to 200 days grazing duration, livestock numbers would need to be halved if the kangaroo population remained, or reduced by about 40%. The true impact of grazing pressure will depend on a range of biotic and abiotic factors, not captured in the above scenario (e.g. dietary selection and pasture composition).

Recent industry-led approaches to TGP management

Considerable innovation and uptake of total grazing pressure (TGP) management has occurred through fencing in southern Australian rangelands (e.g. partial exclusion and cluster fencing, Figure 1). An overview of the economic, ecological and social implications of these methods is provided in Table 1 and highlight uncertainties around:

- investment costs (including the degree of government co-investment)
- within-fence grazing management practices and changes in distribution of grazing pressure both inside and outside exclusion areas
- the nature and success of long-term collaborative agreements and
- a distinct lack of published data on resource condition and biodiversity changes.

In other parts of the rangeland, different forms of cell grazing, efficient supply chains with regional movement and improved adaptation of livestock are receiving attention. Rangelands Self-Herding is a collection of behavior-based management tools to influence grazing patterns and diet selection, and to better adapt animals to new surroundings. It is based on providing animals with choice (rather than exclusion), and encouraging animals to make an appropriate choice through the use of rewards and positive reinforcement.

Conclusion

There are a number of approaches to TGP management which are currently being adopted in south-eastern Australian rangelands. While there appears to be broad industry uptake of these approaches, uncertainties surrounding the economic and ecological implications of these approaches at farm and regional scales is lacking.

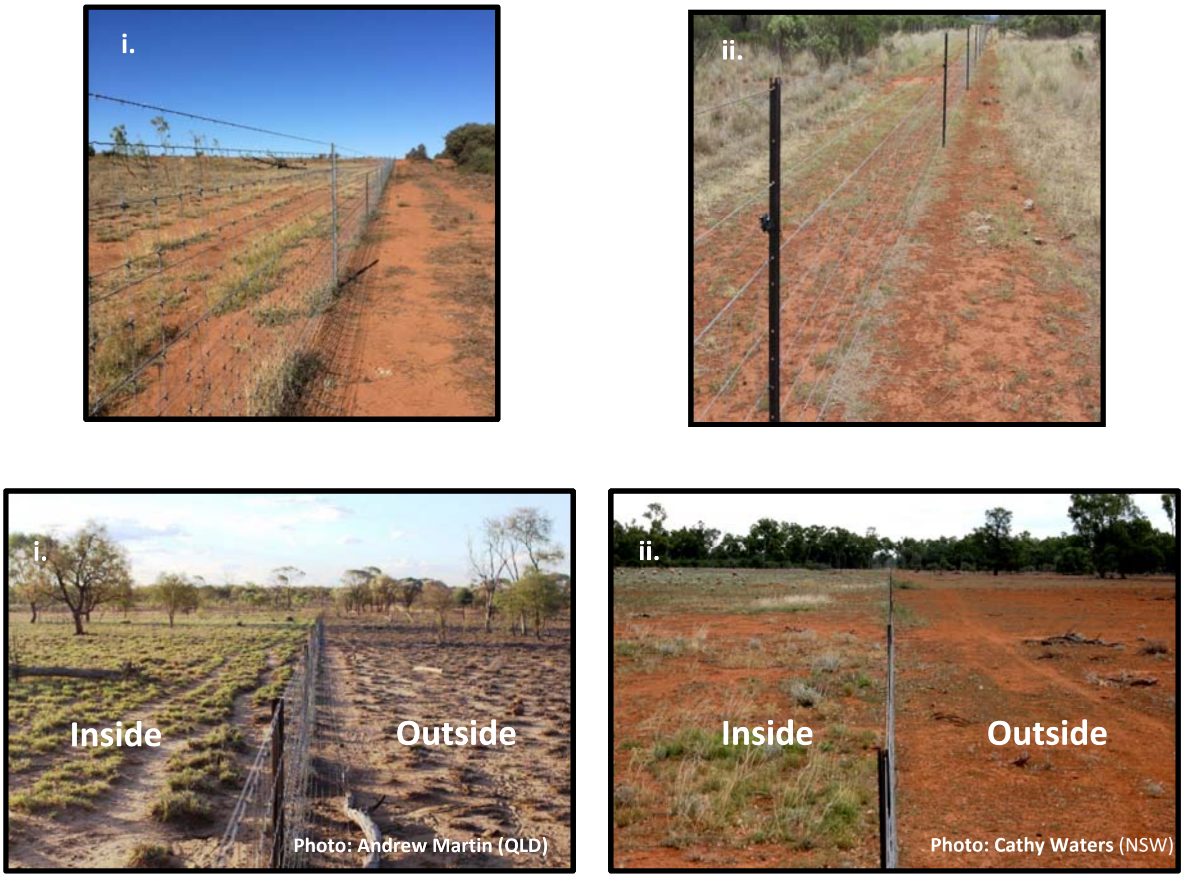

Figure 1. (i) Exclusion fencing: fence height 1.6 m (30 cm apron), 7 m post spacing, hinge-joint suitable to prevent movement of wild dogs, predominantly used in boundaries to surround multiple properties (e.g. 360 to 200K ha **(ii)** TGP fencing: partial exclusion (effective with goats), fence height 1.1 m (top and bottom barb), 10 m post spacing, predominantly used as boundary fences (e.g. 4 to 40K ha).

Table 1. Comparison of three different approaches to management of total grazing pressure and the key uncertainties.

Method	Approach	Target species	Economic	Economic uncertainties	Ecological	Ecological uncertainties	Social	Social uncertainties
Cluster Fencing: Collaborative area management (CAM)	Exclusion	dogs	Fencing cost subsidised through incentive funding Immediate productivity return through 80-100% increased lambing/kidding % Ongoing, coordinated control of wild dogs and kangaroo control required Producers provided with enterprise flexibility (managed goats, sheep, cattle)	Self-funding of internal cluster fencing occurring which places questions over the future role of public funding Current high livestock prices may justify building of internal exclusion fences but in more marginal areas ongoing incentives may be required Divergent priorities for dog/kangaroo control between sheep and cattle producers places uncertainty over permanent reduction in kangaroo/dog numbers	Controls immigration and migration of dogs, kangaroos, goats, emus, rabbits, foxes Limited monitoring data available or undertaken. No trends in increase/decrease of kangaroos inside/outside cluster fences Some inconsistent results in terms of ground cover, perennial species and biodiversity but generally increases in ground cover despite a run of poor seasonal conditions Evidence dogs outside provide some kangaroo control	Whole of landscape impact on ground cover dependent on livestock grazing management Will removal of wild dogs result in increases in kangaroo and goat populations within the cluster Uncertainty over employing goats to control INS within clusters	General optimism in ability and willingness to invest in future farm development Within cluster relationships difficult to build and retain in the long term Properties outside clusters wanting to join	Mechanisms to support, facilitate ongoing biosecurity control as well a collaborative area management
TGP: partial exclusion fencing	Partial exclusion	Goats and kangaroos	Cost of fencing subsidised through funding incentives Generally single property boundary fences Little widespread uptake of internal fencing Increased resilience to seasonal fluctuations in income and reduced drought susceptibility	Unlikely large scale uptake without incentive funding but appears a trend for some carbon farming income in W NSW to be redirected into TGP fencing Competing economic opportunity to harvest unmanaged goats at low input cost despite resource degradation	Controls movement of goats (male goats can be problematic) and partial control of kangaroos Higher perennial ground cover inside TGP fenced areas (9-15%), perhaps Potential restoration tool for degraded areas	Impact contingent on removal of unmanaged animals and ongoing internal grazing management	Increases awareness and desire to obtain incentive funding Provides an avenue for increased drought resilience	Ability of managers to persist with management change especially in periods of duress. Resistance to change from traditional enterprise model

Self-herding	Behavioral	Principally livestock	Low cost Can bring more areas into the grazing range Higher productivity through improved nutrient acquisition by livestock and higher intake associated with diet diversity Reducing/ eliminating lag times when animals are relocated Increased resilience to seasonal fluctuations because animals have a broader set of experiences Improved mustering efficiency	Financial benefits not yet fully quantified across a range of systems Potential benefits to reduced shrinkage and meat quality yet to quantified	Alteration in grazing habitat selection and diet selection	Potential impact of altered dietary patterns Potential to use self-herding tools to influence other (non-livestock) animals	Improves human-animal interactions, making it easier and safer to work with livestock in the paddock and yards	Willingness to continually improve management capacity to implement full suite of Self Herding tools Benefits to public perceptions by improving animal behavior