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**The Devil is in the Detail - Managing feral goat grazing at breeding sites for the endangered Malleefowl *Leipoa ocellata***  
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**Abstract**

Surveys by the Lachlan Catchment Management Authority have mapped the locations of isolated breeding groups of endangered Malleefowl *Leipoa ocellata*. These populations occur within highly specific mallee vegetation that are rare within the general mallee woodlands of the western Lachlan catchment. Direct browsing competition between goats *Capra hircus* and Malleefowl has created a difficult dilemma in balancing conservation outcomes and maintaining income for landholders. In addition to installing a network of 56 water point goat traps, the Lachlan Catchment Management Authority has developed a landscape scale fencing method of passively removing feral goats from critical breeding habitat. Vegetation monitoring sites indicate that removal of high density browsing has positive vegetation outcomes for maintaining critical Malleefowl breeding habitat. In the long-term this new innovative use of strategic fencing to create a system of controlled traffic to reduce the impact of goat grazing in habitats of high conservation value while reducing landholder management costs will make goats profitable under most financial situations yet promote biodiversity of fragile western habitats.

**Introduction**

Malleefowl are listed nationally as Vulnerable under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999, and within New South Wales this species is recognised as Endangered under the Threatened Species Conservation Act 1995. There are at least 4 primary threats and one potential threat that have been identified as causes for the decline of Malleefowl (Benshemesh 2007). The work described in this paper deals with the threat of competition from grazing by feral goats. The western rangelands of the Lachlan catchment, includes the New South Wales Government (DECCWA) Malleefowl monitoring sites of Yathong, Round Hill and Nombinnie Nature Reserves and represent some of the largest continuous expanses of mallee habitat in New South Wales. Potentially these sites hold the most important genetically viable population of Malleefowl for the state. Private/lease lands around the margins of the reserves also hold populations of Malleefowl (Lewis, unpublished data). Helicopter surveys by the Lachlan CMA have provided data to indicate that the distribution of Malleefowl within these private lands is patchy and/or clustered and that Malleefowl may be much lower in density than previously estimated (Lewis *et al.* 2012).

Feral goats are a major threat to biodiversity, particularly in the fragile vegetation of the rangelands and are listed as a key threatening process under the commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (E.P.B.C. Act 1999). The browsing and grazing by this species has significant impacts on native vegetation (Harrington 1976) and can lead to changes in habitat structure and floristic diversity as more palatable species are eaten and removed (Harrington 1976). Browsing by goats directly impacts on the survival of Malleefowl because these birds browse upon the same native vegetation. Indirectly, goat

activity also reduces ground litter and this is a vital resource for nesting Malleefowl in the construction of mounds and in providing cover for newly hatched chicks.

A dilemma has arisen in recent years where goats have become an important resource for landholders in the rangelands yet this species is clearly of conservation concern. In general goats are harvested over warmer periods by trapping at watering points but are rarely managed in a sustainable manner. Conservation of Malleefowl in the rangelands is dependant on finding solutions that reduce the impact of goat browsing and vegetation change but continue to allow landholders to maintain income. A critical development in adaptively managing this threatened species has been locating remaining populations held within private lands, assessing threatening factors and implementing on-ground strategies to prevent these threats continuing. The first of these strategies was to implement a cost-share approach to installing water-point goat traps strategically across the northern band of mallee. The second stage has been to trial a system of strategic fencing around high value Malleefowl breeding sites and incorporate one-way gates to facilitate long-term reduction of goat populations.

### **Methods and Results**

Between April 2009 and November 2011 aerial surveys were conducted across 71,000ha of private/leasehold land in the western Lachlan catchment using grid based techniques to determine locations of nesting mounds (Lewis *et al.* 2012). A total of 30 vegetation assessment sites were deployed on three properties between the 22<sup>nd</sup> November 2010 and 7<sup>th</sup> December 2010 to investigate if differences existed within the vegetation structure between areas containing active nest mounds, and sites where mounds were not evident after thorough aerial surveying (Lewis *et al.* 2012). In addition these sites functioned as monitoring points to determine the level of impact by goat grazing. Five common shrub species were selected that occurred at all sites. At each site five random individuals of each shrub species were selected and from these 10 growing tips were assessed for extent of browsing. Each growing tip was scored for the presence of an intact growth point (score = 10) through to complete lack of fresh growth and loss of leaves (score = 1). Browsing is clearly evident by the loss of branchlets and remaining severed stems. All shrubs were surveyed during a high growth phase following drought breaking Spring rains. Repeated Measures ANOVA found no significant differences across sites indicating that the extent of goat browsing was uniform within all the leasehold properties investigated. All sites were heavily browsed and no shrubs were recorded without damage to growth tips. Following this assessment it was decided to restrict goat access to a trial area of Malleefowl breeding habitat. A goat proof fence was employed around one of the breeding sites with a series of one-way gates allowing outward traffic of feral animals already contained within the site and leading to a system of alleys in low value habitat where animals would be collected at water points (fig. 1). Vegetation monitoring points were randomly placed within this area and adjacent unfenced areas in a similar design as previously described (Lewis *et al.* 2012). Preliminary assessment of plots within fenced enclosures has found no evidence of browsing by goats.

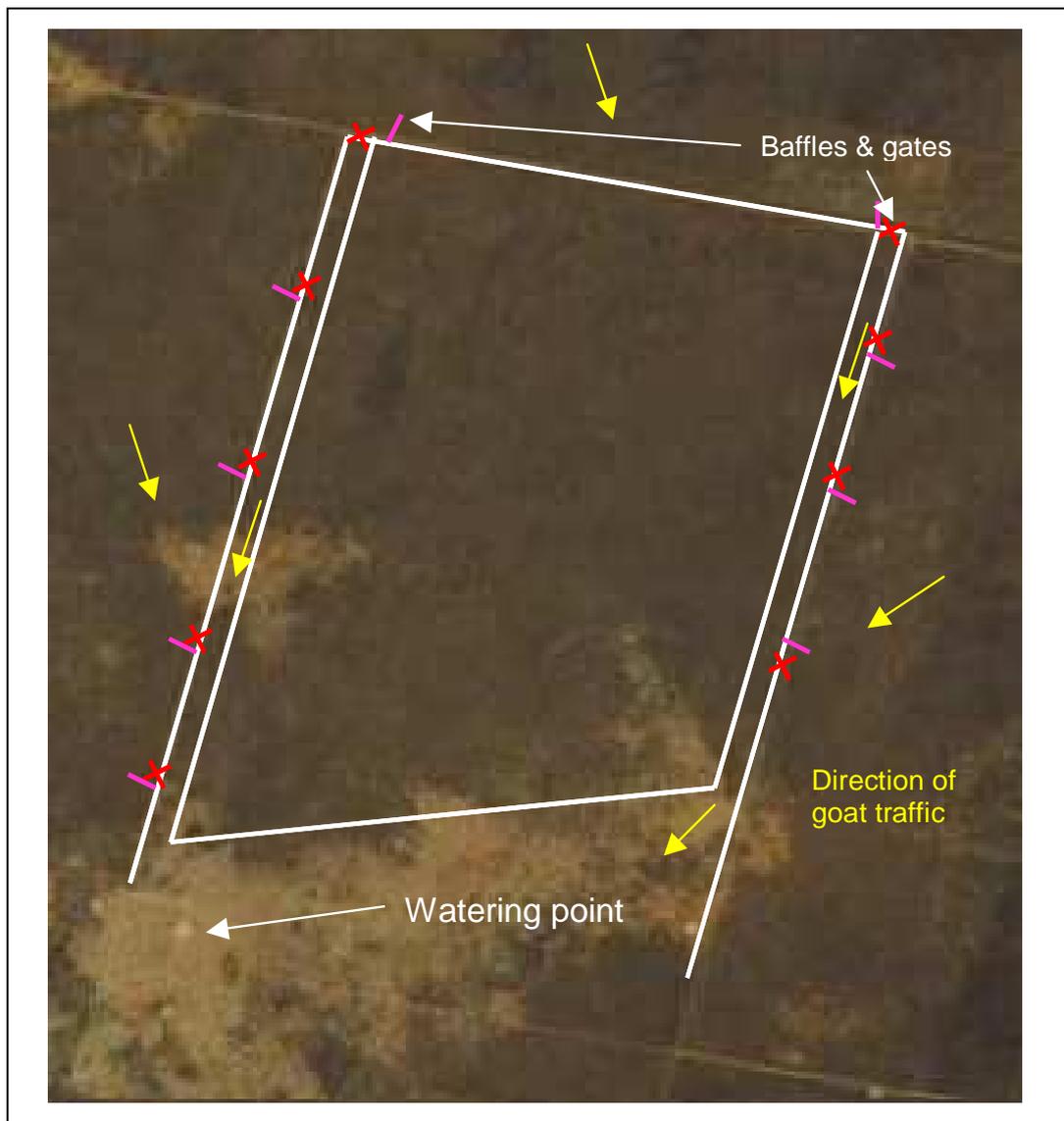


Fig. 1 Restriction fencing design for removal of feral goats within Malleefowl breeding sites.

### Discussion

The distribution of Malleefowl and goats within the rangelands of western New South Wales is not uniform. Malleefowl are located as small isolated clusters of nesting mounds separated by a mean distance of 32.80km. Russell *et al.* (2011) describe the distribution of goats within these rangelands as correlated with water points (artificial and natural), and are rarely found further than 4km from this resource. On lands that are managed for grazing and also contain Malleefowl the distribution of artificial watering sites often leads to the invasion of bird breeding sites by goats. Goats at these sites have a direct impact on vegetation structure that may result in lower reproductive success and survival of Malleefowl. The total area occupied by breeding Malleefowl is less than 500ha across the 71,000ha that has now been surveyed, which is a very small proportion of both the total rangeland area occupied by goats and the area of each lease providing income for landholders. Preliminary results indicate the removal and restriction of goats in mallee can lead to improved vegetation condition. Long-term monitoring of both vegetation and Malleefowl breeding ecology is currently underway to investigate if there are direct conservation benefits to restrictive goat fencing in this case. Malleefowl are a long-lived species and positive population growth is not expected to be measurable in the first three years of the trial but increases in litter and ground cover are promising signs that this trial is a useful adaptive management strategy. If this is the case the

very small area currently occupied by breeding Malleefowl is small enough, financially to be goat-proofed and thus protect Malleefowl from at least one of the key threatening processes currently leading to the decline of this iconic Australian bird species.

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