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THE FERAL GOAT - ITS IMPACT AND PRODUCTION POTENTIAL IN MULGA SHRUBLANDS OF WESTERN AUSTRALIA

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ABSTRACT

The feral goat has demonstrated its suitability to W.A.'s mulga shrublands. The potential to manage goats on poor quality mulga pastures was investigated to assess animal productivity as indicated by reproductive performance, and impact by changes in desirable plant populations and an estimate of the change in desirable plant biomass. Comparisons were made with sheep grazing these pastures.

Goats have no greater impact on this vegetation type than did sheep. The reproductive performance of the goats, at 136% per kidding, was comparable to reported performance elsewhere, and far superior to sheep on this pasture type. The goats did demonstrate the potential for pasture degeneration at high stocking levels.

INTRODUCTION

Feral goat population estimates in 1982 for Western Australia varied from 200,000 to 700,000(1). Goat harvest figures have been increasing over the last five years to a figure of 150,000 in 1989 without any apparent reduction in population(2). Given this level of culling, the population is likely to be much greater than the 1982 lower 200,000 estimate. The feral goat is a problem to the pastoral industry. Goats compete with sheep for forage, place extra grazing pressure on pastures, and reduce the effectiveness of spelling or regeneration programmes. The ability of feral goats to maintain population levels under heavy culling demonstrates their suitability to Western Australia pastoral environment. This obvious suitability has resulted in suggestions that there may be a role for goats in a managed situation, particularly on less productive or under-utilized pasture type.

Environmental damage due to goat grazing is usually a result of poor management or overstocking (3, 4). Before any managed goat grazing enterprise is undertaken, it must be justified that they can be grazed safely and that an acceptable level of animal productivity can be achieved.

Reproductive efficiency is effected by environmental factors, nutrition, and management (5), and reproductive performance should be an indicator of animal productivity and nutritional well-being.

In 1986 the Department of Agriculture commenced a trial to investigate the impact and productivity of feral goats on the poorer mulga pastures in W.A. For the purpose of this paper, data collected on reproductive performance in this trial, and a component of the data on the vegetation study will be used to address the following hypotheses:

•breeding goats can maintain a suitable level of production on poorer mulga pastures.

•goats have no greater impact on these pastures than do sheep at equivalent stocking levels.

METHODS

The trial was established on Yerilla Station, 150 km north of Kalgoorlie in an area of dense mulga-wandarrie shrubland. The vegetation community consisted of mulga (*A. aneura* 500-750/ha) and bowgada (*A. ramulosa* 250/ha) with a shrub understorey of cotton bush (*Ptilotus obovatus*), flannel bush (*Solanum lasiophyllum*) and a range of *Eremophila* species. Woolly butt wandarrie (*Eragrostis eriopoda*) and broad leafed wandarrie (*Monachather paradoxa*) occur as perennial grasses (<50 kg/ha). Annual forage production is seasonal with levels up to 150 kg/ha being recorded.

The trial paddock had not been used in the previous 15 years, but maintained a population of feral goats and kangaroos. Paddock condition was good as indicated by the density and vigour of desirable plant species. The initial pasture condition and composition in each paddock was similar, and paddock boundaries were located to include the major browse shrub types.

Feral goats were mustered on the station and female goats were selected for trial paddocks. The population structure of the available stock was biased toward young animals with 50% being less than one year old. Animals were divided into their five treatment groups by stratified random allocation on age and bodyweight.

Merino ewes were provided by the station as a mixed draft aged $2^1/_2$ to $4^1/_2$ years old.

Treatments consisted of five stocking rates of goats and one of sheep. The range of stocking rates was effected by varying paddock size; each paddock was allocated a similar flock of females. Stocking rates are shown as hectares per dry sheep equivalents (ha/DSE) where a DSE is equivalent to a 45kg dry sheep. The number of goats in each treatment is adjusted to account for their smaller body size when compared with the sheep based on metabolic bodyweight ($W^{0.75}$) (6). The actual stocking rates were not constant due to birth and growth of kids, presence of bucks at joining time, and occasional deaths or disappearances of adults. The stocking rates reported here have been averaged over the four years to include the presence of does, kids, lambs, bucks and any intruding strays entering the trial. Stocking rates are shown in Table 1.

Table 1: Treatment Stocking Rates

TREATMENT	STOCK	PADDOCK SIZE (ha)	AVERAGE STOCKING RATE 1986-1989 (ha/DSE)
1	Goats	48	3.1
2	Goats	96	5.2
3	Goats	192	10.9
4	Goats	288	15.7
5	Goats	384	21.3
6	Sheep	192	15.2

Initially each goat flock contained 20 animals, and the sheep numbered 14. This was reduced to 17 goats or 13 sheep after 12 months to adjust for the presence of bucks, rams, kids and lambs. Each year three or four older does were culled and replaced with weaners. The same group of sheep were used in 1986 and 1987, and then replaced by a similar group of $3^1/_2$ and $4^1/_2$ year old sheep from the general station flock in 1988.

Figure 1

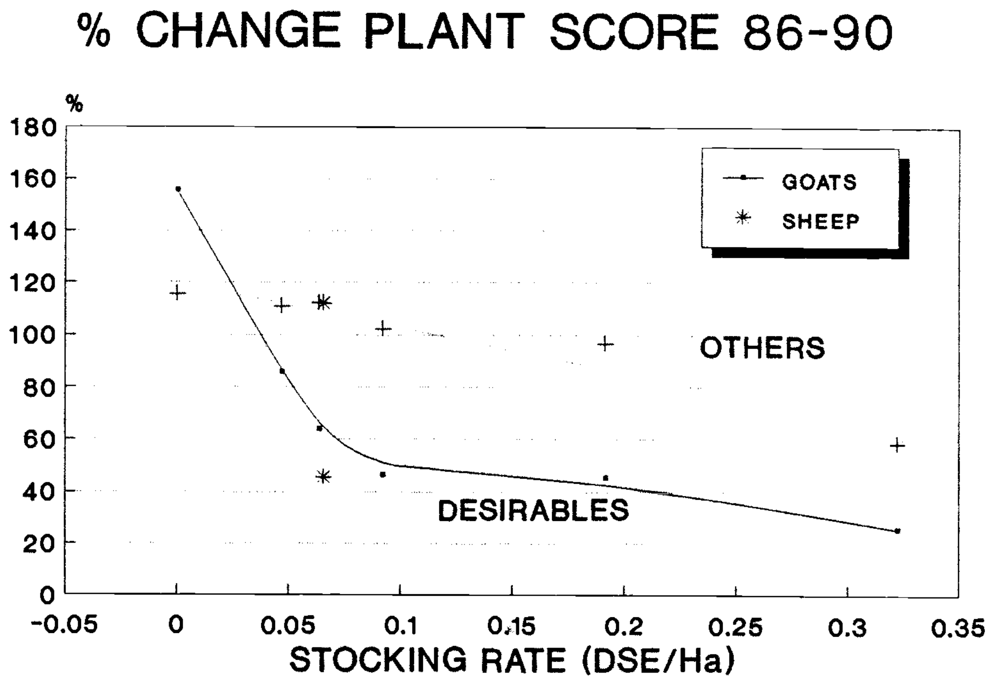
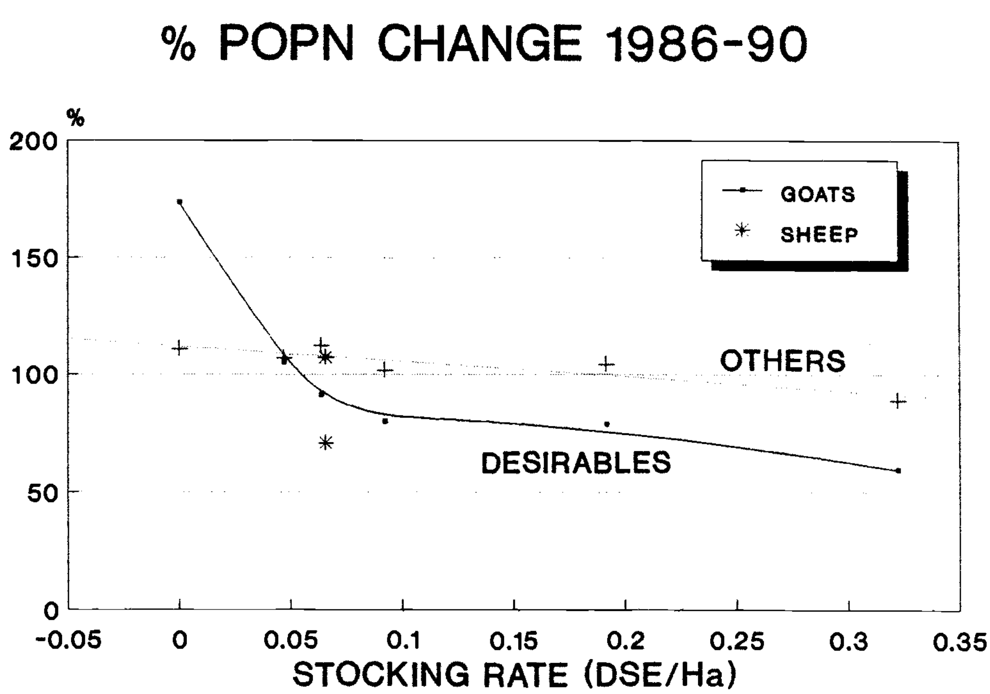


Figure 2



Males were introduced in March and parturition occurred from August onwards. Two males per treatment paddock were used in 1986, 1988 and 1989 and one per treatment in 1987.

Reproductive performance was measured by the number of offspring surviving to November.

Under this stocking regime permanently located transects were assessed annually, and individual plants measured for maximum width and height. By locating each plant by co-ordinates, deaths and recruits could be identified. Each treatment consists of six or seven transects for a total of at least 900 individuals per treatment in 1986. Exclosure fences were also erected and transects located within to act as a control.

Plant dimensions can be related to available forage (7). In this study plant dimensions, specifically the sum of maximum width and height, are recorded on each plant plus any recruits occurring on the transect for each treatment. The summed values of maximum width and height can then be totalled to give a "plant score" for that species or group of species. Changes in "plant score", being a repeated measure made on the same plant population, should be a good indicator of changes in plant biomass for a species or group of species, reflecting both changes in biomass on individual plants and the effect of recruitment and mortality on total available biomass.

RESULTS

All plant species occurring on transects have been classified as "desirable" or "others". The complete perennial species list and their classification is shown in Appendix 1. The classification is arguable and by no means definitive, but "desirables" are regarded as those likely to reflect grazing treatments in this environment; 41% of all individuals fell into the "desirable" class.

A summary of the vegetation recordings is shown in Figure 1 which shows the percentage change in "plant score" over the four years versus stocking rate for both "desirable" and "others". A percentage has been used to account for any variation in initial "plant score" that may occur between treatments.

The curve is plotted for the goat treatments, and the one sheep treatment is also displayed. As expected, the "desirable" species are more responsive to the treatments than the "others".

Figure 2 shows the percentage population change of "desirables" and "others", with curves plotted against stocking rate. The sheep treatments are also displayed. A similar trend to that in Figure 1 is seen.

To give an indication of the fate of new recruits into the community under the various treatments, Figure 3 shows the mortality rate to 1990 of "desirable" plants that were recorded as recruits after 1986. The linear trend shown for the goat treatments (r=0.97) does not hold for the sheep treatment.

Figures 4 and 5 show percentage size change of species *Acacia tetragonophylla* and *Maireana villosa*. The impact of sheep grazing on these two species appears less severe than that of the goats.

The reproductive performance of the goats averaged over the years 1987 to 1989 is shown in Figure 6. The reproductive performance in 1986 was not included

Figure 3

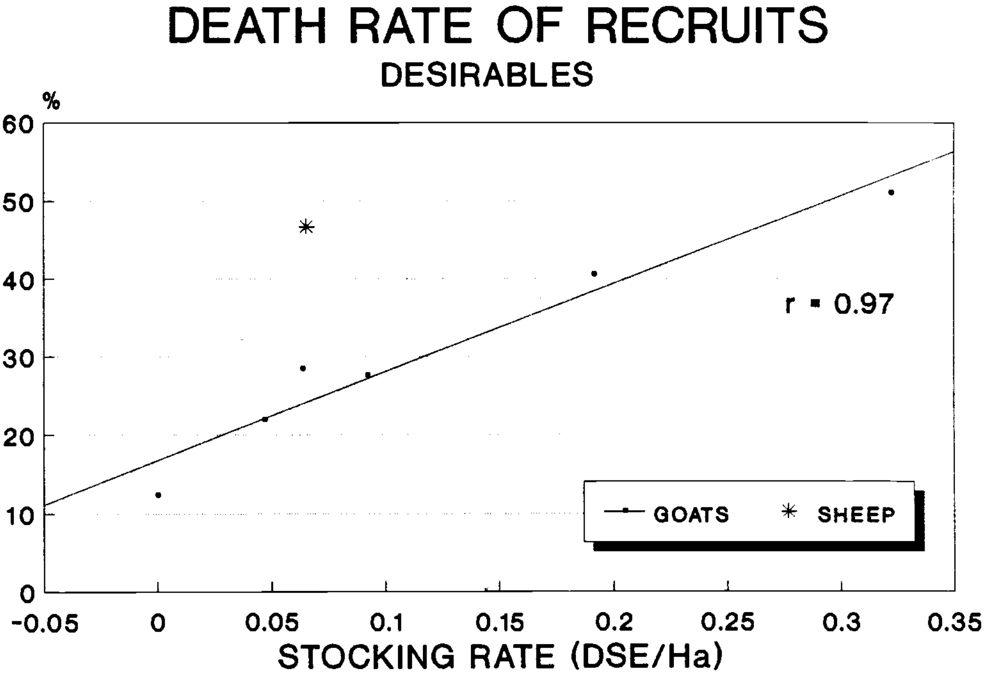


Figure 4

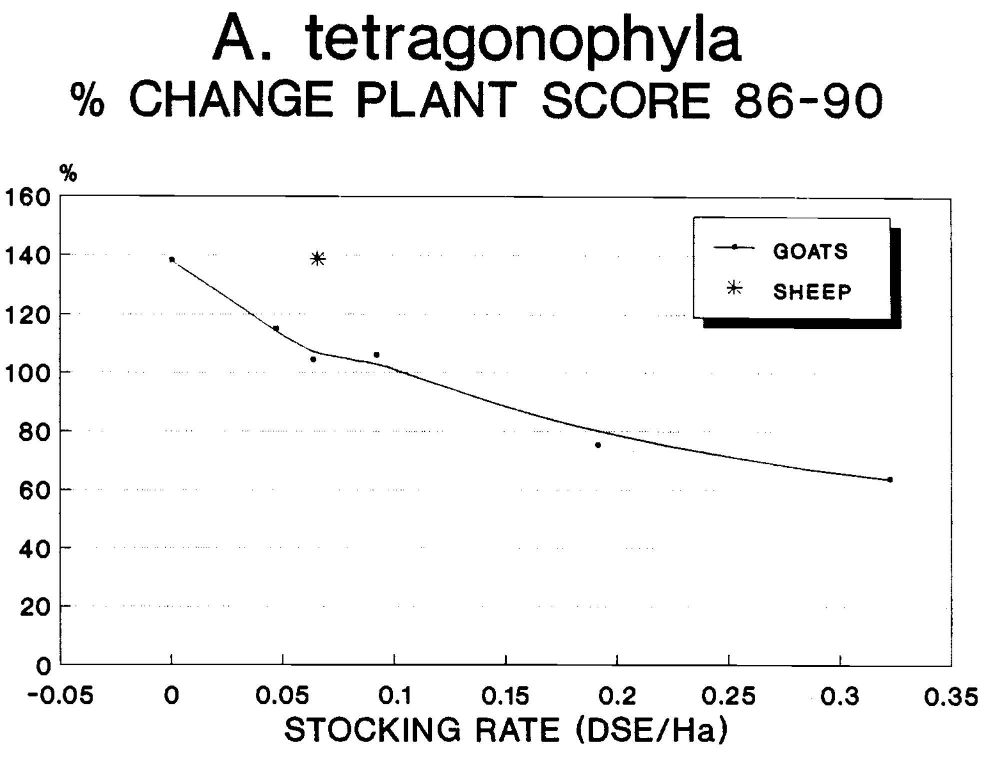


Figure 5

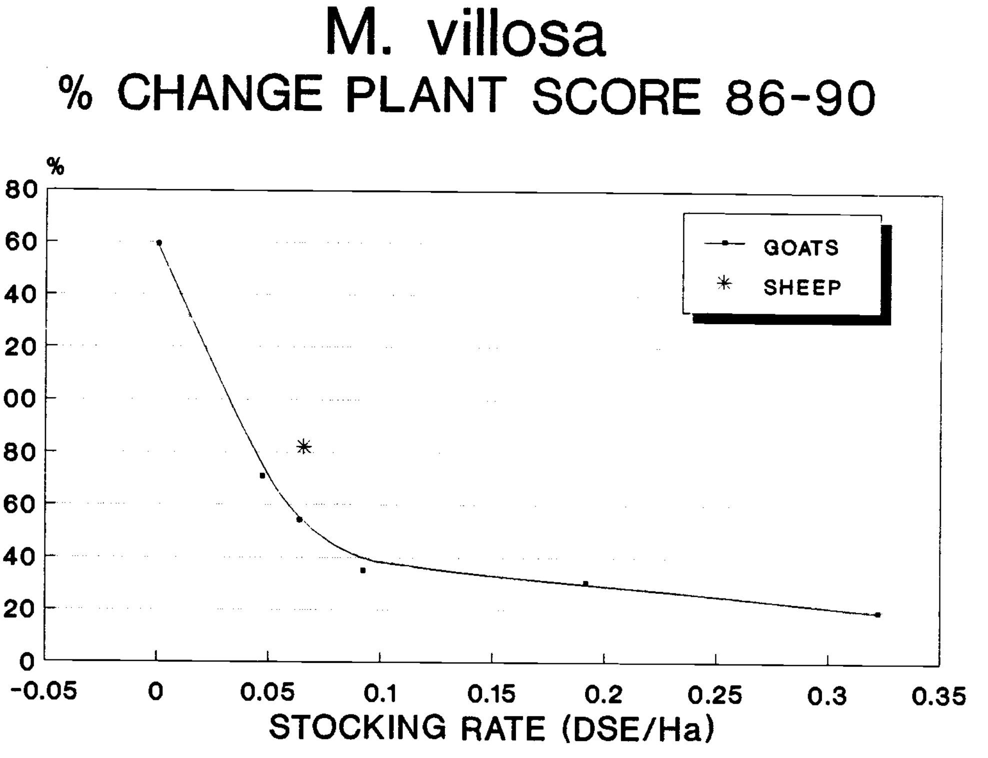
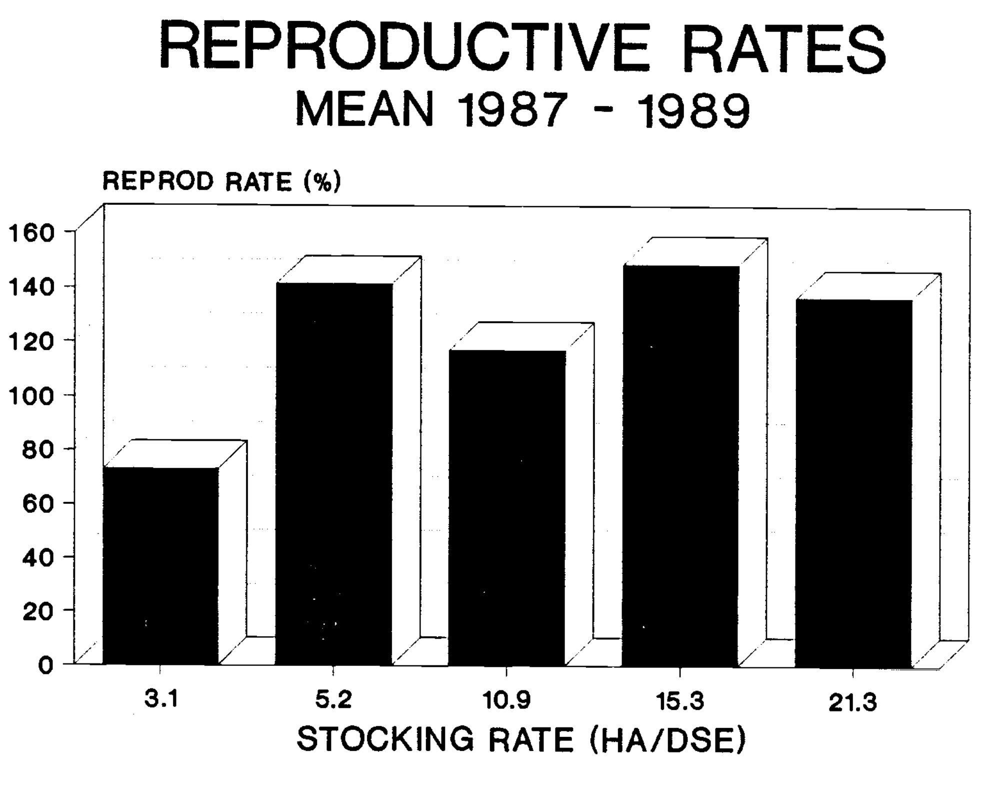


Figure 6



due to the initial "haystack" effect of available forage, which did not reflect the grazing treatments. The reproductive performance of the goats shows a significant reduction at the highest stocked treatment (Chi sq = 10.5 on 1d.f. $p<0.01$). The average of the other treatments over the four years is 136%. Only one lamb was reared over 1987 and 1988. In 1988 a pregnancy scanning showed a 60% conception rate, indicating a likely failure of lambs to survive after birth.

DISCUSSION

Sheep reproductive rates can be as high as 85% in the mulga shrublands of W.A. (8), however breeding ewes are normally run on the better pasture types. The poor reproductive performance of the sheep on this pasture type was not unexpected, as this country normally runs dry sheep. The major reproductive losses appear to occur after birth when the greatest nutritional demands would be placed on the ewe.

Feral does in South Australia can be expected to produce 1.61 kids per kidding (9); 120% kidding rate can be expected from feral does running in agricultural areas in N.S.W. (10). The animals in this trial are rearing 136% kids to weaning, which compares favourably with the South Australian, and the N.S.W agricultural area's figures. The kidding performance is particularly good when compared with the sheep in the same environment.

Given that the animal can successfully reproduce in this environment, what is the likely impact of goats on the vegetation under long term grazing. There has been a decrease in the desirable component in the pasture under all grazing treatments. This was expected, as prior to the trial the grazing pressure was light. It is apparent from Figures 1 and 2 that the goats have no greater impact on the desirables as a group. Using the changes in plant score as indicative of changes in available plant biomass, the productivity of the community under goat grazing will not be less than under sheep grazing.

Looking at a number of individual species it is apparent that goats utilize some species such as the *A. tetragonophylla* and *M. villosa* more so than do sheep. In the case of the former, a prickly acacia, though it is accessible to sheep, it is not preferred. The latter species has a growth habit where it is often hidden within other plants. It could be presumed that the sheep is less adept at searching out these less accessible plants. If the goat does browse a broader range of species, including some of those less desirable species, the impact on the more preferred species is likely to be less.

Clearly from Figure 3, the fate of any recruiting desirable plants is going to be less certain under a sheep grazing regime.

The impact on the desirable plants at the high stocking rate has been marked, with "plant score" being reduced by 75%, and in population of desirables by 40%. The reduced reproductivity within this treatment is reflected in the reproductive performance of the goats. At the 5.2 ha/DSE treatment, no such reduction in reproductive performance occurred, even though there has been quite an effect on the desirable plants. This indicates that the use of animal condition to reflect appropriate stocking levels could result in overstocking under a goat grazing system. Suitable vegetation monitoring techniques should be the basis for setting stocking levels.

CONCLUSIONS

Both hypotheses must be accepted: Goats can maintain a suitable level of productivity on these poorer mulga pastures, and the impact of goats on the vegetation is certainly no greater than that of sheep at an equivalent stocking rate. There is some evidence that goats at a conservative stocking level may have less impact than sheep, and further investigation of the data is required.

At high stocking rates the impact of goats can be severe, but animal productivity is only reduced at the highest stocking levels. Suitable stocking levels for goats must be carefully chosen, considering pasture not animal performance.

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APPENDIX 1

"DESIRABLES"	"OTHERS"
Canthium lineare	*Acacia aneura*
Dodonaea rigida	*A. kempeana*
Eremophila eriocalyx	*A. linophylla*
E. latrobei	*A. ramulosa*
Maireana convexa	*A. tetragonophylla*
M. georgei	*Cassia nemophila*
M. species	*Dianella revoluta*
M. villosa	*Eremophila georgeii*
Prostanthera wilkieana	*E.forrestii*
Ptilotus obovatus	*E. granitica*
Rhagodia eremaea	*E. homoplastica*
Scaevola spinescens	*E. longifolia*
Sida calyxhymenia	*E.punicea*
Sida corrugata	*E. glandulifera*
Sida spp.	*Grevillea spp.*
	Hakea preissii
	Maireana triptera
	Olearia pimeleoides
	Solanum lasiophyllum
	Solanum orbiculatum
	Spartothamnella teucriiflora