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Total grazing management : results and observations from the Pimbee Station trial

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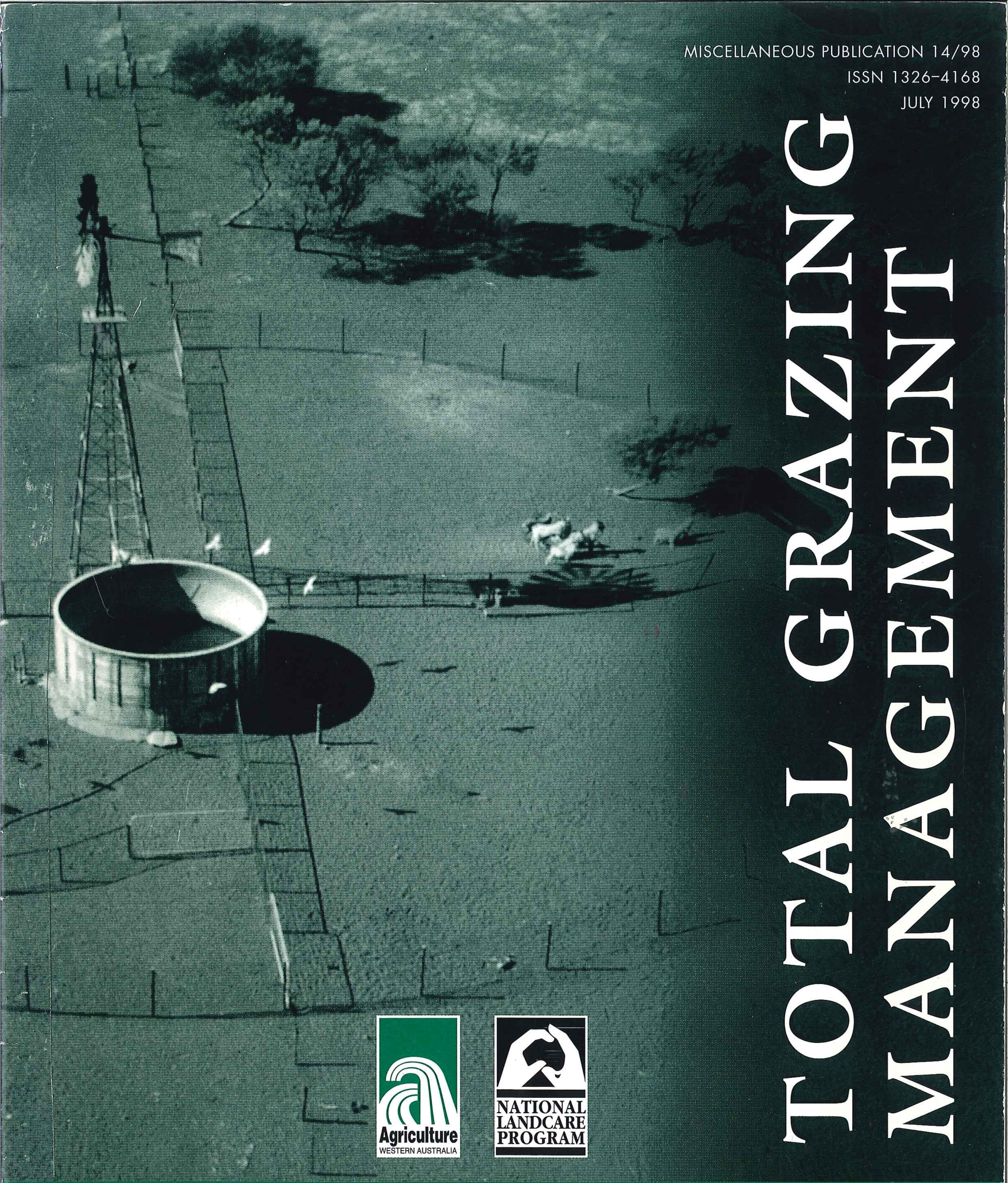

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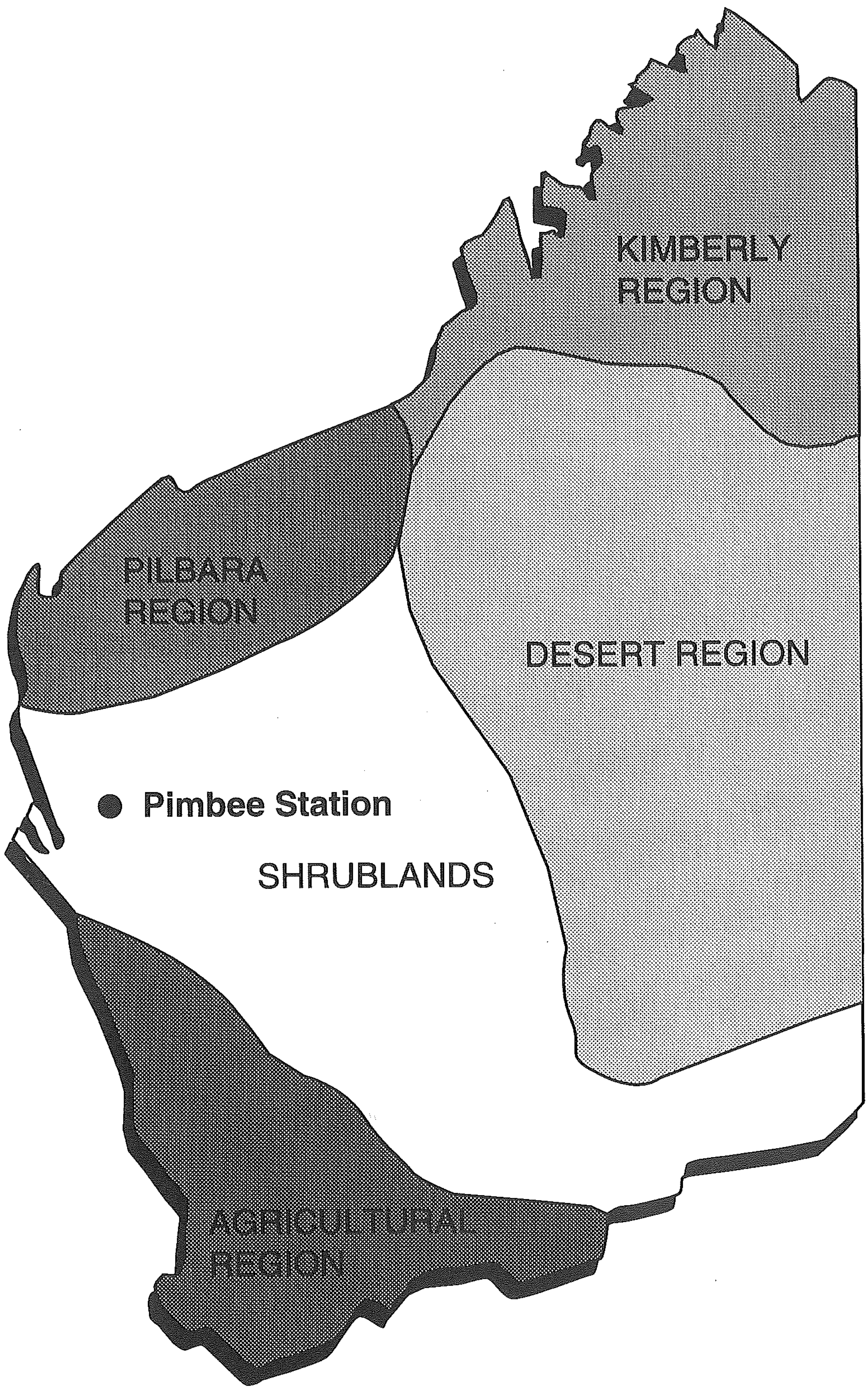

Figure 1. Pimbee trial site location.

SUMMARY OF RESULTS

- Permanent trapyards are effective in managing total grazing pressure.
- Trapyards must be permanent with walk-in, walk-out gates.
- The development of a routine by animals is a critical factor.
- Trapyards should contain animal handling infrastructure.
- Substantial gains in efficiency are possible with permanent trapyards.
- Trapping should occur on a manageable number of waters at any one time.
- Trapyards should be closed overnight when trapping to prevent kangaroo entry.

INTRODUCTION

This report contains the results of the NLP - Agriculture Western Australia funded Total Grazing Management project, initiated in 1995. One of the aims of this regional project was to develop strategies for managing total grazing pressure in the southern rangelands of Western Australia. The following report deals with the project work done at Pimbee Station (Fig. 1), where permanent trapyards established at water points were trialed to determine their potential for managing all grazers.

TOTAL GRAZING PRESSURE

Domestic stock are only one component of the rangeland grazing system, with kangaroos and feral goats contributing more than half of the grazing pressure in some regions (Landsberg and Stol, 1996). Feral goats are extremely well adapted to the semi-arid environment of the southern rangelands, and are capable of maintaining high breeding and population growth rates under adverse conditions that limit the breeding success of other stock and native animals. Under favourable conditions, feral goats have the capacity to increase in numbers by up to 75% per annum (Henzell, 1992). In Western Australia, feral goats have increased in population size and distribution in recent times (Holt and Pickles, 1996), resulting in the introduction of a feral goat eradication program in 1991.

Feral goats are not constrained by traditional station fencing, and as such have the ability to readily move between paddocks and properties. They do not, however, appear to perform large migratory movements (King 1992; Holt and Pickles 1996). Feral goats confine their normal activities to a home range, which may overlap with the home ranges of many other feral goats (Holt and Pickles, 1996). This suggests that, similar to kangaroos, long term control of feral goat numbers is possible in localised areas.

There is general agreement that populations of large macropods in the rangelands have increased through the provision of artificial water points expanding their useable habitat (Norbury, 1992). McNamara and Prince (1986) indicated that in the 600,000km^2 shrubland pastoral areas of Western Australia where sheep grazing is the predominant land use, red kangaroo habitat has been improved. In addition to this, it is possible that the reduction in predatory pressure from dingos has also contributed to the success of the red kangaroo. Caughley *et al.* (1980) suggest that kangaroo density can be directly affected by dingo predation, as in open country where limited or no alternative prey is available, kangaroos cannot maintain high densities. The control of the dingo in the sheep rangelands of Western Australia is likely to have reduced a significant form of population control.

There has been an increased survival of kangaroos into drought which places added stress on dwindling pasture reserves (Edwards, 1989), however, their impact is greatest during more 'normal' years as they may suppress recruitment and survival of desirable perennial plants (Gardiner 1986). Norbury *et al.* (1993) found that kangaroo grazing significantly impeded the accumulation of annual and perennial grass biomass in a degraded shrub community and in regeneration areas. It was found that pasture species diversity was significantly greater in sites protected from kangaroo grazing, and the authors suggest that unless effective methods of kangaroo control are integrated with stock reductions, the recovery of degraded rangeland pastures is likely to be severely limited.

A problem frequently indicated by pastoralists is the apparent increase in kangaroo numbers in areas destocked of sheep, which results in an inability to properly rest paddocks. Norbury and Norbury (1993) found kangaroo presence increased significantly (dung increased six-fold) in paddocks where sheep had been removed. They also indicated that the kangaroos were mostly sedentary, with 'invading' kangaroos emerging from local areas. The concentration of kangaroos on stock-free areas was attributed to an increase in pasture biomass and/or a preference for ungrazed or unsoiled areas as opposed to any behavioural antagonism between the species. This supports the findings of Andrew and Lange (1986), who also indicated that kangaroos move in response to sheep grazing activity rather than the converse.

Freudenberger and Hacker (1997) indicated that kangaroo and feral goat grazing pressure cannot be substantially reduced by the short-term closure of, or denying access to, waters in or near spelled paddocks. It is not known exactly why this is the case, however it may be related to kangaroos visiting alternative nearby water points within their home range

All of the above information suggests that without some form of kangaroo management, the ability to rest paddocks and the regeneration of areas will be hindered, as the potential exists for grazing pressure on such areas to be maintained. However, if incursions into such areas come from 'local' kangaroos moving within existing home ranges, kangaroo control programs are likely to be long lasting, as re-invasion of an area from kangaroos performing migratory movements would be unlikely due to the fact kangaroos possess a home range.

While traditional station fencing generally contains domestic stock, the degree of control is variable due to the size of properties and the condition of some of the infrastructure. Such difficulties mean stock grazing pressure is not always under control. Over the years, pastoralists have installed fence-based management infrastructure aimed primarily at controlling domestic stock; hence ongoing control of total grazing pressure has been difficult and expensive. The final report to the Biodiversity Group of Environment Australia (1997) on the effects of artificial water sources on rangeland biodiversity recommended that grazing associated with water points must be incorporated into strategies for conservation in the semi-arid zone. Permanent trapyards are an obvious method of controlling grazing pressure that exists around water sources.

TOTAL GRAZING MANAGEMENT TRIAL

The major aim of the trial was to assess the effectiveness of permanent trapyards as a system for managing total grazing pressure. Permanent trapyards potentially offer a cost-effective system of controlling domestic stock, feral goats and kangaroos. Criteria used to find a suitable trial location included:

- The number and distribution of water points contained within a property.
- The number of alternative (natural) water points present.
- Proximity to the domestic goat trial at Winderie station.

Five properties were visited during the selection process. On Pimbee station, the distribution of water points over a grid network covering a large area provided a sound basis for the trial activities. The trial site shares a boundary with Winderie and Yalbalgo stations to the north, Wahroonga station to the west and Meedo station to the south.

The trial site was dominated by the Yalbalgo land system. The dunes supported a woodland of sand dune gidgee (*Acacia anastema*) while the dominant vegetation type on the swales was wanyu (*Acacia ramulosa*) (Fig. 2, p. 13). Shrubs included Wilcox bush, cotton bush and spiny mirbelia. Common perennial grasses included broad-leafed wanderrie, nytong grass, barbed wire wanderrie and buck wanderrie. A number of claypans and other drainage foci were present, supplying water irregularly after rain events.

Pimbee station is located in an area that receives predominantly winter rainfall, with an annual average of approximately 220mm. Winters are mild with summers generally hot. The area of the trial site is highly suitable for trapping, with animals generally becoming dependant on artificial waters between October and April, depending on rainfall. Over summer the average daily maximum reaches 40.5 degrees Celsius.

Eleven water points covering an area of approximately 26km x 26km (68,000ha) were included in the trial. Ten of these were bores, tanks and troughs and one was a shire borrow pit, which acted as a dam, holding water for months at a time. Permanent trapyards were established at each of the 11 water points in the trial site. Each animal had to negotiate the trap to access water. Figure 3 illustrates the layout of the trial site.

The four waters in the centre of the trial site were 'protected' in that they lay within an area surrounded by permanent trapyards on water points. Animals present in this centre area would have to travel a minimum of 13km to reach a permanent water point not controlled.

Domestic stock operations were monitored to ascertain the time and labour savings experienced and the effectiveness of the trapyard designs for stock handling. Also, six vegetation monitoring sites were installed to gain information on the range condition at the outset of the trial to act as a reference for future comparison.

Aerial surveys were conducted prior to establishment of the yards and pre- and post-trapping to gain information of feral goat population dynamics in the trial site. A Robinson 22 helicopter was used to survey 11 transects that ran north-south for 26km, spaced 2.5km apart. Systematic sampling was used to aid in repeatability. Surveys were conducted at dawn, and flown at an altitude of 200ft. Observations were made out of the front of the helicopter, looking along the transect. Transects were 150m wide and the area was sampled at an intensity of 6.6 per cent.

Kangaroos were observed in and around the trapyards throughout the trial. Night observations were conducted to gain information on their behaviour when in the trapyards, and when in contact with feral goats. A permit was obtained from the Department of Conservation and Land Management to trial a professional kangaroo shooter, to determine whether the yards had potential as an efficient and humane kangaroo management device. Sheep behaviour and numbers were also monitored.

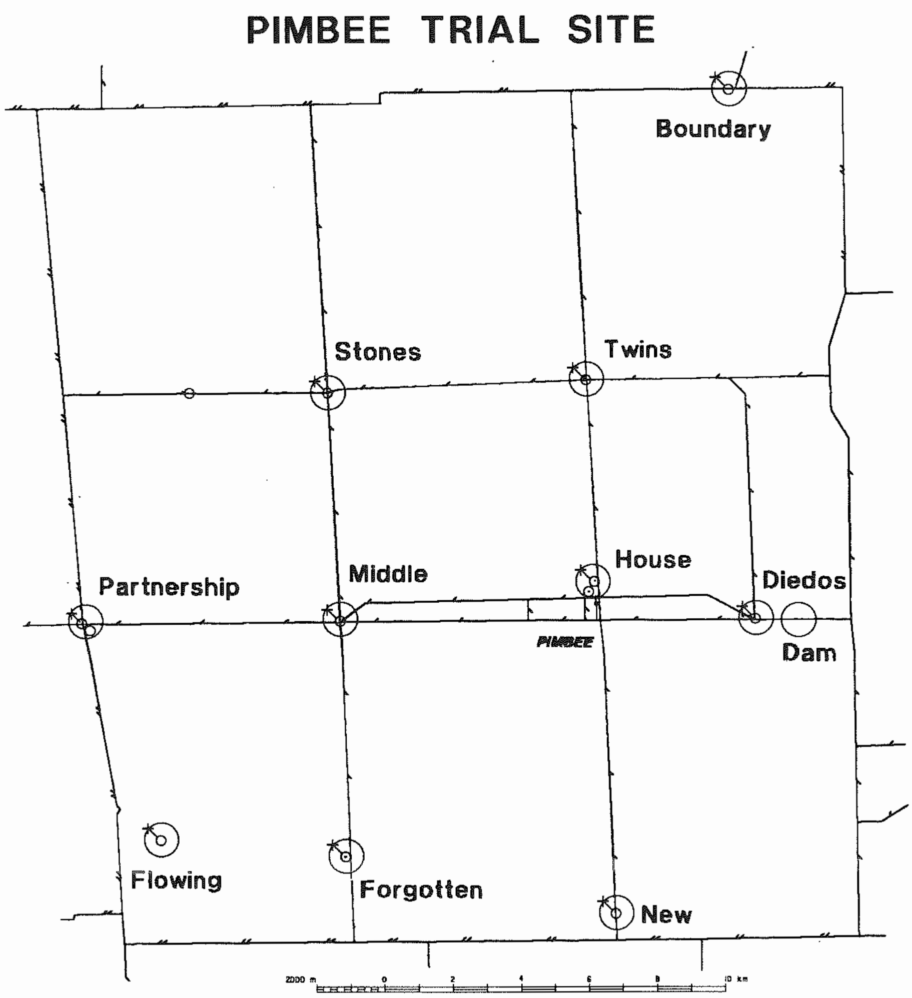

Figure 3. Layout of Pimbee trial site.

PERMANENT TRAPYARDS

Trapyard design

A system is more likely to be adopted by the pastoral community if it is multi-purpose. Each trapyard established at the trial site was more than merely an animal capture device. Loading and drafting facilities were incorporated to make each yard a complete animal handling facility. The majority of water points in the trial site were located at the junction of paddocks. The trial incorporated designs for trapyards established at 2 and 4 paddock junctions, as well as stand alone water points servicing a single area. Detailed specifications of the trapyards and notes on installation are included in Appendix 1.

The circular yards resulted in the most efficient use of materials to gain the maximum internal area. The lack of external corners aided the movement of animals within the yard into the loading area through the internal gates, and minimised the time and effort required to handle them, subsequently reducing animal stress. Figure 4 (pp. 13-15) illustrates trapyards constructed at Pimbee station.

Although each trapyard was constructed to suit the requirements of each water point, the loading/drafting area was kept standard between yards to allow portable infrastructure such as the drafting gates to be carried to each yard as required.

Trap gates

The trap gates used in the trial were of a design based on the best features of the 'Boolathana' type spear gate. The main criteria for the design and construction of the gates was durability and reliability, as they were in place 365 days a year, and used every time any animal accessed water. The trap gates were walk-in, walk-out spear gates enclosed within a 3m gate frame (Fig. 5, p. 16).

Features of the trap gate include:

- Single solid frame – can be used as a normal swinging gate.
- Four equal interchangeable spear assemblies allowing walk-in, walk-out, single and dual entry trapping.
- Removable spear assemblies – easy maintenance, flat loading for freight.
- 40mm angle spears for superior strength, effectiveness and longevity.
- Effective spring adjuster.
- Spear assemblies can be pinned closed when trapping or loading – no pieces of mesh or tie wire required.

Construction and costs

The labour requirement will vary between sites and for alterations in design that may occur. The time required to construct the four paddock junction trapyard was approximately 90 man-hours. The two paddock set up required approximately 60 man-hours, and the single water point required approximately 30 man-hours. No attempt has been made to estimate the labour costs in dollar terms as these vary widely across the industry.

The cost of the yards quoted below are for materials only, and does not include freight charges. Dollar values reflect the prices we paid at the time of construction. Prices may vary for subsequent constructions.

Table 1. Materials and costs for project demonstration yards.

4 paddock system	Quantity	$/unit	$
Diameter	40m		
Posts min. 2 inch (total)	82	7.00	574.00
Mesh 1.4m	2 x 60m rolls	240.00	480.00
Railing 1 inch	10 x 10m lengths	12.00	120.00
Mesh 1.15m	1.8 x 60m rolls	200.00	360.00
Gates	5	90.00	450.00
Consumables		150.00	150.00
Sub total			**2134.00**
Trap gates	4	300.00	1200.00
Total cost of materials			**3334.00**
2 paddock system	**Quantity**	**$/unit**	**$**
Diameter	20m		
Posts min. 2 inch (total)	48	7.00	336.00
Mesh 1.4m	1.3 x 60m rolls	240.00	312.00
Railing 1 inch	6 x 10m lengths	12.00	72.00
Mesh 1.15m	1 x 60m roll	200.00	200.00
Gates	3	90.00	270.00
Consumables		100.00	100.00
Sub total			**1290.00**
Trap gates	2	300.00	600.00
Total cost of materials			**1890.00**
1 paddock system	**Quantity**	**$/unit**	**$**
Posts min. 2 inch (total)	30	7.00	210.00
Mesh 1.4m	1 x 60m roll	240.00	240.00
Railing 1 inch	2 x 10m lengths	12.00	24.00
Mesh 1.15m	0.4 x 60m roll	200.00	70.00
Gates	1	90.00	90.00
Consumables		70.00	70.00
Sub total			**704.00**
Trap gates	1	300.00	300.00
Total cost of materials			**1004.00**

Training of animals

Proper training of animals to the system is a most important. Effective training will reduce the likelihood of problems being encountered. At the completion of each trapyard during the establishment of the trial, the opening where the walk-in walk-out trap gates would normally be positioned was left empty to allow animals to become familiar with the access points for the water. The opening remained for a period of 2 – 8 weeks, depending on when construction was completed. This procedure is particularly important where the animals will be accessing the water from a new direction.

Following this initial familiarisation period, the trap gates were installed and set to the wide position. The large gap between the spears allowed animals to get used to entering and exiting through the appropriate gates. The spears were then gradually brought closer together. Training resulted in animals developing a routine. They quickly became used to accessing water through the trap gates, and as a result were extremely vulnerable to capture by closing the exit gate. Without proper training, trapping effectiveness will be reduced, and animal welfare could be jeopardised.

RESULTS AND DISCUSSION

VEGETATION

A total of six vegetation monitoring sites were installed throughout the trial area to monitor the impact of the system on the vegetation. Each site was located between 1.5km and 2.2km from a water point, and contained a perennial transect and photopoint to determine long term survival and grazing intensity. These sites have been installed to provide information on the effect of the TGM system on the botanical composition and relative abundance and as such it is too soon for treatment effects to be detected.

DOMESTIC STOCK OPERATIONS

Throughout the course of the trial, the host pastoralist (Kym Miles) used the trapyards for a number of sheep operations. Mr Miles indicated he believed the system offered significant benefits. All drafting of sheep for sale is now performed at the yards as opposed to previously having to move sheep to the homestead for this purpose on occasion. The yards are providing an estimated 50 per cent saving in labour and time for sale operations on the property.

All marking/tailing operations could be performed in the yards, and the labour and cost savings by jetting in each yard would be substantial. One of the first major uses of the yards for domestic stock was gathering sheep for a straggler shearing. Mr Miles estimated that the collection and drafting operation took approximately 40 per cent of the time it previously required, with all animals readily trapped due to the routine they had developed. For comparison, Mr Miles used existing plain wire yards with a spear gate set up for the trapping period only, and found it to be unsatisfactory compared with the permanent yards.

The permanent yards provided a degree of stock control not previously encountered, with a far greater ability to remove rams compared with previous methods. Mr Miles indicated that the system genuinely provides the pastoralist with the ability to improve the flock over time, something that was very difficult in the past.

One of the major benefits of the system has been the minimal impact on domestic stock. The ability to do most operations at each water point and the elimination of mustering significantly reduces the amount of stress on the stock. There is also a large saving in wear and tear on bikes, vehicles and equipment.

Overall, Mr Miles estimates that on his property, the permanent trapping system reduces the labour and time requirement for sheep operations by 50 – 60 per cent.

In summary, the permanent trapping system had the following impact on the station enterprise:

- Reduced stress on stock.
- Reduced animal handling time.
- Reduced wear and tear on station vehicles and infrastructure.
- Reduced time and labour component for operations.
- Increased ability to improve flock breeding management.
- Increased ability to spell paddocks.
- Increased ability to control all animals.
- Increased productivity.

The financial ramifications of the trapping system on a station enterprise will vary with each enterprise, however with appropriate management the system offers financial benefits in the form reduced costs and increased productivity.

MANAGEMENT RECOMMENDATIONS – DOMESTIC STOCK

The efficiency of the TGM system relies on the following elements, each of which is integral to the operation. Remove any element or successive elements and the system rapidly loses efficiency, ie. you will have to muster.

- Target animals dependent on water.
- No alternative sources of water available.
- Infrastructure compatible with target animals.
- Target animals' familiarity with system (adequate training provided).

Water dependency

To maximise the benefits of installing permanent trapping systems, all domestic stock operations should be done when animals are highly water dependent. This may require changes to the time of shearing, marketing strategies and other support infrastructure.

In predominantly winter rainfall areas the best months are between October and April. If summer thunderstorms or cyclones are a feature of the region, then completion of trapping should occur before Christmas, lessening the probability of rainfall hindering stock management.

Seasonal conditions prevailing at the time will determine the length and the effectiveness of each trapping period. Ensuring that no man-made alternative water sources are available to limit the effectiveness of trapping is also very important. It is necessary to control tank overflows, leaking tanks, compensators, and pipelines if they occur outside the permanent trap yards.

Compatibility with sheep

The design of the yards must be compatible with the behavioural characteristics of stock, so they can be concentrated and worked with the least effort and stress to the animals and the operators. TGM trap yards have been designed to satisfy all these criteria. The circular design of the yards allows for efficient stock movement, and the incorporation of a bugle/forcing pen, drafting and loading facilities make the permanent yards a complete animal handling facility, allowing the majority of animal husbandry operations to be done on site.

Trap operation

The optimum efficiency gains occur if target animals are familiar with and have used the system many times before trapping occurs. The overriding principle of permanent trap yards is that the trap gates are set in the walk-in, walk-out position throughout the year. No animal should be allowed to access water without negotiating the trap gates. To operate traps in any other way will squander efficiency gains and lower trapping percentages. Animals quickly become accustomed to using the traps and it only causes confusion to keep changing the means of access to water. Similar traps were used in the Boolathana Grazing Study, where the traps were set in the walk-in, walk-out position for 10 years with no detriment to the sheep, feral goats or native animals. The only time the gates are not in the walk-in, walk-out position is when trapping is in progress and the out spears are closed.

Animal training

Training domestic stock and other animals to the new infrastructure is a simple but necessary process. When the yards have been constructed, the installation of the trap gates should be delayed until the animals are accustomed to walking through the trap gate entrance. Usually a week to a fortnight is adequate for this.

If the yards are installed during winter, attach the trap gates after the animals are back on the waters. Once the animals are using the new entrance, attach the trap gates and set in the widest walk-in, walk-out opening or training position. The traps should be visited at least once a day to check if animals are having difficulty entering or exiting the traps. Usually a small percentage of animals have some difficulty, but soon learn by following other animals. When satisfied that all animals are watering without difficulty, set the traps to the normal walk-in, walk-out position. There is no set time before trapping can commence, but the greater the target animals' familiarity with the system the greater the trapping percentage.

Care during trapping

Correctly operated and handled trapping is a low stress means of concentrating domestic stock and feral goats. The main contributor to animal stress is overcrowding and this must be checked at least daily and preferably twice daily. Overcrowding may also result in shy animals staying out of the trapyard. Non-target animals should be released at each visit. Animals that are held in the trap should not be off feed for extended periods, particularly pregnant ewes. If possible, hand feeding regimes should be implemented as soon as necessary. Avoid holding animals for long periods in hot weather without the provision of shade, as their condition will deteriorate rapidly. In busy locations a holding yard that animals can move into may be an advantage. All animals can trap in and drink and congestion would be avoided. In a multi-paddock trapyard, a similar advantage can be gained by shutting out some paddocks and using their section of trapyard to increase holding capacity.

To avoid trapping non-target fauna such as kangaroos and euros it is recommended that the traps are closed from dusk to dawn to prevent their entry. If this is not possible the traps should be visited before daylight to release the animals. Failure to do this may result in stress to these animals, and increase their risk of injury or death.

It is difficult to prevent emus from entering the traps, as their drinking times are similar to domestic stock and feral goats. Emus usually cope with trapping but need to be released at each visit. Animal welfare issues must be of paramount importance when trapping or handling any animals, be they domestic, feral or native. Recognising duty of care and following sound animal husbandry and management principles will prevent unnecessary and adverse impacts on trapped animals.

FERAL GOATS

Aerial surveys were conducted prior to the first trapping exercise to provide an estimate of the original feral goat population. The uncorrected results indicate the estimated minimum feral goat density for the trial area.

Table 2. Results of aerial survey No. 1. 26/11/96

Density on trial site (goats/km^2)	1.7
Std error (density)	0.4
Estimated # on trial site	1091
Std error (estimated number)	288
Sampling intensity	6.6%

Prior to the completion of all of the trapyards in the trial area, one completed water point (Diedos) was trapped for the period of one day only as there was a large number of feral goats using this particular site. Approximately 150 feral goats were removed from this water point in December 1996. The first major trapping exercise was conducted in February 1997, approximately eight weeks after the initial aerial survey. The lag in time between surveying and trapping is likely to have an effect on the actual number of goats present at the time of trapping.

The traps were set on the Monday morning and opened up on the Friday morning. The weather encountered for the first major trapping exercise was not suitable during the first two days, as showers, drizzle and overcast conditions prevailed. Over the remainder of the week temperatures slowly rose, although it did not exceed 30 degrees Celsius until the last day.

Approximately 730 feral goats were removed from the trial area during this trapping period. All saleable goats were transported to the abattoirs, with the rest destroyed on property. A noticeable result of the trapping exercise was the relatively high proportion of large, old feral billies that were trapped. These animals had previously avoided capture, despite regular trapping attempts on the station with portable infrastructure prior to the instalment of the permanent trapyards. Very few goats were observed to be hanging around outside of the permanent yards throughout the exercise, and no animals displayed hesitation to enter the yards.

The first major trapping exercise was not complete in that it did not achieve its objective of ensuring that every feral goat in the trial area had to negotiate a permanent trapyard in order to access water. Due to circumstances beyond the control of the project, the troughs at Middle bore and Boundary bore were not yet located in the new permanent trapyards, as originally planned. Temporary traps were erected around these troughs for the period of trapping only, and therefore animals were unable to develop a routine prior to trapping. A number of goats remained outside of these waters, wary of the portable set-up and refusing to enter. Mild weather conditions resulted in limited pressure on the feral goats for water, and consequently they were able to remain outside.

Because of relatively mild weather conditions at the time and the fact that not every permanent trapyard was operating, a post-trapping aerial survey to see how many goats remained was not performed. The total of 880 feral goats removed from the trial area compares favourably as a proportion of the estimated original population, particularly given the less than ideal weather conditions encountered.

A second aerial survey was conducted in November 1997, three weeks prior to the second major trapping exercise performed at the trial site.

Table 3. Results of aerial survey No. 2. 27/11/97

Density on trial site (goats/km^2)	0.7
Std error (density)	0.3
Estimated # on trial site	454
Std error (estimated number)	199
Sampling intensity	6.6%

The results indicate a minimum population estimate of 454 goats, however the standard error increased to around ± 45% as the number of goats encountered on the transects decreased.

Once again, approximately 730 feral goats, including young kids, were trapped between 16-18 December 1997. It is likely that the number of feral goats present in the trial area increased over the 9-10 month period since the previous trapping exercise, and the results of the second trapping exercise support this. Unlike the previous exercise, every permanent trapyard in the trial area was operating. Once again, there were no feral goats observed loitering outside of the yards when the traps were set.

The weather conditions for the second exercise were suitable for trapping, with fine and mild conditions becoming hot later in the week. Not every feral goat in the trial area was removed in the duration of the trapping exercise. On a few occasions, goats were observed approaching a trapyard when the gates were open to water the sheep, and subsequently retreated, as they could not access the troughs due to sheep numbers. These animals may not have returned for water during the trapping period and therefore avoided capture. When the traps were opened up at the end of the exercise, there were still feral goats entering the yards, suggesting the trapping period needed to be extended. This could not happen due to time constraints and helicopter commitments. The post-trapping aerial survey was performed on the morning following the opening up of the trapyards.

Table 4. Results of aerial survey No. 3. 19/12/97

Density on trial site (goats/km^2)	0.5
Std error (density)	0.3
Estimated # on trial site	318
Std error (estimated number)	173
Sampling intensity	6.6%

As the numbers of feral goats present in the trial area declined substantially, the accuracy of the aerial survey was reduced. The survey results post-trapping indicated 318 goats remained, however the standard error had become very large at ± 55%. Only four groups of goats were sighted during the survey, and one group consisted of 11 individuals, resulting in a relatively high population estimate. Results of the post-trapping survey may have overestimated the remaining feral goat population.

Approximately 1600 feral goats were removed from the trial area over a 12 month period, compared with an initial minimum population estimate of 1091 ± 288. Although not every feral goat in the trial area was captured, the results indicate the trapping system is capable of effective, efficient population reduction when used correctly. It is common for feral goats to move into areas over time. These movements may not necessarily be large migrations, but movements within an existing home range. The aerial survey and trapping results indicate that feral goats moved into the trial area during the trial, although it is impossible to determine from where, and movements may have been within a home range as opposed to a migration. The results from the Winderie Goat Domestication trial indicate a fairly continuous influx of feral goats from outside areas into the trial paddocks. The Winderie trial has shown that trapping is an effective way to deal with such incursions.

Loading/drafting facilities

The procedure used throughout each trapping exercise consisted of transferring trailer loads of feral goats being collected from each trapyard to a holding yard at the homestead to await transport to the abattoirs. In addition to the ability to draft and load animals quickly and easily, a major benefit of the built-in loading race was the ability to lock feral goats away while trapping in the yard continued. Feral goats were 'locked' in the loading race as they were captured, freeing up the trapyard for more animals to be trapped in. When appropriate, the loading race was emptied of goats by simply running them onto a trailer. The process was made very easy by having such a facility built into each yard, and the requirement for additional portable infrastructure was minimal.

Strategic trapping

When trapping exercises were performed during the trial, every operational trapyard was set simultaneously. In a normal station situation, this would be unlikely, and we would suggest only a few trapyards are set at any one time so that each yard can be visited in relatively quick succession.

The results suggest that if one were to only trap on a proportion of waters at any one time, as opposed to all at once, the effect on the resident feral goats would not alter. No goats were seen hanging outside of the permanent trapyards, while many were observed outside of portable infrastructure, indicating the routine the animals develop is a large factor in the success of the system as a feral goat management tool. Due to this routine, if a permanent trapyard is set while the adjacent permanent yard is not, it is unlikely that feral goats will switch to the unset yard and avoid capture.

As a landholder establishes a system of permanent trapyards over a property it is wise to prioritise the location of yards to areas where they will receive the most use, or produce the most benefit. There was no evidence to suggest that the construction of the yards in the Pimbee trial affected the movements of the feral goat population. If one were to install a trapyard on a water point that traditionally supported a large number of goats, it would be unlikely that the goats would all move to the next water point without a yard on it as soon as the trapyard is completed. Given the correct training to the system, and that means allowing animals time to get used to the infrastructure, a routine will quickly be developed.

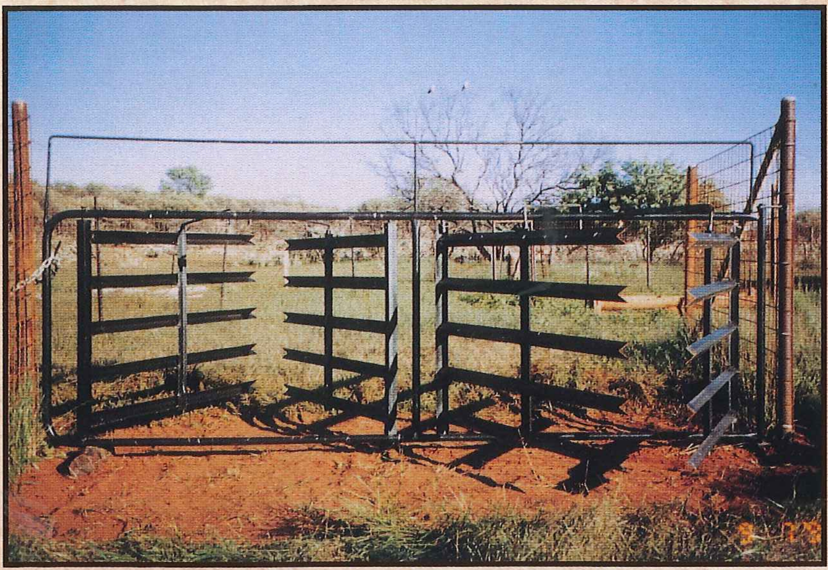

Fig 5a. Permanent trapgate-walk in, walk out.

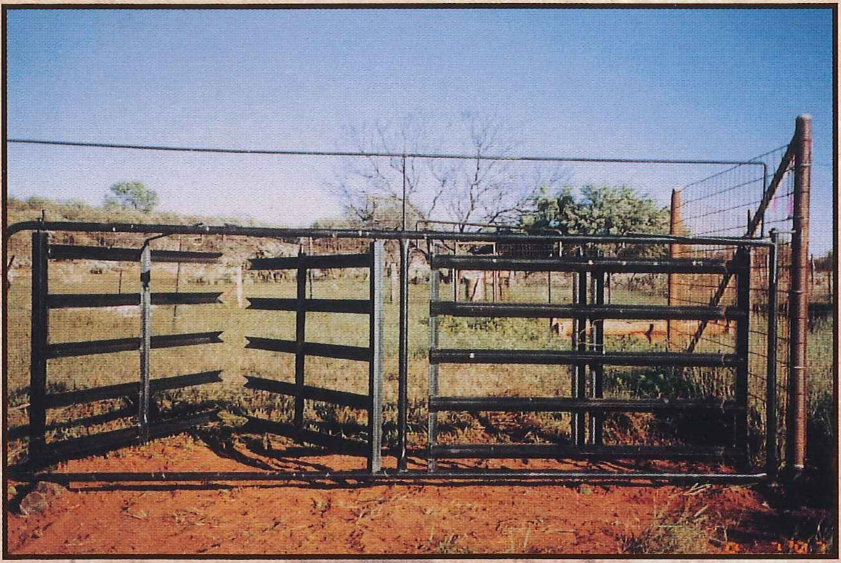

Fig 5b. Permanent trapgate-trapping position

Fig 5c. Permanent trapgate-closed

Fig 2. Aerial view of land systems on Pimbee Station.

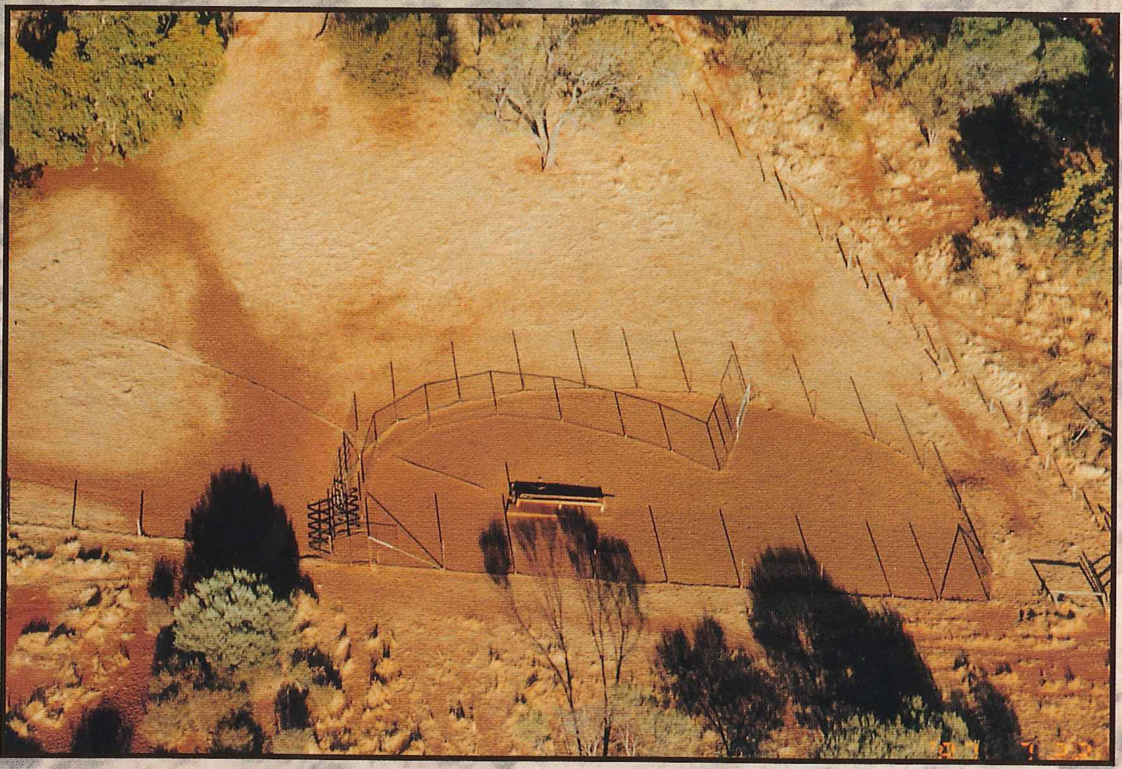

Fig 4a. Trapyard at a single water point.

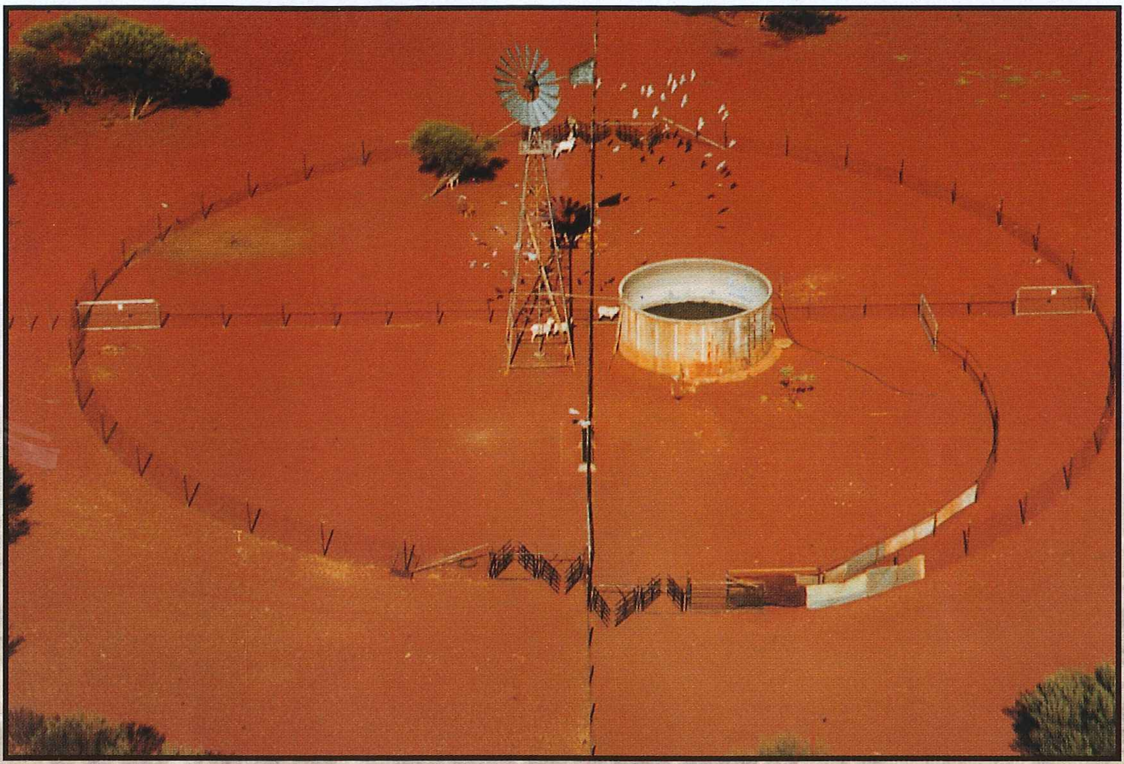

Fig 4b. Trapyard at a four paddock junction, showing trapgate positions.

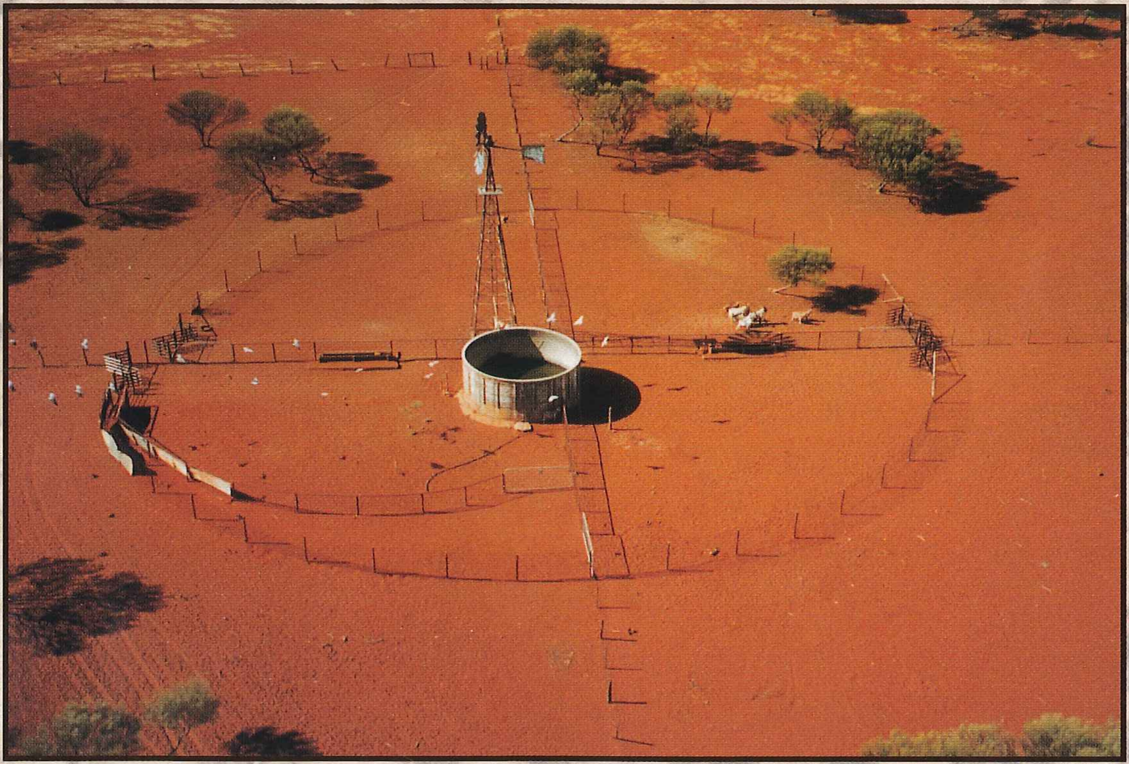

Fig 4c. Trapyard at a four paddock junction, alternative view.

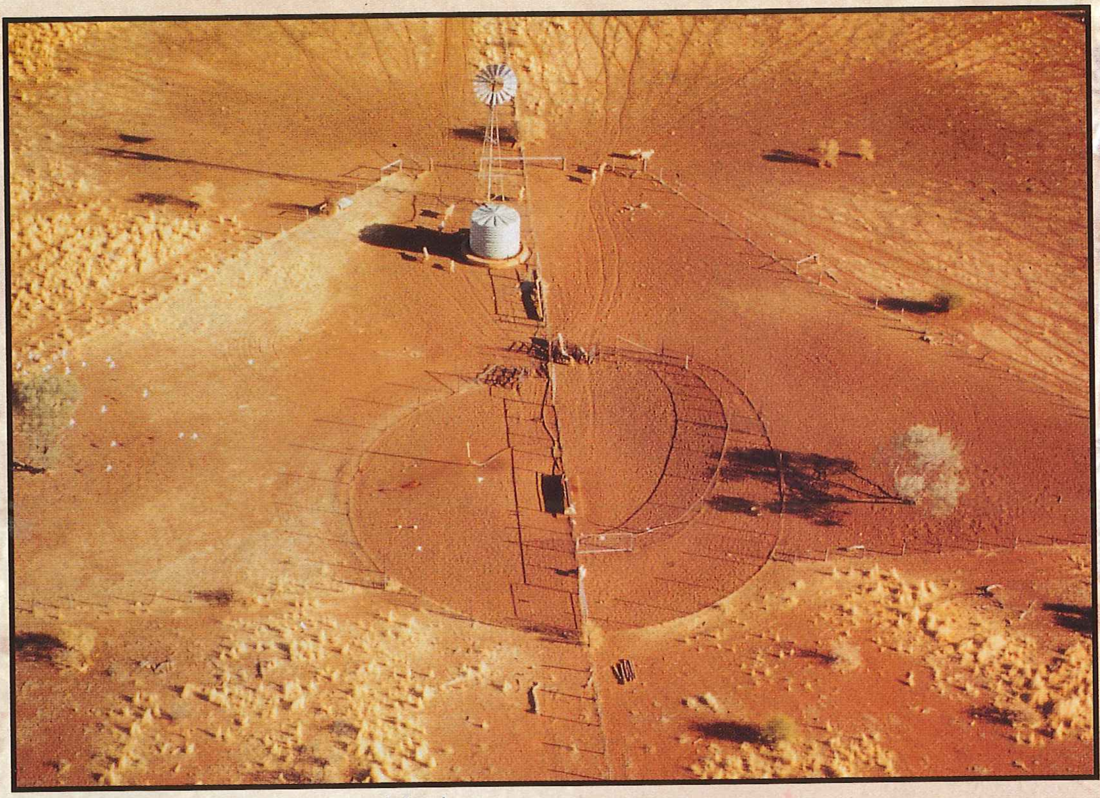

Fig 4d. Trapyard at two paddock junction.

Fig 8. Kangaroo access gate.

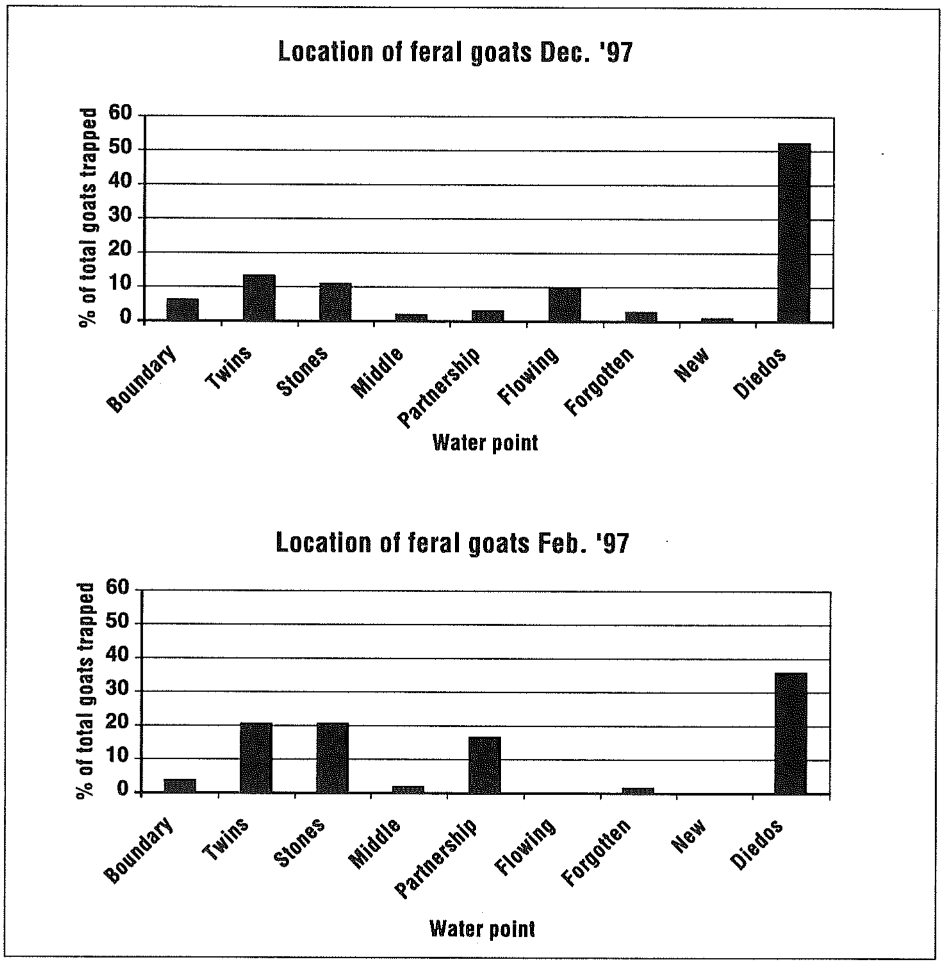

Figure 6. The percentage of feral goats trapped at each water point.

The above results show a similar pattern for each major trapping event, indicating that feral goats may have preferred areas of residence.

MANAGEMENT RECOMMENDATIONS – FERAL GOATS

As is the case with domestic stock, maximum efficiency of feral goat control comes from their familiarity with the yard. The spear gates should be set all year so that the animals must negotiate them every time they access water. If the gates are set only when trapping is occurring, many goats will not enter the trap and are likely to walk off to another water point as they are wary of the new system. Experience at Pimbee indicates that if the animals are familiar with the trap gates they will enter without hesitation.

Allow feral goats at least a week to become familiar with the traps prior to trapping, as the greater the familiarity and routine developed, the better the trapping percentage. The best time to commence training is just after the animals are back on the waters but not too highly water dependent, however it is possible under most conditions. Try to avoid heat wave conditions to allow animals having difficulty negotiating the yards more time to adjust.

The most efficient method of operating the traps for feral goats is when the sheep are out of the paddock at shearing time. This, of course, assumes that shearing is performed in the months suitable for trapping. At this time the majority of the sheep have been trapped out and are being held for shearing. The traps are then set to clean out the remaining stragglers and to trap the feral goats. By the time the shorn sheep are returned to the paddock all stragglers and feral goats have been removed.

If this is not possible or feral goat numbers build up over the summer months at particular waters, effective feral goat trapping can still occur while sheep are in the paddocks. The presence of sheep causes additional work and may shorten the length of the trapping period because of the need to continually water or release sheep. At Pimbee, the sheep were locked out of the traps by plain wire yards enclosing the TGM infrastructure (Fig. 7). The goats climbed through the plain wire and accessed the traps, making it easy to run the trapped goats into the bugle/forcing pen for holding until removed. Once the goats were locked away the sheep were allowed in to water and then the traps were re-set. This procedure is continued for as many days as required. Watering sheep is a time consuming process so where labour is limited it is best to operate only a few waters at a time to minimise stress to the sheep.

If plain wire yards are unavailable and sheep and goats are trapping at the same time then trapping feral goats will still be very effective. The yards will need to be visited at least twice a day to release the sheep. Separating sheep and goats is a very simple process and does not require the use of the drafting facility, but is made easier with two people. When the yard contains sheep and goats it is best to close the 'in' spears so no goats can escape during the separation process. The goats will always move towards the back of the yards and the sheep will tend to move to the front. The sheep can easily be drifted off into another section of the yard or released back into the paddock. Once all goats and sheep are separated, the goats are run into the bugle/forcing pen and the sheep are released.

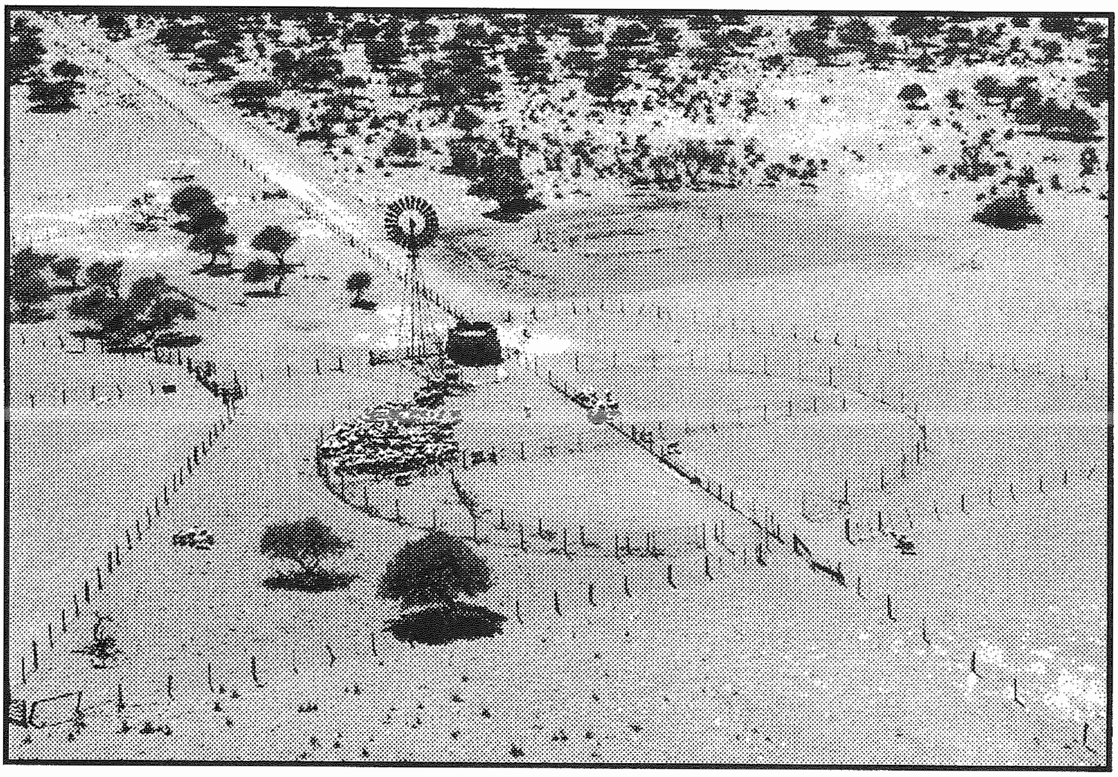

Figure 7. Existing plain wire yards surrounding permanent trapyard (prior to gate installation).

NATIVE ANIMALS

Native animals present in the trial area that were using the trapyards included red kangaroos, euros and emus. A permit was obtained from the Department of Conservation and Land Management for the purposes of trapping kangaroos, observing kangaroo behaviour in trapyards and to evaluate the potential of traps for kangaroo harvesting. All species successfully negotiated the yards to access water when trapping was not occurring. The training period referred to earlier in this report allowed all animals to become familiar with the new entry and exit points at each water point.

A very small number of kangaroos and emus failed to find their way out of the trapyards when the system was first installed, despite the walk-out gates being open. There were no signs of animals loitering outside unable to access water nor were there any perished animals near the yards.

It was hoped that an index of the resident kangaroo population could be gained by aerial surveying, however on every survey, a maximum of only one kangaroo was sighted. Such a low sighting cannot provide a useful estimate of the resident population. The results of the aerial surveys are unlikely to be solely related to sightability. On aerial surveys conducted near the Gascoyne River in 1996 using the same techniques over very similar land systems, kangaroos were readily picked up by the same observer. There would appear to be a low population density of kangaroos naturally occurring in the trial site.

The number of kangaroos present in the trapyards during each trapping exercise was recorded. Observations were made on their behaviour in the yards, and their interaction with other trapped animals such as feral goats and sheep to determine whether the system could serve as a kangaroo management tool.

Red kangaroos and euros were trapped in the yards each time a feral goat trapping exercise was performed. The policy at the trial site was to release all kangaroos and euros trapped in this manner. As was the case with feral goats, no kangaroos were observed loitering outside of the yards during the trapping period, suggesting they too had developed a routine, and did not hesitate to enter the yards. This is supported by observations from the Winderie Goat Domestication Trial where permanent trapyards have been in place since 1995. Kangaroos were rarely observed in the area until the traps were set for the domestic goats, at which point a number of kangaroos were encountered in the yards. They had obviously developed a routine and successfully negotiated the yards to access water without problems.

During the major trapping exercise performed in December 1997 targeting feral goats, a total of 27 red kangaroos entered the yards over a three-night period. This suggests the kangaroo population was small at the trial site, as a total of 10 trapyards were set covering an area of approximately 68,000 hectares. Three male red kangaroos had to be destroyed on welfare grounds. A total of six euros entered the trapyards over the trapping period, of which three were destroyed on welfare grounds.

At each trapping, project staff and the host pastoralist ensured each yard was visited at dawn and trapped kangaroos released. Over a three-night period, observations were conducted to monitor kangaroo behaviour when trapped. Two yards were observed, either side of the trial site boundary between Pimbee and Winderie stations. The yard on the Pimbee side of the fence had a loading/drafting race built in, while the yard on the Winderie side was 'open' inside, without any loading/drafting facilities. The traps were set on both sides from 6.00pm - 6.00am over the three nights.

Kangaroos approaching the traps did so with great caution and rarely entered the trap immediately. This caution would last from 30 minutes to several hours in some cases and was considered normal practice for kangaroos, as they are most vulnerable at the water compared to their grazing or camping areas. If other kangaroos were already trapped there may also have been a reluctance to enter due to the activity in the trapyard.

Once inside the traps the kangaroos went straight to the troughs and commenced drinking. All kangaroos remained alert while drinking for approximately 10 - 20 minutes, after which the kangaroo would go directly to the out gate and attempt to exit the yard in the usual way. Whenever a kangaroo found that it could not get out of the trap it almost immediately started looking for other exit points. This was done on all fours and tail or by slowly hopping. Upon discovering no exit points the kangaroos continued the slow hopping behaviour for most of the night. The kangaroos did not damage themselves in this process and rarely hit the weldmesh at any speed. This behaviour was exhibited to varying degrees by all kangaroos that entered the trap, and was considered to be a function of stress caused by confinement.

Kangaroos appeared most vulnerable during the release process itself, which was performed at daybreak. The kangaroos became highly agitated at the sight of humans and would hop about the yard at great speed, and on occasion try to jump the fence. This generally resulted in the kangaroos striking the fence and falling to the ground. All injuries observed were a result of kangaroos striking the mesh and the gates. Although all groups were in danger, the most vulnerable were the large males and euros.

Emus appeared to be abundant in the trial area, and were commonly found in the trapyards during trapping exercises. All emus were released. Emus did not appear to have any major problems when caught in the yards, although they were at times difficult to separate and walk out of the yard.

Kangaroo harvesting in trapyards

A permit was obtained for a professional kangaroo shooter to test the potential of harvesting kangaroos in the trapyards. This exercise was carried out on the night of the 9th of December 1997 in conjunction with feral goat trapping. Sheep were held out of the traps by plain wire yards enclosing the TGM infrastructure to lessen congestion in the trapyards, resulting in large numbers of sheep remaining at the water during the night until watered next morning. The large numbers of sheep outside the trap may have deterred some kangaroos from approaching the water although none were observed retreating from the area.

The temperature during the day reached a maximum of 38 degrees Celsius and the night remained hot and very still. Eleven traps were visited during the night and nine kangaroos were trapped and shot. Three euros were also trapped and released. The kangaroos and euros were in very good condition and had not suffered any physical injury whilst trapped.

From the outset, the trapped kangaroos exhibited the near continuous slow hopping behaviour that was observed at the night trapping observations. The hopping remained slow and did not involve high-speed challenges to the weldmesh fences, and no injuries were sustained in this process. The kangaroos would only momentarily stop and adopt the sit up posture that is common during field shooting allowing very limited time or opportunity for the kangaroo shooter to take aim and fire. Some shooting opportunities were lost as the kangaroo moved off again, and some delays were experienced until the humane head shot could be completed. Processed animals showed no signs of bruising and carcass quality was high.

The slow hopping behaviour observed during the night observations, and during trap shooting, was considered to be stress associated with confinement. Additional stress may have occurred during the shooting process. Such stress is difficult to quantify, as it did not result in major behavioural changes or increased self-injury. The major changes in kangaroo behaviour occurred during the release process, where kangaroos were most vulnerable to self-injury.

Because of the varying levels of stress exhibited by kangaroos during confinement, trap shooting as a method of kangaroo control can not be recommended at this stage. When trapping for stock or feral goats, it would be better to prevent kangaroo entry, or to selectively allow their exit from the yards. Recommendations for future evaluations are contained in the section headed *Future trial requirements.*

Can the system be used for kangaroo control now?

The current design of TGM infrastructure still has an important role to play in kangaroo control, and can be successfully used without the need to trap or confine kangaroos. When kangaroo control is necessary the trap gates should be closed just prior to dusk. The majority of domestic stock would have watered during the day and vacated the water point. Closing the trap gates would deny kangaroos entry to the trapyards and their access to water. This will cause their numbers to build up during the night, as few kangaroos will leave the water point without drinking. The kangaroo shooter could then exploit this build up and commence field shooting.

Results from the Finlayson Trough Study (Norbury 1992) showed that kangaroos could be concentrated and harvested by denying access to water. This method provides greater efficiency for kangaroo control, and alleviates the stress of confinement during trapping. The trap gates are opened at dawn (or earlier, depending on when shooting ceases) to allow access to water for domestic stock. This procedure can continue each night until the desired level of control is achieved.

Kangaroos and trapyards – is there a future?

Currently kangaroo control is regulated by the Department of Conservation and Land Management (CALM) who issue a licence to take fauna. Licences are available for the destruction of kangaroos whereby no product is allowed to be sold, or a commercial licence may be issued where kangaroo products may be sold subject to various criteria.

Conditions that accompany the issuing of licences indicate that kangaroos are to be taken in the field, excluding any other method, such as trapyards. Regardless of whether the systems promoted in this project report are adopted or not, trapyards of varying description are a common management tool employed throughout the southern rangelands, and will become increasingly important as the economics of mustering become tighter. This project has taken the concept of trapyards on water points to evolve a design that aims to significantly increase the efficiency and effectiveness of trapping animals.

What is needed is a practical system that has the ability to control all species humanely. Management guidelines can be developed to achieve this as much as possible, but the onus is placed firmly on those who manage the land to ensure all steps are taken to safeguard animal welfare.

Total grazing pressure needs to be controlled if effective long-term management of the rangelands is to occur. The pressure being placed on land managers to protect and maintain the rangeland environment is ever increasing. The amount of public resources being channelled into biodiversity conservation and resource protection is testament to current attitudes. The impact of artificial water points on animal populations and dispersal is documented, as is the current inability to rest areas with traditional species-specific station fencing. It is important that practical methods of controlling total grazing pressure are recognised, and allowed to develop to address any problems or concerns.

Permanent trapyards have a definite place in rangeland management as a practical and cost efficient tool. The majority of time would be spent with the yards set as walk-in, walk-out, allowing complete access to grazers. On a few occasions each year the yards would be used for trapping domestic stock and feral goats if present. On these occasions, the potential exists for kangaroos to be trapped, and the land manager would therefore have to make allowances for this. Monitoring of the yards would need to occur to avoid potential problems. Kangaroos in the trapyards could be avoided by altering the trapping procedure. The traps could be closed following sunset to sunrise to prevent access to kangaroos when trapping, and then set again at dawn through dusk for trapping of feral goats and/or domestic stock.

In other words, without actually including kangaroos as a targeted species for management, permanent trapyards have a place in the control of feral goats and stock right now. This still, however, does not address the fact that kangaroos contribute significantly to the total grazing pressure on the rangeland environment, and in some places to the extent where management of the population is most desirable. Management strategies based on the reduction or removal of livestock (spelling) would seem to be insufficient to guarantee improving range condition, particularly if the populations of kangaroos are not similarly controlled (Gardiner, 1986).

The designs of the permanent trapyards developed in this project offer a number of advantages over traditional designs, but they are not necessarily the ultimate design that should be adopted regardless. By trialing the designs, we have gained useful data, particularly with regard to kangaroos, and as such we can make recommendations on principles and criteria for water point control, and requirements for further research. This must be undertaken in collaboration with other agencies and private bodies that share Agriculture Western Australia's concern for proper and humane animal management.

MANAGEMENT RECOMMENDATIONS – TRAPYARDS AND KANGAROOS

The results of the observational work performed at trapyards, the trialing of the professional shooter, and the trapping exercises performed have provided information on how to manage permanent trapping systems to safeguard kangaroo welfare. The following recommendations are a summary of techniques to be incorporated into management systems.

- Close the trapyards at night when trapping.

The observational data gathered confirmed kangaroos predominantly access water at night, and sheep and feral goats generally do not. To avoid any potential kangaroo welfare problems, it is advisable to close the trap gates from immediately prior to dark until dawn. This would prevent kangaroos from entering the yards for water throughout the nocturnal period of activity. The gates would be set for trapping again in the morning to account for the watering period of domestic stock and feral goats throughout daylight hours. This approach involves two visits to the water points each day.

- Trap on a manageable number of waters.

The number of traps that are set at any one time will be determined by factors such as the distance between traps, the number of stock or feral goats to be trapped, and available labour. It is important that one can get to each trapyard each evening and morning in reasonably quick succession to set the trap gates.

FUTURE TRIAL REQUIREMENTS

The Queensland Department of Primary Industries has been running a similar project, where permanent trapyards have been constructed and monitored around a number of water points (Pahl, L. *pers. comm.*). Adverse weather conditions have impeded their data collection, however observations have revealed information that is useful when designing permanent trapyards.

They found that large trapyards, such as those around dams, reduce the potential problems associated with kangaroos being trapped. Obviously, yards that are constructed to encompass dams are will have a substantial internal area, and yards of this size appear to have minimal impact on the welfare of off-target species.

Given an adequate internal area, the use of fabricated fencing to a height of 1.15m was found to be the most satisfactory material for a trapyard designed for feral goats, sheep and/or cattle. This fence allowed kangaroos to exit over the yard if required. The top 30cm section of the fence was lined with shade cloth type material or rabbit netting to avoid the potential of kangaroos becoming caught in the fence when going over it.

For general entry and exit points in large fabricated trapyards around dams, small swinging kangaroo access gates have been installed in many of the DPI yards (Fig. 8, p. 15). These 'gates' provide an alternative to the walk-in, walk-out spear gates for the kangaroos, and appear to be frequently used. If trapping feral goats, they cannot be allowed to swing freely, as feral goats may use them to exit the trapyard. The same may occur when trapping sheep, however they would be ideal when trapping cattle only, in areas free of feral goats such as the Pilbara region in WA, allowing kangaroos and euros to enter and exit freely, and reduce the requirement for human intervention. They would also provide useful multiple exit points when clearing kangaroos from the yards.

The gates are an inexpensive and very simple means of providing multiple access points for kangaroos around a large trapyard, where they may not be utilising the spear gates. Results from the Pimbee trial indicate that kangaroos are using the spear gates without problem in our yards with a relatively small external area.

The results obtained from this project conducted on Pimbee and Winderie stations have highlighted a number of aspects of trapping that should be subsequently investigated:

Lower external mesh on circular yards

The weldmesh used on the permanent trapyards at Pimbee station was 1.4m high, while the internal mesh is 1.15m high, cut to a height of 1m. Results indicate the large male kangaroos appeared to encounter the most difficulties in the yards, and would subsequently challenge the 1.4m external mesh. Lower external mesh would alleviate the frequency of problems by allowing these animals to exit over the top of the mesh if required. The observations of permanent trapyards in Queensland using fabricated fencing of a similar height support this theory.

The containment of feral goats is unlikely to be jeopardised by such a reduction in the external yard height. Feral goats trapped in the Pimbee yards have never been observed to jump over the internal mesh fencing when put under pressure. Nor have they got out of the loading race, which has a 1m internal fence height, when locked in for reasonable periods, despite often containing large numbers of large feral bucks. Experience has shown that in the solid mesh yards, the observed escape method of feral goats, although very uncommon, is via the trap gates. Lower mesh should be trialed in permanent trapyards to test its effectiveness, and it has the additional benefit of costing less than 1.4m mesh.

Fabricated fencing for external trapyard fence

Fabricated fencing instead of solid mesh may reduce the incidence of kangaroo problems by being a comparatively 'soft' fence. Permanent trapyards built as part of a QDPI project have been successfully used around dams and permanent waterholes, without experiencing kangaroo injuries. A strip of rabbit netting or shadecloth material is run along the top section of the fence to prevent a kangaroo's legs becoming entangled if attempting to go over the fence.

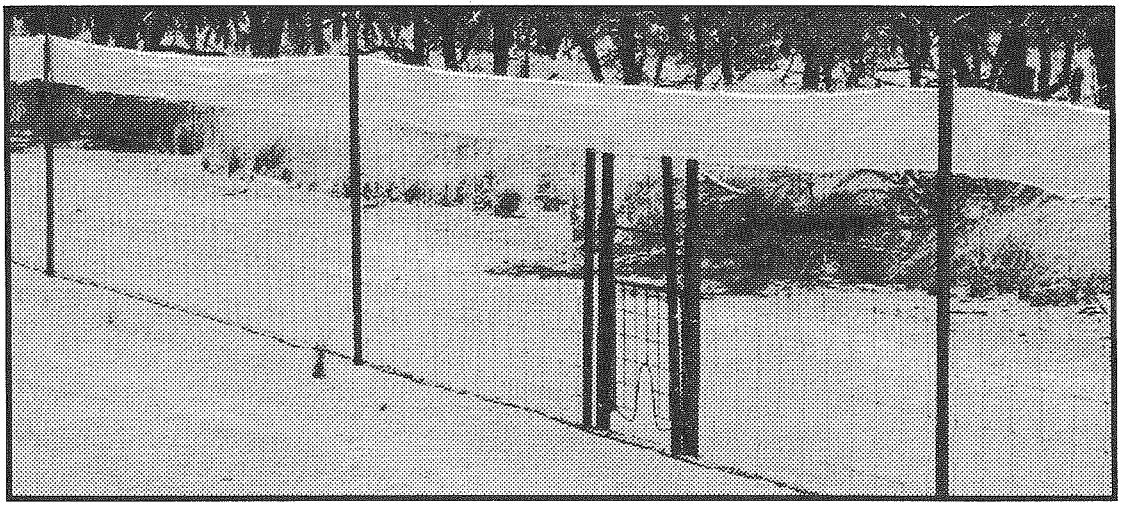

Figure 9. Fabricated fence yard with kangaroo gate and shadecloth.

It is likely that there is a critical minimum size and shape of a yard using this type of fencing to avoid damage by feral goats. Information on its performance would be valuable.

Larger trapyard dimensions

Observations should be made into the effect of yard size on kangaroo behaviour. Kangaroo behaviour in yards built around dams could be compared with behaviour in smaller yards around troughs. There would, however, be a maximum size limit at which point handling the animals becomes difficult without more internal infrastructure.

Selective entry or exit gate

Work should commence on selective entry gates that allow sheep and feral goats into a yard, but at the same time deny kangaroos entry. This would prevent kangaroos becoming trapped in the yards, and hence alleviate any animal welfare concerns. It would also reduce the reliance on human intervention. The gates would be adjustable so that kangaroos were excluded for the period of trapping only, after which they could use the walk-in, walk-out gates. Alternatively, a device that allows kangaroos to exit the yards when the traps are set, yet retains all stock and feral goats would also be a worthwhile avenue of investigation.

Kangaroo deterrent device

Observational work shows that in general, kangaroos drink at night. A deterrent device that operates on a timer may be a simple and effective means of deterring kangaroos from entering trapyards over a trapping period. Kangaroos appear to be quite timid animals, and are highly cautious approaching water. A noise designed to 'startle' kangaroos that is emitted from the entrance point may prevent them from entering. Such a device would only be used when trapping.

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Appendix 1

DESIGN AND INSTALLATION OF PERMANENT TRAPYARDS

Total grazing management yards must incorporate two basic principles:

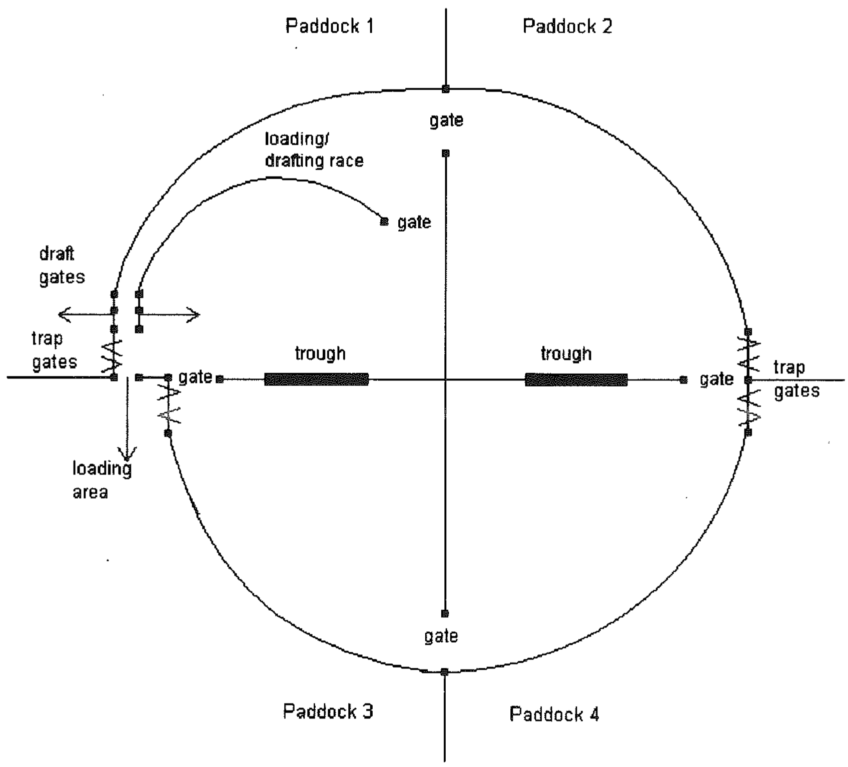
1. **Trapyards are PERMANENT (walk-in, walk-out)**

2. **Trapyards have MULTI-SPECIES capacity**

In addition to these features, it is recommended that yards incorporate animal handling facilities such as the loading/drafting race to gain the maximum benefit from the system.

The following diagrams represent the design of the trapyards incorporated in the Pimbee trial. All trapyards built around trough water points share the following specifications:

- 2.5m high posts on external fence.
- 3m post spacing on external fence.
- 2m high posts on internal fences and loading race.
- 2 – 2.5m post spacing on internal fences and loading race.
- 1m post depth in ground.
- Common loading/drafting race dimensions where straightens.
- 1.4m high mesh for external fence.
- 1.15m* high mesh for internal fences and loading/drafting race.
- 1 inch pipe for rail welded on internal fences and loading/drafting race.



* The 1.15m high mesh that was used for the internal fences and loading drafting facility had one layer of 'squares' removed to make it a height of 1.0m.

Figure 10. Trapyard at four paddock junction – 40m diameter.

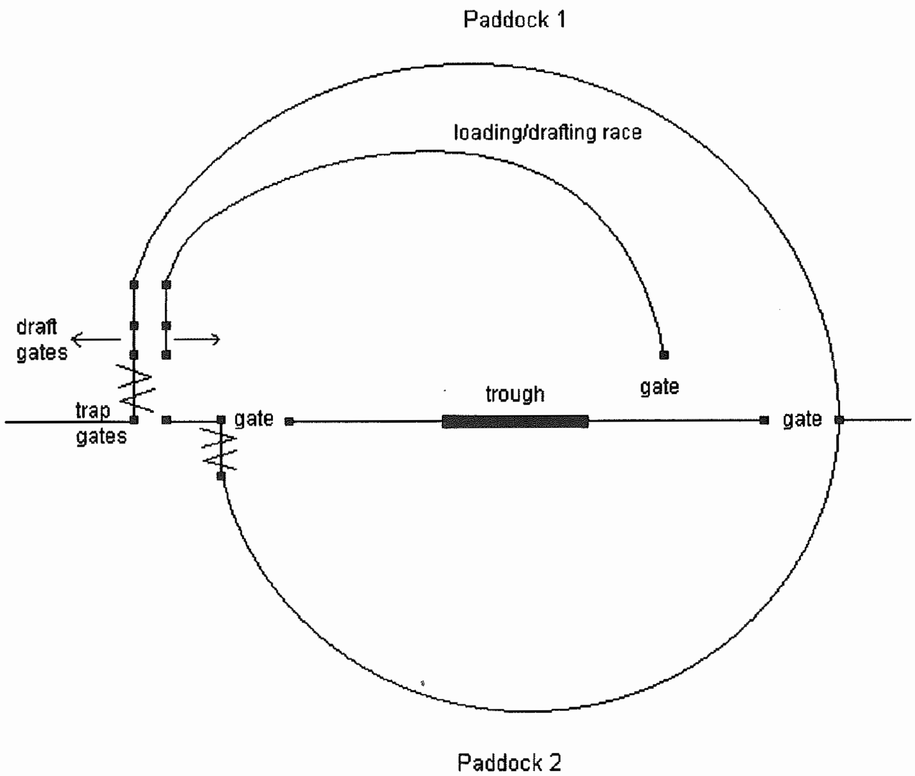


Figure 11. Trapyard at two paddock junction – 25m diameter.

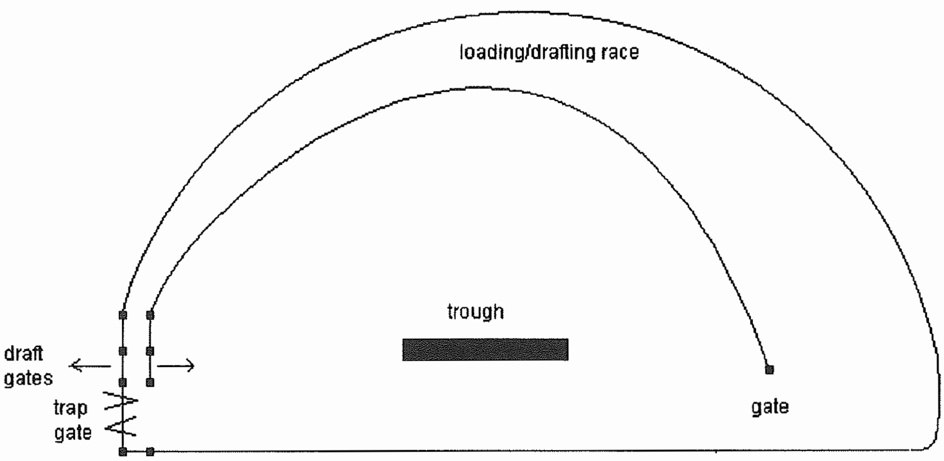


Figure 12. Trapyard at single water point (straight edge due to line of existing sheep yard).

The design of trapyards will need to be tailored to suit each individual property to allow for the terrain surrounding the water point, the type of water point (trough or dam), the number of animals utilising the water point and the species that are present (sheep, cattle, goats and kangaroos). Some may wish to use a 'double yard' to trap animals into a second/holding yard, particularly with regard to cattle, however the principles of being permanent and multi-species remain the same regardless of the design.

Equipment required for the installation of the yards at the Pimbee trial site included a post hole digger, cement mixer, welding equipment and a cut-off saw for cutting posts and rail to length. Other items used included pegs and long tape measures for planning and marking the yards before commencing construction.

Table 5. Materials list for trapyards

4 paddock yard	
Posts (2.5 metre)	41
Posts (2 metre)	41
1.4 m mesh (60 m rolls)	2
1.15 m mesh (60 m rolls)	2
Tie wire	
1 inch rail	~100m
Trap gates	4
Gates	5
2 paddock yard	
Posts (2.5 metre)	31
Posts (2 metre)	20
1.4 m mesh (60 m rolls)	1.5
1.15 m mesh (60 m rolls)	1
Tie wire	
1 inch rail	~50m
Trap gates	2
Gates	3
Single waterpoint	
Posts (2.5 metre)	25
Posts (2 metre)	10
1.4 m mesh (60 m rolls)	1-1.2
1.15 m mesh (60 m rolls)	0.5
Tie wire	
1 inch rail	~30 m
Trap gates	1
Gates	1

Installation

Marking out

All yards should be marked out prior to construction to ensure mistakes are avoided and materials are used efficiently. For a circular trapyard, use a rope that is half the diameter of the trapyard (eg 10m for a 20m diameter) attached to a peg in the centre of the yard location. Keep the rope taut while walking in a circle, marking the ground every 3 metres for post spacings (Fig. 13). Make allowances of 3.2 metres for trapgates if they are 3 metres wide as in the Pimbee trial. Once a circle has been established with post spacings marked, extend one quarter of the circle outward to allow for the loading/drafting race, ensuring that it extends far enough to be able to load a trailer or truck.

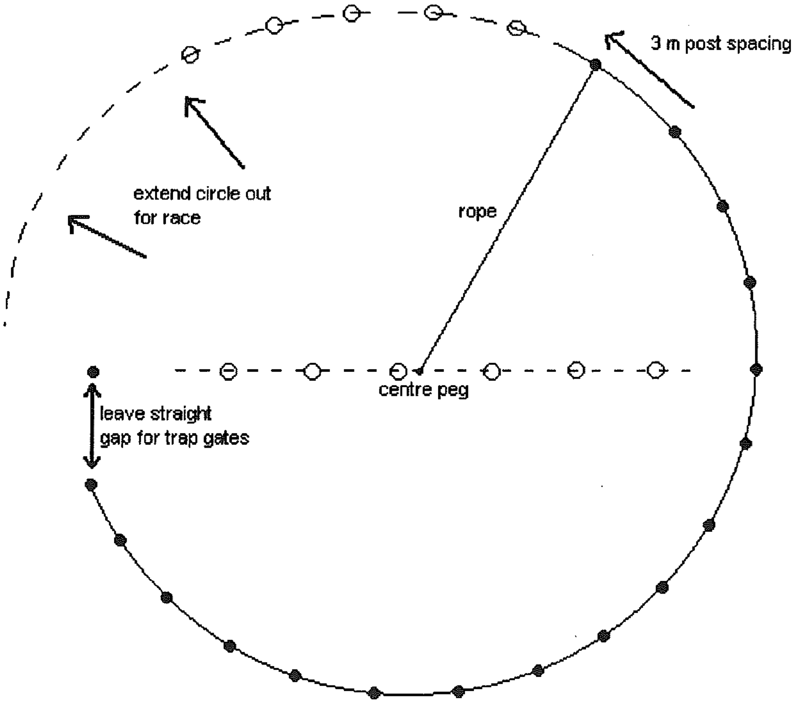


Figure 13. Marking out a circular trapyard prior to construction.

Post spacings for internal mesh fences in the yards vary between 2 and 2.5m. The low mesh fence for the loading/drafting race should also be pegged out prior to construction. Figure 14 indicates the dimensions of the race as it straightens up in the yards. It is most important that these dimensions are the same for each yard, so that drafting gates, crushes etc will fit each race. The curved part of the race should finish 3.2m from another mesh fence so that a gate can be installed to lock animals in (see trapyard photo in main document).

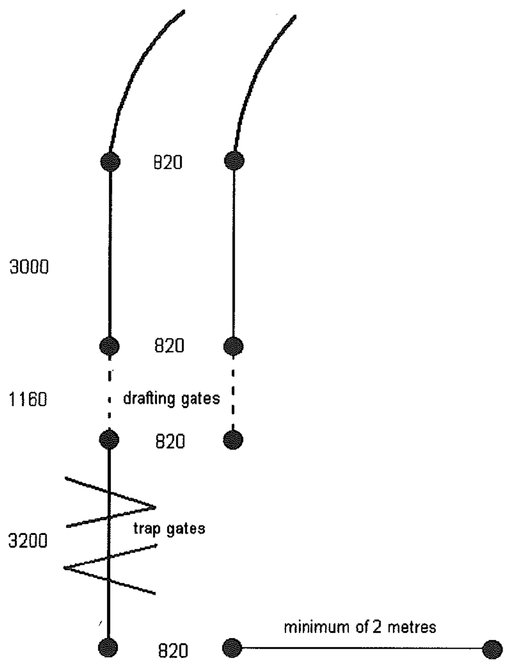


Figure 14. Dimensions of a loading/drafting facility.

Construction

Once the yard has been pegged and you are satisfied with the dimensions, all postholes should be dug, including the internal fences and loading/drafting race. At Pimbee, all posts were cemented in to a depth of 1 metre. Posts used on the external mesh fence in the circular yards should be angled outward approximately four centimetres off-vertical so that the mesh does not slip up the posts when straining or over the life of the yards, and to compensate for any post movement when straining. Posts to be used for the internal fences and the loading/drafting race are flattened at the top to accommodate a rail.

Following the installation of all posts, railing is welded on to the internal posts, including the loading/drafting race up to where drafting gates would be installed. The mesh is then attached to the internal fences and loading/drafting race, strained using a vehicle and tied on to the posts with tie wire. The mesh was welded to the rail in the Pimbee trial yards for a stronger and cleaner finish.

The 1.4m mesh is attached on the outside of the external fence posts and strained using a vehicle. The mesh is tied on with tie wire rather than welded, as it provides greater flexibility, easier maintenance, greater strength and is less labour intensive. Following this, all internal gates and trap gates are attached.

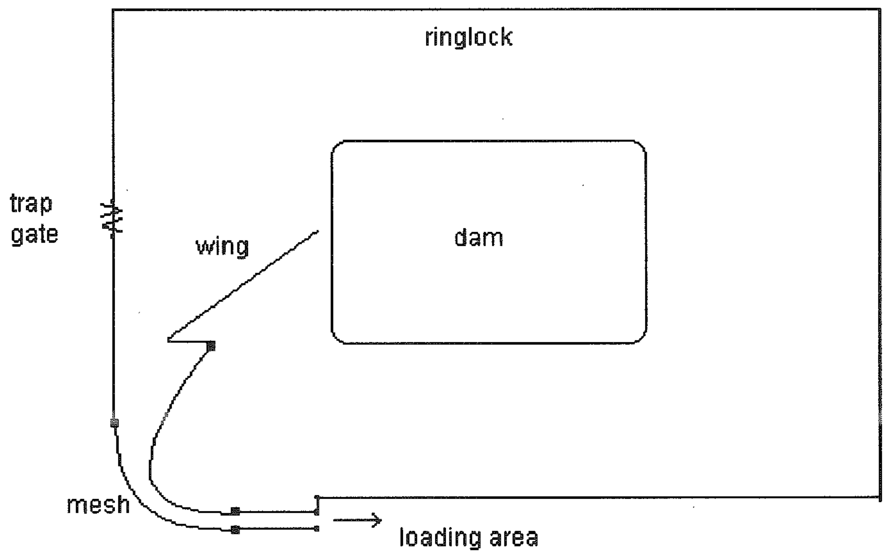


Figure 15. Trapyard at a dam.

The trapyard installed around a dam at Pimbee station used eight-line hingelock fencing left over from the Winderie Goat Domestication trial with a barbed wire below and two above. Table 6 indicates the materials required for a trapyard around a dam or similar.

Table 6. Materials required for a trapyard at a dam.

100 m x 100 m fabricated yard	
Posts (steel pickets)	~55
Fabricated fence (eg hingelock)	400 m
Barb wire	1100 m
Tie wire	
End assemblies	4
Trap gates	1
1.4 m mesh (60 m rolls)	1
1.15 m mesh (60 m rolls)	1
Gates	1
Posts 2.5 metre	19
Posts 2 metre	16
1 inch rail	~40 m

One corner of the dam at Pimbee has been constructed with mesh and $2^{3/8}$ inch posts instead of fabricated fencing as a loading/drafting facility. The materials used and the dimensions of the race are the same as for our circular yards around troughs.

No cattle are present on Pimbee station, so cattle yards have not yet been trialed. The following photo illustrates a trapgate designed for use with cattle, sheep and feral goats. The four lower spears have flat metal attached for feral goat trapping. When trapping cattle only, these are replaced with spears that do not have the flat metal attached.

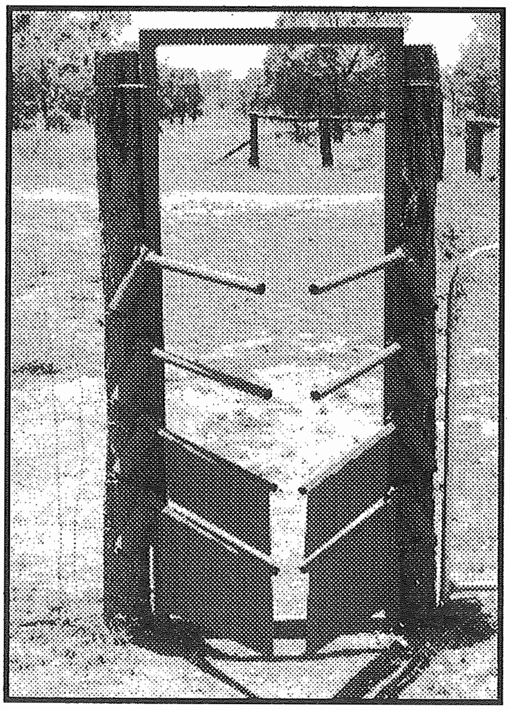


Figure 16. Cattle/sheep/goat gates set for trapping goats at QDPI trapyard near Charleville.