



## CONVENTIONAL RABBIT CONTROL: COSTS AND TIPS

### RABBIT MANAGEMENT: WHAT ARE YOU TRYING TO ACHIEVE?

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In the past we have often just killed rabbits without 'controlling' them. Long-term management should aim to reduce rabbit populations to a level at which their damage is reduced to an acceptable level. In many areas of Australia, warren destruction and surface harbour removal are the keys to long-term rabbit control. After rabbit harbour is destroyed, rabbits can be maintained at a low level for little cost over extended periods (5-10 years). Effective and efficient management of rabbit damage requires coordination, planning and implementation of management programs at the regional level. That is, where practical, any control program should involve your neighbours. The integrated use of several rabbit control methods is also desirable – e.g. ripping programs are

usually most effective after rabbit populations have been reduced by baiting or disease resulting in lower warren reopening rates.

### Keys to successful rabbit control

- Define the problem: nature and location of damage and location and density of rabbits. Will rabbit control improve land management? What damage is the result of other factors?
- Map the control area: rabbit harbour, property boundaries, accessible and environmentally sensitive areas, etc.
- Develop a plan: keep it simple and have goals that can be measured, and that are obtainable.
- Aim to control rabbit *populations* for the *long-term*; not just kill some individual rabbits in the short-term.
- Aim to reduce damage to an acceptable level. This may not necessarily require removing all rabbits.



- Use combinations of control methods. In most situations, no single method will provide adequate control of rabbits in the long term.
- Where possible, time your control programs to maximise any impact of RHD and myxomatosis by undertaking follow-up control after outbreaks of these diseases.
- Monitor the effectiveness of your control methods by measuring rabbit abundance using simple methods such as spotlight counts over the same pre-defined areas. Monitor the rabbit populations for 2–3 consecutive days before and immediately after rabbit control and annually from then on. Success can also be measured by monitoring improvement in the resource, vegetation biomass, reduced erosion etc.
- Evaluate the effectiveness of the management plan and be prepared to change your approach when necessary.
- Have a formal program of ongoing ‘maintenance’ control involving re-ripping, fumigation, baiting and spraying weed harbour re-growth to protect your initial investment and ensure long-term reduction in rabbit damage.
- The management of rabbits, and your on-farm pest management generally, should not be viewed in isolation as they are only one aspect of overall natural resource management. For example, controlling rabbits with 1080 may lead to decreased fox numbers through secondary poisoning of foxes by 1080-poisoned rabbits, and through a reduced food supply for foxes.

## CONTROL TECHNIQUES

### Warren ripping

#### Tips for ripping rabbit warrens

Warren ripping costs vary dramatically depending on the type of equipment used and the terrain. The aim of ripping is to destroy the warren structure, not just to bury the warren entrances. Key points to note before landholders undertake a ripping program are:

- Ensure adequate ripping depth; 700-900 mm penetration is usually necessary to destroy most of the sub-surface structure.

- Ripping is most effective in dry, friable soils that flow down into lower warren spaces.
- Rip when weather is hot to ensure all rabbits are underground and that survival of rabbits above ground is low. Rabbits are also less likely to be breeding in summer. The aim should also be to rip when rabbit numbers are at their lowest based on their breeding cycle and/or recent disease outbreak, or following a baiting program.
- Rip two metres beyond the edge of the warren to destroy burrows that have entrances on the edge of the warren and lead outwards.
- Cross-rip or use winged tines to ensure burrows running parallel to and between the tines are not left intact.



THE USE OF HEAVY MACHINERY WITH MULTIPLE TINES AND WINGED BOOTS GENERALLY INCREASES THE EFFICIENCY OF RIPPING OPERATIONS

## Examples of rabbit warren ripping costs

	<b>Bulloo Downs, Qld</b>	<b>Central Australia</b>	<b>Western NSW</b>	<b>South-western NSW</b>	<b>Flinders Ranges, SA</b>	<b>Western District, Victoria</b>
<b>Landscape</b>	Red sand dunes, with clay flats subject to inundation	Grassy Plains and sand dunes	Stony downs and associated plains with saltbush and bluebush	Mallee, saltbush bluebush, speargrass and perennial and annual herbs and forbs	Broad valleys between steep hills with sand dunes in outlying areas	Basalt lava flow, stony barrier country (60%) with arable plains
<b>Soil type</b>	Distinct sand and clay areas	Calcareous earths and red sands	Red texture-contrast soils; areas of solonized brown soils	Red sandy soils with areas of brown soils and calcareous earths	Mainly calcareous loams	Basalt loam and cracking clays
<b>RCD activity</b>		Uncertain	Uncertain	Uncertain but active at times		Arrived April 1996, recurs annually
<b>Initial warren density</b>		51 warrens per sq. km. with average of 6 holes per warren	50 warrens per sq. km.	11.5 warrens per sq. km. with average of 6-8 active holes per warren	30-100 warrens per sq. km.	In the stony barrier country 950 warrens per sq. km. with an average of 24 entrances/warren
<b>Initial rabbit density</b>		1.5 rabbits per spotlight km.	Approx. 2 rabbits per warren (all warrens active even though rabbits rarely seen)	7.5 rabbits per spotlight km.		142 rabbits per spotlight km.; 235 warren entrances per ha.
<b>Machinery type/ tine format</b>		Cat D6H dozer; 3 tines (900mm spacing/650mm depth) with winged boots (500 mm wide)	Komatsu D85 (250hp); 3 tines (600mm spacing/900mm depth) with winged boots	Various. Best results with Cat 966, D5, D6 and rubber tracked tractors. 3 & 5 tines (600mm spacing/900mm depth) with winged boots	D4 - D65 dozers with 2-3 tines, or blade ploughs in deep sands	Excavator, 25 tonne with 800mm single tine ripping to a depth of 750mm
<b>Cost per sq. km.</b>	\$1462	\$615	\$330	\$86.30	\$300-1000+	\$3705-\$7125
<b>Cost per warren</b>	\$4.50	\$12.10	\$5.54	\$7.48	\$3.50-10	\$7.50
<b>Reopening rate</b>		1%	nil	< 3%	<1% for deep cross-ripping; >20% for shallow ripping (<400mm) extending only to the edge of warrens	0.06%
<b>Post-ripping rabbit density</b>		0.1 rabbits per spotlight km.	nil	0.15 rabbits per spotlight km.		0.7 rabbits per spotlight km, 1.7 warren entrances/ha.

**Notes:** On smaller properties in higher rainfall areas, the cost per hole (and even the cost per warren) may be considerably higher than the above figures due to a range of potential factors including: lower warren density in some areas; smaller number of holes per warren complex; difficult access to warrens due to vegetation, logs, rocks, hilly and/or boggy country; use of smaller, less efficient machinery with only one or two tines; and, any machinery ferry costs are averaged out over a smaller ripping area.

Due to the inaccessibility of most warrens, and because of associated conservation concerns, warren ripping is not a commonly used control technique in Western Australia. Baiting is the recommended conventional control technique in this State.

- Ensure that all warrens are ripped. Rabbits surviving in small missed warrens frequently re-open the larger ripped warrens from which they originated. The efficiency and effectiveness of ripping large areas can be greatly enhanced by using experienced spotters on motorbikes who log warren locations on a GPS before the ripping operation commences.
- Larger machinery may be more expensive on an hourly basis, but is often more cost-effective overall due to the following factors: able to pull more tines and therefore cover a larger area with each pass; able to rip to a greater depth and pull winged boots which usually avoids the need to cross-rip; and the weight of the machine itself facilitates warren destruction.
- Small machinery is most cost-effective for areas with low warren density or for follow-up ripping, where the travel time between warrens is high relative to the time spent ripping warrens.
- Smoothing/backblading the ripped warren complex as well as spreading seed will make it more difficult for rabbits to dig back in and will facilitate surface cover which may be essential to avoid soil erosion on sloped ground. However, these measures are only likely to be cost-effective for smaller operations in higher rainfall areas.
- Get it right the first time. There is no substitute for thoroughness. The unit costs of returning to fix a problem (by re-ripping or any other method) far exceed the additional costs of extra care in the primary treatment.

- Where possible, removing surface rabbit harbour such as scrub, briars, logs and rockpiles should also be conducted to assist long-term rabbit control provided such activities are not detrimental to farm production, biodiversity or cultural resources.

## Other conventional control techniques

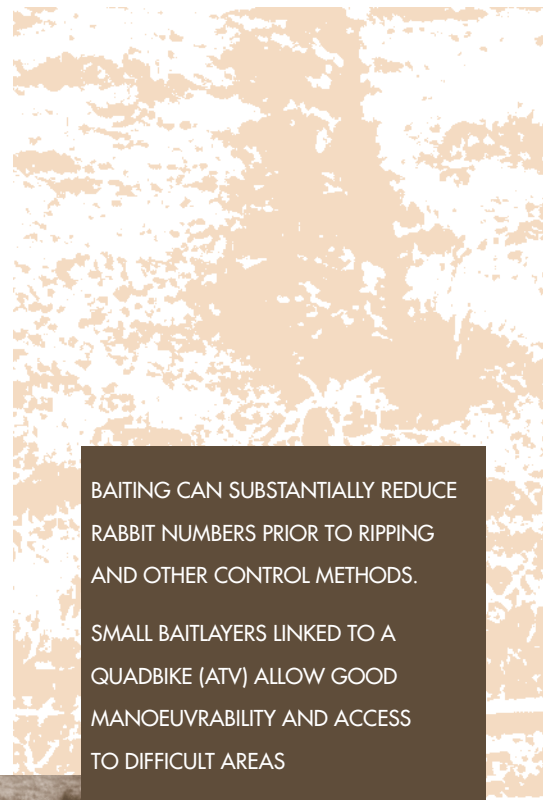
*(information provided by Greg Mutze, SA Animal and Plant Control Commission. **Always clarify your own State regulations and policies in relation to these control methods – see contact details on back page!**)*

### Poison baiting 1080

Poison baiting is used as a primary treatment for rabbit control in agricultural lands to knock down rabbit populations. It is a particularly useful tool for reducing rabbit numbers prior to warren destruction. Key points to note before landholders undertake a baiting program are discussed below:

### South Australian example of conventional baiting

- Ensure adequate trail is laid to cover the feeding areas of all rabbits. Approximately 24 km trail per square km of rabbit infested land may be needed (look-up individual State recommendations).



BAITING CAN SUBSTANTIALLY REDUCE RABBIT NUMBERS PRIOR TO RIPPING AND OTHER CONTROL METHODS. SMALL BAITLAYERS LINKED TO A QUADBIKE (ATV) ALLOW GOOD MANOEUVRABILITY AND ACCESS TO DIFFICULT AREAS





- Lay 3 trails of free-feed (unpoisoned oats at 4.2 kg/km) each 2-3 days apart, to get all rabbits, including shy-feeders, feeding on the trail.
- Follow with one application of 1080-treated oat bait (0.0375% a.i.; 2.8 kg bait/km trail) 3 days after the last free-feed, along the same trail.
- Baiting is most effective when alternative feed is scarce (late summer/autumn) and rabbits are not breeding. During the breeding season, kittens may survive if they are too young to be feeding on the trail but old enough to survive the death of the doe.
- Successful baiting programs should kill >95% of the rabbit population. Lower kill rates can lead to genetic selection towards bait shy rabbit populations.

Costs are based on standard procedure for poisoning rabbits with 1080-treated oat bait in South Australia. Baits are prepared and supplied at cost-recovery by regional Animal and Plant Control Boards. Bait may be laid by landholders using their own equipment or be laid at contract rates by Board Officers using Board vehicles and baitlayers (some Boards offer baitlayers for hire but those costs are not detailed here). Labour and equipment costs are set by the individual Boards and vary according to the type of equipment used and the usual terrain in which they operate. ATV baitlayers are used in difficult terrain and in dense vegetation where vehicle access is limited, trailing rates are necessarily slow and labour costs higher.

The following were average rates in 1990 for a number of Boards that carry out extensive contract baitlaying. Costs for private landholders are similar if labour costs are included: the hourly rate for labour may be lower but there are usually inefficiencies associated with increased time spent obtaining materials and equipment.

**Table 1.** Cost of rabbit control in South Australia for baiting 1ha using 1080-treated oats (GST included)

	4WD utility baitlayer	ATV baitlayer
Poisoned and unpoisoned oats	\$1.30	\$1.30
Labour and equipment (contract rates)	\$4.82	\$8.10
<b>Total</b>	<b>\$6.12</b>	<b>\$9.40</b>

In arid areas, poisoning is seldom cost-effective. Landholders generally achieve a high level of rabbit control by timing ripping programs to take advantage of natural fluctuations in rabbit numbers caused by drought and disease.

**Notes:** Carrots may also be used as a bait material but requires more preparation and deteriorates more rapidly than oat bait.

Western Australia uses a 'one-shot oat' technique where a small proportion ('one in a hundred' grains) of the oat bait contains sufficient 1080 to kill a rabbit. Free feeding is not required but the bait needs to be made available for an extended period (weather conditions need to be dry for 5-10 days). Bait is provided in a narrow trail at 6 kg/km (2-3 trails ~20 m apart),

*laid in a furrow or on the soil surface, or less frequently, in a broad (5m wide) scatter trail at 10-12 kg/km.*

*A similar 'one-shot' procedure is used for the Pindone pre-mix product for controlling rabbits in WA. Poisoned oats (2.8 g/kg pindone acid) are mixed with plain oats to a final concentration in the mixed bait of 0.025% (ie. one poisoned oat to 11 plain oats). The bait mix is laid in a trail at ~17 kg/km.*

*1080 bait mix products can now be purchased from licensed retailers in most States as ready-to-lay products, provided the necessary safe-guards are met.*

### **Pindone**

Pindone is relatively expensive (compared to 1080) but is used near settled areas where 1080 use would be inappropriate. Care needs to be taken so that native and domestic animals are not accidentally poisoned during pindone control programs. However, an antidote does exist (Vitamin K) in case of such poisoning. Pindone can be purchased as pre-prepared oat bait which allows it to be stored and used for small operations as required.

### **Bait stations**

Bait stations may be used for either 1080 or pindone bait to further reduce potential non-target risks; however they are generally not as effective as trail baiting. Properly secured bait stations allow rabbit control to be undertaken without the need to de-stock paddocks.

### **Fumigation**

Warrens can be fumigated either by inserting aluminium phosphide tablets deep into the warren entrances or by pumping chloropicrin in with a small

petrol-driven power fumigator. Key points to note before landholders undertake fumigation are:

- Rabbit warrens are not destroyed by fumigation and may readily be re-opened by other rabbits in the future, so it is only recommended in circumstances where poisoning and ripping are not possible, or to mop up the residual rabbits and prevent rapid re-establishment of the population after successful ripping programs.



DESPITE ITS HIGH REPRODUCTIVE CAPACITY, RABBITS CAN BE EFFECTIVELY MANAGED IN MOST SITUATIONS WITH AN INTEGRATED CONTROL STRATEGY.



- Every hole must be backfilled with soil or rocks to seal the warren (including mouse holes and spider holes that open into the warren).
- Every hole must be treated with fumigant tablets, or power fumigators must be run for adequate time to fill the warren with fumigant.
- Fumigation is most effective in non-porous soils through which gas will not diffuse (e.g. compacted heavy soils or wet soils, not dry sand or cracked clay).
- It is an advantage to use power fumigators to generate smoke and help locate holes even if using aluminium phosphide tablets, especially in scrubby areas.
- Fumigants are highly toxic so extreme care is needed in their application.
- Fumigation is unlikely to be effective where the majority of rabbits live above ground (eg. under scrub) as in much of the agricultural areas of WA.

A thorough survey is needed to check all ripped warrens for re-openings. The cost is likely to be similar to that for the initial survey, i.e. \$1.50/ha. Fumigation is labour-intensive. Additional costs for treating re-opened warrens are roughly proportional to the number of holes that need treatment; about \$6/warren where there are 2-3 holes re-opened (and therefore costs are dependent on the efficacy of poisoning and ripping).

For small rabbit control operations, fumigation may be a convenient alternative to poisoning and/or ripping. Primary treatment costs may be in the order of \$10-\$20/ha for low to

moderate rabbit infestations, but the long-term costs are likely to be high because of the need for frequent maintenance.

## Explosives

Qualified persons may use explosives to destroy warrens inaccessible to ripping or as an alternative to fumigation in many circumstances. Costs are high at about \$2-\$3/hole for materials and \$2-\$5/hole for labour, but explosives have the advantage over fumigants of destroying the burrow, providing longer-term control and thereby reducing future costs for survey and re-treatment.

Key points to note for landholders using explosives for warren destruction are:

- Use the minimum charge necessary to lift and drop the soil – large craters will only encourage recolonisation by rabbits.
- Explosives are obviously hazardous – use only if suitably qualified.

## Exclusion fencing

Rabbit exclusion fencing is generally not an option due to the high cost. However, a recent study in southern Western Australia found that rabbit-proof fencing could be useful where rabbit populations were surviving using the harbour provided by remnant bushland and the food provided by adjacent crops and pastures. Erecting a rabbit-proof fence at the perimeter of crop/pasture and remnant vegetation made it difficult for the rabbit

population to survive. Baiting could then be conducted within the fenced off remnant vegetation to remove remaining rabbits. This approach could be economic where there is high-value crop/pasture and remnant vegetation, although care would need to be taken to ensure such fencing does not adversely affect native animal movement. Rabbit-proof fencing would often be a viable option for many market garden/horticultural enterprises with a rabbit problem.

## Shooting/trapping/ferreting

Leg-hold rabbit trapping and ferreting is illegal in some States. In any case shooting, trapping and ferreting are generally not considered to be effective or efficient rabbit population control techniques and have limited use even for 'mop up' or maintenance control where re-ripping, baiting and fumigation should be the focus of efforts.

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Further information on rabbit control is available in *Managing Vertebrate Pests: Rabbits* by Kent Williams, Ian Parer, Brian Coman, John Burley and Mike Braysher (1995, Bureau of Resource Sciences/CSIRO) which can be ordered through [www.affa.gov.au/rural\\_science\\_pests](http://www.affa.gov.au/rural_science_pests)

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For information on specific State/Territory Government requirements, visit the following internet sites:

- |                              |   |
|------------------------------|---|
| Victoria                     | <a href="http://www.nre.vic.gov.au">http://www.nre.vic.gov.au</a>                               |
| New South Wales              | <a href="http://www.agric.nsw.gov.au">http://www.agric.nsw.gov.au</a>                           |
| Northern Territory           | <a href="http://www.nt.gov.au/ipe/pwcnt/">http://www.nt.gov.au/ipe/pwcnt/</a>                   |
| Queensland                   | Contact your nearest Local Government office  |
| Western Australia            | <a href="http://www.agric.wa.gov.au/programs/app/">http://www.agric.wa.gov.au/programs/app/</a> |
| Australian Capital Territory | <a href="http://www.environment.act.gov.au/ie4/">http://www.environment.act.gov.au/ie4/</a>     |
| South Australia              | <a href="http://www.pir.sa.gov.au">http://www.pir.sa.gov.au</a>                                 |
| Tasmania                     | <a href="http://www.dpiwe.tas.gov.au">http://www.dpiwe.tas.gov.au</a>                           |



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