

The rabbit and its control

Oryctolagus cuniculus

DECLARED CLASS 2



Oryctolagus cuniculus (photo courtesy Mark Ridge)

The problem

The rabbit is a declared Class 2 animal under the *Land Protection (Pest and Stock Route Management Act) 2002*.

Rabbits are one of Australia's major agricultural and environmental animal pests, costing the country between \$600 million and \$1 billion annually. They compete with native animals, destroy the landscape and are a primary cause of soil erosion by preventing regeneration of native vegetation.

Rabbits have played a role in the reduced numbers and extinction of many native animals by competing for food and burrow space. In drought times, rabbits

climb trees to forage on the foliage and often ringbark trees in their search for moisture.

Rabbits affect the quantity and quality of pasture available for other animals. Nutritious plants are selectively grazed, and in times of drought rabbits can consume the majority of the vegetation available. It is documented that the grazing ability of seven to ten rabbits is equivalent to one sheep.

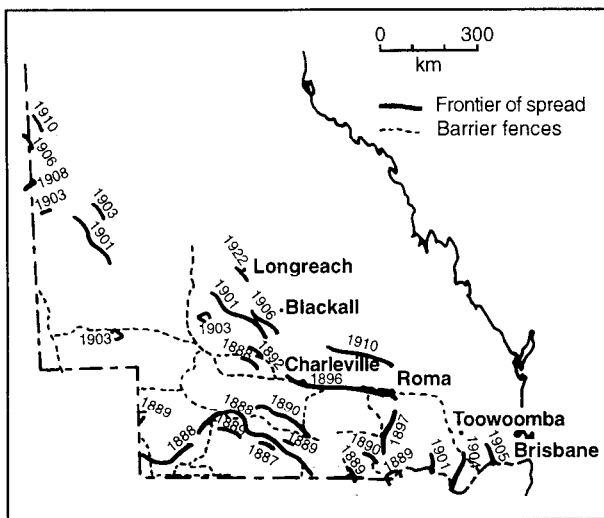
Rabbit grazing and burrowing reduces vegetation and leads to soil erosion. The exposed bare soil is washed or blown away, making areas less productive. Soil that is washed away then builds up and causes increased silting of aquatic ecosystems.

Pet rabbits

Introducing and selling rabbits in Queensland is not permitted (max. penalty \$30 000). Limited numbers of permits for domestic rabbits are only available from the Department of Primary Industries and Fisheries (DPI&F) for research purposes, public display, magic acts or circuses. Before a permit is granted, a number of guidelines need to be fulfilled. Information is available on (07) 3405 5526.

Spread

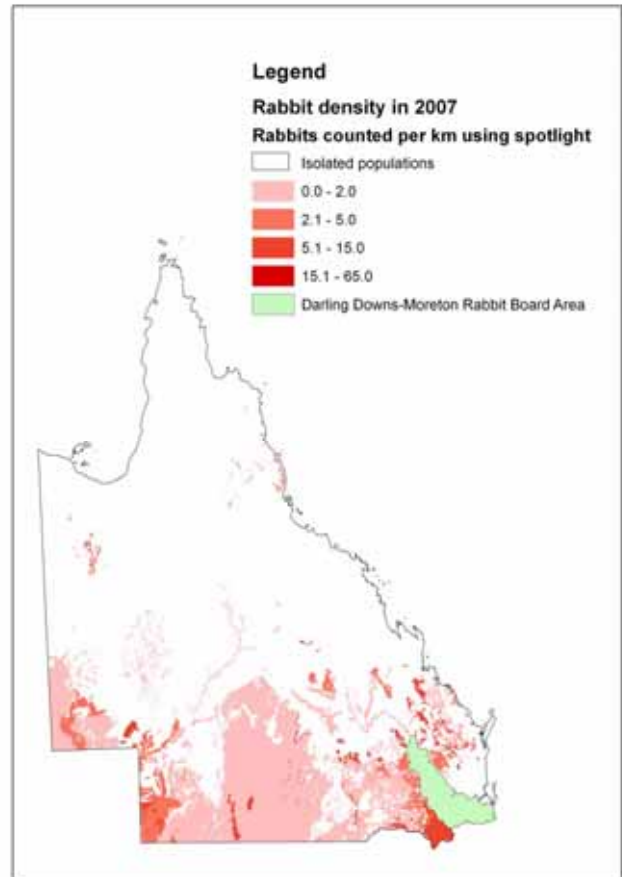
Domestic rabbits were originally brought to Australia with the First Fleet. Feral populations were first reported in southern Tasmania in 1827. Twenty-four wild rabbits were released on the mainland by Thomas Austin of 'Barwon Park', Victoria, in 1859. Rabbits spread rapidly from 'Barwon Park' and another release centre near Adelaide (Kapunda) at rates of up to 100 km a year.



Spread of the rabbit in southern Queensland

Rabbits were first reported in south-western Queensland in the 1880s and their spread was assisted by humans as much as by natural migration. Queensland reacted to the advancing wave of rabbits by introducing the Rabbit Nuisance Bill of 1878 and Act in 1880. Unfortunately, tenders for the construction of a rabbit-proof border fence were not passed until 1886, by which time rabbits were scattered from Wompah in the west to Mungindi in the east.

Rabbits have now spread throughout most of Queensland. Although numbers have contracted since the release of rabbit haemorrhagic disease virus (RHDV)—formerly known as rabbit calicivirus disease—high populations still exist in the Granite Belt and isolated regions throughout southern Queensland.



Number of rabbits likely to be seen with a spotlight at night. Darker areas indicate more suitable rabbit habitat

Habitat

Rabbits are adaptable and sometimes live in close association with people. They live in built environments such as:

- in and under buildings
- old machinery and storage containers
- in old dumps.

In rural environments rabbits frequently live in:

- felled timber and associated windrows
- tussock grasses and rocky areas
- warrens (if soils are easy to dig).

Breeding

Rabbits in mild environments are territorial throughout the year, but increase their social aggression during the breeding season. During the breeding season rabbits live in communities with well-defined social hierarchies or 'pecking orders'. Community boundaries are marked with faeces or an exudate from glands located under the chin.

The dominant buck (male) mates with most does (females) within his territory, but dominant does can prevent breeding in subordinate does. In drier areas, harsh conditions make finding food more important and reduce the strict territorial behaviour of rabbits. Does are pregnant for 28–30 days, but are able to mate within hours of giving birth. The average litter is 3–4 kittens but varies from two in a young doe, up to eight or more in a mature doe, and depends on the amount and quality of food available.

Young does can breed at four months of age if conditions are suitable.

Five to six litters are possible in a good season. This equates to 100 young per doe per year. The litters produced are associated with the length of time young grass is present. In summer rainfall areas with high temperatures, fewer young are a result of less fertile males and poor pasture quality.

Rabbit warrens

Rabbits prefer to live in warrens as protection against predators and extremes in temperature. However, they will survive in above-ground harbours such as logs, windrows and dense thickets of scrub (e.g. blackberry and lantana) or under built harbour, old sheds and machinery etc. In newly colonised areas without warrens, rabbits tend to live in 'scrapes' (or 'squats').



Rabbits on a warren

With warren protection, rabbits are able to produce up to 10 kittens per litter (compared with only four per litter when forced to breed in above-ground harbours). If a warren is available, the number of litters produced per year will also be larger than litters produced by rabbits breeding above ground.

Rabbit dispersal

In Australia, rabbits have high rates of dispersal from the warren where they were born. Understanding this can help with control programs.

Young rabbits disperse to new areas throughout the breeding season. Dispersal rates peak when food becomes scarce and rabbits have to find more food. Dispersing rabbits have been known to move 20 km or more away from their warrens, often moving from areas with a high density of rabbits to areas of low density. After dispersal, a rabbit will take up residence in a vacant warren (if one is available) or will shelter in a surface harbour and attempt to join another social group of rabbits.

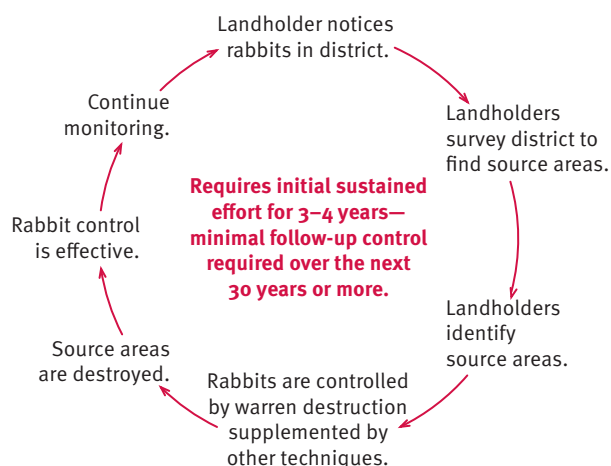
Where to start control

For effective long-term rabbit control, efforts should concentrate on destroying source areas. These can be readily identified by the presence of rabbits even during the worst drought or after a myxomatosis or RHDV epidemic. Source areas will all have well-established warrens or ready-made structures that are cool and provide protection from predators. A source area must also have a good supply of green feed during the cooler seasons.

The reason for targeting source areas is that they are the areas where rabbits breed and the birth rate exceeds the death rate. This leads to an increase in the rabbit population, with the excess rabbits dispersing and continually repopulating the surrounding districts—particularly in good seasons when they can flourish. The dispersing rabbits are less of a concern than those in the source areas, however, because droughts, disease and predators routinely impact upon them to reduce numbers. It is always new rabbits from source areas that will become the next wave of dispersing rabbits in the coming months or seasons.

Coordinating control

Rabbit control is best done as a joint exercise involving all land managers in the district. This may not always be possible, but with landcare groups operating in most areas, and funding often available, it makes sense to talk to other land managers in the district to coordinate efforts. Cost-effective, long-term results can be achieved in rabbit control by following the methods outlined below.



Effective rabbit control cycle

Control methods

Integrated control

Landholders should adopt an integrated control approach, incorporating appropriate strategies from those listed below. It is important landholders understand that biological control agents such as myxomatosis and RHDV are not the complete answer to the rabbit problem. It is essential they are incorporated into a management strategy with other control techniques.

RHDV offers landholders a major opportunity to reduce rabbit numbers; however, failure to combine RHDV with other control strategies could cause rabbit immunity to develop (as occurred with myxomatosis).

Destroying a rabbit's home (e.g. warren) is the most effective method for long-term control. DPI&F has conducted warren ripping trials in Queensland and rabbits fail to re-establish in areas where warrens were ripped properly.

Conventional control methods, such as fumigating, ripping warrens and harbour destruction, are essential for the continued long-term reduction of rabbit numbers.

Warren destruction (ripping)

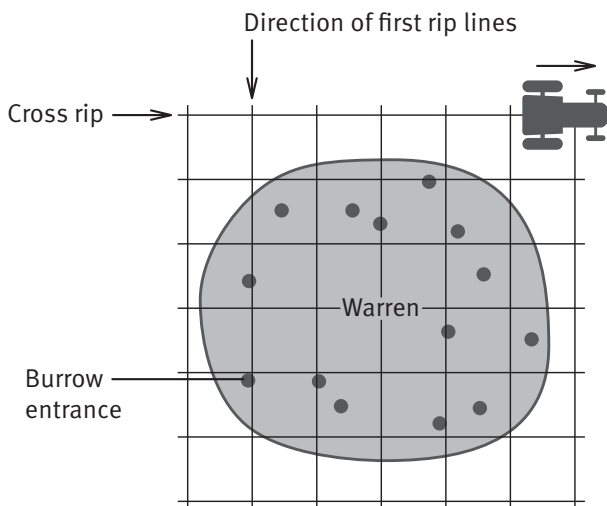
In areas where rabbits live in warrens, destruction (ripping) is the most effective method of long-term control. Ripping is so successful because warrens can rarely be reopened and rabbits are unable to recolonise these areas. While some older rabbits may remain at ripped sites for a year or two, there will be no younger rabbits to replace these older rabbits once they die out.



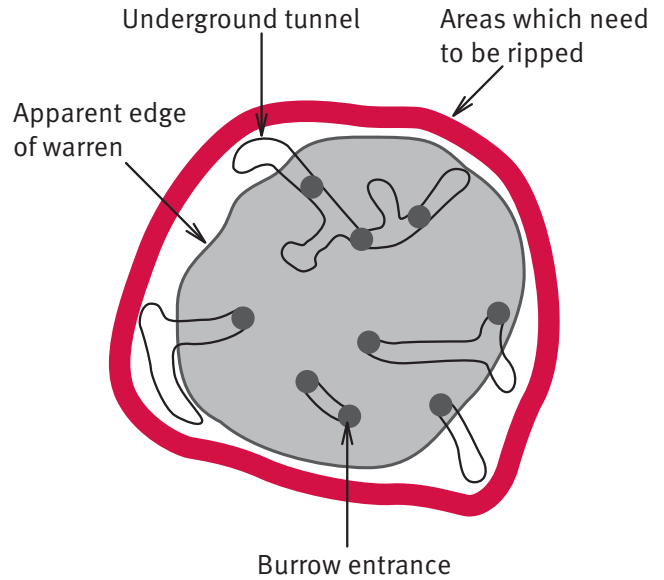
Tyne for ripping warrens (photo courtesy Mark Ridge)

Combined with other control methods, ripping can reduce a rabbit population to 1–2% of its original size. To get the best results it is important to chase as many of the rabbits inside the warren as possible. Dogs can be used to drive rabbits into the warren before ripping starts.

The aim of ripping is to completely destroy the warren. It involves using a tractor with a tyned (sharp-pronged) implement—one tyne or many—that rips through the warren and collapses it. Larger tractors and dozers are more appropriate for properties with many warrens as they are able to move faster and rip wider.



Direction to rip warrens (illustration courtesy Will Dobbie)



Extent to rip warrens (illustration courtesy Will Dobbie)

Obviously, ripping is not suitable for warrens located underneath buildings or on steep rocky country. In such cases, other methods (poison baiting, releasing virus or fumigating burrows) should instead be used to reduce rabbit numbers. Warrens should then be either filled in or covered to stop rabbits from re-establishing. Burrows can be blocked with small boulders or rocks (see below).



Rock blocking rabbit hole

Harbour destruction

Where there is abundant surface harbour, a high proportion of rabbits may live above ground rather than in underground warrens. Rabbits can make their homes in windrows, dense thickets of shrubs (such as blackberries and lantana) and even in old machinery.

To eliminate these above-ground breeding areas, it may be necessary to:

- burn windrows and log piles
- remove noxious weeds through chemical and physical control
- remove movable objects (such as old machinery) from paddocks.

Sometimes removing harbour can expose warrens underneath. If this happens, the warrens will need to be ripped.

Poison baiting

Baiting is not effective as a sole control method and will not eradicate an entire rabbit population. Numbers will quickly increase again, and you will have to continue baiting year after year with no permanent overall change in the rabbit population.

Rabbits can also become 'bait shy' and this method becomes less and less effective over time. Ideally, baiting is best used either before ripping/fumigation to reduce a population, or after ripping/fumigation as a 'mop-up'.

Baiting works best when rabbits are not breeding. During breeding season the majority of the population feeds over a larger-than-normal area, and it is the young rabbits that are most likely to take baits. While numbers will be reduced, animals of breeding age are not likely to be affected.

1080—sodium fluoroacetate

Pre-feeding is required when using 1080 because rabbits will not readily take new feed. The poison-free bait should be laid at least three times over a one-week period before the poisoned bait is laid. (1080-impregnated carrot baits are the most common form of bait used.) The practice helps to ensure that, when the poisoned bait is laid, it will be eaten by most of the rabbit population.

The use of 1080 is controlled by strict guidelines. In Queensland, only land protection officers from DPI&F, officers from the Darling Downs–Moreton Rabbit Board (DDMRB), or local government officers who are 1080-authorized officers licensed by the Health Department may prepare bait material for land managers. If you want to use 1080 for rabbit control, you will need to contact one of these authorized officers.

Pindone

Pindone is an anticoagulant registered for rabbit control. This poison works by preventing blood from clotting. In Queensland, it is not recommended for broadacre use and is mainly used in urban areas and near farm buildings.

Pindone works best when given as a series of small doses/feeds over a period of three days. Although pre-feeding is not essential, it does enhance the bait uptake by shy rabbits as they get used to the feed prior to any poison bait being laid. To be effective, pindone requires multiple feeds so that the poison can build up to fatal levels in the rabbit's body. Feeding over a number of nights provides plenty of opportunity for most of the rabbit population to consume the required lethal dose. Rabbits poisoned with pindone will usually die within 10–20 days.

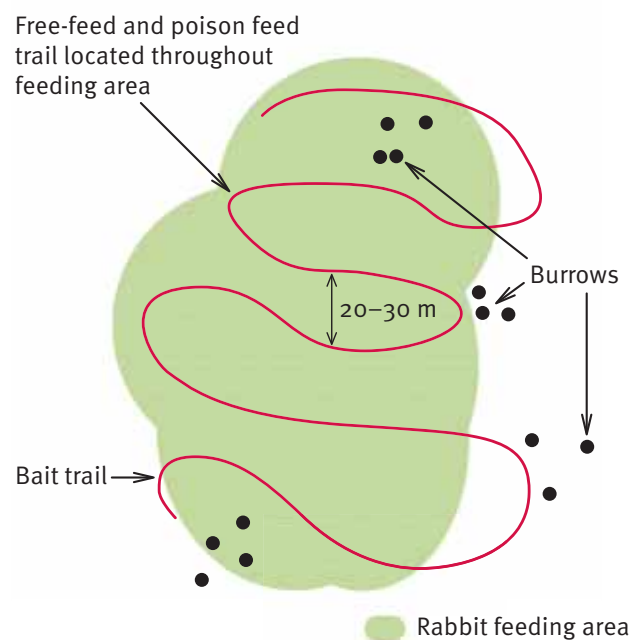
Pindone baiting does not work well when there is a lot of green pick around for rabbits. This is thought to be because the fresh grass contains enough vitamin K1 (pindone's antidote) to counteract the pindone consumed.

Poison bait trails

It is important that bait trails are laid properly to ensure the best results. Baitlayers make it easier to put out bait trails at the correct rate, and they can be towed behind most 4WD vehicles, quad bikes and tractors.

When scratching and laying a trail, these points need to be considered:

- Rabbits like freshly scratched/disturbed soil—this may be because rabbits are territorial and inspect newly disturbed soil, and/or the disturbed vegetation smell attracts them.
- Lay trails around warrens and in the areas where rabbits most often feed.
- Laying trails on slopes and hills requires care—it can cause erosion in some soils types (e.g. granite and traprock). Trails are best laid in a zigzag pattern in steep terrain to minimise erosion.
- A trail that has been scratched for the first feed is easy to follow for the rest of the baiting program.
- The soil should be turned only enough to scratch the surface—don't plough the ground.
- A trail that has been scratched too deep will spook the rabbits because they will not have full sight of their predators.
- Where vegetation is thick or it is difficult to find the main feeding areas, lay bait trails in a grid pattern across the site.
- As a general rule, avoid crossing the bait trail—it can cause confusion when you try to follow



Method for laying a bait trail (illustration courtesy Animal Control Technologies)

Bait trials will be most effective if these guidelines are followed:

- Use good quality, non-contaminated bait material. (Simple rule: if you wouldn't eat it the rabbit won't either.)
- Use enough feed to bait all the rabbits in the area. (The pre-feed will give an indication of the potential bait take.)
- Expect a greater uptake of pre-feed and bait material when vegetation is scarce, dried off or soured.

- Ensure that all the preparation equipment is clean and free of any chemical residues or smells—rabbits can be very shy of unusual odours.
- When there are kittens in a warren, lay the bait trail close to the warrens.

Fumigation

Fumigation is labour intensive and time consuming, and is not usually an effective method if used alone. However, as a 'mop-up' technique or control method for use in areas where ripping is not practical (e.g. steep and rocky terrain), it may be a good alternative.

Because this technique relies on directly affecting the rabbits, and does not affect the structure of the warren, it is absolutely crucial that as many rabbits as possible are underground when fumigation is carried out. Rabbits usually take refuge in their burrows from mid-morning to mid-afternoon and during hot weather so these are the best times to fumigate. Dogs can also be used to drive rabbits into their warrens.

For best results, fumigation should be carried out in two stages—initially, before the breeding season starts (as this reduces the breeding stock), and then again during the breeding season.

There are two types of warren fumigation—static and pressure. In Queensland, static fumigants are a more popular and safer option for controlling rabbits and will be explained below.

Static fumigation

This method is easy to use, and time- and cost-effective. Static fumigation comes in the form of aluminium phosphide (phosphine) tablets, which can be purchased from most agricultural suppliers. These tablets are small and round (about the size of a marble), and weigh 3 g. Trade names for phosphine include Pestex[®], Quickphos[®] and Gastion[®]. General directions for the use of phosphine tablets appear below, but always refer to the manufacturer's specific recommendations for use.

To fumigate warrens using phosphine tablets:

1. Find all warren entrances—both active and inactive.
2. Cut back the warren entrance at right angles using a shovel.
3. Separately wrap two tablets in moistened absorbent paper (toilet paper/paper towels).
4. Insert the tablets as far down into the entrance as possible. (Polypipe and a push rod can be used to help push the tablets down.)
5. Push some scrunched-up newspaper down the hole to block the entrance and then cover it up with soil and, if possible, a rock.
6. Treat all entrances to the warren (active and inactive) the same way.
7. Check warrens about a week after fumigation and re-fumigate any reopened entrances.

Once in the warren, the moistened tablets react with air to release a toxic gas, which spreads quickly throughout the warren. The phosphine gas itself is invisible and odourless but leakages from the warren can be detected by the smell of ammonia.

(This is a safety mechanism that is built into the tablet.) Any leakages need to be blocked immediately.

Biological controls

Rabbit hemorrhagic disease virus (also known as rabbit calicivirus disease)

RHDV is a virus specific to rabbits. The virus escaped from Wardang Island (off the coast of Yorke Peninsula, South Australia) during trials in 1995 and reached Queensland in the same year. The virus works by infecting the lining of the throat, lungs, gut and liver.

Despite its past success in controlling rabbit numbers, RHDV should not be considered a 'silver bullet'. Rather, it is simply another tool that can be used to complement other control techniques.

While there are indications that insects may help to spread the disease, RHDV relies primarily on direct rabbit-to-rabbit contact in order to spread. High rabbit numbers are therefore needed before this control method will be effective. Somehow the virus survives from year to year in an area and revisits rabbit populations (provided there are enough rabbits to support its spread).

After RHDV has infected an area, it is important to use another method for follow-up control to increase the likelihood that the population is eradicated before it is able to develop resistance and increase its numbers again.

Resistance to RHDV depends primarily on the age of the rabbit. Therefore, it is better for RHDV to go through a rabbit population after rabbits have bred and the young are old enough to be affected by the virus. Rabbits that survive RHDV develop antibodies against the virus. Breeding females can also pass these antibodies on to the young (through antibodies in their milk), conferring temporary protection on rabbits up to 12 weeks old.

Myxomatosis

Myxomatosis is a virus that was released in Australia in the early 1950s. It is transferred from rabbit to rabbit by mosquitoes and two species of flea—the European rabbit flea and the Spanish rabbit flea.

When the virus was released, Australia's rabbit population initially decreased dramatically. However, because it was the only control method used, rabbit numbers began to increase again within a few years. Although the virus is no longer produced as a laboratory strain, field strains of myxomatosis still commonly recur and affect rabbit populations.

Trapping

Trapping alone is not considered an effective method of control as rabbit populations will quickly recover; consequently, trapping will need to be repeated year after year. Trapping is also an extremely labour-intensive control method and requires a skilled operator to set the traps to successfully capture rabbits.

If you do plan to trap rabbits on your property, common sense and respect for animal welfare are

essential. While there are currently no strict guidelines for the use of traps in Queensland, it is an area of growing concern for animal welfare advocates.

Cage trap

A cage trap has a lever that closes the cage when a rabbit steps on it. The rabbits are lured into the cage with bait—usually diced carrot. Traps need to be disabled and left open for two or three nights with bait leading into the cage. This entices rabbits to enter. A trap can be set once a rabbit has consumed a trail of bait all the way into that trap. Traps should be checked and emptied regularly—usually a couple of times a night.



Cage traps used in hayshed (photo courtesy Mark Ridge)

This effective and humane technique is most useful for removing any remaining rabbits from places like hay sheds and after the shed has been fenced to prevent additional rabbits from entering and leaving. Free-feed then trap, and keep the shed rabbit-proof to prevent rabbits recolonising.

Foothold traps (soft-jaw or padded)

Although foothold traps are not widely used in Queensland, they can sometimes be useful in situations where other control methods can't be used. They are considered more humane than the serrated, steel-jawed leghold traps that cause pain and suffering, and which should not be used.



Rabbit foothold traps

Soft-jaw foothold traps have a piece of rubber or cushioning attached to the inner surface of the trap. These traps will hold the animal firmly by the foot without causing unnecessary trauma.

Foothold traps are placed on the warren entrance path about 20–30 cm out from an active warren entrance. The trap should be placed in loose, sandy soil. One trap should be placed at the entrance for each active hole in a warren.

Barrel trap

A barrel trap is designed specifically for rabbits. It is cylindrical, made of light mesh, and is about 1 m long and 15 cm in diameter. The trap has one open end with two hinged trap doors along its side. The open end is placed in the burrow, and the hinged gates close and trap the rabbit after it enters from the burrow.

The trap can be left in the burrow entrance for a number of days. However, it must be checked at least daily so that if a rabbit has been caught it does not suffer and animal welfare responsibilities are met.



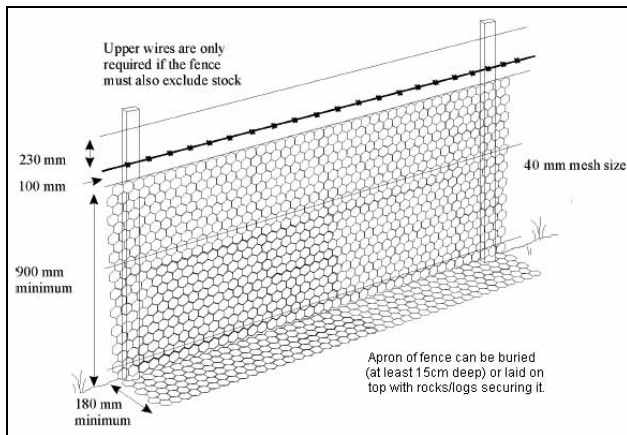
Barrel rabbit trap in hole

Exclusion fencing

Rabbit exclusion fences are built with the aim of keeping rabbits out of a particular area. This control method can be very labour intensive and expensive; costs prohibit the construction of new fences over large areas. It is appropriate for small, high-value areas that require protection. A fully fenced area will only remain rabbit-free in the long term if all rabbits are removed from the enclosed area after fencing and the fence is regularly maintained and checked for holes.

A rabbit-proof fence should be made of wire mesh netting (40 mm² or smaller) and needs to be at least 900 mm high. The netting should also be buried to depth of at least 150 mm. Gates into the fenced area need to be rabbit-proof as well.

Electric fencing is a cheaper alternative, but it is not a complete physical barrier and is also prone to damage from other pest animals and stock.



Exclusion fence for rabbits (illustration courtesy DEWHA)

Shooting

When used alone, shooting is not considered an effective method of rabbit control as it will only have a small impact on the population. It is impossible to shoot all the rabbits on a property and the population will quickly breed up again to replace those shot.

Shooting is most useful when used to 'mop up' after other control methods (such as ripping). To get the best results, shoot at the time of day when rabbits are active. This is usually in the early morning, late afternoon or at night. The best and most economical firearm to use is a .22 calibre rifle.

If your property is within an urban area, you will need to comply with local government regulations and the *Police Powers and Responsibilities Act 2000*, which restrict the use of firearms.

Estimating and monitoring rabbit numbers

An estimate of rabbit numbers can be made quickly and easily, and is the most practical indicator of a potential rabbit problem. The simplest methods are spotlighting and warren counts.

When counting rabbits, it is important to use the same method every time. If possible, also conduct counts at the same time of night and in similar weather conditions. This ensures that other factors remain constant—the only variable that will change is the number of rabbits.

Ideally, you should monitor for rabbits before starting any control work. Monitoring also needs to continue well after control work has ceased. For best results, monitoring should involve measuring changes over time and throughout seasons. If done methodically, it can help detect changes in rabbit numbers before they become obvious to the casual observer.

Spotlight and headlight counts

Using this method, rabbits are counted at night from a ute moving at a slow, constant speed (about 10–20 km/h) over a fixed route with the aid of a hand-held spotlight. This ideally requires at least two people—one to drive and another, holding a spotlight and counting the rabbits, to stand on the back of the ute. All rabbits seen within approximately 100 m on both sides and in front of the vehicle are counted and recorded.

Footprint counts

This method involves siting 15–20 sand plots, which are 1 m in diameter, in and around warrens, harbour areas and feeding areas. The sand plots need to be raked smooth to ensure there is a soft surface on which rabbit footprints will be visible.

It is best to set the plots in the late afternoon and then check them in the morning. Repeating this procedure for three consecutive days should result in an accurate count. This method provides a good indication of rabbit numbers prior to, and following, control methods.

Warren (active entrance) counts

This method is useful only where there are plenty of warrens and most of the rabbit population live in them. However, where most of the rabbits are living above ground or in log piles, counting warren entrances will not provide an accurate estimate of rabbit numbers. (Rabbits using above-ground harbour will move from one area of their above-ground harbour to another and never appear to go underground, whereas their burrow-living rabbits will dive for a burrow entrance as soon as possible).

If the property is small, inspect and count all warrens; if the property is large, only 10–20 warrens need to be inspected. For each warren, count the number of active (used) and inactive (not used) entrances and record the information. To estimate actual numbers of adult rabbits, multiply by 1.6 the number of active warren entrances.

Further reading

For further detailed reading information on specific rabbit control techniques or costing your rabbit control please refer to *Rabbit control in Queensland; a guide for land managers*. It is available for download from the DPI&F website at www.dpi.qld.gov.au.

Further information

Further information is available from animal control/environmental staff at your local government, or if your council does not have animal control staff, from your local DPI&F land protection officer: contact details available through 13 25 23.