CENTRE FOR
INVASIVE SPECIES SOLUTIONS

GLOVEBOX GUIDE FOR MANAGING RABBITS

Part of the

pestSMART

publication series

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This document has combined the above two publications into one new Glovebox Guide

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Contents

1. About this guide

This glovebox guide is part of the PestSmart Toolkit for Rabbits, produced by the **Centre for Invasive Species Solutions**. It provides current and general information on best practice rabbit management for land managers, pest animal officers and others involved in the management of rabbits. This includes general information on:

1. Identify and understand the extent of your problem
2. Set clear and measurable objectives and develop a plan
3. Consider and select management strategies and take action
4. Monitor the outcomes from the plan
5. Evaluate the plan
6. Make improvements based on evaluation

The advice provided in this publication is intended as a source of general information only. Always check current regulations and read the label before using any of the products mentioned. Apply the information for your needs considering environmental, financial and social circumstances.

For further information about rabbits and other pest animals in Australia, visit the website: www.pestsmart.org.au/

Wild European rabbit. Image by Neil Schultz

Taxonomic name:

Oryctolagus cuniculus

Common name:
European rabbit (wild)

Image by Chris Cox

LEARN
Key facts

Appearance

Colour: commonly grey-brown backs and white-grey bellies. Can vary from sandy light brown to ginger, black and occasionally, white.

Attributes: long ears, long hind legs, short fluffy tail and feet that are well-furred beneath, with large straight claws.

Size: Adults weigh 1–2.25 kg and are 35–45 cm long. Males and females are similar in size.

FAST FACT: More variety in rabbit colours generally indicates a larger population. This is because variety in genetic traits, such as albino characteristics, increases in proportion to the size of the population.

Reproduction

Wild rabbits can begin breeding at four months old. They can produce five or more litters in a year, with up to five young per litter. Rabbits have a gestation time of 28-30 days. The main breeding season is usually during late winter/spring after good rainfall, when high-protein plants start growing again. However, they can breed at any time of year when food is in good supply. During breeding season, wild rabbits form territorial groups containing 1–3 males and 7–10 females, led by a dominant pair.

Diet

Rabbits are herbivores and eat a wide variety of plants, including crops, roots, pastures, young trees and vines. They prefer soft, short and succulent plants such as grasses and herbs. They can graze plants to ground level and may consume up to one-third of their own body weight daily, although their average daily intake is between 100–150g. In arid areas rabbits need access to water, but elsewhere they get enough moisture from their food.

Distribution

Rabbits are one of the most widely distributed and abundant mammals in Australia. They are found in all states and territories and many offshore islands. Only the most northerly regions of the mainland are free of rabbits. Their exact abundance is unknown and cannot be readily quantified as population sizes fluctuate significantly. Factors affecting population include: breeding events, mortality caused from biocontrol agents, predators or drought, and availability of food, water and shelter.

Habitat

Rabbits occur in a variety of habitats, including urban and coastal areas, agricultural areas, deserts, natural forests, planted forests, grass and rangelands, disturbed habitats and shrublands. They prefer areas of low vegetation; well-drained, deep sandy soils where they can build warrens; and refuge such as scrub, blackberry bushes or fallen logs.

Warrens are usually up to 3 m deep and 45 m long. Warren complexes are generally larger in more open country. Warrens provide cover and protection from predators and extreme temperatures, and allow rabbits to live in open grasslands, grazed pasture and arid land.

Biological and behavioural weaknesses

Rabbits are dependent on warrens or other shelter so destruction of these will greatly reduce the local rabbit population. Rabbits are also highly susceptible to predators and disease. Their most significant predators are feral cats, foxes and wild dogs.

Two of the deadliest diseases to rabbits are myxomatosis and rabbit haemorrhagic disease (RHD, formerly known as calicivirus). The virulence (the ability of a microorganism to cause disease in the host) of different strains varies across populations. Some rabbits are more genetically resistant and this has reduced the effectiveness of these diseases as biological controls over time. This is why new strains are researched and released.

Warrens provide cover and allow rabbits to live in open grasslands, grazed pasture and arid land.
Image: Brian Lukins

Impacts

Economic

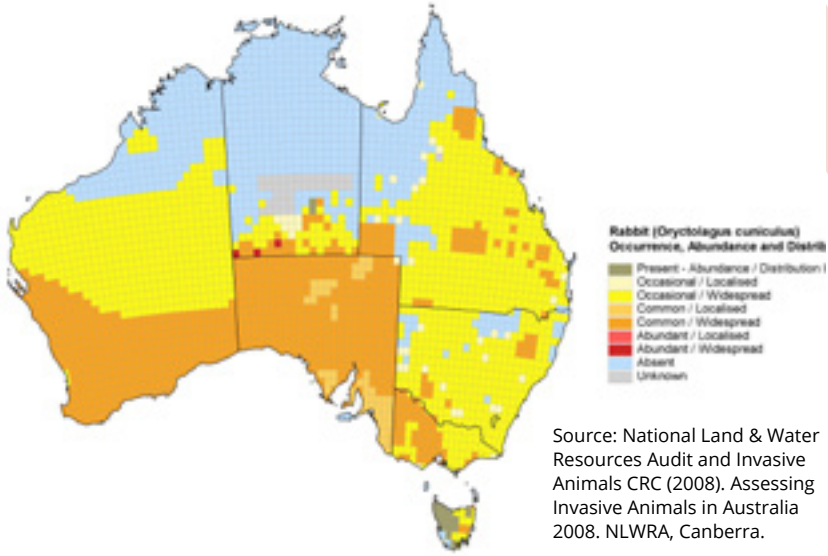
Rabbits cost, on average, Australian agriculture $216 million in production losses each year (McLeod 2016). This is five times greater than the losses from wild dogs and almost ten times greater than the losses caused by foxes and mice.

This is mainly caused through rabbits grazing. As well as reducing crop and pasture yields, grazing can prevent regeneration of seedlings and increase competition for feed with livestock. This may affect the carrying capacity of livestock on a property, resulting in lower weight gain, lower wool production and reduced births. In drought, more stock may die as a result of starvation due to reduced feed. In general, about 9–12 rabbits/ha is equivalent to one DSE (dry sheep equivalent).

Rabbits are also implicated in:

- Greater lambing losses through predation by fox populations that are supported by rabbit populations.
- Reduced sheep fleece quality through exposure to soil from bare ground.
- Livestock leg injury or breakage in rabbit burrows.

In peri-urban and urban areas, rabbits damage lawns, gardens, golf courses, sportsgrounds, and regional parkland reserves, and may undermine buildings, garages and sheds. They eat backyard vegetables and damage ornamental plants. The costs of rabbits in urban areas has not been quantified.



Source: National Land & Water Resources Audit and Invasive Animals CRC (2008). Assessing Invasive Animals in Australia 2008. NLWRA, Canberra.

Health

Rabbits can be a host for parasites and diseases. They may carry dog tape worms and sheep liver fluke. Rabbits may transmit Johne's disease (Mycobacterium avium paratuberculosis) to cattle and act as a vector of infective Escherichia coli in humans.

Rabbits are linked to increases in weeds, such as Paterson's Curse. Paterson's curse can be toxic to a range of livestock (pigs and horses are highly susceptible, cattle are moderately susceptible), causing liver damage, reduced life spans, and in some cases, death after prolonged grazing.

Rabbits can also significantly affect native fauna through their aggressive and territorial behaviour. Rabbits have been observed attacking and injuries small mammals and wallabies.

Environmental

Rabbits directly compete with native wildlife for food and shelter and degrade the land. The decline and extinction of many small species (weights of between 35 and 5500 g), has also been attributed to impacts caused by rabbits, particularly in the arid and semi-arid zones. Rabbits are listed as a key threat to over 300 threatened species of native plants and animals (Environmental Protection and Biodiversity Conservation Act 1999). Specifically, rabbits impact native plants by ringbarking, grazing/ browsing, and preventing seedlings from revegetating. Their digging and browsing reduces vegetation cover, which can result in slope instability and soil erosion.

Social

Wild rabbits can be harvested, providing regional employment, and hunted for recreation.

The damage caused by rabbits (for example to lawns, gardens, sportsgrounds) while costly can also cause significant inconveniences to communities relying on these amenities.

Broader impacts may include psychological stress, for example, anxiety, frustration and depression, due to financial loss through reduced agricultural production, trauma associated with members of the public finding sick animals, and concern about potential injury to horses from warrens.

Pet owners may also be concerned about disease and poison controls. Vaccinations against RHD viruses are available from vets for domestic breeds only.

Check the laws and guidance for your state or territory, including those that address the humane treatment of all animals.

We recommend following the six step pest animal adaptive management framework

PLAN

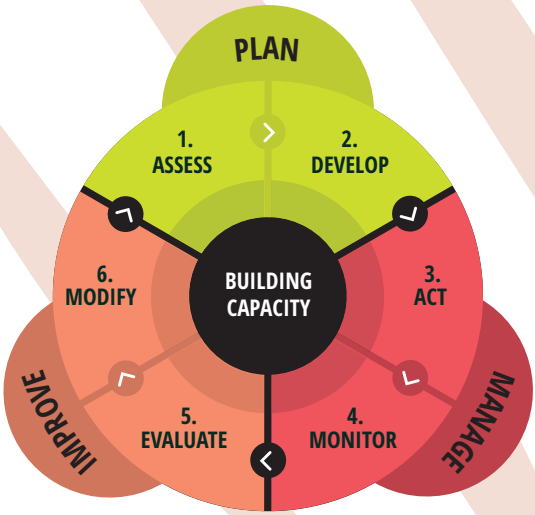
1. Assess and understand the problem
2. Develop a plan and set clear objectives

MANAGE

3. Choose control techniques and strategies and implement
4. Monitor the outcomes of your plan

IMPROVE

5. Evaluate the plan – did you meet your objectives?
6. Modify as required and repeat as necessary



RabbitScan can be used within your local area to map rabbit problem areas, and to help coordinate controls. RabbitScan is available as a smartphone and tablet app (iOS and Android) or through the website.

FERALSCAN .ORG.AU

PLAN

Identifying rabbits and the extent of the problem

Large populations of rabbits are relatively easy to detect as the damage they cause is usually widespread and highly visible. However, the damage caused by small/low density rabbit populations can be much harder to identify.

Population numbers or density do not always correlate to damage. For example, a small population in a highly-sensitive ecological community with many endangered species may be serious.

Rabbit numbers, and changes in their impact, can vary dramatically in a short period of time. Without ongoing monitoring and control, these changes can go unnoticed and the problem can get out of hand, resulting in higher management costs.

Identifying rabbits

Is it a rabbit, hare or bilby?

It may be difficult to identify the animal you are dealing with, particularly if you are using indirect monitoring methods (see footprints; Figure 1).

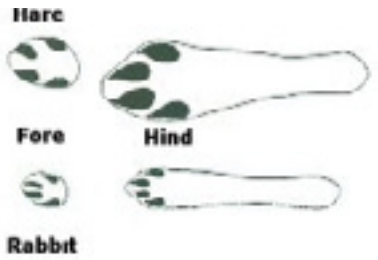


Figure 1: Rabbit and hare footprints. Not to scale: approximately a quarter of actual size (Scale 1:4)

Hares and bilbies are similar in size and appearance to rabbits. Hares are an introduced species from the same genetic family as rabbits (Leporidae). They live in similar habitat types but are usually solitary, and do not build large warrens like rabbits. Greater bilbies are small, protected native animals. Their footprints are similar in size to rabbits. Bilbies also live in warrens.

Other key differences between the three species are:

- hares are noticeably larger than rabbits, with a head and body length of 55 cm while rabbits are about 40 cm in length
- a hare can weigh twice as much as a rabbit
- a hare's hind legs are relatively larger than a rabbit's
- hares can run faster than rabbits
- hares have relatively longer ears than rabbits, with distinct black tips
- rabbit warrens often have more entrances than bilby burrows, and entrances are usually larger
- rabbit diggings are generally shallower than bilby diggings, and tend to be long and narrow.

European brown hare

Greater bilby. Image: SEWPaC

Eurpoean rabbit. Image: Neil Schultz

Monitoring rabbits

Rabbit density is a practical indicator of a potential rabbit problem and can be measured easily, quickly and cheaply. Estimate density directly by counting rabbits or indirectly by counting warrens, active warren entrances or signs of rabbits (for example tracks and dung).

Instructions on how to rapidly assess a rabbit problem using a simple, visual-based technique can be found in the booklet Rabbits: a threat to conservation and natural resource management by Brian Cooke, Steve McPhee and Quentin Hart.

- 0 - none found in the 15 minute search
- 1 - isolated pellets and small clumps of 5 - 10 pellets 10 metres or more apart
- 2 - scattered pellets and clumps less than 10 metres apart
- 3 - common, pellets in larger clumps and occasional buck-heaps on about half the areas you scan closely during the search
- 4 - abundant, pellets often in large clumps and buck-heaps obvious but not present across whole area
- 5 - very abundant, pellets and buck-heaps always apparent

RABBIT ABUNDANCE SCORE	APPROXIMATE DENSITY (ADULT RABBITS/HECTARE)
0	0
1	0.5
2	1
3	2
4	5
5	10 or more

Detailed descriptions of other monitoring methods can be found in the books: Monitoring techniques for vertebrate pests: rabbits and Managing vertebrate pests: rabbits. These are available for download from www.pestsmart.org.au

Determining the extent of the problem

Measuring damage

Simple damage assessments can be used to identify a serious rabbit problem. These include:

- assessing if crops have been eaten out within 50 m from warrens
- distinct 'browse-lines' 50 cm above the ground on shrubs and foliage within reach of rabbits
- more invasive weeds
- scratching and soil disturbance.

Quantifying rabbit damage using other measures can be difficult, costly and time-consuming, and are generally not practical for many land managers. When assessing suspected rabbit damage to vegetation, crops or pastures, it is important to remember that other animals such as grasshoppers, hares and wallabies might cause similar damage.

Planning your approach

Best practice rabbit management is more than just controlling rabbits. It requires a structured and consistent strategic plan of action using the range of tools available to achieve long-term and cost-effective outcomes.

Generally, rabbit management in Australia aims to reduce the damage caused by rabbits by decreasing the population to a level where their impacts are minimal and numbers cannot quickly build up. As each situation is different, it is important to consider what type of rabbit management approach is appropriate. The four main options are:

1. Take no action

Although this option means there is no cost outlay for rabbit control, it is likely to result in higher costs in lost production and ongoing damage to the environment. However, it may be a viable option if the current damage is not significant enough to warrant control, or where actions are not likely to be cost-effective.

2. Reactive management

Responding to a rabbit infestation when numbers are high and damage is obvious or unacceptable is likely to result in high costs for minimal, short-term benefits. Control applied at this time is likely to be less effective and more temporary than control when rabbit numbers are low.

3. Adaptive management (planned, ongoing, refined control)

This option is likely to produce positive, long-term outcomes and maximum benefits, as control is applied when rabbit populations are small and most vulnerable (for example during the hot, dry season). Initial costs may be high (including equipment, labour), and an ongoing commitment is necessary to keep rabbit numbers low.

4. Local eradication

A broadscale, coordinated approach to remove all rabbits from an area is a feasible, long-term management option if there is a concerted effort between neighbouring stakeholders. However effective landscape-scale control is only possible if all rabbit-prone areas are treated. Costs may be high initially, but ongoing and future costs are substantially reduced. Participating landholders need to monitor the area over time to ensure there is no reinvasion, however benefits are high given that no further action should be necessary.

Repetitive poisoning year after year is not effective for landscape-scale rabbit control

Why adaptive management?

In most cases, the best strategy is to develop an adaptive step-by-step plan, evaluate and modify. This approach maximises the effect of control efforts and usually reduces the detrimental effects of rabbits in the most cost- and time-effective way.

The adaptive management process — reflected in the structure of this guide — is :

- defining the problem
- developing a plan of action with achievable and measureable goals (eg set timeframe)
- putting the plan into action
- monitoring progress
- evaluating the plan
- making adjustments and improvements as required along the way.

Developing your plan

As a general rule, you will need to consider the following aspects to develop your management plan:

- How you will work with ecology and behaviour
- How you will work with other people, for example your neighbours and local government
- What your objectives are and how you will judge success
- Which laws and policies apply to your situation
- Resources, including time and money.

This overarching plan will help you choose which control tools are most appropriate to your objectives and your situation and help you monitor and evaluate.

Working with ecology and behaviour and other pest control

Rabbit management should not be an isolated activity. Rabbits share complex relationships with other animals and plants (both native and introduced), so rabbit control should be just one aspect of the overall management of production and natural resource systems.

Other herbivores, including feral goats and kangaroos, can contribute to overgrazing and land degradation problems. It is necessary to determine the impact of each herbivore so that appropriate action can be taken in conjunction with rabbit control. It can be useful to plan rabbit control in conjunction with other pest control activities. As rabbits are a major food source for foxes, feral cats and other predators, controlling rabbits without also controlling the (pest) predators might lead to an increase in native animal predation. When rabbit numbers are low, fox numbers are also generally low.

Consider the whole system when planning your rabbit control program, as this can increase the effectiveness of control, and lead to better production and conservation outcomes.

Working with people and organisations

Successfully controlling rabbit depends on a high level of cooperation between landholders, community groups, local and federal government, and state and territory conservation and pest management agencies.

Rabbits do not respect tenure boundaries such as fences, borders or land uses. This means that results (and costs) for managing rabbits in one area are likely to be affected by the actions or inaction of people in surrounding areas.

Working together ensures that all stakeholders have input and buy-in. Costs and effort can be shared; this typically means a little bit of work from a lot of people, rather than a lot of work from a few people.

Working across time and space

Reducing rabbit numbers is best achieved when management activities and direct controls are applied across broad areas at the same time. Monitoring on a regular basis and being ready to implement controls may also result in better outcomes.

Working with the law

Feral rabbits are listed as a key threatening process under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and many state/territory laws. One example is in the Biodiversity Conservation Act 2016 in New South Wales. Laws are in place in all Australian states and territories that require landowners to take reasonable actions to control rabbits on their land. 'Control' is defined as taking action to minimise the species' impact and limit its spread.

There are also various guidelines, codes of practice, and standard operating procedures for managing rabbits. These may be implemented or driven at the local level.

Violation of laws related to rabbit management can attract serious penalties (for example fines and jail time) for individuals and agencies. You need to check the latest national and state/territory laws, regulations and policies.

Other laws/policy relate to:

- land tenure, for example the treatment of rabbits may be different in national parks versus agricultural areas
- obligations of land owners
- animal welfare (for both rabbits and native, livestock and pet animals)
- control techniques, for example specific legislation dealing with the use of poisons, firearms, and traps
- keeping, sale, and movement of feral rabbits

You should also be aware of the Threat abatement plan for competition and land degradation by rabbits (Australian Gove 2016). This plan lists over 300 EPBC Act listed threatened species (under EPBC Act) and nine ecological communities impacted by rabbits. The plan also provides a framework to make the best possible use of the resources available for wild rabbit management.

Refer to your state/territory agency and the PestSmart website.

Ranger monitoring tree damage.
Image: Brian Cooke

Trapped rabbit
Image: Karen Joynes

MANAGE

Choosing the right control tools

Rabbit control needs to be appropriate for the number of rabbits, the level of damage, and the size and location of the affected area. Each control method has its advantages and disadvantages. Some techniques should only be used as the last remaining option while others may not be practical for every situation. Some control methods may not be permissible in your area.

Important factors to consider when choosing control methods are: humaneness (see figure), cost-effectiveness, efficacy, skills and equipment available, time of year (including the rabbit breeding season and high rainfall periods). Climate, terrain and land use (for example agricultural production, endangered ecological community) may also influence the type of control used. It is important to use local knowledge and seek advice from local pest control authorities when deciding on the best techniques to use.

The most effective approach uses a combination of control techniques applied in a strategic manner

European rabbit
Image: Kevin Solomon

Descriptions of control tools and equipment needed

Toxicants

Toxicants (poison) baits are made by mixing bait material (chopped carrot, oat grains or pellets) with poison. Baits are laid along a trail or spread through rabbit-infested areas. Commonly used poisons include sodium monofluoroacetate (compound 1080) and pindone

1080 dyed carrot rabbit bait contrast with undyed. Image by David Croft

Equipment

To undertake broad-scale baiting with either 1080 or Pindone, you will need access to a bait layer. The bait layer has two functions. Firstly, it creates a furrow by turning over soil. This turned soil attracts the rabbits to the bait trail. Secondly, the bait layer scatters small amounts of bait across the bait trail allowing more rabbits to access the bait. You will also need protective equipment (for example gloves). Refer to the labels on the bait.

You need to pre-feed

Pre-feeding (feeding with un-poisoned carrot or oats) allows you to gauge how much bait you need for the poison program, whether you have non-target

animals visiting and taking the feed and gives the rabbits the opportunity to discover the bait trail. When undertaking a poison program you want as many rabbits as possible to take the bait.

Warren ripping and habitat removal

Warren ripping is the total destruction of rabbit warrens using tools, heavy machinery or explosives. Remove above-ground surface shelter nearby, such as logs, weeds — especially blackberries — and disused building materials.

Equipment

If using bulldozers and excavators, tines should be at least 600mm in length and no more than 500mm apart to ensure complete destruction of the warren. To ensure your tines are deep enough or your excavator is digging deep enough, it is recommended that you dig a trench to understand the warren system in your area. Warrens can be as shallow as 300 mm or as deep as 2600 mm, so digging a trench will help you determine the type of equipment required.

There are a number of ways to rip a warren and this may depend on the type of equipment you are using.

Regardless of the approach, the entire warren system needs to be destroyed. To achieve this, ripping should extend at least 4 m beyond the outermost entrance as tunnels within the warren can extend out beyond the entrance. Cross-ripping is also recommended. This is where you rip at right-angles across the ripped warren. This will help ensure complete destruction of the warren complex.

Once you have completed ripping the warren it is important to smooth over or back-blade the ripped warren. This reduces the opportunity for rabbits to dig back in under furrows and raised edges.

A combination of these tools is essential for effective rabbit control, as no single technique will provide adequate long-term results

Note that each State/Territory has its own restrictions around the removal of vegetation, earthworks near waterways and activities that may affect cultural heritage values. Please be aware of the requirements in your area before undertaking any ripping or harbour removal program.

Reminder: Dial before you Dig on 1100.

Warren ripping

Exclusion fencing

Rabbit-proof fencing involves installing a full physical barrier to protect what is inside. Pay attention to design. For example:

- Fencing to keep out rabbits must be made of wire (plastic can be eaten through)
- Mesh size is typically 40 mm or less and at least 900 mm high (rabbits can jump over 500 mm fences)
- It should be impenetrable from underneath; sometimes aprons are installed but on sandy soils this may not be enough.
- Corners of less than 120 degrees aid animals such as cats, foxes, rabbits and rock wallabies, that are able to brace against, or jump between, adjacent fence panels.
- Gates, waterway crossings and the seaward ends of fences are often weak points that are exploited by feral animals.
- Electrification may be useful.
- It is possible to install (combined) fox, cat and rabbit exclusion fences.

Exclusion fending between native bush remnant and canola crop in Western Australia

Given the limited experimental testing of exclusion fences that has been undertaken in Australia, it is not possible to provide an assessment of the relative effectiveness of the existing fence designs.

Central West Senior Biosecurity Officer Rhett Robinson spreads carrots laced with RHDV K5.

RHDV vial
Image: John Kovaliski

Biological control

Biological control is the deliberate use of one organism (for example a virus, predator) to regulate the population size of a pest organism. Although there are introduced (foxes, cats) and native (eagles) rabbit predators, these animals can cause additional problems in the landscape, and the level of predation is generally not enough to control rabbit numbers (except where rabbits occur at low densities).

Currently there are two biological control agents in the Australian rabbit population: myxoma virus (which causes myxomatosis) and rabbit haemorrhagic disease virus (RHDV, previously known as Calicivirus). These viruses were introduced in past decades and now occur naturally in many wild rabbit populations. Myxoma virus is no longer produced commercially. RHDV is the current biological control and can be deliberately released in some areas (subject to state and territory legislation). RHDV is one of the more humane methods of controlling wild rabbits. Rabbits experience 'cold-like' symptoms, raised body temperature after 24 hours and the animal may exhibit signs of lethargy. In the majority of animals, no symptoms are observed. After the onset of fever, death occurs within 6–12 hours in 70–90% of cases. The overall welfare impact prior to death has been assessed as low using the relative humaneness model developed under the Australian Animal Welfare Strategy.

Shooting, trapping and ferreting

These techniques require a high-skill level and may be useful when rabbit numbers are already low or in situations where other techniques cannot be used. However they are labour-intensive and generally not an effective way of controlling rabbit populations. For more specific information on trapping visit our website.

Fumigation

Fumigation involves the use of toxic gas which is either forced into a rabbit warren under pressure (pressure fumigation) or generated inside the warren and left to diffuse throughout the burrow (diffusion fumigation), leading to the death of rabbits inside the warren.

Equipment needed:

- Suitable respirator for working with toxic gas
- Aluminium phosphide tablets
- Poly pipe
- Water
- Shovel
- Newspaper
- Long rubber gloves
- Overalls
- Warren smoker (where available)

Aversion techniques

There are a range of tools and devices available that are designed to deter rabbits from a small area (eg ornamental garden or vegetable patch). These typically include liquid spray repellents, specialised sounding alarms or flashing lights.

Cage trap
Image: Brian Lukins

Appropriate safety gear must be worn when handling chemicals, such as Phostoxin tablets when fumigating rabbit warrens

Other factors to consider when using biological control are extreme climates or weather events, and the presence of juvenile rabbits, who are less susceptible to virus.

The most effective approach uses a combination of control techniques applied in a strategic manner

Control technique	When to use	Benefits	Precautions
1080 baiting	• late summer during the non-breeding season • when there is little other feed available	• most cost-effective control method • large areas are treated quickly • can be applied on-ground or from the air • many native animals have a high tolerance of 1080	• no effective antidote • humans, livestock, pets (cats/dogs), native animals can be at risk • restrictions on its use (eg cannot be used in built-up areas or close to dwellings) • approval process varies across states/territories • specific skills/qualifications needed eg current 1080 handling certificate • uneaten baits need to be buried • loses toxicity on exposure to rain • dry weather required • needs to be followed up with other methods
Pindone baiting	• late summer during the non-breeding season • before seeding, planting or regeneration activities • when alternative feed is least available	• moderate cost • less hazardous to domestic animals because antidote is available	• must not be used in presence of some native animals (toxic to kangaroos, birds of prey and bandicoots) • only useful in built-up areas close to dwellings • relatively expensive compared to 1080
RHDV suspension	• during autumn when fewer young rabbits are present (to maximise results)	• works well in low rainfall areas • target specific • can be used in urban areas or where the virus has not spread naturally • best used in areas where it will be supported by other control methods	• variable effectiveness • cannot be used in extreme weather or when juvenile rabbits are present • needs large rabbit numbers for it to successfully spread • must be followed up with another control method to be effective • only authorised persons can prepare and use RHDV on bait (contact local pest authorities for more information)

Rabbit. Image: Rebecca Zanker.

Rabbit warren. Image: John Borg

Control technique	When to use	Benefits	Precautions
Warren ripping	• summer for sandy soils • winter for clay soils • before planting/ seeding • after initial reduction from poisoning or disease • after breeding when young are dispersing (Sept - Oct)	• cost-effective and long-lasting control • can be carried out by a contractor • minimal ongoing control required after ripping	• appropriate equipment is needed: usually heavy machinery with multiple ripping tines and appropriate track type for terrain • skilled operator required • labour-intensive: need to map warrens before ripping • high initial cost • need to take care not to damage sensitive areas or promote erosion
Explosives (warren blasting)		• long term control • can destroy deep warrens effectively • useful for warrens among rocks and boulders or hard-to-access areas	• operators must be trained and licensed • relatively expensive, compared to ripping • labour intensive
Harbour destruction/ removal		• best used in areas where it will be supported by other control methods	• labour intensive • may not be practical or feasible to remove all harbour
Exclusion fencing		• humane alternative • can provide long-term protection for crops, pastures, and native bush remnants by completely preventing rabbits from entering the protected area • good for small areas or high value crop/ pastures eg market garden • excludes rabbits from a certain area	• expensive (materials plus labour costs) • costs vary with terrain/soil type/size of area • must be built to a minimum standard • fence requires regular maintenance • can prevent movement of other animals • rabbits need to be removed from within fenced area using other techniques • does not reduce rabbit numbers • impractical for broadscale application

Control technique	When to use	Benefits	Precautions
Fumigation **1) pressure fumigation (gases generated outside and pumped into the warren)** **2) diffusion fumigation (gases generated and diffused inside the warren)**	• during breeding season • after poisoning or warren ripping • when the soil is damp	• good option in sensitive areas • can be carried out by a contractor • useful in areas where ripping is not practical • can be used near urban areas • relatively target-specific • dogs can be used to drive rabbits into their warrens • most effective as a follow-up technique	• skilled operator required (eg current chemical handling certificate) • must strictly follow poison label and take safety precautions (eg do not touch tablets with bare hands, avoid breathing the fumes, work upwind of gas) • labour intensive • expensive • only small areas treated at a time • some animal welfare concerns • does not stop remaining rabbits reopening warrens
Shooting		• humane and target-specific if used correctly	• should only be used as a follow-up technique • can only be used over limited areas • does not give long term control
Trapping		• can be used as a follow-up technique • non-target animals can be released • can be effective in small, targeted areas where other techniques are not practical or permitted (eg vegie patch, ornamental garden)	• skill required • risk of catching non-target animals • not cost-effective • not effective for reducing rabbit numbers • must meet animal welfare and ethics standards (eg steel jaw traps are illegal in most states)

Have you found a dead rabbit?

Visit **RabbitScan** to report and submit a sample.

IMPROVE

Monitoring and evaluation

Monitor progress of your rabbit control program regularly. At the end of the year/season, evaluate and decide if you need to adapt your plan.

Have costs and conditions (for example, financial, environmental) changed?

Were your goals met in a suitable timeframe? If not, you might need to modify the approach or seek further assistance from your local pest management authorities.

Remember: Regular monitoring of rabbit numbers is crucial to ensure the population does not build up again. Control is not effective if you have to keep putting in significant effort to reduce rabbit numbers to manageable levels. as the situation changes on your property and in surrounding areas.

To get help evaluating your plan contact your local biosecurity officer or land management authority.

For further information on rabbit control resources, information and references visit Pestsmart.org.au/toolkits/European-rabbits

Policies and legislation

Successful rabbit control depends on a high level of cooperation between landholders, community groups, local and federal government, and state and territory conservation and pest management agencies. Rabbit legislation is important in allowing state and federal governments to facilitate integrated management of the rabbit problem.

Competition with native animal species and land degradation by feral rabbits are listed as a key threatening process under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The Australian Government has also developed the Threat Abatement Plan for Competition and Land Degradation by Feral Rabbits (TAP). This plan lists 156 threatened species that may be adversely affected by rabbits and provides a framework to make the best possible use of the resources available for wild rabbit management.

Laws are in place in all Australian states and territories that require landowners to take reasonable actions to control rabbits on their land. 'Control' is defined as taking action to minimise the species' impact and limit its spread. It is important to check with the relevant authorities before proceeding with rabbit control measures, as the legislation governing rabbit management and the use of chemicals, poisons or firearms varies between states and can change when Acts are amended.

References and useful resources

A range of useful resources are available on the PestSmart website including Standard Operating Procedures, videos, factsheets and information about latest research.

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