

Rabbits

Rabbits (*Oryctolagus cuniculus*) have once again become a major pest of British agriculture. Serious losses of crops as a result of rabbit damage are being reported. Over the country as a whole, rabbit numbers are at about 35-40% of their pre-myxomatosis levels, and are increasing at about 2% annually. However, much higher numbers can occur locally, in suitable habitats. This continuing increase is due to a number of factors, particularly the reduced effect of myxomatosis.

The need for financial inputs and optimum timing is accepted for the control of other crop pests and diseases, and rabbit control should be regarded in the same way. It is a false economy to invest in pesticides for crop protection, whilst tolerating damage to the crop by rabbits.

Occupiers have certain statutory obligations regarding rabbits that are harbouring on their land. They have a legal responsibility to control infestations and prevent them from causing damage to neighbours' crops.

Damage

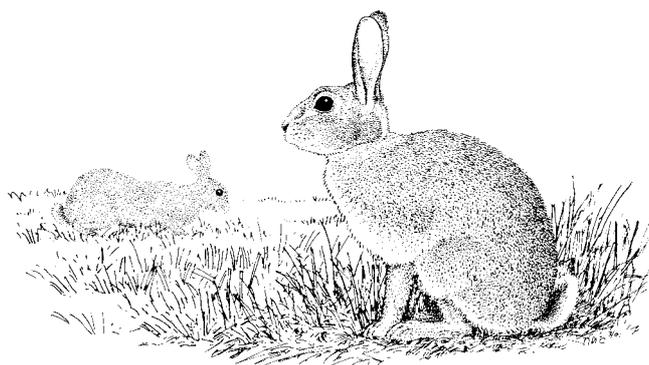
Cereals

It is estimated that farmers are losing about £40 million per annum as a consequence of rabbit damage. Trials to assess more precisely the effects of rabbit grazing throughout the year, on the yield of winter cereals, have indicated losses of about 1% per rabbit per ha. The effects of grazing were most obvious during the winter when plant growth was slow, and became less apparent when the crop grew away in the spring. In fact, by harvest, plants grazed even by 20 rabbits per ha were the same height as plants which had never been grazed. Yields, however, were reduced by about 20%. These results clearly illustrate not only the scale of the problem but also the difficulties in accurately assessing the impact of grazing.

Grassland

The effect of rabbit grazing on pasture is less obvious than on cereals. Grazing of newly sown grassland may result in poor establishment or complete failure. Over-winter grazing of established grassland reduces early grass that is needed in the spring. Yields of crops cut later for silage or hay may also be substantially reduced. Continuous grazing soon reduces the vigour of species such as Italian ryegrass or meadow fescue. Permanent grass on good soils is better able to withstand close defoliation, but grazing by large numbers of rabbits will weaken or kill even persistent

leafy ryegrass. Scratching and burrowing encourages the establishment of weeds such as nettles, thistles and ragwort, degrading the pasture still further.



Other crops

Rabbits feed primarily on grassland or cereals but they will take a wide range of other crops. Roots, brassicas and market garden crops can suffer severe damage, both to the growing plants and the marketable end product.

Trees

Rabbits can damage or kill planted nursery stock and young trees of many species. They may eat young seedlings, cut off leading shoots, browse branches, and remove sufficient bark to check or kill trees. Damage to the bark of large trees can also be serious. Rabbits may attack both semi-mature hedgerows and woodland trees, and can undermine roots by burrowing. They may also prevent natural regeneration in woodlands.

Management

Rabbit populations can withstand high mortality from natural causes, so control efforts by man must add to these, not merely replace them, if direct control is to be effective.

Because of the size of the effort required, and the rabbit's inherent capacity for population increase, complete eradication is impractical. Instead, the aim should be to reduce rabbit numbers to levels at which damage is economically acceptable. Where access can be gained to burrows, gassing, accompanied by careful habitat management to reduce rabbit harbourage if necessary, is the most effective method of control. In some situations, other techniques may be appropriate.

The most effective time for control is from November to March, although earlier action may be needed on autumn cereals showing signs of heavy grazing.

There are four main reasons for this recommendation:

1. Mortality from natural causes will have reduced rabbit numbers to their lowest level by the winter. Up to 90 per cent of young rabbits born during the summer will have died by this time without intervention by man.
2. Action at this time will reduce the adult breeding population before the next breeding season begins. Each doe killed during this period can mean at least 20 fewer young rabbits born next summer.
3. Reduction of numbers during this period will reduce damage to vulnerable autumn sown crops.
4. Vegetation is dying back, making access to burrows easier, a pre-requisite for gassing operations.

More effective results will be achieved if adjoining land is treated at the same time in a co-operative exercise. Rabbits do not respect boundaries, and joint action will remove animals that use burrows on one holding and feed on another. Control over a substantial block of land will also reduce the rate of re-infestation.

Scrub and ground cover may need to be thinned sufficiently to give access to all burrows; this is essential where gassing is planned. Where practicable, burrow systems should be destroyed following control operations. Appropriate measures

should be taken to minimise damage to other wildlife and habitats. For example, scrub clearance should be avoided during the bird-nesting season.

Legal considerations

Under the Wild Mammals (Protection) Act 1996, it is an offence intentionally to inflict unnecessary suffering as specified by the Act on any wild mammal. This legislation may need to be considered where the destruction of occupied warrens and burrow systems is being contemplated.

An Order has been made under Section One of the Pests Act 1954 by which England and Wales (except for the City of London, the Isles of Scilly and Skokholm Island) have been declared a Rabbit Clearance Area. In this area, every occupier of land is responsible for destroying wild rabbits on his land. Where it is not reasonably practical to destroy them, occupiers must take steps to prevent damage. The Department has powers to require rabbit control to be carried out; if this is not done, he may arrange for the necessary work to be undertaken at the expense of the occupier, who could also be liable to a fine.

The Ground Game Act 1880 gives every occupier of land a limited right to kill and take rabbits and hares concurrently with the right of any other person entitled to do so on the same land. An occupier may use any legal method to kill rabbits, such as gassing, trapping, ferreting, shooting, snaring, netting, and, with the exception of shooting, he may authorise other persons to assist him. The Ground Game Act exempts an occupier, and persons authorised by him to kill rabbits, from the need to hold a game licence.

Control methods: Gassing

Correctly used under the right conditions, gassing can reduce the rabbit population by up to 80%. It is essential that rabbits lying out be driven to ground before warrens are gassed. Particular attention should be paid to the possible presence of badger setts or fox earths. It is illegal to gas badgers or foxes so burrows in or around setts and earths must not be treated. The impact on other wildlife living in burrows, for example adders, may also need to be considered.

A fumigant based on sodium cyanide is available. The commercial formulation, Cymag (Sorex Ltd) gives off hydrogen cyanide gas on contact with moist air or soil. The powder can be blown into burrows by power or

hand pump, or placed inside the entrance with a spoon.

A number of materials containing metallic phosphides, which generate phosphine gas on contact with moisture, are also available. These are either in tablet or pellet form.

Fumigants must be approved under the Control of Pesticides Regulations 1986 and must be used according to label instructions.

Gassing should be undertaken by two trained persons and must not be carried out in wet or windy conditions. Fumigants can be lethal to humans and it is essential that users follow the instructions on safety aspects. Users must carry out an assessment as required by the Control of Substances Hazardous to Health Regulations 1999. Guidance on this aspect is provided in Agriculture Information Sheet No 22 available free from the HSE. The choice of formulation should take account of considerations such as operator safety requirements and site conditions.

Use of cyanide

Power gassing

The gassing powder is blown directly around the warren system via a petrol engine applicator to which the tin of powder has been attached. The pipe from the machine is inserted into a burrow entrance on the upwind side of the warren and sealed around with earth. When powder is seen to emerge from other holes, pumping is stopped and these holes carefully blocked with turf or soil. No hole should be blocked until powder is seen to emerge from it. To achieve this it may be necessary to introduce the pipe into several holes within the system.

Hand-pump gassing

The method is the same as for power gassing, except that the pump container must be filled with powder before use and unused powder replaced in the manufacturer's tin. Great care should be taken to avoid spilling powder and this operation must not be undertaken in a confined space or under windy conditions.

Spoon gassing

Using a tablespoon attached to a stick, 30g (1oz) of powder is carefully placed about 300mm (12") down each hole. The entrance is then sealed with turf

placed grass side downwards, ensuring that the powder is not covered with earth.

A lethal concentration of gas builds up along the first 0.6-1m (23-39") of the burrow tunnel and lasts for about 24 hours. Rabbits entering this zone are overcome as they attempt to dig out. Spoon gassing is not usually suitable for burrows in stony or other very porous soils.

Use of phosphine

The basic technique for applying these materials is similar to that used for spoon gassing with Cymag. Due to the toxic nature of this compound, it is important that operators comply with the directions for use and safety precautions.

Phostoxin is formulated as a 3-gram tablet. Phostoxin tablets are spherical and can be introduced into the burrow entrance either by hand with the operator wearing synthetic rubber or PVC gloves, or via an applicator that is available from Rentokil.

The other currently available formulation is Talunex. This consists of a 0.6-gram pellet that must be used in conjunction with a Topex applicator that is specifically designed for use with this product.

Each burrow must be treated and following application, the entrance is blocked with turf to ensure an effective seal; this, in the presence of moisture, will permit a build up of phosphine gas within the tunnel.

Follow-up action

The effectiveness of all gassing treatments should be checked by inspecting for signs of fresh activity. In many situations, a follow-up treatment of reopened holes will be necessary about one week after the initial treatment.

Control methods: Fencing

Traditionally, permanent wire netting fences have been used where the nature of the rabbit harbourage makes other techniques impractical, or when complete exclusion is the aim. However, in many situations, fencing can be a more cost-effective damage prevention measure than control methods that have to be undertaken year after year. Permanent wire netting is now only eligible for grant aid if installed to protect trees or shrubs as part of one of the agri-environment schemes. More recently, temporary electric fences, which use either netting or multi-strand wire systems, have become a popular method of crop

protection. These can be as effective as traditional wire netting fencing, cost less to purchase and erect, and are portable. However, maintenance costs are higher.

Wire-netting

The netting should have a mesh of not more than 31mm (1¼"), a wire thickness of 18 gauge and a width of not less than 900mm (3'). The bottom 150mm (6") of the netting is turned at right angles towards the rabbit harbourage and held down by turves or pegs. Grass will grow through, fixing the netting to the ground. The fence is supported by end posts 2.0m (6' 6") x 100mm (4"), which are braced by struts 2.0m (6' 6") x 80mm (3"), and by intermediate stakes 1.8m (5' 11") x 80mm (3"). Straining wire can either be 2.65mm (1/8") high tensile spring steel or 4.0mm (¼") mild steel, the more traditional material. Unlike mild steel, spring steel has elastic properties and so does not stretch and slacken with seasonal temperature changes. The intermediate stakes can thus be up to 15m (48' 9") apart whereas with mild steel, stakes should be no more than 4m (13') apart to prevent excessive slackening. Fences erected with spring steel are cheaper than those erected with mild steel.

Local site conditions or other considerations may demand a variation to these specifications. It is recommended that these should be discussed with the Wildlife Management Team technical staff before being adopted.

In young farm woodlands it is especially important to prevent invasion by rabbits. Recent research has indicated that 1050mm (3' 6") wide wire netting erected as above, but with the top 150mm (6") projecting outwards at 45° towards the harbourage is very effective at excluding rabbits.

The number of gates in a fence should be kept to a minimum because they make maintenance more difficult. They should be hung on supports which are independent of fence straining posts, as the latter will inevitably move and so affect the hang of the gates. A wooden sill must be dug into the ground to prevent burrowing underneath, and gates should shut against a post. Badger gates should be installed in the netting if the fence crosses any badger tracks or paths. An advisory leaflet, describing the design and installation of badger gates in rabbit-proof fencing (WM11) is available from Defra (see under 'Further Information'). Regular monthly inspections and maintenance of

fences are essential, and they should be kept free from vegetation.

Electrified fences

Several types of electrified netting fences are commercially available. They consist of a mesh made of heavy-duty polythene twine in which the horizontal strands are interwoven with electrically conductive stainless steel wire. To prevent shorting to ground, the steel wires are omitted from the bottom strand. They are between 0.5-0.75m (1' 8"-2' 5") high and are supplied in 25m (82') or 50m (164') rolls in which the fence posts are already fitted. They have been shown to be as effective as wire-netting fences.

An electrified strained wire fence is also available. This consists of seven wires, of which six are live, with the lowest earthed. The earthed wire is 50mm (2") above the ground, the following five are at 50mm (2") intervals, and the top wire is 100mm (4") above the strand below. The fence is therefore 400mm (1' 4") high.

A strip of ground 450-600mm (1'6"- 2') wide along the fence line should be sprayed with herbicide to prevent shorting of the fence by growing vegetation. Initially, fences should be inspected every few days but this can then be extended to 2-3 week intervals. Energisers capable of producing a minimum output of 1.5 Joules should be used. It is important to maintain a minimum of 2.5kV throughout the fenceline. Most mains-operated energisers and the more powerful battery powered units have this capability. A wide range of energisers is available, and users are advised to discuss specific requirements with their supplier. Batteries should be changed regularly (a fully charged 70Ah battery will need to be changed every 2-3 weeks).

A more detailed advisory leaflet on the use of fencing (WM16) is available from Defra (see under 'Further Information').

Other methods of control

Shooting

The Ground Game Act 1880 gives an occupier the right to shoot rabbits on his land during the day and to authorise in writing one other person to do so. The person must be a member of the occupier's household or staff or be employed for reward. An occupier may apply to the Department for authority to use a reasonable number of extra guns, if the owner of the

shooting rights will neither permit the occupier to bring on extra guns, nor undertake to destroy the rabbits himself. Under the Ground Game Act as amended by the Wildlife and Countryside Act 1981, the following are allowed to shoot at night:

- An owner-occupier with shooting rights
- A landlord who has reserved his shooting rights
- A shooting tenant not in occupation who has derived his shooting rights from the owner.
- An occupier or one other person authorised by him provided he has written authority from another person with shooting rights.

The Firearms Act 1968 requires any person possessing, purchasing or acquiring a shot gun to obtain a shot gun certificate from the police. A Firearms Certificate is required for rifle use.

Baited cage trapping

This method is more appropriate for protecting high value crops where manpower is available for frequent checking of traps. Any non-target species that are captured can be released unharmed. Also, the technique does not require access to the rabbit burrows. Traps should be checked twice a day, in early morning and late afternoon. Any captured rabbits must be humanely despatched.

A detailed advisory leaflet on the use of cage-trapping (WM17) is available from Defra (see under 'Further Information').

Drop box trapping

This method of catching rabbits is designed to be used in conjunction with wire mesh netting. A tunnel is either inserted into the fence line at right angles or placed parallel to the netting on the harbourage side of the barrier. Rabbits are caught when they enter the tunnel and fall through a hinged flap into a box that has been buried in the ground.

These traps should be visited at least once a day when set, preferably early in the mornings. Captured rabbits must be despatched humanely. Avoid placing traps where they may be at risk from flooding.

Spring trapping

Under the Pests Act 1954, only approved spring traps designed to catch and kill rabbits humanely may be used. Those currently approved by the Spring Traps Approval Order 1995 are the Imbra Trap Mark I and Mark II, Juby Trap, Fenn Rabbit Trap Mark I, Fenn

Vermin Trap Mark VI (Multi Purpose), Springer Mark VI (Dual Purpose), Victor Conibear 120-2 and the BMI Magnum 116.

All spring traps must be set in natural or artificial tunnels which are, in either case, suitable for the purpose.

The Protection of Animals Act 1911 requires that all traps set for the purpose of catching rabbits (or hares) should be visited at reasonable intervals and at least once every day between sunrise and sunset.

Most traps are set with the treadle plate flush with the burrow floor. The plate is concealed by covering it lightly with soil and the trap is secured with a chain and peg. Stock and pets should be excluded from the area.

Snaring

Snares are made from 6 or 8 stranded brass wires running freely through an "eye" made in one end of the wire. A loop of 100mm (4") diameter is held about 90mm (3") above the ground with a short notched stick (the "pricker" or "teeler"). The free end of the wire is securely tethered with a strong rot proof cord to a peg which is long enough to be driven firmly into the ground thus preventing a snared rabbit from escaping. Snares should be set on well used rabbit runs in grass and should be placed in the middle or in front of the mark left by the fore-feet. Snares with a 'stop' or knot about 140mm (5") from the eye can be used. The 'stop' prevents the loop from closing fully so tethering a rabbit, but in this type of snare it may struggle and could break the cord.

The Wildlife and Countryside Act 1981 prohibits the use of self-locking snares and requires legal snares to be visited daily. Care is needed in their siting since the law requires that all reasonable precautions be taken to avoid catching protected species such as the badger. It is recommended that they are inspected at dawn and dusk, and that they are not set where livestock are present or if there is a risk to domestic pets.

Ferretting

This involves introducing ferrets into the burrow system and catching the rabbits in nets, or shooting them as they bolt from tunnel entrances. The method is time consuming and, when used in isolation, is unlikely to produce effective control of rabbit infestations.

Tree-guards

Where it is impractical or uneconomic to protect young trees by fencing, individual tree guards can be used.

There are many types available including plastic or welded wire-mesh cylinders which are supported on stakes, split plastic tubes or spiral plastic sleeves which fit closely around the trunk of the tree.

Plastic tree shelters, which are manufactured or made up into complete tubes or enclosures, are widely used to successfully protect young trees. Thin spiral guards may be displaced by wind or animals. Split plastic sleeves are suitable for use on standard trees.

Repellents

The use of repellents can be expensive, and generally, they do not provide long term protection from attack by rabbits.

Only repellents approved under the Control of Pesticides Regulations 1986 may be used. Users must comply fully with the label instructions.

Further information

In England, further advice on dealing with rabbit problems, as well as problems caused by other mammals and birds can be obtained by contacting the Department for Environment, Food and Rural Affairs (Defra) Wildlife Management Team at:

Address	Wildlife Administration Unit Defra, Burghill Road Westbury-on-Trym Bristol, BS10 6NJ
Telephone	0845 601 4523 (local rate)
E-mail	enquiries.southwest@defra.gsi.gov.uk

A range of leaflets on wildlife topics is available online at: www.defra.gov.uk/wildlife-countryside/vertebrates

The Forestry Commission produces a number of publications and these can be obtained from Publication Section, Forest Research Station, Alice Holt Lodge, Wrecclesham, Farnham, Surrey GU10 4LH (telephone 01420 23337).

This leaflet was produced by the Defra Rural Development Service (RDS) and the Central Science Laboratory (CSL).