



**Forestry Commission**

**Research Information Note 180**

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# **Grey Squirrel Damage Control with Warfarin**

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## Abstract

Control of bark-stripping damage to trees by grey squirrels is most effectively and economically achieved by poisoning squirrels with 0.02% warfarin dispensed by hoppers during the period April to

July each year. The deployment, siting and topping-up of hoppers, to achieve cost-effective control coupled with low risk to non-target wildlife, are described.

## Damage

Bark-stripping damage to trees by grey squirrels is a major concern to many forest managers and woodland owners. Damage normally occurs during the months of May, June and July and occasionally in August. All tree species can be attacked. Sycamore and beech are the most frequently and severely damaged. Oak, sweet chestnut and Scots pine are less frequently attacked and other species are only occasionally damaged. Generally fewer than 5% of damaged trees are killed. Pole-stage trees aged 10-40 years old are the most vulnerable. Trees younger than 10 years are not generally large enough to attract or support the weight of squirrels, although 5-10-year-old sycamore coppice may be, and the bark on the main stem of trees older than 40 years is too thick to be stripped.

Stripping can occur anywhere on the main stem from the base to 5 cm top diameter in the crown. When damage is confined to the base it is similar in appearance to rabbit damage.



1. Bark stripping damage on beech. (37274)

## Deployment of control

Tree protection can only be achieved by the annual control of squirrel numbers before and during the damage period (April to July). Killing squirrels at any other time of year will not reduce subsequent levels of damage. Control must be concentrated in and around the 10-40-year-old pole-stage vulnerable crops. It is important to locate areas which hold and maintain a high squirrel population, but in which

damage may not occur. These 'holding areas' are often the more mature mixed woods which may not be vulnerable, but nevertheless need effective control to protect adjacent pole-stage plantations. Control using baited hoppers in young damage-vulnerable crops alone can encourage squirrels into them thereby increasing the risk of damage.

## Control methods

Shooting with or without drey poking provides sport but is ineffective in controlling numbers sufficiently to have any impact on damage levels. Cage-trapping, spring-trapping and poisoning are the only recommended methods of control. Poisoning is the cheapest and most effective method.

The Control of Pesticides Regulations 1986 permit the use of warfarin as specified on the product label (reference number MAFF 06455).

The specifications include the bait, 0.02% warfarin on whole wheat, and the design and dimensions of the hopper that must be used.



2. Grey squirrel approaching baited hopper. (39321)

## The bait

The wheat/warfarin bait is available ready mixed but it is expensive. It is cheaper to obtain the approved warfarin liquid concentrate (MAFF/HSE Reference Book 500) available in 500 ml bottles, and mix it with locally obtained wheat. It is essential to mix the liquid thoroughly with the wheat: 12.5 kg of wheat should be placed in a clean drum or strong

polythene bag, then the liquid poured in and agitated vigorously until all the grains become evenly coloured red. Leave to dry for at least 12 hours and before use give a further shake to break up any lumps. Gloves should be worn at all times when mixing bait and filling hoppers.



## Siting hoppers

The success of the control operation depends on the ability to find sites for hoppers that squirrels will visit regularly to feed. The best sites are invariably under a large tree and where the ground is clear of vegetation. Yew and holly trees or a single conifer in a predominantly broadleaved wood will often make good hopper sites as do tree stumps that are regularly used by squirrels for feeding. The latter are identified by the presence of many stripped cones or the peeled outer skins of large broadleaved seeds. Sites near the edge of the forest and adjacent hedge-rows are usually also productive.

Hoppers should be spaced approximately 200 m apart and distributed throughout the control area at a density of one hopper to 1-5 ha.

The hopper should be placed at the base of the tree with the tunnel tilted slightly down to prevent surface water flowing down the tunnel into the bait. The entrance may either face into or away from the tree.

The hopper is then firmly secured with branch-wood or with one or two stakes. Ensure the stakes

do not prevent the lid from closing fully. The hopper should be held to the stake with either tying wire or bands made from a car tyre inner tube.

Branchwood, stone or turf can then be used to hide the hopper from the public gaze. An alternative is to dig the hopper into a bank. Occasionally hoppers will be persistently disturbed and their contents spilled by badgers, despite being well staked and secured. On these occasions first try to find another site, but if this is not possible the hopper must be placed approximately 1 m above ground either in the fork of a tree or on a table (although in this position they are difficult to hide).

Bark-stripping damage can occur on trees adjacent to the hopper site. Therefore avoid using sites near to chosen final crop trees.

Two or three handfuls of yellow whole maize are initially scattered around the hopper to attract squirrels to the site. Maize must never be treated with warfarin. If pheasants remove the maize the tunnel entrance can be extended approximately 150 mm with rabbit netting.

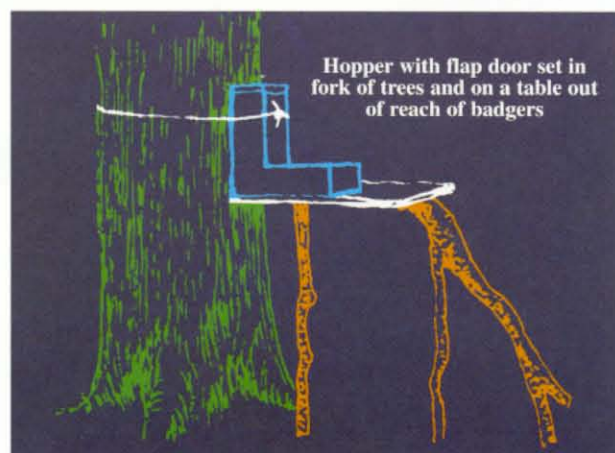
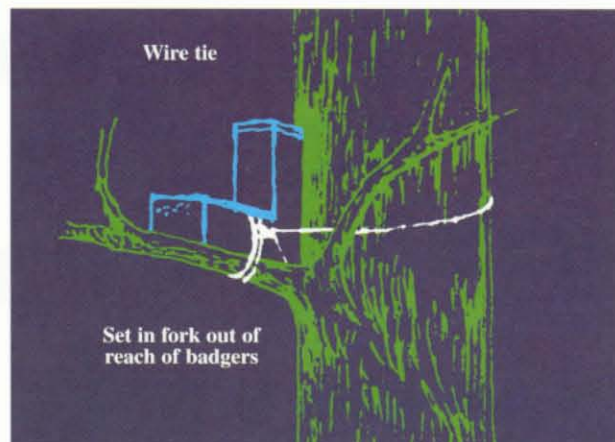
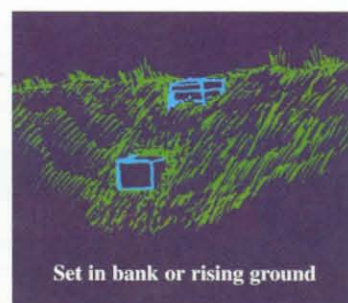
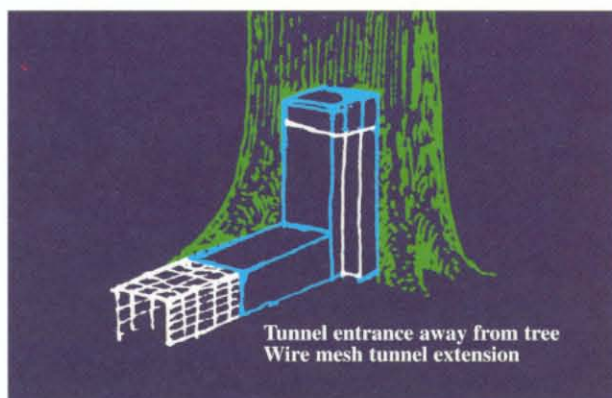


Figure 1: Positioning of hoppers at hopper sites.

Front Cover: Grey squirrel. (41526)



## Topping up

It is essential that a continuous supply of bait is available to the squirrels and the hoppers must not be allowed to become empty. Initially one visit a week is normally enough to keep then topped up. It is not unusual for 1.5-2 kg of bait to be taken in the first week. Therefore when squirrel numbers are high it is worth checking hoppers more frequently. After 2-3 weeks the take of bait will reduce and the hoppers need only be visited once every 2 weeks.

An enamel jug, or similar utensil, can be used as a scoop for topping up hoppers. Bait is easily spilt when pouring it from a large polythene bag into the relatively small opening of the bait container. After filling, close and secure the lid.

At each visit to a hopper it is necessary to check that moisture has not caused the wheat grains to

stick together and prevent the bait running freely from the container into the tunnel. A thin stick is used to check for and free any blockage, but it should be used with restraint to avoid pulling out too much bait into the tunnel. Any grain that has been soiled by moisture and is not in a suitable condition to be replaced in the hopper should be removed for safe disposal.

Spillage that is found or caused at any hopper should be cleared up at each visit.

Control should stop at the end of July or second week of August at the latest. Hoppers are best brought in at the end of the control period but if they are left *in situ* all poison must be removed, and either disposed of or stored in a secure place.

## Hopper modifications to protect non-target wildlife

The hopper specified by the Grey Squirrel (Warfarin) Order 1973 was designed to reduce the number and species of animals other than grey squirrels feeding from it. However, small mammals and birds can and do feed on the bait. Hoppers are now available with a flap door in the tunnel entrance which prevents access to small animals, including common dormice, without

inhibiting grey squirrels (see Research Information Note 232). Design details are given in Forestry Practice Advice Note 4. The amount of bait taken from these hoppers is reduced. Modification kits are available to convert old-style hoppers. The use of these hoppers is required in certain areas; check with the nearest Forestry Authority conservancy office.

## Co-operative control

The Forestry Commission will encourage and assist neighbouring woodland owners to form Grey Squirrel Control Groups to co-ordinate and concentrate their control effort. They will also

give advice and practical training courses. For further information contact your local Forest District Manager.

## Conclusion

The responsible use of warfarin is vital and every attempt must be made to prevent or reduce risk to other species. Hoppers with doors should be used as much as possible. Old style hoppers should never be

used in areas where dormice are present or when hoppers are situated above the ground.

Hoppers must not be used outside the recommended control period.

## Suppliers

### Hoppers

Alpe Thermo Products, 24 Willsbridge Hill, Willsbridge, Bristol, Avon BS15 6EY (Tel: 0117 9491175)

Males, Warners Lane, Selsey, West Sussex PO20 9EL (Tel: 01243 602231)

Long Meadow, Moochers Roost, Lower Wincombe Lane, Downhead St Mary, Shaftesbury, Dorset SP7 9DB (Tel: 01747 828357)

### Grey squirrel liquid concentrate and hoppers

PO Box 2, Denholm Drive, Ossett, West Yorkshire WF5 9NB (Tel: 01924 277641; Fax: 01924 264757)

### Whole wheat and whole maize

Local merchants.

## References

FORESTRY COMMISSION (1996). *Controlling grey squirrel damage to woodlands*. Forestry Practice Advice Note 4. Forestry Commission, Edinburgh.

*Grey Squirrel (Warfarin 1973) Order*, SI 744. HMSO, London.

MAFF/HSE (1996). *Pesticides 1996*. Reference Book 500. HMSO, London.

PEPPER, H.W and STOCKER, D. (1993). *Grey squirrel control using modified hoppers*. Forestry

Commission Research Information Note 232. Forestry Commission, Edinburgh.

ROWE, J.J. (1980). *Grey squirrel control*. Forestry Commission Leaflet 56. HMSO, London.

The use of grey squirrel liquid concentrate (MAFF approval 06455) is covered by *The Control of Pesticides Regulations 1986*.

*Wildlife and Countryside Act 1981*. HMSO, London.