Chapter 3

Alternatives to Snaring

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Contents

Introduction
Snare use in Scotland

The species targeted by snares
Red fox
European rabbit
Mountain hare
Brown hare

Alternative methods of fox control
Cage traps
Breakaway, cushioned snares
Habitat management
Deterrents: Novel disturbances
Deterrents: Shepherding
Deterrents: Exclusion Fencing
Deterrents: Novel methods
Shooting
Shooting at earths

The case for no fox control

Is the fox population increasing?

The costs and benefits of foxes

Alternative methods of controlling rabbits and hares

Rabbits
Deterrents: Habitat Management
Deterrents: Tree guards
Deterrents: Rabbit proof fencing
Drop traps  
Cage traps  
Gassing  
Ferreting  
Use of dogs  
Shooting  
Killing traps  

**Mountain hares**  
Cage traps  
Long netting  
Breakaway, cushioned snares  
Shooting  

**Brown Hares**  
Long netting  
Breakaway, cushioned snares  
Shooting  
Habitat management  
Deterrents: Tree guards  

**Summary of findings**  
Foxes  
Rabbits  
Hares  

**References**
Introduction

Wildlife trapping for control is deemed important by those who use it as part of their day to day activities, and while this has been acceptable in the past, a growing proportion of the public now view trapping activities with disdain. To protect the livelihoods of trap users it is important to address the ethical issues surrounding trapping, since these are the cause of widespread public objection. This chapter deals with alternative control methods to trapping with snares and aims to explore the impact to practitioners of banning snares in their current form and use.

An ideal animal control method should be target specific, effective, efficient and accessible to practitioners, and lessen the suffering of target animals. Although no one technique can meet all these objectives, we try to present a range of techniques that can be used individually and together to lessen the impacts on species that are currently snared. Control methods must also fall within Scottish legislation. Four lethal animal control methods, and deterrents and exclusion are legally used in Scotland. Although these methods are mostly used to reduce animal numbers and their perceived impacts, some species are also harvested for sport, meat and skins. Thus culling may be carried out by people suffering no losses who find sufficient interest in, or gain from culling. Further, whilst the general aim of culling strategies is to reduce numbers in order to reduce damage, there is no simple link between the abundance of a species and the damage it causes, and so population control is not necessarily the same as damage control (Macdonald et al. 2000).

Snare use in Scotland

The UK is one of only a small number of countries in the EU that still permits the use of snares: most others either ban these traps outright or place strict limitations on their use. Snares are most commonly used in Scotland for the capture of foxes, hares and rabbits; whilst in theory they can also be used to catch grey squirrels, mink and rats, these species are, at most, very rarely snared.

The primary users of snares are gamekeepers; approximately 81-86% of gamekeepers in the UK use snares (BASC 1995). Gamekeepers who avoid the use of snares do so primarily to avoid non-target captures of wildlife, livestock or domestic animals (DEFRA 2005). Snares are less commonly utilised by farmers. Although there are no records covering snare use by Scottish farmers, Heydon & Reynolds (2000) found that between 3 and 41% of farmers in three sampled regions of England and Wales used snares. The use of snares was dependent on region, farm size, and whether farms had game shooting interests, and we would expect the same patterns among Scottish farmers. Other snare users include a small number of private land owners and illegal practitioners.

Few others use snares in Scotland. Despite managing bird and wildlife conservation on large tracts of land, the Royal Society for the Protection of Birds (RSPB), Scottish National Heritage (SNH), Forestry Commission Scotland, Scottish Wildlife Trust, Woodland Trust, John Muir Trust, farmers that sign up to Freedom Food standards and all 32 Scottish Local Authorities do not use snares (Robertson 2008).
The species targeted by snares

Trapping is a species-specific activity, and in order to review alternatives to snaring it is important to consider appropriate species-specific techniques for control. In Scotland animals often regarded as pests and targets of snaring control measures include the red fox, European rabbit, mountain hares and the brown hare. In order to put control methods into context, a brief summary of the natural history of these species is given below.

The red fox: Foxes are snared for two main reasons. Firstly they are alleged to be a threat to livestock (mainly lambs and poultry), and secondly they are seen as a threat to game birds in shooting areas (Tapper et al. 1996; Moberly et al. 2004a). Red foxes are found throughout the British mainland and lack specific habitat requirements, though they are found at lower densities in moorland, mountains and sand dunes (Harris & Yalden 2008). Fox distribution throughout rural Scotland reflects a preference for lowland farmland and wooded areas (Webbon et al. 2004). Foxes eat a wide variety of food types, including insects, earthworms, plant material, birds and carrion; however most studies of foxes in rural environments have found that small mammals and rabbits are most important (Lever 1959; Lloyd 1980; Reynolds & Trapper 1995a; Webbon et al. 2006). The high predation levels on rabbits suggests that foxes could be a potential regulating factor, especially at low rabbit densities (Trout & Tittensor 1989; Banks 2000). Their impact on higher density rabbit populations is less clear.

Foxes breed once a year and litters averaging 4-5 cubs are born in March-April (Harris & Yalden 2008). Roughly 75% of foxes die in their first year, and thereafter mortality is approximately 50% in each adult year (Macdonald et al. 2000). People, traffic and disease are typically the largest causes of fox mortality.

European rabbit: The need to control rabbits has mainly arisen in the last 150 years, following changes in agricultural practices and increased predator control to protect game birds. Attitudes towards rabbits have fluctuated in the past; they have been viewed both as a valuable resource and a pest (Baker 2010). Estimates of annual agricultural damage in the UK due to rabbits varies from approximately £115 million to £820 million of agricultural damage per annum (Hansard 2003; Pimentel et al. 2001). The total cost of rabbit control activity is approximately £5 million per annum (Hansard 2003).

Rabbits are a highly adaptable species, but tend to prefer areas where soil is loose, well drained and easily dug, and secure areas in scrub adjacent to feeding grounds. While it thrives on most on dry pastures, rabbits may be expected wherever a blade of grass can grow (Gibb 1990). The most suitable habitats for rabbits are short grassland with secure refuge (burrows, boulders, hedgerows, scrub, woodland) in close proximity to feeding areas, and rarely occur above the tree line (Harris & Yalden 2008). Rabbits tend to be active during the evening and night, but in areas where they are undisturbed by humans they become more active during the day. They feed on a wide range of vegetation, including grasses, tree bark, crops, and herbs. They live in groups numbering between a single pair, up to 30 individuals, inside burrow systems known as 'warrens'. If there is sufficient cover they can also live above ground (Gibb 1990). Litters range in size from about three to nine young, with a mean of about four to six in mid-season, falling to three to four during off-peak periods. Rabbit density is primarily limited by plant production, but predation commonly prevents numbers building up to the carrying capacity of the land. Rabbit populations are
capable of sustaining intensive predation and control pressure because of their high reproductive rates (Gibb 1990).

**Mountain hare:** Mountain hares are harvested for tick control (50%), sport (40%) and forestry or crop protection (10%; Patton *et al.* 2010). Although widespread throughout Scotland, mountain hares are typically more numerous in central and eastern Scotland (Harris *et al.* 1995; Harris & Yalden 2008), with a strong association with mountainous heather moorland and bogs. The highest hare densities are found in heather moorland managed for red grouse (Watson *et al.* 1973). In Scotland mountain hares can produce three litters per annum, giving an annual production of five to six young. Short young heather forms a large part of their diet, but when available, grasses, herbs, and the bark of shrubs and trees are also eaten. Mountain hares are nocturnal but there is increased daylight activity in summer when nights are short, or in winter when food is scarce. They are social species and often gather to feed in the same place in groups of 20-100 (Flux & Aneermann 1990).

The red fox is an important predator of adult and juvenile mountain hares (Hewson 1991; Angerbjörn & Flux 1995). This was exemplified by the increase in mountain hare game bags in association with the sarcoptic mange outbreak among foxes in Sweden (Lindström *et al.* 1994) and Norway (Smedshaug *et al.* 1999) during the 1970s.

**The brown hare:** The brown hare *L. europaeus*, is the second of the two hare species that occur in Scotland. Brown hares are considered a minor pest by farmers and foresters, but are also a game species culled for meat and sport (Macdonald *et al.* 2000). Hares eat crops such as oilseed rape, turnip, grasses and cereals (Hewson 1977; Tapper & Barnes 1986). They will often browse and kill newly planted young trees and shrubs. In rare circumstances, when hares are at high density, damage can be of economic significance to individual growers.

The brown hare is an open landscape specialist that has been favoured by human clearing of forests and the spread of agriculture (Tapper 1987). They are associated with arable farms conducting mixed practices, especially those with wheat beet or fallow land (Vaughan *et al.* 2003). In Scotland they are absent from the northwest and western highlands (UK BAP 2001). Brown hares are mainly nocturnal, preferring to feed at night in open countryside with short vegetation. During the day brown hares lie up in small depressions or den in woodland. Breeding usually occurs between February and September, females typically give birth to around three litters each year of two to four young (Harris & Yalden 2008). The red fox is regarded as important predator of adult and juvenile mountain hares (Reynolds & Tapper 1995b).

**Alternative methods of fox control**

**Cage traps**

**Effectiveness:** In contrast to urban foxes, rural foxes are generally wary and difficult to catch in cage traps (Harris 1985; Macdonald 1987; Baker *et al.* 2001). The unfamiliarity of rural foxes to man-made structures and, in some areas, their experience of control are potential reasons for low capture success. However in circumstances where foxes are using human habitats, and more accustomed to human infrastructure, unfamiliarity will be of less
concern and cage traps will prove extremely effective (e.g. Baker et al. 2001). Application of cage trapping is most suitable at poultry runs, release pens, near barns, farms or houses.

Covering the trap with vegetation or a blanket so that it is shaded inside and sprinkling earth over the mesh floor help to make the trap less conspicuous (Shivik et al. 2005). Leaving an unset trap in-situ before commencing trapping can also help familiarise foxes with the device. Placing meat bait, fox urine and fox droppings within the trap encourage entry (Shivik et al. 2005). Within their boundaries of use, cage traps are effective, low maintenance and inexpensive. Captured foxes can be easily despatched with a firearm. Shots should be aimed to enter the brain, causing instant loss of consciousness.

**Welfare:** Foxes caught in cage traps can injure teeth and claws in efforts to escape, but the incidence of injuries is likely to be extremely low (DEFRA 2005). Such injuries can be minimised by having a small mesh to the trap, so that it is harder for the fox to chew. Several thousand foxes have been caught in cage traps in Bristol. Trapping incidents have been isolated to superficial rubbing of fur from the nose or forelegs when foxes have tried to dig out of the trap (S. Harris unpublished data). Compared with other forms of fox control, cage traps are humane. Regular inspection of traps, release of non-target species, and the quick and humane despatch of target animals minimise welfare concerns.

**Breakaway, cushioned snares**

**Effectiveness:** The Game and Wildlife Conservancy Trust (GWCT) has suggested that breakaway snares may provide an answer to some of the ethical issues surrounding current snare designs, and has been carrying out research to test the effectiveness of breakaway snares.

Breakaway snares were developed in North America circa 1970 to allow for the capture of coyotes and release of non-target captures such as deer (Roy et al. 2006). The breakaway device functions to break and release animals exerting a force greater than that required to hold the target species by creating a weak link in the snare (Philips 1990; Philips et al. 1996; Roy et al. 2006). The mechanism generally releases animals of larger size than the target species, as long as the effects of mass are not compensated for by behavioural or anatomical differences i.e. animals that are less inclined to struggle. The GWCT also suggested the incorporation of a cushioning spring to reduce injuries occurring from the sudden lunges of animals trying to break free. Cushioning has previously been employed by using small trees that bend when pulled as snare anchors (Roy et al. 2006); incorporating them into the snare is better as it provides more control over trap properties.

As with all traps, there are some areas of concern surrounding breakaway snares. There are always potential problems with size overlap between species entering snares, resulting in non-target captures and problems with smaller animals being unable to generate the force required for release (Philips 1990; Philips et al. 1996; Roy et al. 2006). Capture of non-target species can be overcome with expertise in setting traps according to the behaviour and habitat preferences of target species. However, in practice the large numbers of non-target species caught in conventional snares (SSPCA 2007), show that the expertise or practices of those using snares do not adequately prevent non-target capture. For instance, The Independent Working group on Snaring found that the proportion of non-target species caught and held in snares set for foxes was between 21-69% (DEFRA 2005). There is also a
danger that, if a snare is available that is said to release non-target animals, there could be a
tendency for people to be less selective in their choice of snare sites. Expertise is also
necessary to prevent entanglement of the snare preventing the release mechanism from
functioning. The post-capture behaviour of animals affects capture as some species struggle
less than others and may produce inadequate pulling forces for release. This is an issue for
larger non-target species that may suffer overly tight snares increasing the possibility of
tissue necrosis; having such animals escape from these snares would be a significant welfare
problem. Issues with smaller non-targets may be overcome by the snare cushioning device
suggested by the GWCT.

The results of the study testing breakaway cushioned snares by the GWCT will go through
peer review before being published in the near future. Preliminary tests of breakaway
snares indicated that capture efficiency was not compromised, and the simple nature of the
breakaway and spring devices suggests that they should be viable and limit the discomfort
of animals held in snares. Depending on the results of trials, the modified snare may have
the potential to provide a middle way where both pro- and anti-snaring parties are partially
satisfied. However this would depend on the way snares were distributed, the snares’ ability
to capture without injury, and a licensing system to ensure that practitioners had the
expertise necessary to snare with consistent care and proficiency. It is not known whether
other welfare problems, such as the stress and fear of the captured animal would be
reduced.

Welfare: All authors testing breakaway snaring devices have warned that injuries can occur
when the snares are poorly set, adding that effective use of snares is dependent on the
expertise of practitioners. Welfare issues may arise if the snare malfunctions, resulting in
the release mechanism or cushioned spring failing. If the snare is poorly set, animals may be
captured in the snare by a leg or nose and injuries are more likely, animals may also escape
with the snare attached with the possibility of extended suffering. Expertise in setting the
snare and checking the snare frequently is essential to minimise stress and discomfort.
Some concerns may be overcome by the implementation of legislation requiring that
breakaway snares can only be bought by those considered to be proficient in their use, and
that only tagged snares can be used, so that the person who is the recorded owner of the
snare is responsible for any problems that arise in their use. Such legislation would minimise
irresponsible use of snares and ensure that the person who set the snare(s) can be
identified.

Habitat management

Effectiveness: Red foxes are such generalists that altering the physical properties of habitat
will do little to deter use. However there is potential in reducing fox numbers through
reductions in prey availability, which theoretically, will reduce the carrying capacity of fox
habitat. The removal of carrion and rabbits throughout the year has been proposed as one
mechanism to reduce the overall carrying capacity of predators in agricultural systems in
Australia (Catling 1988); this approach could also reduce red fox abundance in upland areas
of Scotland, where sheep carrion is a component of the fox diet (Hewson 1984). Reducing
rabbit density could have an effect on fox populations, but would be heavily dependent on
the existence of other food.
Increasing prey resources has also been proposed as means to dilute the effect of predation by providing alternate prey. However, this requires careful thought and investigation to ensure that foxes feed on the provided prey resources, which should be more vulnerable than the game species, and should be a preferred food item of foxes (Baker & Harris 2003).

**Welfare:** There are no welfare concerns with habitat management.

**Deterrents:** Novel disturbances

**Effectiveness:** On occasions when livestock only need protecting for short periods, such as during lambing, novel objects in an area can be effective deterrents. Flashing lights or rotating beacons may provide temporary protection in small areas or in livestock or poultry enclosures. Combinations of frightening devices, such as simulated gun shots, used at irregular intervals provide better protection than the use of a single device because animals have more difficulty in adapting (Philips & Schmidt 1994).

**Deterrents:** Shepherding

**Effectiveness:** Close shepherding at lambing time is the most effective deterrent and allows early identification of problems so that immediate action can be taken to reduce the risk to newborn lambs. Taking lambs inside at night, or when there are risks of any type and keeping them in a fox proof shelter is a widely used practice.

**Deterrents:** Exclusion Fencing

**Effectiveness:** Permanent fences can be used to exclude foxes from small areas, but are uneconomic at larger scales. A fox-proof enclosure requires a fence that is 1.8 m - 2 m high with an overhang at the top and a buried section at least 45 cm deep, to prevent foxes digging under (Philips & Schmidt 1994). Alternatively, electric wire fencing is popular with poultry producers, is effective and more cost effective than enclosures (Moberly et al. 2004). When available the practice of shed lambing in protected enclosures can be useful in preventing fox depredation on young livestock. The British Association for Shooting and Conservation (BASC) offer advice on methods of protecting game and specifications for fences for pheasant release pens (BASC).

**Deterrents:** Novel methods

**Effectiveness:** In the USA, llamas have been used to guard livestock, especially sheep, from predators for some time (Franklin & Powell 1993; Meadows & Knowlton 2000). The technique has been little used in Britain, but a number of users claim it is a successful method of reducing predation by foxes on lambs, poultry and ground nesting birds (RSPB 2010; Roseland Llamas 2010). This method is particularly suited to hill farming, as llamas can be left as part of the flock, are hardy animals requiring little keeping and produce quality wool products. Several farms are now breeding llamas in the UK and it is likely this technique will increase in popularity. However as llamas can contract TB, suitable
precautions should be taken when buying stock particularly if cattle are also held on site (DEFRA 2009).

Sheepdogs have a long history of use in the UK, however guardian dogs are uncommon but have proven effective in other countries. Guardian dogs are trained to integrate into flocks and can effectively protect them from predators such as foxes (Van Bommel 2010).

**Welfare:** There are no welfare issues with fox deterrents.

**Shooting**

**Effectiveness:** Although shooting is the most uniformly effective control method, all forms of shooting require a clear view of the target and a high enough density of animals to ensure encounters (Rushton *et al.* 2006). These factors limit the efficiency of shooting in summer when vegetative cover is high, and may limit its effectiveness in hilly terrain in Scotland where fox density can be low (Harris & Yalden 2008), reducing the probability of encounter (Reynolds 2000). Shooting is most commonly carried out at night from vehicles using powerful spotlights to detect the fox by the reflection from its eyes (‘lamping’). Vehicles are restricted by hilly terrain, but terrain can be overcome using ATVs. Although hilly terrain can result in excessive cover and poor visibility, it can also offer vantage points from where large areas can be surveyed, although overall it is more difficult to lamp in hilly terrain.

Encounters can be increased by use of a fox whistle. Fox whistles produce squealing noises that mimic the sounds made by a wounded small mammal such as a rabbit, and attract the attention of foxes. The whistle can be used when stationary or when lamping, to attract foxes within shooting range, or to attract the foxes gaze so that they can be picked up using a spotlight. Calling can be done by day or with more success at night. Either rifles or shotguns are used, but to ensure a clean kill with a shotgun the fox should be within 30m.

In the right terrain and hands shooting is an effective means of control. Similar to other control methods, it is most effective in winter. The period between February to late March, when the fox population has largely settled into territories is the most effective time to shoot foxes (Rushton *et al.* 2006). As the majority of foxes currently killed are taken by shooting (Heydon & Reynolds 2000), and it is generally viewed as the most effective form of fox control (White *et al.* 2003), this is the method most likely to increase in prevalence in the future.

**Welfare:** Shooting is widely considered a humane way to kill animals when appropriately armed and experienced persons are employed. When shots are on target they cause immediate loss of consciousness and death without suffering.

**Shooting at earths**

**Effectiveness:** The cubbing earth provides a focal point within fox territories where adults as well as cubs may be culled. One may also lie in wait next to a cubbing earth, and shoot adults returning to the cubs with food (Looney 2003). Earths used for cubbing are difficult to recognise early in the spring, but become more obvious as evidence of occupation accumulates around them.
For effective control the aim is to destroy resident breeding females as early as possible in the season, as only culling cubs is predicted to have little effect on population size unless it is very heavy (Macdonald et al. 2000). Culling in spring and summer can be effective if adult females are targeted because, fox for fox, this has the greatest impact on population growth.

**Welfare:** Culling at cubbing earths carries an increased welfare cost associated with the need to locate and destroy orphaned cubs, to prevent extended suffering from starvation as a result of losing their mothers. Thus, although logical and effective for a number of aims, the strategy of culling by any means during spring and summer has a welfare cost not shared by culling in other seasons (Macdonald et al. 2000).

**The case for no fox control**

The case for controlling foxes is often overstated, and it should not automatically be assumed that a ban on the use of snares would result in a great increase in fox predation on livestock or game, even if alternative methods of fox control (or fox damage control) did not exist. Human perceptions of fox density are notoriously unreliable, as has been proven by several studies of fox populations; it is important that only science is used to understand issues of abundance (Macdonald et al. 2000; Baker et al. 2005).

**Is the fox population increasing?**

In the first instance for control to be necessary, it is important to understand if the species in question is in fact increasing, or if problems are arising from modern practices increasingly conflicting with foxes. Several studies have tried to identify whether fox populations have increased in the UK. Even though most fox mortality is caused by humans, either through collisions with motor vehicles or by culling (Reynolds et al. 1993; Pye-Smith 1997; Heydon & Reynolds 2000) there is no evidence that culling foxes has any effect on fox population size other than locally. Most foxes are culled in the winter. Two studies have quantified the impact of winter culling on spring breeding populations, one in Scotland and the other in Welsh coniferous forests, both found that, where more foxes were killed in the winter, spring numbers tended to be higher (Hewson 1986; Baker & Harris 2006). The studies therefore suggest that in some cases fox culling can be counter-productive, and that removing resident populations leads to higher numbers of immigrants.

The poor effect of culling on population size stems from the fact that the foxes are territorial, where individual families maintain specific home areas. Fox population size is therefore regulated by the number of fox territories available (Rushton et al. 2006). While it is possible to remove a fox from a territory, it is not possible to remove the territory itself, meaning that the released space (territory) is quickly filled by dispersing sub-adults trying to find a territory of their own. Even in the rare cases where culling can achieve some level of population suppression, the level of culling required for effective population control will prove impractical at the landscape scale (Baker et al. 2002; Rushton et al. 2006). These biological facts make increases in fox populations unlikely and make the permanent reduction of fox numbers extremely difficult. The self regulation of fox populations has been
backed up by empirical evidence of stable fox numbers across Britain. For instance, there was no detectable increase in fox numbers between 1999/2000 and 2002 in eight of nine regions of mainland Britain, when hunting with hounds ceased following the outbreak of foot and mouth disease in 2001 (Baker et al. 2002; Baker et al. 2003). The estimates provided by Baker et al. (2002) of 258,000 adult foxes also agreed closely with those of Macdonald et al. (1981) of 252,000 adults and of Harris et al. (1995) of 240,000 adults. Estimates thus show that there has been no detectable increase or decrease in fox numbers over the last 30 years.

The costs and benefits of foxes

Game birds are the only clear case of conflict with foxes. Foxes are generally cited as the most important external factor affecting game bird productivity. Two studies have quantified game bird losses due to foxes. The first demonstrated that predator control (including fox control) during the nesting period had a positive effect on wild partridge (Perdix perdix) numbers resulting in a surplus for shooting in the autumn (Tapper et al. 1996). The fox was the most important of the suite of predators removed (Reynolds et al. 1992). A further study found that legal control of foxes and crows led to an average threefold increase in the breeding success of red grouse (Lagopus lagopus scotica) and a number of bird species of conservation concern (Fletcher et al. 2010). The study showed that in natural un-penned conditions predation rate can be reduced using predator control. However the assertion of Fletcher et al. (2010) that predator control should be a general tool used for bird conservation ignores that fact that conservation requires sustainable, long term solutions to securing the habitats of threatened species. However, there may also be positive impacts of fox predation for red grouse populations; as foxes mostly predate birds with heavy parasite loads, the removal of the parasitized grouse may increase the grouse population (Hudson 1992). Generally there has been little research conducted on the impact of foxes on the game industry; such studies would improve our ability to understand and effectively manage losses due to foxes. For example, for the pheasant shooting industry, which now largely relies on reared birds, it is unknown whether it is more economical to control foxes or to rely on rearing and releasing more birds to compensate for predator losses; research seeking to improve bird husbandry is also needed.

Foxes can kill lambs and poultry, but recent studies suggest that the overall impact on farm income is not significant. For example, White et al. (2000) found that foxes were responsible for a loss in farm income in any 1 year of between only 0.6 and 1% of total revenue from lamb production. Moberly et al. (2003) also found fox control to be an uneconomic solution to losses sustained by sheep farmers. The Burns Inquiry concluded that although individual foxes may cause some damage, fox predation is not a significant cause of lamb mortality (Burns et al. 2000). It is well documented that the majority of lamb deaths result from hypothermia or disease (McDonald et al. 1997).

While there is little doubt that certain industries suffer economic costs due to foxes, a very important aspect of foxes at a landscape scale is their influence on other pests such as rabbits, hares and small mammals, which are often perceived as bigger problems (Macdonald 1984; Baker & Macdonald 2000). The role of foxes and other predators in regulating prey populations has been debated over many years (Erlinge et al. 1984). There is now substantial direct and indirect evidence that foxes can regulate rabbit populations,
especially at low densities (Trout & Tittensor 1989; Banks 2000; Baker & Harris 2003). Rabbit abundance appears to be higher on farms where foxes are culled than where they are not culled (Trout & Tittensor 1989; Trout et al. 2000). Importantly, when rabbit numbers are moderate to low after active control, predator pressure can prevent rabbit population recovery (Trout & Tittensor 1989; Pech et al. 1992; Delibes-Mateos et al. 2008). Foxes are therefore most valuable if farmers control rabbits to a density at which foxes can then regulate their populations (Macdonald et al. 2003).

Rabbits cause between approximately £115 million to £820 million in agricultural damage per annum in the UK (Hansard 2003; Pimentel et al. 2001). Macdonald et al. (2003) estimated that foxes can mitigate crop losses by rabbits by as much as £103.53 per hectare per annum and that each fox killed by a farmer could cost the farmer between £156-£886 in lost earnings. Individual farmers may therefore benefit financially from not killing foxes as a result of the reduced crop losses, although the cost-benefit trade-off is complex and dependent on the farmer’s financial interests (Macdonald et al. 2003). As foxes are one of the few carnivores resident in Scotland preferentially feeding on rabbits (Webbon et al. 2006), and rabbits are increasingly perceived as a problem species in Scotland for forestry and agriculture, the importance of fox predation cannot be overstated. In addition foxes control other pest species. Approximately £15.3 to £30.6 million pounds of farm losses are the result of rats (Battersby 2004), and although there are no figures available for economic losses to the agricultural sector caused by voles, or mice (Hansard 2003), these species have economic impacts. Foxes are the main predator of these pests.

**Alternative methods of controlling rabbits and hares**

The situation regarding the control of rabbits is different to that of foxes in a number of ways. One important difference is that rabbits are widely recognised as a serious problem for agriculture in Britain. Rabbits can also cause considerable damage to young trees and the forestry industry and may reach densities of 30 per hectare. Another difference is that landowners and occupiers have legal obligations regarding the control of rabbits on their land under the Pests Act 1954. This obliges landowners and occupiers to destroy rabbits on their land or to prevent them from causing damage elsewhere. As with foxes, there are a number of convincing alternatives to snares as a means of controlling rabbits.

In contrast mountain hares and brown hares only cause minor problems, and most of this is due to the perceived role of mountain hares in the spread and persistence of ticks and louping-ill (Gilbert et al. 2001). Both hares are usually culled for sport and sold to game dealers (Harris & McLaren 1998). Mountain hares are listed in Annex V of the EC Habitats Directive (1992) as a species ‘of community interest whose taking in the wild and exploitation may be subject to management measures’. This means that certain methods of capture are prohibited and may only take place under licence.

**Rabbits**

**Deterrents: Habitat Management**

**Effectiveness:** Habitat quality for rabbits appears to be determined by availability of food, type of soil, vegetation cover and pressure from predators (Parker et al. 1976; Rogers &
Myers 1979). Low food and refuge availability appear to reduce rabbit abundance (Lombardi et al. 2003). Depending on the landscape, a number of actions can be taken to reduce habitat quality for rabbits. These are best carried out after control has taken place to reduce the recovery of rabbit populations and the carrying capacity of the landscape.

Red foxes and birds of prey are the main predators of rabbits, therefore reducing fox control in the area and creating habitats for birds of prey is a viable option for rabbit control. Removing thick bushes, piles of brush, stones and wood close to or within a field that rabbits use as hiding places reduces the level of security of foraging rabbits and will limit, but not stop, crop or pasture damage.

In Australia, warren ripping, where large aggregations of burrows are mechanically destroyed, is a very effective control measure (McPhee & Butler 2010). Although the terrain and habitat of Scotland makes the use of the machinery required for warren ripping impractical, control followed by the effective blocking of burrows is extremely effective, as it deprives rabbits of shelter from the cold and predators. Since rabbits do not readily dig new warrens, rabbit populations do not persist in areas where warrens are effectively destroyed (McPhee & Butler 2010).

**Welfare:** The main welfare issues arise from habitat management targeting the plugging of rabbit warrens. If the burrow is not first emptied then rabbits and other wildlife could be trapped, fail to free themselves, and subsequently starve or suffocate to death over a long period of time. Species at particular risk include small mustelids and hedgehogs.

**Deterrents: Tree guards**

**Effectiveness:** Individual tree guards can be used to protect young trees and shrubs from rabbit browsing and bark stripping where it is impractical or uneconomical to enclose whole areas with fencing. There are many types available including plastic net guards, split plastic tubes, spiral plastic sleeves and welded mesh cylinders. Spiral plastic sleeves are perhaps the least successful because they tend to be displaced by wind or animals. The effectiveness of split plastic sleeves and net guards is greater because they are more robust. To reduce rabbit damage, tree guards should be at least 60 cm (2 ft) high (Natural England 2007c).

**Welfare:** There are no welfare issues with the use of tree guards.

**Deterrents: Rabbit proof fencing**

**Effectiveness:** One of the most common forms of managing the problems rabbits pose is to deny them access to vulnerable areas. Fencing can be an effective method of protecting crops from rabbits but can be expensive to install (McKillop et al. 1998). Fences should be erected along the boundary between the field to be protected and the identified warrens. Both traditional wire-mesh netting and electric fencing can be used to exclude rabbits. In trials both wire-mesh netting and electric fences erected along the boundary of fields reduced rabbit damage by > 80% (McKillop et al. 1998; Natural England 2007a). The choice of fencing required will depend on local conditions, but Natural England provides guidance in making this decision (Natural England 2007a). In general fields requiring year-round protection for several years are better served by wire mesh netting, but if protection is
required for only part of the year, electric fencing may be cost-effective and convenient (McKillop et al. 1998).

**Welfare:** There are no rabbit welfare issues arising from fencing, but other wildlife may be affected. A number of valuable wildlife habitats and species depend on the short sward produced by rabbit grazing, including plants, butterflies and ground-nesting birds. Therefore, wildlife interests should be considered when deciding if, or where, rabbit fencing is to be erected (Natural England 2007a). Access of badgers will also be restricted by fences and can result in fence damage by badgers. This can be dealt with using badger gates (Natural England 2007b).

**Drop-traps**

**Effectiveness:** A combination of fencing and rabbit drop traps is widely regarded as an effective method of rabbit control (DEFRA 2004). Typical rabbit behaviour is to run alongside a fence looking for a way through, often creating holes in fences by digging under the fence or biting through. Drop traps take advantage of rabbits behaviour and their habitual travel routes (runs) throughout their habitat. The ideal drop-trap procedure is to use rabbit mesh fencing to exclude rabbits from an area, but allow them to pass through holes in the fence through drop-traps. A weighted trap door above causes rabbits passing through traps to drop through the trap door into an underground cellar. The natural behaviour of rabbits is to live underground so they are not alarmed at being caught and sit quietly prior to humane despatch.

Traps should be installed at approximately 100 m intervals, depending on the local rabbit density. After 2-3 weeks, the rabbits become accustomed to using the tunnels and the traps can be set to catch rabbits for a 24-hour period. Emptying the trap should be done at least once in the 24-hour period, but with large numbers of rabbits it may be necessary to check it at 8-hour intervals or less. After 24 hours the traps can be set back to their disabled state, ready for the process to begin again. After the initial setup, the combination of fencing and drop-traps can remove large numbers of rabbits quickly and humanely providing years of cost-effective control with little input of time i.e. set for one day every three weeks. The caught rabbits may also be used as a saleable meat product.

Drop traps are a long-term control measure with a substantial initial investment which is quickly recouped and gives years of consistent control. For an individual farmer, the decision on whether to use such a method will depend on the value of the crop being protected, the size of the rabbit infestation and the amount of fencing required. This is often difficult to assess because of difficulties in estimating the cost of rabbit damage (McKillop et al. 1998).

**Welfare:** Frequent inspection of traps and the quick despatch of captured rabbits reduce welfare concerns. The humaneness of drop trapping compares favourably with other methods.

**Cage traps**

**Effectiveness:** Cage traps baited with carrot, apple or parsnip can catch substantial numbers of rabbits in a wide range of situations. They may be used throughout the year when set in open, short vegetation where rabbits can be attracted to the bait, but are especially
Effective for catching adult rabbits during winter (DEFRA 2004). Control is exercised at the site of damage and cage traps are positioned above ground, so that locating and accessing the warren system is not necessary. Cage trapping can be particularly appropriate where access to burrows is difficult, or on golf courses, amenity land and gardens, and where pets or other wildlife may be at risk from other control methods (DEFRA 2004).

**Welfare:** As with drop traps, frequent inspection of the traps and quick despatch of rabbits is essential to reduce welfare concerns. Occasionally, incidents may occur if rabbits get their heads trapped between the door and the side of the cage.

**Gassing**

**Effectiveness:** Gassing is the most effective method of reducing rabbit numbers where burrows are accessible. When correctly used, under the right conditions, gassing can reduce the rabbit population by up to 80%. However, effectiveness decreases in porous soils, when soil moisture is low and when air temperatures fall below 5°C. For best results, it is essential to drive rabbits to ground before gassing and to find and treat every entrance to the warren system (Natural England 2007c). Following effective gassing, holes should be blocked to slow future rabbit colonisation. The only commercially available fumigants are formulations (Phostoxin and Talunix) that generate phosphine gas on contact with moisture (DEFRA 2005). All moisture-activated gassing compounds are classified as ‘very toxic’ chemicals and will expose operators to health risks (HSE 1997). For this reason, gassing should only be undertaken by trained persons.

**Welfare:** Death by phosphine poisoning is associated with risks to the welfare of rabbits against which they are used (Mason & Littin 2003) as well as risks to other species that may use rabbit warrens (e.g. small mustelids and hedgehogs).

**Ferreting**

**Effectiveness:** This involves the introduction of ferrets into the burrow system, which drive rabbits into nets placed over the burrow entrances or to waiting guns that shoot them as they bolt from tunnel entrances (Natural England 2007c). Ferreting is most successful in winter, as it avoids high numbers of sub-adults and more effectively targets female rabbits. Ferreting is however time consuming and regarded as ineffective when used in isolation (Natural England 2007c).

**Welfare:** Ferreting could involve an unquantified amount of pain and injury before death, depending on the ferret-rabbit interaction before bolting from the burrow. There is also a small risk to other animals if the ferret escapes.

**Use of dogs**

**Effectiveness:** The use of dogs for hunting rabbits is widespread and involves a large number of breeds/types of dog, the lurcher appearing to be the type most commonly used. This activity is carried out as a sport and as a means of pest control and can take several forms, for example in conjunction with ferrets to bolt rabbits and with lamping. Terriers are
also used, often in conjunction with ferrets, with the terrier being used to mark the warren before the ferret is introduced (Burns 2000).

**Welfare:** While this method could be deemed unethical, because of the dog attack on the rabbit, the chase is short and the kill relatively quick compared with the use of snares.

**Shooting**

**Effectiveness:** Shooting rabbits is a popular method of rabbit control and a popular pastime in rural areas. Shooting is most effective when conducted at night using a spotlight, but success can also be achieved during the day. Single shooting operations are not particularly effective and reduce rabbit numbers by only about 30%. Shooting also tends to target adult males and therefore has little effect on the breeding population. The technique should only be used in addition to other more effective control methods (DEFRA 2005; Natural England 2007c). The efficiency of shooting also varies markedly depending on the method used and the skill of the operator (DEFRA 2005). Shooting can be carried out by the occupier of the land and occupiers can authorise other persons to do so (DEFRA 2005).

**Welfare:** Shooting can be a very humane killing method when appropriate firearms are used and when shots are on target causing immediate loss of consciousness and death.

**Killing traps**

**Effectiveness:** Spring traps generally consist of a pair of clamps that are triggered with foot plates to catch rabbits that step onto the mechanism. A number of spring traps are licensed for use in the UK under the Spring Traps Approval Order (1995) for the control of rabbits (DEFRA 2005). Traps are set firmly in position with the treadle plate flush with the floor and the plate is concealed by covering lightly with soil or dung. While there are no good data on their relative cost effectiveness, if set properly they are likely to be effective.

**Welfare:** A clean capture will kill a rabbit quickly and humanely; however, different types of trap differ in their effectiveness. Spring traps used for rabbits must be inspected at least once a day to ensure that captures are dead and not suffering. As with snares, killing traps pose a risk of injury and death to other wildlife species which can step into the trap unawares. However as spring traps may by law only be set within burrows and not in the open, non-target captures are less likely.

**Mountain hares**

**Cage traps**

**Effectiveness:** Numerous scientific studies have used cage traps as a means of capture (Sullivan & Moses 1986; Iason 1989; Hewson & Hinge 1990; Newey et al. 2003, 2004). Cage traps were set either in holes in rabbit proof fences without bait, or baited and set in grids or in lines along hare runs. The successful use of cage traps to quantify hare density (Newey et al. 2003) indicates that cage traps can be an effective capture technique, as density could
not be derived if hares were overly trap shy. Newey et al. (2003) reported a trap success of 6 to 11 captures per 100 set traps (i.e. trap nights).

**Welfare:** Frequent inspection of the traps and quick despatch of hares is essential to reduce welfare concerns.

**Long netting**

**Effectiveness:** Hares are driven from resting hides into a net and become entangled; they can be removed and humanely despatched. The use of long nets for capturing mountain hares is an efficient method, but many logistic problems must be considered. The method needs a high number of operators to drive the animals into the nets and subsequently to take them out (Nodari et al. 2005). Scandinavian researchers have used long drives and nets to study hare population size in the past (Angerbjörn & Hjernquist, 1984; Angerbjörn, 1986, 1989).

**Welfare:** The presence of many people and the noise produced to drive hares could stress hares and other animals; hares are stressed by the running, falling into the net and from extraction. There is also the possibility that hares injure themselves while trying to escape the net.

**Breakaway, cushioned snares**

**Effectiveness:** Breakaway snares as described for foxes and rabbits may be less suitable for hares because hares do not settle in traps as well as other species. Previous wildlife studies have used stopped snares, but note that snares need to be checked at least every 3 hours (Hewson 1965). Hewson 1976 reported an average capture success rate of 6 in every 100 snares set, with a maximum capture success of 20 in every 100 snares set. The time investment necessary to check snares may make them impractical for game managers. The effectiveness of cage traps suggests that it is a more efficient method.

**Welfare:** It is uncertain whether breakaway cushioned would result in less welfare concerns than stopped snares. If snares are not checked every 2-3 hours, then hares may injure themselves while trying to struggle free. This would need to be researched to verify.

**Shooting**

**Effectiveness:** Hares can currently be shot throughout the year on enclosed land and from the 1st of July – 31st March on moorland and unenclosed land, although the Wildlife and Natural Environment (Scotland) Bill introduces a proposed close season for Scotland from March to July. Hare shoots (using shotguns) are usually organised as a series of drives, and unlike game bird shoots, there is no separation between beaters and guns. Hares either are shot as they flush running forward, or are taken as they break out through one of the lines of guns. Teams of walking guns of between 6-10 are the norm with bags of over 100 hares not unusual.
**Welfare:** Shooting can be a very humane killing method when appropriate firearms are used and when shots are on target causing immediate loss of consciousness and death. However until close seasons are implemented, there are serious welfare concerns surrounding the killing of lactating females, leaving dependent young to die.

**Brown Hares**

**Long netting**

**Effectiveness:** Hares are driven from resting hides into a net and become entangled; they can be removed and humanely despatched, or they can be boxed and transported to another area for the purpose of restocking (Burns 2000). The driving process mimics that of driven shoots. The method is resource intensive and is comparatively ineffective (White et al. 2004).

**Welfare:** The presence of many people and the noise produced to drive hares could stress hares and other animals; hares are stressed by the running, falling into the net and from extraction. Hares are known to break their backs while trying to escape entanglement in the net (S. Harris unpubl. data).

**Breakaway, cushioned snares**

**Effectiveness:** In the same manner to mountain hares, breakaway snares may be less suitable for brown hares because they do not settle in traps as well as other species. Previous wildlife studies have noted brown hare injuries when accidentally caught in stopped snares, despite the snares being checked every six hours (Macdonald et al. 2000b; DEFRA 2005). The time investment necessary for frequent checking may make snares impractical.

**Welfare:** It is uncertain whether breakaway cushioned snares would result in less welfare concerns than stopped snares. If snares are not checked extremely frequently, then hares may injure themselves while trying to struggle free.

**Shooting**

**Effectiveness:** Hare shooting is the most significant form of hare culling in the countryside and the method most frequently adopted by farmers in arable areas as a means of pest control (Tapper 1987). Shooting is widely viewed as the most effective method of hare control (White et al. 2003; Natural England 2007d). Similar to mountain hares, driven shoots (using shotguns) are very successful, with hares shot as they flush. Dogs may also be used to flush hares for shooting (Natural England 2007d). February has been the most common month for organised hare shoots in England (Tapper & Barnes 1986); however for Scotland, the Wildlife and Natural Environment (Scotland) Bill will introduce a close season from February to September for brown hares. Hare numbers can be substantially reduced by steady attrition over a period of weeks or months, using a .22 rifle (Macdonald et al. 2000).
**Welfare:** Shooting can be a very humane killing method when appropriate firearms are used and when shots are on target causing immediate loss of consciousness and death, providing attention is paid to the breeding seasons and the risks of leaving dependent young.

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**Habitat Management**

Although many farms in England are being encouraged to improve habitat for hares (Nature England 2007d), there are also ways to manage habitat to reduce suitability for brown hares. Habitat changes typical of agricultural intensification, such as a loss of habitat heterogeneity, reduce resources for hares to forage and find day-time shelter. Such agricultural intensification has been associated with population reductions of brown hares throughout the UK (Smith et al. 2005).

Some evidence suggests that foxes are able to regulate hares under certain circumstances. For example Reynolds & Tapper (1995b) found that in a population of hares (which was not subject to culling by man), foxes effectively wiped out the annual reproductive gains of the population. Thus ceasing control of foxes is a potential tool for brown hare management, though as with rabbits, it is likely that specific ecological conditions are needed for control to take place.

**Welfare:** Habitat alteration to reduce habitat heterogeneity is bad for biodiversity conservation. As well as the welfare issues involved in loss of biodiversity, biodiversity loss may result in the loss of essential ecosystem services.

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**Deterrents: Tree guards**

**Effectiveness:** As with rabbits, individual tree guards can be used to protect young trees and shrubs from hare browsing and bark stripping. This is of particular use where it is undesirable or impractical to control hares. There are many types of guard available and recommended, including plastic net guards, split plastic tubes, and welded mesh cylinders. To reduce hare damage, tree guards should be at least 60 cm (2 ft) high (Natural England 2007c).

**Welfare:** There are no welfare issues with the use of tree guards.
**Summary of findings**

This review has outlined several viable alternatives to snares that produce results and reduce the ethical concerns associated with trapping with conventional snares. All methods are relatively easy to adopt but granted are more difficult than continuing to set conventional snares. In order to achieve success, users will need to engage with new methods, change, and be willing to put an extra initial effort in to set the change in motion. After this initial push, the methods we have highlighted are advantageous in that they are effective, and importantly will improve the negative public image of people who use traps as part of their job, by improving the welfare standards of their profession. It is important if such change occurs, however small, that the efforts of the people involved are appreciated. The negotiations to change trapping practice must be a two way process.

**Foxes**

Of the three main species controlled in Scotland, foxes are the most difficult to trap. Trapping foxes also requires consideration of circumstances, habitat, and what resources fox seek from their habitat. The following is a summary of fox control options:

- In any area where foxes are using habitats containing human infrastructure (such as chicken runs, farm buildings), cage trapping should be attempted. Cages are highly effective in urban environments and, if set correctly, and the fox is first acclimatised to cages by pre-baiting, cages have the potential to function effectively. Thoroughly testing the effectiveness of one cage is recommended as a first step.

- In situations where lambs are in danger of fox predation, and improving husbandry during the lambing seasons is unfeasible, llamas can be added to the flock to effectively guard the flock from foxes. Llamas are hardy creatures and perfect for hill farming situations. Llamas can contract TB and so, as with other species, precautions need to be taken.

- In open rural areas, shooting with spotlights, especially during the winter, is regarded as the most effective means of control as it decreases the breeding opportunities of the population.

- Although killing cubs at dens may be effective, welfare issues come into play after the cubs are born. Conducting a discrete stakeout at the earth reduces welfare concerns, so long as the cubs are killed before the adults.

- Breakaway, cushioned snares may provide an effective means of control in other situations. The adoption of the new snare design however is dependent on the results of GWCT trials. The development of a method to produce and adopt the technique while ensuring only experts use the method and are responsible for their actions is seen as important. A permit system should be developed for tagged snares to be given to professionals could accomplish this.

- Valuation of the fox as a resource needs to be considered in many situations. The fox does not always deserve its ubiquitous negative image. Foxes are a valuable resource for many farmers, particularly those with crops and pasture, through its control of
rabbits, small mammals and rats. While there is variation in the monetary value of each fox to farmers, all estimates indicate that farmers are best served by maintaining its service as an important native UK predator. Fox control and economics needs to be studied at a larger scale in order to understand if the benefits to one group (farmers) overcome the costs to another (gamekeepers). Such a study would allow a more holistic, ecosystem-based approach to fox control and would highlight where industrial subsidies may be a cost-effective solution.

Rabbits

Rabbits are relatively easy to capture using alternative trapping methods, but very difficult to control due to their breeding rate and success. However, given the following alternatives snares are not essential to the effective control of rabbits:

- Live trapping using baited cages can be effective and easy to use in affected areas. Where cage traps are ineffective, drop traps may work, but require an initial investment. However, the investment may be lowered if existing fencing can be modified to accommodate the drop-trap method. Importantly drop traps are a long term solution to rabbit problems and, depending on the crop to be protected, investments can be paid off quickly. Both live trapping methods are humane means of capture.
- In open rural areas lamping is useful in combination with other methods, but is unlikely to be effective alone.
- Where there are large rabbit infestations, and warren systems can be identified, gassing should be considered. It is important to identify warrens correctly so that non-target species are not killed. Blocking or destroying the warren system should follow gassing to slow recolonisation of rabbits.

Hares

As with rabbits, there seems little reason to snare mountain and brown hares. Several methods are available that are far superior to snaring.

- Cage trapping has proven effective on mountain hares with high trap success in Scotland. Accomplishment in this method requires time investment to improve procedures and trapping success.
- Driving and shooting both mountain and brown hares is a highly effective means of control. This is method often has economic returns when sold to recreational hunters.
References


