Written evidence submission to the 2017 Natural Resources Wales review of the use of shooting on land managed by them

Who we are

This submission has been produced by the Game & Wildlife Conservation Trust (GWCT), a research and education charity that has had over 1,000 scientific papers published in peer-reviewed journals over the past 80 years. On the basis of our scientific expertise, we regularly provide advice to statutory bodies such as Defra, Scottish Natural Heritage and Natural England. We also provide practical advice to farmers and landowners on how to manage their land with a view to improving biodiversity.

Much of our research is undertaken in collaboration with other institutions and organisations, including Cardiff University, the British Trust for Ornithology, the Centre for Ecology and Hydrology, and the RSPB.

To help disseminate this knowledge, representatives of the GWCT sat on over 100 external committees in 2015, including the Welsh Bird Conservation Forum, the UK Birds of Conservation Concern Panel, and Natural England's main board.

Why we have submitted evidence

Most of the scientific evidence on the conservation impacts of game management in the UK has been produced by the GWCT. We welcome this opportunity to present the available scientific evidence and to highlight the importance and benefits of adhering to best practice.

After spending more than 80 years researching and advising on game management and conservation across Britain, we support best practice-run shooting for four primary reasons:

1. The habitat management undertaken on land managed for pheasants conserves and enhances woodland.
2. The package of management, notably habitat enhancement along with predator control and supplementary feeding, contributes to the conservation of many other species, including some woodland birds that are in decline.
3. This conservation of habitat and its wildlife may help to stem national declines, which have been driven by land-use change, predation pressure and climate change.
4. This land use delivers high nature conservation value but is financed primarily by private investment. This alleviates the need for state-funded land management for conservation in these areas, providing income in place of expenditure. It also supports local communities economically, socially and culturally.

Executive Summary

1. A Prosperous Wales

- The shooting industry directly and indirectly contributes up to £75m per year to the Welsh economy.
- Employment for local people and income for local businesses linked to shooting is especially valuable during the winter months when alternative employment and tourism may be limited. Shoot provision is integrated into the fabric of local economies and communities.
- Pest management contributes to a thriving Welsh economy by protecting crops and livestock from damage.

2. A Resilient Wales

- Evidence demonstrates that, where pheasant shooting is performed in accordance with the Code of Good Shooting Practice and GWCT best practice guidelines, the overall impact on biodiversity is positive.
- Pest management is a necessary component of conservation for many species whose survival is threatened by competition with or predation by pest species.

3. A Globally Responsible Wales

- Management of land for shooting delivers well-recognised conservation benefits, which helps Wales to meet international responsibilities towards wildlife.
- The obligation to adhere to best practice guidelines on NRW land allows Welsh shoots to act as a pioneering example of the benefits that can be delivered by responsible shoot management. This may encourage others to follow this lead and increase the sustainability of their practices.

4. Sustainable Management of Natural Resources

- Sustainable development consists of environmental, social and economic sustainability. The above points demonstrate that responsibly run shoots, as is required on NRW land, fulfil all these criteria and contribute to sustainable management in Wales.

1. A Prosperous Wales

1.1 Does shooting/the use of firearms contribute to the economy of Wales?

1 The economics of shooting provision were explored in a report from 2014 examining the value of sporting shooting in the UK[1] (PACEC report). There are limitations in the methods used and we would treat the values reported with some caution, however it provides the most complete data available, and shows that shooting contributes to both local and national economies.

2 The PACEC report suggests that the shooting industry in Wales supports the equivalent of 2,400 full-time jobs, and directly adds £11m to the Welsh economy, which is increased to £75m when indirect income is included[1]. These estimates are considered by many to be too high, but experts conducting a critical analysis of the report concede that "the basic assertions that the sport shooting industry has a significant impact on the economy, the environment and the communities involved, cannot be disputed"[2].

3 PACEC also reports that maintenance expenditure by shoot providers is considerable, with a significant proportion going to local suppliers, primarily within 10-15 miles of the shoot site[1]. Shoots on NRW land in Wales are likely to support many local businesses.

4 Shoot provision requires staffing, including gamekeepers, beaters and pickers-up. Employment opportunities for younger people in some rural areas out of the main tourist season can be scarce. Furthermore, the attraction of those who shoot to rural areas in the winter provides support for the local service industries.

5 A further economic contribution, which is at present difficult to quantify but should not be overlooked, is the provision of game meat to the food industry. Game suppliers and butchers sell pheasant, rabbit, venison and more in a section of the market that has been increasing in recent years, and is of growing interest in Wales. The Welsh Game Meat project, funded by the Welsh Government Rural Communities - Rural Development Programme (2014-2020), aims to increase the value of healthy, local game meat to the Welsh economy by 2020.

6 In addition, cost savings need to be considered in the economic analysis of shooting leases. Considerable conservation benefits occur as a result of responsible shoot management (discussed below), the costs of which are borne by the shoot provider. To achieve these effects in the absence of shoot management would require substantial investment by NRW.

Anecdotal evidence: impact on the local economy

Many business owners submitted evidence to the recent debate on driven grouse shooting at Westminster, outlining their concerns regarding the impact of the loss of shooting. A link to some examples can be found below:

http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/petitions-committee/grouse-shooting/written/40300.html

http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/petitions-committee/grouse-shooting/written/40307.html

http://data.parliament.uk/writtenevidence/committeeevidence.svc/evidencedocument/petitions-committee/grouse-shooting/written/40310.html

These fears are supported by anecdotal evidence from Langholm Moor in Scotland. When grouse shooting ceased on the moor, hotel owners reported a loss of business and the local culture, economy and employment suffered. Although merely observation of the effects seen in one location under specific circumstances, this highlights the potential that shooting has to contribute to local economies and the possible consequences of its loss.

1.2 Does the use of firearms in pest management contribute to the economy of Wales?

7 Protection of crops and livestock through pest control makes an important economic contribution to agriculture across the UK. Indeed, an animal species is regarded as a pest if it has a destructive influence on agriculture, livestock or humans. Control of these species to protect the interests of agriculture is widespread.

8 Common examples include: the control of grey squirrels and deer to protect timber production; rabbits to protect a wide range of arable crops; foxes to reduce losses of livestock; and generalist predators to protect gamebirds including pheasants.

9 We emphasise that all pest and predator control should be performed in compliance with the law and best practice guidelines.

Example: Deer control

10 Deer damage to woodland can be the result of tree browsing or bark stripping for food, or antler damage that can lead to trunk scoring or bark fraying[3]. These activities can have economic impacts on timber growth. Additionally, high deer densities can result in destruction of lower storey vegetation, which along with tree damage can reduce woodland biodiversity[4].

11 Deer browsing can lead to slower establishment of trees[5], removal of the apical (main growth) shoot resulting in damaged growth and multiple stems[5], and reduced natural regeneration of trees[6]. Delays in establishment can lead to a considerable reduction in net value per hectare of commercial forestry through reduced growth or timber quality[5]. Although specific data are not available for Wales, deer damage is also likely to limit growth in Welsh forestry, therefore deer control is sometimes considered necessary.

12 Alternative methods of control are limited for deer species. While deer fencing can exclude animals from small areas, it is costly to maintain and will often be breached if deer numbers are high.

Furthermore, deer fencing also restricts the movement of other wildlife. In practice, it is often found necessary to combine fencing with population reduction. Population reduction can only be achieved by culling, and for a large mammal such as deer, shooting is the only suitable culling method.

13 Because it requires considerable effort to achieve, population control is the primary motivation for deer culling, but there are legitimate and valuable secondary roles of providing wild game meat, sporting (stalking) opportunities and trophies.

14 There are well-established best practice methods for shooting deer, and a widely available training and education programme.

Example: Generalist predators

15 Lethal control of generalist predators is carried out to reduce gamebird losses to predation. For lowland pheasant shoots, approximately 20% of released pheasants can be lost to predation between release in July and the beginning of the shooting season in October[7]. This predation pressure continues throughout the season, accounting for another 15% of birds[7].

16 Predator control has a significant positive impact on grey partridge autumn numbers and breeding stock[8]. In the uplands, effective predator control can increase red grouse breeding success threefold[9].

17 Limited evidence is available demonstrating the efficacy of predator control for protecting released gamebirds. However, a recent GWCT analysis suggests that a high level of predator control can contribute significantly to the continued survival of adult birds in spring and early summer. In this study, 60% of adult pheasants were predated at four sites performing low-level predator control, and 30% at three sites with high-level predator control[10].

18 This improved breeding success for wild gamebirds, and reduced predation on released birds, carries economic benefits for shoot providers. However, wider conservation benefits of predator control have been demonstrated for other species at suitable sites, particularly ground-nesting birds[9,11–15]. These will be discussed further in section 2.2.

19 Fox control can also play an important role in protecting livestock. In sheep-farming areas, woodland can provide cover for foxes, which then predate livestock at night, particularly lambs[16]. Where these two habitats are in separate ownership, a 'good neighbour' policy often involves cooperation over fox culling to minimise or eliminate instances of lamb predation, thus contributing to the economic viability of livestock farming as well as conservation[17]. Exempt hunting provides an important method of fox control under such circumstances, where other methods may be unsuitable or inefficient.

20 The lawful methods of fox control are: shooting (with a shotgun or rifle, including night shooting with a spotlight, night vision or thermal imaging, and including the use of no more than two dogs to flush a fox from cover); non-locking neck snares; live-capture cage or box traps; use of a terrier to bolt a fox from underground allowing it to be caught in a net or shot (in the interests of game management only). The use of leg-hold traps (gin traps), self-locking neck snares, poison and gas, and hunting with dogs are prohibited (with the exemptions already described and listed in Schedule 1 of the Hunting Act 2004). Foxes captured alive in snares or cage traps must be dispatched humanely[17]. A firearm is likely to be the most effective method, and for this reason alone fox control is reliant on the use of firearms of sufficient power.

21 The culling of foxes can have both local (farm-scale) and regional (county-scale) impacts. At the local scale, the removal of individual foxes can reduce or eliminate immediate issues, particularly with respect to predation on lambs. At a regional scale, individual people engage in fox culling for a

variety of reasons, but the net effect is that fox density is capped at a level that is acceptable to the community as a whole[18].

2. A Resilient Wales

2.1 Does the use of firearms in third-party activities on our land contribute to a biodiverse natural environment?

22 The impact of pheasant shoots on biodiversity and the local environment has been much researched in recent years. This body of evidence demonstrates that, where shoots adhere to the Code of Good Shooting Practice[19] and follow best practice guidelines published by the GWCT[20], there is an overall benefit to biodiversity.

23 In 2010, an RSPB research report into the impacts of non-native gamebird release considered all the available evidence, before concluding: "on estates that operate good habitat management, and release birds at sustainable densities, the positive effects of habitat management are likely to result in a positive net conservation impact"[21].

24 Management practices usually performed for the benefit of pheasants include: reducing the canopy density, maintenance of wide woodland rides and a dense vegetation understory, promoting diverse woodland edges, creating or maintaining hedgerows, planting cover crops, predator control and supplementary feeding[1,22–26].

25 These techniques also improve habitat for other woodland species, and studies have found increases in the number and diversity of songbirds, butterflies and flowering shrubs in game-managed woods[24,27–30]. Woodland management also benefits some small mammals, such as wood mice and bank voles[31]. The provision of supplementary feed has positive effects on some seed-eating birds[32]. If these management practices are carried out by NRW tenants, such biodiversity benefits can be expected.

26 Woodland that is not managed for game is much less likely to receive such investment in maintenance, as it provides a lower economic return than game woods. It therefore tends to have a denser canopy and less ground vegetation[24].

27 There can also be negative impacts of pheasant release. These can include more bare ground, and an altered profile of ground vegetation and beetle species composition near to release pens[22,23,33]. It has been suggested that released pheasants may be involved in disease transmission to wild birds or that predation of other birds may be higher on pheasant shoots without good predator control. There is currently little or no scientific evidence that this is the case, and we await studies to investigate these suggestions.

28 In general, some localised negative impacts can be seen around the release pen and feed sites because of the birds themselves. Wider positive effects are seen in the surrounding woodland and farmland as a result of management measures undertaken for the pheasants but which tend also to benefit other wildlife.

29 GWCT research examining how best to balance these two considerations showed that keeping pheasant densities below 1,000 birds per hectare of release pen (700 in environmentally sensitive areas) avoids the negative effects of high bird densities, while retaining the benefits of habitat management. Our best practice guidelines are cited in the Code of Good Shooting Practice.

30 The key to seeing the conservation benefits from shoot management is in responsibility and sustainability. Where shoots are well managed and responsibly run according to best practice, environmental damage is avoided and there are wider conservation gains.

31 As shoots are contractually obliged to adhere to best practice on land leased from NRW, the environmental benefits of habitat management for pheasants should be gained, whilst the potential

negatives of inappropriate management should be avoided, thus leading to increased biodiversity. We would urge all shoots to adhere to the Code of Good Shooting Practice and GWCT best practice guidelines. More information on these issues, and the relevant scientific studies can be found on the GWCT website.

2.2 Does the use of firearms in pest management contribute to the maintenance and enhancement of a biodiverse natural environment?

32 For conservation, the definition of a pest may be broadened to include those species that threaten the survival of other species. Pest management is a necessary component of conservation for many species whose survival is reduced by predation by or competition with pest species.

Example: Grey squirrels

33 Control of non-native grey squirrels is carried out with two main aims: the economic benefit of reducing tree damage for timber production, and the conservation benefit of protecting the native red squirrel.

34 Grey squirrels have replaced reds in almost all areas of the country where they are present, through a combination of competition pressure and disease transfer[34,35]. Small areas in Wales support populations of either both species or red squirrels alone.

35 The potential efficacy of grey squirrel control has been demonstrated by a long-term culling project[36] that has removed grey squirrels from Anglesey, allowing a resurgence of the red squirrel population. Lethal control for squirrels has historically been achieved with either poisoning (currently illegal); trapping and killing either by shooting or a blow to the head; or direct shooting, sometimes with drey-poking. Lethal grey squirrel control is currently an essential component of red squirrel conservation.

36 There is a continuing challenge to develop more humane, effective or cost-effective pest control methods. For example, the technique of sterilisation by hormonal or immuno-contraception has been under investigation for squirrels, foxes and rabbits[37,38]. Although not yet viable, this may become an effective non-lethal alternative at some time in the future.

Example: American mink

37 The American mink is an invasive species, which has spread rapidly throughout British river systems. The addition of another carnivorous predator has had a profound effect on the ecosystem balance.

38 National surveys in the early 1990s detected an 88% decline in the British water vole, with some regions having lost 98% of their population. In 2001, it was reported that there was a real possibility of the water vole becoming extinct in Britain without strategic mink control, which until then had been unsuccessful.

39 In 2002, the GWCT developed the only effective method of mink control, the mink raft. This demonstrates the presence of mink, and a live trap or kill trap can then be set on the raft. Using a live trap allows release of non-target captures and humane killing of captured mink. This is usually achieved by shooting with an air weapon or a shotgun, which provides the most practical humane method.

40 A study on the River Monnow in Herefordshire, where water voles had been extinct since the 1980s, demonstrated that the live-trapping guided by mink rafts can effectively clear an area of mink,

allowing water voles to be reintroduced[39]. With continued mink control, this water vole population has persisted to the present day.

41 Because mink are well-established throughout Britain, conservation of the water vole (and seabirds on inshore islands) requires continuing control of mink. Systematic trapping (e.g. using the mink raft) is currently the only viable and practical method to achieve this, and necessarily involves shooting for humane dispatch.

42 The mink diet is varied, and although the evidence base is still building, it is likely that mink predation also has an impact on a range of other species. For example fish, including migratory salmonids, and water birds such as coot and moorhens[40].

Example: Fox

43 As discussed above, fox control in forestry may be performed to protect nearby livestock, however reducing fox populations can also have important conservation benefits, both for species in the woodland itself, such as woodcock, as well as those in adjacent habitats.

44 Ground-nesting birds can be particularly vulnerable to predation, and many are in decline in Wales as well as across the UK. Where forestry opens on to moorland, a suite of ground-nesting birds such as curlew and golden plover may benefit from reduced predation pressure[9]. On grassland that abuts woodland, breeding lapwing or snipe may benefit from fox control performed in the forestry block.

45 Predation has been identified as a major cause of reduced breeding success for many ground-nesting birds. A large European study examined nesting success and predation for five species: Eurasian oystercatcher, northern lapwing, black-tailed godwit, Eurasian curlew, and common redshank. This showed that, for all five species, nest predation has increased by approximately 40% in the last four decades, and that reproductive output is currently too low to sustain their populations[41]. For curlew nests observed between 1996 and 2006, 65% were predated, and over 70% failed to fledge a chick[41].

46 Curlew have recently been identified as the most pressing bird conservation priority in the UK[42], and predation is an important factor for this species[43]. One study in Northern Ireland found 74-86% of nest failures, and 74% of chick mortality, were due to predation[44]. The predators responsible varied between sites, but were predominantly foxes and crows[44].

47 At appropriate sites, predator control can improve nesting success for breeding curlew and other ground-nesting birds[9]. This is recognised in an RSPB paper, which demonstrates the importance of gamekeeping on moorland for curlew[45]. At some sites, lapwing breeding success is twice as high when predator control is performed[14].

48 Fox control can play an important role in protecting ground-nesting birds, as demonstrated by the positive associations between grouse moor management and a range of these species[46–48]. The loss of the majority of grouse moors in Wales may have contributed to declines in some of these moorland birds in recent decades[49].

3. A Globally Responsible Wales

3.1 Is the use of firearms in the management of land globally responsible?

49 Wales has international responsibilities towards the conservation of wildlife[50], and the protection of vulnerable species by appropriate control of predators that threaten their persistence can contribute to this conservation. For some species, the use of firearms is the most suitable method of control.

50 The conservation benefits of pest control have been discussed at length above. Predator control is an essential component of conservation for many species, including some that are of conservation concern, for example curlew and other waders[9,42,51]. Breeding curlew are in severe decline in Wales[52], and predation pressure is one of the factors thought to contribute to reduced breeding success[43]. See case study below.

51 Exempt hunting contributes to overall fox population control, being the most appropriate method for successful control in some areas, and is therefore likely to help NRW in meeting its international responsibilities in conserving ground-nesting birds.

3.2 Does the use of firearms in third-party activities on NRW land contribute to the wellbeing of Wales and beyond?

52 The responsible approach of NRW to contractually oblige land leased for shooting to be managed according to best practice guidelines allows Welsh shoots to act as a pioneering example of the benefits that can be delivered by responsible shoot management.

53 We would hope this demonstration of good practice may encourage others to follow the lead of NRW shoots and increase the sustainability of their practices, thus raising the overall standard of shoot management.

Case study: Curlew Country – Shropshire Hills and Welsh Marches Curlew Recovery Project

This project has worked with farmers to monitor curlew nests, their breeding success and the reasons for failure over the past two breeding seasons, to determine the most important pressures on breeding and identify how best to support the local population.

The findings of the project's second year demonstrate the impact of predation for breeding curlew on this site:

- 21 nests were identified and monitored.
- Two had no eggs when they were found, another had already been predated.
- 17 nests failed at the egg stage. 15 of these were definitely or highly likely to have been predated, mostly by foxes and badgers. Some clutches were replaced.
- A total of 63 eggs were observed.
- A total of seven chicks hatched.
- No chicks survived to fledging.
- The main factor limiting success was predation

4. Sustainable Management of Natural Resources

4.1 Does shooting on NRW land constitute the sustainable use of natural resources?

54 The definition of environmental sustainability is "the quality of not being harmful to the environment or depleting natural resources, and thereby supporting long-term ecological balance". Fulfilling this is the aim of best practice guidelines for shooting. However, it is important to remember that there are often more aspects to sustainability than this alone.

55 The International Union for Conservation of Nature (IUCN) definition of sustainability recognises that true sustainability must consider additional factors, including economic drivers: "The core of mainstream sustainability thinking has become the idea of three dimensions, environmental, social and economic sustainability."[53]

56 Sustainability in shooting is critical to satisfy both environmental, ethical and legal obligations for its continuation. The potential impact of pheasant release on the natural environment is discussed above, demonstrating that where appropriate codes and guidelines are adhered to, as they are obliged to be on NRW land, pheasant shooting is indeed environmentally sustainable.

57 The continuation of pheasant shooting provides not only the revenue to NRW from leasing shooting rights over its land, but as discussed in section 1.1, shoot provision also contributes to wider income for the local economy[1]. Shoots provide employment for local people, and income for local businesses during the winter months when alternative employment and tourism may be limited. Shoot provision is therefore integrated into the fabric of local society and economy.

58 Sustainable development consists of environmental, social and economic sustainability. The above points demonstrate that responsibly run shoots, as is required on NRW land, fulfil all these criteria and contribute to sustainable management for Wales.

4.2 Does the use of firearms in pest management contribute to the sustainable use of natural resources?

59 As described above, pest control at appropriate sites can make a considerable contribution to conservation, particularly for ground-nesting birds such as lapwing and curlew[9,13,14]. The preservation and promotion of biodiversity is an important factor in promoting ecosystem resilience, thus contributing to sustainable development in Wales.

60 Where pest control is necessary, it must be humane, efficient, practical and cost-effective. Alternatives to firearms for pest control are a) alternative lethal methods, e.g. poison, traps, or b) non-lethal methods.

61 Non-lethal control methods are sometimes appropriate, for example fencing where exclusion from a certain area is sufficient to prevent predation or damage[15]. Lethal methods are required where population level control is needed, or exclusion is not possible/effective. When undertaking the management of large areas of land, such as the case for NRW, a wider view of the population of a pest species may be required.

62 Controlling pests is a delicate issue, and the decision of whether to use lethal or non-lethal methods must be taken carefully. The GWCT is committed to animal welfare, and has been involved in various research projects exploring possible alternatives to lethal pest control.

63 For example, a new project at Auchnerran, the GWCT demonstration farm in Scotland, will examine the capacity for laser fences to deter or disperse pest mammal species such as rabbits,

stoats and foxes[54]. This may provide an effective alternative where exclusion is the desired result, rather than population reduction.

64 The GWCT has also conducted research into the efficacy of 'conditioned taste-aversion' to discourage predators from targeting particular prey; and has carefully considered the use of fertility control to reduce numbers of problem wildlife species. While both of these approaches are effective in captive conditions, neither has yet been successful in a real-world context. We continue to look for alternative humane, effective, practical and cost-effective approaches.

65 If we accept the premise that lethal pest control is necessary under some circumstances, but wish to avoid firearms, alternative methods for killing pests must be considered. The most responsible approach must be allowing the controller the widest range of options, so the most effective and humane method can always be selected.

66 Continual re-assessment of current practice and awareness of new developments is critical to ensure that the highest standards are being met, and the most appropriate methods are employed. Different methods of control are suitable under different circumstances, dependent on the characteristics, behaviour and habitat of that species. We reconsider the examples given throughout this submission with respect to viable alternatives:

Example: Deer control

67 Deer are currently controlled by culling with firearms, under strict regulation. Large animals such as deer may not be taken or killed using snares, poison or lethal traps. There are no humane alternatives for deer.

Example: Generalist predators

68 "Generalist predators" includes a range of pest species, controlled using different methods. The most efficient method of crow control is use of a Larsen trap to live catch, with humane dispatch by administering an overwhelming blow to the head. Fox control can be performed by restraint using a snare or cage, after which the recommended humane method for dispatch is shooting with an appropriate firearm. At certain times of year in suitable conditions, foxes can be shot from a high seat. Smaller generalist predators that can be the subject of predator control include stoats and weasels, which are usually caught in a spring trap concealed in a tunnel. Although these are occasionally shot, which helps contribute to overall population control, the main method utilised is trapping.

Example: Grey squirrels

69 Lethal control of grey squirrels has historically been done using poison (currently illegal); trapping in kill traps; trapping in live traps followed either by shooting or a blow to the head; or direct shooting, sometimes with drey-poking. Kill traps should not be used where red squirrels could be present.

70 Where grey squirrels are live-trapped, the choice of dispatch method is influenced by several factors, not least one's responsibilities under animal welfare legislation. When using a firearm, location, licensing and landowner permission must be considered. There is no viable alternative to direct shooting when culling by drey-poking.

Example: American mink

71 As discussed, American mink control is usually achieved through live-trapping followed by dispatch using a suitable firearm. This method was awarded the first Universities Federation Wild Animal Welfare Award in 2004. Although it may be possible to avoid the use of a firearm for dispatch of the animal, for example by release into a tunnel containing a spring trap, this approach requires the transport of large equipment to sometimes remote areas. The additional level of animal handling may increase the associated possibility of error. The GWCT does not believe that the alternatives to shooting are suitable, and they may lead to a breach of the Animal Welfare Act 2006. Killing with a firearm is humane, practical and discreet.

72 In response to claims regarding traps and snares by those opposed to pest control, we note that:

- No predator control device in the UK is designed to strangle. It is a legal requirement that snares restrain, rather than kill, an animal. This allows release of non-target captures and humane dispatch of target pests.
- For example, code of practice compliant snares used in accordance with the Welsh Government Code of Best Practice have been shown to comply with standards for restraining traps agreed in the Agreement on International Humane Trapping Standards (AIHTS).
- When used in accordance with the code of practice, less than 1% of captured foxes sustain injuries when restrained in a snare[55].
- NRW leaseholders are obliged to adhere to best practice standards. The Welsh Government Code of Best Practice on the use of snares in fox control specifies the technical features that must be present on a snare set in Wales – those designed by the GWCT incorporate all these features and ensure high standards of animal welfare.

References

1. PACEC. *The Value of Sporting Shooting*. (2014).
2. Rotherham, I. & Cormack. *A review of the PACEC reports (2006 & 2014) estimating net economic benefits from shooting sports in the UK*. (2014).
3. Putman, R. J. & Moore, N. P. Impact of deer in lowland Britain on agriculture, forestry and conservation habitats. *Mamm. Rev.* **28,** 141–164 (1998).
4. Fuller, R. J. & Gill, R. M. A. Ecological impacts of increasing numbers of deer in British woodland. in *Forestry* **74,** 193–199 (2001).
5. Ward, A. I., White, P. C. ., Smith, A. & Critchley, C. H. Modelling the cost of roe deer browsing damage to forestry. *For. Ecol. Manage.* **191,** 301–310 (2004).
6. Gill, R. M. A. & Morgan, G. The effects of varying deer density on natural regeneration in woodlands in lowland Britain. *Forestry* **83,** 53–63 (2010).
7. Turner, C. & Sage, R. Fate of released pheasants. *GWCT Annual Review* 74–75 (2003).
8. Tapper, S. C., Potts, G. R. & Brockless, M. H. The Effect of an Experimental Reduction in Predation Pressure on the Breeding Success and Population Density of Grey Partridges Perdix perdix. *J. Appl. Ecol.* **33,** 965 (1996).
9. Fletcher, K., Aebischer, N. J., Baines, D., Foster, R. & Hoodless, A. N. Changes in breeding success and abundance of ground-nesting moorland birds in relation to the experimental deployment of legal predator control. *J. Appl. Ecol.* **47,** 263–272 (2010).
10. Sage, R. B., Woodburn, M. I. A., Hoodless, A. N., Draycott, R. A. H. & Sotherton, N. W. Predation of common pheasants Phasianus colchicus on lowland farmland in the UK and elsewhere and the effect of predator control. *Submitted*
11. Tapper, S. *Singing Fields. Why gamekeeping helps birds in the countryside*. (2007).
12. Stoate, C., Leake, A., Jarvis, P. & Szczur, J. *Fields for the future*. (2012).
13. Isaksson, D., Wallander, J. & Larsson, M. Managing predation on ground-nesting birds: The effectiveness of nest exclosures. *Biol. Conserv.* **136,** 136–142 (2007).
14. Bolton, M., Tyler, G., Smith, K. & Bamford, R. The impact of predator control on lapwing Vanellus vanellus breeding success on wet grassland nature reserves. *J. Appl. Ecol.* **44,** 534–544 (2007).
15. Malpas, L. R. *et al.* The use of predator-exclusion fencing as a management tool improves the breeding success of waders on lowland wet grassland. *J. Nat. Conserv.* **21,** 37–47 (2013).
16. Moberly, R. L., White, P. C. L., Webbon, C. C., Baker, P. J. & Harris, S. Modelling the cost of predation and the preventative measures on sheep farms in Britain. *J. Environ. Manage.* **70,** 129–143 (2004).
17. Heydon, M. J. & Reynolds, J. C. Fox (Vulpes vulpes) management in three contrasting regions of Britain, in relation to agricultural and sporting interests. *J. Zool.* **251,** 237–252 (2000).
18. Heydon, M. J. & Reynolds, J. C. Demography of rural foxes (Vulpes vulpes) in relation to cull intensity in three contrasting regions of Britain. *J. Zool.* **251,** 265–276 (2000).
19. Code of Good Shooting Practice. Available at: http://www.codeofgoodshootingpractice.org.uk/.
20. GWCT. Guidelines for Sustainable Gamebird Releasing. Available at: http://www.gwct.org.uk/media/208606/Sustainable-gamebird-releasing.pdf.
21. Bicknell, J. *et al. Impacts of non-native gamebird release in the UK: a review. RSPB Research Report*

Number 40. (2010).

22. Draycott, R. A. H., Hoodless, A. N., Cooke, M. & Sage, R. B. The influence of pheasant releasing and associated management on farmland hedgerows and birds in England. *Eur. J. Wildl. Res.* **58,** 227–234 (2012).
23. Neumann, J. L., Holloway, G. J., Sage, R. B. & Hoodless, A. N. Releasing of pheasants for shooting in the UK alters woodland invertebrate communities. *Biol. Conserv.* **191,** 50–59 (2015).
24. Draycott, R. A. H., Hoodless, A. N. & Sage, R. B. Effects of pheasant management on vegetation and birds in lowland woodlands. *J. Appl. Ecol.* **45,** 334–341 (2008).
25. Sage, R. B. & Swan, M. *Woodland conservation and pheasants.* (2003).
26. Sage, R. B. *Guidelines for sustainable gamebird releasing*. (2007).
27. Sage, R. B., Parish, D. M. B., Woodburn, M. I. A. & Thompson, P. G. L. Songbirds using crops planted on farmland as cover for game birds. *Eur. J. Wildl. Res.* **51,** 248–253 (2005).
28. Parish, D. M. B. & Sotherton, N. W. Game crops and threatened farmland songbirds in Scotland : a step towards halting population declines ? *Bird Study* **51,** 107–112 (2004).
29. Henderson, I. G., Vickery, J. A. & Carter, N. The use of winter bird crops by farmland birds in lowland England. *Biol. Conserv.* **118,** 21–32 (2004).
30. Hoodless, A. N. & Draycott, R. A. H. Effects of pheasant management at wood edges. *GWCT Annual Review* 30 (2005).
31. Davey, C. The impact of game management for pheasant (Phasianus colchicus) shooting on vertebrate biodiversity in British woodlands. (2008).
32. Sanchez-Garcia, C., Buner, F. D. & Aebischer, N. J. Supplementary winter food for gamebirds through feeders: Which species actually benefit? *J. Wildl. Manage.* **79,** 832–845 (2015).
33. Sage, R. B., Ludolf, C. & Robertson, P. A. The ground flora of ancient semi-natural woodlands in pheasant release pens in England. *Biol. Conserv.* **122,** 243–252 (2005).
34. Rushton, S. P., Lurz, P. W. W., Gurnell, J. & Fuller, R. Modelling the spatial dynamics of parapoxvirus disease in red and grey squirrels: a possible cause of the decline in the red squirrel in the UK? *J. Appl. Ecol.* **37,** 997–1012 (2000).
35. Gurnell, J., Wauters, L. A., Lurz, P. W. W. & Tosi, G. Alien species and interspecific competition: effects of introduced eastern grey squirrels on red squirrel population dynamics. *J. Anim. Ecol.* **73,** 26–35 (2004).
36. Schuchert, P., Shuttleworth, C. M., Mcinnes, C. J., Everest, D. J. & Rushton, S. P. Landscape scale impacts of culling upon a European grey squirrel population : can trapping reduce population size and decrease the threat of squirrelpox virus infection for the native red squirrel? *Biol. Invasions* **16,** 2381–2391 (2014).
37. Barr, J. J. F., Lurz, P. W. W., Shirley, M. D. F. & Rushton, S. P. Evaluation of Immunocontraception as a Publicly Acceptable Form of Vertebrate Pest Species Control: The Introduced Grey Squirrel in Britain as an Example. *Environ. Manage.* **30,** 342–351 (2002).
38. Boyle, D. Disease and fertility control in wildlife and feral animal populations: options for vaccine delivery using vectors. *Reprod. Fertil. Dev.* **6,** 393–400 (1994).
39. Reynolds, J. C., Richardson, S. M., Rodgers, B. J. E. & Rodgers, O. R. K. Effective control of non-native American mink by strategic trapping in a river catchment in mainland Britain. *J. Wildl. Manage.* **77,** 545–554 (2013).
40. Ferreras, P. & Macdonald, D. W. The impact of American mink Mustela vison on water birds in the upper Thames. *J. Appl. Ecol.* **36,** 701–708 (1999).

41. Roodbergen, M., van der Werf, B. & Hotker, H. Revealing the contributions of reproduction and survival to the Europe-wide decline in meadow birds: Review and meta-analysis. *Journal of Ornithology* **153,** 53–74 (2012).

42. Brown, D. *et al.* The Eurasian Curlew - the most pressing bird conservation priority in the UK? *Br. Birds* **108,** 660–668 (2015).

43. Brown, D. J. *International Single Species Action Plan for the Conservation of the Eurasian Curlew numenius arquata arquata, N. a. orientalis and N. a. suschkini. AEWA Technical Series* (2015).

44. Grant, M. C. *et al.* Breeding success and causes of breeding failure of curlew Numenius arquata in Northern Ireland. *J. Appl. Ecol.* **36,** 59–74 (1999).

45. Douglas, D. J. T. *et al.* Upland land use predicts population decline in a globally near-threatened wader. *J. Appl. Ecol.* **51,** 194–203 (2014).

46. Tharme, A. P., Green, R. E., Baines, D., Bainbridge, I. P. & O'Brien, M. The effect of management for red grouse shooting on the population density of breeding birds on heather-dominated moorland. *J. Appl. Ecol.* **38,** 439–457 (2001).

47. Thompson, D. B. A., Gillings, S. D., Galbraith, C. A., Redpath, S. M. & Drewitt, J. *The contribution of game management to biodiversity: a review of the importance of grouse moors for upland birds. Biodiversity in Scotland: Status, Trends and Initiatives* (Scottish National Heritage, 1997).

48. Newey, S., Mustin, K., Bryce, R., Fielding, D. & Redpath, S. Impact of Management on Avian Communities in the Scottish Highlands. *PLoS One* **11,** (2016).

49. Warren, P. & Baines, D. Changes in the abundance and distribution of upland breeding birds in the Berwyn Special Protection Area, North Wales 1983-2002. *Birds in Wales* **11,** 32–42 (2014).

50. United Nations Environment Programme. Rio Declaration on Environment and Development. *The United Nations Conference on Environment and Development* (1992). Available at: http://www.unep.org/documents.multilingual/default.asp?documentid=78&articleid=1163.

51. Eaton, M. *et al.* Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle on Man. *Br. Birds* **108,** 708–746 (2015).

52. Balmer, D. *et al. Bird Atlas 2007-11: the breeding and wintering birds of Britain and Ireland*. (BTO Books, 2013).

53. IUCN. *The Future of Sustainability: Re-thinking Environment and Development in the Twenty-first Century*. (2006).

54. GWCT. LIFE laser fence. Available at: http://www.gwct.org.uk/scotland/research/life-laser-fence/.

55. Short, M. J., Weldon, A. W., Richardson, S. M. & Reynolds, J. C. Selectivity and injury risk in an improved neck snare for live-capture of foxes. *Wildl. Soc. Bull.* **36,** 208–219 (2012).