Grouse Moor Management Review Group

Report to the Scottish Government

November 2019

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Chair's Preface

When I accepted the invitation from the Scottish Government to lead an expert review on grouse shooting, I had not fully appreciated the complexity of the issues involved, the passion with which contrasting views were held nor the length of time the review would require. In responding to that invitation two years later I owe a significant debt to the other five members of the Grouse Moor Management Group (Alison Hester, Alex Jameson, Ian Newton, Mark Oddy and Colin Reid), the four Specialist Advisers (Susan Davies, Calum MacDonald, Adam Smith and Des Thompson) and the Secretary to the Group (Karen Rentoul). All these individuals contributed to lively and robust discussions that informed my thinking and helped draft much of this report. I thank each of these individuals for their energy and commitment to this challenging task.

Grappling with the evidence in terms of raptor and upland ecology, environmental law, wildlife law and related police and judicial procedures, veterinary science, the socio-economics of Scotland's moorland, and much more besides, has proved a major challenge. But the opportunity to assemble a robust evidence-base on the key issues via written and oral evidence from many of the leading authorities and individuals working in this area has exposed me to a whole new literature which I have found both stimulating and thought-provoking. As a geographer and field scientist, I especially enjoyed and valued the opportunity to visit a variety of estates where grouse shooting occurs and, in one case, where re-wilding is under way.

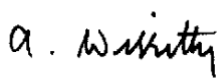
In retrospect, although we have attempted throughout to be evidence-led, it is striking how many significant evidence gaps remain and how much of the fundamental science is contested. Especially problematic has been the tension between the 'expert' knowledge of scientists reported in peer-reviewed sources and 'local' knowledge held by practitioners based in the field. Even projects designed to clarify the position, such as those at Langholm, have left a contested legacy. Our remit invited us to make recommendations to reduce the illegal killing of raptors but at the same time to give due regard to the socio-economic contribution that grouse shooting makes to Scotland's rural economy. Both topics have proved complex and problematic. Confirming the scale of the illegal killing of raptors is challenging and such criminal activity admits to no easy resolution. The socio-economic contribution to the rural economy of grouse shooting in isolation is very poorly understood, as are the consequences of any potential changes in land use.

In terms of proposing more sustainable land management practices that underpin the shooting of grouse (muirburn, managing Mountain Hares and using medicated grit) evidence-based recommendations are both more readily available and more robust. For each of these land management practices, we are agreed on

enhanced or new regulation which we see as transparent, accountable, consistent, proportionate and targeted only where needed. These properties underpin other recommendations in the report.

But our main recommendation on the licensing of grouse shooting proved more contentious. Because the evidence-base is so heavily contested, reaching a unanimous recommendation was fraught – personal opinions and values intervened. But we did agree that any decision on licensing is ultimately a political one in which wider societal views also need to be taken into account.

The Group was evenly split on whether or not to license grouse shooting. When, as Chair, I sought to exercise a casting vote in favour of the immediate introduction of licensing, this was contested by two members of the Group. In order to have a unanimous recommendation on this key issue with the authority that implies, the Group proposes a five year probationary period for specified raptors on or near grouse shooting estates to recover to a 'favourable' conservation status. Should this target fail to be achieved, then licensing should immediately be introduced. In that situation we all agree that licensing is the only way forward – a significant advance in terms of the debate given the wide spectrum of views within the Group and beyond. Ultimately, whether and when to licence grouse shooting are political decisions that rest with the Scottish Government. I hope this report will contribute to and inform that decision.



Alan Werritty

Chair: Grouse Moor Management Group

1. Executive summary

In May 2017 the Scottish Government's Cabinet Secretary for Environment, Climate Change and Land Reform, Roseanna Cunningham, announced the setting up of an expert group to look at managing grouse moors sustainably and within the law. This had been triggered by the publication of *Analyses of the fates of satellite tracked Golden Eagles in Scotland* (Whitfield & Fielding, 2017) a report by Scottish Natural Heritage (SNH), which recorded that 40 out of 131 young Golden Eagles had disappeared in suspicious circumstances over the period 2004-16, mostly in locations on or adjacent to grouse moors.

Our report represents the findings of that expert group on grouse moor management. It is divided into seven sections with one appendix and four annexes. Following an Executive Summary (**Section 1**), the main body of the report comprises background and context (**Section 2**), options for regulation (**Section 3**), summaries of scientific evidence (**Section 4**), recommendations (**Section 5**), proposals for the increased control of specified activities and associated recommendations (**Section 6**), and ends with an itemised list of all the recommendations (**Section 7**). An **Appendix** lists the arguments in favour and against licensing the shooting of grouse and four **Annexes** provide a list of published sources used in compiling the report, an account of how the review was conducted, a list of abbreviations used throughout the report, and a glossary.

The Review Group comprised six experts reflecting a broad and relevant set of interests – grouse shooting and estate management and academic research. This core membership was augmented by four Specialist Advisers chosen to widen the Group's overall competence. The Group met on eighteen occasions between January 2018 and July 2019, mainly at the Royal Society of Edinburgh, but also took evidence in the field from a variety of grouse shooting estates and one estate managed by a conservation charity. Evidence was gathered from specialist knowledge provided within the Group and its Specialist Advisers and augmented by contributions (both written and oral) from outside specialists. This was designed to gather as wide-ranging and balanced a view as possible on the key issues. Responses to a questionnaire circulated to key stakeholders provided further evidence, as did oral hearings with nine experts who collectively represented a wide spectrum of views on grouse shooting. In compiling the report we became very aware of significant gaps in key data: most notably the relationship between the recorded and actual number of incidents of illegal killing of raptors, current numbers and population trends of Mountain Hares and the socio-economic impacts of grouse shooting. The last issue is the subject of a separate Scottish Government study whose phase 1 findings we have noted.

Key findings from the review

1. Range of available regulatory systems

A wide range of regulatory mechanisms is available for improving the management of grouse moors. These range from self-regulation, financial measures and prohibition, through to licensing or permitting systems often involving Codes of Practice. Such measures are not mutually exclusive and can be adopted in a variety of combinations depending on the level of intervention sought and the

practicalities of their implementation. Ideally any newly introduced regulation should accord with the principles of Better Regulation and be transparent, accountable, consistent, proportionate, accessible, effective and targeted only where needed. In addition to regulation, better management can be promoted by accreditation schemes in which, rather than punishing bad behaviour, good behaviour is rewarded. Codes of Practice are already used in the management of grouse moors as a guide to best practice but with few legal sanctions for non-compliance. If such Codes are to 'have teeth', they need to be better integrated with one another and incorporate legal controls to the limits of acceptable behaviour beyond which sanctions can be applied.

2. Scientific evidence underpinning greater regulation

Raptor predation and persecution

Raptor numbers across Britain were greatly reduced in the 19th-early 20th centuries with five species eliminated altogether. Over recent decades numbers have substantially increased but most species still do not fully occupy their potential range. This is locally attributed to illegal killing, especially in some grouse moor areas. The major predators on grouse (Fox, Stoat, Weasel and Carrion/Hooded Crow) are routinely and legally killed on grouse moors leaving birds of prey as the principal remaining predators. The Joint Raptor Study on Langholm Moor showed that, in sufficient numbers, Hen Harriers can reduce the densities of grouse to such low levels that driven grouse shooting is impracticable. This may also to be true for Peregrines in some areas. During the subsequent Langholm Moor Demonstration Project, with mammalian predators and diseases controlled, 82% of the grouse kills found were attributed to raptor predation or scavenging. After nine years, the project was terminated as the grouse did not achieve sufficient numbers to be shot on a commercial driven basis. In an attempt to reduce grouse predation by raptors we are not convinced that, applied on a wide scale, diversionary feeding is a cost-effective management tool as the known and potential disadvantages out-weigh the advantages, although others disagree.

Muirburn

A favoured management tool for centuries, muirburn comprises the controlled burning of vegetation to provide young, more nutritious shoots for grouse and other species, and to destroy regenerating trees, thereby maintaining open moorland. Muirburn is currently regulated by the Scottish Government's *Muirburn Code* designed to promote best practice and minimise the likelihood of detrimental impacts. Given the absence of a robust system of monitoring compliance, it is not currently possible to assess the effectiveness of the *Code* which has few statutory provisions. In addition to the above impacts, muirburn affects biodiversity, soil stability and hydrology. Both positive and negative effects on all these components of the system have been recorded – in general terms most positive effects of muirburn have been recorded in dry heathlands and most detrimental effects in wet heaths and peatlands. Fires of greater intensity appear more likely to have detrimental effects, but there is much disagreement in the literature and many knowledge-gaps. The relationships between muirburn and wildfires are also poorly understood and the subject of current scrutiny. Given the increased risk of intense, damaging wildfires under climate change, it is critically important to introduce

comprehensive muirburn monitoring and ensure compliance with best practice, underpinned by robust scientific evidence, to minimise risk of damaging effects and address potential benefits such as the reduction of fuel loads.

Mountain Hares

Mountain Hares are fairly widespread in Scotland and strongly associated with heather moorland, including areas managed for driven grouse shooting where their populations are sometimes harvested and controlled. The number of hares shot during the open season is not regulated, but land managers are expected to exercise restraint, in view of obligations under the EC Habitats Directive. The Mountain Hare is on the Scottish Biodiversity List with the UK Joint Nature Conservation Committee (JNCC) report to the EU for 2013-18 reporting Mountain Hares as being in an "unfavourable-inadequate" conservation status. The current lack of a standardised method for counting Mountain Hares, coupled with no mandatory formal monitoring of populations, makes determining the conservation status of Mountain Hares problematic. All published estimates of Mountain Hare numbers in Scotland to date are at least partially based on ancillary data and primarily non-hare-specific surveys. In terms of the impact of sport shooting on hare populations, it is widely assumed that the numbers of hares killed for sport shooting probably have a limited effect on Mountain Hare conservation status – an assumption that cannot currently be tested on the very limited evidence available. There is no substantive evidence to support the population control of Mountain Hares as part of tick and/or Louping Ill virus control to benefit Red Grouse.

Medicated grit

Cyclical fluctuations in grouse numbers with peaks every 6-9 years caused by the presence of the strongyle worm in the gut can be suppressed by the use of quartz grit coated with the wormer flubendazole. Introduced in 2007, this medication enables grouse numbers to be maintained at a consistently higher level than hitherto. The use of medicated grit is controlled by the Veterinary Medicines Regulations 2013 with Guidance Note 13 on the use of Cascade and the Wildlife & Countryside Act 1981. When used correctly, flubendazole has proved highly effective in reducing endemic strongyle worm levels in grouse guts with residues in food for human consumption presenting a very low risk. The dosage supplied to birds must be determined by a veterinary prescription reflecting the current worm burden in the grouse in terms of health and breeding success. Not all estates routinely determine worm burdens: some use medicated grit as an insurance and others continue to treat worms against perceived wider risks to the grouse population from weather, predators and tick-borne disease. Land managers must also ensure that no drug is ingested 28 days before the grouse are harvested. There is some evidence that prescription levels are too high, that gritting holidays are not always observed, and that grit may not always be withdrawn from grouse at least 28 days before Red Grouse enter the food chain. At present there is little evidence of a resistance problem with the use of medicated grit, but there is some evidence that flubendazole is toxic to aquatic organisms.

3. Option of licensing grouse shooting

Licensing is widely seen as an option for regulating grouse shooting and is specifically included in the remit for the review. The lack of an agreed definition of the term 'grouse shooting businesses' as referenced in our remit means that, should licensing be introduced, a clear target must be identified. Licensing can be used to control specific activities such as muirburn to control their potential adverse impacts, or to provide wider oversight of the activity of grouse shooting, which is a driver for these specific management activities and for illegal killing of raptors. In promoting the more sustainable management of grouse moors, licensing schemes represent one possible approach for stronger regulation of muirburn, the management of Mountain Hares and the use of medicated grit. If licensing were to be introduced, SNH should be the licensing authority using procedures allowing for both individual and general licences (as currently used for the control of corvids) and with scope for any initial licensing scheme to be amended as required in response to changing conditions, behaviour, knowledge and understanding of risk. In terms of enforcement options, SNH should have powers comparable to those available to the Scottish Environment Protection Agency (SEPA) which provide fixed or variable monetary penalties to be imposed as an initial response, but with the potential to escalate to criminal prosecution in the event of serious, deliberate or persistent breaches of the law.

4. Recommendations

All recommendations on licensing are based on scientific evidence and with due regard to the contribution that grouse shooting makes to the rural economy in sparsely populated areas. On whether or not to introduce licensing for the activity of shooting grouse, the Group was evenly split (with arguments for and against detailed in Appendix 1). In light of this, and with the Chair choosing not to exercise a casting vote, **we unanimously recommend that a licensing scheme be introduced for the shooting of grouse if, within five years from the Scottish Government publishing this report, there is no marked improvement in the ecological sustainability of grouse moor management, as evidenced by the populations of breeding Golden Eagles, Hen Harriers and Peregrines on or within the vicinity of grouse moors being in favourable condition**. This recommendation, whilst science-based, also reflects values and opinions that differ across members of the Group. Ultimately, whether or not to license the shooting of grouse is a political decision. We further recommend additional regulation for the land management practices of muirburn, managing Mountain Hares and the use of medicated grit. For muirburn we propose licensing; for the management of Mountain Hares we propose increased legal regulation; and for the use of medicated grit we propose a voluntary Code of Practice. Should the proposals on Mountain Hares and medicated grit prove ineffective, we further recommend that all three land management practices be licensed. Should the above recommendations on licensing be accepted by the Scottish Government, the resulting SNH register of grouse shooting activity would fill a major evidence gap.

In addition to the specific recommendations on licensing and increased regulation, we make a wide range of other recommendations arising directly from the

summaries of scientific evidence (Section 4) and other information gathered during the review. Issues covered in these recommendations include new and enhanced Codes of Practice, training for land managers on relevant land management activities and the promotion of best practice via an accreditation scheme. In terms of incentives, we recommend that a wider range of moorland management activities become eligible for Rural Payments and Inspections Division (RPID) support. The illegal killing of raptors is targeted via a series of recommendations which include: more thorough regulation of the fitting and use of satellite tags coupled with more expeditious sharing of information; and enactment of proposals in the 2015 Wildlife Penalties Review Group on levels of fines and custodial sentences, alternative penalties and sentencing guidelines. To support our specific recommendations on the use of muirburn, management of Mountain Hares and the use of medicated grit, in Section 6 we also explore in detail how these recommendations might be made operational.

A consolidated list of our recommendations is provided in Section 7.

2. Background, terms of reference and context

The Red Grouse flying fast and low over open moorland is the ultimate test of a hunter's skills and reactions. From the mid-19th century onwards it became the most prized quarry for those who shoot game and, for the season opening on 12th August (the Glorious 12th), continues to attract many visitors each year to Scotland from other parts of the UK and abroad. Red Grouse are not 'produced' under the rear-and-release system used for lowland game birds. Accordingly, grouse moors are managed to raise grouse densities to a level that will yield a 'sustainable surplus' for shooting. This involves heather burning, predator control, disease management using medicated grit, and tracks for improved access; in the past, it also involved land drainage. In recent years, the sport of grouse shooting has attracted an increasingly polarised debate. Some claim that grouse moors provide a significant contribution to the rural economy, providing both employment and income in areas where alternatives are scarce. Others identify a link between raptor persecution and grouse moors and claim that the associated land management practices are environmentally damaging. Less contentious are the various benefits that arise from protecting open heather moorland including the associated biodiversity, evidenced by some moorland birds and other mammals.

Why the need for a review?

For many years conservation groups have reported the number of raptors over grouse moors to be lower than expected. It was inferred that in at least some estates predator control included the illegal killing of raptors. This inference is supported by the frequent finding of poisoned baits and poisoned birds, traps and other signs of illegal activity. Some of the land management practices necessary to sustain a viable grouse shoot – in particular muirburn and the use of medicated grit – have also been challenged as being potentially damaging to the environment and in the latter case, possibly affecting the food chain. Shooting of large numbers of hares on some estates has also received much attention in the media. The actual definition of a 'viable' grouse shoot has also been debated, and there is widespread acknowledgment of substantial investment of private income in 'driven' grouse shooting.

In May 2017, following the publication of SNH's report *Analyses of the fates of satellite tracked Golden Eagles in Scotland,* (Whitfield & Fielding, 2017) which recorded that 40 out of 131 young Golden Eagles had disappeared in suspicious circumstances between 2004 and 2016, mostly in areas of grouse moors, the Cabinet Secretary for Environment, Climate Change and Land Reform, Roseanna Cunningham, announced the setting up of an expert group to look at managing grouse moors sustainably and within the law. She confirmed that, in response to a request from the Environment, Climate Change and Land Reform Committee, the group would also advise on the option of licensing grouse shooting businesses. In the same ministerial statement the Cabinet Secretary announced that she would commission research into the costs and benefits of large shooting estates to Scotland's economy and biodiversity. This research has since been reported in the Scottish Government's *Socio-economic and biodiversity impacts of driven grouse*

moors in Scotland (Thomson, McMorran & Glass, 2018). The Review Group much regrets the delay in commissioning phase 2 of this research anticipated to produce more authoritative and precise estimates of the socio-economic benefits of driven grouse moors. As a result, the task of balancing the issue of tackling wildlife crime with the contribution that grouse moor management makes to the rural economy has proved very difficult.

In January 2018 an expert group was set up comprising:

- Professor Alan Werritty, University of Dundee (Chair)
- Professor Alison Hester, James Hutton Institute
- Mr Alexander Jameson, independent consultant
- Professor Ian Newton, formerly Centre for Hydrology and Ecology
- Mr Mark Oddy, independent consultant, Chair of the Langholm Moor Demonstration Project
- Professor Colin Reid, University of Dundee

The expert group, subsequently referred to as the Review Group, was assisted by the following Specialist Advisers:

- Ms Susan Davies
- Mr Calum MacDonald
- Dr Adam Smith
- Professor Des Thompson

The Specialist Advisers were appointed on the basis of their knowledge and expertise on issues arising from the Review Group's remit. In undertaking this task, they should not be seen as reflecting the views of their present or past employers.

Secretarial and administrative support for the work of the Group was provided by Ms Karen Rentoul (SNH).

Terms of reference

The terms of reference for the Review Group were:

> *To examine the environmental impact of grouse moor management practices such as muirburn, the use of medicated grit and mountain hare culls and advise on the option of licensing grouse shooting businesses. In doing so it will look at what can be done to balance the Government's commitment to tackling wildlife crime with grouse moor management practices, so that this form of management continues to contribute to our rural economy, while being sustainable and compliant with the law.*

The Group was also invited to consider other topics relevant to grouse moor management, referred to it by Government, or raised by the Chair. At its first meeting the Group reviewed its terms of reference and explored whether or not to expand them to include the draining of grouse moors and the expansion of tracks across grouse moors. It was agreed that the original terms of reference were

appropriate and that extending them further ran the risk of diluting the primary focus of the review.

During its deliberations, the Group took evidence from key stakeholders from various organisations and conducted a questionnaire survey to canvass the opinions and experience of a wide range of interested parties. The Group also visited a number of grouse moors to see their management at first hand. A more detailed account of these activities, and of how the Group undertook the review, is given in Annex 2.

Organisation of review and structure of the report

The report is organised into seven sections with one appendix and four annexes:

1. Executive Summary
2. Background, context and terms of reference
3. Options for regulation
4. Summaries of scientific evidence on raptor persecution and predation, muirburn, Mountain Hares, and use of medicated grit
5. Recommendations
6. Increased control of specified activities and associated recommendations
7. Recommendations: consolidated list

Appendix –

1. Licensing grouse shooting: arguments in favour and against

Annexes –

1. List of published sources
2. Account of how the review was conducted
3. List of abbreviations
4. Glossary

Having explored the context for the review, the remainder of this introductory section examines a number of key issues explored in more detail during the review process:

- Definition of a grouse moor
- Extent of illegal practices
- Impact of wider changes in land use and habitat
- A 'natural' landscape?
- Complexity
- Conflict
- Inconsistency
- Need for clarity and focus
- Fragmentation

The succeeding sections (3 to 6) are ordered in a sequence that moves from examining options for regulation, through the science needed to underpin regulation, to specific recommendations on new forms of regulation and ways in which these recommendations might be enacted.

Section 3 explores a wide range of regulatory approaches for grouse shooting businesses ranging from education and persuasion through to licensing and permitting systems. Options considered later in the report are then outlined: no change to existing legal regulation; improving the effectiveness of existing law; direct prohibition; Codes of Practice; financial incentives and licensing. **Section 4** then summarises four areas of science specifically related to our remit: raptors and predation, muirburn, the management of Mountain Hares and the use of medicated grit. The summaries of the scientific evidence in these areas, coupled with our evaluation of a wide range of regulatory options, underpin the main recommendations of the Group itemised in **Section 5**. Selected recommendations

in the report relating to muirburn, the management of Mountain Hares and the use of medicated grit are then examined in greater detail in **Section 6**. This section concludes with recommendations on the use of traps and training for estate managers and their staff. **Section 7** provides a summary itemising all the recommendations.

As noted in Section 4, the Group relied on a wide range of materials in compiling its evidence-base including written sources. For stylistic reasons and to ease reading the report, it was decided generally not to quote references in the text but to list them, itemised under appropriate headings, in Annex 1. In accordance with normal practice, legal sources (both national and international) are not referenced as these are readily accessible via the internet. Throughout the report we have adopted the convention to capitalise the names of individual species (e.g. Red Grouse), but to use lower case when the reference is generic (e.g. grouse populations).

Context for the review

History

From the 1750s onwards the sport of 'walked-up shooting' emerged. Grouse were flushed, often by dogs, and shot using muzzle-loading guns providing both food for the table and outdoor exercise – a form of grouse shooting that with modern guns continues to this day. In 1831 the Game Act confirmed the landowner's exclusive right to take grouse and other game on their land, thereby incentivising management with the aim of enhancing habitat, reducing disease and predation pressure and thus producing sustainable and more consistent bags. From the 1850s onwards, with the invention of the breech-loading double-barrelled shotgun, the manner in which Red Grouse could be shot changed radically. Now the shooters could fire at more frequent intervals as the birds were driven towards the stationary shooters in a line of butts, thereby giving rise to 'driven grouse shooting'. This is now the dominant mode of grouse shooting and, with appropriate management, yields more consistent and sustainable bags than had previously been possible.

The popularity of grouse shooting and associated bags has varied markedly since the 1850s reflecting changing demand and the profitability of alternative land uses, notably sheep-grazing or plantation forestry. Bag sizes per unit area peaked in the late 19th and early 20th centuries, declining during the First and Second World Wars when gamekeepers were away on war service. Recovery to 1974 was followed by a decline from which some moors have more recently returned to bag sizes at late 19th century levels. But in general, since the late 19th century, the area of moorland managed for shooting grouse has declined. Where this has occurred, heather has tended to give way to grass under more intensive sheep-grazing and to new tree plantations. An example of the significant decline in the number of grouse moors is in South West Scotland where the more than 100 properties that shot grouse before 1914 were reduced to a handful by 2019. Similar pressures resulted in the complete disappearance of driven grouse shooting in Wales. By contrast, the Northern Pennines grouse moors have long reported much larger bags than in

Scotland. Where there is still open land, heather restoration is possible if grazing is restricted, but as the Langholm Moor experiment has demonstrated, this can be an expensive and lengthy operation, especially if the aim is to re-establish a functioning grouse moor. The range contraction of 11% for Red Grouse in Scotland reported by the British Trust for Ornithology (BTO) between 1970 and 1990 is attributed to increased grazing pressure, tree-planting, reduction in the numbers of gamekeepers and an increase in the numbers of predators. As a consequence of these pressures, for estates that continue to provide driven grouse shooting, a pre-shooting target of at least 150 to 200 grouse per km^2 is considered desirable. This can only be achieved by actively managing grouse and their habitat as a sustainable wild bird ecosystem.

Ecology

Uplands cover around two thirds of Scotland's land area, with almost 15% of the land area being heather-dominated moorland – the ideal habitat for grouse and a EU priority habitat of which 75% is found in the UK. The Scottish Moorland Group estimates that less than 7% of Scotland's land area has some component of grouse moor management. Grouse moors are typically found on hills on which heather grows well on the drier flanks but less well on the blanket peat and wetter summits. The dominant easterly distribution of grouse moors in Scotland reflects the optimal combination of hills with a climate and geology that favour both heather and grouse. Effective predator control is an integral part of grouse management. This practice can also benefit some other species – most notably waders such as Curlew, Golden Plover and Lapwing which can be locally abundant; and Mountain Hares, for which the combination of predator control, good food source (young heather shoots) and cover (older heather) is considered highly beneficial. Black Grouse and ground-nesting raptors (Hen Harriers and Merlins) can also benefit. Predator control can have agricultural benefits where lamb losses are reduced; but predator control on isolated grouse moors can be more difficult on account of the continuing influx of predators from surrounding areas where the predators are largely left undisturbed. Other management activities associated with grouse moors also impact on the ecology of these and neighbouring areas, as detailed later in the report.

Socio-economic impacts and alternative land uses

Obtaining robust and reliable estimates of the contribution made by grouse shooting to the rural economy has proved difficult. The most recent and detailed summary of past research to date is the Scottish Government's report *Socio-economic and biodiversity impacts of driven grouse moors in Scotland* (Thomson, McMorran, & Glass, 2018). However, the authors urge caution in interpreting their key findings as they are derived from a narrow evidence-base in which data collection was inconsistent. In addition, the lack of a definitive data set based on a representative sample of estates engaged in grouse moor management makes it impossible to extrapolate the findings to the whole sector. Despite these qualifications, the report states that, on the basis of the existing database, in 2009 the grouse moor sector supported around 2,640 FTE jobs (both direct and indirect) with £14.5 million spent on wages, grouse moor management and support

services. This yields a total Gross Value Added £23 million contribution to the Scottish economy annually, concentrated in rural areas where there are considered to be few other economic opportunities. More recent data collected by the Scottish Moorland Group suggests that more intensively managed estates have an average annual wage bill of £210,000 and support suppliers (often rurally located) with around £515,000 of annual expenditure. Income from grouse shooting varies greatly reflecting the mix of private versus commercial shooting and whether the shooting is walked-up or driven. Active moorland management practices can increase the annual grouse bag enhancing the capital value of the estate (£5,000 per brace in capital terms). In assessing the socio-economic contribution of grouse shooting to the rural economy it must be recognised that grouse moor management and shooting are often only one part of a much more diversified and closely integrated business enterprise. Differing land management activities may be undertaken on the same piece of ground and staff also partially deployed elsewhere for activities unrelated to grouse shooting.

As part of our evidence gathering activities, the Group undertook its own survey of the economic impact of grouse shooting based on 16 estates, 13 driven and 3 walked-up. We had access to very detailed account information for which we thank the participants. The key findings were:

- Only one grouse enterprise made a small profit; all the rest were loss-making and reliant on substantial private investment;
- The average investment (revenue and capital) was £183 per ha across the estates. This compares with a typical sheep farming business of £50 per ha, but which includes approximately £25 per ha of public subsidy;
- On the 16 grouse moor estates that provided information, the average labour unit was 1 FTE gamekeeper per 704 ha, compared one FTE shepherd per 4,046 ha;
- Capital expenditure, often high in the first 5-10 years, can make significant contributions to the local economy;
- On driven grouse moors, the employment of casual labour to help with the shooting activities can be significant to the local economy, often employing up to 100 casual staff over the whole season with approximately 30 employed on each day of shooting throughout an average season.

Finally, analysis shows that post-breeding grouse density on driven grouse moors is less than half on Scottish moors compared with those in England. The last five-year averages were 143.4 grouse/per 100 ha Scotland, 316.4 grouse /per 100 ha England (2014-18).

Several recent attempts have been made to quantify the socio-economic impacts of alternative land uses on moorland areas. On some estates, these focus on re-wilding and conservation measures largely underwritten by funds provided by the landowner or by the members of environmental NGOs. In order to be economically viable, other alternatives, such as farming, forestry and renewables often rely heavily on public payments in the form of grants or subsidies. For these alternative land uses other factors such as biophysical constraints (e.g. for farming, forestry and woodland management, wind energy and housing) and regulatory controls

(e.g. for wind farms, forestry and woodland management) mean they can only be developed where they are either permitted (planning and related controls) or viable (biophysical constraints). Extrapolation of the value of these alternative land uses across Scotland's moorland requires careful regard to be given to these various constraints. At present, as a result of grants or subsidies, the afforestation of moorland, where feasible, is more profitable for the owner than retaining the moorland for Red Grouse. The majority of grouse moor enterprises are not profitable but still contribute significantly to the local economy even in a season when there is no shooting. Grouse shooting is seasonally inconsistent and generally loss making and as a result is more vulnerable than other more profitable land uses to any negative changes in the natural or regulatory environment.

As a result of the delayed Phase 2 Report on alternative land use options, the Group cannot definitively compare alternative land uses to grouse moor management. However, the economic contribution from grouse moors undoubtedly makes a valuable contribution to some remote local communities. The long-term private investment attracted by grouse moors, and willingness to bear financial losses, is unlikely to be repeated for other activities. Unlike other upland land uses, neither grouse shooting nor deer stalking are subsidised from the public purse. According to some members of the Group, if grouse shooting were subject to a licensing scheme, it may become fragile and face an uncertain long-term future. Re-wilding can make a useful contribution, but in terms of geographic coverage or national economic contribution this is not currently considered to be a realistic alternative, at least in the short-term. But this could change based on the current growth in this type of activity in Scotland.

Key issues underpinning the review

Definition of a grouse moor

A major challenge in undertaking this review was the lack of definition of a 'grouse moor' and the absence of official information on the number of estates on which grouse shooting occurs. We estimate that the current number of grouse shooting estates in Scotland is around 120 but note that this includes great diversity in both the size and level of investment in individual grouse shooting businesses. We welcome the publication of grouse butts density maps in the *Socio-economic and biodiversity impacts of driven grouse moors in Scotland part 3* report (Matthews, Miller, Mell & Aalders, 2018). These maps derived by a GIS analysis of the presence of shooting butts provide the first spatially referenced record of intensity (but not area) of driven grouse shooting across Scotland. We note that the strip muirburn maps produced by the Royal Society for the Protection of Birds (RSPB) also provide an important indicator of the extensive presence of grouse moors (driven and to a lesser degree, walked-up). The lack of accessible records of grouse shooting enterprises continues to hinder the collection of key statistics on both their environmental footprint and their contribution to local and national economies.

Extent of illegal practice

In undertaking our review a key issue was whether or not criminal practices are widespread across grouse shooting estates. Against the general background of

regulation that applies more widely, including the killing, injuring and disturbance of raptors, specific activities which are illegal are undertaking muirburn outwith the designated season or without giving due notice to neighbouring estates, and using medicated grit contrary to the Veterinary Medicines Regulations 2013. At present few convictions arise from these actions prohibited by law on account of difficulties in obtaining the necessary evidence to support a prosecution. This is especially true for the illegal killing of raptors. Although the number of convictions has declined since the turn of the century, there are strong grounds for inferring higher levels of persecution than is apparent from the current number of convictions. The number of detected poisoning incidents has declined, but it is alleged that offenders are resorting to shooting, especially at night (aided by improved and readily available night-vision equipment) and being more thorough in the disposal of carcasses and other evidence.

Impact of wider changes in land use and habitat

The Red Grouse is one of many key species on Scotland's moorlands whose population level is subject to wider changes in land use and habitat. Major drivers for such change include government policy and the impacts of climate change. In terms of the former, Scotland's forest area is projected to increase to 21% by 2032 (by planting an additional 15,000 ha per year) and it is planned to restore 250,000 ha of degraded peatland by 2030. Both targets are likely to generate significant changes in moorland use and habitat with effects on the numbers and coverage of grouse moors. Other policies potentially impacting to a lesser extent on grouse populations are the Scottish Government's land reform agenda, progress towards biodiversity Aichi targets and encouragement of more outdoor recreation. Climate change (higher temperatures in summer and winter, increased winter rainfall but decreased summer rainfall, and more frequent and more extreme rainfall events) is already impacting on Scotland's moorlands and wildlife. Likely effects specifically on grouse populations include:

- Direct impacts of severe wet weather on grouse clutches and broods and indirect effects resulting from reduced foraging time;
- Loss of plant and invertebrate food if blanket bog and other habitats dry out in the drier summers;
- Increased risk of wildfires adversely affecting vegetation and peat soils;
- Loss of some moorland edge areas as changing climate conditions permit their more intensive agricultural use;
- Greater risks of some wildlife diseases notably helminths and vector-borne diseases transmitted by increasing populations of ticks.

A 'natural' landscape?

Heather moorland – admired by tourists in high summer when the hills appear to be covered in a purple haze – is not the natural vegetation on much of Scotland's hill country. Within the climatic 'forest zone', much of Scotland's heather moorland is the product of centuries of burning and other management, initially through deforestation and fire (some of it natural), and then for the grazing of livestock (sheep, cattle and goats) and, since the mid-19th century, also for the shooting of

grouse. Relaxation of this active management, allowing the vegetation to revert to natural forest would likely yield a different landscape over much of Scotland from that of today's open moorland. In some locations natural regeneration of the native woodland up to the former tree line is already well under way with consequent gains and losses for species diversity dependent on different habitats. The moorland landscape associated with grouse shooting is thus largely a 'cultural' landscape in which muirburn alongside other management activities are essential for its perpetuation.

Complexity

Against this complex background, the increased public awareness of certain management practices – predator control, culling of Mountain Hares, building or upgrading tracks to improve access and the introduction of medicated grit – and especially the associations made between raptor persecution and grouse moor areas, combine to result in the debates over the benefits or otherwise of grouse shooting being highly contested. In terms of ecology, many species in addition to grouse (notably waders) benefit from prevailing management practices, while predators do not; but many smaller impacts are less well understood. The paucity of robust, scientific evidence on the environmental and socio-economic impacts of many of these management activities has been one of the most striking findings in this review. Given this imperfect understanding of key factors that determine the impacts of grouse shooting – in ecological, economic, social and cultural terms – it comes as no surprise that this complexity makes for an often highly heated debate, in common with debates over the impacts of many land management practices or extractive uses of natural resources (e.g. fishing). Overlaying this is the issue of 'values' – what is deemed environmentally unacceptable to some is viewed as beneficial to others. Values set the tone and fabric of much of the debate around the evidence-base, and we are mindful of this. What is environmentally sustainable can depend on the values attached to 'nature' and biological science and the elements within economic and socio-cultural appraisals.

Conflict

Taking evidence from the published literature, plus answers to our stakeholder questionnaire and oral responses from invited experts, exposed us to the passion and conflicting views held by protagonists on both sides of the debate. This was vividly apparent in the rhetoric used by those who would ban grouse shooting outright and by those for whom the *status quo* with minor adjustments is considered to be all that is needed. Such language coupled with the use of social media has exacerbated commitment to entrenched positions on both sides of the debate. It has also inhibited the realisation that alternative views can be both credible and evidence-based. This stand-off also needs to be placed within the context of the perception of a lack of sympathy for the sector by successive governments post devolution.

As already noted, gaps in the scientific evidence and the contested nature of much that has been published – most notably the tension between the *expert* knowledge of scientists versus the *local* knowledge of gamekeepers and other land managers – further intensifies the debate. Another key issue is the apparent conflict between

findings reported at a local/regional scale and those at the national scale. Thus, Golden Eagles, whilst recovering well at the national scale, are under-represented in those parts of their range containing grouse moors. Whilst we have sought to be as thorough as possible in our review of the available evidence (see Annex 1), significant gaps remain, as the science summaries below demonstrate. Throughout we have sought to make our recommendations evidence-led, but in places we have had to exercise collective 'expert judgment'.

Inconsistency

In taking evidence, we have also been aware of many inconsistencies, both at an individual and corporate level, that conflate key aspects of the debate. Thus, the impression is that the public's view of different species may, for example, favour Hen Harriers on open moors, but have qualms about Sparrowhawks feeding at bird-tables. Within wildlife law there is internal inconsistency in the range and level of penalties that can be imposed and in relation to the need for corroboration, and further inconsistency when comparisons are made with the regulatory and enforcement structures available in other areas of environmental law, e.g. to SEPA. Under current EU support for farming, state financial aid for agriculture and forestry is both extensive and well established. By contrast, moorland estates have recently had only limited support for their farming activities via agricultural subsidies and Agri-Environment schemes. Regulation of the shooting of game birds should also be more sensitive to the contrasts between lowland shooting and grouse moor shooting. The former mainly involves the use of birds that have been reared in captivity, in some ways treated as an agricultural product. The latter involves managing land to produce a shooting surplus of wild birds each year, albeit with medication administered to these wild birds. Within conservation law, there can also be difficulties in responding when management of a species in need of protection poses a threat to other species in a more precarious position (e.g. Pine Martens predating on Capercaillie) or the increasing abundance of a formerly rare species gives rise to conflicts with other priorities.

Need for clarity and focus

As noted in SNH's *Review on Sustainable Moorland Management* (Werritty, Pakeman, Shedden, Smith & Wilson, 2015, p. 4) "there is no shared vision or strategy for Scotland's moorland, beyond that enshrined in legislation and Government policies, and there is a sense of stasis in thinking and ambition over how to develop a programme to sustain Scotland's moorlands". There is clearly a need to develop a shared vision collectively across key stakeholders, linking with other initiatives both general (e.g. land reform policy, forestry strategy) and specific (e.g. the forthcoming report of the Deer Working Group).

Fragmentation

Fragmented provision of regulation bedevils the better management of grouse moors. Guidance in terms of Codes of Practice and Best Practice exist: specifically the Scottish Government's *Muirburn Code*; Scotland's Moorland Forum's *Moorland Management Best Practice* which contains advice on Mountain Hare management and worm control; and a range of guides from the Game & Wildlife Conservation Trust (GWCT) and the British Association for Shooting and

Conservation. Much of this guidance is voluntary and includes very few actions prohibited by law. Because these codes are largely voluntary there are also no duties placed on a public body to monitor compliance. Co-ordinated Codes of Practice with clearly defined responsibilities on grouse shooting estates and a designated public body to monitor compliance is urgently needed. Where legal controls apply, they are again fragmented, with EU measures playing an important part in relation to wildlife and the legislation subject to many amendments over the years making it difficult to keep track of the current provisions.

3. Options for regulation

Regulatory approaches

In general, when it is considered that there should be intervention to prevent or limit unacceptable behaviour, there are several options which can be adopted. These are not mutually exclusive and most regulatory systems involve more than one approach. The choice of regulatory approach depends on the level of intervention desired and the practicalities of making use of different legal mechanisms. Many of the activities involved in managing a grouse moor are already regulated to some extent by one or more of these approaches. Options include:

Education and persuasion: Efforts to change behaviour are made by raising awareness of the negative consequences of the undesired behaviour and explaining the sort of conduct expected by society, possibly supported by formal and informal education and training for those most directly concerned. No sanctions are available against those who do not comply.

Self-regulation: Again there are no sanctions for non-compliance, but there is a more concerted effort to use peer and public pressure to secure the desired results. Accreditation schemes and voluntary Codes of Practice can help to define what is expected.

Financial measures: These can provide tangible incentives to behave in the way desired and disincentives against undesired behaviour. These can take the form of stand-alone measures, such as the provision of grants to support particular desired activities, or be integrated into wider financial measures such as taxation or support for a sector of industry.

***Prohibition*:** It can be made a criminal offence to carry out particular conduct. That conduct must be precisely defined so that it can be proved in court whether or not an accused person has acted in the proscribed way. The definition of the prohibited conduct may require proof of deliberate or knowing wrong-doing and may cover an activity whenever and however undertaken or only when carried out in specific circumstances (e.g. hunting during a specified close season). Where it is difficult to detect or prove commission of the main crime, offences may target related activities, e.g. simply possessing specific poisons or eggs.

Licensing or permitting systems: These build on prohibitions by providing that an activity that is prohibited may nevertheless proceed lawfully when permission has been granted by the relevant regulatory body. Most commonly, licensing schemes require an individual application and express grant of a licence, but licences can be granted automatically where prescribed criteria are met. The licence may contain conditions (a standard set applied in all cases or bespoke conditions for the individual case) that must be observed in order for the activity to be lawfully authorised. In view of the costs involved in operating a licensing system, it may also entail fees and charges, for applications, for the grant of a licence and/or annual subsistence fees.

Under the Wildlife and Countryside Act 1981, another style of licence is used, the 'general licence' whereby everyone who falls within a specific class and acts within the limits of certain conditions is automatically granted a licence (e.g. although collecting birds' eggs is prohibited, occupiers of land are authorised under a general licence, without having to apply individually, to clear unhatched eggs from nest-boxes during certain months outside the nesting season). The modification or withdrawal of a licence can be a sanction in itself, but still requires a clear evidential basis where this has a substantial effect on the licence holder. The licensing scheme under the 1981 Act allows for a general licence to be withdrawn from sites or individuals where there is reason to believe that the terms of the licence have not been observed. The structure of general binding rules, notifications, registrations and permits available to SEPA under the Environmental Authorisations (Scotland) Regulations 2018 offers a further model for a permitting system which allows activities to be regulated without an individual permit being required in every case.

All regulatory options will entail different costs to operators, regulators and monitoring bodies. The costs of managing and monitoring the regulatory system can be met by the public purse, as one of the many services provided by government, or attempts can be made to recover these in whole or part through fees and charges on those carrying out the regulated activity, increasing the burden on them.

Codes of Practice: In various areas of activity Codes of Practice are used or proposed, but it is important to be clear about the status of any Code. Sometimes Codes are part of an approach based on education, persuasion and self-regulation, providing a guide to best practice but with no legal sanctions for non-compliance. A voluntary Code of this sort can still 'have teeth', but only if there is widespread confidence that breaches of the Code will be detected and some meaningful consequences follow, e.g. loss of accreditation that is commercially crucial since it enables premium prices and market access. Other Codes are integrated into legal controls, helping to define the limits of acceptable behaviour, beyond which sanctions can be applied. The existence of legal measures directly controlling the relevant conduct is a prerequisite for a Code to 'have teeth' in this more formal way.

In some contexts there are references to 'statutory Codes', but again it is important to be clear what is in mind. A Code can be 'statutory' in the sense that there is a legal duty on a specified body to produce a Code, but without it having any direct legal weight; or it can be given legal consequences, either guiding the discretion of a regulatory body and/or court or helping to define what is acceptable or unacceptable behaviour, with legal sanctions flowing from that.

Human Rights: Any regulation of the way in which the owners can use their land is an encroachment on their right to the "peaceful enjoyment of possessions" under the Human Rights Act 1998. The owner's right to use their land as they wish in the absence of existing regulation is thus protected, and this includes the right to damage or destroy the property (except where statute has intervened or the rights

of others are adversely affected). This right, however, is not absolute and can be limited where "deem[ed] necessary to control the use of property in accordance with the public interest"; environmental regulation has been accepted as an interest that justifies intervention. The overwhelming majority of challenges to regulatory controls on the basis of interference with the right to property fail, but the intervention must be clearly set out in the law and be proportionate, which requires that the legal measures imposed do fulfil the stated legislative objective and encroach on the rights no further than is necessary to accomplish that objective.

Options for consideration

No change to existing legal regulatory structure

Without introducing any changes to the formal regulatory structure, a higher profile could be given to ensuring the sustainable and lawful management of grouse moors, through publicity, the opportunity for training for relevant staff and the development of voluntary Codes of Practice and accreditation schemes.

There could also be a greater willingness to consider using existing legal measures. Examples include reviewing whether changing ecological conditions (such as the decline in nesting wader populations) mean that more grouse moors now meet the scientific tests to qualify for a statutory conservation designation, e.g. Sites of Special Scientific Interest, that may both impose some further regulation and open the opportunity for financial support for management activities. The potential to limit or grant general or specific licences might be more fully exploited in cases where birds are causing or suffering difficulties. Where seriously harmful acts occur, e.g. muirburn that damages a substantial area of valuable habitat, consideration could be given to use of the offence under s.40 of the Regulatory Reform (Scotland) Act 2014, which punishes those who act or fail to act, or permit another person to act or not act, in a way that causes, or is likely to cause, significant environmental harm.

Improve the effectiveness of the existing law

The primary focus of attention, the killing or control of raptors, is already unlawful, but the law is proving ineffective because of the difficulties in detecting direct harm, identifying the offenders and gathering sufficient admissible evidence for prosecution. Improving the effectiveness of the existing criminal law might resolve this. Increased priority and resources devoted to this activity might produce results, especially when combined with scientific advances in evidence gathering, the increasing use and sensitivity of tracking devices and the rapid availability of the data produced for law enforcement purposes.

Legal changes might further improve the position. The use of surveillance cameras has potential to improve detection but, as our discussions with the Crown Office and Procurator Fiscal Service have shown, is likely to remain of limited use. This is because of general restrictions on when and where cameras can be installed, especially without the permission of the person on whose property they are placed, and on the admissibility of covertly obtained evidence. Improved access to data from remote monitoring tags attached to birds may assist the police's work. The law on the need for corroboration could be rationalised – there

is no need for corroboration for some wildlife crimes – but may make little difference in practice. More consistent and severe sanctions could be introduced. This final issue has already been considered by the Wildlife Crime Penalties Review Group (Poustie Review) that reported in 2015 and guidance on sentencing for wildlife offences is included in the early work of the Scottish Sentencing Council. Legislation on aspects of this issue is contained in the Animals and Wildlife (Penalties, Protections and Powers) (Scotland) Bill introduced to the Scottish Parliament at the end of September 2019.

Direct prohibitions

As noted above, the killing or control of raptors has been a criminal offence for many years. Other prohibitions could, however, be introduced to support this, targeting conduct which supports or serves as the driver for such unlawful conduct. If prohibitions are used, the proscribed conduct must be capable of clear definition, but the effect of a prohibition can be softened by a licensing scheme authorising the conduct in specific circumstances. There is at present no satisfactory definition of a 'grouse moor', and changing conditions mean that whether and in what way grouse are shot on particular land may vary over time. However, the shooting of grouse would provide a feasible target for prohibition, completely banning the activity, and thus removing the reason for carrying out the range of (lawful and unlawful) management measures that can harm raptors and habitat. In the absence of a licensing scheme to allow shooting to continue in approved circumstances, such a prohibition would end the use of land as grouse moors and all related commercial activity.

Codes of Practice

As noted above, Codes of Practice can be of many sorts and play many different roles, and a key issue is always their legal status and the consequences if the Code is breached. Codes can be integrated into legal regulatory schemes in a way that gives more flexibility than the use of the criminal law, e.g. so that breaches do not attract a sanction immediately but are relevant to decisions on whether to grant or revoke a licence. Even in such cases, though, there must still be some credible (and ultimately legally defensible) basis for taking any formal action that has a negative impact on the allegedly offending party.

More could be done to develop Codes of Practice on various issues, either wholly new ones such as for shooting Mountain Hares and the application of medicated grit, or enhancing existing ones such as for muirburn. Their status and interaction with more formal regulatory controls must be clearly specified.

Accreditation schemes

Emphasis could be placed on rewarding good behaviour, rather than punishing bad, by means of an accreditation scheme. This operates by providing formal recognition of those who have the training, or whose practice has shown that they can confidently be expected, to live up to high standards. This works best where there is a market in which the accreditation will confer a clear advantage on the holder. At present it is unclear whether market conditions are such that accreditation would be a key factor driving crucial consumer choices in buying

game or shooting opportunities. Moreover, there would be a need to identify a body (or group of bodies working together) whose operation of an accreditation scheme would earn widespread credibility and respect.

Financial incentives

There are various formal financial schemes which offer opportunities for intervention, e.g. rural development and agricultural subsidies and many aspects of the tax system. Although some grouse moors are not run on a commercial basis, financial considerations are usually of great significance in choosing between alternative land uses.

The changing emphasis in agricultural policy in England towards 'public money for public goods' might have echoes in Scotland as the value of the varied ecosystem services provided by grouse moors, or by alternative land uses, is increasingly recognised and potentially rewarded. In the lowlands at present the state is paying large sums to farmers to manage land in a way that is 'environment-friendly', whereas in the uplands land management which produces (contested) environmental goods is being provided in some areas at private expense, with significant local socio-economic benefits as an additional side-effect. To the extent that moorland management is accepted as enhancing some elements of biodiversity it might be possible to include it within financial support schemes. The availability of support for particular management activities, e.g. for habitat enhancement, within or beyond designated sites, may also encourage desirable practices.

Licensing

The possibility of licensing arrangements for grouse moors is mentioned in our remit and has been much discussed. The starting point for any such scheme is the initial prohibition of the defined activity unless a licence is obtained (as for muirburn or shooting Mountain Hares outwith the respective permitted seasons). Where some legal controls already exist, there is a question of whether all aspects should be brought within the licensing system or some continue to be directly regulated. For example, if muirburn were to require a licence, would the rules on notifying neighbours become conditions of the licence, or remain as free-standing requirements which would directly result in criminal liability if breached?

For any licensing system a number of key questions arise. The answers will be affected not just by the objective being sought but also by practicality, since for any system to work well, clear definitions and ease of administration and enforcement are important. The issue of the cost of establishing and operating the system and how far this is to be recovered from those seeking or obtaining licences must also be considered.

- *What activity is to be licensed and how is its scope to be defined?*
    - Some activities can be clearly identified, e.g. shooting Mountain Hares. On the other hand, there is no clear definition of 'grouse shooting businesses' (as specified in our terms of reference), nor of 'grouse moors' and although it is the more intensive management for driven grouse shoots that is thought to be most problematic, annual variations

can mean that in different years the same land is used for driven, walked- up or no shooting of grouse.

- *Who is to be licensed?*
    - The licence-holder could be a land-owner, land manager, individual worker or individual hunter. The land-owner is in a position to exercise ultimate control over what happens on the land, but complications may arise when land is owned by corporations or trusts or overseas owners.
- *What are the criteria for determining whether a licence should be granted and whether its terms are being met?*
    - Criteria could relate to the present condition of the land affected and the record of those seeking the licence. Breaches of the law in this or related areas might also be relevant. More positively, there could be objectives set for the medium- to long-term management of the site (e.g. an expectation of specified populations of certain birds) and progress against this used as a criterion (with due regard for the disruptive potential of unforeseen events such as disease or weather). At this point a Code of Practice might be relevant, with breaches of the Code not directly attracting sanctions but being a key consideration in whether a licence is granted and retained.
- *Who is to be the licensing body?*
    - In this area the obvious choice is SNH.
- *What is the application process (in terms of complexity and what must be demonstrated)?*
    - If a general licence is used, there is no application process at all and the licence can be automatically used by all those who meet the set criteria. Beyond that, a balance must be struck between the degree of individual supervision and control, adapted to local circumstances, and the burden (on applicant and regulator) of a heavily individualised process.
- *Is the licence to be in a standard form or wholly individualised or a mixture of standard and bespoke conditions?*
    - Even where individual licences are used, all or most of the terms could be in a standard form, reducing the regulatory burden on all concerned.
- *What provision is to be made for renewing, reviewing, revising and revoking the licence?*
    - Licences could be annual, or for another fixed period, or indefinite. Regular renewals of licences provide an opportunity to apply adaptive management and also to bring the permission to an end where there are sufficient grounds to believe, but not proof to the criminal standard, that undesirable conduct has been taking place.
- *How will the licence respond to changing conditions in terms of variations being proposed/ imposed by the licensee or regulator?*
    - If a licence lasts for several years, there should be provision for its review and revision to reflect changing circumstances. Especially in

areas where the scientific evidence is uncertain, the scope to adjust exactly what is licensed is an important aspect of delivering an adaptive management approach.

- *How is compliance to be monitored?*
    - Those seeking or operating under licences could be required to report on their activities (e.g. on the number of Mountain Hares present and/or shot). There also needs to be clear provision of powers of entry, search and seizure to enable the regulatory body to investigate whether granting a licence is appropriate and obtain evidence on breaches.
- *How is compliance to be enforced?*
    - Carrying out an activity without a licence or in breach of its terms would be a criminal offence. As with existing offences, proving unlawful conduct beyond reasonable doubt may be difficult, but a lesser standard of proof may be acceptable as the basis for exercising the regulatory body's discretion to limit, refuse or revoke a licence.
- *How should the licence interact with other legal and financial regimes, e.g. for financial support?*
    - The fact that a licence is held for an activity could be a test for establishing entitlement to financial support, or its absence a reason for withholding this.
- *What appeal mechanism should there be?*
    - In keeping with the position for other matters under the Wildlife and Countryside Act 1981, it would seem appropriate to allow for appeals to the Scottish Land Court.

Detailed arguments in favour of and against licensing of grouse shooting are presented in Appendix 1. Our conclusions on whether or not to license grouse shooting and related land management activities are presented in Sections 5 and 6.

4. Summaries of scientific evidence on raptor persecution and predation, muirburn, Mountain Hares, and use of medicated grit

In this section we summarise the scientific evidence on raptor persecution and predation, the practice of muirburn, the ecology and management of Mountain Hares and the use of medicated grit. We have gathered evidence from the following sources: monographs, peer-reviewed journal articles, reports from relevant public sector organisations and NGOs, responses to our questionnaire, information supplied by Police Scotland and the Crown Office and Procurator Fiscal Service and oral evidence from presentations and invited experts (see Annex 2 for further details). As in previous sections in we do not generally cite sources in the main body of the report, but list all the published sources in Annex 1.

Raptor persecution and predation

Background

This review was triggered, in part, by the SNH report *Analyses of the fates of satellite tracked Golden Eagles in Scotland* which concluded that "a relatively large number of the satellite tagged golden eagles were probably killed, mostly on or near some grouse moors where there is recent, independent evidence of illegal persecution" (Whitfield & Fielding, 2017, p. vii). Prior to this, extensive research had explored the relationship between raptors and predation on grouse – most notably the initial Joint Raptor Study (JRS) at Langholm and the more recent Langholm Moor Demonstration Project (LMDP). Scotland's Moorland Forum report *Understanding Predation* (2016) provides a wider review of the role that predators play in terms of overall ecosystem health. The scientific evidence on the persecution of raptors and the relationship between raptors and predation on grouse is summarised in this section alongside comments on gaps and uncertainties in the evidence-base.

Effects of illegal killing on raptors

Owing to persistent but then legal killing of many raptor species, mainly in the interests of game rearing, raptor numbers across Britain were greatly reduced in the 19th-early 20th centuries. Five species were eliminated altogether from Britain, and most others were much restricted in distribution. All species became protected by law from 1954, except for the Sparrowhawk which was protected from 1968 in Scotland. Around this time, use of organo-chlorine pesticides caused further reductions in the numbers of several species. Recoveries in numbers followed reductions in organo-chlorine use and deliberate killing, and have been especially evident since the 1970s. At the national level most species have increased substantially over recent decades, but most still do not occupy their entire potential range in Britain. Eliminated species either recolonised naturally or were reintroduced. Despite increasing nationally, several raptor species have declined in grouse moor areas during this century.

Raptors vary in the extent to which they eat the eggs, chicks or adults of the International Union for the Conservation of Nature's (IUCN) red and amber-listed ground-nesting birds, including Red Grouse. Important grouse-predators include the Golden Eagle, Peregrine Falcon, Goshawk and Hen Harrier. Three of these species are green-listed, but the Hen Harrier is red-listed. Studies have shown that illegal killing is reducing the population and breeding success of all these species (plus Red Kite) in at least some grouse moor areas. The evidence consists of: (1) observed population declines or reduced occupancy of known territories; (2) reduced nest success; (3) reduced adult survival; (4) reduced age of first breeding (implying ready availability of vacant territories); (5) unexpectedly high disappearance of satellite-tracked raptors on grouse moors; and (6) finding on moors of poisoned baits and traps, and shot or poisoned carcasses of raptors. Not all types of evidence are available for every species. As well as being targeted directly, some raptors are killed incidentally in attempts to trap or poison other predators. Killing on driven grouse moors can be inferred to be affecting raptor numbers over much wider areas. In the absence of interference, all these raptors breed as well or better on grouse moors than in other upland habitats, benefiting from various aspects of moorland management. Discovered cases of raptor killing probably represent only a small proportion of actual cases. Then only a small proportion of discovered cases get to court, and an even smaller proportion lead to successful convictions.

During this century, reports of poisoned or shot raptors have declined in numbers. However, this cannot be taken as evidence of a decline in raptor killing. It may be associated with a reported (but not proven) increase in the use of night-viewing equipment to shoot raptors on their roosting sites. Night-killing can be practised at any time of year, and carcasses removed, making legally robust evidence of illegal killing practically impossible to obtain. Likewise, the repeated disappearance of satellite-tracked birds on particular moors is not sufficient to obtain a prosecution in a criminal court, because the disappearance cannot be assigned to a particular individual, and no carcass is normally available. These changes over the last two decades have made it increasingly difficult to prosecute anyone for killing raptors. However, a continued decline in reported cases has followed the introduction of vicarious liability in Scotland: the UK-wide *Birdcrime report* shows five confirmed incidents of illegal raptor killing in Scotland in 2017 compared with 27 as the last five year average (but the figure had increased to 12 in 2018). The 2017 report also drew attention to the relatively large number of unexplained disappearances of satellite-tracked raptors in grouse moor areas. It is also possible (but unproven) that perpetrators have become more concerned with hiding the evidence of their actions in recent years, following press reports of the disappearance of satellite-tracked birds. Some moor managers may have ceased or reduced their killing of raptors in recent years, although other evidence suggests that the practice continues.

Effects of raptors on grouse

The major predators on grouse (eggs, chicks or adults), namely Fox, Stoat, Weasel and Carrion/Hooded Crow, are routinely and legally killed on grouse moors. This leaves birds of prey as the principal remaining predators, so it is not surprising that most discovered grouse remains show signs of having been killed (or at least fed upon) by raptors. In this situation, with Foxes, Stoats, Weasels and Crows controlled, scientifically robust evidence is available from the first Langholm study (JRS) to show that, in sufficient numbers, Hen Harriers can reduce the densities of grouse to such low levels that driven grouse shooting is impracticable. The same is likely to be true for Peregrines in some areas, but in the only relevant study, Peregrines were preying on the same grouse population as harriers. No detailed studies have been made of the impact of Golden Eagles and Goshawks on Red Grouse. One 6-year study at Langholm suggests that individual Buzzards have negligible impact on grouse, although at high densities promoted by abundant alternative food supplies, their collective impact could become significant.

Langholm Moor Demonstration Project

The second study at Langholm (LMDP) was a ten-year project which sought to recover a former driven grouse moor to commercial viability. The project has now ended and its final report *Managing Moorland for Birds of Prey and Red Grouse* (Langholm Moor Demonstration Project Board, 2019) has been published together with several scientific papers. When coupled with the *Langham Moor Demonstration Project: seven year review* (Langham Moor Demonstration Project, 2014) this report provides an authoritative guide on the challenges of reconciling commercial grouse shooting with healthy raptor populations

The main conclusions were:

- The grouse showed good health, body condition and large clutch size;
- Habitat was not a limiting factor for any major aspect of grouse performance;
- All legal predator control was carried out to good industry standards;
- In some years, with high vole numbers, around 70 nests of raptors, owls and Ravens were found on or near the 115 km^2 grouse moor;
- Under the control of mammalian predators, 82% of grouse kills found were assigned to raptor predation or scavenging, but it was not possible to assign kills to individual species;
- Grouse did not achieve sufficient numbers to be shot on a commercial driven basis and the keepering team was made redundant before the end of the project;
- Other red and amber-listed ground-nesting species such as Lapwing, Curlew and Golden Plover increased slightly in numbers during the study, but did not reach the conservation targets set; Meadow Pipits and Black Grouse increased more substantially.

Gaps and uncertainties in the evidence-base

The first study at Langholm Moor (JRS) showed that, in the absence of killing, Hen Harriers increased to levels at which their predation prevented grouse from reaching numbers sufficient for driven shooting. For various reasons Langholm moor provided ideal habitat for harriers. But it is uncertain, in the absence of killing, how many other moors would support harriers at densities high enough to cause similar suppression of grouse numbers. It is partly fear over a repeat of the Langholm experience that leads other moor managers to kill harriers and other raptors.

The years between the JRS and the LMDP, when gamekeepers were absent, showed that the resulting lack of habitat management and predator control was associated with reduced numbers and breeding success of ground-nesting harriers and other species. It has not yet been quantified to what extent similar cessation of grouse moor management elsewhere has negatively affected ground-nesting raptors, but their downward population trends in a number of areas which were formerly grouse moors suggests similar effects may be operating.

The Langholm experience has done much to shape the attitudes of land managers and, as noted above, the final report of the LMDP is an authoritative guide on the relationships between commercial grouse shooting and healthy raptor populations. But, as in all field experiments, the question arises as to how far Langholm Moor is typical of Scottish grouse moors in general.

Studies have so far concentrated on the main predators of grouse. There remains the possibility that, while no individual species would have a significant impact on grouse, the collective impact of several or all species might together reduce grouse to levels below those needed for driven shooting. This is a field of study requiring enormous resources, and impinges on the question of to what extent removal of one key predator species might lead to greater predation by others. It is also unknown what impact the increase in the national population of Buzzards and Ravens is having on available food sources and if this is impacting on other raptors who may have to feed more on grouse and other ground-nesting birds than they otherwise would.

The JRS study implied that Peregrines could also have a substantial impact on grouse numbers, but it was impossible to separate their winter impact from that of harriers. The individual impact of Peregrines in areas lacking harriers therefore remains unknown. In similar vein, the impact of raptors studied in the LMDP was made in a situation of no grouse shooting.

It has been claimed that Golden Eagles, by killing or deterring other raptors, can limit the densities of these other species in their home range. This situation needs more study, because if true, it provides a natural way in which the numbers of some raptors could be controlled, and the overall predation on grouse reduced.

Diversionary feeding

This practice, adopted as part of the LMDP, involves the daily provision of extra food (in the form of small dead animals) to raptor pairs to see whether it would lessen their predation on grouse to an acceptable level. Diversionary feeding of Hen Harriers while they were raising young resulted in a substantial reduction of their predation on grouse both during an initial trial and during the LMDP. But there are concerns from the shooting community that the practice is time consuming and could result in additional harriers on the moor in subsequent years. Also, the number of grouse did not increase sufficiently to allow shooting, at least not under the stated threshold densities of grouse considered necessary by the project managers for driven shooting. From a land manager's perspective, the known and potential disadvantages of diversionary feeding out-weigh the advantages, so this is not seen as an effective management tool, although others disagree.

Brood management

As part of the Department of Environment Food & Rural Affairs' Hen Harrier Recovery Plan, a 2-year trial granted under a research licence began in England in 2019 aimed at increasing the overall population of Hen Harriers. Any moor manager who has more than a specified density of Hen Harrier nests on their land is allowed to arrange for the surplus clutches or broods to be collected for captive rearing in a dedicated facility, and the release of the resulting young elsewhere. This partly removes the concern of the moor manager that, if he allows harriers to nest on his land, in time their numbers on the moor might increase to such a level as to make driven shooting non-viable. The removal of broods means that no grouse are killed to feed them. In this opening year, only one brood became available for hand rearing and, although five young fledged successfully, it is too early to judge whether such a trial can achieve its objective of increasing the numbers of harriers nesting on English moors. The scheme could fail if moor managers refused to participate in the scheme, or if too many reared birds were killed before they could breed themselves.

Muirburn

Background

Most moorland vegetation is highly flammable and 'muirburn' refers to the burning of vegetation in moorland areas, usually in a controlled manner, in order to maintain open moorland. This practice has been a favoured management tool for many centuries. The iconic landscape in which heather is the dominant species, much appreciated by tourists during the summer months and designated for its international conservation importance, is partly natural (beyond the climatic limits for tree and scrub growth) and partly a 'cultural' landscape kept open by active management.

There is a particularly strong association between muirburn and habitat management for Red Grouse, but muirburn is also used in some areas for the management of deer and livestock grazing. On moorland areas managed for driven grouse shooting, rotational muirburn is carried out to create small patches of heather of different ages to produce patches of ground containing young, more

nutritious heather shoots for grouse to eat and patches of taller heather for cover – the aim being to produce a mosaic in which heather of different heights/ages occurs within the territory of each grouse pair. Well-managed muirburn normally achieves its desired aims of providing good habitat for grouse and other species. But the wider impacts of muirburn are highly contested, with variable and sometimes contradictory findings from different experiments and monitoring work. Guidance on the management of muirburn is available in the *Muirburn Code*, administered by SNH on behalf of the Scottish Government. As noted in the *Code*: "Most of Scotland's moorland is not burnt or cut and does not require burning, but fire and cutting equipment are useful management tools, when used with skill and understanding. The Scottish Government supports well-managed muirburn and recognises its potential to reduce the impact of wildfire" (Scottish Government, 2017, p. 1).

Muirburn Code

The *Muirburn Code* (most recently updated by Scotland's Moorland Forum in 2017) is designed to promote best practice and minimise the likelihood of the detrimental impacts that can arise from muirburn. The *Code* provides detailed guidance, with some statutory provisions relating only to the timing and notification of a proposed muirburn (derived from the Hill Farming Act 1946 as amended by the Wildlife and Natural Environment (Scotland) Act 2011 and the Climate Change (Scotland) Act 2009). In addition to complying with these statutory provisions, landowners receiving payments from the Rural Payment and Inspectorate Directorate Payments (RPID) must also meet requirements in terms of Good Agricultural and Environmental Condition (GAEC), some of which relate to elements of the *Muirburn Code* (see below). Failure to meet these requirements can result in a reduction being applied to support payments.

Two major issues arise in terms of compliance with the *Muirburn Code.* First, under RPID cross-compliance, although breaches can be investigated and penalty charges applied, only a small subset of muirburn-related activities in the *Code* are deemed to 'breach' the grant conditions – specifically a fire left unattended, an uncontrolled fire over a large area, or burning which results in damage to woodland. Other potentially damaging activities listed in the *Muirburn Code*, such as burning on steep slopes, thin soils or peatlands, are currently not included in this penalty system. Given the effort and resources currently being put into peatland restoration, the omission of burning on peatlands from this penalty system is particularly concerning. Second, the 'breach and penalty' system only applies to those receiving RPID muirburn-related support payments. No other penalty systems, other than prosecution for failing to notify neighbours or undertaking muirburn outwith the specified time periods, address non-compliance with the *Muirburn Code.* Both issues represent major weaknesses in promoting the sustainable management of muirburn.

Although the *Muirburn Code* is designed to minimise the likelihood of detrimental impacts by promoting 'good' practice, there have been no assessments to date of levels of adherence to the good practice detailed in the *Code.* In the absence of a robust system of monitoring compliance, plus the relatively few instances under the

Code of the withholding of RPID payments under cross compliance, it is not currently possible to assess the *Code's* effectiveness.

Understanding the impacts of muirburn

Reviewing the extensive literature on muirburn impacts immediately reveals the importance of fire characteristics in determining biodiversity and wider ecosystem effects, yet in much of the debate over contradictory findings, this is sometimes glossed over or overlooked. Greater recording of fire characteristics alongside their impacts is much needed. In general terms, the benefits of muirburn in providing young, more nutritious shoots for grouse (and livestock, deer and Mountain Hares) are well-established. There is also evidence that regular muirburn managed in accordance with the *Muirburn Code* can increase above-ground biodiversity (evidence includes plants, birds, invertebrates) compared with unburnt moorland, particularly in dry heaths, through the creation of mosaics of different ages of heather giving a mix of habitat structures. Muirburn does of course restrict colonisation by woodland that would represent the natural habitat type in many of these 'cultural' moorland areas. There is also strong evidence that muirburn can cause detrimental effects in some situations – on biodiversity, hydrology, soil stability and other components of the system. Many factors can determine the impact of a moorland fire, but possibly one of the most critical factors is fire intensity (driven by fuel load, weather, moisture content and many other factors). To date this has rarely been recorded, so in very few cases can direct causal-associations be made between fire intensity and impacts. A key issue is whether or not the fire has burned into the moss/litter layer/soil/peat – in that order it greatly increases the likelihood of detrimental impacts.

Muirburn impacts can also differ according to the type of moorland. The strongest, but still inconclusive evidence for a greater likelihood of long-term detrimental impacts comes from blanket bog/wet heath areas, and it has been widely assumed that regular muirburn is detrimental to peat-forming plant species. However, this is not conclusive as several studies have found the opposite, including a long-term (60 years) experimental study in the Pennines.

The effects of muirburn below-ground are the least well understood. In general terms the intensity of a fire is thought to be a key issue: impacts on soil structure/properties (and carbon in particular) tend to be more severe (sometimes catastrophic) under more intense, longer duration fires igniting dry soil/peat. Fires penetrating the moss/litter soil are likely to destroy much of the seed bank, which could result in a very different post-fire plant species composition as well as changes to hydrology, soil chemistry and increased likelihood of erosion. Muirburn can have both positive and negative effects on carbon storage, both directly, by affecting carbon contents of soil and vegetation, and indirectly, by affecting carbon storage potential through the changes in plant community composition after fire. There is often an assumed net loss of carbon under regular muirburn, but the evidence is not conclusive and the longest running study (60 years) shows reduced carbon sequestration in regularly burnt areas but no long-term reductions in soil carbon accumulation. Data on muirburn impacts on dissolved organic carbon, particulate organic matter, suspended sediments, aluminium, iron etc. in runoff are

also inconclusive, with varying data on losses and subsequent recovery within the system as vegetation regrows, as well as some evidence for interactive effects with historical and current pollutant deposition and post-fire rainfall patterns. The few studies on hydrology indicate lowering of water tables in regularly burnt areas, but divergent effects on overland water flows according to the nature of concurrent rainfall events. There are obvious implications here for future climate change affecting muirburn impacts.

Given the clear, but unquantified, risks of major environmental damage from moorland fires, it is appropriate and critically important to increase the assessment of fire practices and their impacts (both positive and negative), particularly in relation to predicted climate changes. We note the recent fire assessment work by SNH and others using remote sensing and are highly supportive of this as a powerful approach to assess location, frequency and extent of moorland fires, combined with more detailed monitoring on the ground, particularly in relation to the 'best practice' specified in the *Muirburn Code*.

Some key questions

Is burning necessary to retain heather-dominance?

It was traditionally thought that regular muirburn was necessary for heather to remain dominant within the 'cultural' moorland zone, but this has been disproved at least for some moorland areas where heather has remained dominant (with the plants 'rejuvenating' through stem layering/rooting) for at least 40-60 years without burning. It is not known what proportion of Scotland's moorland has never been burnt so this is a key evidence gap – we cannot estimate what proportion of moorland might remain heather-dominated in the long-term in the complete absence of fire. This information would greatly inform the debate about the 'need' or otherwise of regular moorland burning in terms of maintaining heather *dominance* (as opposed to maintaining a supply of young, more nutritious shoots for grazing, as mentioned above). Clearly, in areas where tree seed sources are sufficiently abundant then moorland areas might gradually become (re)colonised by young trees. But this process would likely be relatively limited in areal extent in the short-to medium-term because it would depend mainly on short distance spread from existing trees.

Burning versus cutting

There is relatively little comparative information on the impacts of heather burning versus cutting and from the few studies found, the differences are apparently not simple. In relation to heather regeneration (the main focus of most published comparisons), old heather stands tend to regenerate better after fire than cutting (strongly dependent on seed germination and seedbed), but the few data available indicate that younger heather may regenerate better under cutting than burning. Discussions on the relative impacts of muirburn versus cutting on other elements of biodiversity are mostly speculative as there is so little information available. It is important also to note that burning and cutting are not interchangeable everywhere – for example machine-cutting is not practicable on slopes that are too steep or too rocky for machinery to operate safely.

Climate change, muirburn and wildfires

The risk of uncontrolled fire is predicted to increase in Scotland as the summers are projected to become hotter and drier under current climate change scenarios. Muirburns can potentially have both negative and positive effects in this respect. They can of course be the cause of wildfires if they get out of control, but they can also be used to reduce the risk of wildfires through reducing fuel-load build-up or acting as fire-breaks. Data sources from both Scotland and England are relatively few and quote varying proportions of wildfires starting from muirburns, and the levels of risk are currently difficult to quantify. This is primarily due to the uncertainty (stated by many including Scottish Fire and Rescue Service, SFRS) regarding attribution of causes of wildfires, coupled with the fact that an unknown number of out-of-control management fires are brought back under control without reporting (a 2003 questionnaire to 42 estate owner/managers reported that less than half the wildfires on their land involved call-outs to the fire brigade). A very recent unpublished assessment by the Scottish Wildfire Forum of ten years of SFRS data found that, out of 118 fires attended by SFRS, less than 10% of reported wildfires were attributed to 'controlled burning' or 'heather burning' (on any land, not just grouse moors), but larger numbers were reported as 'other – not known' cause. The only published data we found that came directly from estate owners/managers was the 2003 questionnaire (as above). Responding estates reported an average of 1-2 wildfires per estate in 2003, less than 50% of which were caused by escaped management fires. Putting this into the context of the large numbers of management fires carried out, this represented less than 1% of all management fires that year on these estates, but the average size of each wildfire was 150 ha, i.e. considerably larger than a normal management fire. Minimising risk is of course paramount and it is critically important that the *Muirburn Code* and regulation updates relating to muirburn use the best available evidence to minimise the chance of muirburn fires getting out of control. Muirburn and grazing and cutting can all play a role in reducing fuel loads and possibly reducing the incidence or at least severity (temperature) of wildfires, although there is a lack of data demonstrating how these management actions can be combined to best effect. We note the recent initiative announced by the SFRS to explore and test the use of muirburn as a management tool to reduce wildfire risk in future, and the current work funded by the Scottish Government to explore the possible development of a fire danger rating system.

Mountain Hares

Background

Mountain Hares are widespread in Scotland, but they are particularly strongly associated with heather moorland, including areas managed for driven grouse shooting where their populations are sometimes harvested and controlled. Mountain Hares are also considered to benefit from some aspects of grouse moor management, particularly the reduction in predators and the creation/maintenance of mosaics of different ages of heather.

Since the 19th century, Mountain Hares have been a legal game species for sport shooting during the open season: 1st August - 28th February. Shooting of large

numbers of hares on some estates has received much attention in the media and this is one of the drivers for including Mountain Hares in our evidence review and recommendations. A licence is required from SNH to kill hares during the closed season and landowners must provide a justification and indication of numbers to be killed. In addition to sport shooting, Mountain Hares are also killed for the protection of young trees and other sensitive plants, and (from our questionnaire responses) they are still killed on some estates as part of tick control measures (see discussion below). The number of Mountain Hares that can be killed in the open season is not regulated and does not require any statutory reporting, but land managers are expected to exercise restraint, in regard of our obligations under the EC Habitats Directive.

Conservation status of Mountain Hares

The Mountain Hare is on the Scottish Biodiversity List, i.e. considered by Scottish Ministers to be of 'principal importance' for biodiversity conservation. The Mountain Hare is also listed in Annex V of the EC Habitats Directive as a species "of community interest whose taking in the wild and exploitation may be subject to management measures". Member States are required to ensure that the exploitation of Annex V species "is compatible with their being maintained at a "favourable conservation status" and to make regular reports on this to the EU.

In a recent assessment of all UK mammals carried out by the Mammal Society according to IUCN red listing criteria, the conservation status of Mountain Hares in Scotland was assessed as "Near Threatened" (but close to "Vulnerable" under several of the criteria). The assessment noted that "further evidence is urgently required since re-evaluation may move the species to the Vulnerable category." In the Joint Nature Conservation Committee 2019 report to the EU for the period 2013-18, Mountain Hares in the UK were categorised as being in an "unfavourable-inadequate conservation status"; the term "inadequate" referring to a lack of data (see also Annex 4).

A major issue in determining the conservation status of Mountain Hares is a poor evidence-base. Until recently (see below) there has been no standardised method specifically designed for counting Mountain Hares, and there is also no mandatory formal monitoring of Mountain Hare populations in the UK or Scotland. All published estimates of Mountain Hare numbers to date are at least partially based on ancillary data and primarily non-hare-specific surveys. The recent publications on Mountain Hare numbers illustrate this problem well. The Mountain Hare data recorded as part of BTO's Breeding Bird Survey is based on daylight counts by observers on foot; the recent papers by Watson & Wilson and Hesford *et al.* both used data from daylight counts made by observers with dogs. Given that the study locations selected for these papers were non-random, we cannot extrapolate the findings beyond those particular areas and sites. As detailed by Newey *et al*. (2018) in the SNH report *Developing a counting methodology for mountain hares (Lepus timidus) in Scotland*, these methods are not particularly well suited to surveying Mountain Hares and have no known calibrations with actual population sizes, nor any information on repeatability-accuracy. Given the problems with methodology used to date, the lack of whole-Scotland count data, and the highly

contrasting findings presented by different papers, it is currently not possible to estimate with any certainty what the population of Mountain Hares in Scotland actually is, nor how it has changed over time. This is a critical issue for this Annex V species.

There is also no mandatory formal recording of Mountain Hare numbers shot in-season. The National Gamebag Census administered by the Game & Wildlife Conservation Trust (GWCT) is voluntary and records numbers reported as shot by participating estates but does not record numbers present. Since 1961, we understand that an average of 30% of the total number of estates that have reported shooting hares return Mountain Hare 'bag' information in any one year but it is not known what proportion of the others are 'non-returns' and what proportion are 'non-shoot' years. We have been informed by GWCT that analyses of data from a questionnaire on hare presence / absence and numbers shot that was sent to estates across Scotland in 2016-17 is currently in preparation.

Uncertainties over population size, trends over time and the number of Mountain Hares being killed undermine any attempt at a robust and reliable assessment of the conservation status of Mountain Hares. Accordingly, we support the roll out of a standardised national counting method (coupled with mandatory reporting of numbers killed – see below) and welcome SNH's new standardised counting method (Newey *et al.* 2018), currently being rolled out to moors by GWCT, as a first step in resolving the debate on trends in Mountain Hare numbers. At present the understanding of population responses to numbers killed is too poor to impose direct controls on shooting of Mountain Hares with any degree of certainty.

Management of Mountain Hare populations

The sporting sector manages Mountain Hare populations by shooting during the open season for sporting purposes, as well as to reduce numbers when considered by the estate to be necessary. There is controversy around Mountain Hare population management. Below we list the main reasons given for managing Mountain Hare populations (collated from verbal and/or written evidence presented to the Review Group, as well as published literature) and we consider each in turn:

- Sport shooting and game food;
- Reducing competition with grouse for food (heather shoots);
- Reducing browsing impacts on young trees and other sensitive plant species;
- Reducing the tick burden on red grouse and, associated with this, reducing the incidence of Louping Ill virus within the local grouse population;
- Reducing parasite burdens on Mountain Hares and risk of wildlife diseases; both potentially causing population decline.

Impact of sport shooting on hare populations

Having reviewed the literature and taken evidence from key stakeholders, it is widely assumed that the number of hares killed for sport shooting probably has a limited effect on Mountain Hare conservation status overall, although this could differ locally. This finding is based on the assumption that traditional sport shooting cull levels are designed to be proportional to what local populations are believed to

be able to sustain, with the intention of sustaining the sporting interest into the future. But we note that this assumption cannot be tested on account of the very limited evidence available.

Assessing the impact of sport shooting is further complicated by Mountain Hares having the potential for high population growth, although this can vary significantly between years. A modelling-based study, parametrised with data from a Scottish grouse moor managed for driven grouse shooting, suggests that Mountain Hare populations may be robust to a maximum of 40% of individuals removed annually by whatever means including natural predation. Against this estimate many other factors need to sit (e.g. population size, age of hares shot, other concurrent causes of mortality, etc.) which, when combined with limited dispersal capacity, means that local extinctions could happen as a result of sport shooting culls.

Reducing food-competition with grouse; browsing impacts on young trees and other sensitive plant species

There is no substantive evidence that Mountain Hare grazing of heather will detrimentally affect grouse through food-competition. Calculations of potential offtake of heather shoots by hares also confirm that this would be extremely unlikely even at maximum hare population densities found in Scotland.

There is evidence that Mountain Hare browsing activity can locally reduce or suppress tree and shrub growth, i.e. preventing natural succession and contributing towards maintaining open heather moorland. SNH reported that they have issued out-of-season licenses to cull Mountain Hares to protect young trees, but never yet to protect any open-ground plant species.

Hare population control as part of tick control measures

There is no substantive evidence to support the population control of Mountain Hares as part of tick and/or Louping Ill virus control to benefit grouse, except under unusual circumstances. The published study that was used to support this assertion was carried out on an estate with no deer present (Lochindorb) and the research was criticised for potentially confounding treatments, lack of replication and no meaningful experimental control. A recent study found no effects of Mountain Hare abundance on grouse tick burdens and actually found better grouse chick survival in areas with greater numbers of Mountain Hares, although tick biting rates were low on both species. There is a joint SNH-GWCT-SLE statement on voluntary restraint that acknowledges the lack of evidence to support population control of Mountain Hares to benefit Red Grouse. Despite all of this, the reporting of disease transmission as a primary ‘reason for shooting Mountain Hares’ was still more widely stated than any other reason in the questionnaire responses to the Review Group, and the advice that Mountain Hare culling should be part of tick disease control strategies is still present on some key land management websites (e.g. https://www.gwct.org.uk/policy/position-statements/mountain-hare-management/).

Reducing parasite burden on Mountain Hares and risk of wildlife diseases
The little information available reveals no evidence that parasite burdens on Mountain Hares are affected by their population density. Very little is also known about the risks of wildlife diseases (such as RDHV2) that could affect Mountain Hare populations in Scotland, but as yet do not appear to be doing so.

In addition to the above, it has been variously stated that reducing Mountain Hare numbers could increase predator pressure on other prey species (including Red Grouse), but there is no substantive evidence to support or refute this.

Medicated grit

Background

The presence of the strongyle worm (*Trichostrongylus tenuis*) in the gut of Red Grouse can cause cyclical fluctuations in grouse numbers every 6-9 years in Scotland. The use of 3-8 mm medicated grit in the form of quartz grit coated with a worming agent (currently flubendazole) has substantially suppressed these grouse cycles. The medicated grit is delivered to individual birds via grit stations deployed across the moor and the dosage should be based on pre-determined worm levels in the grouse. The delivery of flubendazole-coated grit to individual birds is overseen by local veterinary surgeons who can prescribe medicated grit and, when appropriate, advise on gritting holidays when the medicated grit is replaced in the tray by uncoated quartz grit.

Success following the introduction of flubendazole-coated grit can be judged by strongyle worm burdens now registering all-time lows, and by an almost doubling of grouse densities on driven grouse moors since its introduction in 2007. Given that previous efforts at controlling the strongyle worm without medicated grit were unsuccessful, and ever-increasing pressure on grouse by protected predators (as evidenced from the Langholm Moor projects), its use is now deemed essential if grouse levels are to be kept high enough to yield a harvestable surplus. Even with low worm burdens, managers may treat grouse as a precautionary measure, feeling it is the only mortality factor they can control, against the many other uncontrollable risks that grouse face. Consistent grouse numbers, year on year, help maintain viable levels of shooting, underpin investment decisions and contribute to the economic viability of grouse moors. Flubendazole is also commonly used to treat worm burdens in sheep and cattle.

The principal legislation influencing the use of medicated grit includes the Veterinary Medicines Regulations 2013 with Guidance Note 13 on the use of Cascade in terms of prescription (need and use) and the Wildlife & Countryside Act 1981 (as amended) with regards to operations requiring consent on designated sites. The amendments to the 1981 Act introduced by the Wildlife & Natural Environment Act (Scotland) Act 2011 also relate to direct dosing of grouse, which we do not consider here, rather than the use of medicated grit. Guidance on the use of medicated grit is provided in the Moorland Management Best Practice *Worm Control in Red Grouse Guidance* (Scotland's Moorland Forum) and *Best practice use of medicated grit* (GWCT). Not all estates determine worm burdens and some use medicated grit as an insurance. Even for estates that do determine worm

burdens, the evidence is not always given sufficient weight and moors continue to treat worms against the perceived wider risks to the grouse population from weather, predators and tick-borne disease.

Review of evidence

Having reviewed the written and verbal evidence presented to the Group we find that, when used correctly, flubendazole is a widespread treatment that has proved highly effective in reducing endemic strongyle worm levels in grouse guts. Also when used correctly, its residues in grouse for human consumption currently appear to present a very low risk. As past efforts of controlling strongyle worm burdens have not worked, the use of medicated grit is a key factor in maintaining consistent grouse numbers year on year.

The dosage of medicated grit supplied to birds must be determined by a veterinary prescription but this should reflect the current worm burden in the grouse in terms of health and breeding success. Whilst veterinary surgeons control the overall dosage, land managers determine the actual delivery of medicated grit to individual birds on the hill via grit trays, acknowledging that under the Cascade system, the prescribing veterinary surgeon must be satisfied that the individual using the medicated grit does so correctly. The prescribing veterinary surgeon has responsibility for the health of the grouse and should have seen the grouse before prescribing. Good practice includes testing a selection of birds to determine their worm burden. Low burdens indicate that gritting holidays could be taken, balancing this against the known risk of slightly lower grouse breeding success. Land managers are also required by law to ensure that no drug is ingested 28 days before the grouse are harvested. Medicated grit is commonly delivered in a grit tray with a lid to prevent access during that period. At present, there is little evidence for resistance to flubendazole developing in the strongyle worm population, but the main purpose of 'gritting holidays' is to reduce the chance of such resistance developing.

In terms of contested evidence, there are concerns that prescription levels when measured against the worm burden are too high, that gritting holidays reflecting low worm burdens are not always observed, and that grit may not always be withdrawn from grouse at least 28 days before Red Grouse enter the food chain. Although attempts have been made to address these issues in terms of Scotland's Moorland Form's *Worm Control in Red Grouse Guidance* and GWCT's *Best practice use of medicated grit,* plus recent workshops provided by the Moredun Research Institute, there is no system in place for monitoring the use of medicated grit. Although there are estates following sustainable practices in the use of medicated grit, many are not. There is a need for estates to address this and bring the standards up to best practice usage as described in the Scotland's Moorland Forum and GWCT best practice guidance.

We also identify a number of significant evidence gaps. There is anecdotal evidence of grit piles on open mounds instead of in bespoke grit trays, and similar claims of grit piles being found too near to water courses. Both these situations could lead to greater environmental contamination. Although there is as yet little

evidence of a resistance problem with the use of medicated grit, more research is required on the potential development of such resistance and its implications. Better calibrated dosage reflecting worm risk based on weather and worm burden (determined by autumn worm counts and spring worm egg counts) would help allay the risk of resistance developing. There is some evidence that flubendazole is toxic to aquatic organisms; accordingly GWCT guidance recommends that grit trays be located no closer than 5m to running or standing waters. At present SEPA does not test for the presence of flubendazole contamination in water bodies. Current testing for flubendazole residues in the food chain is based on a small number of grouse samples each year and it is unclear what level of contamination would constitute a threat to human health. Although *Cryptosporidium* has only been detected once on grouse moors in Scotland, its presence in Northern England and connection to increased densities of grouse, with higher numbers visiting each grit tray, raises concerns for the future.

5. Recommendations

In this section we examine the role of licensing in regulating grouse shooting. We then itemise our main recommendations that arise directly from an examination of options for regulation (Section 3) and also from summaries of the scientific evidence relating to raptors and predation, muirburn, Mountain Hares and the use of medicated grit (Section 4). Additional more specific recommendations on the use of muirburn, culling of Mountain Hares and the use of medicated grit are added in the next section (Increased control on specific activities Section 6), again based on evidence reported in our earlier science summaries.

Options for using licensing to regulate grouse shooting

Licensing is only one of many regulatory approaches that can be used to address our remit. But it is explicitly referred to in our remit and so warrants particular attention. The remit for this review invites the Group "*to advise on the option of licensing grouse shooting businesses*" and to do so in a way that balances "*the Government's commitment to tackling wildlife crime with grouse moor management practice, ….. so that this form of management continues to contribute to our rural economy, while being sustainable and compliant with the law".* As documented in an extended discussion on how licensing might operate (Section 3: Options for Regulation) and the itemisation of the advantages and disadvantages of licensing (Appendix 1), we have explored the option of licensing in great detail. In order to promote further debate on this issue, arguments in favour of and against licensing have been provided by individual members of the Group and brought together in Appendix 1. Not all Group members are in agreement with all points made, so any one individual point cannot be assumed to represent the views of the whole Group.

As noted in Appendix 1, licensing grouse shooting businesses is problematic not least because there is no agreed definition of the term 'grouse shooting business'. This does not mean that licensing cannot be introduced to better manage grouse shooting – rather it points to the need for such licensing to be appropriately targeted, as recommended in the discussion on licensing in Section 3. This is clearly evident in our recommendations itemised below, which are designed to make the use of muirburn and medicated grit and the management of Mountain Hares more sustainable. For each of these practices, we variously propose licensing, increased legal regulation and a voluntary Code of Practice respectively, with licensing for the management of Mountain Hares and use of medicated grit being introduced should less onerous regulation fail. Such targeted and proportionate regulation for these land management practices accords with relevant scientific evidence and meets the criteria for Better Regulation.

Licensing can also be used to shape the wider context of specific activities. For some Group members the association between some areas of grouse moor management and the evidence for activities adversely affecting raptor populations provides grounds for the licensing of grouse shooting. But for other Group members this evidence is strongly contested and the case for licensing on these grounds is deemed to be flawed (see Annex 1). However, we are agreed that if the effect of our more specific recommendations and the sector's response to scrutiny

do not result in an improvement, and evidence of unlawful activity continues, measures must be taken. There is then justification for taking action which controls, and might ultimately prevent, the use of land which malefactors think is being served by illegal persecution.

It is this anticipated deterrent effect which provides the strongest grounds for considering the introduction of licensing, especially since this review was triggered by the Cabinet Secretary's concern over the suspicious disappearance of 31% of satellite-tracked Golden Eagles over the period 2004 to 2016. Appendix 1 demonstrates, however, that it is not the only reason for considering the introduction of licensing.

In order to manage the proliferation of licensing schemes, with their attendant costs, should a licensing scheme to shoot grouse be introduced, its implementation should build on the experience of using general and specific licences (as for the control of corvids) and allow for integration with other regulatory schemes. A framework Code of Practice on grouse shooting could be introduced providing advice on best management practices and on regulatory requirements, including licences on muirburn, the management of Mountain Hares and use of medicated grit if and when these are introduced.

Recommendation concerning licensing grouse shooting

In contrast to our other recommendations that are strongly evidence-based, any proposal to license grouse shooting is problematic, its underlying rationale being contested. In our summary of the science on raptors and predation, we state there is evidence of illegal killing. But we also recognise that the scale and impact of this is contested by land managers on the grounds of recent reductions in officially recorded illegal killing (especially involving the use of poison) and recovering populations at a national level despite local declines in the numbers of Golden Eagles, Hen Harriers and Peregrines on or near grouse moors. The claim that licensing will provide an effective deterrent in terms of future illegal killing is also contested (see Appendix 1). Furthermore, our remit requires a balance to be struck between introducing new regulation and it adversely impacting on the contribution that grouse shooting makes to the rural economy. This inevitably takes the debate into a question of values.

This means that any recommendation to license grouse shooting although science-based inevitably involves expert judgment in which values and opinions also come into play. In making a recommendation in this area we are very aware of these challenges and note that at a societal level the final decision is ultimately a political one.

The Review Group was evenly divided on the relative merits for and against the licensing of grouse shooting. In light of this and noting the contested nature of some of the evidence, we make the following recommendation:

1. *We unanimously recommend that a licensing scheme be introduced for the shooting of grouse if, within five years from the Scottish Government publishing this report, there is no marked improvement in the ecological sustainability of grouse moor management, as evidenced by the*

populations of breeding Golden Eagles, Hen Harriers and Peregrines on or within the vicinity of grouse moors being in favourable condition.[1]

The primary goal of such a recommendation is a decrease in the illegal killing of raptors on or within the vicinity of grouse moors, and a significant improvement in their conservation status in these areas. We would not expect all three specified raptors to increase on every moor because conditions may not be locally suitable for them, but what is needed is a measurable increase over grouse moors as a whole.

Statement from the Chair: My option to use the Chair's casting vote in favour of the immediate introduction of licensing was contested by two members of the Group. In the interests of seeking to produce a unanimous recommendation I chose not to exercise my casting vote.

Recommendations arising from the science reviews

In light of the evidence reported in the reviews of scientific evidence, we recommend:

2. *That a framework Code of Practice on grouse shooting be produced reflecting regulation specific to the sector and advising on best management practices. If statutory provisions are included, the Code would need approval by Scottish Ministers with SNH having oversight and ownership.*

Within this framework and in light of the science summaries covering raptor persecution and predation, muirburn, the management of Mountain Hares and the use of medicated grit, we make the following recommendations:

Raptor persecution and predation

3. *That there should be no change in the legal status of any bird-of-prey species in Scotland.*
4. *That where particular species are perceived to be limiting the populations of red and or amber-listed ground-nesting birds, including Red Grouse, greater use should be made of the Wildlife & Countryside Act 1981 s16. This existing licensing legislation allows SNH to permit under licence a range of lethal and non-lethal management options.*
5. *That the brood management programme for Hen Harriers in England should be monitored, and if it is deemed successful in producing an increase in the breeding numbers and distribution of Hen Harriers, then consideration should be given to introducing a similar programme in Scotland.*
6. *That as much as possible should be done to change the culture of grouse moor management to accept more loss of grouse to avian predators and to allow these predators to nest locally.*
7. *That SNH, possibly through their licensing agent the BTO, or directly, ensure that the licences issued for the satellite-based tracking of tagged*

[1] 'favourable condition' defined in Annex 4: Glossary

raptors includes a condition that commits the data holder (i.e. the owner of the tag) to: (a) being listed on a register of data holders which SNH, BTO and Police Scotland have access to; and (b) cooperate expeditiously with Police Scotland and SNH in sharing data and associated information regarding tagged birds found dead or missing in suspicious circumstances. That on receipt of shared data and associated information, Police Scotland expeditiously processes the shared data and associated information to determine whether or not it warrants referral to the Crown Office and Procurator Fiscal Service. The current priority raptors for data sharing would be Golden Eagle, Hen Harrier, Red Kite, Peregrine, White-tailed Eagle and Goshawk.

Muirburn

8. *That muirburn should be subject to increased legal regulation. This should apply to all muirburn, not only on grouse moors.*
    - *That the Scottish Government should increase regulatory control relating to the Muirburn Code;*
    - *That SNH and Rural Payments and Inspections Directorate (RPID) should be given power and resources to monitor adherence to the Muirburn Code by any land manager[2] carrying out muirburn, whether or not they are in receipt of muirburn-related support payments;*
    - *That increased training should be required for any land manager directly involved in setting and managing fires;*
    - *That the Muirburn Code should be subject to regular updates to represent best available knowledge and consideration of predicted changes in climate that might require additional changes to parts of the Code. That this process be subject to expert peer-review;*
    - *That a fire danger rating system for Scotland should be introduced to better support decision-making about where and when to burn;*
    - *That the Scottish Government explore changes to the current RPID support payments that would discourage malpractice more effectively than the current very limited breach and penalty powers;*
    - *That the Muirburn Code published in 2017 should be updated to include the Supplement to the Code: A guide to Best Practice.*

Mountain Hares

9. *That the shooting of Mountain Hares should be subject to increased legal regulation.*
    - *That, where the shooting of Mountain Hares is to be undertaken, land managers should be required to report annually to SNH the number of Mountain Hares present (using a standard counting method) and numbers shot on an area of land;*

[2] Definition of 'land manager': the person who should be legally responsible for any activity covered by this report.

- *That shooting of Mountain Hares should only be undertaken at the times licensed and in compliance with a Code of Practice on the management of Mountain Hares;*
- *That, to address concerns about the reliability of estimates of Mountain Hare numbers, SNH should generate a more robust evidence-base on the distribution, numbers and management influences on Mountain Hares to better inform management as well as Article 17 reporting to the Scottish Government and the EU;*
- *That adaptive management research should be used to determine relationships between local populations and numbers killed, to help inform and improve management recommendations over time to promote favourable conservation status for Mountain Hares in Scotland.*

Medicated grit

10. *That the use of medicated grit should be subject to increased regulation.*
    - *That SNH, following consultation with other appropriate bodies, should publish a Code of Practice on the use of medicated grit;*
    - *That all land managers using medicated grit to reduce the worm burden in Red Grouse populations should adhere to the Code of Practice on the use of medicated grit;*
    - *That SNH should have powers to check compliance with the Code on the use of medicated grit;*
    - *That if, after five years or less, following introduction of the Code, non-compliance is widespread, the option of introducing licensing should be considered.*

Further recommendations on implementing the above with respect to muirburn, managing Mountain Hares and the use of medicated grit are itemised in section 6.

Recommendations arising from options for regulation

In light of our examination of regulatory options (Section 3), we make the following recommendations:

11. *That in accordance with our remit to "ensure that grouse moor management continues to contribute to the rural economy" we do not recommend that grouse shooting be banned.*
12. *That, while noting the progress of the Animals and Wildlife (Penalties, Protections and Powers) (Scotland) Bill , the following recommendations of the Wildlife Crime Penalties Review Group (Poustie Review) should be enacted:*

    Levels of fines and custodial sentences

    - *That maximum penalties available on summary conviction at least for the more serious offences, are raised to at least a £40,000 fine and up to 12 months imprisonment.*

- *That conviction on indictment is more commonly made available across the range of wildlife offences with a maximum term of imprisonment of up to 5 years.*

Alternative penalties

- *That forfeiture provisions are extended and these and other alternative penalties are made consistent across the range of wildlife legislation as appropriate.*
- *That where a firearm or shotgun is involved in the commission of a wildlife crime, the court should have the power to cancel the relevant certificate, as is already the case in the Deer (Scotland) Act 1996.*
- *That consideration should be given to amending firearms legislation which is reserved to the UK Parliament to allow the Chief Constable to withdraw a shotgun certificate where such a weapon has been involved in the commission of a wildlife crime not just on grounds of public safety but also on the grounds of a threat to the safety of wildlife.*

Sentencing Guidelines

- *That with the establishment of the Scottish Sentencing Council in October 2015, sentencing guidelines are developed for wildlife offences in order to enhance the consistency and transparency of sentencing.*

13. *That a wider range of moorland management activities should become eligible for RPID support.*
14. *That land managers should undertake training on relevant land management activities (muirburn, use of medicated grit, managing Mountain Hares, corvid control and setting of traps) and refresher courses when required, to ensure compliance with relevant Codes of Practice.*
15. *That an accreditation scheme on grouse moor management should be developed following widespread consultation across the grouse shooting sector.*
16. *Given the fragmented nature of current wildlife legislation, we recommend consolidation of this area of law (as recommended by Poustie).*

6. Increased control of specific activities and associated recommendations

The recommendations in favour of increased regulation of certain activities given in section 5 do not specify the precise form of that regulation. The decision on what is appropriate in each case requires careful consideration of both the preferred approach for and the detailed design of any regulatory scheme. This consideration should be based on the Better Regulation principles: regulation should be transparent, accountable, consistent, proportionate, accessible, effective and targeted only where needed. It should also consider how far the wider range of regulatory mechanisms available in other environmental contexts, such as SEPA's powers in relation to general binding rules, registrations and civil penalties, should be extended to SNH's existing and potential new functions.

An issue that affects several regulatory options is the person who should carry legal responsibility for activities. Land may be owned by an individual, company or trust, may be occupied by the owner or by another person under a variety of long or short-term arrangements (including leases) and the control of activities on the land may be delegated to a separate land manager (employed or contracted). In our discussions we refer to the 'land manager' as the person who should be legally responsible for any activity covered by this report. Reflecting their underlying control of the situation, this may in most circumstances be "the owner or occupier" as is commonly the case in other relevant legislation. Nevertheless, to reflect practice, it may be appropriate to consider ways in which the owner can expressly delegate responsibility to a manager who will share responsibility, matching their effective control of activities on the ground. This is not to enable the owner to escape responsibility but to ensure that the consequences of any wrong-doing are felt by the person who has really been in charge. The implications for the contractual arrangements between owners and staff or contractors may require consideration as detailed rules are formulated.

Where legal obligations and controls are proposed, we consider that in many cases it would be appropriate for the regulatory body (chiefly SNH) to have available to it a range of enforcement options. The powers available to SEPA under the Regulatory Reform (Scotland) Act 2014 provide a useful model, with the scope for fixed or variable monetary penalties to be imposed as an initial response, but with the potential to escalate to criminal prosecution in the event of serious, deliberate or persistent breaches of the law.

Muirburn

Muirburn is currently regulated by a number of specific statutory provisions making it an offence to undertake this operation at certain times of the year (unless a licence has been obtained) and without giving due notice. These statutory provisions are supported by the *Muirburn Code* which provides guidance on many aspects of muirburn, including areas where it should be carried out, but which carries no legal sanction for non-compliance. It is recommended that there should be increased regulation for all muirburn, not just that undertaken in relation to

grouse moor management. One element of this will be revision of the *Muirburn Code* to operate appropriately in the reformed regulatory context.

Increased regulation could take the form of: a) adding further requirements to the existing legislation which specify when muirburn can lawfully be carried out; b) adding a general condition that the operation is carried out in accordance with the *Muirburn Code*; or: c) requiring a licence for all muirburn.

Option a) would require additional conditions to be clearly specified and enforcement would rely on the use of the police and the standard criminal justice system. Possible conditions include requirements that the person responsible for the operation has completed certain certified training and that a record is kept of the date of the operation and area affected.

Option b) would appear to offer a more holistic approach to controlling muirburn operations, but has the severe drawback that the Code is not, and probably cannot be, written in a way that sets the clear and rigid boundaries of what is acceptable or not as required for the criminal law, and it would be difficult to obtain admissible evidence in many circumstances to establish in court whether the terms of the Code have been overstepped.

Option c) offers more overall control with a range of sanctions being incorporated into the licensing scheme, allowing greater flexibility in enforcement rather than the all-or-nothing approach of criminal law. Licences could be granted by SNH to the land-owner or other designated land manager, with conditions including:

- Substantial compliance with the *Muirburn Code* (and any subsequent updates);
- Mandatory training for the staff directly involved in setting and managing fires;
- Keeping a record (ideally a map showing the location and date) of each operation.

The potential should be explored for an automatically available 'general licence' to authorise certain forms of muirburn without an individual application for and grant of a licence, and for licences that cover multiple sites and seasons where the risks of inappropriate activity are low. A similar outcome could be achieved by using a scheme for general binding rules, notification and registration such as provided for SEPA under the Environmental Authorisations (Scotland) Regulations 2018. The existing legal rules on timing and notice could be incorporated within the licensing scheme.

Muirburn plans for each land management unit, or jointly for two or more neighbouring land management units, might also be required or provide a basis for a longer-term licence covering a number of individual operations. A licensing system should also include SNH having powers to check compliance, including inspection of muirburn records. SNH should have the power to respond flexibly and proportionately to breaches by imposing tighter conditions, imposing financial penalties, suspending or revoking the licence or referring the matter for prosecution for unlicensed muirburn.

In reviewing options a), b) and c), we favour option c) i.e. that muirburn should be unlawful unless carried out under a licence. There should be

provision for a general licence (or equivalent) to allow muirburn to take place without seeking individual permission provided that the requirements noted above are complied with. Most instances will fall within the general licence without the need for tighter controls, but this option offers to SNH the opportunity to revise the conditions for what is acceptable in response to changing needs and to non-compliance in a flexible and proportionate way.

Mountain Hares

The Mountain Hare is a species of Community interest under the EC Habitats Directive and as such must be protected against being killed or taken by certain specified methods or by any other means which is indiscriminate and capable of causing the local disappearance of, or serious disturbance to, a population (Conservation (Natural Habitats, etc) Regulations 1994, reg.41). Moreover, the government is obliged to "take measures to ensure that the taking in the wild of specimens of [the] species as well as their exploitation is compatible with their being maintained at a favourable conservation status" [3] (Directive, art.14(1)). Doing so requires remedying the present lack of knowledge of the numbers present and being shot. We therefore recommend that SNH embark on achieving a proper count of Mountain Hare numbers across Scotland, not just on grouse moors nor just where they are being shot.

Beyond the need to ensure that a proper population count is achieved across all land where Mountain Hares occur, three possible options to respond to the present situation may be considered:

a) Code of Practice with a commitment to adaptive management;
b) Legal obligation to report numbers where shooting takes place, and;
c) Introduction of a licensing system for the shooting of Mountain Hares.

Central to all three of these is the undertaking of counts to determine the numbers of Mountain Hares present and (where relevant) the numbers shot.

Option a) would involve the current legislation in relation to the closed season (with the potential for licences to permit shooting at other times) being supported by a Code of Practice. The Code would build on the *Mountain Hare Management Guidance* within the Moorland Management Best Practice produced by Scotland's Moorland Forum. It would take account of adaptive management requirements, with the vital addition of guidance on the standardised counting method and reporting to SNH, the basis for determining whether and how many hares may be shot in a given year and training for staff. This Code would not itself be legally enforceable.

Option b) imposes a reporting requirement to address the current lack of data on the number of Mountain Hares present and shot. This is the biggest obstacle in ascertaining whether the legal obligations under the EC Habitats Directive are being met. It would introduce alongside the voluntary Code (as in option a) a specific legal obligation to notify SNH of the intention to shoot hares and report the

[3] 'favourable condition' defined in Annex 4: Glossary

number of Mountain Hares present and shot (cf. the power to require returns in relation to deer under ss.40 and 40A of the Deer (Scotland) Act 1996). There would also be a requirement on those shooting hares to report on the number of hares present using a standard counting method. Failure to report would be a criminal offence. Options other than prosecution should be provided as an initial response, with only serious or persistent offending leading to prosecution. Such a provision would not limit the right to shoot Mountain Hares in season. This reporting requirement would not provide data on land where no shooting is taking place. Accordingly, as proposed above, a robust system of regular counting of Mountain Hares across Scotland should be put in place by SNH.

Option c) is that the shooting of Mountain Hares should be undertaken only under a licence granted by SNH. The licensing scheme would include the following elements:

- An annual licence would be required for the shooting of Mountain Hares, specifying the period and location where shooting is permitted;
- Landowners wishing to shoot Mountain Hares should record the number of Mountain Hares present (using a standardised reporting procedure) and numbers shot and report these numbers annually to SNH;
- Adaptive management should be used to determine the initial and subsequent numbers of Mountain Hares permitted to be shot over successive years;
- Shooting should be carried out in accordance with the Code of Practice;
- Mandatory training should be required for staff directly involved in overseeing the counting and shooting of Mountain Hares;
- SNH would have the power to impose an escalating range of penalties via Fixed and Variable penalty notices for non-compliance with the Code of Practice.

The potential should be explored for an automatically available 'general licence' or 'registration' to authorise certain forms of shooting provided that basic information is supplied, without an individual application for and grant of a licence. Similarly, the potential should be considered for licences that cover multiple sites and seasons where the risks of inappropriate activity are low. As before, SNH would have the authority to impose an escalating range of penalties for non-compliance with the Code of Practice on the management of Mountain Hares, the ultimate sanction being suspension or revocation of the licence to shoot Mountain Hares.

We propose that Option b) is adopted and followed for sufficient time to enable robust data to be gathered, from this and other sources, on the population status of Mountain Hares across Scotland (taking into account hare population cycles). If it is found that the population status of hares is 'unfavourable', our view is that option c) should then be considered as one of the responses that might be required to ensure remedial action. Any action in response to a declining population needs to be directed to the reasons why and places where the decline is taking place; these might not necessarily be related to grouse moors.

Medicated grit

The use of medicated grit is already partly controlled by the laws concerning prescription-only medicines, but some further regulation is recommended. This is an area where a voluntary Code of Practice seems appropriate at present, but tighter controls are desirable. If after five years or less of introduction of the Code, non-compliance is widespread or if at any time improved understanding of the position suggests that the risks are substantial, the option of introducing a licensing system should be considered.

Our recommendation of a voluntary Code of Practice on the use of medicated grit, overseen by SNH and prepared in consultation with stakeholders, is deemed to be an appropriate response to the currently perceived level of risk, subject to further understanding of the levels of compliance and environmental and health risks of the use of medication. Items to be included in the Code of Practice on the use of medicated grit:

- Veterinary surgeons and grouse managers to collaborate on developing and delivering "Grouse Health Plans" which include evidence in support of use of medicated grit at appropriate scales across the estate;
- Gritting withdrawal period to be strictly observed and medicated grit always removed at least 28 days before Red Grouse are shot;
- All land managers using medicated grit to undertake training appropriate to their role. This to include whether treatment is required, option of gritting holidays and withdrawal 28 days before shooting, GPS mapping of grit trays/stations, and clear identification on the hill where medicated grit is used.

In addition to adherence to a Code of Practice, we recommend the following actions:

- ***Food Standards Scotland should undertake work to identify the levels of flubendazole residues in grouse in the food chain that are judged inimical to human health and establish appropriate monitoring;***
- ***There should be wider CPD training for veterinary surgeons on the use of medicated grit;***
- ***SEPA should initiate a desk-based study to determine the appropriate nature and extent of a monitoring programme to ascertain whether flubendazole residues exist in water bodies on or downstream from where it is being used, including in association with grouse moors, to conduct such a monitoring programme and to report on its findings***;
- ***Future monitoring of Cryptosporidium in connection with use of medicated grit should be undertaken should the associated risk prove necessary***.

If it is considered that the proven risks arising from current practice are such that stronger measures are required immediately, or if in future these are required because of either the level of non-compliance with the proposed Code or our changing understanding of the risks, then the current prescription system could be supplemented by a separate licensing system relating to the actual application of

the grit. This would require the land-owner or designated land-manager to obtain a licence before putting out medicated grit, with conditions reflecting some or all of the elements noted in the recommendation on the use of medicated grit (e.g. training, preparation of grouse health plans and withdrawal periods).

Predator control

The control of avian predators is unlawful, although where problems arise intervention is possible under a specific or general licence. Licences under s.16 of the Wildlife and Countryside Act 1981 permit action to be taken against protected birds for various purposes including "for the purpose of conserving wild birds" and "for the purpose of conserving flora or fauna". Licences cannot be granted "unless [SNH] is satisfied that, as regards that purpose, there is no other satisfactory solution". Where particular species are perceived to be limiting the populations of Red Grouse and/ or other red or amber-listed ground-nesting birds, then greater use should be made of this power to authorise intervention, predominantly through non-lethal means but potentially extending to include lethal control where the predator species is widespread and has a strong population status.

The control of mammal predators is regulated by the laws on animal cruelty and controls on the sort of traps and snares that can be used, with new regulations on certain forms of traps in course of being implemented in accordance with the Agreement on International Humane Trapping Standards (affecting traps for stoats). The protected status of some predatory species (e.g. badgers) must also be taken into account. Increased regulation on the use of snares was introduced a few years ago and provides a model for other activities. For both cage traps and spring traps, in addition to the existing rules on the nature of the trap that can be used, further measures are recommended.

The lawful use of traps to catch corvids can result in the capture of, and on occasion injury to, raptors and other traps can also cause unintended harm to wildlife. The existing regulation on traps should be supported by a training requirement on those who set them. In keeping with the requirements for snares, new legislation should be introduced to make it a legal requirement for training so that it becomes an offence to set or operate a trap without an operator having successfully completed a course run by an approved and accredited body and dealing with the relevant category of trap (cage and/or spring). Any operator should undergo refresher training at least once every ten years. A trap operator who has successfully completed a relevant trap training course should apply to their local police station for a unique identification number which must be attached to all traps that are set.

Monitoring and enforcement

As noted in the more general discussion on regulation, in all cases any legislative scheme will have to identify the regulatory body – in these cases SNH is the obvious choice – and ensure that it has the appropriate powers, including powers of entry to land, in order to monitor compliance and gather evidence for enforcement activity. In keeping with regulatory practice in other areas there should be scope for flexibility in the response when non-compliance is discovered, including adjustments to the terms of a licence, stricter scrutiny of any licence

application (and loss of the ability to rely on any automatic 'general licence' if this is available) and ultimately suspension or revocation of the licence for serious or persistent non-compliance. Activity which does not fall within the terms of the licence would be unlawful and thus a criminal offence, although prosecution is unlikely to be the first resort in enforcement. Given the significance of the regulatory powers involved, an appeal mechanism should be provided, probably to the Scottish Land Court (as is already the route for certain matters under the Wildlife and Countryside Act 1981).

Training

In several places we recommend approved and accredited training for those responsible for certain activities. We recognise that the practical management of land involves many people, with varying degrees of control over what is to happen and some of whom are involved only on specific occasions when an increased workforce is required for a particular task, e.g. in looking after muirburn. The training requirement should not be applied to all those involved in any capacity but to those in a position to control the activity. This may require default responsibility falling on the owner or occupier, but their responsibility would not necessarily to be trained themselves, but to have formally identified the person who has *de facto* control of the activity and ensured that s/he has the requisite training. The aim is to ensure that the training requirement is satisfied at the most appropriate level, and some further work will be required with employers and training providers on specifying the content of training and what level of training provided by whom will be appropriate (e.g. anyone who applies pesticides as part of their professional activities should hold a recognised specified training certificate). The implications for the contractual arrangements between owners and staff or contractors may require consideration as detailed rules are formulated.

Recommendations in section 6 – summary list

17. *That muirburn should be unlawful unless carried out under a licence.*
18. *That SNH embark on achieving a count of Mountain Hare numbers across Scotland, not just on grouse moors nor just where they are being shot.*
19. *That a Code of Practice on the management of Mountain Hares, including legally enforceable reporting requirements, should be developed.*
20. *That should the conservation status of Mountain Hares prove to be 'unfavourable' then a licensing system for the shooting of Mountain Hares should be introduced.*
21. *That Food Standards Scotland should undertake work to identify the levels of flubendazole residues in grouse in the food chain that are judged inimical to human health and establish appropriate monitoring.*
22. *That there should be wider CPD training for veterinary surgeons on the use of medicated grit.*
23. *That SEPA should initiate a desk-based study to determine the appropriate nature and extent of a monitoring programme to ascertain whether flubendazole residues exist in water bodies on or downstream from where it is*

being used, including in association with grouse moors, to conduct such a monitoring programme and to report on its findings.

24. *That future monitoring of Cryptosporidium in connection with use of medicated grit should be undertaken should the associated risk prove necessary.*
25. *That new legislation should be introduced to make it a legal requirement that it becomes an offence to set or operate a trap without an operator having successfully completed a course run by an approved and accredited body and dealing with the relevant category of trap (cage and/or spring). A trap operator who has successfully completed a relevant trap training course should apply to their local police station for a unique identification number which must be attached to all traps that are set.*
26. *That any operator dealing with the relevant category of trap (cage and/or spring) should undergo refresher training at least once every ten years*.

7. Recommendations: consolidated list

This section brings together recommendations in sections 5 and 6 into a consolidated list.

General

1. *We unanimously recommend that a licensing scheme be introduced for the shooting of grouse if, within five years from the Scottish Government publishing this report, there is no marked improvement in the ecological sustainability of grouse moor management, as evidenced by the populations of breeding Golden Eagles, Hen Harriers and Peregrines on or within the vicinity of grouse moors being in favourable condition.*[4]
2. *That a framework Code of Practice on grouse shooting be produced reflecting regulation specific to the sector and advising on best management practices. If statutory provisions are included, the Code would need approval by Scottish Ministers with SNH having oversight and ownership.*

Raptors and predation

3. *That there should be no change in the legal status of any bird-of-prey species in Scotland.*
4. *That where particular species are perceived to be limiting the populations of red and or amber-listed ground-nesting birds, including Red Grouse, greater use should be made of the Wildlife & Countryside Act 1981 s16. This existing licensing legislation allows SNH to permit under licence a range of lethal and non-lethal management options.*
5. *That the brood management programme for Hen Harriers in England should be monitored, and if it is deemed successful in producing an increase in the breeding numbers and distribution of Hen Harriers, then consideration should be given to introducing a similar programme in Scotland.*
6. *That as much as possible should be done to change the culture of grouse moor management to accept more loss of grouse to avian predators and to allow these predators to nest locally.*
7. *That SNH, possibly through their licensing agent the BTO, or directly, ensure that the licences issued for the satellite-based tracking of tagged raptors includes a condition that commits the data holder (i.e. the owner of the tag) to: (a) being listed on a register of data holders which SNH, BTO and Police Scotland have access to; and (b) cooperate expeditiously with Police Scotland and SNH in sharing data and associated information regarding tagged birds found dead or missing in suspicious circumstances. That on receipt of shared data and associated information, Police Scotland expeditiously processes the shared data and associated information to determine whether or not it warrants referral to the Crown Office and Procurator Fiscal Service. The current priority raptors for data sharing would be Golden Eagle, Hen Harrier, Red Kite, Peregrine, White-tailed Eagle and Goshawk.*

[4] 'favourable condition' defined in Annex 4: Glossary.

Muirburn

8. That muirburn should be subject to increased legal regulation. This should apply to all muirburn, not only on grouse moors.

- *That the Scottish Government should increase regulatory control relating to the Muirburn Code;*
- *That SNH and Rural Payments and Inspections Directorate (RPID) should be given power and resources to monitor adherence to the Muirburn Code by any land manager[5] carrying out muirburn, whether or not they are in receipt of muirburn-related support payments;*
- *That increased training should be required for any land manager directly involved in setting and managing fires;*
- *That the Muirburn Code should be subject to regular updates to represent best available knowledge and consideration of predicted changes in climate that might require additional changes to parts of the Code. That this process be subject to expert peer-review;*
- *That a fire danger rating system for Scotland should be introduced to better support decision-making about where and when to burn;*
- *That the Scottish Government explore changes to the current RPID support payments that would discourage malpractice more effectively than the current very limited breach and penalty powers;*
- *That the Muirburn Code published in 2017 should be updated to include the Supplement to the Code: A guide to Best Practice.*

Mountain hares

9. That the shooting of Mountain Hares should be subject to increased legal regulation.

- *That, where the shooting of Mountain Hares is to be undertaken, land managers should be required to report annually to SNH the number of Mountain Hares present (using a standard counting method) and numbers shot on an area of land;*
- *That shooting of Mountain Hares should only be undertaken at the times licensed and in compliance with a Code of Practice on the management of Mountain Hares;*
- *That, to address concerns about the reliability of Mountain Hare numbers, SNH should generate a more robust evidence-base on the distribution, numbers and management influences on Mountain Hares to better inform management as well as Article 17 reporting to the Scottish Government and the EU;*
- *That adaptive management research should be used to determine relationships between local populations and numbers killed, to help inform*

[5] Definition of 'land manager': the person who should be legally responsible for any activity covered by this report.

and improve management recommendations over time to promote favourable conservation status for Mountain Hares in Scotland.

Medicated grit

10. *That the use of medicated grit should be subject to increased regulation.*
    - *That SNH, following consultation with other appropriate bodies, should publish a Code of Practice on the use of medicated grit;*
    - *That all land managers using medicated grit to reduce the worm burden in Red Grouse populations should adhere to the Code of Practice on the use of medicated grit;*
    - *That SNH should have powers to check compliance with the Code on the use of medicated grit;*
    - *That if, after five years or less, following introduction of the Code, non-compliance is widespread, the option of introducing increased legal control should be considered.*

Regulation

11. *That in accordance with the remit to "ensure that grouse moor management continues to contribute to the rural economy" we do not recommend that grouse shooting be banned.*
12. *That, in light of announced consultations, the following recommendations of the Wildlife Crime Penalties Review Group (Poustie Review) should be enacted:*

    Levels of fines and custodial sentences
    - *That maximum penalties available on summary conviction at least for the more serious offences, are raised to at least a £40,000 fine and up to 12 months imprisonment.*
    - *That conviction on indictment is more commonly made available across the range of wildlife offences with a maximum term of imprisonment of up to 5 years. This would not necessarily require a stand-alone Act but could be achieved as part of the next Criminal Justice or Criminal Proceedings Act.*

    Alternative penalties
    - *That forfeiture provisions are extended and these and other alternative penalties are made consistent across the range of wildlife legislation as appropriate.*
    - *That where a firearm or shotgun is involved in the commission of a wildlife crime, the court should have the power to cancel the relevant certificate, as is already the case in the Deer (Scotland) Act 1996.*
    - *That consideration should be given to amending firearms legislation which is reserved to the UK Parliament to allow the Chief Constable to withdraw a shotgun certificate where such a weapon has been involved in the commission of a wildlife crime not just on grounds of public safety but also on the grounds of a threat to the safety of wildlife.*

Sentencing Guidelines

- *That with the establishment of the Scottish Sentencing Council in October 2015, sentencing guidelines are developed for wildlife offences in order to enhance the consistency and transparency of sentencing.*

13. *That a wider range of moorland management activities should become eligible for RPID support.*
14. *That land managers should undertake training on relevant land management activities (muirburn, use of medicated grit, managing Mountain Hares, corvid control and setting of traps) and refresher courses when required, to ensure compliance with relevant Codes of Practice.*
15. *That an accreditation scheme on grouse moor management should be developed following widespread consultation across the grouse shooting sector.*
16. *Given the fragmented nature of current wildlife legislation, we recommend consolidation of this area of law (as recommended by Poustie).*

Recommendations on land management practices

17. *That muirburn should be unlawful unless carried out under a licence.*
18. *That SNH embark on achieving a count of Mountain Hare numbers across Scotland, not just on grouse moors nor just where they are being shot.*
19. *That a Code of Practice on the management of Mountain Hares, including legally enforceable reporting requirements, should be developed.*
20. *That should the conservation status of Mountain Hares prove to be 'unfavourable' then a licensing system for the shooting of Mountain Hares should be introduced.*
21. *That Food Standards Scotland should undertake work to identify the levels of flubendazole residues in grouse in the food chain that are judged inimical to human health and establish appropriate monitoring.*
22. *That there should be wider CPD training for veterinary surgeons on the use of medicated grit.*
23. *That SEPA should initiate a desk-based study to determine the appropriate nature and extent of a monitoring programme to ascertain whether flubendazole residues exist in water bodies on or downstream from where it is being used, including in association with grouse moors, to conduct such a monitoring programme and to report on its findings.*
24. *That future monitoring of Cryptosporidium in connection with use of medicated grit should be undertaken should the associated risk prove necessary.*
25. *That new legislation should be introduced to make it a legal requirement that it becomes an offence to set or operate a trap without an operator having successfully completed a course run by an approved and accredited body and dealing with the relevant category of trap (cage and/or spring). A trap operator who has successfully completed a relevant trap training course should apply to their local police station for a unique identification number which must be attached to all traps that are set.*

26. *That any operator dealing with the relevant category of trap (cage and/or spring) should undergo refresher training at least once every ten years.*

Appendix 1: Licensing grouse shooting: arguments in favour and against

The remit for this review invited us "*to advise on the option of licensing grouse shooting businesses*" and this is an issue to which we have given particular attention. Any assessment of the position is deeply affected by the lack of clear evidence on many aspects of the background – ecological, social and economic – and on how changes in the regulatory framework will alter the behaviour of key parties. An important point to appreciate is that this issue should not be viewed in isolation but is affected by action taken in relation to other aspects of this review, and to other reviews (e.g. Poustie, Deer Working Group), as well as by the wider choices that affect the policy and finances for various uses of land and the consequences of their implementation. Nevertheless, the discussion below endeavours to maintain a narrower focus, summarising the main arguments for and against introducing a licensing system for grouse shooting.

A preliminary issue to note is that there is no clear definition of 'grouse shooting businesses', since shooting on any land may be intermittent, depending on local conditions, and may be undertaken on a non-commercial basis. Consideration of a licensing scheme has therefore proceeded on the basis that the activity requiring a licence would be the killing of grouse. This avoids difficult questions in defining and identifying a 'grouse shooting business', a 'grouse moor', or in distinguishing between where land is managed for driven shoots (which tends to encourage the more intensive styles of management) as opposed to walked-up shooting.

A radical alternative, adopting an approach taken in many other countries, would be to shift the focus of controls on hunting away from the land where the hunting takes place and its owner and onto the hunter individually, see the SNH report *A Review of Game Bird Law and Licensing in Selected European Countrie*s (Pillai & Turner, 2017). Across the UK, hunting laws derive from the property rights of landowners, including the entitlement to hunt on their land, and the right to control who is allowed to take game on their land, with the landowner's control over access being the major constraint on hunting activity; the same applies to much of the law on fishing. A different perspective is to focus on the individual hunters and place controls and responsibilities on them, e.g. training and reporting requirements and limits on bag-size, with issues relating to access to land fulfilling a secondary role. Introducing such a change for grouse shooting alone would only increase the undesirable fragmentation of the law, with a clash between two underlying approaches to regulation, and accordingly is not further considered here. Reflection on the fundamental structure of the controls on hunting would be appropriate for a much deeper and more far-reaching review of the law and policy affecting that activity and related land use.

Arguments in favour of and against licensing have been provided by individual members of the Group. Viewed together, they should not be seen as representing the views of the whole Group. For the sake of a clear statement of the range of views reflected, rather than adding careful qualifications to almost every point, the arguments are phrased in terms of what 'will' and 'would' occur in certain

circumstances even though they are often matters of speculation and the likely outcomes are legitimately contested. Accordingly, what follows is stated in more definite and absolute terms than is strictly justified, on both sides of the argument, and does not represent the conclusions of the Group as a whole on any individual matter.

Arguments in favour

1. Grouse shooting and grouse moor management are activities that have a major impact on landscapes, habitats and the populations of wild creatures, but operate under fragmented legal regulation. Some aspects are controlled, e.g. close seasons for shooting and muirburn, but there are no limits on the intensity or forms of management, on the side-effects on other creatures, or on bag sizes. An activity that has such a major impact on our environment should be subject to a degree of control and central record keeping.
2. Although several forms of unacceptable conduct (e.g. killing raptors) have been criminal offences for years, the law is regarded as not being effective. Enforcement is difficult, requiring admissible evidence of specific wrong-doing against particular individuals. Although some improvements in detection and enforcement might be made, these may be matched by the adoption of new methods of offending and the inherent difficulty will remain. Enabling grouse shooting to take place at a fairly intensive level is perceived as a driver behind unacceptable practices, and by threatening the continuation of this activity, an effective deterrent would be provided. Land-owners/managers would be led to do their utmost to see that unacceptable conduct does not occur (even more so than the current vicarious liability which can only take effect when the evidential burden for a successful prosecution has been satisfied).
3. Under a licensing scheme there can be a graduated scale of consequences when inappropriate conduct is detected (e.g. additional reporting requirements, tighter conditions and ultimately revocation of the licence). These can be imposed on the basis of the civil burden of proof and a cumulative record of misbehaviour (as with the current rules for revoking a general licence under the Wildlife and Countryside Act 1981), avoiding the almost overwhelming difficulty of proving specific wrong-doing beyond reasonable doubt.
4. A licensing scheme need not impose substantial additional burdens for most operators, and in any event most substantial land uses, e.g. agriculture, already require some administrative burden, although often related to receipt of financial support. More onerous controls might be imposed only where required in view of particular problems that have been identified.
5. Media attention has been drawn to the activities of some grouse moor managers, mainly over the suspected killing of protected birds of prey, but also over the large-scale killing of hares and other animals, and over other aspects of moor management, such as muirburn, peat destruction and use of medicated grit. Some of these activities have repercussions well beyond the boundaries of grouse moors. The introduction of a centralised licensing scheme would help to reassure the public that government is taking these concerns seriously.

6. In a complex area, a licensing scheme offers greater flexibility rather than the blunt instrument of using the criminal law to prohibit particular unacceptable practices, especially when these may be hard to define and prove in a way that allows the criminal justice process to operate. The flexibility is also beneficial in terms of adopting an adaptive management approach, responding to our changing understanding of the position and the factors that influence it, and of incorporating a number of important public objectives (e.g. climate concerns as well as biodiversity).
7. A transparent licensing scheme would assist those in the industry who already observe high standards. Obtaining and keeping a licence would be a visible sign that the activity is being sustainably managed in an acceptable way and that land is being managed appropriately, directing any public criticism onto those who are not doing so. The potential for meaningful consequences if standards slip would also offer public reassurance. This would help to take the heat out of current polarised discussions where all grouse moors are treated alike.
8. Existing controls are not proving effective in guaranteeing appropriate and sustainable management (although what is 'appropriate and sustainable' can be contested). Codes of Practice can capture what constitutes good practice but do not 'have teeth'. Given the very varied financial positions and ambitions of grouse moor owners, financial incentives and penalties such as are widely used in agriculture and forestry will not always be effective. A licence allows for sanctions to be imposed for non-compliance, without every minor transgression necessarily amounting to a criminal offence.
9. A licensing scheme would allow for information to be gathered at national level, filling the information gaps which this review has shown, including the number, area and locations of grouse moors, the management activities undertaken and the number of animals present and killed. This would provide the basis for sound science to be used in future decision-making at a local and national level and enable an adaptive management approach to be taken, responding to changing circumstances.

Arguments against

1. The main forms of unacceptable behaviour are already unlawful and the emphasis should be on detecting and punishing the wrong-doers, not additional controls on others. The difficulties of effective enforcement are recognised, but there are improvements that can be made and these should be tried before more regulation is placed on all grouse moor owners, regardless of their behaviour.
2. The activities which are already criminal are being carried out by those who are consciously and deliberately breaking the law. Those willing to break the law today would not be deterred by a further layer of regulation, especially when it does not target them directly. Vicarious liability already places land-owners/managers at risk if they do not take steps to prevent offending by those under their control.

3. The other problems that have been identified in relation to grouse moors are related to aspects of specific land management practices (muirburn, medicated grit, etc.) and there are other more precisely targeted and arguably less burdensome measures to tighten existing controls on these practices which should be tried first. Many aspects of grouse moor management are already affected by legislation. Similarly, there could be more robust use of existing powers (e.g. revocation of general licences under the Wildlife and Countryside Act 1981) to address local problems.
4. Any increased costs or operational constraints arising from a licensing system will fall on all operators, including the reputable and conscientious ones, whilst those individuals willing to break the rules are likely still to escape sanctions in the absence of an unfeasibly high level of effort in detection and enforcement.
5. To meet legal standards, the imposition of any meaningful sanctions still requires a substantial evidential basis, so that although there may be no need to meet the full criminal threshold, there will remain a substantial challenge in establishing the case for stronger intervention. The introduction of a licensing system will not solve the problem of detecting and attributing wrong-doing.
6. A workable licensing system could be devised, but there would be difficult design issues and administrative costs and burdens on the licensing body and those licensed. It would be a disproportionate imposition in policy terms. There are other more precisely targeted and less burdensome measures which should be tried first. Moreover, as a restriction on the freedom of land-owners to enjoy their property as they wish, any licensing scheme may be subject to challenge under the Human Rights Act 1998. Like most forms of environmental regulation, a well-designed scheme should be legally acceptable, but there is a risk of legal challenge that would be a distraction. Dealing with these issues would divert time and resources from making a difference on the ground (c.f. the prolonged litigation over minimum pricing of alcohol).
7. Licensing for grouse shooting would single it out from many other forms of land use that can also have substantial environmental impacts (arable farming, forestry), but are not subject to a regulatory scheme that would not just control particular operations but could bring the underlying land use to an end. Similarly, other forms of shooting (e.g. for pheasants and partridges) are not currently subject to any regulation of the activity as a whole (as opposed to specific aspects of how it is carried out). Licensing can be seen in two very different ways: as a useful regulatory device, or, since the starting point is the outlawing of the activity (unless a specific exception is made), some people may perceive licensing as identifying grouse shooting as an inherently unwelcome activity to be tolerated only under strict conditions. For those people, such a development will not promote a cooperative atmosphere nor the search for mutually accepted solutions. The industry already feels itself under attack and even vulnerable to malicious interference as evidenced by damage to and tampering with snares, traps and cages which are often reported to the Police. Should a licensing scheme be introduced, the grouse sector fears that the incentive for malicious interference could well increase.

8. Although there are still some problems, much of the industry is alert to changing attitudes and conservation needs, and is responding with various measures already in train, e.g. the increased training for gamekeepers that highlights legal and conservation responsibilities, and initiatives such as the East Cairngorms Moorland Partnership.
9. Any increased demands in terms of regulation and implementation costs (e.g. time devoted to a licence application and record-keeping) would have an adverse effect on investment and viability, unless the benefits are greater than the costs. While some estates have wealthy backers, for others grouse shooting is one of several elements in an integrated management and financial system, and any additional costs may threaten the enterprise as a whole unless they bring greater direct benefits.
10. A licensing system that has the ultimate sanction of removing the right to shoot grouse (even if only in extreme circumstances) makes any investment in a grouse moor more precarious than in the absence of a licensing requirement and therefore might make it less likely to happen. The grouse industry is a major reason for investment in some rural areas, sustaining many jobs and services in those areas. This investment comes from the private sector with virtually no state support, whereas alternatives such as forestry and farming can in most cases attract substantial public funding.
11. Recent decades have seen a decline in the area of land managed as grouse moors and therefore of the habitat they provide, which is beneficial for some species other than grouse. Any measure that risks a decline in active management is likely to affect the state of the land in question and have an effect on neighbouring land as well (e.g. in relation to predator numbers) and will be very likely to lead to a further decrease in the area of managed moorland.
12. It is not clear that there are other land uses available for land currently used as grouse moor which can provide the same environmental, economic and social benefits at such low cost to the public purse.
13. With less investment in grouse moors generally and the risk of fewer grouse moors in total, there would be a significant effect on biodiversity (e.g. nesting waders). No other upland activity is likely to carry out significant predator control.

Annex 1: List of published sources

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Annex 2: Account of how the review was conducted

The Review Group met eighteen times for full-day meetings generally at the Royal Society of Edinburgh, but for three of our meetings we were hosted by estates variously located in the Angus Glens, the Scottish Borders and Speyside. Being able to see grouse moors and a conservation charity's property at first hand and discussing issues with owners and land managers greatly assisted our subsequent deliberations. We are most grateful for the hospitality we received at these estates.

Our initial meetings in 2018 from January through to July were focused on building an initial evidence-base. Group members, assisted by our Specialist Advisers and other experts in key areas, provided a series of presentations summarising key findings on each of the main issues in our remit – environmental law relevant to grouse moors, SEPA's licensing systems, wildlife crime (within both Scotland and the UK), raptor population trends and illegal persecution, legal predator controls, Mountain Hare management, muirburn and the use of medicated grit. We are most grateful for the contribution made by these outside experts. The Chair also held meetings with a number of organisations, normally with another member of the Group. Alongside receiving oral presentations, we assembled a database of key references. Some of the references were provided from within the Group and others contributed by outside groups and individuals who wished to contribute to our discussions and deliberations. Items in this database are included in our list of published sources. We decided not to add references generally to the main body of the text but provide the sources which we consulted in an extended list in Annex 1.

Having reviewed all the information and summarised the key findings from our initial trawl for evidence, during the summer (July through September 2018) we issued a questionnaire for key stakeholders. In this questionnaire (sent to 57 organisations and individuals) we sought to explore key issues in greater detail that either remained contested or constituted evidence gaps at this stage in the review. By the end of September we had received responses from 31 organisations and individuals across a wide range of stakeholders: individual estates, organisations variously representing particular interests (conservation NGOs, conservation special interest groups, land-owners and land managers, gamekeepers, sport shooting, groups of estates, trade organisations), firms of chartered surveyors, research scientists, veterinary scientists and public bodies including National Parks. Having analysed responses to our questionnaire, we then identified key areas where we wished to dig deeper into the evidence-base, either to resolve the remaining contested issues or to fill in continuing evidence gaps. Two meetings in November and December were devoted to taking oral evidence from nine experts, who collectively represented a wide range of views on grouse shooting. Again we are most grateful for the care taken by each of these experts in preparing for the meeting and for engaging in lively discussion with Group members. The Specialist Advisers were present at all except one of the meetings throughout 2018.

In 2019 we had six meetings (January, February, May, two in June and one in July). The significant gap between the second and third meetings arose from the Chair's temporary incapacity due to illness. The first four of these meetings in 2019 involved only Group members and were used to compile our report. The Specialist Advisers were invited back to re-join the Group for our second meeting in June. The Review Group then concluded its work during video-conferencing sessions in July and subsequent discussions from August to November.

Evidence gathered during the inquiry included that retained in the Minutes of meetings; copies of presentations made to the Group; a spreadsheet in which all the questionnaire returns were initially extracted verbatim and then subsequently summarised and commented upon by Group members; and a database of key references used by Group members.

Annex 3: List of abbreviations

BBS	Breeding Bird Survey
BTO	British Trust for Ornithology
CPD	Continuing Professional Development
EU	European Union
EC	European Commission
FTE	Full time equivalent
GIS	Geographic Information System
GPS	Global Positioning System
GWCT	Game & Wildlife Conservation Trust
IUCN	International Union for the Conservation of Nature
JNCC	Joint Nature Conservation Committee
JRS	Joint Raptor Study
LMDP	Langholm Moor Demonstration Project
RPID	Rural Payments and Inspections Division
RSPB	Royal Society for the Protection of Birds
SEPA	Scottish Environment Protection Agency
SFRS	Scottish Fire and Rescue Service
SLE	Scottish Land & Estates
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
SNH	Scottish Natural Heritage

Annex 4: Glossary

Favourable conservation status

The statutory nature conservation agency, SNH, advises JNCC and the UK and Scottish governments on the condition assessments, based on 'condition objectives' set for individual species and sites (SPAs, SSSIs), and EC Birds Directive Article 12 and EC Habitat Article 17 assessments. On collating returns from a variety of sources, the conservation status of the species being considered can be reported as:

- Good: Favourable
- Unknown
- Poor: Unfavourable-inadequate
- Bad: Unfavourable-bad
- Not applicable/not reported

with the category 'inadequate' referring to the available data.

In the present context, emphasis will be placed specifically on the local conservation status of raptors (especially, Golden Eagles, Peregrines and Hen Harriers) on and around grouse moors.

SNH reports to and advises the JNCC and the UK and Scottish governments on the conservation assessment of raptors in Scotland. The assessments are drawn from a variety of sources including the **BBS** (BTO/JNCC/RSPB Breeding Bird Survey – the main scheme for monitoring the population changes of the UK's common and widespread breeding birds, producing population trends for 117 bird and nine mammal species), the **Scottish Raptor Monitoring Scheme** (SRMS, chaired by SNH, of which JNCC is also a member), the **Rare Breeding Birds Breeding Panel**, and national surveys organised under **SCARABBS** (Statutory Conservation Agency and RSPB Annual Breeding Bird Scheme).

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