

Foreword

Every journey starts with a single footstep. The journey we are embarking on starts in a place and time when almost one fifth of Scotland is managed for the single purpose of artificially increasing the number of red grouse reared to be shot for recreation.

In order to maximise the number of grouse available to be shot, any animal that threatens them is labelled a pest and rigorous efforts are made to eradicate them. The grouse are liberally medicated and flocks of sheep are employed as "tick mops" to attract ticks away from the grouse. The moors are set on fire to make life better for the grouse and worse for other animals and the climate. An average of 26,000 iconic mountain hares are killed each year, also supposedly for the grouse's protection and at the same time unregulated tracks and roads scar the landscape to make these activities easier.

But what of that landscape? Grouse moors have only been with us since Victorian times. It's too easy to look out over expanses of barren, depopulated and exposed moors and think that's what the uplands naturally look like. But they look that way because misguided human intervention has made them look that way. And they've been made that way to ensure that there are as many red grouse as possible to shoot for recreation. They are an amazing national resource which is being squandered, one of Scotland's biggest failures of potential and an economic loss to us all.

The journey we are on leads to a time and place when we know who owns all of Scotland. We want all that land to have the chance to benefit local communities, the wider economy and the flora and fauna that should exist there.

The journey will be long and we will need friends along the way. That's why the Revive coalition is being formed and launched towards the end of 2018. Social, environmental and animal welfare organisations often watch each other's progress with satisfaction but only occasionally work together. But when we started to explore the idea of a coalition aiming to reform Scotland's grouse moors there was no hesitation. It was, as they say, a no brainer.

This report carefully and rigorously states the case for why reform is not only needed but urgently needed. It will be followed by a number of publications, events and opportunities for members of the public to show their support for grouse moor reform.

We will engage with the Scottish Government which has already taken some of the same steps on our journey. We stand ready to be an encouraging and helpful hand.

It will not be a short journey but we are prepared for that. Our aim is to question why almost a fifth of Scotland is allowed to be used to the detriment of people and animals and to put forward visions of how it could be better utilised. We look forward to working with anyone who shares our passion for making Scotland a better place.

The Revive Coalition

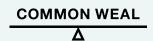


The coalition for grouse moor reform











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Summary

There is uncertainty about the extent of grouse moors in Scotland, but they are estimated to cover somewhere between 1 and 1.5 million hectares, amounting to 12–18% of the country's landmass. That means that almost one fifth of Scotland is managed for grouse shooting. There is also uncertainty about the ownership of some of these vast estates, as the identities of some owners are obscured in offshore accounts.

Driven grouse shooting, where wild red grouse are 'driven' (flushed) by beaters towards a static line of shooters, relies upon the availability of high numbers of grouse. To achieve this surplus, grouse moor managers incorporate three core elements of management:

- Habitat manipulation (rotational burning of heather) to produce a mosaic of nutritious young heather for grouse to eat and older heather to provide nesting cover and protection from predators;
- Parasite control, which includes medicating the grouse with a veterinary drug dispensed via medicated grit and direct dosing, and also the mass culling of mountain hares that host some parasites;
- Lethal predator control typically of foxes, weasels, stoats, crows but some grouse moor managers are also involved in the illegal persecution of birds of prey.

The success of a grouse moor (and its economic value) is measured by the number of grouse shot each season (the bag size). Since the early 2000s there has been an intensification of the three main management techniques to meet the demand for large bags. This has been largely unregulated (and where it is, the regulation is light) and the subsequent impacts of intensification can cause significant and widespread environmental damage.

The increased frequency and intensity of heather burning, especially over deep peat, can have negative impacts on nutrient cycling, water quality, soil erosion, air pollution, biodiversity, and of most concern, can contribute to the long-term loss of the carbon store. In Scotland, burning is one of the main reasons for the poor condition of upland sites designated for their conservation value.

Red grouse are now maintained at such artificially high densities that they are badly affected by a disease (Cryptosporidiosis) usually associated with high density flocks of captive poultry. This disease, which spreads via the communal use of medicated grit trays, threatens not only the red grouse but also species of high conservation concern that inhabit grouse moors, e.g. black grouse. Some grouse moor managers are now using super-strength medicated grit, up to twenty times the original dose. Statutory monitoring to ensure the drug does not enter the food chain is virtually

non-existent and the environmental impact of depositing a high dose medicine in to a sensitive environment is unmonitored, even though this particular drug (Flubendazole) has been shown in studies elsewhere to be an emerging environmental contaminant of acute and chronic toxicity, particularly to aquatic organisms.

The killing of wildlife on driven grouse moors is a relentless, year-round slaughter, carried out to ensure high stocks of red grouse are available for recreational shooting. The number of animals killed is unknown as there is no statutory requirement for reporting, but the annual toll on predators must number in the hundreds of thousands, at least. Mountain hares are killed to such an extent (almost 38,000 reported in 2017 alone) that this protected species has suffered a catastrophic decline on grouse moors in the Eastern Highlands, including inside the Cairngorms National Park.

In addition to legal predator control, birds of prey continue to be persecuted on some driven grouse moors to such an extent it is causing population-level effects on iconic species such as golden eagles, hen harriers, red kites and peregrines. The level of criminality, which, we believe, fits the definition of organised serious crime, is unacceptable and is out of control.

This report contains

compelling evidence

on the need for urgent

radical reform of

driven grouse moor

management which is

long overdue: the weight

of evidence can no

longer be ignored.

Introduction



By 1850, with the introduction of breechloading shotguns, driven grouse-shooting became very popular and the expansion of the railway network made the moors increasingly accessible. Driving grouse involves a line of 'beaters' disturbing the grouse and causing them to fly towards a line of 'butts' in which shooters use shotguns to attempt to kill as many of the birds as possible. Early introduction of modified management of moorland involved heather burning to provide an enhanced habitat for breeding and the almost total elimination of predators. These techniques led to a rapid increase in the red grouse population with record numbers of over 2,000 birds killed in a single day.

These early interventions of intensive management were accompanied by dramatic fluctuations in numbers of birds due to outbreaks of disease. Despite regular burning and the killing of predatory species such as foxes and crows, the fluctuations in



Red grouse, courtesy of Scotland: the Big Picture

grouse populations continued and were the subject of a number of detailed studies (e.g. Kerlin *et al.* 2007) which attempted to isolate the process by which such fluctuations in the population occur.

In recent years, the management of driven grouse moors has intensified significantly with higher levels of intervention on both the habitat and the population of red grouse. A range of new management techniques have been introduced with very little oversight or scrutiny. Electric fencing, road construction, medication, culling of other species such as mountain hares and unrelenting illegal persecution of raptors are all features of a management framework that has intensified on many driven grouse moors with, until recently, very little public surveillance or debate.

In 2015 we wrote a report (Wightman & Tingay, 2015) that identified those interventions, analysed their impacts

and drew conclusions on how those developments should be addressed in light of the widespread concerns that have emerged.

Since the publication of our report, driven grouse moor management has been the subject of increasing public and political concern (e.g. see Thompson et al. 2016), resulting in the Scottish Government commissioning a review in 2017 on the environmental impacts of grouse moor management and the costs and benefits of large shooting estates to Scotland's economy and biodiversity. That review (known as the Werritty Review) is due to report in spring 2019.

Here we provide an update to our 2015 report to include further information about newly published scientific research, as well as reporting on recent political activity and policy, to help inform the public debate.



Legal framework

The red grouse in law

The red grouse is a wild bird. In law it is res nullius. It belongs to no-one until it is taken or killed, and is thus a public resource. Historically, the grouse was defined in law as a game bird and was the subject of a legislative framework that had been in place since at least the 18th century and the Game (Scotland) Act 1772. In 2011, however, this status was repealed by the Wildlife and Natural Environment (Scotland) Act 2011 which ended the distinct legal category of game species and added the species to Schedule 2 Part 1 of the Wildlife and Countryside Act 1981 as a bird that may be killed or taken (captured).

The management of red grouse is predominantly under the control of those who own the land upon which the bird nests and feeds. The state only has a role in regulating matters such as the species that can be killed, the seasons and the hunting method together with some regulation of management activities such as moor burning. Beyond specific legislative provisions in relation to the species and wider environmental and wildlife law, there is no distinct body of law on grouse shooting as an activity or land use. Any owner or occupier is free to manage moorlands to encourage artificially large populations of grouse that can be shot for recreational purposes.

This contrasts sharply with the regulatory approach of other European countries where the state enforces strict legislation to ensure the sustainability of game bird hunting. A recent Scottish Government-commissioned report (Pillai & Turner, 2017) found that in 14 European countries the state regulates game bird hunting through legislation which includes the licensing of individual hunters and a strict requirement to report harvest quotas and bags. Licences can be revoked if the legislation is contravened and penalties can be imposed for serious breaches. In many of these countries, hunters must pass a two-part practical and theoretical examination to qualify for a hunting licence.

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In 2016, the Scottish Raptor Study Group lodged a petition (PE01615) with the Scottish Parliament calling for a state-regulated licensing system for all game bird hunting in Scotland (Steele & Hudspeth, 2016). The Scottish Government is currently considering a potential licensing option as part of a wider commissioned review of grouse moor management (Werritty, 2018).

Extent, ownership and tenure

There is uncertainty about the extent of land managed for grouse shooting in Scotland. Scotlish Land & Estates (2013) claim there are approximately one million hectares of grouse moors, whereas the Scotlish Government's Land Reform Review Group (Scotlish Government, 2014) cite 1.5 million hectares from Warren (2009). With Scotland's landmass at 80,077km2, this means grouse moors cover between 12–18% of the country.

Estimates of the extent of this land use vary depending upon definitions and the type of grouse moor management deployed, i.e. the intensive management required for driven grouse shooting, where large stocks of red grouse are required, or the less intensively managed walked-up grouse shooting and shooting over dogs; types of management which are not so reliant on high density stocks of red grouse (Grant et al. 2012). The estimated coverage of between one million and 1.5 million hectares includes all three types of grouse shooting and it is unclear what proportion of this is intensively managed for driven grouse shooting (the focus of this report), although it is likely to be considerable as recent commentary from a prominent sporting agent states that in Scotland:

"...the amount of walked-up shooting has significantly reduced from the glory days. The bulk of walked-up shooting is on moors that are managed more intensively for their driven grouse, and the days take place before the driven programme starts."

(Rattray, 2016).

In addition to the reduction in walked-up shooting, the practice of shooting over dogs also appears to be in decline, in favour of a greater focus on intensive driven grouse shooting. An article in The Field magazine (2011) states:

"At one time shooting over dogs at the start of the season was considered good practice on many moors, provided the weather had been decent during the spring and there was not a high percentage of late broods. This was the case when my grandfather was the shooting tenant of Tullymurdoch in Perthshire during the early Twenties. For the first fortnight the moor was dogged on the theory that if the first and last pair in a covey were shot, old birds and sick birds were being taken out. Further-more, there was the strongly

held belief that birds used to getting up performed better when driving started. Dogging also provided the young with an invaluable opportunity to shoot their first grouse and learn something of the mechanics of moorland management. Now demand for shooting over setters and pointers exceeds supply. With the huge commitment involved and the escalating costs of maintaining good heather habitat, few owners can afford to give up days early in the season to shooting over dogs, even on the periphery, if a moor is good enough to be driven. Dogging opportunities on many of the marginal estates in Sutherland and Caithness or parts of the west coast have been lost due to habitat shrink-age, tick and the ever-increasing raptor problem, particularly from ravens".

Further complications arise in estimating the extent of land used for grouse shooting when one particular aspect of grouse moor management (predator control) is taken in to account. Predator control occurs on the grouse moor itself but also beyond the boundary of the moor (e.g. in forestry blocks or on in-bye ground) so the mapping of moorland habitat alone is insufficient to calculate the full extent of grouse moor management as a land use 'type'.

The vast majority of grouse moors are owned as part of relatively large landholdings or sporting estates that were established in the 19th century for hunting. The core extent of ground managed for the killing of driven grouse is in Strathspey, the eastern Cairngorms, Highland Perthshire, the Angus Glens and the Lammermuir and Lowther Hills.

This new cadre of grouse moor manager has

introduced a more aggressive and intensive

approach to management designed to

increase grouse yields and boost profitability

Selection of prominent grouse moor estates

Estate	Owner	x
Buccleuch Estate	Buccleuch Estates Ltd. Selkirk	x
Burncastle Estate	Duke of Northumberland	
Cawdor Estate	Cawdor Trusts, Nairn	х
Corrybrough Estate	Tinsley (Branston) Farms Ltd., Lincoln	Х
Dorback Estate	Salingore Real Estate Ltd., Bahamas	
Drumochter Estate	Alasdair & Eira Drysdale, Newtonmore	X
Farr & Glen Kyllachy	Newbie Salmon Fisheries (Scotland) Ltd., Tomatin	Х
Glendye Estate	Leased to Glen Dye Grouse Moor Syndicate	Х
Glenfiddich & Cabrach	Golden Lane Securities Ltd., London	х
Glenlochy Estate	Umena Management Ltd., St. Vincent, The Grenadines	х
Glenogil Estate	Baron Ferdinand von Baumbach, Munich, Germany	Х
Invercauld Estate	Farquharson Trust leased shooting tenants	Х
Invermark Estate	Dalhousie 2006 Trust, Brechin	х
Leadhills Estate	Marquess of Linlithgow, Linlithgow	Х
Millden Estate	Millden Sporting LLP, Glasgow	X
Moy Estate	John Mackintosh, Tomatin	Х
North Glenbuchat	North Glen Estate Ltd., Turks & Caicos Islands	X
Raeshaw Estate	Raeshaw Holdings Ltd., Jersey	х
Roxburghe Estate	Roxburghe Trusts, Edinburgh, Guernsey & Bermuda	
Seafield Estate	Earl of Seafield & Trusts, Buckie	х

X = estates where wildlife crime has been recorded in recent years

Grouse moors have traditionally been owned by established landed families such as the Earls of Seafield, Roxburghe, Mansfield and Dalhousie. These moors typically form a part of a much larger landholding that includes low-ground farming. Over the past 50 years or so, an increasing amount of grouse shooting has been rented to paying clients in order to try and cover the costs of managing grouse moors and until around 2000, this was the typical profile of driven grouse moors in Scotland.

Since then, two important developments have taken place. Firstly, some grouse moors that were formerly part of larger holdings have been sold, creating new landholdings dedicated to grouse shooting. Secondly, some of the grouse moors on traditionally-owned estates have been let on long leases of between 10 and 20 years to shooting tenants (e.g. on Seafield and Invercauld Estates).

This change in the ownership and management of grouse moors has resulted in an influx of new money mainly from the financial sector. Hedge fund managers, investment bankers and merchant bankers who were earning multi-million-pound salaries and bonuses, were drawn to the conspicuous consumption of grouse moors. In 2006, research had shown that an estate bought 20 years previously would have generated a better return than the stock market (Independent, 2006). Scotland was the destination for some of the £2 billion bonus pot distributed to City workers that year, as Andrew Rettie from Strutt and Parker noted at the time:

"Fuelled by record bonus payments to investment bankers and other City personnel, the demand for estates in Scotland during 2006 has been the highest I have witnessed for a long time. Not everyone working in the City wants to buy a Scottish estate, but if you are in your 50s and your children have left home and been educated, then you might want to indulge your passions. And if it's game shooting or salmon fishing then what better place than Scotland?" (Scotsman, 2006).

Money has been the principal driver for the intensification of grouse moor management as new owners and tenants seek to overcome the cyclical nature of red grouse populations and secure a sustainable population surplus that can be killed by recreational shooting.

This new cadre of grouse moor manager has introduced a more aggressive and intensive approach to management designed to increase grouse yields and boost profitability as illustrated by the case study as illustrated in the Glen Ogil case study overleaf.

Glen Ogil estate - case study

Grouse shooting estates are not required to provide any statutory financial or other returns other than as required by company law where relevant. It is difficult therefore to ascertain much in the way of details about management policies and financial performance. One estate, however, that has attracted some attention has been Glenogil Estate in Angus and the following provides an insight into the contemporary affairs of an intensive grouse-shooting estate.

John Dodd, co-founder of Artemis fund managers, acquired Glenogil Estate in Angus in 2003 from the Earl of Woolton for £6.3 million. Dodd hired grouse moor management consultant Mark Osborne to 'restore' the moor and boost the grouse numbers (Percy, 2008). This involved the construction of an electrified fence along the boundary of the estate to keep red deer out and sheep in, intensive road construction, the widespread use of medication for wild grouse and the killing of predators.

Associated with this intensification of management has been a catalogue of recorded incidents on Glenogil Estate involving illegal persecution of raptors although it is not proven that any of these were the responsibility of the estate.

Although managed as a grouse shooting estate, Glenogil receives agricultural subsidies from the Scottish Government. The presence of a sheep flock is sufficient to qualify the estate as an agricultural holding and as an agricultural activity. In 2010, Glenogil Estate received £368,787 in public funds and in 2011, £346,757.

In 2008, the farming subsidy was cut by £107,000 by the Scottish Government after poisoned baits were found on the estate. It was the largest civil penalty imposed under EU cross-compliance legislation, which makes protection of wildlife a condition of subsidy.

In 2013, John Dodd sold the estate for £19 million to Baron Ferdinand von Baumbach from Munich, Germany. This represents a £10 million real-terms increase in value from the £ 6.3 million (£ 9.1 million at 2013 prices) acquisition price in 2003. Detailed accounts are not available although Glenogil Ltd. publishes very modest trading accounts. It is reasonable to suppose, however, taking account of ongoing public subsidy of around £300,000 per year and costs associated with the grouse shooting enterprise, that the estate has yielded a very handsome return on capital.

Wild life crime reports

2006 Poisoned rabbit bait (Carbofuran).	No prosecution.
2006 Poisoned rabbit bait (Carbofuran).	No prosecution.
2006 Poisoned woodpigeon bait (Carbofuran).	No prosecution.
2006 Traces of Carbofuran found in estate vehicles & on equipment during police search.	No prosecution.
2007 Disappearance of radio-tagged white-tailed eagle Bird N coincides with tip off to police that bird been shot.	No prosecution.
2008 Thirty-two poisoned meat baits on fence posts (Carbofuran, Isophenfos, Bendiocarb).	No prosecution.
2008 Poisoned meat bait on fencepost (Carbofuran).	No prosecution.
2009 Poisoned buzzard (Carbofuran).	No prosecution.
2009 Poisoned buzzard (Carbofuran).	No prosecution.
2009 Poisoned white-tailed eagle 89 (Carbofuran).	No prosecution.
2010 Poisoned buzzard (Chloralose)	No prosecution.
2010 Poisoned buzzard (Carbofuran).	No prosecution.
2010 Poisoned pigeon bait (Carbofuran).	No prosecution.
2010 Poisoned pigeon bait (Carbofuran).	No prosecution.
2012 Remains of buzzard found beside pheasant pen.	Suspicious death.
2012 Spring-trapped buzzard.	No prosecution.
2012 Remains of buzzard found under a rock.	Suspicious death.
2013 Shot buzzard.	No prosecution.
2013 Illegal hawk trap.	No prosecution.
2014 Shot buzzard.	No prosecution.



Management impacts

Introduction

There are three management principles to achieving a 'successful' driven grouse moor: habitat management, parasite control and predator control. The intensification of these grouse moor management techniques is causing increasing concern to a number of public authorities with responsibilities for aspects of countryside management. A report on moorland management prepared for the Cairngorms National Park Authority (Cairngorms National Park Authority, 2014) noted that, "The way in which moorland management is carried out has a significant influence on delivering a range of National Park Partnership and Cairngorms Nature outcomes and priorities."

Noting that intensification of management was designed to "maximise production of red grouse", the report argued that "there are concerns about the single-species focus of this management and negative impacts on other species and habitats in the National Park."

In cautious and diplomatic language, the report then notes detailed concerns over habitat management, wildlife persecution, culling of mountain hares, hill tracks and fencing.

This concern continues to date. In its National Park Partnership Plan 2017–2022, the Cairngorms National Park Authority writes:

"Good moorland management makes a significant contribution to delivering conservation priorities set out in the Partnership Plan. In some places, however, the intensity of management measures to maintain or increase grouse populations is out of balance with delivering wider public interest priorities" (Cairngorms National Park Authority, 2017).

This section of the report examines some of these specific issues arising as a result of intensification practices.

"There are concerns about the single-species focus

of this management and negative impacts on other

species and habitats in the National Park."

Heather and peatland burning

Grouse shooting is a major land use in the UK (Douglas *et al.* 2015) but many grouse moors overlie blanket peat soils. Peat moorlands are internationally important resources, storing 3.2 billion tonnes of carbon – the largest terrestrial carbon resource in the UK (Brown *et al.* 2014). In addition to carbon storage and sequestration, other important ecosystem services provided by peat moorland include water regulation, flood risk regulation, fire risk regulation and biodiversity protection (Moors for the Future Partnership, 2012).

Grouse moor managers routinely burn patches of heather (known as 'strip muirburn') to create a structurally diverse patchwork habitat to favour red grouse: tall heather provides concealment from predators, younger heather (regrowth after burning) provides adult grouse with more nutritious shoots for food, and short heather provides greater insect availability for chicks.

In Scotland this management technique is governed by the recently-revised Muirburn Code (Scotland's Moorland Forum, 2017) which provides a combination of statutory requirements and 'good practice' guidelines. Muirburn is permitted only during the statutory season (1st October to 15th April inclusive) although it can be extended to 30th April with landowner's permission, but this increases the risk to ground-nesting birds. Scottish Natural Heritage (SNH) may also license muirburn

beyond the season in certain circumstances. The enforcement of the Muirburn Code (apart from the seasonal restrictions) is limited, and there have been suspected breaches of the Code including the burning out of hen harrier (Circus cyaneus) nests on heather banks and the torching of golden eagle (Aguila chrysatos) eyries (Steele, 2016) which have been explained by grouse shooting representatives as being 'accidents' relating to muirburn. Excessive muirburn has also been suggested as a contributory factor in the long-term decline of breeding merlin (Falco columbarius) on grouse moors in the Lammermuir Hills (Heavisides et al. 2017).

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Burning heather, courtesy of Ruth Tingay

Moorlands are of high conservation value for their vegetation, invertebrate and bird communities with large areas given legal protection for nature conservation under the European Habitats Directive (Special Areas of Conservation) and Birds Directive (Special Protection Areas) (Douglas *et al.* 2015). However, burning alters vegetation composition and structure and, where fire temperatures are high and rotation lengths are short, it may be damaging to fire-sensitive, peat-forming species such as *Sphagnum* moss species (Brown *et al.* 2014). Inappropriate burning is cited as one of the main reasons for poor condition of upland sites designated for their conservation value, contributing to the reasons for 'unfavourable' condition on 87% of 'unfavourable' upland bog features in Scotland (Scottish Natural Heritage, 2010).

The EMBER (Effects of Moorland Burning on the Ecohydrology of River basins) study by the University of Leeds was conducted over five years to examine the impact of heather-burning on ten river catchments in northern England, half of which were regularly burnt for grouse shooting and half which were not. Key findings were that burning had impacts on peat hydrology, peat chemistry and physical properties, river water chemistry and river ecology (Brown *et al.* 2014).

Professor Joseph Holden, from the School of Geography at the University of Leeds, and a co-author of the study said: "Altering the hydrology of peatlands so they become drier is known to cause significant losses of carbon from storage in the soil. This is of great concern, as peatlands are the largest natural store for carbon on the land surface of the UK and play a crucial role in climate change. They are the Amazon of the UK."

An issue of growing concern is the increasing extent and intensity of burning on grouse moors, and particularly the effects of burning over deep peat (usually defined as > 0.5 m depth; Bain *et al.* 2011). Where blanket bog is damaged by burning, impacts include a lowered water table and breakdown of the active peat-forming structure resulting in the long-term loss of the carbon store.

Despite there being a presumption in the Muirburn Code against burning on deep peat, recent research has found that 28% of all 1km squares subjected to burning in Scotland overlie deep peat, including many protected sites, and the annual number of burns increased significantly (11% per annum) between 2001–2011, the years covered by the study (Douglas *et al.* 2015). The authors considered these findings likely to be a conservative underestimate.

This increased burning coincides with the general intensification of grouse moor management. Rotational heather burning has been shown to increase red grouse breeding success (Robertson et al. 2017), which maximises grouse abundance available for recreational shooting in the autumn. As the 'success' of a driven grouse moor is measured by grouse productivity (Tighe, 2016), there is little financial incentive for grouse moor managers to reduce the extent and intensity of muirburn.

This is in direct conflict with concerns about meeting global carbon emission targets. In June 2015, the UK statutory advisory Committee on Climate Change published its report to Parliament and noted that, "Wetland habitats, including the majority of upland areas with carbon-rich peat soils, are in poor condition. The damaging practice of burning peat to increase grouse yields continues, including on internationally protected sites" (Committee on Climate Change, 2015).

The European Commission is currently taking legal action against the UK Government for alleged breaches of the Habitats and Birds Directives in relation to the burning of blanket bog on protected sites in northern England. Permission for this burning is entirely on land managed for driven grouse shooting (RSPB, 2016a).

This management system that has been in place for 150 years and which is increasing in extent and intensity is clearly no longer sustainable in light of recent research. The results of another five-year study on the impact of three different management practices for blanket bog (uncut vs burnt vs mown) is expected imminently from researchers at York University (Peatland-ES-UK, 2016). This study assessed the effects of each management practice on vegetation dynamics, carbon flux, carbon stock, greenhouse gas emissions, water quality and water flows and the results are anticipated to demonstrate further the negative impact of burning.

Policies to reverse the

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Policies to reverse the damaging environmental effects of peatland burning must be implemented as a matter of urgency. However, bizarrely, the grouse shooting industry is calling for the continued burning of peatland moors as "one of the most effective means of reducing the risk of damage from wildfires by providing breaks in continuous moorland cover and reducing the fuel load" (Gift of Grouse, 2018).

This position contradicts the Muirburn Code which states that, "Fires escaping from muirburn are a major cause of wildfire in Scotland" (Scotland's Moorland Forum, 2017). In addition, the recent SNH-commissioned review of sustainable moorland management states:

"Whilst large, intense wildfires can be destructive, many may have no greater impact than prescribed burns (Clay et al. 2010) and evidence suggests that over 50% of wildfires with known causes may themselves be caused by loss of control of prescribed burns" (Werritty et al. 2015).

Mass outdoor medication

As early as 1911, a Parliamentary Committee of Inquiry had identified a parasitic threadworm as the principal cause of disease in red grouse:

"After investigating nearly two thousand cases of death from other than natural causes, and the facts surrounding circumstances of over two hundred outbreaks of disease, the Committee have arrived at the conclusion that the Strongyle worm, and the Strongyle worm alone, is the immediate cause of adult grouse disease" (Lovat, 1911.)

A parasitic worm (the nematode worm, *Trichostrongylus tenuis*, a gut parasite causing strongylosis) is known to play a role in the population fluctuations of red grouse (Hudson *et al.* 2003), causing natural population 'crashes' every four to seven years. To try to encourage a consistently high population density of grouse available to kill, one of the intensification methods adopted since the 1980s has been the use of medication to reduce the incidence of the worm (Game Conservancy Trust, 2004) and thus 'override' the red grouse's natural and cyclical 'boom and bust' population crashes.



Medicated grit tray, courtesy of Ruth Tingay Grouse naturally ingest mineral grit to assist the digestion of heather so grouse moor managers provide them with an alternative source of grit, coated with the pharmaceutical worming drug Flubendazole. Some grouse moor managers, dissatisfied with the results of using double-strength medicated grit, are now using super-strength medication of up to twenty times the concentration of the original anthelmintic drug (Osborne, 2013).

The medicated grit is dispensed via grit trays regularly distributed across the moor, sometimes as frequently as every 75m depending on grouse density (one tray per grouse territory). The use of medicated grit is supposed to be administered under veterinary supervision and only as annual worm counts dictate. However, we have seen recent evidence of potential grit 'stockpiling' on one estate in the Angus Glens, with sacks of ten-years-out-ofdate grit piled up on pallets behind an out-building (League Against Cruel Sports investigator, pers. comm. 2018). As there is no routine statutory monitoring of the use of medicated grit, it is not known whether this out-of-date grit is still being dispensed.

There is a statutory 28-day withdrawal period for medicated grit to ensure the veterinary drug Flubendazole does not enter the human food chain via shot grouse. However, recent Freedom of Information requests have revealed that prior to 2015, the Government's Veterinary Medicines

Directorate (VMD), responsible for national monitoring of veterinary drugs in food products, had failed to complete any monitoring or surveillance for drug residues in red grouse because its staff claimed not to know where to locate shot grouse for testing (Raptor Persecution UK, 2015a).

Some grouse moor

managers, dissatisfied

with the results of using

double-strength medicated

grit, are now using

super-strength medication

of up to twenty times

the concentration of the

original anthelmintic drug



Grouse grit, courtesy of League Against Cruel Sports Scotland (LACSS)

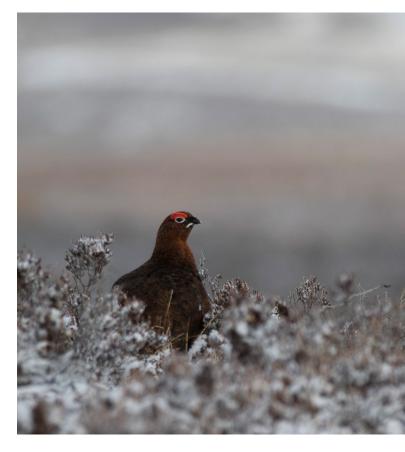
Since then, the VMD's surveillance has been woefully inadequate. The number of red grouse shot in the UK is unknown as there is no statutory requirement to submit annual bag figures. However, in 2012/2013, the Game & Wildlife Conservation Trust (GWCT) conservatively estimated, via voluntary bag returns of some but not all UK grouse–shooting estates, that 700,000 grouse were shot that season (Game & Wildlife Conservation Trust, 2018a). Given the ongoing intensification of grouse moor management and reports of increased density of red grouse on some grouse moors (as high as 200–500 birds/km2 and over 20,000 birds shot on one single grouse moor in one season, Baines *et al.* 2014), six years on this figure is now likely to exceed one million shot birds per annum. The proportion of these that are shot in Scotland is unknown, but it is reasonable to suggest they number in the hundreds of thousands.

Of those shot grouse, in 2016 the VMD tested just six samples (two from Scotland, four from England) for veterinary drug residues. In 2017, it tested eight birds (four from Scotland, four from England). In 2018 it proposed to test just ten birds (Raptor Persecution UK, 2018a).

Another technique used to medicate red grouse against the Strongyle worm is to direct dose them with another anthelmintic drug, Levamisole Hydrochloride. The grouse are caught at night and the drug is orally administered using a syringe to dispense the drug into the grouse's throat. It is an offence to take or kill a red grouse in the closed season but the Wildlife and Natural Environment (Scotland) Act 2011 introduced Section 2(3C) of the Wildlife and Countryside Act 1981 allowing for the taking of red grouse in order to administer medication with the intention of releasing it within 12 hours. This provision was introduced to the Act with no formal public consultation. In order to take a red grouse for the purposes of medication, it is an offence under the EU Birds Directive and the Wildlife and Countryside Act 1981 to use any artificial lighting or dazzling device. To by-pass this prohibition, statutory provision has been made to do this under a General Licence (GL/05/2015) from Scottish Natural Heritage (Scottish Natural Heritage, 2015).

The use of this General Licence is permitted across Scotland from 1st January – 31st December, with the exception of the red grouse breeding season defined as 16th April – 31st July. This means the drug Levamisole Hydrochloride may be administered during the grouse shooting season (12th August – 10th December), in contravention of the statutory 28-day withdrawal period to prevent veterinary drugs entering the human food chain via shot grouse. As far as we are aware, the VMD has never carried out surveillance on shot red grouse to test for residues of this drug.

Red grouse have also been medicated to protect against Louping ill virus, an endemic tick-borne disease which can lead to fatalities (Jeffries et al. 2014). Treatment applications have included attaching pesticide-impregnated leg rings and wing tags to red grouse, as well as direct dosing with acaricidal drugs (Porter, 2011; Raptor Persecution UK, 2016a), although as this practice appears to be unregulated it is not known how many grouse moor managers are employing these techniques.



Red grouse, courtesy of Scotland:
The Big Picture

The grouse are caught at

night and the drug is orally

administered using a syringe

to dispense the drug into

the grouse's throat

The extent to which red grouse are medicated is officially undocumented (again, due to the lack of statutory monitoring) although a recent GWCT research paper stated "virtually all grouse managers" are using medicated grit (Baines et al. 2017). Likewise, the extent to which red grouse are direct dosed with Levamisole Hydrochloride is also officially undocumented, although a recent report indicated that on Glenogil Estate in the Angus Glens, "Almost 90% of the adult birds were caught in late autumn to dispense each with a fluid vermicide" (Hoffmann & Rohe, 2015). Whether this is representative of all driven grouse moors is unknown.

Medicating wild red grouse against the Strongyle worm has been reported as having significant success in overriding the red grouse's naturally cyclical 'boom and bust' population crashes (Baines *et al.* 2016). However, on intensively managed grouse moors it has led to the significant and rapid spread of disease – respiratory cryptosporidiosis (*Crypotosporidrum baileyi*), also known as 'Bulgy Eye'.

Cryptosporidiosis was, until recently, almost entirely associated with captive poultry flocks that were kept at high density, usually for breeding purposes. It was first detected in wild red grouse in 2010 and by 2014 it had spread across approximately half of the intensively managed grouse moors in northern England (Baines et al. 2014), although it may have spread further since then. The main route of transmission has been identified as contaminated, communally-used grit boxes (Baines et al. 2017a), although other contributory factors may include the 'driving' (flushing) of birds for several kilometres during a shooting day (Baines et al. 2014) and contaminated peat being transferred between grouse moors on the wheels of vehicles, boots and equipment (Osborne, 2014).

Cryptosporidiosis was first recorded in Scotland (on grouse moors in the Lammermuirs) in 2013 (Baines et al. 2014) and in 2015 a GWCT scientist told a seminar audience that "since then we've heard of much further outbreaks" [sic] (Tingay, 2015a) but we have been unable to find any further information on this. A Freedom of Information request to Scottish Natural Heritage (SNH) in 2018 confirmed that SNH was not undertaking any monitoring or surveillance on the spread of this disease (Raptor Persecution UK, 2018b).

This apparent indifference to a potential disease epidemic caused by intensive grouse moor management is of deep concern, particularly as this disease not only poses welfare concerns but also a significant threat to biodiversity, especially to other avian species of high conservation concern inhabiting the same moors, such as Black grouse (*Lyrurus tetrix*) (Parsons *et al.* 2017; Baines *et al.* 2017b).

As well as the implications of the rapid spread of disease impacting on wildlife, wider questions remain about the potential environmental impacts of placing a veterinary medicine (Flubendazole, via medicated grit) in the open air in the natural environment. Ecotoxicology studies elsewhere have identified Flubendazole as an emerging environmental contaminant of acute and chronic toxicity (Wollenberger et al. 2000) and has been shown to be particularly toxic to aquatic organisms (Zrncic et al. 2014; Wagil et al. 2015). As far as we are aware, in Scotland no assessment has been made of the environmental impacts of this drug in upland ecosystems.

The distribution of a pharmaceutical drug across the landscape and into the food chain represents a level of intensification that transforms moorland from a seminatural environment into a quasidomesticated farmed environment.

Lethal predator control

Lethal predator control is one of the three management requirements for a successful driven grouse moor. Red grouse are a ground-nesting species and as such are highly vulnerable to aerial and ground predators. Predation is a natural phenomenon to which all bird species are subject and have evolved, as have their predators, to maintain a general balance (e.g. Gibbons et al. 2007). However, with grouse moor owners' ongoing ambition to increase the number of grouse available to be shot, the density of red grouse on some grouse moors has increased far in excess of the 60 grouse per km² suggested by Hudson (1992) as the population density required for viable driven grouse shooting. With reports of red grouse densities on some driven grouse moors being as high as 200-500 birds/km² (Baines et al. 2014), these excessively and artificially high densities can only be sustained by a consistently high level of lethal predator control.



Snared fox, courtesy of OneKind

Lethal control of birds

Under European and Scottish law all wild bird species are protected, but the killing of so-called 'pest' bird species by 'authorised persons' is specifically permitted and regulated either by individual licences or by General Licences. There are currently 17 General Licences issued annually by SNH (Scottish Natural Heritage, 2018a) and three of those are most commonly used to permit the killing of native bird species on driven grouse moors:

GL 01/2018 — To kill or take certain birds for the conservation of wild birds
GL 02/2018 — To kill or take certain birds for the prevention of serious damage
GL 03/2018 — To kill or take certain birds for the preservation of public health, public safety and preventing the spread of disease

General Licences avoid the need for individual licensing, which means that anyone without a recent conviction for wildlife crime may kill certain bird species under certain circumstances without needing any prior permission (except the landowner's), training or certification of competence, although General Licences do define conditions of use including authorised trap designs, restrictions on manner of use, provisions for welfare of decoy birds, and the tagging of traps

to identify the owner. Failure to comply with these conditions may constitute an offence under various wildlife and animal welfare legislation. However, many of these conditions have been widely and repeatedly criticised as being ambiguous and wide open to misuse and abuse (e.g. Dick, 1997; Dick & Stronach, 1999; Dick, 2005; Raptor Persecution UK, 2012a; RSPB Scotland, 2017a).

The methods of killing birds permitted by the General Licences include the pricking of eggs, oiling of eggs, destruction of eggs and nests, live-trapping (using a wide array of trap designs which are largely indiscriminate, e.g. see OneKind, 2018a), targeted falconry, by hand, and by shooting, including the use of shotguns and semi-automatic firearms.

The bird species commonly killed under a General Licence on driven grouse moors include carrion crow (Corvus corone), hooded crow (Corvus cornix,) jackdaw (Corvus monedula) and rook (Corvus frugilegus) although other permitted species include the jay (Larus marinus), magpie (Pica pica) and various species of gull and pigeon.

The extent of lethal bird control on driven grouse moors is unknown as there is no statutory requirement to report the number killed under a General Licence (with the exception of herring gull (*Larus*

The extent of lethal bird control on driven grouse moors

is unknown as there is no statutory requirement to

report the number killed under a General Licence

argentartus) killed under GL 03/18). A recent SNH-commissioned review estimated in an average year 282,966 corvid species are killed by 1,183 trap operators in Scotland (Reynolds, 2016) although for the purposes of this report this figure needs to be treated with great caution as it did not include all grouse moor trap operators and did include some trap operators not associated with grouse moor management.

More accurate figures from just one grouse shooting estate (Raeshaw Estate in the Scottish Borders) reported that in little over a month (between 19th July – 25th August 2016), a total of 1,000 birds (294 rooks and 706 jackdaws) were killed (Raptor Persecution UK, 2017a). As lethal bird control is permitted year-round under the General Licences, the number of wild native birds lawfully killed to enable the recreational shooting of red grouse must be considerable, in addition to the unlawfully killed species that are often caught in such indiscriminate traps (e.g. see Dick, 2005; Hartley et al. 2016).

SNH reviews the General Licences annually and whilst it has responded to some criticisms by making some amendments, General Licences are still considered to be a light-touch form of regulation for the killing of wild birds, in stark contrast to the especially stringent licensing requirements for those who capture and release wild birds for scientific purposes (e.g. bird ringers, see BTO, 2018).

Apart from having no idea how many birds are killed, or even how many traps are in use, there is no routine inspection of traps by the statutory authorities and no register of individual trap operators. Enforcement of breaches of the General Licence conditions is especially problematic, particularly on large commercial driven grouse moors where multiple gamekeepers are employed.

The General Licence conditions state that live-catch corvid traps must display an identification number of the trap owner, but this number does not identify an individual trap operator, only the owner (usually the landowner or agent). If an alleged breach/ offence has been detected on a grouse moor where multiple gamekeepers are employed, all the gamekeepers need to do is offer a 'no comment' response to a police enquiry and no further action can be taken as the individual responsible cannot be identified. If the offence involves raptor persecution then SNH may consider withdrawing the use of the General Licence for a period of three years, although this has limitations (see section on Scottish Government's Measures to Tackle Raptor Persecution) and is only applicable to offences relating specifically to raptor persecution, not to offences involving non-raptor species.



Crow cage trap, courtesy of LACSS

Where a bird species is not permitted to be killed under a General Licence, SNH may issue an individual licence for lethal control if certain conditions are met. Earlier this year a cadre of grouse moor managers, using the name Strathbraan Community Collaboration for Waders, successfully applied for a 'research' licence to SNH to permit the mass killing of protected ravens (*Corvus corax*) on a number of grouse moors in Perthshire, purportedly to protect breeding waders although many suspected it was to protect red grouse stocks (Raptor Persecution UK, (2018c). However, this licence was successfully challenged and SNH's own Scientific Advisory Committee later criticised the scientific rigour of the licence as being "completely inadequate" and "seriously flawed" (Scottish Natural Heritage, 2018b).

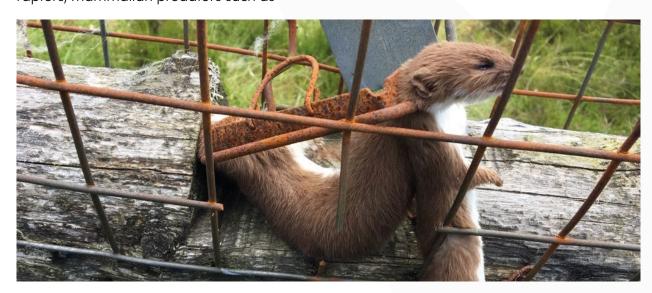
Lethal control of mammals

The lethal control of some mammals (notably foxes (*Vulpes vulpes*), stoats (*Mustela erminea*), weasels (*Mustela nivalis*)) is widely undertaken on driven grouse moors but unlike the control of wild birds, is not covered by a General Licence. As with lethal bird control, grouse moor managers may kill as many of these species as they wish, whenever they wish, with no requirement to report on the number killed.

Lethal predator control (avian and mammalian) on driven grouse moors can be beneficial to the breeding success of red grouse and to other ground-nesting birds of conservation concern such as golden plover (*Pluvialis apricaria*) and Eurasian curlew (*Numenius arquata*) (e.g. Tharme *et al.* 2001, Fletcher *et al.* 2010). However, protected raptors, mammalian predators such as

wildcats (*Felis silvestris*), badgers (*Meles meles*), pine martens (*Martes martes*) and even domestic cats are also regularly killed, either by accident or deliberately, as a result of some trapping methods (e.g. Harris & Yalden, 2008).

There are a variety of traps which are used to kill small mammals on driven grouse moors (e.g. see OneKind, 2018a), and the design and use of these is governed by the Spring Traps Approval (Scotland) Order 2011. The most commonly used trap is the spring (Fenn) trap to target stoats and weasels. These traps aim to kill quickly and humanely by breaking the spinal cord although often a victim may be caught just by a limb, causing considerable pain and suffering and a prolonged death (OneKind, 2018a).



Stoats in Fenn trap, courtesy of LACSS

Grouse moor managers

may kill as many of these

species as they wish,

whenever they wish, with

no requirement to report

on the number killed.

Spring traps are regularly and widely abused on some driven grouse moors to illegally catch non-target species, notably raptors (e.g. RSPB Scotland, 2015a) by setting them in the open (instead of inside a natural or artificial tunnel as the legislation requires) next to baits or chained to the top of a post to create a 'pole trap'. Pole traps are particularly barbaric as when the raptor lands on the trap, its legs are crushed in the trap jaws. As the bird tries to fly free, the trap, which is chained to the post, holds the bird by the legs, resulting in the bird dangling upside down, suffering acute pain from its injuries, and left to die a prolonged and agonising death. Pole traps were banned in 1904 and yet gamekeepers are still caught using them with alarming regularity (e.g. Raptor Persecution UK, 2017b).

Spring trap operators are not required to undertake any training prior to use, nor are they required to be registered anywhere, nor to retain records of use. As with the lethal control of wild birds, enforcing the legislation when spring trap offences are discovered on large commercial driven grouse moors where multiple gamekeepers are employed is virtually impossible, as was the case recently when illegally-set spring traps were

found set on a grouse moor on Invercauld Estate in the Cairngorms National Park (Raptor Persecution UK, 2016b).

As there is no statutory duty to report trap use or to retain records, the extent to which these traps are used on driven grouse moors in Scotland, and their impact on small mammal populations, is unknown.

However, some insight can be gleaned from a recent report that claimed "about 2000 [spring] traps" were in operation on the intensively managed driven grouse moors at Glenogil Estate in the Angus Glens (Hoffmann & Rohe, 2015).

Some spring traps, notably the widely-used Fenn model, have recently been identified as being inhumane for catching stoats under the Agreement on International Humane Trapping Standards (AIHTS) and are set to be withdrawn from use in Scotland (for catching stoats) on 1st January 2020 (Game & Wildlife Conservation Trust, 2018b). However, the AIHTS does not include weasels (because unlike stoats, weasels are not used for the fur trade) so it is unclear whether trap operators will still be permitted to use these traps to kill weasels and if so, how they will exclude the probability of killing stoats.



Snare, courtesy of LACSS



Stink pit, courtesy of LACSS

Foxes are routinely and systematically killed on driven grouse moors and the most common methods used are shooting and snaring.

Snares consist of a wire noose that captures the fox around the neck. The intention is that the noose keeps the fox in place until the gamekeeper arrives to dispatch the victim. However, being captured in a noose rarely causes foxes to keep still and their struggle to escape can cause serious injury and even death (OneKind, 2017a).

Snares may be set in strategic locations on driven grouse moors and very often they are used in conjunction with a 'stink pit' (also known as a midden). These stink pits consist of piles of rotting animal carcasses (including the corpses of native wildlife and sometimes domestic pets) that are dumped in a heap and surrounded by snares (e.g. OneKind, 2017b). The putrefying stench from the corpses attracts predators to the pit which are then caught in the snares, killed, and thrown on to the stink pit. In 2017 during a Parliamentary debate on the use of stink pits, Environment Cabinet Secretary Roseanna Cunningham MSP committed to undertaking two separate reviews on this unregulated practice (Raptor Persecution UK, 2017c).

In 2011, in response to long-term campaigns by the League Against Cruel Sports (2010) and OneKind (2010) about the indiscriminate nature of snares and the serious welfare implications associated with their use, the Scottish Government introduced a new regulatory regime for snare use through the Wildlife and Natural Environment (Scotland) Act 2011. These regulations include a requirement for snare operators to undergo training and registration, to use an individual ID tag on each snare to identify both the individual snare operator and the species the snare has been set to catch, restrictions on the type of snare used and its placement in the landscape, a duty to inspect a set snare at least once every day at intervals of no more than every 24 hours, and a requirement for extensive record keeping.

However, although these regulations appear to be robust in comparison to other types of lethal predator control, research has revealed that the new regulations still do not address the "unnecessary and unjustifiable suffering" of snared animals and there is widespread public support for a ban on snare use in Scotland (OneKind & League Against Cruel Sports Scotland, 2016).



Mountain hare culls

In addition to the routine and widespread lethal control of predators, mountain hares (*Lepus timidus*) are also killed in huge numbers on many driven grouse moors in Scotland and the scale of the culling is believed to have increased as part of the intensification of grouse moor management (Watson, 2013a; Watson & Wilson, 2018).

The mountain hare is Britain's only native hare and has an important ecological role in the uplands, especially as a source of prey for top predators of conservation concern such as golden and white-tailed eagles (e.g. Whitfield *et al.* 2007; 2013).

The mountain hare's conservation status in Scotland is as follows (from OneKind, 2017c):

- Listed on Annex V of the EU Habitats Directive (1992) which requires member states to maintain populations in favourable conservation status;
- Listed as a priority species for conservation action under the UK Biodiversity Action Plan;
- Included on the Scottish Biodiversity List, which means that it is considered by Scottish Ministers to be of principal importance for biodiversity conservation;
- Protected by a closed season under the Wildlife and Natural Environment (Scotland) Act 2011, which makes it an offence to kill a mountain hare in the closed season (1st March to 31st July)
 without a licence from SNH.

Mountain hares are killed for a variety of reasons including to protect forestry interests and for recreational sport shooting, but overwhelmingly on driven grouse moors to seek to control the viral disease 'Louping-ill' (LIV) in red grouse (Kinrade *et al.* 2008).



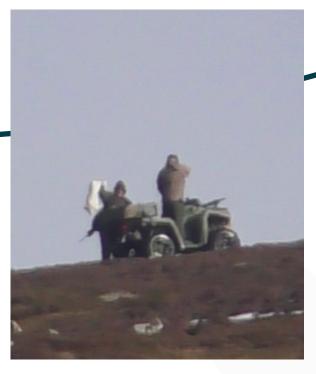
Dead mountain hare removal from the moors, courtesy of LACSS/OneKind

LIV can be transmitted by ticks that are hosted by mountain hares and other mammals and can affect grouse chick mortality (Hudson, 1992). A study in 2003 concluded that experimental removal of mountain hares reduced tick numbers, grouse tick burdens and the prevalence of LIV (Laurenson et al. 2003). However, Cope et al. (2004) noted that the study found no significant impact of hare culling on the grouse surplus available for shooting and advised that reducing mountain hare numbers would be premature. A further study found "There is no compelling evidence base to suggest culling mountain hares might increase red grouse densities" (Harrison et al. 2010).

Despite these findings, culling mountain hares on driven grouse moors specifically to control ticks (on the misunderstanding that it will increase red grouse densities) has been a management technique recommended by the Game and Wildlife Conservation Trust for at least the last nine years (Smith, 2009; Game & Wildlife Conservation Trust,

2018c) and led to large-scale culls reported on driven grouse moors in Inverness-shire, Moray, Banffshire and Nairnshire (Watson, 2013a), Aberdeenshire (Edwards, 2013), the Angus Glens (Raptor Persecution UK, 2013a), and the Lammermuirs (Edwards, 2014).

The impact of these mass culls on the mountain hare's population status was unknown as the species is notoriously difficult to survey (e.g. Newey et al. 2018). However, given the unregulated culling, the lack of a statutory reporting requirement, and the large number of hares estimated to have been killed on driven grouse moors (at least 25,000 in one year, Kinrade et al. 2008) and the subsequent public outcry, in 2014 SNH, in a joint statement with GWCT and Scottish Land & Estates, called on grouse moor managers to undertake 'voluntary restraint' (Scottish Natural Heritage, 2014). In addition, SNH announced a three-year study to develop counting methods for mountain hares.



Mountain hare cull, courtesy of LACSS/OneKind

In 2015 a consortium of ten wildlife conservation organisations called on the Scottish Government to impose a three-year moratorium on mountain hare culling as a precaution to safeguard the population until an approved counting method had been established (RSPB Scotland, 2015a). The Scottish Government refused but supported continued voluntary restraint.

However, evidence emerged that the grouse shooting industry was not respecting the call for voluntary restraint as more mass hare culls were reported on grouse moors in the Cairngorms National Park (e.g. Raptor Persecution UK, 2016c) and a Freedom of Information request revealed a Cairngorms National Park Authority Board Member had advised gamekeepers to 'cover up' dead mountain hares to reduce the chance of photographs appearing in the public domain (Raptor Persecution UK, 2016d).

Later that year OneKind held a demonstration rally at the Scottish Parliament (Huyton, 2017a) which was "There is no compelling

evidence base to suggest

culling mountain hares

might increase red

grouse densities"

addressed by Environment Secretary Roseanna Cunningham MSP:

"...the Government does not support
mass culling. We don't want to see
mass culling, but we do need the
evidence. If you can provide us with
actual evidence....then certainly we
will be looking at dealing further
with this issue".

In 2017 the consortium of ten wildlife conservation organisations again called on the Scottish Government to introduce a three-year moratorium on mountain hare culling as it was suggested voluntary restraint was being ignored (RSPB Scotland, 2017b). Pressure was also increased by a OneKind petition to the Scottish Parliament's Public Petitions Committee calling for greater protection of mountain hares (Huyton, 2017b) and a series of Parliamentary questions and a motion from Alison Johnstone MSP calling for "urgent action" (Raptor Persecution UK, 2017d). The Scottish Government agreed to include a review of mountain hare culls in the forthcoming Werritty Review but still claimed evidence of large-scale culls was lacking.

In response to a Parliamentary question (S5W-14021) from Colin Smyth MSP in February 2018 asking what efforts the Government had made to prevent large-scale culls of mountain hares that winter, the Cabinet Secretary responded:

"The Scottish Government opposes large-scale culls of mountain hares. There is no current evidence to indicate that large scale culls are taking place but if evidence emerges that points to large-scale culls taking place that could cause significant population declines, locally or nationally, the Scottish Government will consider bringing forward further measures to protect mountain hares. This could include the use of Nature Conservation Orders or giving mountain hares further protection under the Wildlife & Countryside Act 1981.

Recent analyses of available data by Scottish Natural Heritage (SNH) provides no evidence of a national decline in mountain hares. Data from the North East of Scotland suggests there may be local population declines but these are not reflected at a national scale".



Roseanna Cunningham, courtesy of OneKind

One month later, a consortium of campaigners from OneKind, League Against Cruel Sports Scotland and Lush released video footage of "brutal, military-style culls" of mountain hares that had been filmed on a number of driven grouse moors a few weeks earlier (OneKind, 2018b).

In response to this shocking footage, the following conversation took place in the Scottish Parliament on 29 March 2018 (Scottish Parliament, 2018):
Alison Johnstone MSP:

"New footage of the sickening slaughter of mountain hares is reported by the BBC today. Has the fact that the evidence comes from well-regarded animal welfare groups finally convinced the Government that voluntary restraint is sadly lacking on too many Scottish shooting estates? When and with whom will the urgent meetings that the Government is now seeking take place, and when will the Scottish Government introduce new legal protection for this fabulous iconic animal?"

First Minister Nicola Sturgeon MSP:

"I share Alison Johnstone's concern—and her anger, which is evident in her voice—about some of the images that we are seeing on our screens today. There is real public concern about this iconic species of the Scottish mountains, and that is a concern that we share. Large—scale culling of mountain hares could put their conservation status at risk: that is clearly unacceptable. I know that the pictures to which Alison Johnstone refers will be distressing to many people.

"Alison Johnstone asked who will be at the meetings that the Cabinet Secretary for Environment, Climate Change and Land Reform has talked about. The meetings will take place with all relevant stakeholders, landowner groups, gamekeepers, and environmental organisations. I make it very clear that the Government is exploring all the available options in order to prevent mass culls of mountain hares. One of those options, of course, is legislation and a licensing scheme. What we are seeing is not acceptable. That is the very clear message from the Government".

With indisputable evidence that largescale culling is continuing (nearly 38,000 hares killed during the 2017 season, Briggs, 2018), in contravention of the Governmentendorsed voluntary restraint, all that is left to demonstrate is that these on-going culls have led directly to a decline in the mountain hare population.

This evidence has been provided by the publication of two scientific peer-reviewed papers in 2018. The first (Massimino *et al.* 2018) uses data collected during bird surveys since 1995 and through spatial trend modelling shows a significant decline (<50%) on 24% of recorded sites where trends can be estimated. The results from this study illustrate mountain hare declines at a national level.

However, the majority of mountain hares are found in the Cairngorms and northeast Highlands, predominantly on land managed for grouse moors (Kinrade *et*

al. 2008). The second paper (Watson & Wilson, 2018) focuses on this core range and analyses an extraordinary long-term dataset (1954-2017) over a large sample of plots (113 sites). The authors show severe long-term declines of spring transect counts of mountain hares on moorland (grouse moor and deer forest), with fluctuating but gradually increasing numbers on higher, alpine sites. Amongst moorland sites, grouse moors exhibited the lowest rates of decline until the end of the 20th century but experienced the fastest rates of decline thereafter (numbers in 2017 were 99% lower than numbers recorded when the study began in 1954). The timing of this recent catastrophic decline coincides with the onset of widespread culling of mountain hares to seek to limit the spread of Louping-ill to red grouse.

At the time of writing the Scottish Government is yet to respond to these findings.



Mountain hares culled on a grouse moor and left to rot, courtesy of LACSS

Illegal raptor persecution

There has been a long and well-documented association between raptor persecution and grouse moor management in the UK uplands, dating back to the mid-1800s and continuing to the present (e.g. Anon, 2000; Whitfield *et al.* 2003; Lovegrove, 2007; Amar *et al.* 2012; Avery, 2015).

By the early 1900s, the combined effect of persecution on grouse moors (traditionally by poisoning, trapping, shooting and nest destruction) as well as persecution by other groups such as skin and egg collectors (Mearns & Mearns, 1998; Cole & Trobe, 2000) resulted in dire consequences for many raptor populations. Several species became extinct in Scotland including the white-tailed eagle (Love, 1983), goshawk (Marquiss & Newton, 1982), red kite (Evans et al. 1997) and osprey (Pandion haliaetus) (Brown & Waterston,1962). Other species in Scotland managed to avoid extinction but suffered severe range contraction as a direct result of persecution, including the hen harrier (Watson, 1977), peregrine (Falco peregrinus) (Ratcliffe, 1993), golden eagle (Watson, 1997) and buzzard (*Buteo buteo*) (Tubbs 1974).

Full legal protection for all raptors followed with the enactment of the Protection of Birds Act 1954 (with the exception of the sparrowhawk (*Accipter nisus*) which was afforded protection in 1961). Following a change in society's perception of raptors over the following 60 years, several raptor

recovery projects took place in Scotland including white-tailed eagle (Love, 1983; 2013) and red kite (Evans et al. 1997) reintroductions and this year a project has begun to translocate golden eagles from the Highlands to south Scotland to help reinforce the tiny, isolated population (South Scotland Golden Eagle Project, 2018).

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in the UK uplands

Further legislation to protect raptors was also introduced during this period including a complex array of Scottish, UK and European-specific laws. These afforded raptor species the high level of legal protection they have today, making it an offence to poison, shoot, trap, destroy nests or recklessly or deliberately interfere with a nesting raptor.

Nevertheless, despite progressive societal attitudes and increased legislative protection, raptor persecution continues in the twenty-first century, as evidenced by the long-term data published by the RSPB and RSPB Scotland (RSPB 2014; 2015; 2016b; 2017; RSPB Scotland 2008; 2009; 2010; 2011; 2012a; 2013; 2015b). (see table below)

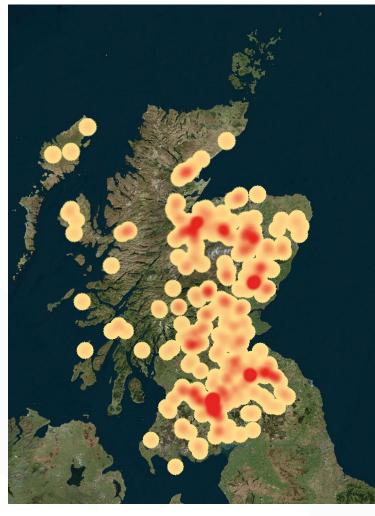
Number of confirmed poisoning incidents, and number of confirmed and probable incidents of other types of persecution in Scotland 2007–2016. [Data post–2016 not published at the time of writing].

Incident type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	10yr total
Confirmed (poisoning)	35	24	34	26	14	4	8	7	10	14	176
Confirmed (other)	16	12	10	17	14	25	24	15	17	7	157
Probable (other)	25	28	20	11	18	23	10	8	7	14	164
Total	76	64	64	54	46	52	42	30	34	35	497

These data are routinely challenged by those within the grouse shooting industry as being "exaggerated" (Carrell, 2006), "unofficial" (Scotsman, 2009) and "speculative" (Scottish Gamekeepers Association, 2013). One MSP (John Scott) stated in Parliament that the Scottish Conservatives did not accept that raptor persecution was widespread and that he considered it to be "a part real, part imaginary crime" (Raptor Persecution UK, 2010). Conversely, others have argued that these raptor persecution data can be considered the most accurate, detailed and consistently collected in comparison to other wildlife crime recording in Scotland and that the recording method is scientifically legitimate with a clear indication of interpretative limitations (Tingay, 2015b).

The full extent of raptor persecution in Scotland is difficult to determine. Wildlife crime in general is widely recognised as being under-recorded (Gavin *et al.* 2009; Wellsmith, 2011) and is accepted as such in Scotland (Scottish Government 2008; 2013; NWCU, 2014; Tingay, 2015b).

The under-recording of raptor persecution crime is largely due to the remoteness of some of the crime locations, especially those in rural areas (i.e. grouse moors) where geographic constraints severely limit the number of potential witnesses. Indeed, what is usually found is the aftermath of a crime, as opposed to the witnessing of



Heatmap of raptor persecution incidents 2005-2014

a crime in progress. Most evidence, often in the form of victims of the crime, are found purely by accidental discovery (e.g. by passing walkers). It is also known that some perpetrators take extra measures to prevent the detection of their crimes, e.g. by removing injured or dead birds from the crime scene and relocating them elsewhere (e.g. Raptor Persecution UK, 2011a; RSPB Scotland, 2012b). Search efforts that are reliant on such a limited, ad hoc basis, coupled with the social and cultural pressures inhibiting certain sectors of the rural community from reporting persecution incidents will inevitably result in an (unknown) quantity of undetected crimes against raptors.

Raptor persecution crimes that are recorded are often described as representing 'the tip of the iceberg' (e.g. RSPB Scotland, 2013), a claim vigorously disputed (Carrell, 2006; Scotsman, 2008; Edwards, 2011) when used to describe the extent of raptor persecution on land managed for driven grouse shooting. However, there is a significant weight of scientific evidence supporting the contention that the crimes detected represent only a proportion of those committed (e.g. McMillan, 2011), particularly when the extent of persecution is considered sufficiently high to be constraining the populations of some species at the local, regional and/or national level.

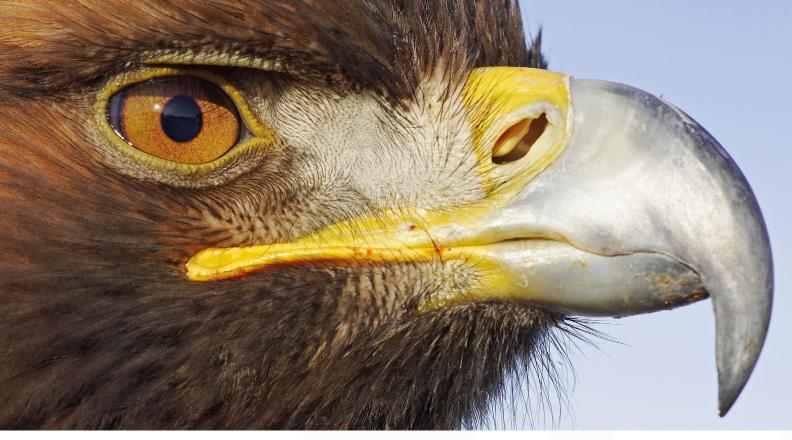
An award-winning scientific study (Smart et al. 2010) highlighted this low probability of detection by demonstrating the number of illegally-killed red kites in a sub-population in northern Scotland. Using population modelling techniques the authors calculated that a total of 166 red kites had been illegally poisoned between 1999 and 2006, but only 41 poisoned carcasses were actually found.

Other peer reviewed scientific studies have also helped to inform an estimate of the extent of raptor persecution on Scottish grouse moors by examining the severe effect of sustained persecution on the population dynamics of several raptor species. These include the golden eagle

(Watson & Whitfield, 2002; Whitfield et al. 2004a; 2004b; 2007; 2008; Watson, 2010; Watson, 2013b); goshawk (Petty & Anderson, 1996; Marquiss et al. 2003; Kenward, 2006); hen harrier (Etheridge et al. 1997; Green & Etheridge, 1999; Summers et al. 2003; Sim et al. 2007; Anderson et al. 2009; Fielding et al. 2011; Hayhow et al. 2013; Rebecca et al. 2016); peregrine (Hardey et al. 2003; North East Raptor Study Group, 2015); and red kite (Carter et al. 2003; Sansom et al. 2016).

Collectively, these studies render the dispute about the exact number of raptor persecution incidents inconsequential because clearly, raptor persecution on grouse moors in Scotland is sufficiently widespread and prevalent to be causing population-scale impacts.

Some of these studies are now over 20 years old and some might argue the results are now out of date. However, in the past four years there have been national (UK) surveys on three species: peregrine (2014), golden eagle (2015) and hen harrier (2016). These coordinated national surveys are undertaken periodically for several raptor species and help to build a picture of national and regional population trends. The results from all three recent national surveys provide damning evidence that illegal raptor persecution on many driven grouse moors continues to cause population-level effects, decades after first being described.



Golden eagle, couresty of Scotland: The Big Picture

Peregrine - Although the 2014 UK breeding population overall (estimated at 1,769 pairs) had increased by 22% since the previous national survey in 2002, this was largely due to increases in lowland areas in England where over a quarter of pairs are now breeding on man-made structures. In Scotland there was a modest overall population decline but regional declines were much more prominent, particularly in upland areas where peregrine occupancy and breeding success were lower in and near areas managed for driven grouse shooting (Wilson et al. 2018). These national results mirror other regional studies that have demonstrated that grouse moor management is negatively associated with peregrine breeding success (Amar et al. 2012; North East Raptor Study Group, 2015; Melling et al. 2018).

Golden eagle - The headline news was that overall, the national 2015 UK breeding population (all in Scotland) had increased by 15%, rising from 442 pairs in the 2003 national survey to 508 territorial pairs in 2015, resulting in the species gaining 'favourable conservation status' (500 pairs is the threshold criteria), even though this is still well below the country's estimated carry capacity of 700 pairs (Whitfield et al. 2008). However, as with the peregrine, this overall national increase masked significant regional variation. The 2015 national survey results (Hayhow et al. 2017) showed continued low occupancy of golden eagle territories in the eastern and south-central Highlands where the land is intensively managed for driven grouse shooting, just as the results had shown from the previous national survey undertaken fourteen years ago in 2003 (Eaton et al. 2007). Illegal persecution on driven grouse moors has been repeatedly identified as being the most significant constraint to population growth in these regions (Whitfield et al. 2003; Whitfield et al. 2004a; Whitfield et al. 2004b; Whitfield et al. 2007; Whitfield et al. 2008; Watson, 2013b).



Hen harrier, courtesy of Scotland: The Big Picture

Hen harrier – The results of the national UK survey in 2016 showed population declines in each country with a national total of 545 territorial pairs (Wotton et al. 2018). In Scotland, the population fell by 9% (460 pairs in 2016 national survey, down from 505 pairs in 2010) but longer-term figures demonstrate a highly significant 27% decline since the 2004 national survey (633 pairs, Sim et al. 2007). Losing over a quarter of the population in just 12 years is a matter of conservation concern as Scotland currently holds 80% of the UK hen harrier population. As with peregrines and golden eagles, the 2016 survey results showed low occupancy and population decline in the eastern Highlands (67% decline) and southern uplands (33% decline), areas dominated by intensively managed driven grouse moors. Illegal persecution on driven grouse moors has long been recognised as the most serious factor preventing the recovery of the hen harrier population (e.g. Etheridge et al. 1997; Fielding et al. 2011; Rebecca et al. 2016) although the grouse shooting industry's representatives continue to deny responsibility, claiming it is an "historical controversy" (Baynes, 2017) and that the hen harrier population has "remained static" (Scottish Land & Estates, 2018), despite overwhelming evidence to the contrary. This wilful blindness has been manifested in a recent project 'Heads up for Harriers' (PAW Scotland, 2018) whereby grouse moor owners are purported to be welcoming breeding hen harriers on their land. However, this project has been criticised as being a misleading greenwashing exercise designed to hide the ongoing criminal activities of some within the driven grouse shooting industry (Wightman, 2017; Raptor Persecution UK, 2018d).

Another recent, and unexpected, source of evidence about the extent of illegal raptor persecution associated with driven grouse moors has been raptor satellite tag data. Researchers have been fitting satellite tags to various raptor species in Scotland (e.g. golden eagle, white-tailed eagle, red kite, hen harrier, goshawk, peregrine) since the late 2000s to investigate the birds' dispersal ecology, foraging ecology, habitat use, survival rates etc.

When these tags were first deployed, they led to the discovery of a number of illegally killed raptors, including a poisoned golden eagle called Alma found dead on the Millden Estate in the Angus Glens (RSPB, 2009), a poisoned golden eagle called Fearnan found dead on a grouse moor in Glenlethnot in the Angus Glens (Raptor Persecution UK, 2013b), and a golden eagle found dead in an Aberdeenshire lay-by with two almost-severed legs. This eagle's injuries, combined with its satellite tag tracking data, suggested it had been trapped in an illegally-set spring trap on an Angus Glens grouse moor and removed, in the middle of the night and under the cover of darkness, and dumped away from the estate and left to die (Raptor Persecution UK, 2012b). The estate did not comment on this incident.

In recent years, as those responsible for killing eagles grew wise to the powerful technology of these tags and understood that the tag would still transmit even if the bird was dead (and would thus lead investigators to the corpse/evidence), they changed tactics and began to destroy both the bird and the tag. Evidence of this was provided when a tag was discovered on a grouse moor in the Angus Glens showing its casing had been stabbed by a sharp implement and its harness had been cut cleanly by a sharp instrument (Whitfield & Fielding, 2017). Subsequently, many of these tags, which have a demonstrated reliability of between 94-98% depending on tag type (Klaassen, 2016; Whitfield & Fielding, 2017), have been suddenly and inexplicably stopping, and, suspiciously, both the tags and the birds have been 'disappearing' without trace.



Illegally killed satellite-tagged golden eagle, courtesy of RSPB



Buzzard in pole trap, courtesy of Raptor Persecution UK

Earlier this year, researchers and wildlife investigators uncovered what they believe to be a bungled cover-up when the tag of a young golden eagle ('Fred') suddenly stopped transmitting in the Pentland Hills but then transmitted again, briefly, a few days later 10 miles off-shore from St Andrews in the North Sea. A forensic analysis of the tag's meta-data revealed the tag had likely been disabled to prevent its normal GPS transmission, but not sufficiently well to disable the transmission of underlying meta-data. The meta-data showed the tag (and possibly Fred) had travelled a route towards the coast at North Berwick that mirrored the road network and it was suspected that the tag (and possibly Fred) was ditched in the sea to avoid detection (Raptor Persecution UK, 2018e).

In August 2016 the RSPB revealed that eight satellite-tagged golden eagles had 'disappeared' in suspicious circumstances within five years in one grouse moordominated part of the Monadhliaths (RSPB Of 131 young eagles

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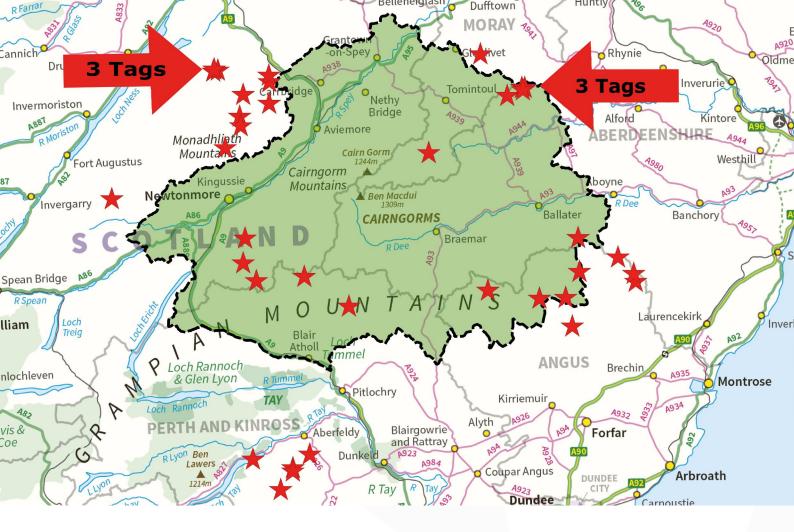
of illegal persecution.

Scotland, 2016). In response, Environment Cabinet Secretary Roseanna Cunningham MSP ordered a review of golden eagle satellite tag data "to discover if there is a pattern of suspicious activity" (Scottish Government, 2016a).

The review's findings, published in May 2017, were devastatingly clear.

From the summary:

"Of 131 young eagles tracked, as many as 41 (31%) have disappeared (presumably died) under suspicious circumstances significantly connected with contemporaneous records of illegal persecution. These disappearances occurred mainly in six areas of the Highlands (predominantly in the central and eastern Highlands). Some, but not all, areas managed as grouse moors were strongly associated with the disappearance of many of the



tagged eagles. Tagging revealed that the persecution of young eagles is suppressing the golden eagle population in the central and eastern Highlands, and hampering overall recovery from historic, widespread persecution" (Whitfield & Fielding, 2017).

The Cabinet Secretary responded by establishing an independent panel to examine the environmental impact of grouse moor management practices, to consider a licensing scheme for grouse shooting, and to assess the costs and benefits of large shooting estates to Scotland's economy and biodiversity (Scottish Government, 2017a). This panel (the Werritty Review) is due to report in spring 2019.

Since the golden eagle satellite tag data analysis was undertaken (January 2017), and at the time of writing this report, another 14 satellite-tagged raptors have 'disappeared' in suspicious circumstances in Scotland, (four golden eagles, eight hen harriers and two white-tailed eagles), most of them on or close to areas managed for driven grouse shooting (Raptor Persecution UK, 2018f; Ian Thomson RSPB Scotland, pers comm. 2018).

The on-going suspicious 'disappearance' of satellite-tagged hen harriers in Scotland has prompted a similar analysis to the golden eagle review and preliminary findings suggest comparable results with up to a third of tagged hen harriers 'disappearing' in areas close to land managed for driven grouse shooting (Ian Thomson RSPB Scotland, pers. comm. 2018). A comparable study of satellite-tagged hen harriers in England is due to be published imminently and is expected to demonstrate yet another clear association with areas managed for driven grouse shooting (Amar et al. 2018).

Scottish government's measures to tackle raptor persecution

Twenty years ago the Scottish Raptor Study Group published a report assessing the extent of the illegal killing of birds of prey in Scotland (Scottish Raptor Study Group, 1998). Speaking at the report's launch, the then Secretary of State, Donald Dewar, famously described the situation "a national disgrace". He also said:

"Although we are all aware of individual incidents of wildlife crime in Scotland, such as theft of eggs and shooting and poisoning of birds of prey, it is less well known that illegal persecution of some species, rather than the lack of suitable habitat, is the reason why in some areas the birds are scarce or non-existent. The government, and no doubt the Scottish Parliament will take all possible steps to eliminate persecution. The government is committed to strengthening protection for wildlife, and in due course the Scottish Parliament will consider proposals from the Partnership Against Wildlife Crime for stronger enforcement measures" (Anon, 2000).

Since devolution the following year, and up until the present day, the Scottish Government, and the Scottish Parliament, has indeed taken some steps to address illegal raptor persecution, although certainly not "all possible steps". A series of measures have been introduced, with especially increasing frequency over the last six years as social media has raised public awareness leading to subsequent pressure being placed on the Government to act (e.g. Shorrock, 2016). These measures are summarised below.

In 2000 the UK Raptor Working Group (established in 1995 and comprising a variety of statutory agencies, conservation NGOs and game shooting bodies) published a report with a series of recommendations to address the recovery of bird of prey populations and their perceived impact on game birds, moorland management, and on pigeon racing (Anon, 2000).

In 2002 SNH advised the Scottish Executive to accept most of the recommendations (Scottish Natural Heritage, 2002) and this led to many developments, with a particular focus on partnership-working including the establishment of the Scottish Raptor Monitoring Scheme to coordinate raptor monitoring and reporting (Scottish Raptor Monitoring Scheme, 2018) and the Moorland Forum to develop a co-ordinated approach to moorland conservation management (Moorland Forum, 2018).

Meanwhile, the illegal persecution of raptors continued but the poisoning of a golden eagle in the Scottish Borders in 2007 was especially significant (RSPB Scotland, 2008). This bird was the adult female from the only breeding pair in the region. Such was the public's outrage to this crime and the lack of any subsequent prosecution, it led to two Parliamentary debates on wildlife crime and the then Environment Minister, Michael Russell MSP, announced a Thematic Review in to the prevention, investigation and prosecution of wildlife crime, to be undertaken by HM Inspector of Constabulary and HM Chief Inspector of Prosecutions. This review (known as the Natural Justice Report) was published in 2008 (Scottish Government, 2008a) and made a series of recommendations to improve wildlife crime investigations and prosecutions. In response to the Natural Justice Report, the Scottish Government published a Scottish Wildlife Crime Reduction Strategy (Scottish Government, 2008b) to be implemented through the Partnership for Wildlife Crime (PAW Scotland). However, in 2015, Scottish Environment LINK published a damning report claiming wildlife crime enforcement measures remained inconsistent, and in many cases, weak and ineffective (Tingay, 2015b).

Scottish Government policy on tackling illegal raptor persecution has relied heavily on the PAW Scotland Raptor sub-group but

this particular partnership has consistently failed to deliver results as raptor persecution on many driven grouse moors continues (e.g. Whitfield & Fielding, 2017). This partnership is heavily weighted towards, and influenced by, game-shooting interests that have entirely opposing objectives to the members with raptor conservation interests. For example, whereas members such as the RSPB and the Scottish Raptor Study Group are pushing for the increased enforcement of legislation designed to protect birds of prey, other members such as the Scottish Gamekeepers Association (SGA) and Scottish Land & Estates, although condemning illegal raptor persecution, have been openly campaigning for years to legalise it to protect game bird stock (e.g. Edwards, 1996; Kelbie, 2003; Scotsman, 2009; BBC, 2011; Raptor Persecution UK, 2016e) and consistently deny and downplay the extent of illegal raptor persecution on driven grouse moors, despite overwhelming evidence to the contrary (e.g. ECCLR, 2017).

Last year, the SGA announced it was boycotting PAW Raptor Group meetings until further notice (Edwards, 2017), although it apparently still retains its membership in PAW and is being permitted to pick and choose its own terms of engagement. It could be argued that being able to cite PAW membership is useful to the SGA because it allows it to create an illusion of 'partnership-working' while the reality is continued obfuscation and denial.

The Scottish Government has also introduced a series of more tangible measures to address illegal raptor persecution in recent years. Principal amongst these was the enactment of the Wildlife and Natural Environment (Scotland) Act 2011 (known as the WANE Act) which included a provision that requires the Scottish Government to publish an annual report on wildlife crime figures. Now in its fifth year of reporting, the reports are still a long way from being perfect, partly due to Police Scotland still withholding data on some live investigations into alleged raptor persecution (Raptor Persecution UK, 2016f), however these reports are helpful with their annual publication providing the Scottish Parliament, and the public, an opportunity to regularly scrutinise the Scottish Government's performance on tackling raptor persecution and other wildlife crime.

Another significant inclusion in the WANE Act was the introduction of vicarious liability for certain types of raptor persecution offences and possession of banned poisons. Vicarious liability is where one person is legally liable for the actions of another person under their supervision or control. A prosecution can only take place if prosecutors can demonstrate that the original wildlife crime offence took place and that it was committed by a third party who has a specific relationship to the person being charged with vicarious liability. A defence of due diligence is available if the

accused can demonstrate that he/she did not know the offence was being committed AND he/she took all reasonable steps AND exercised all due diligence to prevent the offence being committed.

Since its enactment on 1st January 2012, there have only been two successful prosecutions (Raptor Persecution UK, 2014; 2015b) although there should have been more but in one case the landowner could not be identified as his identity was concealed in an offshore jurisdiction (Wightman, 2015) and in another case the Crown Office simply declared it "was not in the public interest to continue to trial" but did not provide further explanation (Raptor Persecution UK, 2017e).

Following a consultation undertaken between 2008–2009, the Scottish Government enacted the Wildlife & Countryside Act 1981 (Variation of Schedules A1 and 1A (Scotland) Order 2013 which afforded even greater protection to a number of already protected raptor species (golden eagle, white-tailed eagle, hen harrier and red kite), protecting them from harassment and for some, nest protection throughout the year rather than just restricted to the breeding season (Raptor Persecution UK, 2013c).



Sheep next to grouse butt, courtesy of Ruth Tingay

Another measure introduced by Paul Wheelhouse MSP, in his role as Minister for Environment and Climate Change (2012–2014), in response to continuing difficulties of securing criminal prosecutions, was an instruction to SNH to withdraw the use of General Licences (available for legal predator control) on land where crimes against raptors are believed to have taken place but where there is insufficient evidence to instigate criminal proceedings. The decision to withdraw the licence would be based on the civil standard of proof which relates to the balance of probability as opposed to the higher standard of proof required for a criminal conviction (Scottish Natural Heritage, 2018c).

This measure is not without its limitations, particularly as estates can simply apply for an Individual licence instead which allows them to continue predator control activities but under slightly closer scrutiny. However, since this measure became active on 1st January 2014, there have only been four General Licence withdrawals (Scottish Natural Heritage, 2018). There are at least nine other cases where the General Licence could potentially have been withdrawn but was not, and SNH has claimed it is "not in the public interest" to explain those decisions (Raptor Persecution UK, 2018g).

Other measures introduced by the Scottish Government over recent years include:

Two poison disposal schemes (Raptor Persecution UK, 2011b; 2015c) although illegal poisoning continues in 2018 (BBC, 2018);

A commissioned review in 2013 by then Environment Minister Paul Wheelhouse MSP to undertake an assessment of wildlife crime penalties as part of a review on how wildlife crime is dealt with in the Scottish criminal justice system. The report (known as the Poustie Review) was published in 2015, and in 2016 the then Environment Minister Dr Aileen McLeod MSP accepted Professor Poustie's recommendations to substantially increase penalties for wildlife crime (Scottish Government, 2016b). This has yet to be implemented but the Scottish Government has committed to progress Professor Poustie's recommendations in its 2018 Programme for Government (Scottish Government, 2017b);

An instruction from Paul Wheelhouse MSP in 2013 to the Crown Office to ensure law enforcement utilises all investigative tools at their disposal (PAW Scotland, 2013) but covertly-filmed video evidence continues to be considered 'inadmissible' (e.g. RSPB Scotland, 2017c);

A commissioned review in 2014 by Paul Wheelhouse MSP on game bird management in other European countries to assess whether those different management approaches could help address raptor persecution in Scotland. The report was published in 2017 (Pillai & Turner, 2017) but no subsequent management decisions have been made at the time of writing although these are thought to be being assessed by the on-going Werritty Review;

A commissioned review in 2016 by Environment Cabinet Secretary Roseanna Cunningham MSP on golden eagle satellite tag data demonstrating deliberate and sustained raptor persecution on some areas of land managed intensively for driven grouse shooting (Whitfield & Fielding, 2017) which led to the commissioning of another review on grouse moor management — the Werritty Review, due to report in 2019.

In 2016, the Scottish Government made the following pledge in its election manifesto: "In the next Parliament, we will undertake a wildlife crime prevention review and set up a Wildlife Crime Investigations Unit as part of Police Scotland" (Scottish National Party, 2016). However, in 2018 it was revealed the Scottish Government had changed its mind and instead had opted to fund a 12-month pilot scheme of five police special constables (working voluntarily and part-time) in the Cairngorms National Park to focus on wildlife and rural crime (Murray, 2018). This decision also coincided with the Scottish Government's decision not to increase investigatory powers for the Scottish SPCA after six years of deliberation by five consecutive Environment Ministers (Raptor Persecution UK, 2017f).

Illegal raptor persecution

on driven grouse moors

continues to this day

Twenty years on from the establishment of the Scottish Parliament and Donald Dewar's statement that illegal raptor persecution is "a national disgrace" and that the Scottish Government, and Parliament, would take "all possible steps" to eradicate it, we are no further forward. Illegal raptor persecution on driven grouse moors continues to this day, despite a long list of Government-commissioned reviews, the enactment of new legislation, the provision of new civil sanctions, long-term attempts at partnership-working, and statements from a series of consecutive Environment Ministers claiming that "it won't be tolerated" (e.g. see Raptor Persecution UK, 2016g).

The European Parliament recently voted (MEPs for Wildlife, 2016) to upgrade illegal wildlife trafficking to be categorised as 'serious and organised crime', the same category as terrorism, human trafficking and arms smuggling. Serious and organised crime is defined as:

"Serious crime planned, coordinated and conducted by people working together on a continuing basis. Their motivation is often, but not always, financial gain" (National Crime Agency, 2018).

Given this definition, it has been argued that the widespread and systematic persecution of raptors on many driven grouse moors should also be similarly classified (Tingay, 2018). This would encourage a greater sense of political urgency and attract the increased resources necessary to tackle these crimes effectively.

Infrastructure

Hilltracks

Off-road constructed vehicle tracks (often referred to as 'hilltracks') can ease access for land management purposes but can also have major visual and environmental impacts, particularly on the wilder landscapes for which Scotland is so highly-regarded.

Private tracks constructed for agriculture or forestry use have been allowed under Permitted Development Rights (PDRs) since 1947, which exempts them from the normal planning process. This has allowed tracks to be constructed without application for planning permission, the satisfaction of minimum standards, or any need to inform local authorities, statutory bodies, or the general public (Brown, 2013).

PDRs date back to the post-war period when the expansion and intensification of forestry and agriculture were felt to be of such national importance that a full planning application was seen as an unnecessary hindrance (Brown, 2013).

The consequence has been the construction of thousands of kilometres of tracks in often sensitive upland environments. Grouse moor management has been a major contributor to the proliferation of hill tracks (Brown, 2013). Despite PDRs never having been available for game shooting, many of these tracks have either been built unlawfully or with the pretence that there is an agricultural operation being carried out

(most frequently this has been the keeping of a flock of sheep to act as tick mops). In recent years, as grouse management has intensified, the scale of the damage has increased as typified by the example of Millden Estate, (see box opposite).

Concerns have been raised repeatedly about the damaging impacts of such tracks and the failure of the planning system to adequately regulate them (e.g. Scottish Environment LINK, 2017; Nicoll, 2018). Negative impacts include:

- Serious and wide-reaching visual impacts, leading to the loss of visual and environmental amenity;
- Damage to sensitive vegetation and soils, especially in upland environments;
- Increased disturbance to wildlife;
- The destruction of, and consequent loss of stored carbon from, large areas of peatland;
- Initiation of erosion that often spreads over very large areas and causes silt run-off into waterways with adverse consequences for sensitive wildlife such as freshwater pearl mussels (Margaritifera margaritifera);
- Damage to or destruction of geological and geomorphological features:
- Devaluation of recreational opportunities;
- Potential damage to tourism.



New grouse butt construction with Firmounth and Scottish Rights of Way sign indicating junction between the ancient Firmounth and Fungle routes (Grid Ref. NO499853), courtesy of James Carron

Millden Estate in Angus is owned by Millden Sporting LLP, a limited liability partnership of Richard Hanson and Millden Holdings Ltd. (a company wholly owned by Richard Hanson). Hanson is the Chairman and co-founder of fund managers, Doughty Hanson & Co. The estate was acquired for £6.3 million in 2004. Since then it has been the subject of intensive management for grouse shooting. One of the Directors of Millden Holdings Ltd. is Nicholas Baikie, a grouse management consultant who is a partner in BH Sporting LLP, specialists in "grouse moor recovery". In 2010, over 3,000 brace of grouse were killed on Millden Estate, compared with the 90 year average of 2,352 brace. Part of the intensification has involved the construction of new and upgraded hill tracks and electric fencing.

Machinery at work burying historic Firmounth (Grid Ref. NO494875), courtesy of James Carron

The Firmounth is an ancient route that traverses the Mounth from Glen Tanar to Tarfside on the border between Aberdeenshire and Angus. The route dates back to medieval times and was more recently a much-used drove road for cattle. It is a designated heritage path and popular with walkers. In recent years, however, much of the historic route has been damaged by bulldozers upgrading the track for vehicular access. By 2010, the estate had constructed 36.9km of new tracks and upgraded 43.9km of existing tracks including the obliteration of the ancient Firmounth (Heritage Paths, 2018; Watson, 2011).

As one journalist wrote when discovering the works for the first time in 2012:

"It is a great pity that the old Firmounth has been bulldozed out in such a fashion. Gone is a wonderful old hill track. In its original state, it was an integral part of the landscape. Weathered and overgrown, the heathery highway lay hidden amongst the hills. Now, sadly, it is an all too obvious scar of grit and gravel" (Carron, 2012).

Since 1980, planning consent has been required for tracks above 300m in National Scenic Areas (Scottish Development Department, 1980) but this has not prevented many unauthorised tracks being constructed. Recent studies have documented the extent of damage caused by inappropriate vehicular tracks, often crudely constructed, causing significant environmental damage and causing fierce public controversy (Watson, 2011; Brown, 2013).

Following decades of public concern, in 2013 Scottish Environment LINK published a report (Brown, 2013) which argued that agricultural and forestry tracks should not enjoy PDRs and should be subject to a requirement for full planning permission to ensure they are subject to the closest scrutiny and to give the public the opportunity to comment on and help inform planning authority decisions.

In spite of the evidence presented, the Scottish Government rejected the call for full planning control, settling instead on the lesser requirement for 'Prior Notification' of the design, construction or route of tracks built for agricultural or forestry purposes (HMSO, 2014). This secondary legislation was enacted in December 2014.

However, since then evidence has emerged that the Prior Notification system is failing (Edwards, 2018) and in August 2018 Andy Wightman lodged an amendment to the Planning (Scotland) Bill that would bring tracks built on land used for shooting and field sports under full planning control, as well as all hilltracks proposed in National Parks and on land designated as a Site of Special Scientific Interest.

Scottish Environment LINK has gone further and a recently published report from its Hilltracks sub group (Nicoll, 2018) calls on the Scottish Government to remove PDRs from all agricultural tracks, not just those used for field sports.

At the time of writing it is not clear whether this will become law.

Fencing

To reduce the prevalence of ticks (which can transmit disease to red grouse and thus impact on grouse densities), an increasing number of grouse shooting estates are constructing electric fencing to exclude wild red deer (*Cervus elaphus*) from the grouse moor and to contain flocks of domestic sheep on the moor that are used as 'tickmops'. Sheep are dipped with an acaricide (a tick-killing chemical) which then mop up the ticks and reduce the scope for infection of red grouse by reducing the tick burden (Fletcher & Baines, 2017).

The practice of using fencing to boost populations of grouse to be killed is controversial. As the Cairngorms National Park Authority noted in 2014,

"Whilst fencing can be beneficial in assisting habitat enhancement and can be a short-term measure, there are also concerns about cumulative impacts on habitat, deer welfare, access and sensitive upland landscapes. There is a significant risk that deer fenced out on some moors only exacerbates habitat management problems elsewhere. Inappropriately designed and located fencing to manage livestock and deer, just as fencing for other objectives, can impact negatively on the landscape and ability for people to access upland areas" (Cairngorms National Park Authority, 2014).

Concerns about deer fences adversely impacting on landscape and access are well documented, such as blocking access for walkers and skiers and being visually obtrusive and conspicuous (e.g. Watson, 2013a). The extent of new fencing has also been raised as an issue, for example the Cairngorms National Park Authority acknowledges that in much of the Angus Glens deer are "virtually excluded by fencing in favour of management for grouse" (Cairngorms National Park Authority, 2016), in apparent contravention of best practice guidelines which state that where deer have been historically present, moors should not maintain zero deer densities (Smith, 2014).



Electric fencing and gate on Millden Estate, Angus. Courtesy of Chris Townsend



A new 20km long electrified fence on Glenavon Estate, Cairngorms, courtesy of Dave Morris

Disturbance

Another controversial management technique that has emerged over recent years is the deployment of propane powered gas guns on grouse moors. Also known as scare cannons, these devices are routinely used for bird scaring on lowland agricultural fields by producing a periodic booming noise to cause a flight reaction in pigeons and geese etc. to remove them from crops. The intermittent audible bang can reach volumes in excess of 150 decibels, which is comparative to the noise created by a jet aircraft taking off 25 metres away and is loud enough to cause eardrum rupture (Purdue University, 2000).

Other scaring devices reported on grouse moors in the Angus Glens include 'Scary Man Bird Scarers' which can be set to inflate for intervals of 25 seconds and are accompanied by a loud siren. They can also be illuminated for operation in darkness (Raptor Persecution UK, 2016h). Another device used is 'banger ropes', which are designed to mimic the sound of a shotgun. Explosives are attached to a rope and then draped over a gatepost or hung from a grouse butt (Raptor Persecution UK, 2016i). When the end of the rope is lit, loud explosions are caused when the flame reaches each banger unit. Some ropes are designed to burn for six hours, igniting the explosives at 15- or 30-minute intervals; other ropes are designed to burn through the night for up to 12 hours.

The use of these bird scaring devices on driven grouse moors has developed in the absence of any guidance or oversight and there are considerable concerns that their deployment could unlawfully disturb specially protected (Schedule 1 and Schedule 1A) birds, particularly the nesting attempts of hen harriers.

Gas guns were claimed by the former CEO of Scottish Land & Estates to be "targeted and proportional" in their use to scare flocks of juvenile ravens deemed to pose a threat to red grouse (Raptor Persecution UK, 2015d), although it is not known how regular 150-decibel booms can be considered 'targeted' or 'proportional'.

As one writer (who supports grouse shooting) observed:

"There is no peace here, just desperate madness to protect the grouse from something that is not readily apparent. Every other second a scarecrow banger goes off somewhere on the grouse moors of Millden Estate, but there are few carrion crows and fewer ravens in this part of the glen, certainly not enough to warrant this wartime barrage of gunnery noise" (Adam, 2015).

There is further concern that their use in some Special Protection Areas (SPA), without written consent from Scottish Natural Heritage (SNH), is in contravention of SPA management guidelines.



Gas gun, courtesy of Raptor Persecution UK

In 2015 SNH, and its English counterpart Natural England (NE), was asked to provide guidance on the use of gas guns on grouse moors (Raptor Persecution UK, 2015d). In response, SNH stated it had "no specific evidence of an impact on breeding or nesting birds" and then "there is insufficient evidence to warrant the production of guidance" and then acknowledged "SNH guidance is not enforceable by law should an individual decide not to adhere to it" (Raptor Persecution UK, 2016j).

Later that year, NE and SNH produced joint guidance on the use of gas guns on grouse moors in the form of a decision flowchart (Raptor Persecution UK, 2016k). This amounted to nothing more substantial than advising grouse moor managers to "ensure that gas guns are located so that they do not disturb breeding Schedule 1 birds".

More direct forms of disturbance have included the deliberate felling of nest trees, including the blatant destruction of a white-tailed eagle nest tree on an Angus Glens grouse moor, the species' first breeding attempt in the region in over a century, Raptor Persecution UK, 2013d), the burning of traditional nest sites in Perthshire (e.g. Steele, 2016) and the deliberate shooting of either occupied or unoccupied nests, notably goshawk nests on Forestry Commission land adjacent to driven grouse moors (e.g. in the Cairngorms National Park: Raptor Persecution UK, 2015e; and in the Monadhliaths: Raptor Persecution UK, 2017g).



Lead ammunition

Grouse are killed with shotguns using lead shot. Lead is a highly toxic metal that occurs naturally but has been widely distributed by human activity. It is known to pose significant threat to human health and wildlife health (e.g. Green & Pain, 2015; Pain et al. 2015). No 'safe' blood lead level in children has been identified below which negative health effects cannot be detected (CDC, 2012) but extraordinarily, all game birds (including red grouse) appear to be exempt from statutory testing for lead shot, in sharp contrast to other meat types destined for human consumption (Avery, 2016).

In the UK, the Food Standards Agency (FSA) in 2012 conducted a risk assessment on lead exposure from game meat consumption, based on a consumption survey of highlevel consumers of lead-shot wild-game meat in Scotland and pre-existing data on lead levels in these types of food in the UK. The risk assessment concluded that regular consumption of game meat could increase exposure to lead, and that this increased exposure would be a concern in the case of toddlers, young children and pregnant women, because of the neurotoxicity of lead to the developing brain (Food Standards Agency, 2012). The report highlighted that lead levels were higher in smaller game (birds) than larger game (venison). Following the risk assessment, the UK Food Standard Agency issued the following advice:

"To minimise the risk of lead intake, people who frequently eat lead-shot game, particularly small game, should cut down their consumption. Pregnant women or women trying for a baby are particularly advised to minimise their exposure to lead" (Food Standards Agency, 2012).

Interestingly, the devolved regulator Food Standards Scotland does not appear to promote this advice on its website, despite the bulk of evidence used by the FSA originating from Scottish consumers (Food Standards Agency Scotland, 2012).

With most of the previously significant sources of lead in the environment now having been eliminated decades ago (such as lead-based paints and leaded petrol), lead-based ammunition is the most significant unregulated source of lead deliberately emitted into the environment in the EU (see Group of Scientists, 2014).

In response to growing concerns about the effect of poisoning on humans and wildlife from lead ammunition, the DEFRA and the Food Standards Agency-commissioned Lead Ammunition Group was formed in 2010 with a remit to identify and assess key risks (Lead Ammunition Group 2018a).

The Group's findings were published in 2015 (Lead Ammunition Group, 2015) and include the following conclusions, as detailed in a summary letter to DEFRA from John Swift, the Chair of the Lead Ammunition Group (Swift, 2015):

Lead is a highly toxic hazard and presents risk at all levels of exposure. It is especially dangerous as a neurotoxin for both young people and for wild animals.

Some 6,000 tonnes of lead from ammunition used in shotgun and rifle shooting are being discharged every year. At least 2,000 tonnes of shot used for game and pest shooting are irretrievably and unevenly deposited on or close to the soil surface where it is available for ingestion by birds. It probably becomes unavailable to them quite quickly, though it remains in the soil and substrates for a long time with as yet unknown consequences.

Lead from ammunition can (and does) get into wildlife by several routes, mainly by ingestion by many species of bird in mistake for grit or food items, or in scavenged dead animals, or as the prey of some raptors. In areas of intensive shooting lead is taken up by some plants and soil microfauna getting into the food chain, but the research studies that have been done on this latter route are limited.

Lead from ammunition causes harm to wildlife and certainly kills some birds. Numbers are hard to be certain about, but almost certainly at least tens of thousands to hundreds of thousands annually in UK. The welfare effects in these animals, and the larger numbers that ingest sub-lethal doses, are sufficient to cause illness and can be very severe and prolonged for them.

Lead shot and bullet fragments can be present in game meat at levels sufficient to cause significant health risks to children and adult consumers, depending on the amount of game they consume.

Almost certainly some 10,000 children are growing up in households where they could regularly be eating sufficient game shot with lead ammunition to cause them neurodevelopmental harm and other health impairments. Tens of thousands of adults are also exposed to additional lead by eating game as part of their normal diet, and this could cause a range of low level but harmful health effects, of which they will not be aware.

For human health there is no evidence that existing advice from FSA and other stakeholders has so far reached target groups or affected game eating habits.

There is currently no evidence to suggest that the will, funding or resources exist, or are being planned, to develop measures that will ensure that game and venison containing lead levels above those permissible for red meat and poultry do not enter public markets as food.

For small game, no proposals have been made to the Group for any measure, short of lead shot replacement, that would ensure that small game entering the food chain do not have elevated lead concentrations.

Safer alternatives to lead ammunition are now available and being improved and adapted all the time for use in different shooting disciplines. There is considerable experience from other countries where change has already been undertaken.

There is no evidence to suggest that a phase out of lead ammunition and the use of alternatives would have significant drawbacks for wildlife or human health or, at least, none that carry the same scale of risks as continuing use of lead; though there are procedural, technical and R&D issues still to work on and resolve.

There is no convincing evidence on which to conclude that other options, short of replacement of lead ammunition, will address known risks to human health, especially child health.

In response to this report, the then Secretary of State Elizabeth Truss MP considered that the findings "did not show that the impacts of lead ammunition were significant enough to justify changing current policy", on the risk to both human and wildlife health, and she rejected the Group's recommendation to ban the use of lead ammunition (DEFRA, 2016).

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However, as this is a devolved issue the Scottish Government is entitled to draw its own conclusions and adapt policy in favour of the Lead Ammunition Group's recommendation. It is not known whether this is under consideration.

Since the publication of the LAG Report in 2015, there have been further developments in international policy towards reducing the risks to human and wildlife health from the use of lead ammunition. Considerable new research has been published covering the risk to human health, effects on population processes and trends in wild birds, and effects on scavenging and predatory birds across Europe. New ammunition types have also been developed and tested for suitability, doubtless stimulated by new resolutions within multilateral environmental agreements and national legislation introduced elsewhere. This new research has been summarised in an updated report recently published by the Lead Ammunition Group (Lead Ammunition Group, 2018b).

Currently in Scotland, the use of lead ammunition is prohibited over wetlands under the terms of the African–Eurasian Waterbird Agreement (AEWA). For the purposes of the AEWA, 'wetlands' are defined by reference to Article 1(1) of the 1971 Ramsar Convention (Ramsar, 2014) which state:

"For the purposes of this Convention wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres."

The inclusion of 'peatland' in the Ramsar definition of 'wetland' would include many upland areas managed for driven grouse shooting. However, the Environmental Protection (Restriction on Use of Lead Shot) (Scotland) (No.2) Regulations 2004 deliberately exclude many driven grouse moors from regulation as 'peatland' is specifically defined in this Scottish legislation (Para. 3(2)(b)) as, "only peatlands with visible water".

However, in September 2018 the European Chemicals Agency identified further risks to the environment from lead ammunition and submitted recommendations to the European Commission to regulate the use of lead ammunition in terrestrial as well as wetland environments (European Chemicals Agency, 2018). If implemented, this may prohibit the use of lead ammunition on all peatland areas including land managed for driven grouse shooting.

Economics and finance

Economic review

Grouse-shooting is part of a wider shooting economy and whilst there is little doubt that shooting has an economic impact on the Scottish economy, the key question is how significant it is. Such economic impact studies have been undertaken by Public and Corporate Economic Consultants, the most recent being in 2014 (PACEC, 2014).

That report is described as the "mainstay of the defence of shooting in the UK" and, in an email to those in Scotland invited to complete it, the Scottish Land & Estates' Moorland Group Director claimed that,

"The benefits of this new survey will be greatest for Scotland because this time it is combining a study of shooting and stalking related tourism in Scotland. We know that VisitScotland now recognises country sports and we want to press that home to politicians with comprehensive facts.

If you are a participant in shooting sports, or if you are involved in organising or providing shooting activities, then any information you can give us will be invaluable."

However, the results of this survey relied on self-selected respondents (most of whom have a vested interest in securing favourable economic impact results) and the data are not open to independent verification. Economists have pointed to the lack of assessment of displacement and deadweight issues and questioned the reliability of such economic data (Cormack & Rotherham, 2014). We are aware of a number of individuals who completed the most recent PACEC survey (multiple times in a few cases), none of whom have any involvement in shooting sports, but whose submission was nevertheless recorded with no requirement to prove their identity.

In relation to employment, recent studies have shown that grouse-shooting contributes 2,640 full-time equivalent jobs and £30.1 million in wages (Scottish Land and Estates, 2013). This equates to an average salary of £11,401 which is below the level of the national minimum wage.

Grouse moor management is popularly portrayed as an endeavour that costs considerable sums of money and which inevitably runs at a loss. This is true in a number of instances but it is not a particular revelation to discover that a recreational activity such as this costs money in just the same way as other expensive pursuits such as sailing, horseracing or motor-sport. But the observation masks the reality which is that grouse shooting is often a profitable business.

The estate agency Knight Frank publishes an annual Sporting Property Index (SPI). Recent data show that over the ten years 2004 – 2014, grouse moors have outperformed all other sporting properties (deer forests, salmon rivers etc.). The average capital value of a grouse moor over this period increased by 49% which equates to a 4.1% return on capital. The survey noted that returns from a "well-managed and heavily invested moor may be significantly higher because greater numbers of birds are being shot each year" (Knight Frank, 2014).

In terms of annual profitability, a recent study by the Fraser of Allander Institute shows that the percentage of landholdings whose grouse moors made a profit rose from 2.1% in 1994 to 17.6% in 2001 and 42.6% in 2010. Given that many grouse moors are not managed as businesses but as personal recreational assets, it is probable that the majority of grouse moors in Scotland are now operating at a profit. (Fraser of Allander Institute, 2010).

It is likely that public subsidies are contributing to this profitability. As part of the new system of public subsidies for agriculture paid under the EU Common Agricultural Policy, the Scottish Government sought to exclude sporting estates from being eligible for the area-based basic payments scheme in cases where shooting was carried out and agricultural activities did not account for the majority of the applicant's income. However, the EU rules on the so-called 'negative list' (which typically includes land such as airports and sports grounds) do not at present allow such a move. Sporting estates and grouse moors are, therefore eligible for payment of an annual basic payment provided they meet minimum qualifying criteria for agricultural activity.

Grouse shooting estates are therefore eligible for farming subsidies and, since managing sheep flocks is an agricultural operation even though its principal purpose is mopping up ticks, many should be eligible for substantial subsidies. In the case of Glenogil Estate in the Angus Glens this exceeded £300,000 per year (2005–2008) in public subsidy and other estates are likely to be eligible for similar amounts. Such agricultural operation can then also be used to justify the necessity for more extensive and intrusive roads being constructed in the hills.

Sporting rates

Shootings and deer forests are classes of land use that have been subject to the payment of non-domestic rates since 1854. Grouse moors were included within this and the revenue raised contributed albeit modestly to the costs incurred by local government in maintaining schools, roads and a range of public services upon which those who own, live and work on grouse moors depend.

In 1995, following many years of lobbying from shooting interests, these rates were abolished and all entries on the valuation roll were removed. In a letter written to members of the Scottish Landowners' Federation (now Scottish Land & Estates) in April 1995, the President informed them that abolition marked a "great success" for the Federation "culminating many years of negotiation.....many members will be relieved of substantial expense" (Scottish Landowners' Federation, 1995).

The Scottish Government proposed to reintroduce rates for shooting and deer forests in the Land Reform Bill introduced to Parliament in 2015 and which was enacted in April 2016. From 1st April 2017 all shootings and deer forests are once again liable for non-domestic rates.

The total number of new entries on the valuation roll is 13,705 with a total rateable value of £21,960,880. The current non-domestic rate is 48p in the pound The great majority of

owners and occupiers

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meaning that the total potential revenue from shootings and deer forests could be around £10.5 million. However, the Scottish Government introduced the Small Business Bonus Scheme (SBBS) which grants 100% relief from rates to any property with a rateable value of less than £15,000 and a graduated set of further reliefs up to £35,000. The great majority of owners and occupiers of grouse moors qualify for SBBS and will thus pay no rates to the local authority.

According to research carried out on behalf of Andy Wightman, the total revenue from the reintroduced sporting rates could be as low as £2.8 million if all occupiers apply for SBBS. Furthermore, around £1 million of revenue comes from public owners of land such as Scottish Ministers and given that this revenue is paid for by the public purse, the new public revenue could be as low as £1.8 million in total (Scottish Parliament Information Centre, 2018).

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