Killing our Countryside

A REPORT INTO THE IMPACTS OF GAMEBIRD RELEASES ON THE ENVIRONMENT AND BIODIVERSITY

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Contents

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A fully referenced version of this report is available on Animal Aid's website at:
animalaid.org.uk/environment-report

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"I don't believe that you can profess to love nature, the environment or our wildlife and support the shooting of huge numbers of non-native pheasants & partridges, known to some as 'Gamebirds'.

I know that what I say will be contentious with some conservationists but the simple truth remains that releasing tens of millions of pheasants and partridges every single year cannot but affect the environment – and for all the shooting industry's protestations about the conservation work they undertake, it is my belief that overall this is greenwashing to hide the substantial and irreparable damage done by their activities.

This excellent new report leads the way towards exposing the extent of the damage to our native flora and fauna inflicted by the shooting industry – there is surely more to come – but I think you'll find the content shocking and eye-opening. Some of the damage may be well known to nature enthusiasts, but the hidden consequences of the mass release of pheasants and partridges and the subsequent free-for-all slaughter of the birds will come as a revelation.

So I'll repeat myself a bit – if you love animals, if you love nature, if you love the countryside, if you are passionate about wildlife, then join us and oppose this huge industry which produces birds solely to use them as feathered targets.

Enough is enough. The shooting industry is killing our countryside. It has to change".

Chris Packham - naturalist, broadcaster, environmental campaigner

A huge game farm with rows of raised laying cages

Introduction[1]

Around 40-60 million captive-bred pheasants and partridges are reared and released into the British countryside every year to be shot for sport. [2,3,4] **In late summer the biomass of these artificially bred birds is greater than all of Britain's wild birds. Shockingly, the UK is one of the most nature-depleted countries in the world,[5] yet the sheer scale and complexity of the harm that the gamebird shooting industry does to our wildlife and environment needs closer examination and urgent action.**

Animal Aid has been a long-standing opponent and critic of the shooting industry. We continue to expose the terrible conditions suffered by intensively farmed gamebirds* – the terrible conditions suffered by the breeding birds imprisoned with the sole purpose of producing eggs, which are intensively hatched, and the chicks transported and reared in captivity before they are released and then shot – on an industrial scale. But the other part of this sad and shameful story is the harm captive-bred gamebird shooting is doing to wildlife, habitats and ecosystems.

The impacts are multiple and often complex. The shooting industry tries to present game-bird shooting as environmentally benign. But claims about beneficial estate management distract from the reality that it releases 40-60 million non-native birds into the countryside each year followed closely by tonnes of lead ammunition.

The sheer scale of these mass gamebird releases is truly astounding, and should alarm anyone concerned about Britain's wildlife and ecosystems. In August each year the total of released and naturalised pheasants and red-legged partridges is greater than the biomass of all other British birds at that time. An annual environmental intervention of this size could not fail to make a deep and lasting mark on the British countryside.[6]

But this harmful environmental impact extends well beyond the immediate actions of the birds themselves. To protect gamebirds, shooting estate employees (usually gamekeepers) continue to persecute and poison vulnerable and sometimes rare birds of prey and other wildlife. Lead shot from shooting estates is a pollution scourge of the British countryside, poisoning and killing millions of birds, sometimes affecting their population levels.[7]

Finally, the rearing and dispersing of 40-60 million gamebirds for shooting is actively contributing to the maintenance and spread of deadly avian flu, which is having population-level impacts on waterbirds, devastating whole colonies. There is also an ever-present threat of the disease jumping species.

> **THE SHEER SCALE OF THESE MASS GAMEBIRD RELEASES IS TRULY ASTOUNDING, AND SHOULD ALARM ANYONE CONCERNED ABOUT BRITAIN'S WILDLIFE AND ECOSYSTEMS.**

In the following pages we describe the numerous and diverse environmental impacts of the pheasants and partridges themselves, how they compete with native wildlife for resources and how their presence affects predator numbers and species (or groups of species) within ecosystems. Although much of the report focuses on birds, we also describe how mammals, other animals and plants are negatively affected, too.

All this makes sobering, but very necessary, reading, especially at a time when nature is feeling the acute pressure of the climate and biodiversity emergencies. Solving the climate crisis and stopping catastrophic biodiversity loss are the major challenges of our time. Nobody is pretending the solutions are easy. But one thing would strengthen nature's hand and remove some of the pressure threatening vulnerable birds and wildlife: an end to gamebird shooting.

*Animal Aid prefers not to use the word 'gamebird' (gamebird) as the word has been applied to pheasants, partridges and grouse to denote their 'sport function'. However, for ease of locating this paper through internet searches, we have reverted to using 'gamebird' as one word.
2.6 million mallard ducks are also reared in captivity and released each year for shooting. This report does not address the issues raised by mallard rearing and releasing.

Breeding and rearing of gamebirds: confinement and suffering on an industrial scale

This report focuses on the harm done by the shooting industry to wildlife and the environment. But it must start with the suffering inflicted on the birds themselves.

For their high-paying customers, shooting estates might offer the promise of rural tranquillity. But getting millions of birds primed and ready for shooting requires an industrial system that is just as cruel and inhumane as the worst factory farms. These industrial farms are also found in Europe, from where the shooting industry still imports hundreds of thousands of pheasant eggs to be hatched in the UK.[8]

What follows is a description of the routine practices involved, some observed and evidenced from undercover filming in the UK.[9,10]

The industrial-scale farms that Animal Aid has investigated confine egg-laying pheasants and partridges in cramped metal battery cages. The birds can spend the whole of their productive lives in these cages. Animal Aid's undercover team has filmed cages holding breeding birds that are completely barren, breaching Defra's official Welfare Code.[11]

Each pheasant-breeding cage holds one male and between eight and ten females. The units have a wire mesh sloping floor so that the eggs can roll through for easy collection. The roof is also largely made from wire netting, exposing the birds to the elements, with little respite from the wind, rain, cold and burning sun. Animal Aid undercover investigators have recorded temperatures as high as 41C in summer and as low as -4C in winter inside the cages. With the UK experiencing increasingly extreme temperatures due to climate change, these birds will suffer greater exposure to extreme weather.

Our undercover evidence has shown these birds suffering stress, feather loss and back and head wounds resulting from stress-induced aggression. Many pheasants leap repeatedly at their cage roofs in a futile attempt to escape, damaging their heads in the process. This is called 'jump escape' behaviour.

Partridge-breeding cages are smaller, confining breeding pairs in enclosed metal boxes that are just as claustrophobic and restrictive as the pheasant units. In the wild, partridges roam vast areas and select a mate for life. Courtship rituals involve a male display and both birds pecking at nearby objects. Breeding partridges for the shooting industry denies the birds these natural behaviours, instead creating 'forced pairs'. Forcing pairs together in unnatural confined conditions can lead to high levels of stress and birds killing one another.[12,13]


A confined partridge seeking escape

OUR UNDERCOVER EVIDENCE HAS SHOWN THESE BIRDS SUFFERING STRESS, FEATHER LOSS AND BACK AND HEAD WOUNDS RESULTING FROM STRESS-INDUCED AGGRESSION.

In an effort to eliminate the effects of aggression between birds caused by the crowded conditions and unnatural groupings in breeding cages, restraining devices ('bits') are fitted over the birds' beaks to prevent them pecking their cagemates. Although this may limit some of the wounds birds inflict on one another, it does nothing to reduce their stress from being caged in a harsh, crowded environment. Bits are also used on the birds to limit wounding during rearing.


A raised laying cage for breeding pheasants

Newly hatched chicks

Eggs are collected, incubated and hatched in hatcheries. Animal Aid undercover footage from two game farms (one in England, one in Wales) revealed horrific evidence of living hatching chicks (considered sub-standard), along with trays of eggs, being tossed into a macerator – a high-speed grinder – and ground to death. The film also shows chicks being dropped on the ground, getting stuck in machinery and being kicked out from under a conveyor belt.[14]

The surviving newborn chicks are transferred to crowded sheds. Each shed can hold as many as 10,000 birds. At a few weeks of age, they are then transferred to outdoor pens where they are reared by gamekeepers.

A few weeks before the start of the partridge and pheasant shooting seasons (1 September for partridges, 1 October for pheasants, both ending 1 February), the birds are released en masse. Factory-farmed pheasants and partridges are ill-prepared for life in the wild. Around a third of released birds are shot, with the remainder mostly dying of disease, starvation, being run over or being killed by predators.[15] 2018 research found that 60% of released pheasants were not shot, but died mostly from these causes.[16] Only around 6% of the birds bred to be shot enter the human food chain through licensed game processing plants.[17]

On shoot days, surviving birds are 'beaten' up into the sky to serve as feathered targets. Shooters pay, on average, more than £750 a day to kill them, [18] although prices can be in excess of £3,000. One estate described a '600-bird' day costing £3,900 in 2019.[19] Many birds will not receive a 'clean' fatal shot and may die a slow lingering death from their wounds, if they have not died on hitting the ground.

Eggs and a live chick tossed into the macerator


Rows of partridge cages

Game farm pollution

Flies, excrement, smells and noise

Shooting enthusiasts pay to kill pheasants and partridges for sport, but probably rarely consider the environmental damage and pollution caused by game farms, especially when this is out of sight. Local environmental pollution is one under-reported impact caused by game farms, where birds are reared on an industrial scale. This can have a major impact on the quality of life of local residents and those living downwind of game farms.

The intensive battery cage system used for the mass production of gamebird eggs and the large indoor rearing sheds cause a concentrated build-up of bird faeces, which can mingle with bird feed. These waste products can be hazardous, attracting flies and releasing intense odour, with the potential to cause serious pollution to the local environment. Rats are also likely to be attracted and keeping large numbers of birds in overcrowded conditions inevitably causes noise pollution.

Residents near one large game farm described intolerable noise pollution, disgusting smells, increased rat numbers in their gardens and swarms of flies making it impossible to stay outside for more than five minutes.[20] An application from the same game farm (Heart of England) for new rearing pens was met by opposition from local residents and an objection from the parish council. The main environmental impacts cited were flies, odour and noise from the birds.[21]

Water pollution

Animal Aid commissioned professionals to obtain and test watercourse samples from land adjacent to a game farm in Warwickshire. This followed the identification of slurry overflow from the farm. [22] The results showed contamination with ammonia and phosphorus and elevated levels of dissolved organic carbon. Ammonia levels exceeded the long-term standard for fresh water 'significantly'. The sample was found to be a risk to aquatic life and to the quality of receiving waters.*[23]

Samples taken from a water source near another game farm in Lancashire also showed raised levels of ammonia which exceeded the long-term standards and posed a risk to aquatic life.

These are just two examples but are unlikely to be exceptional. Unfortunately, pollution information is hard to obtain and specific pollution incidents often go undetected. Water pollution and other forms of local environmental pollution are increasing concerns across the UK. It is clear that intensively rearing 40-60 million gamebirds each year is playing a part in that pollution.


Slurry pit on a game farm


© Illustration by Lucy Lapwing

Direct impacts

The environment impacts of mass pheasant releases are huge and multifaceted. As already mentioned, in August the total biomass of released captive-reared birds for shooting is greater than all the UK's wild birds combined – 52.5% pheasants and red-legged partridges, with all other birds accounting for the remaining 47.5%.[24]

It has been estimated that 1 in 12 of all woodlands in England contains a pheasant release pen. [25] Since this assessment, conducted in 2005, pheasant release numbers have increased so their impacts on woodland may be greater. (Although woodland cover is increasing, it is still under threat: only 7 per cent of Britain's native woodlands are in good ecological health, woodland wildlife has reduced, and native woodland trees are experiencing increased risk from pests and pathogens.)[26] These direct environmental impacts arise from the presence of released birds in the environment.

Pheasant release pens

Release pens are fenced static structures built in woodlands to hold young pheasants transferred from rearing sheds. They can hold thousands of birds, where they can move between the pens and the surrounding environment before being released for shooting.[27] Release pens can hold pheasants at high densities, and although the Game and Wildlife Conservation Trust (GWCT) recommends a maximum 1,000 birds per hectare (10 square metres per bird) or 700 in Ancient Semi-Natural Woodlands,[28] there is no law against much higher stocking densities and no enforcement of these recommendations.

Browsing

When the birds are released, they browse the environment. This involves damaging leaves, stems, flowers and seeds when feeding on plants. It can also involve damaging roots and disturbing soil by pecking, digging, scratching and trampling in the process of feeding or dust-bathing.[29] Although they are primarily seed eaters, pheasants will eat many different parts of plants, including leaves, roots, flower buds, fruits, nuts, seeds, roots, bulbs, rhizomes and tubers.[30]

Studies have shown that woodland ground flora inside release pens suffer visible change during the period in which pheasants are released, involving plant damage and soil disturbance. Compared to non-release plots, release pens were found to have reduced density of low vegetation cover, a reduction of shade-tolerant and winter-green perennials, with an increase in bare ground (and species characteristic of disturbed soil). Studies of ground flora undertaken the following spring/summer revealed that release pens had a lower diversity of plants, with fewer species of ancient woodland flora and more undesirable grass species.[31, 32]

Multiple studies have shown that release pens have fewer archetypal woodland species and ancient semi-natural woodland indicator plants, fewer woodland herb species and more bare ground. [33, 34, 35]

A 2017/18 study found more bare ground (40% inside pens compared with 10% outside pheasant pen areas), fewer woodland herb species (15% inside compared with 30% outside) and a negative effect on ferns.[36, 37] Another study found that yellow archangel, greater stitchwort, tufted hair grass, wood sorrel, common honeysuckle, creeping buttercup, yellow pimpernel and herb robert were only present in the absence of pheasant releases.[38, 39]

Long-term environmental damage

Environmental damage caused by pheasant browsing and soil enrichment (from their faeces) can last for many years.[40] Even after ten years of abandonment, areas used for pheasant pens still show signs of environmental damage. There is only a slow recolonisation of woodland herb species, a long-standing prevalence of species preferring fertile soils, such as nettles, and only low levels of winter green perennials, ancient semi-natural woodland plant species and overall species richness. Where release densities were greater than 1,000 pheasants per hectare no environmental recovery was found even after ten years.[41, 42]

Hedgerow impacts

Hedgerows form the UK's largest wildlife habitat. They play a vital role in halting biodiversity loss and by acting as carbon sinks they help tackle the climate crisis. Yet, astonishingly, 50% of UK hedgerows have been lost in the last 75 years. Those left are vulnerable to removal, mismanagement and becoming degraded.[43]

Pheasants often use hedgerows as corridors leading from woodlands with release pens to game cover crops and other arable habitats managed for gamebirds.[44] One study looked at 109 shooting estates on farmland with hedgerows across four regions in England, comparing hedgerow species composition. Compared to other (control) hedgerows it found more bare ground, fewer stable perennial plant species and fewer tree and shrub seedlings in hedges near to release sites. Shrub leafiness within hedges was found to be reduced at 10–20cm off the ground. High densities of pheasants were found to cause increased soil fertility and soil disturbance leading to changes to ground flora species composition.[45]

Although shooting estates can compensate for hedgerow damage caused by gamebirds by actively maintaining hedgerows, there is no legal requirement for them to do so.

Crop damage

Pheasants can damage crops, particularly wheat, oil seed rape, barley and potatoes when they disperse into arable farmland adjacent to their release site.[46, 47, 48] Pheasants are not released or hunted on Jersey, but it is home to a naturalised population. 33% of Jersey farmers believe pheasants severely damage their crops and 27% believe pheasants cause a substantial loss of profit on their yield of brassicas, cereals, fruit and potatoes.[49, 50]

How gamebird browsing harms other wildlife

There are concerns that gamebird browsing impacts on hedgerows and hedgebank species and also negatively affects farmland birds and birds nesting in hedgebanks or lower portions of hedges.[51]

A 2020 review of the environmental impacts of gamebird releases highlighted the potential impact on a wide range of bird species making use of hedgerows and their verges: "The abundance and diversity of bird groups such as finches, buntings, larks and tits is positively associated with hedgerows that have adjacent species-rich verges. Therefore, where gamebirds released at high densities reduce hedgerow and hedgebank species richness, there is the potential for indirect effects on a range of farmland birds." [52]

Another study found one third fewer songbirds in hedgerows close to release pens where more than 1,500 gamebirds were released. [53, 54]

Yellowhammer

Yellowhammer nest in or below lower hedge sections and thrive in species-rich verges near hedges that provide good foraging habitat – precisely the environments depleted by gamebird browsing. Yellowhammer have had Red List status in the UK since 2002. [55] Between 1967 and 2022 the UK breeding population has suffered a 64% decrease, although decline has slowed in recent years. [56, 57] Loss and degradation of hedges has been identified as a factor reducing nest site availability[58] with reductions in nest success seen as a factor in yellowhammer decline.[59]

Singing from the top of his favoured hedgerow habitat, the male yellowhammer is best known for his 'Little Bit of Bread' song and striking bright yellow head. Sadly the Yellowhammer has been of conservation concern in the UK since 2002. [60]

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Butterflies

A 1989 study found seven butterfly species to be at high risk of predation from pheasants. The study found that 10km map squares with high pheasant numbers correlated with decline in these butterflies. The butterflies identified were the chequered skipper, brown hairstreak, small pearl-bordered fritillary, pearl-bordered fritillary, dark-green fritillary, silver-washed fritillary and marsh fritillary. [61,62] But research published in 1993 did not support these findings. [63]

However, a 2020 review highlighted concerns over potential impacts, noting that "the numbers of pheasants released into the countryside has however almost doubled since this study was conducted in the 1990s". Referencing a 2009 study, it noted that "high densities of pheasants can result in the loss of larval food plants for Fritillary butterflies such as Viola species and the larval biomass of woodland caterpillars decreases as pheasant release densities increase up to 300 pheasants per hectare." [64, 65]

Soil enrichment

Pheasants are usually released into woodland areas in open-topped, fenced pens in late summer, often in very high densities. Their faeces build up and alter the chemistry of the soil. This 'enrichment' can significantly increase levels of nitrogen, phosphorus and potassium in the soil. [66]

One study found 2.5 times more soil potassium and 65% more phosphate in woodland release pens. Another study found 35% increased potassium and 75% increased phosphate levels. [67, 68] It also found that soil recovery was very slow, with only partial soil recovery after more than 14 years abandonment, and even poorer recovery where gamebird densities were over 1,000 birds per hectare. [69, 70] A 2018 report concerning a site in Derbyshire detailed soil erosion, soil enrichment and associated concentrations of pheasant faeces. [71, 72]

Soil enrichment changes which plant species are able to thrive on the woodland floor, having a negative effect on some essential ancient woodland flora. These plants cannot compete with species which thrive in higher nutrient soil, such as nettles, bramble and annual grasses. There may still be high diversity of species and vegetation cover, but the ancient woodland species associated with low fertility soils become marginalised, altering the ecology. [73]

Increased airborne nitrogen – depleting mosses and liverworts

Nitrogen can rise from soils, forming nitrous oxide and ammonia in the air. This is often recorded in nitrogen-rich agricultural soils. Large quantities of gamebird faeces decomposing into the soil can increase soil emissions causing higher levels of airborne nitrogen. This can spread well beyond pheasant pen areas, affecting much wider areas of woodland. [74] The diversity of mosses and liverworts on tree trunks has been found to be half as abundant in pheasant-releasing woods, with the impact also being recorded in surrounding woodlands. [75, 76]

Mosses and liverworts (bryophytes)

Bryophytes are a family of plants made up of mosses, liverworts and hornworts. [77] Some of these plants only survive in very specific conditions, and as a result can be extremely rare. An important bryophyte community including nationally rare species is established at Craig Leek, a limestone crag outcrop SSSI in Scotland. Some of these species only exist in a tiny number of colonies in the UK. The release of red-legged partridges by an adjacent shooting estate has caused soil enrichment which is damaging these rare plant communities, to the point of threatening their existence in the UK. [78, 79]

Soil enrichment impacts on invertebrates

Mass pheasant releases in woodlands have been found to change the numbers and composition of invertebrates, especially affecting creatures that are 'woodland specialists'. This happens in three different ways: firstly as a result of gamebirds eating them, secondly by changing the vegetation structure, through trampling and soil surface disturbance from scratching and dust-bathing, and thirdly by their droppings increasing soil nutrients. [80]

Changes to the woodland invertebrate community have been found where pheasants were released in high densities. Pheasants cause such changes by the combined action of soil disturbance (from their behaviour) and soil enrichment from the build-up of their droppings. High density releases were found to have particularly negative effects on specialist woodland invertebrates. [81]

Predation by pheasants and partridges

Pheasants and red-legged partridges consume invertebrates and also some vertebrates such as reptiles, amphibians, small mammals and even young birds. [82]

Invertebrates

Pheasants and red-legged partridges eat a wide variety of invertebrates, including beetles, spiders, ants, caterpillars, slugs, snails, earthworms and flies. [83] Releasing 40-60 million of these captive-bred birds into the UK countryside every year inevitably has an impact on the numbers and distribution of these creatures. Playing essential roles in food chains, ecosystems and the diets of much native wildlife, gamebird impacts on invertebrates can have wide and serious repercussions for them and their natural predators.

Multiple studies show that gamebirds reared for mass release have negative impacts on invertebrates. [84] A 2024 paper summarising evidence reviews includes the predation of invertebrates under one of ten environmental "effects from the release of gamebirds". [85]

Pheasants impact negatively on woodland ground invertebrates. [86] One study found that release pens had fewer invertebrates, including reductions in beetles and spiders, with pheasant predation a likely cause. It also found decreases outside the pens when pheasants started to disperse. Pheasant impacts on invertebrates were found to be caused "directly by predation or indirectly by modifying vegetation". [87] Another study found larger ground beetles to be depleted in woodland release pens. Pheasant presence was also found to change the community of invertebrate species inside woodland release pens. [88]

Reptiles

Pheasants are thought to be attracted to the sinuous wriggling movements of snakes. [89, 90] Studies and anecdotal observations attest to pheasants preying on reptiles. [91]

Predation by pheasants is thought to severely reduce some reptile populations, with impacts greatest where pheasant densities are high. [92, 93] A study on Jersey recorded numerous witnesses observing pheasants predating reptiles or amphibians. [94]

Pheasants are known to prey on adders. [95, 96] Described as one of the adder's most consistent predators, young snakes are particularly at risk. [97] Large-scale pheasant-rearing has been specifically blamed for adder declines. [98]

Local populations of all six British reptiles could be affected by pheasant predation. According to the UK Reptile Habitat Management Handbook pheasants are the main predator threat to native reptiles, along with domestic cats. [99] The handbook specifically mentions threats to adders and common lizards and highlights particular problems arising for reptiles when large numbers of gamebirds are released close to hibernation sites, breeding sites or basking banks. [100] The Amphibian and Reptile Conservation Trust (ARC) suggests that all six British reptile species are vulnerable to predation by pheasants, which could affect their local conservation status. [101]

Adult, young and newly born reptiles are at risk from pheasants in the autumn after birds have dispersed from release pens and before reptile hibernation begins. Pheasants have spatial overlap with all six British reptiles. This means all UK reptile species may encounter them. Although gamebird populations are much lower when reptiles emerge from hibernation in the spring, they are sluggish and less able to avoid predation. Concentrations of adders emerging from hibernation are thought to be particularly vulnerable. [102]

Belgian research in Wallonia into the impacts of mass pheasant releases on reptiles found that one widespread lizard species made a return to an area only years after the disappearance of pheasants.

According to the study's authors "Our results suggest that lizards and snakes have disappeared from areas subject to massive pheasant releases." The researchers have called for the mass releasing of captive pheasants into the wild to be banned. [103]

Resource competition

The millions of captive-reared pheasants and partridges released into the British countryside every year represents a huge and overwhelming resource burden on the natural environment.

Astonishingly, in August the total of (released and naturalised) pheasants and red-legged partridges is greater than the biomass of all other birds in the British countryside at that time. The split is 52.5% pheasants and red-legged partridges, with all other birds accounting for just 47.5%. [104]

The scale of this presence in the countryside cannot fail to have an impact in terms of competition with other birds for resources and space as well as on ecosystems more generally.

Impacts during and after the breeding season are a particular concern, with naturalised gamebirds breeding during the same months as most native breeding birds, and their chicks sharing a similar invertebrate diet. According to one study "the potential consequences of so much pheasant biomass and energy use, both during and after the breeding season, on the resources available to native bird species are huge. The numbers alone suggest the likelihood of strong effects of direct competition on other seed and invertebrate consumers". [105]

Yellowhammer, corn bunting and grey partridge are three native farmland birds suffering serious decline. Yellowhammer have declined in the UK by 31% in the last 27 years (1995-2022) and by 37% in England over the same period. Over the same period UK corn bunting numbers have dropped 16% and grey partridge numbers have fallen an alarming 63%. [106] These birds feed their chicks on a range of arthropods, including flies, beetles, spiders and butterfly and moth larvae. Pheasants also feed their young on these species groups and this similarity in diet represents serious resource competition putting pressure on these and other declining birds. [107] Pheasants are bigger than other farmland birds and their brood size is greater. When raising their young, they will consume high volumes of insects and other invertebrates. There is serious concern that nesting pheasants are outcompeting other farmland birds, reducing the availability of essential food for their chicks. [108] The decline in grey partridge numbers has been attributed to "in the first instance... reduction in the abundance of insects eaten by chicks". This foodsource scarcity has largely been attributed to farming practices and specifically the use of herbicides and insecticides. [109] However, this scarcity can only be made worse by 40-60 million gamebirds competing for the same food supplies.

Seed-eating farmland birds

In the winter, pheasants also compete with small seed-eating farmland birds, where scarce food supplies can contribute to population declines. [110]

Tree sparrow

The tree sparrow is another species suffering serious decline. In the last ten years (2012-22) UK numbers have fallen by 26% and by 38% in England. [111] The tree sparrow breeding population has been strongly negatively correlated with pheasant release intensity during the previous year. The tree sparrow population was found to halve with every increase of around 40 pheasants released per 100 hectares. This may be due to competition from pheasants for winter seed resources. [112, 113]

Grey partridge

The native grey partridge suffered a 93% decline between 1970 and 2018. [114] Steep declines continue, with the English population falling a further 21% in the last decade (2012-22). [115] It has had Red List conservation status in the UK since 1996 and is classified as vulnerable in the European Union. [116, 117] This decline has multiple causes although deterioration in the bird's agricultural habitat is seen as the biggest problem. [118] Impacts on grey partridge come from resource competition with gamebirds and from infection by the parasite Heterakis gallinarum. Pheasants act as a reservoir host for this parasite and spread this to grey partridges. [119] Under the IUCN EICAT scheme for classifying environmental impacts of alien species [120] pheasants have been found to have disease impact on grey partridges. As a result, pheasants have been classified as having 'moderate impact' contributing to the population decline of at least one native species. [121] Grey partridges also suffer negative impacts from nest parasitism, [122] lead ammunition poisoning and from being unintentionally shot.

Accidental shooting of grey partridges

Accidental shooting has a serious impact on grey partridges. It is hard to distinguish between captive-reared red-legged partridges and native grey partridges when the birds are in flight. [123] Even though they have Red List status and are in serious decline, it is still legal to shoot grey partridges for sport. [124] However, their similarity to captive-bred partridges means that they can frequently be shot by mistake. [125]

A study of shooting estates in Sussex which focused on captive-reared gamebirds found that 86 of 243 (35%) grey partridges present were shot. On two farms with large red-legged partridge releases around two-thirds of grey partridges present were shot. Grey partridge deaths from shooting were found to be twice as high as deaths caused by raptor predation. The study modelled that if more than 50% of autumn grey partridge numbers were 'lost' then the species would become extinct locally. It argued that the use of warning systems and gun training to avoid grey partridges can reduce the numbers of grey partridges shot. [126, 127] A GWCT shooting project using such methods was found to reduce the number of grey partridges unintentionally shot, but the number killed was still 5% of the local grey partridge population. [128] Even this so-called 'best case' scenario is unacceptable for such a threatened and declining native bird. It is also unclear how many shooting estates adopt and fully implement these measures, and there is no legal requirement to do so. Meanwhile it is still legal to deliberately shoot grey partridges for sport, within the shooting season running from 1st September to 1st February, even though their numbers continue to fall. [129]

Indirect impacts

Increase in predators and predation pressure

These impacts relate to how large populations of released birds for shooting lead to increased numbers of predators in particular areas and how this has a knock-on impact for other wildlife.

A 2024 study surveying 104 managers of protected sites, including nature reserve staff, but also farmers and gamekeepers, found widespread agreement that there is a negative impact in terms of increased predators and predation pressure. [130] Although it is uncertain whether greater predator numbers increase predation impact on particular species, studies do suggest this increases predation pressures. [131, 132] A separate Swedish study found how magpie and hooded crow territories were associated with increased nest predation of the red-backed shrike, with nest sites being abandoned in subsequent years. Nests were occupied again when magpies and hooded crows had moved away from the site. [133]

The 2024 survey found that conservation-oriented managers of protected sites were particularly concerned about increased predation on native species linked to gamebird releases, especially ground-nesting wader species. [134]

Crows

Crows are extremely intelligent birds that scavenge in order to survive and feed their young. This behaviour includes taking eggs and chicks from some ground-nesting birds. Conservation efforts to protect ground-nesting birds often target crows. This can involve scaring them, shooting them or catching them in Larsen traps. Culling these birds has mixed results and can be counterproductive. Culling corvids has been found to increase dispersal and their rate of replacement with other birds who also predate. Removing territorial pairs can lead to an influx of non-breeding birds that still predate nests. [135, 136] But, crucially, a large presence of crows in an area can be caused by high numbers of gamebirds. A 2023 study measured wildlife presence and other biodiversity features in areas where the birds were mass-released in comparison with areas without releases. It found higher numbers of carrion crows in areas where gamebirds were released. [137]

Another 2023 study measured (and lethally controlled) crow numbers in relation to threatened wading birds. [138] It found strong evidence that the abundance of gamebirds present was a decisive factor determining crow numbers. Crows showed largest declines (when culled) on sites with fewer gamebirds. This confirmed a 2019 study [139] which showed crow population growth to be associated with gamebird abundance. [140] It is thought that high numbers of dead gamebirds provide an important additional food resource for crows, leading to increased numbers in those areas. Between 2.4 and 6.1 million pheasants are estimated to be killed on UK roads each year. [141] Cardiff and Exeter University research revealed that pheasants are 13 times more likely to die on roads than other birds, making up almost 7% of all animals killed on the roads. [142] This inevitably provides an additional food resource for crows and is frequently observed by drivers on country roads.

A 2020 study of ground nest predation using camera traps in French farmland found that carrion crows were involved in around 60% of all 'predation events'. [143] A 2020 review into the impacts of gamebirds highlighted the role played by corvids in limiting the populations of some ground-nesting birds, stating that "any increase in predator populations as a result of gamebird release is [therefore] likely to exacerbate this problem" [144, 145]

Fox

Foxes and crows are usually thought of as two common 'generalist predators', often inhabiting similar shared environments. However, there are both similarities and important differences when it comes to their relationship with gamebirds.

Although attitudes are changing, the fox is still widely seen as a pest that must be killed and whose numbers must be 'kept under control'. Yet foxes play an important part in ecosystems and their numbers are in serious decline. The British fox population was estimated by the Mammal Society (in 2018) to be 357,000 and this figure is used for Natural England's IUCN Red List assessment. [146] Fox numbers in the UK have nearly halved (a 49% drop) over the past 27 years (1996-2022). Steep declines are continuing, with the population falling by 34% in the decade between 2012 and 2022. [147]

A 2021 review reported that around 40% of released pheasants and red-legged partridges are thought to be predated by foxes. [148] Shooting estates see foxes as a threat to the birds they rear and release for shooting. In attempts to eradicate them, gamekeepers working for shooting estates routinely shoot and snare foxes. This can involve night shooting. [149] Foxes are still shot with lead ammunition, contributing to the lead poisoning of birds, other wildlife and the environment. [150] The cruel use of snares is something Animal Aid has been campaigning to ban for many years. This has now happened in Wales and Scotland, but snares remain legal and still widely used in England. Foxes, as well as other mammals, suffer excruciating pain when caught in snares set by shooting estates. [151, 152]

It is sometimes claimed that shooting estates kill foxes to protect ground-nesting birds. This is highly questionable and unlikely to be effective. [153] Shooting estates and their gamekeepers persecute foxes primarily because they are seen as an economic threat to their central business: the production of pheasants and partridges for shooting.

Most reared gamebird shooting takes place in lowland rural areas and in these areas the fox diet is mostly made up of small mammals. [154] However, a 2018 study identified foxes as one of the predators limiting the populations of certain birds. These bird species tend to be single-brooded, long-lived, begin breeding later in life and, to a lesser extent, are ground-nesting. [155] But the research paper also identified mass gamebird releases as providing foxes with a significant additional food resource which is likely to increase overall fox numbers therefore leading to artificially higher levels of predation. [156] It may initially seem paradoxical, but this account is compatible with the overall drop in fox numbers mentioned elsewhere. Mass gamebird releases could be slowing the rate at which fox numbers decline.

One 2023 study found lower fox numbers in 1km squares where gamebirds were released compared with elsewhere. [157] This may appear to contradict the claim that foxes thrive and are attracted to release areas because of gamebirds. However, shooting estates undertake the mass culling of foxes on a huge scale.

A study of fox culling on 22 shooting estates found that every estate suppressed fox numbers relative to the estimated fox-carrying capacity within that estate. [158] On average, culling on shooting estates reduced the pre-breeding fox density to 47% of estimated carrying capacity, with variations of 20%–90%. The study found that additional foxes arrived to take the place of culled foxes: "Estimated rates of immigration were variable among estates, but in most cases indicated rapid replacement of culled foxes so that intensive culling efforts were required to maintain low fox densities." [159] Mass pheasant releases on shooting estates could therefore attract high numbers of foxes but regular intensive culling reduce these numbers such that net fox levels are lower in these areas than elsewhere.

The decline in many bird species, including some ground-nesting birds is a serious conservation concern. However, it has not been established that foxes are the cause of such declines. The 2018 research only identified foxes as playing a contributory role, and even then it identified ultimate causes other than fox behaviour to explain the problem. These included intensified farming, increased livestock numbers and mass gamebird releases, all of which boost the food supplies of generalist predators. [160] A 2024 study in the New Forest found that human-related foods, including food waste from nearby human settlements, were a major food source for local foxes. It found that this was likely boosting fox numbers and predation pressures on wading birds, including curlew, and that this could partly be addressed by fox-proof bins and greater control of human-derived food waste. [161]

The underlying causes of most bird species declines relate to agricultural practices, land use, pesticides and climate change. [162]

Fox numbers are falling due to a reduction in rabbit numbers, their main food source, and sarcoptic mange. [163] Yet shooting estates continue to shoot and snare them to protect their stock of pheasants and partridges, who will in turn be shot. In assessing the negative impacts of the mass shooting of birds for sport, foxes are another wildlife victim.

Persecution of wildlife

The shooting industry runs its estates commercially for profit. Pheasants and partridges are captive-reared and released in their millions every year in order to charge large fees for participation in the 'sport' of shooting released birds. Wild birds or mammals thought to be taking the birds are seen as enemies which need to be dealt with, and this extends to the killing of species protected in law. Many shooting estates and their staff have been linked to the illegal persecution and killing of wildlife. Prosecutions and convictions do happen, but the burden of proof is high, evidence is hard to gather, and eye-witnesses are rare, especially in remote locations. The few prosecutions and convictions that do take place represent only a tiny proportion of incidents. Persecution is happening at such a scale that a number of protected species are threatened and many conservation efforts are being undermined or rendered ineffective.

The birds of prey most commonly persecuted are buzzards, peregrine falcon, golden eagle, hen harrier, red kite and short-eared owl. [164] White-tailed eagle, goshawk, barn owl, tawny owl and other birds are also targeted. [165]

There is a clear connection between the killing and persecution of birds of prey and gamebird shooting. The RSPB found that at least 64% of all confirmed raptor persecution incidents in 2022 took place on land managed for gamebird shooting. Similar levels were recorded in the previous two years. [166] For 2021 it was at least 71%. [167]

Much raptor killing and persecution takes place on moors managed for the shooting of wild red grouse. Grouse moors are only found in northern upland Britain. Due to geography, central, south, east and west lowland Britain is largely limited to captive-reared pheasant/partridge shooting. [168]

However, for both of the two most recent years of RSPB-collated data (2021 and 2022) the greatest proportion of persecution cases have been associated with pheasant/partridge shooting. [169, 170] In 2021 more than half of all cases were associated with pheasant/partridge shooting. Pheasant and partridge shooting was associated with 50% of incidents, with an additional 8% attributed to mixed 'grouse/pheasant/partridge' shooting. [171]

Of the 191 individuals convicted of bird of prey persecution-related offences from 1990 to 2022, 67.5% have been gamekeepers. [172] The RSPB has produced an online Raptor Persecution Map Hub detailing every known case of raptor persecution in the UK. [173] Between 2007 and 2022 there have been 1,679 confirmed incidents but only a tiny number of prosecutions.

The illegal killing of birds of prey on some shooting estates is used as a management technique to get rid of raptors who are seen as a threat to gamebirds. This assessment is supported by decades of data and research by the RSPB, government figures, scientific studies and police prosecutions. [174]

Cases involving Norfolk gamekeepers

In 2023 a gamekeeper from Norfolk was convicted of 19 charges in a multi-agency raptor persecution investigation. [175] He was found guilty of possessing five dead young goshawks containing shotgun pellets, all dumped in Suffolk. Goshawks are a highly protected schedule 1 species.* The conviction was only possible due to DNA analysis linked to the gamekeeper's presence on the police database. [176] The court case heard that he told the police 'all gamekeepers were killing birds of prey'. [177]

*** Schedule 1**

Schedule 1 of the Wildlife and Countryside Act 1981 lists bird species that are protected during the nesting season. This makes it illegal to intentionally or recklessly disturb any Schedule 1 wild bird while nest building, or occupying or close to a nest containing eggs or young, or to disturb their nest or dependent young. [178]

Raptor persecution in lowland areas is impacting goshawk and can be directly linked to pheasant shooting. Another case involving a gamekeeper related to an area of lowland farmland used for pheasant shooting in the Breckland Special Protection Area (SPA) in Norfolk. The gamekeeper, Matthew Stroud, pleaded guilty to killing seven birds of prey, including a goshawk and buzzards. He also pleaded guilty to using lethal poisoned baits, illegal possession of poisons, including the banned chemical Strychnine, and the unauthorised release of over

'An illegal "hawk trap" on a game farm'

3,000 gamebirds in a Special Protection Area (SPA). Mr Stroud stated that his motivation was ‘to protect pheasants’. Although found guilty on multiple charges he was not given a custodial sentence. [179]

White-tailed eagle

Also known as sea eagles, white-tailed eagles are the UK’s largest bird of prey, with a wingspan of up to 2.5 metres. They suffered serious decline in Europe during the 19th and 20th centuries and were driven to extinction in the UK, largely due to persecution. [180]

In 2021 the white-tailed eagle’s UK conservation status improved from red to amber, with its population recovering from historic decline. This is due to successful reintroduction programmes in Scotland, and more recently in England on the Isle of Wight. [181] In 2023 white-tailed eagles fledged for the first time in England for 240 years. [182] Yet this conservation success is being partially thwarted by persecution associated with gamebird shooting. According to the British Trust for Ornithology ongoing persecution is limiting its population recovery in some areas. [183]

In 2021 the body of a poisoned white-tailed eagle was recovered from a pheasant shooting estate in West Sussex. The bird had been poisoned with a bait laced with bendiocarb, a highly toxic insecticide. The bird was a satellite-tagged white-tailed eagle from the Roy Dennis Wildlife Foundation and Forestry England reintroduction project. A few days earlier a labrador retriever had died on the same pheasant estate, also from bendiocarb poisoning. Although the laying of any poison bait in the open is illegal, it is a method commonly used to kill birds of prey. On land used for gamebird releases, the birds most commonly targeted are red kites and buzzards. The RSPB therefore considers it unlikely that white-tailed eagles were the intended target in this case. [184] However, the incident demonstrates that the laying of poisoned baits in the open to protect captive-reared gamebirds is killing vulnerable wildlife, including iconic species such as the white-tailed eagle, as well as posing a fatal risk to companion animals and other wildlife.

A 2022 case involved the lethal poisoning of another young white-tailed eagle on a shooting estate in Dorset. The bird had been poisoned with seven times the lethal dose of the rodenticide brodifacoum. Astonishingly, Dorset Police refused to search the estate, despite representations from the RSPB and the National Wildlife Crime Unit (NWCU). [185]

In shocking contrast to widespread public support for the white-tailed eagle reintroduction work in southern England, the former constituency MP Chris Loder (West Dorset) shamefully said that white-tailed eagles should not be reintroduced in Dorset and the police should not use their resources investigating such incidents. [186] It emerged that Chris Loder’s 2019 election campaign benefited from a £14,000 donation from Ilchester Estates, which runs shoots in his constituency. [187] The alarming situation in Dorset demonstrates how far shooting interests can thwart genuine conservation and the investigation of crimes against wildlife.

Young white-tailed eagles are particularly at risk of being poisoned because they are opportunistic scavengers and, according to satellite-tagging data, they cover large areas in their first year of life. [188] Reintroductions are aiming to re-establish viable white-tailed eagle populations in England following their persecution to extinction centuries ago. This has rightly been championed as important and successful conservation work, with strong public support. Yet the laying of poisoned baits on shooting estates is likely to kill more white-tailed eagles, seriously thwarting conservation efforts. This could make the establishment of viable white-tailed eagle populations in England impossible.

Poisoning and shooting of buzzards and red kites

In 2021 the two counties with the greatest number of persecution incidents were Norfolk (13 incidents) and Dorset (12 incidents), both lowland areas dominated by pheasant and partridge shooting. The third worst county, North Yorkshire (10 incidents), has pheasant and partridge shooting as well as grouse. [189]

One case involved a gamekeeper on a Wiltshire pheasant shoot. The bodies of at least 11 buzzards and four red kites were discovered down a well and the gamekeeper pleaded guilty to offences relating to possessing the dead remains of birds of prey. [190]

An illegally shot buzzard and illegally poisoned red kite were found on a pheasant shooting estate in Llanarmon Dyffryn Ceiriog, Wales. The red kite had been poisoned with bendiocarb, a banned product often associated with poisoning birds of prey. The shot buzzard was found inside a pheasant release pen. The gamekeeper, David Matthews, who had worked on the McAlpine Estate for 25 years, pleaded guilty to possessing unauthorised pesticides. The investigation discovered an unlocked barn containing 18 highly toxic products including cymag which has been banned since 2004. The RSPB’s investigating officer described it as one of the worse cases of illegal pesticide storage ever seen, representing a serious risk to wildlife, people and companion animals. [191]

LEAD AMMUNITION

More than 7,000 tonnes of lead ammunition is discharged into the UK environment every year, poisoning birds, other wildlife and the environment. [192]

Other than being directly shot with lead ammunition, the biggest single cause of poisoning is ingestion of lead gunshot which many wild birds mistake for grit. Many birds of prey and scavengers suffer secondary poisoning by eating live prey or carrion poisoned with lead. Other birds and animals suffer secondary poisoning as a result of lead entering the food chain more generally as a result of poisoned ecosystems.

Lead ammunition poisons up to 400,000 wildfowl in the UK every winter, causing untold suffering. Of these, up to 100,000 wildfowl are killed annually from ingesting lead gunshot. [193, 194] Taking all types of birds into account, an evidence review concluded that several million birds are likely to ingest gunshot in the course of a year in the UK. [195]

Not all of these impacts are caused by the shooting of pheasants and partridges. However, the vast scale of gamebird shooting means it bears responsibility for much of the suffering and death to wildlife and poisoning of the environment caused by lead shot pollution. A 2024 study investigating attitudes to captive gamebird releasing and shooting listed 'native bird species ingesting lead gunshot' as one of ten well-established 'effects from the release of gamebirds'. [196]

Lead poisoning affects physiology, behaviour and reproduction. A 2019 evidence review found "compelling evidence that lead from ammunition can, and sometimes does, negatively affect population levels and trends, and not only in quarry species". [197] The routine use of lead shot in gamebird shooting has caused serious harm to wildlife and environmental pollution to the countryside. As captive-reared bird shooting has increased so has its contribution to lead poisoning of wildlife and ecosystems. The case against lead shot is overwhelming and calls for it to be banned also go back decades. [198]

A comprehensive review of evidence found that "lead poisoning of birds is likely to occur wherever lead ammunition is used and a pathway of exposure exists". This affects a wide range of bird species, with population-level effects of lead poisoning being felt in wildfowl, terrestrial birds, raptors and scavengers. [199] The review also concluded that mammals that are scavengers and predators are also at risk.

Death and sub-lethal poisoning

The victims of lead poisoning suffer in a number of ways. Poisoning leading to death is the most extreme and obvious way that birds suffer. However, sub-lethal poisoning is common and can cause suffering and affect population levels.

Numerous studies have revealed many sub-lethal effects harming a wide range of wild bird species, sometimes at relatively low levels of lead poisoning. Sub-lethal effects include reproductive impairment and a wide range of other serious health impacts including impairment of vision (bald eagles), weakened body condition (wild ducks), impaired immunity (mallards), altered bone remodelling (red-legged partridges), weakened winter body condition (whooper swans), reduced flight height and movement rate (golden eagles), weight loss (griffon vultures) and the passing on of lead poisoning to offspring (from female mallards), with lead in eggshells, reduced body mass of ducklings and associated first-week duckling deaths. [200]

Population-level impacts

As well as suffering individually, lead pollution is affecting the population levels of some birds. The 2023 State of Nature report stated that some species of wintering waterbirds are declining due to poisoning from lead ammunition. [201, 202]

A 2016 study found correlative evidence indicating ingested lead gunshot to be affecting the population levels of eight UK wintering duck species. [203] One of these is the pochard, which has declined in recent years, with its status changing from amber to red in 2015. [204]

Between 1995/6 and 2020/21 the UK wintering population fell by 73%. [205] These birds are globally threatened, with 'vulnerable' status. [206] The European wintering population is also classed as vulnerable and is declining. [207] Although pochard populations face numerous pressures, lead gunshot poisoning is likely to be playing a role in their decline. The 2016 study stated that "the possible impact of ingested lead gunshot on the Common Pochard Aythya ferina, a species listed as globally threatened, is of special concern". [208]

Ingestion of lead shot

Waterbirds, wild gamebirds (galliformes) and cranes all ingest small stones and grit to help their digestion. Many of these bird species consume gunshot pellets or fragments mistaking them for grit or stones. [209] This has a huge impact on waterfowl and wetland bird species. The threat to wetland birds is so grave that in 2023 it became illegal in the EU, Iceland, Norway and Lichtenstein to use lead shot ammunition in wetlands. It is estimated that this will save the lives of one million waterbirds across Europe every year. [210, 211] This is important progress, but is not enough to solve the problems caused by lead shot. With use of lead shot still legal in non-wetland environments, effective enforcement of a wetland ban becomes challenging. A wetland ban on lead shot has been in place in Scotland since 2004, but a 2023 study revealed that compliance was low, with about half of the cartridges used found to illegally contain lead gunshot. Restrictions on the use of lead shot in England for the shooting of wild ducks (and ducks released for shooting) also has low compliance, with around 70% still illegally using lead shot. [212] A more universal ban on lead shot is needed to protect a wider range of species and environments but also to ensure high compliance in wetlands. In February 2025 the European Commission proposed a more comprehensive lead ammunition ban covering all habitats, albeit with some exemptions. [213] The proposal has to be considered by members states and the European Parliament before being adopted. But if enacted it will take effect across the EU and likely to include Northern Ireland.

As well as waterbirds, numerous terrestrial birds and animals are known to ingest lead shot. [214, 215, 216]

Hundreds of thousands of gamebirds die of lead poisoning each year, the vast majority of which are pheasants and red-legged partridges. [217] One estimate puts the number of pheasants and red-legged partridges killed by lead shot poisoning at over 320,000 each year. [218]

One major casualty of lead shot poisoning is the threatened native grey partridge (see panel on page 12). They often occupy the same habitats and geographical range as captive-reared gamebirds. It has been estimated that grey partridge populations could be suffering a 10% reduction solely due to lead gunshot ingestion. [219, 220]

The overall impact of lead ingestion on British birds is huge. Several million undetected birds are likely to ingest lead gunshot in the UK every year. [221, 222, 223]

Lead pollution: the environment

Lead pollution from ammunition is a serious environmental threat, contaminating soil, water and ecosystems. Unlike other forms of shooting, such as static target ranges, live bird shooting disperses lead ammunition widely across the countryside. A high proportion of lead from spent shot usually stays in the upper soil, only breaking down slowly and with some leaching into the surrounding environment. [224] Locations with high levels of shooting will inevitably have very high levels of ammunition discharge, which is likely to be cumulative over time. Studies show that in areas of high ammunition deposition, soil concentrations can be up to hundreds of times higher than in uncontaminated control sites. [225, 226] In intensive shooting locations, lead from spent ammunition can be taken up by some plants and soil microfauna and enter the food chain. [227, 228] In some cases lead levels found in plants are extremely high, exceeding acceptable limits for food for both animals and humans. [229, 230] Some of the highest levels are on shooting ranges but other locations where there is repeated shooting over time, including shooting estates, can see high accumulated levels.

Lead concentrations in soil from wood and field ecosystems used for annual pheasant shoots have been compared to levels

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in non-shooting wood and field ecosystems. Lead levels were found to be significantly higher in both wood and field soils used for annual pheasant shooting. The study found some evidence of lead accumulation in ryegrass foliage, moss and worms at the shooting sites. Lead levels in moss and worm tissues were found to be significantly higher in the shooting wood, compared to the non-shooting wood. Worm tissue lead levels were several orders of magnitude higher (112 mg/kg compared with 5 mg/kg). Significantly higher levels of lead were found in ryegrass in the shooting field, compared with the non-shooting field. [231, 232] Heightened levels of lead in soil, earthworms and plants means this can spread further through the food chain and ecosystems.

High lead levels in earthworms can have a knock-on effect through the food chain, with many birds and mammals consuming large quantities of earthworms in their diet. These include blackbirds, robins, starlings, thrushes, raptors such as buzzards and red kites and many waders. Many birds feed earthworms to their young. A wide range of mammals eat earthworms, including hedgehogs, badgers, moles and shrews. [233]

Spent lead shot is a serious and long-term pollution problem for wetlands. Lead shot can reside in the upper sediment of a wetland for extended periods of time and remain bioavailable for decades. As well as leaching lead, spent lead ammunition can also leach arsenic and antimony into the environment. [234]

Secondary poisoning: birds of prey and mammals

Birds that are predators or scavengers are the main victims of secondary lead poisoning. They consume lead shot fragments that are embedded in living prey or dead carrion. Evidence of secondary poisoning exists for at least 37 predator and scavenger species across Europe and North America and many of these are breeding birds in the UK. These include golden eagle, red kite, white-tailed eagle, common buzzard, peregrine falcon, marsh harrier, hen harrier, sparrowhawk, goshawk, long-eared owl, raven, rook, hooded crow and magpie. Although the lead poisoning impacts on many species have been studied in populations in other countries, it is extremely likely that UK populations are also suffering secondary lead poisoning. [235]
One UK study found elevated lead levels in a number of deceased birds of prey: peregrine falcon, buzzard, short-eared owl, little owl, kestrel, sparrowhawk, merlin and hobby. Levels recorded in peregrines and buzzards were high enough to cause clinical poisoning and mortality. [236, 237]

Buzzards

One study of 187 buzzard livers found that substantially higher lead concentrations correlated to the gamebird hunting season. Using isotope analysis it found that shotgun pellets were the major source of buzzard lead poisoning. It concluded that most lethal and sub-lethal effects of lead liver poisoning in buzzards are due to the birds' preying upon and scavenging gamebirds and mammals shot with lead pellets. [238]

Red Kites

As well as consuming live prey, red kite diets are made up of large amounts of scavenged carrion. They are particularly vulnerable to secondary lead poisoning by consuming dead animals that have already succumbed to lead poisoning.

One study of reintroduced red kites found that 14% of dead kites examined had fatal levels of lead poisoning, with elevated lead levels in the bones of 21% of examined birds. After testing the lead sources by isotope signature, the study concluded that lead ammunition in their food was the main causing of poisoning. [239]

Separate research shows that lead shot ingestion is affecting red kite population levels. Following reintroductions, the red kite population in Wales is increasing. However, the ingestion of lead shot is slowing this recovery, curbing annual expansion from 6.5% to 4%. [240]

Red kite were persecuted to near-extinction in Britain, with populations just surviving in Wales. Reintroduction programmes have been a great success in both Wales and England. But this conservation success is being undermined. They are being deliberately persecuted again, as well as succumbing to lead poisoning. [241, 242] Both are strongly linked to gamebird shooting.

Secondary poisoning: mammals

The risks to many British mammals and birds from eating earthworms containing high lead levels has already been mentioned. Numerous international studies have investigated the effects on mammals preying upon, scavenging or being fed game species shot with lead ammunition. Many mammals have been found to have significantly elevated levels of lead in their brain, blood, tissue or stomach. Two captive cheetahs regularly fed on hunted antelope and gamebirds were found to have died from lead poisoning. [243, 244] Shrews and moles were found to have high lead levels after consuming earthworms on a lead-polluted heathland site in the Netherlands. [245, 246, 247] All the signs are that British mammals are at risk from lead poisoning caused by gamebird shooting.

Lead-shot game meat: a serious risk to human health

As well as harming animals and polluting the environment, consuming game meat shot with lead ammunition poses a serious health risk to humans. Eating lead-shot game exposes people to potentially harmful levels of lead. It has been found to damage cardiovascular health and kidney function in adults and put children at risk of a reduced IQ. It has been estimated that children consuming at least one game meal a week are at risk of a 1 point or more decrease in their IQ. In terms of the impact upon children and society, US research estimated that a 1 point IQ drop equates to a 4.5% increased risk of failure to graduate from high school and a 2% decrease in productivity in later life. [248]

According to the Food Standards Agency and health expert advice there is no agreed safe level for lead intake. Lead can damage the nervous system and harm the developing brain. As well as frequent consumers of lead-shot game, the FSA has highlighted the greatest risks to children and women who are pregnant or trying for a baby. [249]

Shooting industry response: no progress

In 2020, whilst still opposing a ban in law, nine UK organisations (making up the UK shooting industry) finally conceded that it would voluntarily transition away from the use of lead shot over a five year period, to be completed by 2025. [250, 251]

At the end of this five year transition period there has been virtually no progress. Over this period Wild Justice has been testing the lead levels of UK partridge and pheasant game meat sold for human consumption from numerous outlets, including Marks and Spencer. The most recent results show all outlets still selling partridge and pheasant meat with lead levels higher than the legal maximum allowed for non-game meat. [252] Wild Justice concludes that “If these products were chicken, pork, lamb or beef their lead contamination levels would render them illegal and unsafe for human consumption. The game shooting industry is getting away with putting public safety at risk simply because the Government has failed to set a maximum legal limit for toxic lead in game meat.” [253]

A separate study published in 2024 revealed that 93% of pheasants destined for human consumption were killed using lead ammunition in the 2023/24 season. One of the retail outlets in this study was Waitrose. The majority of pheasant meat samples sold by Waitrose was found to contain lead shot. [254] Both Marks & Spencer and Waitrose have committed to ending the sale of game meat shot with lead ammunition, yet these two studies reveal they are still selling it to consumers. [255]

Despite statements of intent to the contrary, the game shooting industry continues to sell lead-contaminated game meat into the UK market for human consumption. Allowing the shooting industry to decide its own aspirational targets and police itself has failed.

Current regulations to restrict lead ammunition are not working. According to the Wildfowl and Wetlands Trust “voluntary agreements on the phaseout of poisonous lead ammunition are having virtually no effect”. [256]

Government inaction and delay

In fact, as long ago as 2021 the UK government had announced plans for phasing out or restricting lead ammunition. Yet despite consultations and pressure for action, no decision or legislative proposals have been forthcoming. Following parliamentary questions, in March 2024 the government stated that the process and decision would again be delayed. [257]

Is a ban finally coming?

Following long delays the UK Health and Safety Executive published its recommendation in December 2024 for a lead ammunition ban. [258] It is currently being considered by the UK Government. This is a long overdue, but welcome, development. However, the HSE is recommending that implementation is delayed, with a five year transition period before fully taking effect. Environmental organisations are rightly concerned that this will mean yet more lead pollution for wildlife, and are urging the government to reduce this to 18 months. [259]

Without a ban, the shooting industry’s continued use of lead ammunition will continue to put human health at risk, poison wildlife and pollute the environment.

Government officials culling birds at a game farm

Avian Flu

There is serious and widespread concern about the severe impacts of highly pathogenic avian influenza (HPAI) on many wild bird species. In the UK, at least 78 bird species have tested positive for avian flu. [260] This includes 21 of our 25 regularly breeding seabird species. [261] A 2022 Defra risk assessment concluded that infected (released) gamebirds posed a high to very high transmission risk of HPAI for waterfowl, birds of prey, corvids, waders, gulls and wild pheasants; a high to medium risk for owls and passerines (finches and sparrows); and a medium risk for pigeons. [262]

Avian flu strains can affect species in different ways, with some species suffering significant fatalities only from more virulent strains. For example, H5N8 clade 2.3.4.4b was the first form of avian flu found to be lethal to white-tailed eagles in Europe, mainly birds younger than five years old. [263] It is considered a threat to white-tailed eagles by BirdLife International. [264]

New, increasingly virulent forms of avian flu are becoming more threatening to a greater number of wild bird species, and ornithologists are, understandably, extremely concerned. Only by taking a precautionary approach can the worst impacts of avian flu on wild birds be minimised. Many bird species are already facing pressures from the climate crisis, pesticides, habitat loss, plastics, pollution and the depletion of fish numbers. [265, 266, 267, 268, 269] Precautionary action on avian flu is widely seen as an essential response to this aspect of the biodiversity crisis.

According to RSPB surveys the impact of the 2021-2022 HPAI outbreak has been devastating for numerous UK seabird species, including some in long term decline and others previously showing signs of recovery. Declines over the period suffered by gannet (-25%), great skua (-76%) and roseate tern (-21%) have been attributed to avian flu. Population levels of these birds had been improving prior to the outbreak. Sandwich terns and common terns had previously enjoyed relatively stable populations, but following the outbreak numbers fell severely, by 35% and 42% respectively, with avian flu the main explanation. [270] Other already declining seabird species have seen losses since the outbreak, although for these birds it is less clear how far this is due to avian flu.

Avian flu has been attributed to significant further mortalities recorded in 2023 for black-headed gulls, kittiwakes, guillemots and tern species. [271] Overall, the impacts have been immense.

Gamebirds spreading avian flu

Numerous studies and reports present very strong evidence that the mass rearing and release of captive gamebirds in their millions plays a dangerous role in the spread of avian flu.

A 2014 study of avian flu in the birds species group including pheasants and partridges warned that “spreading disease into the wild by releasing apparently healthy farm-reared gamebirds for hunting purposes could represent a substantial threat”. [272]

A Defra-funded 2021 study of H5N6 found that this form of avian flu was highly virulent in pheasants. It confirmed that pheasants act as a bridging host in the infection of commercial poultry and stressed “the ongoing risk for HPAIV introduction into gamebird premises and the maintenance of these viruses within this sector.” [273] It also confirmed the role that pheasants can play as a bridging host between wild birds and ‘housed’ or free-range chickens. It warned that “maintenance and infection outcomes in captive pheasants presents additional disease control challenges.” [274]

Spreading deadly avian flu to wild birds

The role that captive-bred gamebirds play in spreading avian flu is mostly spreading the disease to the commercial poultry industry. But they also pose a serious risk in spreading the disease to wild birds. The Scientific Advisory Group in highly pathogenic avian influenza (HPAIG) expert report to Defra in 2023 highlighted the “risk posed by gamebird releases to maintaining or amplifying infection in wild birds”. [275] The report explained how birds released on a mass-scale can pose a risk of spreading highly pathogenic avian flu to wild birds in a number of ways: “the very high numbers of gamebirds that are released, almost doubling the biomass of the wild bird population over a short period of time, pose potential disease risks to other birds, not only as a direct source of transmission. They could also maintain HPAI in the other wild bird populations or increase infection pressure to resident wild birds over the late summer and early autumn, before migratory waterfowl species arrive in Great Britain in late autumn. Feeding stations provided for gamebirds could provide a high-risk environment for transmission if they artificially concentrate individuals beyond what would occur naturally, and there are also risks of onward transmission to predators, scavenging raptors and mammals, which may be attracted to these sites.” [276]

A 2024 study further demonstrated transmission of H5N1 from pheasants to chickens and onwards among chickens. It also demonstrated the spread of H5N1 between red-legged partridges. The study highlighted the potential for gamebirds to play a role as bridging hosts between wild birds and commercial poultry in the spread of highly pathogenic avian flu. It warned that "the introduction of such a large biomass into the ecosystem impacts on habitats and wildlife, with accompanying challenges to infectious disease control. This biological overabundance may affect the infection status of wild birds by increasing pathogen circulation." [277]

Shared feeding stations: a deadly avian flu risk for wild birds

The HPAIG report's emphasis on the risk to wild birds using gamebird feeding stations is also supported by a study of pheasants in England infected with H5N8. [278] In this 2022 research an observed case study attributed the disease spread amongst reared pheasants to contact with wild waterfowl in the surrounding area which were "observed on the pheasant properties in the vicinity of the pheasants' food." [279] The study did not focus on transmission from pheasants to wild birds, but it is reasonable to conclude that wild waterfowl mingling at feeding points are at least as much at risk of contracting HPAIV from infected pheasants.

Ornithologists have also expressed concern about supplementary shared feeding on shooting estates spreading avian flu to wild birds. [280]

Why gamebirds?

Gamebirds pose such a great avian flu risk because of the ways they are intensively hatched, reared and transported on an industrial scale, weak biosecurity standards (lower than the poultry industry), the sharing of feeding points with wild birds and the sheer volume of the releases into the natural world.

Infected pheasants can spread avian flu when alive by mixing with wild birds, but also as infected carcasses in the wild, whether they have died from HPAI, shooting or other causes. According to a UK government risk assessment pheasant carcasses could transmit infection to raptor species including buzzards and owls. [281]

One UK study singled out the frequent moving of gamebirds, which is central to the mass rearing process, as constituting "the single biggest risk factor for the spread of infection" [282] But all these factors combine to increase incubation and spread of the disease.

A different 2022 study described a number of ways in which hatcheries, the breeding system and gamebird rearing facilities give rise to particular risks, involving practices that differ from commercial poultry production. [283] In particular, pheasant breeding stock is caught from the wild or overwintered in grass runs, where they have contact with wild birds. Released birds share a habitat with wild waterfowl, and scattered gamebird feed also attracts wild birds, leading to shared eating points. These and other practices increase the chances of gamebirds, including breeding birds, coming into contact with wild birds and their excrement, making adherence to biosecurity measures "challenging". The study describes problems in ensuring biosecurity between hatcheries and nearby rearing or egg production sites, and highlights risks arising where operators also receive eggs from satellite farms. It states that "biosecurity and hygiene levels in the gamebird sector are considered sub-optimal compared to the commercial poultry sector". [284]

A report based on visits to five different UK gamebird premises also described biosecurity measures in UK game farms as either non-existent or very limited. It highlighted issues such as a poor biosecurity protocol for staff/visitors and a lack of preventative measures against wild birds in the outdoor run. [285, 286] Animal Aid's investigations have also revealed poor biosecurity on game farms even after the period of avian flu outbreaks.

One routine practice of gamebird rearing is 'catching-up'. This involves gathering together birds previously released into the wild to use as breeding stock. These birds may have had high levels of contact with other birds and gathering them together has potential to spread avian flu through game farms. Animal Aid wrote to the authorities in England and Wales urging that catching up should not be permitted at the end of the shooting season. [287] Animal Aid has highlighted numerous other gamebird-related routine practices to the authorities that risk spreading avian flu. These include the movement of birds between sites, contact between dogs and shot gamebirds, and lack of inspections of game farms by the Animal and Plant Health Agency and local Trading Standards. Additional Government regulations regarding quarantining birds who have been caught-up can only go so far, and, as demonstrated at Bettws Hall, the relaxation of regulations was quickly followed by an outbreak of bird flu (see below).

Between 2021 and 2023 there have been 10 outbreaks of highly pathogenic avian flu in British gamebird rearing premises: one in Scotland, five in England and four in Wales. Defra statistics on HPAI in wild birds show 70 positive tests in pheasants in 2022 from August to December, with a peak occurring in October. Most cases have been in England, with 9 cases in Wales and 4 in Scotland. Northern Ireland has seen at least two positive tests in pheasants. [288]

In 2023 there was an outbreak of highly pathogenic H5N1 avian flu at Britain's largest game farm, Bettws Hall in Powys, Wales. [289, 290] Bettws Hall describes itself as 'Europe's leading game hatchery' [291, 292] rearing over 1.7 million gamebirds each year. [293] Responding to the outbreak the Welsh Government set up a 3km Protection Zone and a 10km Surveillance Zone around the farm, involving emergency biosecurity measures. [294]
Bettws Hall has been investigated by Animal Aid numerous times over the past twenty years. [295, 296]

Ornithologists concerned and alarmed

The spread of avian flu has led to catastrophic levels of fatality in numerous bird species, many of which are already of conservation concern. There is deep and widespread concern among ornithologists about the role played by gamebirds in its spread.

The British Trust for Ornithology (BTO) ran a series of expert workshops on avian flu in late 2022. The report of these workshops detailed numerous concerns about gamebirds spreading highly pathogenic avian flu to wild birds. There was particular concern about how gamebirds may spread avian flu to raptors, including hen harriers and goshawk, who capture, eat and scavenge released gamebirds. Concerns were voiced about the role of released gamebirds as vectors for the disease, the potential for supplementary feeding to spread the disease, the impact of the mass release of mallards for shooting, and the need to better understand transmission pathways. [297]

Concern that released birds are spreading HPAI to wild bird populations led the RSPB to demand government action to stop mass releases of pheasants, partridges and mallards. [298]

Highly pathogenic avian flu is killing wild birds, especially seabirds, on a vast scale, devastating whole colonies and populations. Captive-reared and released gamebirds clearly play a role maintaining the disease and spreading it in wild bird populations. Their contribution may be hard to quantify, but releasing 40-60 million gamebirds into the wild every year in Britain is only making the tragedy worse.

Antimicrobial Resistance, Antibiotics And Human Health

Resistance to common antibiotics, also known as antimicrobial resistance (AMR), is a serious problem threatening human health in the UK and globally. The misuse and overuse of antibiotics administered to humans, animals and plants is the main cause of the development of drug-resistant pathogens. [299] The rise and spread of antimicrobial resistance is creating a new generation of 'superbugs' that cannot be treated with existing medicines. This is ranked within the top 10 threats to human health by the World Health Organization. [300] In 2019 AMR contributed to 4.95 million global deaths, including 1·27 million deaths directly caused by AMR bacteria. [301] By the middle of the century AMR could cause 10 million deaths every year. [302] This is comparable to the global 2020 death toll from cancer. [303] The UN Environment Programme is also concerned about the scale of AMR impacts on animal health and the wider environment. [304]

The UK government has warned that rising AMR will cause people to suffer longer infectious illnesses as they become more difficult to treat. It also warns of increases in human deaths, suffering from infectious disease, and greater socio-economic costs associated with treating human illness. [305] In England alone 58,244 cases of severe antibiotic-resistant infections were recorded in 2022. [306]

This serious health threat has led to calls for restrictions to be placed on non-essential uses of antibiotics. [307] The use of antibiotics in the rearing of pheasants and partridges is widespread and routine, with the quantities used proportionally greater than is used in poultry farming. The very fact that gamebirds are released into the wild means they have much greater contact with wild birds than birds farmed for food, thereby having more opportunity to spread both disease and antibiotic resistance. Although there have been reductions in recent years the UK gamebird rearing industry currently administers around 10 tonnes of antibiotics to gamebirds every year. 2023 figures show a rise to 9.9 tonnes from a temporary drop to around 6 tonnes during the Covid years. [308, 309] This is more than 6.5 times the amount of antibiotics used on the UK's laying hens in 2023. [310] Numerous studies show that gamebirds are known to harbour antimicrobial resistance. Yet monitoring the extent of this resistance is still not taking place. [311]

Beta-lactam (β-Lactam) antibiotics are one of the largest classes of antimicrobials. They play a significant role in human medicine but also have high rates of use on captive-reared pheasants and partridges. A 2023 study of β-Lactam antibiotic resistance at pheasant and partridge rearing sites in southern England found that 58% of the birds sampled during the rearing season harboured genes resistant to β-Lactam antibiotics. [312]

Methicillin-resistant Staphylococcus aureus (MRSA) has been identified in a pheasant in Scotland. [313, 314] Staphylococcus aureus has been identified as the second leading pathogen for deaths associated with antimicrobial resistance. [315]

The medication of gamebirds is largely unregulated. This means that heavily medicated pheasants and partridges can legally be released into the wild in their millions. This puts antibiotics and other medicines into ecosystems, with the potential for resistance to be passed on to and by birds and mammals that prey upon and scavenge gamebirds. The gamebird industry claims to be reducing medication and antibiotic use, but the voluntary approach favoured by government means the industry still medicates gamebirds with tonnes of antibiotics every year with no notable reduction since 2020.

The UK government has taken what it calls a "voluntary collaborative approach" with industry to reduce antibiotic use in farmed animals. [316] This does not involve a legal requirement for action or any genuinely independent assessment. As part of this approach the gamebird industry reports antibiotic use under the animal agriculture industry body RUMA, the Responsible use of Medicines in Agriculture Alliance. Via RUMA the gamebird industry has voluntarily committed to reducing antibiotic use by 40% from a 2019 baseline of 10.4 tonnes. [317] Yet the latest figure of 9.9 tonnes, as mentioned above, show that this has failed.

Industry figures show that gamebird antibiotic use has increased since 2020, up from 6 tonnes in 2020 to 6.4 (or 6.7) tonnes in 2022. [318, 319] However, the figures around 6 tonnes may be distorted by the effects of Covid and avian flu, both of which the industry has reported as causing reductions to gamebird numbers. The most recent figures where the industry is operating at 'full capacity' in terms of gamebird numbers show antibiotic use at around 9-10 tonnes each year. [320, 321]

In May 2024 the shortly to be outgoing UK government published its 5 year action plan 'Confronting antimicrobial resistance 2024 to 2029'. [322] Although recent years have seen reductions in antibiotic use on gamebirds and in animal agriculture overall, this plan contains no targets for further reductions. There are no signs that antibiotic use in gamebirds will fall below current levels. Without any firm new targets or legal requirements the quantities of antibiotics used to rear gamebirds could easily rise higher again.

There are additional reasons why ongoing use of antibiotics and other medication of gamebirds should be a particular concern.

The RUMA 2023 report states that, looking ahead, gamebirds are likely to require more, not less, medication and antibiotics due to climate change. Here is the full quotation:

"The weather is having an increasingly greater impact on antibiotic use in the gamebird sector. The sector is more vulnerable to the effects of weather than any other, and this is equally true during the rearing cycle at the time of release (although treatment at time of release increases antibiotic use disproportionately as a course of treatment requires a greater quantity of medication as the birds get older). As the effects of climate change appear to create more extreme weather patterns, there is a distinct correlation with weather patterns and the effect on antibiotic use in the gamebird sector, whether it be due to wet weather affecting egg cleanliness, hot weather leading to heat stress, damp weather creating problems with hexamita and coccidiosis, or cold windy weather making it difficult to maintain uniform temperatures in brooder huts; all these factors contribute to increasing the need for medical intervention." [323]

Although it is unclear how far this is borne out by evidence, it indicates an expectation by the industry that captive-reared pheasants and partridges are likely to be increasingly reliant on antibiotics and medication in the long term.

One study has highlighted how low levels of biosecurity that are inherent in current gamebird rearing and releasing practices increase the risk of spreading resistance. [324] Under standard practice, once gamebirds are in their open-topped release pens, they are effectively sharing the space with wild birds and small mammals. Just as the birds can move in and out of the release pens, so can wild birds, rodents and other small animals. They can also share drinking and feeding points, with the latter known to attract rats. AMR has been detected in samples from pheasants long after medication, suggesting that the risk of it spreading to wild animals (and other gamebirds) persists even when medication has ceased. Resistance could also be spread in the wild by the five to eight million pheasants estimated by the shooting industry to survive the shooting season each year. [325, 326, 327, 328, 329, 330]

High levels of resistance associated with medicated gamebird feeders have been found in bank vole and wood mice populations in

northwest England and in foxes in Scotland. High levels of resistance were also found in buzzards in Portugal. These birds may have consumed gamebird carcasses containing antibiotics or antimicrobial-resistant organisms. [331]

Ionophore antibiotics in gamebird feed

Coccidia are intestinal parasites that gamebirds and poultry routinely suffer from. It is standard practice for birds to be given medicated feed to prevent the development of the associated disease coccidiosis. Symptoms include watery diarrhoea and weight loss, and outbreaks can lead to high levels of mortality if untreated. [332] Outbreaks are more likely where birds are stressed or overcrowded. A coccidiostat is a pharmaceutical agent used to treat or prevent the condition.

Lasalocid is a polyether ionophore antibiotic extensively used as a coccidiostat in both gamebird rearing and poultry production. It is licensed for use in the UK as the medical feed additive Avatec 150G. [333]

Avatec is routinely added as a medication to commercial gamebird feed. Feeding instructions stipulate that feeds containing Avatec must be withdrawn at least five days before the birds are killed for human consumption. [334] Pheasant feeds medicated with Avatec are sold for feeding from week 1 to week 12. Feed for poults aged 8-12 weeks continues to be medicated with Avatec but non-medicated feed is sold for use from week 13 “throughout the shooting season”. [335] Pheasants are moved from rearing sheds to release pens for the final weeks of their lives before the shooting season begins. They are likely to be in release pens longer than the five day limit mentioned above. However it is unclear whether feed used in release pens may be medicated with Avatec. This is significant because Avatec’s active ingredient lasolocid is an ionophore antibiotic.

Ionophores are the second most widely used class of antibiotic in agriculture. Ionophores are not used in humans, so it has been widely assumed that their agricultural use does not impact human health. Regulation of their use has therefore been much less robust than for antibiotics used for humans. However, there are concerns about cross-resistance and co-selection between ionophores and medically important antibiotics which point to them playing a possible role in the spread of antimicrobial resistance. Some scientists have identified a clear and urgent need to systematically investigate this issue. [336, 337] An important 2022 study found that “opposed to previously made assumptions, a relationship between the use of coccidiostats and the occurrence and dissemination of resistance to therapeutically used antibiotics does exist.” [338] It concluded that the use of ionophores “is therefore counteracting efforts to reduce the prevalence of AMR in poultry by more prudent use of antibiotics.”. [339] A 2024 review of recent research on polyether ionophores (PIs) used routinely in medicated animal feed stated that “PI-resistant bacteria can colonize humans and cause invasive infections and the PI resistance plasmids can spread in bacterial populations” and that “therefore, there is a potential risk associated with the use of in-feed PIs”. [340]

Although bacterial resistance to polyether ionophores has been described for decades, the specific resistance mechanisms have been poorly understood. However, bacterial resistance has been identified in relation to lasalocid, the ionophore used in most gamebird feed as Avatec. [341, 342]

Research attention to the chemical components of medicated gamebird feed and how it may relate to the spread of antimicrobial resistance is a cause for concern. With AMR such a major threat to human health (as well as to animal health and the environment) all routes with the potential to hasten its spread need very close scrutiny. The gamebird rearing and shooting industry has poor biosecurity and no independent regulation and operates in ways which could spread AMR. This should not be allowed to continue.

Shooting estate management: helping wildlife or distracting from real impacts?

Specific land management practices used on shooting estates are sometimes credited as increasing numbers of some species. One major impact review , for example, has assessed some game estate management of woodland and farmland as positive for nature. For farmland areas a number of management practices were identified: conservation headlands, beetle banks, grass margins, additional hedgerows, the planting of game cover crops and leaving winter stubble. (Lethal pest control was also identified as beneficial.) For woodland areas, it identified management of woodland canopies to increase understorey light levels, coppicing and the maintenance of open rides and glades. [343] Most of these practices, in the right circumstances, can benefit a range of species. However, extreme caution is needed when attributing benefits from these practices to gamebird shooting.

Even where some nature-friendly practices have been taken up, this is far from unique to shooting estates. In fact environmentally friendly land management practices are being encouraged by government to be adopted by all farmers and landowners.

The system in England for paying farmers and landowners for environmentally beneficial practices was changed in 2023 and may change again under the current government. [344] But in mid-2023, 34% of agricultural land was covered by Countryside and Environmental Stewardship scheme agreements with farmers and landowners, with Defra's intention (in 2023) that by 2028, 70% of farmed land is covered "so that farmers and land managers can collectively deliver our ambitious targets for the environment and climate, alongside food production". [345] The government's Environment Improvement Plan target for England requires 65-80% of landowners and farmers to adopt nature-friendly farming on at least 10-15% of their land by 2030. [346, 347]

Environmentalists mostly want these targets increased, arguing that the halting and reversal of biodiversity loss requires nature-friendly farming and land management practices to be more comprehensively adopted. The recovery of priority and specialist bird species, for example, are seen as requiring greater levels of support from agri-environment schemes. [348]

In the case of woodland areas, a 2022 study of woodland agri-environment management funded under the Woodland Improvement Grant found that it enhanced the populations of specific nationally declining woodland birds. The practices, largely involving actively managing woodland structure, were found to benefit target species. But it was found that between 36% and 50% of woodland bird populations need to be under Woodland Improvement Grant management to positively affect population trends. [349, 350]

Rodenticides – killing rats, poisoning wildlife and the environment

Rat poisons and traps are used to protect maize and other cover crops that attract rats. Rats are also attracted to gamebird feeders. [351] Rodenticides are routinely used to kill them in the vicinity of feeders, with 91% of gamekeepers reporting their use. This has been shown to also kill wood mice, bank voles and field voles, leading to some significant local population declines of these small mammals. Shrews were also poisoned. There is concern that residues can accumulate in the food chain, where these mammals are eaten by predators and scavengers. [352]

One study found wood mice, bank voles and field voles feeding on anticoagulant rodenticide from bait boxes targeting rats around different feed hoppers for gamebirds. They fed on bait immediately it was provided. Wood mice and vole populations were found to decline by an average of 48% in areas surrounding the feeders. Numbers partially recovered after three months, although this depended on timing relative to the breeding cycle. [353, 354]

When rodents are poisoned by anticoagulant rodenticides they may not die for several days. During that time they can continue normal behaviour and if predated their carcasses can poison predators and scavengers. Rodenticide poisoning has been recorded as causing the deaths of many birds of prey species, including buzzards, red kites, peregrine falcons and tawny owls, as well as ravens. [355]

Game cover crops

Shooting estates plant game cover crops for the purpose of feeding released gamebirds and stopping them from straying. [356] It is claimed that game crops also provide additional food for wild birds, but this depends on which game crops are planted. Maize is the game crop most commonly planted and is the first crop featured in the GCWT's guide to game crops. It is described as "a wonderfully reliable crop for holding game". [357] However, this game crop does not provide food for wild birds of conservation concern and also attracts rats. GCWT guidance states that "rats must be controlled effectively if maize is grown" which means the use of rat poisons and traps. [358, 359] Triticale, a hybrid wheat/rye crop, is another game crop recommended by GWCT that it states also attracts rats. [360]

Other game crops listed by GWCT can provide additional feed for wild birds, including millet, kale, quinoa, sunflowers, fodder radish and other cereal mixes. Combination planting of these as part of wild bird seed mixtures is funded under the Environmental Stewardship agri-environment scheme. [361] and the Countryside Stewardship Scheme. [362] This means that planting these

crops is taking place on arable lands more generally and is likely to become more prevalent with the accelerated roll-out of agri-environment schemes. It also means that shooting estates are publicly funded when they take this action. These factors show that shooting estates do not make a unique or distinct environmental contribution in this area. For those many estates planting maize game crops and using rodenticides to control the resultant rats these impacts are negative rather than positive.

Wildlife-friendly management practices sometimes associated with shooting estates are mostly included under UK agri-environment schemes for which publicly funded payments are available. Payments have been from £30 per hectare per year, under the Entry Level Stewardship ELS scheme, with greater per hectare payments in the higher level schemes. (The grant system changed in 2024 but many farmers/landowners are still subject to these earlier agreements.) Beetle banks, conservation/cereal headlands, winter stubble, hedgerow restoration/management for wildlife and planting certain cover crops are all practices included for funding under the Entry Level Stewardship agri-environment scheme. [363] Payments for establishing/maintaining flower-rich grass margins are available under the Sustainable Farming Incentive (SFI) scheme. [364]

Game cover crops grown by shooting estates (see panel) are a related area where benefits to wild birds can be exaggerated and the effects are sometimes negative.

Crucially, nature-friendly management practices do not require gamebird shooting in order for them to be undertaken by landowners and farmers. In fact, these practices are commonly undertaken by a wide range of landowners and farmers who are publicly funded to do so under the UK's agri-environment schemes. Many shooting estates receive public funding to undertake environmentally benign practices under these schemes and so are financially incentivised to do so. Indeed, it could be argued that this funding helps subsidise shooting estates. But these schemes fund a much larger and wider range of landowners and farmers to also undertake these practices. The very point of agri-environment schemes is to roll out environmentally beneficial practices as widely as possible.

Claims by shooting interests that managing land for shooting is more environmentally benign than land management for other purposes just don't bear scrutiny. Undertaking publicly funded agri-environment schemes cannot justify or compensate for the harm done, and must not distract from it.

When all the impacts of rearing, releasing and shooting gamebirds are taken into account we can only conclude that the overall impact on wildlife and the environment is overwhelmingly negative.

Lyme disease research

In 2025, research published by the University of Exeter's Centre for Ecology and Conservation and the UK Health Security Agency (UKHSA), suggested that ticks are more likely to carry the bacteria that can cause Lyme disease in pheasant release areas. [365]

Borrelia spp., the bacteria that can cause Lyme disease, was nearly 2.5 times more common in ticks in areas where pheasants had been released, with one of the researchers, Emile Michels, stating that pheasants "have a relatively high likelihood of contracting and retransmitting the bacteria."

Dr. Barbara Tschirren, from the University of Exeter, observed that "Our findings are evidence of 'spillback'—where non-native species increase the prevalence of native pathogens."

Conclusion

Every year the gamebird shooting industry condemns 40-60 million pheasants and partridges to terrible suffering before being shot. The millions that do survive can be predated or run over, or die slowly from wounds or lead poisoning. But the gamebird industry has other victims too: the British countryside and its wildlife.

This report has investigated the various ways in which mass gamebird shooting is causing devastating harm to animals, the environment and humans.

The list is long. Local environmental pollution. Water contamination. Direct environmental damage caused by the pheasants and partridges themselves. Changes to soil, hedgerows, plants and ecosystems. Multiple impacts on birds, mammals, reptiles and invertebrates. Threats to rare species. Persecution of birds of prey. Lead pollution. Spread of avian flu. Strengthening antimicrobial resistance, threatening human health.

Some of this may have made difficult, disturbing reading. But it will be much more disturbing, and dangerous, if these practices are allowed to continue.

This report has also scrutinised claims made that gamebird shooting benefits the environment. These are mostly found to be exaggerations, offering little more than is provided by other farmers and landowners, and often distracting from the environmental harm being done.

It cannot make any sense for 40-60 million non-native birds to be captive-reared every year and then be released into the environment, their mass being greater than all the other birds present for some of the year. It is a dangerous experiment and it must stop. This report has hopefully equipped more people with the arguments, information and source material to help bring about this change.

The shooting industry has been left unregulated and its efforts at voluntary self-regulation amount to very little. The industry's 2020 commitments to phase out lead ammunition have not been fulfilled, with no progress on other fronts. Even attempts to limit densities to 1,000 birds per hectare are only advisory. [366]

The way forward needs to be a ban on the mass release and shooting of captive-bred gamebirds. As an immediate priority the use of battery cages in gamebird rearing must stop, and Animal Aid continues to campaign for that. [367] But the huge impacts on wildlife and the environment detailed in this report would still remain.

Opponents of a ban might think that such a 'drastic' response is unwarranted. But it has already happened elsewhere. Following the adoption of its Flora and Fauna Act of 2002 the Netherlands banned the mass release of non-native gamebirds into the Dutch countryside. [368] That ban has been in place for over 20 years. A UK ban is long overdue.

The evidence demonstrating serious harm to native wildlife and the environment is overwhelming. A tiny minority may take pleasure in shooting captive-reared birds and be prepared to pay for an industry to provide this service. But a much bigger price is being paid by nature, as well as by the millions of birds bred each year to suffer and be killed for sport.

As the biodiversity crisis worsens there is a growing realisation that nature needs much greater protection and declines must be urgently halted and reversed. If not, the consequences will be irreversible and dire for us all. Releasing 40-60 million non-native birds into the British countryside every year plays a big part in this story of ecological decline. It has been ignored and tolerated for too long. That now has to change.

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Killing Our Countryside was written and researched by Danny Bates. An experienced researcher, campaigner and advocate for animals and the environment, Danny has undertaken numerous projects for Animal Aid. He was a member of Animal Aid Council for many years. **You can contact Danny via Animal Aid or linktr.ee/dannybates. He can also be found on Bluesky at dannybates1.bsky.social.**

A fully referenced version of this report is available on Animal Aid's website at: **animalaid.org.uk/environment-report**

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