The Moorland Association

Response to Defra's Call for Evidence on Gamebird Release, Shooting and Welfare During Rearing

1 November 2026
Submitted by: Andrew Gilruth, Chief Executive

Purpose and status of this submission

This submission has been prepared by the Moorland Association in response to Defra's 2026 Call for Evidence on gamebird release, shooting and welfare during rearing. It reflects the evidence, operational experience and analysis available to the Association at the time of submission, with particular reference to wild red grouse and associated upland management in England.

The Association has sought to distinguish established findings from emerging, incomplete or contested evidence, and to identify relevant limitations in the supporting sources. This submission should therefore be understood as a dated contribution to the evidence base, rather than an exhaustive or permanent assessment of the issues considered. Any subsequent interpretation or use should take account of its original context, the qualifications accompanying the evidence and any material developments thereafter. The Association reserves the opportunity to supplement or revise its assessment as further evidence becomes available.

The question numbers used throughout this submission correspond to those in Defra's original 2026 Call for Evidence. Where questions have been omitted, this reflects the Association's decision to concentrate on matters within its remit and for which it is able to provide relevant evidence.

Call for Evidence Questions - About you

Question 1: Would you like your response to this call for evidence to be confidential in the event of an access to information request?
No

Question 2: **Provide your full name**
Andrew Gilruth

Question 3: Provide your email address or, alternatively, your full postal address
agilruth@moorlandassociation.org

Question 4: In what capacity are you completing this call for evidence?
As a representative of an interest group or trade association

Question 5: If you are responding on behalf of an organisation, what is the name of that organisation?
The Moorland Association

Question 6: Where are you, or the organisation you are representing, located?
England

Question 7: Would you like to answer questions regarding gamebird release and shooting, or would you like to skip to the questions regarding gamebird welfare during rearing and breeding?
Answer questions on gamebird release and shooting

Executive summary

The Moorland Association's response relates principally to red grouse shooting and the associated management of England's uplands. Red grouse are wild birds managed in situ and are not reared and released. The evidence concerning grouse shooting must therefore be distinguished from evidence concerning the breeding, rearing and release of pheasants, partridges and mallard.

The central conclusion of this submission is that the evidence does not support treating either grouse shooting or grouse-moor management as a single, uniformly positive or negative environmental pressure. The relevant evidence concerns a series of different activities—including habitat and vegetation management, lawful predator control, grazing, hydrology, wildfire-risk management, monitoring, access and the harvesting of grouse—which can produce different outcomes for different species, habitats and places.

There is credible evidence of adverse impacts associated with some practices and of illegal killing and other offences against birds of prey. Such evidence must be taken seriously and demonstrated harms should be addressed. There is also substantial experimental and observational evidence that some management associated with grouse moors can benefit upland habitats and species of conservation concern, particularly through maintaining suitable open habitat and improving the breeding success of some ground-nesting birds. An objective assessment must consider both.

The MA is not asking Defra to assume that existing management is necessarily optimal. Nor do we suggest that additional regulation can never be justified. Any additional statutory intervention must, however, be shown to be necessary, proportionate and likely to deliver a better outcome than existing regulation, improved practice, adaptive management or earned recognition. We are asking Defra to establish what the evidence demonstrates before selecting a policy response, to distinguish scientific findings from subsequent policy judgements and to apply the same evidential standard to positive and negative claims.

Six principles run through this response.

1. **Assess individual practices and outcomes.** The presence of grouse shooting does not, by itself, establish that it caused either a positive or negative environmental outcome. Defra should identify the particular practice, plausible causal mechanism and measured outcome, distinguishing correlation from causation and proxies from ultimate environmental effects.
2. **Consider the realistic counterfactual.** The appropriate comparison is not between existing grouse-moor management and an assumed risk-free alternative. If management is restricted or removed, land use, investment, predator management, vegetation management, employment and conservation activity may also change. Defra should compare the likely environmental, economic and social outcomes of credible alternative management regimes.
3. **Recognise uncertainty and conflicting evidence.** Different studies sometimes produce different results because species, sites, methods and management contexts differ. Evidence gaps identified by government, regulators or researchers should not subsequently be treated as settled. Conflicting findings should be reported and evaluated rather than resolved through selective inclusion or weighting.
4. **Target demonstrated problems through proportionate measures.** Where a particular practice is shown to cause harm, policy should address that practice and the outcome concerned. Defra should consider the full range of available responses, including enforcement of existing law, improved practice, voluntary standards, adaptive management, earned recognition and additional regulation. A new statutory mechanism should be selected only where evidence demonstrates that it is necessary and likely to produce a better outcome than the available alternatives.

5. **Assess cumulative and unintended consequences.** Grouse-moor management supports employment, investment, specialist skills, recreation, community participation and year-round habitat and wildlife management. These benefits do not override demonstrated environmental harm, but neither should they be excluded from the assessment. The effects of regulatory uncertainty may also arise before any decision has been taken on whether further intervention is required, where credible expectations of possible change affect recruitment, retention, infrastructure and long-term management investment. Experience in Scotland illustrates why any future policy appraisal should examine anticipatory, cumulative and displacement effects, rather than assessing impacts only from the point at which a particular intervention, if adopted, takes effect.
6. **Make the evidence-assessment process transparent and auditable.** The interpretation of a body of evidence can change materially according to which studies are included, excluded or emphasised and how uncertainty and conflicting findings are weighted. Defra should therefore publish its evidence-assessment methodology, inclusion and exclusion criteria, approach to study quality and declarations of interest, together with the evidence relied upon or an indexed evidence register. This should occur before policy options are selected, rather than being reconstructed after a preferred intervention has been developed.

If Defra subsequently proposes regulatory intervention, the baseline, intended environmental, economic and social outcomes, monitoring methodology and tests of success or failure should be published before a final decision is taken. Any review must be genuinely symmetrical: capable of recommending tighter requirements where evidence demonstrates continuing harm, but also capable of recommending stability, simplification or withdrawal where outcomes are being achieved, anticipated risks have not materialised or unintended consequences outweigh the benefits.

Otherwise, periodic review and continuing uncertainty risk creating a regulatory ratchet under which investment and management capacity decline even without an express prohibition. The result could be the practical loss of an activity—and of associated employment and beneficial land management—without an explicit assessment demonstrating that such an outcome is necessary, proportionate or environmentally preferable.

The MA therefore asks Defra to use this Call for Evidence to identify:

- which particular activities and practices produce which outcomes;
- the strength, limitations and geographical applicability of the evidence;
- where material uncertainty or conflicting evidence remains;
- the likely consequences of realistic alternative land-management scenarios;
- the environmental, economic and social effects of possible intervention; and
- which combination of existing regulation, improved standards, adaptive management, earned recognition or further intervention is most likely to deliver the outcomes sought.

The detailed answers which follow provide the supporting evidence and qualifications. Annex 1 identifies the principal sources relied upon, their evidential status, their relevance to the MA's response and their important limitations.

Section A: Call for Evidence Questions - Biodiversity

Question 8: What evidence is there of positive and/or negative impacts from:

a. grouse shooting;
b. pheasant/partridge release and shooting;
c. mallard release and shooting on biodiversity.
d. and related activities.

8.1 The Moorland Association's response to this question relates principally to (a) grouse shooting and (d) the associated land-management activities. We do not seek to provide specialist evidence on pheasant/partridge or mallard release and shooting, which are outside the principal focus of our membership.

Scope and evidential approach

8.2 The available evidence does not support treating grouse shooting or grouse-moor management as a uniformly positive or negative biodiversity pressure. Peer-reviewed experimental and observational research demonstrates that particular management practices associated with managed grouse moors, including lawful control of generalist predators and habitat and vegetation management, can produce positive outcomes for some upland breeding birds, including species of conservation concern. This includes experimental, observational and follow-up evidence concerning predator management and breeding waders, including Fletcher et al. (2010), Baines et al. (2023), Baines (2025) and Baines & Aebischer (2026). Other evidence identifies risks, limitations and species- or site-specific responses. The appropriate task for this Call for Evidence is therefore to identify which particular practices are associated with which outcomes, and with what degree of evidential confidence, rather than attributing a single biodiversity effect to "grouse shooting" as a whole.

8.3 The MA welcomes Defra's statement that this Call for Evidence does not make policy proposals or prejudge future regulation. The evidence-gathering exercise must therefore remain genuinely capable of supporting a range of conclusions, including that identified risks can be addressed through existing regulation, improved practice, voluntary standards or earned recognition and that no additional statutory intervention is justified by the evidence.

8.4 In assessing the evidence, Defra should distinguish correlation from causation, identify the particular activity or management practice associated with an outcome, recognise uncertainty and limitations, and consider credible alternative land-management scenarios. The relevant comparison is not between an existing activity and an assumed risk-free alternative, but between the likely environmental and social outcomes of realistic management options.

8.5 The MA also considers it important that the degree of confidence attached to an evidential conclusion reflects the state of the underlying evidence. Where Government, regulators or researchers have themselves identified material evidence gaps or commissioned further research to resolve uncertainty, those questions should not subsequently be treated as settled for the purposes of policy appraisal. Evidence of an intermediate outcome or proxy should similarly not be treated as evidence of the ultimate environmental outcome unless the causal relationship between them has been demonstrated. The same discipline should apply to predetermined tests of success: where a demonstration project has specified an outcome or viability threshold in advance, failure to meet that threshold should not subsequently be recharacterised as success because a lower level of activity might hypothetically have been possible.

8.6 This approach is consistent with the IUCN Species Survival Commission's 2023 Guidelines on Human-Wildlife Conflict and Coexistence. Although those Guidelines are not specific to grouse shooting and do not provide evidence about its ecological effects, they set out relevant principles for decision-making in contested wildlife-management situations. They advise practitioners to "not rush into assumptions about causal links", to understand ecological, land-use, social and governance context, to assess the risk of unintended consequences, to base planning and action on evidence and sound science, and to create a learning process in which interventions are measured, evaluated and adapted. They also emphasise that solutions should be context-specific rather than transferred automatically between situations and that longer-term decisions should consider landscape-scale ecological, economic and social effects (IUCN SSC, *Guidelines on Human-Wildlife Conflict and Coexistence*, 2023, Principles and Good Practice Checklist, pp. 11-14).

8.7 The relevance to the present Call for Evidence is methodological. Before attributing an outcome to gamebird shooting or selecting a policy response, Defra should identify the relevant ecological and human drivers, establish the evidential basis for the proposed causal relationship, consider the consequences and potential unintended effects of intervention, and assess whether conclusions drawn in one management context are transferable to another. This is consistent with the MA's request that individual management practices, outcomes and realistic alternative land-management scenarios are assessed separately rather than treating "grouse shooting" as a single ecological pressure.

8.8 There is also more directly relevant precedent for this approach in the specific context of grouse-moor management. The Scottish Government's independent Grouse Moor Management Review Group reported in 2019 that, despite an extensive review of the available evidence, "significant evidence gaps" remained and that much of the underlying science was contested. The Group drew on peer-reviewed research, public-sector and NGO evidence, stakeholder submissions, field visits and oral evidence, but nevertheless identified important uncertainty across issues including illegal killing of raptors and other bird-of-prey crime, socio-economic effects and aspects of moorland management.

8.9 That uncertainty did not lead the Group to conclude that no regulatory action was justified. Indeed, it recommended additional regulation in several areas and ultimately proposed that licensing of grouse shooting should follow if specified conservation improvements were not achieved within five years. However, the Group was evenly divided on the immediate introduction of licensing and expressly recognised that whether and when to license grouse shooting was ultimately a policy decision informed by, rather than determined solely by, the scientific evidence. The relevance to the present Call for Evidence is therefore methodological: where important evidence remains uncertain or contested, Defra should identify that uncertainty explicitly and distinguish the evidential findings from the subsequent policy judgement made on the basis of them.

Distinguishing shooting from associated management

8.10 It is important to distinguish between the act of grouse shooting and the wider system of land management associated with managed grouse moors. That distinction is particularly important because the Call for Evidence is intended to examine both positive and negative impacts. Red grouse are wild birds and are not reared and released. The relevant biodiversity question is therefore not simply the effect of harvesting grouse, but the effects of the individual management practices (including habitat and vegetation management, lawful predator management, grazing, monitoring and conservation investment) that may accompany that land use.

8.11 The presence of a species, incident or particular ecological condition on land managed for grouse shooting does not, by itself, demonstrate that grouse shooting or any particular associated management practice caused that outcome. Equally, the presence of grouse shooting should not, by itself, be treated as evidence of a positive biodiversity outcome. The same evidential standard should apply in both directions: the relevant practice, plausible causal mechanism and observed ecological outcome should, so far as the evidence allows, be identified separately.

8.12 Conservation benefits arising from management undertaken principally for shooting should be assessed according to their demonstrated ecological significance, geographical scale, persistence and uncertainty. The fact that a benefit is described as "secondary", or is not the primary purpose of the activity, does not establish that it has lesser conservation value. The weight attached to that benefit should be justified by the evidence about the ecological outcome.

Biodiversity evidence and individual management practices

8.13 There is evidence that some of these associated management practices can deliver positive biodiversity outcomes, particularly for upland breeding birds. For example, Natural England's own assessment of common snipe records evidence that grouse moor management, including predator control, may be beneficial to snipe, while also noting that the evidence is not uniform across studies and that an English study did not demonstrate the same benefit. This illustrates the importance of considering individual management practices, habitat and local circumstances rather than treating "grouse shooting" as a single ecological pressure.

8.14 This is not the only relevant evidence. Fletcher et al. (2010), Newey et al. (2016), Littlewood et al. (2019), Mustin et al. (2018), Baines et al. (2023) and Baines (2025) indicate that legal control of generalist predators can benefit some ground-nesting birds. Baines et al. (2023), for example, found curlew productivity around four times higher on the grouse moors than on the paired non-grouse moors examined, with breeding outcomes associated with lower indices of foxes and corvids. That was an observational paired-site study rather than an experimental manipulation and does not demonstrate that the same effect will occur in every landscape. It nevertheless provides further peer-reviewed evidence that predator abundance and management can be material to the breeding outcome of a species of conservation concern.

8.15 Longer-term evidence is also available from the area used for the earlier Upland Predation Experiment. Baines (2025) resurveyed four plots around Otterburn approximately ten years after the experimental predator-control programme had ceased. Carrion-crow abundance and the fox index had increased, while golden plover, snipe, red grouse and curlew had declined substantially and black grouse and grey partridge were no longer recorded on the study plots. Most measured habitat variables showed little corresponding change. The resurvey was observational rather than a repeat of the original controlled experiment, was confined to one study area and occurred against wider national changes in some of the species concerned. The paper also identifies released pheasants and partridges as one factor capable of supporting high generalist-predator densities and acknowledges continuing illegal killing of protected raptors. Those qualifications reinforce, rather than weaken, the need to distinguish different gamebird systems and individual causal mechanisms when assessing biodiversity outcomes (Baines, 2025).

8.16 More recent evidence from northern England also demonstrates why the overall management system should be examined rather than the act of shooting alone. Baines & Aebischer (2026) estimated approximately 1,764 breeding curlew pairs in Upper Teesdale and found that blanket bog managed by burning or cutting held more than twice the curlew density recorded on unmanaged blanket bog within the study. Estimated productivity was around one fledged chick per pair and

repeat surveys approximately a decade apart indicated broadly stable numbers against a substantial national decline. This was an observational study in a landscape where habitat, farming, predator management and other aspects of grouse-moor management are interrelated, so the observed outcomes cannot be attributed to any one intervention. The study nevertheless provides current peer-reviewed evidence that a grouse-moor-dominated landscape can support high densities and breeding productivity of a species of significant conservation concern (Baines & Aebischer, 2026).

8.17 Vegetation management is a separate mechanism. A ten-year replicated field experiment on three northern English blanket bog grouse moors found that burning, cutting and non-management produced different effects on the elemental composition and nutritional quality of heather, with management effects generally diminishing as vegetation recovered over time (Heinemeyer et al., 2025a). The study measured plant chemistry rather than bird abundance or breeding success and should not therefore be treated as direct evidence of a biodiversity outcome. It is nevertheless relevant because it demonstrates experimentally that alternative vegetation-management treatments are not ecologically interchangeable and that their effects change through time. This supports assessment of the particular management intervention and outcome rather than assigning a single effect to "grouse-moor management".

8.18 Evidence from other European heathland systems provides additional, though not directly transferable, support for the ecological importance of habitat heterogeneity. Rainsford et al. (2026) found that mosaic cutting and prescribed burning in a Mediterranean Natura 2000 heathland regenerated open habitat and supported declining open-habitat birds relative to untreated reference areas. Brüggeshemke, Henning & Fartmann (2025) recorded higher densities of characteristic open-heathland birds on fire-managed German heathland than on a comparison area managed principally through grazing and cutting, while recognising other differences between the sites. Rittl et al. (2025), examining plants, invertebrates and soil biota in Norwegian coastal heathland, found that different managed successional phases supported distinct assemblages and that the resulting mosaic supported greater overall biodiversity than any single phase. These systems differ materially from English blanket bog in soils, climate and management history, so they should not be used to infer the effect of prescribed burning on English peatlands. Their relevance is narrower: they provide independent evidence for the ecological principle that different disturbance histories and vegetation structures can support different species and assemblages. Long-term work at Langholm similarly demonstrates that grazing pressure is a separate vegetation driver which must be considered when interpreting changes in heather cover (Ludwig et al., 2020).

8.19 The Moorland Association considers that the evidence should therefore assess separately, and where possible quantify:

- habitat creation, restoration and maintenance associated with grouse-moor management, including the effects of different vegetation structures and management histories (Heinemeyer et al., 2025a; Rainsford et al., 2026; Brüggeshemke, Henning & Fartmann, 2025; Rittl et al., 2025)
- legal predator management and its effects on breeding success and population trajectories of ground-nesting birds (Fletcher et al., 2010; Mustin et al., 2018; Littlewood et al., 2019; Baines et al., 2023; Baines, 2025; Baines & Aebischer, 2026)
- grazing and vegetation management, including their interaction and effects on habitat condition (Ludwig et al., 2020; Heinemeyer et al., 2025a)
- wildfire prevention, preparedness and recovery
- monitoring and practitioner data collection, including long-running gamekeeper-led Merlin monitoring in the North York Moors and Yorkshire Dales. In the Yorkshire Dales, a ten-

year project covering 2016–2025 recorded more than 140 successful nests and fewer than ten failed nests, with more than 90% of monitored pairs fledging at least one young. Gamekeepers identified nesting places and undertook nest monitoring as accredited agents of the licensed project coordinator. These observational data do not establish the effect of any single management intervention, but demonstrate the potential conservation value of systematic practitioner monitoring and the importance of incorporating land-manager evidence into species assessment (Moorland Association, 2026, North York Moors Merlin monitoring; Yorkshire Dales National Park Authority, 2024; Jack Orchel, pers. comm., October 2026; see 9.22–9.24).

- the effects of management on designated-site features and wider species assemblages
- any negative effects identified in the evidence, including where these can be attributed to particular management practices rather than to grouse shooting itself

8.20 Equally, where good evidence demonstrates an adverse impact, it should be addressed. The objective should be to identify which individual practices produce positive outcomes, which produce negative outcomes, where effects vary between species or sites, and which practices can be improved.

Counterfactuals and alternative management scenarios

8.21 The Moorland Association therefore supports an evidence-led assessment of grouse shooting and associated management which considers the whole management system and its counterfactual: not simply what occurs on managed grouse moors, but what would be likely to happen to habitat management, predator management, monitoring and conservation investment if that management system were reduced or removed.

8.22 That need for counterfactual assessment is illustrated by the RSPB-commissioned Rayment analysis of future grouse-moor policy options. For its 2022 appraisal, the report acknowledged that evidence gaps and uncertainty prevented a robust quantitative assessment of the costs and benefits of the alternative policy options. Its analysis instead sought to identify the nature, direction and, where possible, relative value of likely economic, social and environmental changes (Rayment, 2022, p. 82). The MA therefore treats its projections as a qualified policy appraisal, rather than a complete quantitative comparison of the overall net benefits of the alternative options. Although the report identified potential benefits from additional regulation and from alternative land-management approaches, it also recognised that changes to grouse shooting could alter land use, employment, predator management, vegetation management and species outcomes, and that those effects would differ geographically. Its assessment of a ban on driven grouse shooting envisaged cessation of heather management, predator control and red-grouse medication across substantial areas, while recognising that some conservation management might continue and that land might instead move towards peatland restoration, afforestation, rewilding or different grazing regimes (Rayment, 2022).

8.23 The RSPB's subsequent short-form briefing of the same study makes the counterfactual particularly clear. It records that driven and walked-up grouse shooting have materially different economic and management characteristics and states that a ban on driven shooting would have an "immediate and locally significant" negative effect on the rural economy, including loss of employment and cessation of associated management activities. The evidential point is not that these effects necessarily outweigh environmental benefits associated with alternative management, but that both sets of effects form part of the relevant comparison. Defra should therefore assess what habitat management, lawful predator management, monitoring, employment and conservation investment would actually continue under each realistic alternative land-management scenario, rather than assuming that existing benefits would either continue unchanged or disappear altogether (Rayment, 2022; RSPB, 2023a).

8.24 The same briefing also identifies potential biodiversity trade-offs within its licensing scenario. Its policy-options table anticipates small declines in heather moorland, red grouse and breeding waders under business as usual, alongside a small increase in vegetation and species diversity, and describes the corresponding trends under licensing as "similar but slightly magnified". It also anticipates reduced illegal killing of raptors, helping affected populations to recover, and possible benefits from improved regulation of heather burning (RSPB, 2023a, policy-options table). These are prospective assessments, not measured effects of an implemented licensing scheme, and they do not establish that licensing would necessarily cause such declines or have a negative overall effect on biodiversity. They nevertheless reinforce the need for Defra to assess how any proposed licensing conditions would affect the habitat management and lawful predator control supporting breeding waders, alongside the intended benefits for raptors and other environmental objectives. The assessment should identify the expected gains and losses for particular species and habitats, the management changes through which those effects might arise, and the uncertainty surrounding those predictions.

8.25 Rayment's underlying report also linked the anticipated carbon, water-quality and flood-management benefits of a ban on driven grouse shooting to ongoing investment in ecosystem restoration. It stated that ongoing public and private funding would be needed to maximise those benefits, particularly where peatlands were heavily degraded (Rayment, 2022, p. 80). The MA considers that Defra should therefore assess who would fund and deliver the necessary restoration and ongoing management, over what period, and how the resulting benefits would be sustained. These practical delivery requirements form part of the counterfactual: potential benefits from restoration should not simply be assumed to arise from regulatory change alone.

8.26 Peer-reviewed modelling provides further evidence that the ecological counterfactual is material. Mason et al. (2025) modelled the effects of future management and climate change on red grouse, curlew and golden plover across Great Britain. Their modelling predicted reductions in all three species if grouse-moor management ceased, with larger projected declines when management change was combined with future climate change. At the median level of management intensity used in the study, predicted abundance was higher for all three species than on unmanaged moorland. However, climate and land cover explained substantially more variation than grouse-moor management for curlew and golden plover; the effects attributed to management were correlative; and the authors also identified potential benefits from cessation for controlled predators and raptors affected by illegal killing. The study therefore does not establish that continuation of current management is environmentally preferable overall. Its importance to this Call for Evidence is that a change in management has its own predicted ecological consequences and cannot be assessed against an assumed environmentally neutral alternative (Mason et al., 2025).

8.27 Recent Defra and Natural England-funded research on curlew recovery provides a complementary example. Macgregor et al. (2026) reviewed curlew-focused conservation interventions and modelled alternative population scenarios. The report found evidence that interventions can improve nest success, while also identifying low chick survival as an important constraint. Its high-productivity scenario drew on grouse-moor-adjacent farmland subject to intensive predator management; in the modelling, removal of that favourable management reduced the projected rate of population growth substantially. The report also estimates that grouse moors support a significant proportion of the UK breeding curlew population. The authors emphasise that the intervention evidence is often based on relatively small datasets, that measures are commonly implemented together and that the scenarios are hypothetical, limiting attribution to any single intervention. Those limitations are important. The relevance here is that the likely continuation or loss of habitat and predator

management needs to form part of the counterfactual rather than assuming that conservation outcomes would be unchanged under a different land-management system (Macgregor et al., 2026).

8.28 The Langholm Moor Demonstration Project provides a quantified example of why the financial underpinning of conservation management must form part of the counterfactual. The partnership's final report records expenditure of approximately £2.25 million on routine moorland management and £1.5 million on capital investment during the project. Management involving five gamekeepers contributed to improvements in heather habitat and several bird populations, but these activities could not ultimately be sustained through grouse-shooting income, and keepering ceased in February 2016. These are site-specific figures arising from a project supported by public and private partners; they should not be treated as representative costs for all grouse moors. They nevertheless demonstrate that assessing the consequences of removing or reducing grouse shooting requires Defra to consider which conservation activities would continue, how they would be funded and whether an alternative management model could deliver comparable outcomes over time (Langholm Moor Demonstration Project Board, 2019, pp. 6–10 and 33–35).

8.29 The RSPB's 2020 AGM statement recognised that land well managed for shooting can have "considerable wildlife benefits" (RSPB, 2020, AGM statement, p. 1). Its accompanying Q&A also acknowledged that loss of the right to shoot could greatly reduce the revenue supporting the underlying management, presenting this as part of the deterrent effect of licence withdrawal (RSPB, 2020, Gamebird Shooting Policy Review – Q&As, p. 8). The MA considers that these statements reinforce the need to assess which beneficial management activities might be affected, and how they would be maintained or replaced, if shooting income were reduced or removed.

Rothbury Estate – a prospective test of biodiversity outcomes

8.30 The Rothbury Estate in Northumberland offers an important opportunity to assess the long-term biodiversity outcomes of alternative approaches to upland land management. On 30 October 2026, The Wildlife Trusts announced completion of their acquisition of approximately 9,500 acres, supported in part by a £1.94 million funding pledge from Defra associated with the Government's 30by30 ambitions.

8.31 The MA welcomes the scientific monitoring already announced by the charities, including work with university researchers to establish ecological baselines. However, the success of this nationally significant nature-recovery project should ultimately be assessed through measurable changes in wildlife abundance, breeding productivity where practicable, and habitat condition.

8.32 For characteristic upland species, including curlew and lapwing, establishing species presence is not sufficient to demonstrate improvements in breeding populations or fledging success. Repeatable field surveys, consistent methodologies and transparent reporting of outcomes will therefore be important.

8.33 Defra's published 30by30 assessment criteria require land contributing towards the target to demonstrate progress through ecological monitoring, including baselines, trends in important species and habitats, and evaluation of management effectiveness (Defra, 2026, 30by30 on land). The MA considers that these principles should be applied consistently to all upland management models, irrespective of ownership or management objectives. Both positive and adverse outcomes should be reported and used to inform future management decisions.

8.34 Rothbury therefore presents a valuable opportunity for long-term, evidence-led comparison of land-management approaches. It would, however, be premature to draw conclusions about the

biodiversity effects of the new management arrangements before comparable monitoring results become available.

8.35 The MA also considers it important that relevant historical breeding-bird records are identified and assessed wherever available. Such records may provide valuable evidence of species abundance and distribution under previous land-management arrangements, helping to establish a longer-term baseline against which future changes can be evaluated. Appropriate allowance must be made for differences in survey methods, coverage and timing. Establishing a new monitoring programme should not mean overlooking reliable historical evidence that could help distinguish long-term trends from changes associated with more recent management decisions.

8.36 There is also a relevant example of this wider approach in the sector's own evidence base. In 2022, the Game & Wildlife Conservation Trust published *Sustaining ecosystems - English grouse moors*, which audited grouse-moor management against the environmental and socio-economic goals of Defra's 25 Year Environment Plan using a natural-capital framework. Rather than treating grouse-moor management as uniformly beneficial or harmful, the audit considered the upsides, downsides, challenges and opportunities associated with different aspects of management across biodiversity, water, climate, wildfire and other ecosystem services.

8.37 The report is a sector-produced evidence audit rather than an independent primary study, and the individual ecological propositions it contains should be assessed against their underlying sources. Its framework is nevertheless relevant to this Call for Evidence because it illustrates why policy should assess the combined effects and trade-offs of a land-management system, and compare those effects with credible alternative management scenarios, rather than examining individual interventions in isolation.

8.38 An earlier GWCT synthesis, *The Moorland Balance: The Science Behind Grouse Shooting and Moorland Management* (second edition, 2019), provides a further route into the underlying evidence base. It draws upon more than 160 peer-reviewed papers and brings together evidence concerning upland bird communities, vegetation management, peat formation, carbon, water, wildfire, rewetting, disease management, lawful predator control, raptor conflict, alternative land uses and rural economics.

8.39 The publication is relevant partly because it does not present every aspect of grouse-moor management as beneficial. It records evidence of illegal raptor killing on some grouse moors, acknowledges that inappropriate burning can cause harm, identifies the risk of unnecessary or inappropriate use of medicated grit, and repeatedly identifies uncertainty, conflicting findings and areas requiring further research.

8.40 The Moorland Balance is nevertheless a GWCT-authored sector synthesis rather than an independent systematic review. It should not therefore be treated as primary evidence for every proposition it contains, and individual claims should be assessed against the underlying studies and their limitations. The MA has included it as supporting evidence so that Defra has access to the breadth of relevant research and its extensive bibliography, and can examine the underlying science (including contrary findings and recognised evidence gaps) rather than relying upon a narrower selection of studies.

Comparative evidence from Ireland

8.41 Comparative evidence from Ireland provides a further, although not directly transferable, illustration of why the counterfactual matters. Ireland differs from England in its history of grouse shooting, land

ownership, farming, forestry and upland management, and Irish experience should not therefore be treated as a prediction of what would occur if grouse-moor management changed in England. It nevertheless provides an observed comparator in which active management directed towards red grouse has substantially diminished.

8.42 Ireland's Red Grouse Species Action Plan records the historic decline of keepered grouse management and states that the decline in grouse keepers may have accelerated Red Grouse decline because of the resulting reduction in land managed specifically for the species. The Plan consequently set an objective of increasing the area of peatland and moorland under active grouse management and identified habitat management through grazing, burning or cutting, together with lawful predator control, among the measures available to local groups (National Red Grouse Steering Committee, 2013).

8.43 That evidence sits within a wider Irish upland context in which other ground-nesting species have also experienced severe decline. The national breeding Curlew survey estimated 105 confirmed or probable breeding pairs in 2021, a decline of approximately 98% since the 1980s, and identified habitat loss associated with agricultural intensification, afforestation and peat extraction, together with predation, among the likely drivers (Colhoun et al., 2022). This does not demonstrate that the reduction of grouse management caused those declines, or that maintaining grouse shooting would have prevented them. Its relevance is narrower but important: the alternative to an established upland-management system is not an ecologically neutral landscape. Land use, habitat management, predator management, grazing and forestry can themselves change, with consequences for species of conservation concern. Defra should therefore assess the likely replacement management regime rather than treating cessation or substantial reduction of grouse-moor management as a no-impact counterfactual.

Transparency and the evidential audit trail

8.44 Defra has expressly stated that this Call for Evidence "does not make policy proposals or prejudge future regulation" and that the evidence received will inform any potential next steps. The MA welcomes that assurance. If future policy proposals are subsequently brought forward, including any proposal for licensing, there should therefore be a clear and auditable evidential chain showing: the problem identified from the evidence; the strength and limitations of the evidence supporting that conclusion; the alternative explanations and counterfactuals considered; the range of regulatory and non-regulatory options assessed; and why the particular intervention proposed is expected to produce a better outcome than the available alternatives.

8.45 That evidential chain, including the methodology by which evidence has been assessed, should be published before policy options are selected, rather than reconstructed after a preferred intervention has been developed. Otherwise, neither stakeholders nor decision-makers can determine whether the evidence has genuinely identified the appropriate intervention or has instead been assessed through the lens of a pre-existing policy preference. Where the evidence remains uncertain or contested, that uncertainty must be reported as such. It would not provide a sound evidential basis for policy simply to resolve an acknowledged uncertainty in favour of a previously advocated intervention.

8.46 Defra should therefore publish, alongside its conclusions, the methodology used to assess the evidence; the criteria used for inclusion, exclusion and weighting; how study quality, relevance, uncertainty and conflicting evidence have been treated; and the role and declarations of interest of any external reviewers. Subject to legitimate confidentiality and data-protection requirements, Defra

should also publish the evidence relied upon, or an indexed evidence register sufficient to show how the conclusions reached relate to the underlying material.

8.47 A related distinction is necessary between evidence and advocacy. The RSPB's 2023 publication *Time for change: Commit to licensing*, for example, expressly describes itself as a 'Driven Grouse Shooting Advocacy Report' (RSPB, 2023b). Its conclusion in favour of licensing is therefore evidence of an organisational policy position; it is not itself an independent scientific finding and should not be assigned evidential weight additional to that of the underlying evidence on which it relies. Defra should assess those underlying sources on their own merits, including their methods, findings, limitations, geographical applicability and degree of uncertainty, rather than treating the policy conclusion reached in an advocacy document as independent evidence in support of that same conclusion. A similar distinction was reflected in the Scottish Government's Grouse Moor Management Review. Its Specialist Advisers, including Dr Adam Smith, formerly of the GWCT, were appointed for their individual knowledge and expertise, with the final report expressly stating that they should not be regarded as reflecting the views of their employers. RSPB Scotland participated in the Review as an external evidence provider, including through oral evidence from its Head of Research. Dr Smith has explained that the RSPB was not appointed within the advisory structure because it was regarded as a campaigning organisation. The significance is not that evidence supplied by a campaigning organisation should be excluded, but that organisational advocacy and independent expert assessment are different evidential roles and should be identified and weighted transparently. The same distinction should be applied consistently to advocacy material produced by shooting, conservation and other interested organisations.

Evidence selection and synthesis in practice

8.48 The importance of transparency in evidence synthesis is illustrated by two Viewpoint articles published in *Ibis*. Thompson et al. (2016), whose authors were RSPB scientists, reviewed the environmental impacts of high-output driven grouse shooting. The article acknowledged some environmental benefits, including the maintenance of heather moorland and benefits for some ground-nesting birds, but concluded that there was growing evidence of negative environmental impacts and societal costs.

8.49 In response, Sotherton, Baines and Aebischer (2017), whose authors were from the Game & Wildlife Conservation Trust, did not dispute that published evidence indicated damage from some aspects of grouse-moor management. They argued, however, that the overall case presented was incomplete and introduced additional published evidence, contrary findings, positive outcomes and areas of uncertainty which had been omitted or interpreted differently. This resulted in a materially different overall assessment without requiring every individual observation in the earlier article to be rejected.

8.50 The comparative Irish evidence discussed under Question 8 points in the same direction. Ireland's Red Grouse Species Action Plan identified the reduction in land actively managed for Red Grouse following the decline in grouse keepers as a possible contributor to population decline (National Red Grouse Steering Committee, 2013), while the national breeding Curlew survey identifies agricultural intensification, afforestation, peat extraction and predation among likely drivers of the species' severe decline (Colhoun et al., 2022). These observations do not establish what would occur in England, but they reinforce the need for Defra to examine the ecological consequences of the replacement land-use and management regime rather than assuming that cessation of grouse-moor management constitutes a neutral baseline.

8.51 Neither Viewpoint should be treated as a systematic review or as resolving the underlying debate. Their exchange nevertheless demonstrates that an overall synthesis can change materially according to which studies are included and how conflicting findings are weighted. Because the sources and reasoning were visible, those choices could be challenged. Defra should provide the same degree of transparency in its own evidence assessment. The same principle applies to statutory evidence reviews. Where published or formally submitted methodological criticisms identify potentially material issues concerning study selection, study quality, confounding, temporal or spatial scale, or the interpretation or omission of findings, Defra should establish whether and how those criticisms were considered before relying on the review's conclusions. The fact that a review has been produced by a statutory body should not remove the need to examine the underlying evidence, subsequent critique and any material unresolved scientific disagreement.

8.52 An example from the separate literature on non-native gamebird release illustrates why classification and interpretation also require scrutiny. Mason et al. (2020, p. 15) described benefits of associated management as "secondary", while the review grouped habitat management, supplementary feeding and legal predator control within a broad game-estate-management theme. In a subsequent review commissioned by Natural Resources Wales, Madden (2023, pp. 15-16) recorded the GWCT's criticism that the grouping of themes could distort the apparent balance of benefits and harms, while explaining that this objection concerned interpretation rather than the collection or basic analysis of the evidence. The relevance of this example to the present submission is methodological. The number of positively or negatively scored themes does not measure the net environmental effect of a management system. Defra should explain how findings are grouped and weighted, and assess the ecological significance of the underlying outcomes rather than the number or labels of categories.

Monitoring and symmetrical review

8.53 If Defra subsequently proposes a regulatory intervention, it should also publish the proposed monitoring and review framework before a final decision is taken. That framework should state: the baseline against which effects will be measured; the environmental, economic and social outcomes sought; the evidence required to demonstrate success or failure; how anticipatory, cumulative and displacement effects will be assessed; the timetable for evaluation; and the circumstances in which the intervention could be retained, tightened, simplified or withdrawn.

8.54 Review must be genuinely symmetrical. It should be capable of identifying a need for additional protection where evidence demonstrates continuing harm, but equally capable of recommending stability, simplification or relaxation where the intended outcomes are being achieved, anticipated risks have not materialised or unintended consequences outweigh the benefits. A framework whose practical direction of travel is limited to additional restriction would not provide an objective evaluation of outcomes.

8.55 This is also consistent with IUCN guidance, which emphasises that conservation actors (including researchers, NGOs and wildlife-management bodies) are themselves stakeholders in contested wildlife issues and should be transparent about their roles, priorities and potential positionality (IUCN SSC, 2023, Chapter 2).

8.56 This would allow any subsequent policy proposal to be traced clearly back to the evidence on which it is based, including where conclusions depend upon assumptions, proxies or unresolved uncertainty.

8.57 For transparency, the principal sources relied upon in this response, their evidential status and relevant limitations are summarised in Annex 1.

Question 9: What evidence is there of impacts on species included in national species indicators or Red List species?

9.1 The Moorland Association's evidence relates principally to species associated with England's uplands and to the effects of land management undertaken on moors managed for wild red grouse.

9.2 A number of species occurring on managed moorland are themselves species of conservation concern. Birds of Conservation Concern 5 identifies, amongst others, curlew, lapwing, black grouse, woodcock, hen harrier, merlin and ring ouzel as Red-listed, while snipe and golden plover are Amber-listed. BoCC5 also concludes that there has been no overall improvement in the status of species associated with the uplands.

9.3 This makes it particularly important that policy assesses the effects of individual management practices on these species rather than assuming that the presence of grouse shooting is itself indicative of either a positive or negative biodiversity outcome.

9.4 There is a substantial body of evidence indicating that some management associated with grouse moors can benefit upland species of conservation concern, particularly through the maintenance of suitable open habitat and the lawful control of generalist predators.

Hen harrier: risks and breeding recovery

9.5 Hen harrier provides an important further example of why conservation outcomes and individual management practices need to be considered separately. The species remains Red-listed and evidence concerning illegal killing and other offences against hen harriers must be considered seriously. At the same time, Natural England's monitoring records a substantial increase in breeding activity during the period of the Hen Harrier Action Plan and brood-management trial. In 2021, Natural England recorded 31 breeding attempts in England, of which 24 were successful and fledged 84 chicks.

9.6 Natural England subsequently reported that nesting attempts increased from 12 in 2018 to 49 in 2022, with the increase occurring mainly on land managed wholly or partly for grouse shooting, while numbers on forestry land and moorland not managed for grouse shooting remained broadly steady. Its final 2026 evaluation of the brood-management trial records that the strongest increases occurred on grouse moors where brood management was available and concludes that the availability of brood management appears likely to have contributed to more hen harriers breeding successfully on some grouse moors.

9.7 Natural England-commissioned population modelling by the British Trust for Ornithology provides an important qualification to the interpretation of that recovery. Macgregor et al. (2025) examined 221 recorded breeding attempts during 2018-2024. The number of attempts increased from 14 in 2018 to 54 in 2023 before falling to 34 in 2024. The modelling concluded that the direct increase in productivity attributable to brood management and diversionary feeding was too small to explain most of the observed increase in breeding attempts: the estimated productivity gain was approximately 0.2 chicks per nest, equating in the peak year to roughly ten additional fledged chicks and, in the subsequent modelling, approximately one additional breeding pair. The increase in the English breeding population therefore required improvements in survival, settlement or both rather than being explicable simply by additional chicks produced through intervention (Macgregor et al., 2025).

9.8 Macgregor et al. considered reduced illegal killing or nest interference coincident with the availability of brood management as one plausible mechanism contributing to improved survival or settlement, while also recording that illegal killing and nest interference continued during the trial period. The report therefore does not support attributing the recovery simply to the direct productivity effect of brood management, nor does it demonstrate that the underlying conflict has been resolved. It does, however, reinforce the importance of assessing the complete conservation response: breeding numbers increased substantially in England during the period in which the conflict-management measures operated, but the causal pathway is more complex than chick production alone. Defra should therefore consider both the continuing evidence of illegal killing and nest interference and the substantial improvement in breeding status, while distinguishing carefully between association, mechanism and demonstrated causation.

9.9 Natural England's October 2026 update provides further national context. Monitoring by Natural England, the RSPB and partners recorded 45 breeding attempts in England in 2026, of which 33 were successful and fledged 112 chicks. The corresponding figures for 2025 were 39 breeding attempts, 33 successful attempts and 106 fledged chicks. Nine of the 45 recorded attempts in 2026 were on moors managed for grouse. However, Natural England expressly cautioned that the relatively small number recorded on grouse moors could reflect reduced monitoring of those moors compared with previous years. It also acknowledged that not all breeding hen harriers in England are likely to have been counted (Natural England, 2026, 14 October). The MA considers that these qualifications are material when interpreting changes between years or comparing land-management categories. Monitoring coverage and recording effort should therefore be assessed before differences in recorded breeding activity are used to infer changes in the distribution of the breeding population or the relative conservation performance of different management systems.

9.10 Recent RSPB field monitoring provides complementary site-level evidence. Its 2026 breeding-season summary for the United Utilities Bowland estate records nine hen harrier nests, of which eight were successful and fledged 30 young. The report describes the estate as managed for water quality, wildlife conservation, livestock farming and gamebird shooting. It also records that 15 of the 16 breeding hen harriers that could be aged were adults in their third calendar year or older (94%), compared with adult proportions of 72-92% during 2021-2025 and 38% in 2020. The RSPB considers that this pattern "suggests a sustained increase in adult survival rates". This is evidence about the age composition of breeding birds, not a direct estimate of annual survival, and does not establish a reduction in illegal killing or an effect of any particular management intervention. Nor does the estate's mixed-use character establish that all nests were on actively grouse-managed ground. These observations nevertheless provide relevant contemporary evidence of successful breeding and a demographic indicator which should be considered alongside the wider evidence concerning hen harrier recovery and continuing illegal killing (RSPB, 2026, Bowland breeding-season summary, pp. 1-2).

Predator management, breeding waders and Langholm

9.11 The GWCT Upland Predation Experiment provides experimental evidence of the effect of legal generalist-predator control. Lapwing, golden plover, curlew, red grouse and meadow pipit bred, on average, around three times more successfully when predator control was undertaken than when predators were not controlled. Breeding numbers subsequently increased during predator control and declined in its absence (Fletcher et al., 2010). Fletcher et al. was an experimental study rather than simply a comparison between different moors, and Natural England itself cites it in its 2026 assessment of common snipe.

9.12 The wider ecological mechanism is supported by Roos et al. (2018), which reviewed the evidence concerning predation as a limiting factor for UK bird populations and found good evidence that populations of some ground-nesting seabirds, waders and gamebirds can be limited by predation. This does not demonstrate that predator control is necessary or appropriate in every location, nor that habitat condition and other pressures are unimportant. It does, however, demonstrate that predation can operate as a population-level pressure rather than merely causing individual nest failures. The RSPB's 2020 gamebird shooting review Q&A also acknowledged that "in the short term, the legal control of widespread predators (like the red fox) can help some other species to breed more successfully". The same answer emphasised wider ecosystem effects and the RSPB's interest in reducing predation without predator control (RSPB, 2020, Gamebird Shooting Policy Review – Q&As, p. 8). Defra should therefore assess lawful predator management as a potentially material conservation intervention while considering its necessity, effectiveness and consequences in the particular ecological circumstances of each site.

9.13 More directly relevant recent UK evidence is provided by Baines et al. (2023). Across paired moorland study areas, curlew productivity was approximately four times higher on grouse moors subject to legal generalist-predator control than on paired non-grouse moors, with breeding outcomes associated with lower indices of foxes and corvids. The study was observational rather than an experimental manipulation, and the results should not be assumed to apply identically in every landscape. It nevertheless provides peer-reviewed field evidence linking differences in predator abundance and management with materially different breeding outcomes for a Red-listed species (Baines, Fletcher, Hesford et al., 2023).

9.14 Longer-term evidence from the area used for the earlier Upland Predation Experiment points in the same direction. Baines (2025) resurveyed four plots around Otterburn approximately ten years after the experimental predator-control programme had ceased. Carrion-crow abundance increased by 78% and the fox index by 127%, while golden plover declined by 81%, snipe by 76%, red grouse by around 71% and curlew by 24%; black grouse and grey partridge were no longer recorded on the study plots. Most measured habitat variables showed relatively little corresponding change. The later resurvey was observational rather than a continuation of the original experimental treatment, was confined to one study area and occurred against wider national declines in some of the species concerned, so it does not independently isolate predation as the sole cause. The paper also identifies released pheasants and partridges as one potential contributor to high generalist-predator abundance and acknowledges continuing illegal killing of raptors. Those qualifications are relevant because they reinforce the need to distinguish wild red-grouse management from released-gamebird systems and to assess different ecological mechanisms separately (Baines, 2025).

9.15 Current evidence from Upper Teesdale provides a further species-level example. Baines & Aebischer (2026) estimated approximately 1,764 breeding curlew pairs across the study landscape, equivalent to about 3% of the UK population. Blanket bog managed by burning or cutting held more than twice the curlew density recorded on unmanaged blanket bog within the study, and estimated productivity was approximately one fledged chick per pair. Repeat surveys around a decade apart indicated broadly stable numbers against a substantial national decline. The study was observational: habitat, farming, altitude, vegetation management and predator management were interrelated, and there was no unmanaged comparison landscape within the same experimental design. It therefore cannot identify one management intervention as the cause of the observed outcome. It nevertheless provides recent peer-reviewed evidence that a grouse-moor-dominated English landscape can support high densities and breeding productivity of a Red-listed species (Baines & Aebischer, 2026).

9.16 BTO fieldwork in the Yorkshire Dales provides useful corroboration at a smaller scale. Bowgen et al. (2025) GPS-tracked breeding curlew across a moorland-to-farmland gradient and recorded

approximately 0.62 fledglings per pair per year. The report notes that some of the highest UK curlew densities occur on farmland adjoining moorland where landscape-scale predator control is undertaken. The sample was small and non-random, differences in breeding success between habitats were not statistically significant, and the authors caution against extrapolating beyond the Yorkshire Dales. It should therefore be treated as supporting rather than determinative evidence (Bowgen et al., 2025).

9.17 The wider intervention evidence has also been reviewed through the Defra and Natural England Species Recovery Programme. Macgregor et al. (2026) examined curlew-recovery projects across the UK and western Europe and modelled alternative population scenarios. The review found that conservation interventions could improve nest success but that chick survival frequently remained a limiting factor. Its high-productivity scenario drew on grouse-moor-adjacent farmland subject to intensive predator management, and removal of that favourable management materially reduced projected population growth. The report also notes an estimate that grouse moors support approximately 36% of the UK breeding curlew population. The questionnaire sample was too small for formal statistical analysis, interventions were commonly implemented together and the population scenarios were explicitly hypothetical. The report therefore does not isolate predator control as the sole explanation for curlew performance, but it provides current statutory-funded evidence that the management package and its potential loss are material considerations in curlew recovery (Macgregor et al., 2026).

9.18 Evidence from the Langholm Moor Demonstration Project also found that restoration of grouse-moor management was associated with increases in three breeding wader species: curlew increased by an average of 10% per year, golden plover by 16% and snipe by 21%. The authors concluded that restoration of predator control as part of grouse management could reverse declines in some breeding waders (Ludwig, Roos & Baines, 2019). The full paper is *Responses of breeding waders to restoration of grouse management on a moor in South-West Scotland*, published in the *Journal of Ornithology*.

9.19 Langholm is also useful because the responses were not uniform across species. During the Langholm Moor Demonstration Project, the partners reported that the project's heather-habitat targets had been met and that, by 2014, the number of nesting hen harriers exceeded the project target. Merlin breeding pairs increased from one in 2008 to six in 2014, while the number of lekking male black grouse increased from five to 18 over the same period. Subsequent peer-reviewed analysis of the restoration period reported increases in curlew, golden plover and snipe. At the same time, red grouse did not recover sufficiently to support the commercially viable driven shooting which was one of the project's principal objectives.

9.20 The final partnership report also records that lapwing numbers did not increase, demonstrating that the positive response among breeding waders was not universal. A subsequent peer-reviewed analysis covering 27 years at Langholm found that ground-nesting hen harriers and merlins were more abundant and had higher nesting success during periods of grouse-moor management, whereas peregrines, buzzards and ravens did not demonstrate comparable management-associated benefits. The authors also emphasised that, nationally, the potential benefits to hen harriers from lawful predator management were outweighed by the effects of illegal killing. The evidence therefore supports a species-specific assessment that recognises both the conservation benefits of lawful management and the serious consequences of unlawful activity (Langholm Moor Demonstration Project Board, 2019; Ludwig, Roos, Rollie & Baines, 2020).

9.21 This should not be interpreted as demonstrating that the management regime alone caused each of those changes. The Langholm project was a scientifically monitored demonstration project rather than a controlled experiment, and the response of individual species was influenced by different ecological factors. Its relevance is that the same managed landscape produced markedly different outcomes for different species. Langholm therefore illustrates why "grouse-moor management" should not be assigned a single biodiversity effect: Defra should examine the response of each species to the particular management mechanisms relevant to it.

Gamekeeper-led Merlin monitoring in northern England

9.22 Additional contemporary evidence is provided by long-running, gamekeeper-supported Merlin monitoring programmes in northern England, including the North York Moors and Yorkshire Dales. On the North York Moors, an annual monitoring programme now in its eighth year, covering more than 90% of the National Park's moorland, recorded 46 fledglings and 51 adult birds exhibiting breeding behaviour in 2026, compared with 27 fledglings and 32 adults in 2025 (Moorland Association, 2026, North York Moors Merlin monitoring).

9.23 In the Yorkshire Dales, the National Park Authority's published bird-of-prey evidence report acknowledges the contribution of a licensed, keeper-supported Merlin monitoring project operating since 2016. Drawing on information provided by the Yorkshire Dales Merlin Project, the Authority recorded 108 monitored nesting attempts, 101 successful attempts and more than 310 young fledged during the first seven years of the programme (Yorkshire Dales National Park Authority, 2024). More recent information supplied by the project coordinator extends that evidence across the full ten-year period from 2016 to 2025. The study involved gamekeepers identifying nesting places through their normal duties and, acting as accredited agents of a British Trust for Ornithology-licensed project coordinator, monitoring nests between April and the end of July with the aim of minimising disturbance (Jack Orchel, Yorkshire Dales Merlin Project, pers. comm., October 2026).

9.24 Across the ten-year study, the project recorded more than 140 successful nests and fewer than ten failed nests. On the monitored grouse moors, where avian and mammalian predators were controlled, more than 90% of monitored Merlin pairs reared at least one young to fledging, while approximately 70% of successful pairs produced broods of three or four fledged young (Jack Orchel, Yorkshire Dales Merlin Project, pers. comm., October 2026). These are substantial long-term observational records of breeding performance, but they are not a controlled experiment and should not be interpreted as demonstrating that predator control, grouse-moor management or any single intervention caused the recorded outcomes. Their significance is that managed grouse moors in the Yorkshire Dales have supported sustained successful breeding by a Red-listed raptor, while gamekeepers have contributed directly to systematic monitoring of that breeding population.

Landscape-scale and national evidence

9.25 There is also evidence at a wider geographical scale. An analysis of grouse-management status across the north of England, mainland Scotland, Wales and south-west England found that range contraction of curlew, golden plover, lapwing and dunlin was smallest where grouse shooting had been retained and greatest where it had disappeared completely (Aebischer, Ewald & Tapper, 2010). The study was observational and does not demonstrate that grouse management itself caused the differences in range change, but it identifies a landscape-scale association which requires consideration alongside more local experimental and field evidence.

9.26 The same analysis also drew on Shepherd's 2005-07 breeding-bird survey of all 17 SSSIs forming the North Pennine Moors SPA, undertaken as an unpublished report to Natural England. Aebischer,

Ewald & Tapper report that the survey recorded approximately 16,000 breeding pairs of five wader species and, after grouping SSSIs geographically, found that within most groups average wader density increased with the proportion of land managed for grouse. This was an observational secondary analysis of a Natural England-commissioned survey rather than an experimental comparison, and the underlying Shepherd report is unpublished. It should therefore not be interpreted as demonstrating that grouse management alone caused the differences observed. It does, however, provide a further landscape-scale comparison indicating that management context is associated with materially different breeding-wader outcomes.

9.27 A separate comparative study by Tharme et al. (2001), published in the Journal of Applied Ecology, examined the densities of breeding birds on heather-dominated moorland managed and not managed for red grouse shooting. Four of its five authors were affiliated with the RSPB at the time of publication, with the fifth affiliated with the Game Conservancy Trust. Densities of golden plover and lapwing were approximately five times higher, and densities of curlew and red grouse approximately twice as high, on the grouse moors studied. The study did not demonstrate a uniform benefit across the whole bird community, and its comparative design does not establish that grouse-moor management alone caused every difference observed. It nevertheless provides directly relevant evidence that management status was associated with materially different outcomes for several upland species now identified as being of conservation concern.

9.28 Black grouse provides a further example in which landscape structure and management need to be considered together. Warren et al. (2020) analysed 121 black-grouse leks in southern Scotland over the period 1989-2018. Leks which remained occupied were associated with more rough grassland, less conifer woodland and substantially larger contiguous areas of moorland; occupied moorland patches were approximately 26 times larger than unoccupied patches, while leks on moorland managed for driven red-grouse shooting held approximately twice as many males. Black grouse declined substantially across the study region, including on managed grouse moors, so the study does not demonstrate that grouse management prevented the wider decline. Its importance is that it identifies habitat extent, fragmentation and management context as material factors for a Red-listed species and cautions against assuming that replacement land uses, including poorly located woodland expansion, are environmentally neutral (Warren et al., 2020).

9.29 Other research similarly identifies relationships between grouse-moor management and upland bird populations (Baines et al., 2014; Whitehead, Hesford & Baines, 2018; Newey et al., 2020). Particularly relevant is a peer-reviewed study by six researchers affiliated with the RSPB, examining curlew population change and nesting success in southern Scotland and the South Pennines. Douglas et al. (2014) found that both measures were positively associated with gamekeeper density, used as a proxy for predator-control intensity, and negatively associated with surrounding woodland cover. Their model suggested that increasing woodland cover from 0% to 10% within 1 km of occupied sites would require approximately 48% higher gamekeeper density to maintain curlew population stability. The findings were observational and the predicted management requirements were modelled rather than experimentally demonstrated. Nevertheless, the study provides important evidence that woodland expansion, predator management and the conservation consequences of changing grouse-moor management should be considered together. Newey et al. (2020) found that curlew and golden-plover prevalence generally increased with the extent of controlled burning, whereas merlin showed a more complex response, increasing to intermediate levels before declining at the highest levels. That study lacked an unmanaged experimental control and could not isolate burning from predator control, habitat and other correlated features of management. Taken together, these findings support a species- and mechanism-specific assessment rather than the

assumption that either greater management intensity or its cessation will produce uniformly better biodiversity outcomes.

9.30 Recent national-scale modelling provides a further test of these relationships. Mason et al. (2025) modelled red grouse, curlew and golden-plover abundance across 8,095 two-kilometre upland grid cells in Great Britain. At the median level of the management proxy used in the analysis, predicted abundance of all three species was higher than on unmanaged moorland; the authors modelled declines of approximately 33% for red grouse, 11% for curlew and 6% for golden plover if grouse-moor management ceased, with larger reductions when management change was combined with projected climate change. However, climate and land cover explained considerably more variation than grouse-moor management for curlew and golden plover, burning extent was used as a proxy because national predator-control data were unavailable, and the analysis was correlative. The authors also identify potential benefits of management cessation for controlled predators and raptors affected by illegal killing. This study therefore does not establish that current management should be retained unchanged; it does provide peer-reviewed national-scale evidence that management change and climate change can have different consequences for individual moorland species and that the counterfactual cannot be assumed to be biodiversity-neutral (Mason et al., 2025).

9.31 Defra's latest accredited official statistics provide important additional national context. Between 1994 and 2025, England's upland specialist bird index declined by 39.3%, including a decline of 20.2% between 2020 and 2025. By contrast, the upland generalist index increased by 21.1% over the longer period. The overall upland bird index declined by 15.1% in England and 18.8% across the UK since 1994. In summarising reviews of the causes of change, Defra identifies reductions in site-based predator control among the major pressures affecting open-nesting moorland birds, alongside changing grazing pressure, forest expansion and climate change. Defra also recognises that reductions in unlawful killing and other offences against birds of prey have contributed to the recovery of several raptor species, while acknowledging that such unlawful activity remains an ongoing pressure (Defra, 2026, Wild bird populations).

9.32 These national indices do not distinguish grouse-managed from other upland habitats, nor do they establish that changes in predator control caused the recorded population trends. Nevertheless, Defra's recognition of reduced predator control as a significant pressure, considered alongside the experimental and observational evidence discussed above, reinforces the importance of assessing the conservation consequences of changes to grouse-moor management. In particular, Defra should examine whether alternative land-management arrangements would maintain the lawful predator control, specialist management capacity and associated funding currently supporting some threatened ground-nesting species. An earlier ONS (2022) experimental natural-capital indicator reported a 12% increase in an unsmoothed UK moorland bird index between 1994 and 2019, alongside a fourfold increase in a moth-abundance index between 1991 and 2019. These indicators differ from Defra's 2026 accredited upland-bird statistics in their scope, methodology and assessment periods and should not be treated as directly comparable. Neither establishes the effects of grouse-moor management in isolation. Together, they reinforce the need for transparent, consistent, species-specific monitoring and careful assessment of the consequences of different management approaches (ONS, 2022; Defra, 2026, Wild bird populations).

RSPB reserve monitoring: mixed species trajectories

9.33 The MA has undertaken an exploratory examination of the RSPB's Annual Reserve Avian Monitoring records published through the NBN Atlas. This compared published numerical records for selected upland bird species across matched reserve/species combinations for 2014–2018 and 2019–2023,

excluding 2020 because of the disruption to monitoring during the Covid-19 pandemic (see Annex 6). The exercise identified differences in recorded counts between the two periods, with higher values for some species and lower values for others. However, these arithmetic differences should not be interpreted as validated estimates of changes in bird abundance or population trends.

9.34 Subsequent correspondence between the MA and the RSPB has provided important methodological clarification. In letters dated 29 September and 27 October 2026, the RSPB confirmed that the NBN dataset comprises summarised reserve-level records which are not suitable for formal trend analysis. Underlying survey methods and surveyed areas may differ, while records for sensitive species may be withheld or presented at reduced resolution. The RSPB also confirmed that it holds more complete reserve-level monitoring information, sets species-specific conservation objectives and has equivalent monitoring data for 2024 and 2025. However, the detailed survey-effort information, management histories, monitoring metadata and assessments necessary to establish robust like-for-like comparisons have not been provided through that correspondence. The MA accepts the RSPB's methodological clarification and does not suggest that the published differences demonstrate that RSPB management caused changes in bird populations.

9.35 The relevance of this exchange to Defra's Call for Evidence is therefore methodological rather than evidence of the effectiveness or otherwise of RSPB management. Meaningful assessment of biodiversity outcomes requires consistent monitoring methods, clearly defined baselines, adequate information about survey effort and coverage, knowledge of management interventions and an appropriate comparator. These requirements apply equally to grouse-moor management and to alternative conservation-management regimes. The existence of conservation objectives, or the publication of selected monitoring results, does not by itself establish whether the intended outcomes have been achieved or what caused them. Defra should therefore apply consistent evidential standards when assessing positive and negative biodiversity claims and when evaluating the likely consequences of alternative approaches to upland land management.

9.36 The RSPB's own monitoring reports provide further evidence of the importance of examining individual management interventions and species outcomes. In *Wildlife on RSPB reserves in 2025* (RSPB, 2026, pp. 12–13), the RSPB reports that at Aird's Moss East in Scotland, curlew increased from 10 to 20 pairs and lapwing from three to 23 pairs between 2021 and 2025, alongside a management programme incorporating cattle grazing, targeted mechanical vegetation cutting, wetland and peatland restoration, and targeted predator control. At Dove Stone in England, the RSPB reports that curlew increased from 23 pairs in 2019 to 34 pairs in 2025 without predator control. These are site-specific observations rather than controlled comparisons and do not isolate the contribution of any single intervention. Nevertheless, they provide an independent illustration of how different combinations of habitat, vegetation, hydrological and predator management can be associated with positive conservation outcomes. They reinforce the need to assess the effectiveness and appropriateness of individual interventions in their local ecological context, rather than assuming that one management approach will produce the same results in every upland landscape.

9.37 A site-specific example is provided by the RSPB-commissioned assessment of future grouse-moor management options at Geltsdale in the North Pennines. The report records that changes in management increased overall biodiversity and that around 90 breeding bird species had been recorded. However, it also records declines in golden plover and curlew, while black grouse benefited from the more varied vegetation structure. In its detailed Geltsdale case study, the report states that changes to vegetation management had been agreed with Natural England and that changes in vegetation structure had adverse effects on some breeding waders, notably golden plover, while the local Natural England adviser had argued for further increases in scrub (Rayment, 2022).

9.38 Geltsdale should not be interpreted as demonstrating that conservation-led management caused every recorded decline, or that grouse-moor management would necessarily have produced a better overall biodiversity outcome. Its relevance is that different conservation objectives and management changes produced different responses among species. An increase in overall species richness or in a particular species such as black grouse does not, by itself, resolve what happened to golden plover, curlew or other species of conservation concern. Defra should therefore assess those outcomes separately, identifying the management mechanism, relevant pressures and appropriate counterfactual rather than treating any single species or aggregate biodiversity measure as a proxy for the whole upland bird assemblage.

Species-specific monitoring in Bowland

9.39 The RSPB's 2026 breeding-season summary for the United Utilities Bowland estate provides a further contemporary example of why outcomes should be assessed separately for different species. Alongside its positive hen harrier breeding results, the report records 52 curlews in 14 one-kilometre Breeding Bird Survey squares in 2024, 57 in 2025 and 38 in 2026. Separate surveys of selected in-bye fields recorded 15 curlew pairs in 2024, 17 in 2025 and 10 in 2026. These are different measures from different survey components: individual bird counts and breeding-pair counts must not be combined or treated as an estate-wide census. The report identifies 2014 as the year of the last intensive standardised curlew surveys, while also describing 2026 as the third year of renewed annual BBS monitoring and reporting targeted surveys of selected in-bye fields. The lower 2026 counts are observed changes in those monitored samples, not validated estimates of estate-wide population trends, and the report does not establish which management practices or other pressures caused them. Its relevance is that successful breeding by one priority species does not, by itself, establish the outcomes for other species of conservation concern. Defra should therefore assess species-specific outcomes using clearly defined survey coverage, comparable methods and appropriate baselines, applying the same evidential standards to grouse-moor management and other upland management approaches (RSPB, 2026, Bowland breeding-season summary, pp. 3-5).

Interpreting mixed evidence and conservation status

9.40 The evidence is therefore not uniform across every species or every management intervention. Natural England's 2026 assessment of common snipe illustrates this particularly well. It records the positive response of snipe following restoration of grouse management at Langholm (Ludwig, Roos & Baines, 2019), while noting that the northern England predator-control experiment did not demonstrate a corresponding benefit for snipe (Fletcher et al., 2010). Natural England also identifies drainage, agricultural improvement, habitat condition and changing climatic conditions as potentially important pressures on snipe populations.

9.41 The appropriate conclusion is therefore not that "grouse management" has a single positive or negative effect. Different species respond differently to particular interventions and local circumstances. The relevant evidence should distinguish, where possible, between the effects of habitat condition and vegetation structure; lawful predator management; hydrology and drainage; grazing and other agricultural land use; wildfire and vegetation-fuel management; disturbance; climate and weather; direct mortality; and the consequences of changes in grouse-moor management itself.

9.42 This distinction is also important when interpreting conservation status. Red-listing identifies conservation concern; it does not, by itself, establish the cause of a species' decline. BoCC5 assessments take account of factors including historic and recent population decline, range change, population size, localisation, international importance and international threat status. Policy

interventions should therefore be directed at pressures for which there is evidence rather than treating Red or Amber status as evidence that a particular land use is responsible.

The counterfactual for species conservation

9.43 The MA also considers that the relevant assessment must include the counterfactual. Where land is currently managed for grouse shooting, Defra should consider what would happen to habitat management, lawful predator management, monitoring and conservation investment if that management materially changed or ceased. Historic Scottish evidence illustrates why. Robertson, Park & Barton (2001) examined changes in heather moorland and reported an average loss of 24% of heather cover in areas which retained grouse-moor management, compared with 41% in areas where grouse management had ceased. The authors associated that difference principally with greater conversion of former heather moorland to grassland or forestry where grouse management was no longer maintained.

9.44 This is observational and historic Scottish evidence and does not establish that the same outcome would necessarily follow from policy change in England today. More recent evidence nevertheless demonstrates that alternative land uses can themselves influence species outcomes. Whitehead, Hesford & Baines (2018) reported declines in several upland bird species in south-west Scotland, including golden plover, lapwing and curlew, alongside substantial land-use change including afforestation, more intensive farming and reductions in grouse-moor management. Warren et al. (2020) similarly found that persistence of black grouse was associated with large contiguous areas of moorland and rough grassland and negatively associated with greater conifer cover around leks. These studies do not establish that woodland or alternative management is inherently harmful; they demonstrate that the location, extent and nature of replacement land uses matter to particular species.

9.45 The counterfactual has now also been examined explicitly through national modelling. Mason et al. (2025) predicted declines in red grouse, curlew and golden plover under a scenario in which grouse-moor management ceased, with climate change increasing the magnitude of projected declines. Those predictions are model-dependent and the estimated effects of management on curlew and golden plover were weaker than the effects of climate and land cover. Nevertheless, the analysis demonstrates that cessation of one management system should not be represented analytically as the removal of a pressure with all other ecological conditions held constant. Species distributions and abundance are likely to respond to the replacement vegetation, predator and land-use regime as well as to climate.

9.46 The Defra and Natural England-funded curlew review provides the same warning at population level. Macgregor et al. (2026) modelled curlew population trajectories under different intervention scenarios and found that removing the high-productivity management scenario derived from land adjoining managed grouse moor substantially reduced projected population growth. The scenarios were explicitly hypothetical and the underlying intervention datasets were limited, so this is not a prediction of what would necessarily occur following regulatory change. It does, however, illustrate why Defra should identify which predator management, habitat management and monitoring would continue, cease or be replaced under each credible alternative scenario rather than assuming that existing conservation outcomes would persist automatically.

9.47 Taken together, this evidence does not identify a single inevitable consequence of changing grouse-moor management and does not establish that every current practice should continue. It does demonstrate that the alternative is itself an ecological scenario with potential effects on habitat structure, predator abundance, land use and species populations. Defra's assessment of Red List and

indicator species should therefore be undertaken at species and management-practice level, recognising positive as well as negative evidence, distinguishing correlation from causation, and explicitly comparing credible alternative land-management scenarios.

Question 10: What evidence is there that practices aligned with recognised regulatory requirements, industry codes or guidance increase the likelihood of positive outcomes and reduce the risk of negative outcomes for biodiversity?

10.1 The Moorland Association considers that clear, evidence-based standards of practice can increase the likelihood of positive biodiversity outcomes and reduce environmental risks, particularly where those standards are outcome-focused, proportionate, practical to implement and supported by effective monitoring.

10.2 In the uplands, biodiversity outcomes rarely depend on a single intervention. They arise from the interaction between habitat condition, vegetation management, grazing, hydrology, lawful predator management, wildfire-risk management and disturbance. Codes and guidance can therefore be valuable where they translate available evidence into clear expectations for practitioners while retaining sufficient flexibility to respond to local ecological conditions.

10.3 The MA considers that the effectiveness of such approaches depends on several features:

- the standard or guidance should have a clear evidential basis and defined environmental objectives;
- requirements should relate to measurable outcomes rather than simply prescribing process;
- monitoring should be proportionate and capable of demonstrating whether the intended outcomes are actually being achieved;
- standards should be capable of adapting as the evidence changes;
- regulators should recognise and give appropriate weight to demonstrably high standards of management; and
- different regulatory requirements should be coherent and should not create conflicting incentives or unnecessary duplication.

Existing standards and sector codes

10.4 There is already an established foundation of regulatory requirements, codes and guidance within the shooting and moorland-management sector. The 2023 evidence review *Sustainable Driven Grouse Shooting?* records the development of the Principles of Sustainable Gamebird Management, which were designed to complement the Government's environmental objectives and draw together existing industry codes of practice, the UK legislative framework and international principles governing sustainable use of natural resources. The report records that in 2020 the Moorland Association joined BASC, the Countryside Alliance, National Gamekeepers' Organisation, British Game Assurance, Country Land and Business Association and Game Farmers' Association in supporting those Principles.

10.5 The Principles themselves build on existing requirements and guidance, including the Code of Good Shooting Practice, assurance standards and legislation governing wildlife, animal welfare and land management. The 2023 review concludes that, if fully implemented, such principles have the potential to deliver positive implications for biodiversity.

10.6 The MA does not suggest that the existence of a code or set of principles is, by itself, evidence that a biodiversity outcome has been achieved. The relevant test is whether the practice is implemented, monitored and associated with the intended environmental result. A code that exists only on paper is of limited value; equally, demonstrably effective practice should be recognised rather than disregarded simply because it is voluntary.

Regulatory and international principles

10.7 This approach is consistent with the independent Corry Review of Defra's regulatory landscape, which recommended greater focus on outcomes, scale and proportionality, more adaptive and process-light regulation, and a compliance model in which trusted partners demonstrating good performance can earn greater autonomy. Where recognised standards can be shown through monitoring to deliver the environmental outcomes sought, that performance should therefore be capable of recognition within the regulatory system rather than assuming that an additional statutory process will necessarily deliver a better result.

10.8 The same broad principle is reflected in IUCN guidance on policy instruments for managing conflicts over wildlife. The IUCN notes that effective policy commonly involves a combination of regulatory, economic and informational instruments, and cautions that arrangements accumulated over time can become incoherent or counterproductive. It recommends assessing existing instruments, their effectiveness and stakeholder experience before redesigning policy (IUCN SSC, *Guidelines on Human-Wildlife Conflict and Coexistence*, 2023, Chapter 24). The relevance here is not that regulation is unnecessary, but that the instrument selected should be proportionate to the problem, evidence and outcome sought.

10.9 More directly, the Council of Europe's *European Charter on Hunting and Biodiversity*, adopted under the Bern Convention, sets out principles for sustainable hunting based on reliable science, local knowledge, population and harvest monitoring, adaptive management and continuing review. It also calls for transparent regulatory processes involving hunters and other stakeholders and for rules capable of responding to differing biological, social and local conditions (Council of Europe, *European Charter on Hunting and Biodiversity*, 2007, Principles 1-3).

10.10 The Charter was formally welcomed by the IUCN World Conservation Congress in 2008 (IUCN Resolution 4.026). Taken together, the Corry Review, IUCN guidance and the European Charter provide support for an outcomes-based approach in which regulation, monitoring, practitioner responsibility and adaptive management can operate together, rather than assuming that one regulatory mechanism is necessarily appropriate in every circumstance.

10.11 The relevance of overseas licensing arrangements also depends on what is being licensed. Austin's policy analysis, commissioned by RSPB Scotland, notes that the European systems examined in the Scottish Natural Heritage review included licensing of individual hunters, whereas his proposed Scottish approach would be directed at those controlling grouse-moor management. He also distinguishes the existence of regulation from whether the legislation or its implementation achieves sustainability. Although supportive of licensing, the report proposes a regulatory mechanism and does not evaluate the conservation outcomes of an implemented grouse-moor licensing scheme (Austin, 2019, pp. 12-13). Defra should therefore identify the activities and persons regulated by each comparator, the problems addressed, the outcomes measured and the applicability of those findings to English grouse-moor management. The existence of licensing elsewhere should not, by itself, be treated as demonstrating that a particular licensing model would deliver additional biodiversity benefits in England.

Linking standards to measurable outcomes

10.12 The evidential question for Defra should therefore be whether adherence to a particular standard can be linked to a measurable environmental outcome. Evidence of adoption or compliance is relevant, but it is not the same as evidence of biodiversity benefit. The same caution is required where policy or advocacy material uses descriptors such as "intensive", "less intensive" or "sustainable". Those terms do not, by themselves, identify either a particular management practice or an environmental outcome. Where possible, Defra's assessment should therefore identify the practice or level of intensity concerned, the environmental pressure it is intended to address, the level of implementation achieved and the resulting ecological response. Where a threshold between acceptable and unacceptable intensity is proposed, the evidential basis for that threshold and the measurable outcome it is intended to deliver should also be identified.

10.13 There is now peer-reviewed UK evidence demonstrating how that approach can work in practice. Baker et al. (2026) measured soil heating during eight prescribed vegetation burns undertaken by four trained teams operating according to the first UK vegetation-fire standards and within the legal burning season. Although surface temperatures reached approximately 1,000°C, temperatures measured at 2–3 cm soil depth remained low: mean maximum soil temperatures across the burns were below 43.4°C; only four of 189 thermocouples exceeded 70°C, and those exceedances lasted for a mean of approximately 29 seconds. Fire-severity assessments recorded no loss of below-ground organic matter, and measured temperatures were substantially below those associated with pyrolysis of peat. The study therefore provides directly measured evidence that prescribed burns undertaken by trained teams in accordance with defined standards and under suitable conditions can limit one important environmental risk: damaging heating of the underlying organic soil (Baker et al., 2026).

10.14 The limitations are equally important. Baker et al. examined eight burns carried out under relatively mild conditions by experienced teams; measurements related to individual burn events and principally to soil temperatures at 2-3 cm depth. The study does not establish the long-term carbon balance of repeated burning, the effect of different burning rotations, vegetation recovery or wider biodiversity outcomes, and it should not be interpreted as demonstrating that every prescribed burn conducted in every circumstance is environmentally benign. Its particular significance to this question is narrower but important: it links defined operational standards and trained practice to a directly measurable environmental outcome rather than treating compliance with a code as an outcome in itself.

10.15 This distinction is illustrated by the Scottish red-grouse licensing regime. The regime requires licence holders to comply with a statutory Code of Practice and includes provisions for modifying, suspending or revoking licences in connection with relevant offending or non-compliance. Although the Code requires grouse-bag returns, it does not define "intensive" or "less intensive" shooting or prescribe a maximum grouse bag or number of shoot days. The existence of the Scottish regime therefore provides no evidential threshold between "acceptable" and "unacceptable" shooting "intensity" and should not be treated as demonstrating that licensing is the appropriate response to a concern expressed in those undefined terms (NatureScot, Code of Practice for Grouse Moor Management, 2024).

10.16 International evidence provides supporting context for the importance of operational standards, while requiring caution in transfer to English uplands. Szczygieł et al. (2025) describe a controlled-burning methodology developed for heathland conservation in Poland which specifies planning, weather conditions, staffing, training and fire-control procedures. Monitoring associated with the

programme recorded substantial vegetative regeneration of heather in the first year and development of a habitat mosaic over subsequent years without a reported reduction in plant, fungal or invertebrate diversity. The work concerns lowland dry heath on mineral soils rather than blanket peat and is principally a methodological paper rather than a controlled ecological experiment, so it should not be treated as evidence of equivalent outcomes on English peatlands. Its relevance is that recognised standards for potentially high-risk management interventions can combine defined operational limits, trained practitioners and subsequent monitoring rather than relying on a simple prohibition or permission.

10.17 Defra should therefore assess recognised standards against measurable outcomes rather than treating either the existence of a standard or compliance with it as proof of success. Where research demonstrates that specified training, operating conditions and procedures reduce a measurable environmental risk, that evidence should inform the standard; where monitoring shows that the intended outcome is not being achieved, the standard should be capable of adaptation. The relevant question is not whether a practice is labelled "regulated", "voluntary" or "sustainable", but whether the required practice can be shown, with an appropriate degree of confidence, to improve the outcome or reduce the identified risk.

10.18 Operational evidence can also help test whether compliance with a prescribed management process produces the intended ecological outcome. A Peak District Moorland Group case-study report records Sphagnum inoculation undertaken following approved vegetation cutting on deep-peat SSSI sites. At Woodhead and Snailsden it reports that 360,000 Sphagnum plugs were planted, with estimated survival of up to 30% in wetter areas but below 1% in drier areas; in a survey covering more than 1,500m² of inoculated ground, only 71 plugs were located. At a second site, 1,000 plugs planted across ten permitted cuts were reported to have experienced a 100% failure rate. These are practitioner-reported, site-specific case studies rather than an independently controlled experiment, and they do not establish that Sphagnum inoculation is ineffective generally. Their relevance is narrower: they illustrate why a requirement or standard should be assessed by whether it delivers the intended outcome under the conditions in which it is applied, and why monitoring should allow prescriptions to be adapted where that outcome is not being achieved (Peak District Moorland Group, *The Blanket Approach is Failing*).

10.19 In that context, the outcome of this Call for Evidence should remain genuinely open: further statutory regulation should be considered only where the evidence demonstrates a problem requiring it and where it can reasonably be expected to deliver a better outcome than existing regulation, improved standards, adaptive management or earned recognition. Where those tests are not met, the evidential conclusion should be that an additional statutory mechanism has not been justified.

Question 11: What evidence exists on the factors that influence whether practices aligned with recognised regulatory requirements, industry codes or guidance are adopted and maintained?

11.1 The Moorland Association considers that adoption and continued use of recognised standards is influenced not simply by whether requirements are mandatory or voluntary, but by whether practitioners regard them as credible, practical, proportionate and capable of delivering the environmental outcome sought.

Evidence of voluntary adoption

11.2 There is evidence that voluntary approaches can achieve high levels of uptake within the shooting community. For example, GWCT reported in 2026 that 89% of respondents to its membership survey did not shoot woodcock before the recommended date and 92% did not shoot snipe before 30 September. The same survey found evidence of changes in bag size and of habitat-management activity associated with quarry species. GWCT concluded that there was evidence of self-regulation and argued for greater use of adaptive management supported by improved recording.

Factors influencing adoption and continued compliance

11.3 The MA's experience of upland land management suggests that several factors are particularly important in determining whether standards are adopted and maintained:

- **Clear purpose and evidence:** practitioners need to understand what environmental problem a requirement is intended to address and the evidence linking the required action to the desired outcome.

- **Practicality:** standards need to be capable of implementation under real land-management conditions and sufficiently flexible to accommodate differences between sites.

- **Proportionality:** requirements which impose significant administrative or operational burdens without a commensurate environmental benefit risk reducing engagement rather than improving outcomes.

- **Consistency and regulatory certainty:** land managers are better able to make long-term investments in habitat and conservation management where the regulatory framework is stable, coherent and predictable.

- **Co-design and practitioner involvement:** those responsible for delivering management on the ground can contribute practical knowledge to the design of standards and help identify unintended consequences before requirements are implemented.

- **Monitoring and feedback:** practitioners are more likely to maintain standards where monitoring demonstrates whether actions are working and where requirements can be adapted in response to evidence.

- **Recognition of good performance:** there should be a meaningful benefit to demonstrating consistently high standards. An approach based on earned recognition can provide an incentive for continued improvement while allowing regulatory attention to be focused where risks are greatest.

11.4 Current England-specific research provides support for several of these factors. Noyes et al. (2026), in a Defra Farming in Protected Landscapes-funded assessment of agri-environment provision for curlew in the Yorkshire Dales, reviewed current Sustainable Farming Incentive and Countryside Stewardship Higher Tier options alongside interviews with participating farmers. The authors found that existing options did not provide for lethal predator control and could not fund some of the landscape-scale coordination required, including facilitators and multi-holding agreements. They also noted that the intensive and experienced predator management undertaken by grouse-moor gamekeepers had rarely been replicated through agri-environment schemes. All farmers interviewed supported inclusion of lethal predator control within future environmental schemes.

11.5 The study has important limitations: only 18 farmers across 11 farms were interviewed, the participants were already involved in a wader-conservation project and their views should not be assumed to represent farmers generally. Nor does the study demonstrate that any particular scheme design produces a specified biodiversity outcome. Its relevance to this question is narrower: it provides direct contemporary evidence that the availability of appropriate management options, adequate funding and mechanisms for landscape-scale coordination can influence whether practitioners consider conservation measures practical and deliverable (Noyes et al., 2026).

11.6 Peer-reviewed international research provides complementary evidence that regulatory design and practical costs can affect uptake even where the underlying management intervention has substantial expected benefits. Muyima, Kleynhans & de Lange (2025) examined prescribed burning among 13 commercial farmers in South Africa's Langeberg Mountains. Their cost-benefit analysis estimated benefits substantially exceeding the direct costs of prescribed burning, principally through avoided wildfire losses and suppression costs, yet 69% of the farmers surveyed did not undertake prescribed burning. The authors identified legal liability if a burn escaped, permit delays and labour costs among the barriers to uptake and recommended changes intended to reduce those constraints.

11.7 The South African legal system, vegetation and wildfire context differ materially from the English uplands, and the study is based on a very small sample and self-reported financial information. Its numerical findings should therefore not be transferred to England. Its relevance is instead behavioural and regulatory: even where practitioners perceive an intervention to have benefits, liability, administrative delay, transaction costs and insufficient practical support can affect whether that intervention is adopted and maintained (Muyima, Kleynhans & de Lange, 2025).

Independent support for these factors

11.8 There is independent support for several of these principles from the Scottish Government's Grouse Moor Management Review Group. Having examined a range of regulatory approaches specifically in relation to grouse-moor management, the Group concluded that regulation should follow Better Regulation principles and be transparent, accountable, consistent, proportionate, accessible, effective and targeted only where needed. It also recognised that regulation need not rely upon a single mechanism: education and training, Codes of Practice, accreditation, financial incentives and statutory controls can operate in different combinations according to the risk and the outcome being sought (Grouse Moor Management Review Group, 2019).

11.9 Of particular relevance to this question, the Group recommended that land managers undertake training in relevant management activities, with refresher training where required, to support compliance with Codes of Practice. It also recommended that an accreditation scheme for grouse-moor management should be developed following widespread consultation with the grouse-shooting sector. In its consideration of regulatory options, the Group described accreditation as an approach which can reward good behaviour rather than relying solely upon sanctions for poor behaviour.

11.10 The MA considers that this provides useful independent precedent for an earned-recognition approach. Accreditation is not, by itself, evidence that an environmental outcome has been achieved, and any such scheme would need credible standards, monitoring and appropriate governance. But where managers can demonstrate the training, systems and environmental performance required by an agreed standard, recognition of that performance can provide an incentive for continued compliance while allowing regulatory attention to be concentrated where evidence indicates greater risk. This is support for the principle of earned recognition, not endorsement of any particular accreditation or certification scheme; the design or adoption of any such scheme would require separate consideration.

Adaptive management and auditable delivery

11.11 There is also practical support for an adaptive approach. GWCT's Sustaining ecosystems - English grouse moors recommended site-specific environmental management plans, routine monitoring of management outcomes and adjustment of practice in response to the results. Its relevance here is not evidence that such arrangements have already delivered particular environmental outcomes, but that they provide a practical model through which standards can be made auditable and adaptive (Game & Wildlife Conservation Trust, Sustaining ecosystems - English grouse moors, 2022).

11.12 Defra's 2026 Towards a flourishing uplands review supports the same broad approach from outside the shooting sector. It cautions that technical solutions can fail where the social and practical conditions for implementation are not understood, describes existing approaches as too often "top down and technical", and calls for local voices, trusted relationships and longer-term goals. The independent Dartmoor Review provides a practical example through Dartmoor Farming Futures, where farmers participated in designing, delivering and monitoring environmental outcomes, and through its recommendation for a "safe-space" in which agreement holders could undertake innovation and experimentation (Defra, Towards a flourishing uplands, 2026; Defra, Independent Review of Protected Site Management on Dartmoor, 2023).

11.13 The same principle is reflected in IUCN guidance, which states that the uptake and sustainability of wildlife-management measures are likely to be greater where affected stakeholders participate in their selection, design and implementation (IUCN SSC, Guidelines on Human-Wildlife Conflict and Coexistence, 2023, Chapter 3). Taken together, these sources support standards which are developed with practitioners, tailored to local circumstances, monitored against measurable outcomes and capable of adaptation where the evidence shows that change is required.

11.14 The available evidence indicates that the design of the regulatory and incentive framework can itself affect whether desired management is practicable and sustained. Noyes et al. (2026) identified gaps in the availability and coordination of agri-environment measures relevant to curlew conservation, while Muyima, Kleynhans & de Lange (2025) provide peer-reviewed evidence from a different management system that liability, permitting delays and implementation costs can inhibit adoption even where an intervention is assessed as economically beneficial. Defra's own 2026 uplands review similarly cautions that technically appropriate interventions can fail where the practical and social conditions required for delivery are not understood.

11.15 This does not mean that regulation, permitting or environmental safeguards necessarily reduce adoption, or that requirements should be relaxed simply because practitioners find them burdensome. Appropriate regulation can provide clarity, minimum standards and protection against environmental harm. The relevant question is whether each requirement is demonstrably connected to the outcome sought and whether the cumulative framework enables that outcome to be delivered effectively in practice. Monitoring should therefore examine implementation and environmental performance as well as formal compliance.

11.16 Taken together, the evidence suggests that adoption and maintenance of good practice depend not simply on whether a requirement is mandatory or voluntary, but on whether it has a credible evidential purpose, is practically deliverable, provides sufficient continuity and coordination, imposes proportionate costs and liabilities, involves those responsible for delivery, and allows performance to be measured and recognised. Those factors should be considered when comparing additional statutory requirements with improved guidance, incentives, accreditation, adaptive management or earned-recognition approaches.

Section A: Call for Evidence Questions - Protected sites and habitats

Question 12: What evidence exists of links between gamebird activities and damage to protected sites or habitats, or positive impacts on biodiversity within protected sites?

12.1 The Moorland Association's response relates principally to red grouse shooting and the associated management of upland habitats. Red grouse are wild birds managed in situ rather than reared and released, a distinction which Defra itself recognises in this Call for Evidence.

12.2 A substantial proportion of grouse-moor management takes place within or alongside nationally and internationally protected upland habitats. It is therefore important that impacts are assessed at the level of the particular management practice and the particular protected feature, rather than attributing either damage or benefit simply to the presence of grouse shooting.

Grouse-moor management and protected sites

12.3 There is a significant spatial relationship between grouse-moor management and protected upland landscapes. The 2023 evidence review *Sustainable Driven Grouse Shooting?* reports that shooting estates accounted for 29% of upland SSSI area, compared with an expected 16% if they were randomly distributed across the uplands. It also reports that 74% of upland Special Protection Areas in England are managed as grouse moors.

12.4 These figures do not, by themselves, demonstrate that grouse-moor management caused the designation of those sites or that it is responsible for their present condition. They do, however, demonstrate that grouse-moor management substantially overlaps with some of England's most important protected upland habitats and bird assemblages. Any assessment of impact should therefore consider both the management which has operated alongside those protected features and the consequences of changing that management.

Evidence of positive and negative impacts

12.5 There is evidence that some management associated with grouse moors can produce positive biodiversity outcomes within upland habitats. A substantial body of research concerns the effects of lawful control of generalist predators on ground-nesting birds, including species which are themselves features of conservation interest on protected uplands. Experimental, observational and review evidence includes Fletcher et al. (2010), Mustin et al. (2018), Littlewood et al. (2019), Baines et al. (2023) and Baines (2025).

12.6 The experimental work of Fletcher et al. (2010) is particularly relevant. Breeding success of several ground-nesting moorland birds, including lapwing, golden plover and curlew, was substantially higher where legal predator control was undertaken, and breeding numbers subsequently increased under predator control and declined in its absence. More recent paired-site research found curlew productivity approximately four times higher on grouse moors subject to legal generalist-predator control than on paired non-grouse moors, associated with lower indices of foxes and corvids (Baines et al., 2023). The latter was observational rather than experimental and does not establish that the same relationship will occur on every protected site. Together, however, the studies provide evidence that predator abundance and lawful predator management can materially affect the breeding outcome of protected upland bird species.

12.7 Longer-term follow-up evidence points in the same direction while requiring similar caution. Baines (2025) resurveyed four plots around Otterburn approximately ten years after the earlier experimental predator-control programme had ceased. Carrion-crow abundance and the fox index had increased, while golden plover, snipe, red grouse and curlew had declined substantially and black grouse and grey partridge were no longer recorded on the plots. The later resurvey was observational, confined to one study area and occurred against wider national changes in some of the species concerned; it therefore does not independently establish predation as the sole cause. Its relevance is that changes in predator abundance can form part of the causal chain affecting wildlife features on upland sites and should be considered alongside habitat condition and other pressures (Baines, 2025).

12.8 Natural England's own evidence review for common snipe provides a useful illustration of why these effects cannot be generalised across species or sites. It records evidence from Scotland that restoration of grouse-moor management, including predator control, was associated with increased breeding snipe, while noting that the northern England predator-control experiment did not demonstrate the same benefit for that species. This illustrates why site, species and management practice need to be considered separately rather than assuming that "grouse management" has a uniform effect.

12.9 There is also primary scientific evidence concerning the effects of vegetation-management practices on blanket bog. Whitehead & Baines (2018) examined vegetation responses following prescribed burning on blanket peat, while Whitehead, Weald & Baines (2021) examined a chronosequence of burns on a Scottish blanket-bog grouse moor. The latter found higher Sphagnum cover on plots eight to ten years after burning than on unburned controls, higher cotton-grass cover across burned plots and no overall effect of burn age on plant or moss diversity. These studies were observational, site-specific and do not demonstrate that burning is appropriate on every blanket-bog site. They do, however, show that post-burning vegetation responses are more complex than a simple assumption of uniform habitat loss (Whitehead & Baines, 2018; Whitehead, Weald & Baines, 2021).

12.10 Experimental evidence also demonstrates that different vegetation-management treatments can produce different ecological effects. Heinemeyer et al. (2019) found that cutting and burning produced different effects on peat-surface structure and microtopography, including effects associated with machinery used for cutting. A subsequent long-term replicated study found that burning, cutting and non-management produced different effects on the elemental composition and nutritional quality of heather, with most treatment differences diminishing as vegetation recovered over time (Heinemeyer et al., 2025a). Neither study should be treated as demonstrating that one technique is environmentally preferable in every circumstance: they instead reinforce the need to assess the specific intervention, site conditions and protected feature concerned.

12.11 Grazing is another potentially important confounding pressure. Long-term work at Langholm found substantial historic loss of heather during a period of heavy sheep grazing, followed by recovery of heather after major reductions in sheep numbers and destocking of parts of the moor (Ludwig et al., 2020). This is particularly relevant when attributing the condition of protected moorland habitat: observed changes in vegetation may reflect the interaction of grazing, burning or cutting, hydrology, climate and other pressures rather than any one management practice in isolation.

12.12 The MA equally recognises that management associated with grouse shooting is capable of causing harm where an intervention is inappropriate for the site, location or protected feature, or is undertaken to an inappropriate standard. The evidence above should not be read as demonstrating that prescribed burning, predator control or any other intervention is universally beneficial. Where

robust evidence demonstrates damage to a protected habitat or designated feature, that pressure should be addressed. The evidential requirement should be symmetrical: positive and negative claims should identify the particular management intervention, the protected feature affected and the evidence linking the two.

Attribution at practice and protected-feature level

12.13 It is therefore important to distinguish between:

- the act of grouse shooting itself;
- the wider land-management system associated with grouse shooting;
- individual management practices within that system; and
- whether a particular practice is being undertaken appropriately or inappropriately on a particular site.

12.14 Without those distinctions there is a risk of attributing an impact to "grouse shooting" which may actually result from a specific management intervention, historic drainage, grazing pressure, hydrological change, wildfire, climate or another environmental pressure.

12.15 The same point applies in the opposite direction. The presence of grouse shooting on a protected site is not, by itself, proof of biodiversity benefit. Where positive outcomes are claimed, the evidence should identify the relevant practice and the species or habitat response.

12.16 The MA therefore considers that evidence relating to protected sites should be assessed site by site, feature by feature and pressure by pressure, with clear consideration of causation. The existence of a management activity on a protected site should not itself be treated as evidence that it has caused the condition of that site, positively or negatively.

The counterfactual for protected sites

12.17 It is also important to consider the counterfactual. Where management associated with grouse shooting supports habitat maintenance, lawful predator management, species monitoring, wildfire management or other conservation activity within a protected site, an assessment of policy change should consider what is likely to happen to those activities if the management system which currently supports them is materially changed or removed.

Langholm Moor: changing the management system

12.18 Langholm Moor provides a useful protected-site example of why that counterfactual matters. Langholm-Newcastleton Hills is both an SSSI and SPA and was the subject of a long-running demonstration project involving Scottish Natural Heritage, Natural England, the RSPB, GWCT and Buccleuch Estates. The resulting review should not therefore be characterised as evidence produced by the shooting sector alone. The RSPB and Natural England were formal project partners; the Seven Year Review states that it was approved by the project's directors and that the evidence within it had been reviewed by the project's scientists and advisers. The detailed progress statements were also reviewed through the project's scientific and technical groups before approval by the Project Board.

12.19 Following the cessation of driven grouse shooting and the substantial reduction of keepering after the earlier Joint Raptor Study, the project partners recorded increases in fox and carrion-crow abundance, further declines in red grouse, breeding waders falling to very low numbers and hen

harriers declining from their earlier peak; both the SSSI and SPA were also found to be in unfavourable condition.

12.20 Grouse-moor management was restored from 2008 under the Langholm Moor Demonstration Project, including habitat restoration, reduced grazing, lawful control of generalist predators, heather management and monitoring. By the seven-year review, the project had met its targets for increasing the extent and improving the condition of heather habitat, and the number of nesting hen harriers had exceeded the project target. Peer-reviewed analysis of the restoration period found that curlew increased by an average of approximately 10% per year, golden plover by 16% and snipe by 21%, with the authors concluding that restoration of predator control as part of grouse management could reverse declines in some breeding waders (Ludwig, Roos & Baines, 2019).

12.21 Longer-term vegetation research at Langholm also demonstrates the importance of separating the different components of the management system. Ludwig et al. (2020) found that heather cover had declined substantially during an earlier period of heavy sheep grazing and subsequently increased following major reductions in sheep numbers and destocking. The result does not demonstrate that grouse-moor management as a whole caused habitat recovery; rather, it identifies grazing pressure as an important independent driver of the protected upland vegetation. This reinforces the need to distinguish the effects of grazing, predator management, vegetation management and other interventions when interpreting protected-site outcomes.

12.22 Langholm should not be treated as a controlled experiment demonstrating that withdrawal or restoration of grouse-moor management alone caused those changes. It was a scientifically monitored demonstration project in which several management variables changed together, and individual species responded differently. Red grouse did not recover sufficiently to meet the project's predetermined objective of commercially viable driven shooting. Its relevance to this question is therefore not that the Langholm management system was uniformly successful, but that changing the management system on a protected upland site altered habitat, predator and species outcomes in different directions. Defra should assess those constituent mechanisms and the likely replacement management regime rather than treating either the presence or removal of grouse shooting as a single environmental intervention.

Langholm's predetermined test of success

12.23 The RSPB's subsequent interpretation of Langholm requires an important qualification. Its 2020 environmental review states that the project restored red grouse to a level at which shooting of smaller bags "would have been sustainable". That is a retrospective assessment of what might theoretically have been harvested; it was not the outcome against which the demonstration project had agreed to test success.

12.24 The project's stated objective was to re-establish Langholm as a driven grouse moor while maintaining a viable hen-harrier population and meeting the site's conservation objectives. Its agreed interim shooting target was 2,000 birds (1,000 brace) in one year. The Seven Year Review calculated that this would require an autumn population of approximately 6,000 grouse and, following reassessment of the core grouse habitat, a July density of approximately 200 birds per km². Importantly, the partnership's final report makes clear that the 1,000-brace milestone did not represent financial break-even. It estimated that approximately 3,000 brace would have been required to cover management costs, exceeding the original 2,000-brace figure considered necessary to attract sporting investment. In practice, no grouse were shot during the project because the partners considered that mortality was too high to permit a sustainable harvest. The keepering operation ceased in February 2016, and the project did not demonstrate that driven shooting could

generate sufficient income to sustain the management responsible for its conservation gains (Langholm Moor Demonstration Project, 2014; Langholm Moor Demonstration Project Board, 2019, pp. 9–10, 14–15 and 33).

12.25 This distinction is important. Langholm produced positive conservation outcomes, including improvements in heather habitat and some bird populations, and those outcomes should be recognised. But the central demonstration concerned whether a management system capable of supporting viable driven grouse shooting could be restored alongside the agreed conservation objectives. On the project's own predetermined measure, that demonstration did not succeed. A later proposition that a smaller number of grouse could theoretically have been shot should therefore not be presented as though the project's viability objective had been achieved.

12.26 The 2023 review is relevant in this respect because it repeatedly emphasises that alternative uses of moorland would themselves produce different environmental outcomes and that those alternatives have not always been assessed with the same evidential intensity as existing grouse-moor management.

12.27 The MA therefore supports an evidence-led approach which identifies which individual practices deliver positive outcomes on protected sites, which create demonstrable risks, and how standards can be used to retain the former while reducing the latter. In our view, that approach is more likely to improve the condition and resilience of protected upland habitats than treating grouse shooting itself as a single environmental pressure.

Question 13: What evidence exists on whether, and how, high standards of practice reduce risks to protected sites and habitats?

13.1 High standards of practice can reduce risks to protected sites where they address an identified pressure on a particular protected feature and are capable of delivering a measurable environmental outcome. The relevant test is therefore not simply whether a standard has been adopted or a prescribed process followed, but whether the practice required by that standard addresses the risk concerned and produces the intended result.

13.2 There is direct peer-reviewed UK evidence of this principle in relation to prescribed vegetation burning. Baker et al. (2026) measured temperatures and fire severity during eight prescribed burns undertaken at four UK sites by trained teams operating according to the first UK vegetation-fire standards. Although above-ground flame temperatures were high, mean maximum soil temperatures at 2–3 cm depth remained below 43.4°C; only four of 189 thermocouples exceeded 70°C and those exceedances lasted for a mean of approximately 29 seconds. Fire-severity assessments found no below-ground organic-matter loss, and measured temperatures were far below those required for pyrolysis of peat. The study therefore provides directly measured evidence that trained practitioners, appropriate operating conditions and defined burning standards can materially limit one identified risk to protected organic soils (Baker et al., 2026).

13.3 That result should be interpreted within its stated limits. Baker et al. examined eight burns undertaken by experienced teams under relatively mild conditions during the legal burning season. It did not assess repeated burn rotations, long-term carbon balance, vegetation recovery or wider biodiversity effects, and cannot demonstrate that every prescribed burn undertaken on a protected site will produce the same outcome. Its relevance to this question is precisely that distinction: a high standard is meaningful where the operating conditions, practitioner competence and procedures can be connected to a measured reduction in the environmental risk concerned.

13.4 The wider scientific literature supports the importance of distinguishing controlled prescribed fire from wildfire when assessing that risk. Doerr et al. (2025), in a global evaluation of soil heating during wildfires and prescribed burns, found very wide variation in soil-heating intensity and duration according to fire behaviour, vegetation, fuel and soil conditions. Reported prescribed-fire temperatures in some shrubland systems were substantially higher than those measured beneath the UK burns examined by Baker et al. (2026). The global evidence is not directly transferable to English blanket peat because it encompasses very different ecosystems and fire types. It does, however, demonstrate that "burning" is not a single exposure: fire behaviour, fuel condition, weather, soil and operational practice materially affect the degree of soil heating (Doerr et al., 2025).

13.5 Independent Scottish evidence provides a further, landscape-scale perspective. Fielding et al. (2024) compared mapped prescribed burning with wildfire occurrence across approximately 39,000 km² of Scottish moorland. Prescribed burning occurred across 13.1% of the moorland studied and wildfire across 1.1%; 96% of the total mapped wildfire area occurred outside moorland mapped as managed by prescribed burning. Three-quarters of the wildfire area on moorland occurred on peat, whereas only around one-third of the mapped prescribed-burning area was on peat.

13.6 Fielding et al. (2024) expressly caution that this spatial association does not demonstrate that prescribed burning itself caused the lower wildfire occurrence. Wildfire occurrence was not progressively lower at increasing levels of prescribed-burning intensity, and the authors identify several plausible alternative or additional explanations, including estate wildfire-prevention strategies, trained personnel and equipment, firebreaks, grazing and differences in visitor pressure. They also note evidence that some prescribed fires escape, although such events may be controlled before becoming large wildfires. The study therefore does not establish prescribed burning as a universal wildfire-prevention measure. It does, however, provide independent evidence that the wider management system (including preparedness, training, equipment and fuel management) may be relevant to wildfire exposure on protected moorland and should itself be assessed rather than assuming that the presence of managed fire necessarily increases wildfire risk.

13.7 These studies illustrate why "high standards" should be defined in operational and outcome terms. On upland protected sites, relevant standards may include practitioner competence and training; suitable weather and fuel-moisture conditions; appropriate fire behaviour and burn size; protection of sensitive soils, habitats and features; sufficient people and equipment to contain the intervention; monitoring of the resulting environmental effect; and the ability to stop or adapt management where the intended outcome is not being achieved. The appropriate standard will differ between management activities and protected features, but in each case its purpose should be to control a defined risk and its effectiveness should be capable of evaluation.

13.8 The same evidential discipline should apply where a prescribed practice does not achieve the desired result. As noted in response to Question 10, practitioner monitoring of Sphagnum inoculation following approved vegetation cutting on Peak District deep-peat SSSIs has recorded very low survival in some locations. Those case studies are not controlled scientific experiments and do not demonstrate that Sphagnum inoculation is ineffective generally. They nevertheless illustrate why formal compliance with an approved process should not be treated as equivalent to successful habitat recovery: monitoring must be capable of identifying failure as well as success and allowing practice to be adapted.

13.9 Defra should therefore assess standards through a clear evidential sequence: what protected feature is at issue; what pressure or risk has been identified; what practice or standard is intended to address it; what evidence supports the causal mechanism; was that standard implemented; and what

measured environmental outcome followed? Practices which demonstrably reduce risk or improve protected features should be retained and refined, while practices which fail to deliver the intended result should be capable of adaptation. This allows standards to be judged by environmental performance rather than treating either compliance or prohibition as an outcome in itself.

Question 14: What evidence is there that gamebird release or shooting affects the condition of Sites of Special Scientific Interest (SSSIs), or the wildlife, habitats or geological features for which they are protected?

14.1 The Moorland Association's response relates principally to red grouse shooting and associated upland land management. Red grouse are wild birds managed in situ and are not reared and released, a distinction Defra itself makes in this Call for Evidence.

14.2 The MA does not hold specific evidence concerning impacts on geological features of SSSIs and therefore confines this response principally to habitats and wildlife features.

Interpreting SSSI condition and causation

14.3 Care is needed when interpreting evidence about SSSI condition. The fact that a SSSI is managed for grouse shooting does not itself establish that grouse shooting has caused either favourable or unfavourable condition. In the case of red grouse, much of the relevant evidence concerns the associated land-management practices rather than the act of shooting itself. The appropriate question is therefore which particular practice affects which notified feature, in what way, and with what evidence of causation.

Grouse-moor management and protected-site features

14.4 There is substantial overlap between grouse-moor management and protected upland sites. The 2023 review *Sustainable Driven Grouse Shooting?* reports the results of the GWCT Grouse Moor Survey, in which shooting estates accounted for 29% of upland SSSI area, compared with an expected 16% if shooting estates were randomly distributed across the uplands. The same review reports that 74% of upland Special Protection Areas in England are managed as grouse moors.

14.5 These figures do not establish that grouse-moor management caused those sites to be designated or that it is responsible for their present condition. They do, however, demonstrate that grouse-moor management has coexisted over substantial areas with habitats and species considered sufficiently important to warrant national and international protection.

14.6 There is primary scientific evidence that some management associated with grouse moors can affect wildlife features relevant to protected upland sites. Fletcher et al. (2010) experimentally demonstrated substantially higher breeding success for several ground-nesting birds, including golden plover, lapwing and curlew, where legal generalist-predator control was undertaken. More recent paired-site work found substantially higher curlew productivity on grouse moors subject to predator control than on paired non-grouse moors, associated with lower indices of foxes and corvids (Baines et al., 2023). Both studies concern particular management interventions and species responses rather than the act of grouse shooting itself.

14.7 Longer-term evidence from Otterburn provides additional, though observational, evidence. Baines (2025) resurveyed plots approximately ten years after the earlier predator-control experiment had ceased and recorded substantial increases in fox and carrion-crow indices alongside declines in golden plover, snipe, curlew and red grouse and the disappearance of black grouse and grey partridge from the study plots. The later resurvey was confined to one study area and occurred

against wider national changes in several species, so it does not establish predation as the sole cause. It nevertheless demonstrates why predator abundance is a potentially material pressure on notified upland bird features and should be assessed separately from habitat condition and other management variables (Baines, 2025).

14.8 Current evidence from Upper Teesdale provides a further example. Baines & Aebischer (2026) estimated approximately 1,764 breeding curlew pairs across the study landscape. Curlew density on blanket bog managed by burning or cutting was more than twice that recorded on unmanaged blanket bog within the study, estimated productivity was around one fledged chick per pair, and repeat surveys approximately a decade apart indicated broadly stable numbers. The study was observational and habitat, farming, predator management, altitude and vegetation management were interrelated, so these outcomes cannot be attributed to one intervention. They nevertheless provide recent peer-reviewed evidence that protected upland bird features can respond to the combined management context of a grouse-moor landscape (Baines & Aebischer, 2026).

14.9 Natural England's own 2026 assessment of common snipe illustrates why those responses should not be generalised. It records that restoration of grouse-moor management, including predator control, was associated with increased breeding snipe at Langholm (Ludwig, Roos & Baines, 2019), while the northern England predator-control experiment of Fletcher et al. (2010) did not demonstrate the same response for that species. Site, species and intervention therefore need to be considered separately.

14.10 The same requirement applies to protected habitats. Whitehead & Baines (2018) examined vegetation responses following prescribed burning on blanket peat, while Whitehead, Weald & Baines (2021) examined post-burning vegetation across a chronosequence on Scottish blanket bog. The latter recorded higher Sphagnum cover on plots eight to ten years after burning than on unburned controls, greater cotton-grass cover across burned plots and no overall effect of burn age on plant or moss diversity. These were site-specific observational studies and do not demonstrate that burning is appropriate, or beneficial, on every blanket-bog site. They do demonstrate that vegetation responses following prescribed management are not adequately represented by assuming a uniform deterioration of peatland vegetation (Whitehead & Baines, 2018; Whitehead, Weald & Baines, 2021).

14.11 Experimental work also demonstrates that alternative vegetation-management techniques are not ecologically interchangeable. Heinemeyer, Berry & Sloan (2019) recorded different effects of cutting and burning on blanket-bog surface structure and microtopography, including effects associated with tracked cutting machinery. More recent long-term replicated work found that burning, cutting and non-management produced different effects on the elemental composition and nutritional quality of heather, with treatment differences generally diminishing as vegetation recovered over time (Heinemeyer et al., 2025a). Neither study establishes that one intervention is environmentally preferable in every protected-site context; their importance here is that the technique, frequency, site conditions and protected feature all matter.

14.12 Further evidence is provided by the wider Peatland-ES-UK programme, initiated with Defra and undertaken on three northern English blanket-bog grouse moors. Its ten-year report compared prescribed burning, mowing and no further vegetation management, examining vegetation, hydrology and carbon-related outcomes. Sphagnum cover increased over time under both burning and mowing, although responses differed between sites and through time (Heinemeyer, 2023). Subsequent monitoring published by the University of York indicates that Sphagnum cover continued to increase on burned plots, reaching the highest reported mean cover of the management treatments by 2025.

However, these later results are presented as a descriptive project update rather than a fully analysed, peer-reviewed comparison, and the treatments differed in their vegetation composition before management began. The evidence does not establish that burning is universally preferable to cutting. It does demonstrate why assessments based only on the immediate response to an intervention may fail to capture longer-term vegetation trajectories, and why baseline conditions and the length of the management cycle matter.

14.13 Grazing pressure is a further potentially important driver of protected-site vegetation. Long-term analysis at Langholm found substantial historic heather loss during a period of heavy sheep grazing and subsequent recovery following major reductions in sheep numbers and destocking (Ludwig et al., 2020). This is relevant to causal attribution because changes in heather extent or vegetation condition may result from grazing, hydrology, burning or cutting, climate and their interaction rather than from grouse shooting as a category of land use.

14.14 The MA equally recognises that inappropriate management can damage protected features. The evidence above should not be interpreted as establishing that predator control, burning, cutting or any other management technique is universally beneficial. Where burning is undertaken in inappropriate locations, under unsuitable conditions or at inappropriate frequency, or where another management intervention is demonstrated to be damaging a notified feature, that pressure should be addressed. The evidential test should be symmetrical: Defra should identify the particular protected feature, the particular pressure or intervention and the evidence connecting the two before attributing either favourable or unfavourable condition to grouse-moor management generally.

Moor House, Upper Teesdale: condition is not causation

14.15 SSSI condition also needs to be handled with considerable caution as a proxy for the environmental performance of a particular land use or land manager. Moor House, Upper Teesdale provides a useful illustration. Moor House was one of England's first National Nature Reserves, established in 1952, and is a long-established upland NNR managed by Natural England. It therefore provides a particularly relevant comparator when considering the interpretation of condition data from privately managed upland SSSIs.

14.16 Published SSSI unit-condition data reviewed by the MA record five of the 25 Moor House, Upper Teesdale units as favourable and 20 (80%) as not currently recorded in favourable condition. Of those 20 units, 15 are recorded as unfavourable recovering, four as unfavourable declining and one as destroyed (see Annex 3). That headline figure should itself be interpreted carefully. "Unfavourable" is not a single condition or trajectory: an unfavourable-recovering unit may be subject to management intended to move the notified feature towards favourable condition even though it has not yet reached that condition.

14.17 The MA does not suggest that the 80% figure demonstrates that Natural England, or state conservation management, caused those units to be in unfavourable condition. That would make precisely the attribution error against which we caution. Condition may reflect historic pressures, grazing, atmospheric deposition, hydrology, previous land management, environmental change and the time required for habitat recovery. Government assessments of the wider Moor House, Upper Teesdale protected site themselves identify a range of pressures behind unfavourable condition.

14.18 The relevance of Moor House is therefore narrower but important. It demonstrates that condition status and causal attribution are different evidential questions. A site may remain formally unfavourable under long-term conservation management for reasons which pre-date the current

management, arise from multiple pressures, or reflect the time required for recovery. The same evidential caution should be applied when interpreting unfavourable condition on privately managed grouse moors.

Wider condition data: National Nature Reserves and managed uplands

14.19 The same evidential caution applies beyond Moor House. The MA has compiled Natural England SSSI unit-condition records associated with National Nature Reserves in England. The original workbook contains 221 reserve entries reporting 3,509 SSSI units. However, two entries contain inconsistencies between their reported unit totals and condition-category counts and have therefore been excluded from the aggregate analysis. The resulting dataset comprises 219 reserve entries and 3,496 compiled SSSI-unit entries. Of these, 1,796 (51.4%) are recorded as favourable, 1,182 (33.8%) as unfavourable recovering, 249 (7.1%) as unfavourable no change and 255 (7.3%) as unfavourable declining. The remaining entries comprise seven part destroyed, six destroyed and one not assessed.

14.20 These figures require careful interpretation. Some reserve entries reference the same SSSI records, meaning that the aggregate cannot be treated as a verified count of distinct SSSI units. The figures are not area-weighted, and the relationship between individual SSSI units and NNR boundaries has not been independently reconciled. They should therefore not be presented as a national estimate of NNR condition or as evidence that any particular management regime caused the recorded condition.

14.21 Nevertheless, the compilation illustrates an important evidential principle. Favourable condition and unfavourable recovering represent different classifications, and neither designation nor management objectives can establish, by themselves, whether favourable condition has been achieved or what caused the recorded outcome. The same care must be exercised when assessing the condition of SSSIs managed for grouse shooting (see Annex 4).

14.22 A separate MA compilation of SSSI unit-condition records across six managed upland areas provides a complementary illustration. Of 801 unit records examined across the North York Moors, Calderdale, Bowland, the Peak District, Nidderdale and the Yorkshire Dales, 104 (13.0%) were recorded as favourable, 598 (74.7%) as unfavourable recovering, 76 (9.5%) as unfavourable no change, 23 (2.9%) as unfavourable declining or destroyed. These two categories are combined here for disclosure protection; they remain distinct official condition categories (see Annex 5). This is a selected compilation rather than a nationally representative or area-weighted sample and should not be used to estimate the condition of English upland SSSIs as a whole. It nevertheless illustrates an important interpretative point: a simple statement that approximately 87% of these unit records are "unfavourable" would conceal the fact that the large majority are recorded as recovering. Defra should therefore distinguish condition from trajectory when using SSSI classifications as evidence.

14.23 The Peak District subset also permits a limited descriptive comparison according to the workbook's recorded shooting-status classifications. In both groups, approximately three quarters of the records are classified as unfavourable recovering. Detailed subgroup totals, condition counts and precise percentages are not published to reduce the risk of identifying individual holdings (see Annex 5). This is not a controlled or matched comparison and does not demonstrate that grouse shooting either improves or worsens SSSI condition: the groups may differ in habitat, location, ownership, management history and other relevant pressures. Its relevance is narrower. Within this dataset, condition classification does not map in any simple way onto the presence or absence of shooting, reinforcing the need to identify the particular feature, pressure, management intervention and causal mechanism concerned.

Lake Vyrnwy: mixed outcomes under conservation management

14.24 Lake Vyrnwy provides a second, and different, illustration of the same evidential problem. The RSPB has managed the in-hand upland farm there since 1996 within a landscape much of which forms part of the Berwyn SSSI, SPA and SAC. Its management plans established explicit objectives for protected upland habitats and priority bird species. The 2007 plan sought, among other objectives, to maintain the SSSI breeding-bird assemblage in favourable condition, increase curlew from two pairs to a five-year mean of five pairs and maintain a five-year mean of 15 lekking male black grouse.

14.25 Denny (2025a), drawing substantially on RSPB management plans and bird-count data supplied by the RSPB, records mixed subsequent outcomes. Curlew numbers in the Lake Vyrnwy area had averaged 24 pairs between 1978 and 1986, when the RSPB had an advisory rather than management role. By 2000-2006 they averaged around two pairs, and in 2024 one pair was recorded nesting in the Lake Vyrnwy area, on farmland adjoining the RSPB farm. Seven lekking male black grouse were recorded in 2024 against the management-plan target of a five-year mean of 15. The report itself cautions that black grouse at Lake Vyrnwy are at the southern geographical margin of their UK range and that bird numbers can fluctuate for reasons including weather.

14.26 Those figures should not be interpreted as demonstrating that RSPB management caused the decline of either species. Lake Vyrnwy has experienced substantial changes in grazing, forestry, hydrology, vegetation management and predator management, and the RSPB operates within constraints arising from land ownership, water-supply interests and statutory requirements. Nor have the outcomes been uniformly negative: the report records substantial blanket-bog restoration and positive responses for a number of other species, including hobby, pied flycatcher, redstart, wood warbler and willow tit, with golden plover recorded in 2024 following rewetting work.

14.27 The relevance of Lake Vyrnwy is therefore not that one conservation-management model has "failed" and another should replace it. Rather, it demonstrates that even long-term, conservation-led management of a highly protected upland landscape can produce different outcomes for different habitats and species, and can involve difficult trade-offs between grazing, hydrology, vegetation structure, predator management and other objectives. It reinforces the MA's central point that Defra should identify the particular pressure, management intervention and measured outcome before attributing either favourable or unfavourable condition to a particular land use. The same evidential standard should apply to grouse moors and to alternative management regimes. A comparable species-level trade-off is recorded in the RSPB-commissioned Geltsdale case study discussed under Question 9, where conservation-led management was associated with increased overall biodiversity while golden plover and curlew declined and other species, including black grouse, benefited (Rayment, 2022).

14.28 Consequently, the fact that a SSSI unit on a grouse moor is classified as unfavourable should not itself be treated as evidence that grouse shooting, or grouse-moor management generally, caused that condition. SSSI condition is evidence about the state of the protected feature; it is not, without a further evidential chain, evidence identifying the cause.

Government evidence on condition and attribution

14.29 This distinction is consistent with the Government's own Environmental Improvement Plan 2025. The EIP focuses on SSSI features and on whether actions are on track to achieve favourable condition, supported by monitoring, evaluation and adaptive delivery. Defra's subsequent reporting also recognises that protected-site condition can reflect multiple interacting pressures requiring coordinated action. The appropriate evidential question is therefore not simply whether a feature is favourable or unfavourable, but which pressures are preventing favourable condition, what evidence

identifies those pressures, and whether the proposed management response is demonstrably moving the feature towards the desired outcome.

14.30 The independent Dartmoor Review commissioned by Defra provides further support for this caution. The review found significant limitations in the evidence available for interpreting protected-site condition, including incomplete historic monitoring, uncertainty over the condition of SSSIs when first notified, and unresolved causal relationships between management, climate and other environmental pressures. It subsequently concluded that, without consistent monitoring, it was impossible to establish whether some SSSIs had ever been in favourable condition or what their long-term trajectory had been. The review's scientific panel also emphasised that condition assessment is a rapid appraisal tool and should be accompanied by proper data capture, suitable baselines and scientific evaluation (Defra, Independent Review of Protected Site Management on Dartmoor, 2023, paras 4.2-4.5 and 16.1-16.5).

14.31 Recent statutory scientific work also illustrates the difficulty of reducing peatland condition to a single vegetation characteristic or threshold. A NatureScot-commissioned review by Andersen et al. (2026) found that there is no universally agreed definition of peat, peatland or "active" peatland and cautioned that numerical thresholds used for classification are necessarily artificial simplifications of ecological continua. The review also notes that active blanket bog can contain heather and other ericaceous vegetation and that functioning peatland landscapes may contain areas undergoing both peat accumulation and erosion. It argues for assessment of ecological functioning and capacity for peat formation rather than relying uncritically on uncertain quantitative proxies (Andersen et al., 2026).

14.32 That report was commissioned in a Scottish planning and peatland-assessment context and does not assess English SSSI condition or the effects of grouse-moor management. Its relevance is methodological. Where Defra relies upon vegetation composition, dominant species, peat depth or another condition indicator as evidence of the effect of a particular management practice, it should establish that the indicator is an appropriate proxy for the ecological function or protected feature actually at issue rather than treating the proxy and the outcome as synonymous.

14.33 Further scientific evidence demonstrates why natural ecohydrological differences must be considered when interpreting peatland condition. Glatzel et al. (2024) compared organic-matter transformation and hydrological functioning in an Austrian raised bog and the Moor House blanket bog in northern England. They identified important differences associated with landscape position, water movement, water-table stability and the export and transformation of organic matter. The authors distinguish between a relatively self-contained raised-bog system and a more freely draining blanket-bog landscape. This two-site study does not establish that rewetting is ineffective, or that existing management practices are appropriate, on any particular English SSSI. Its relevance is that ecological functioning and the natural potential of a peatland cannot be inferred from vegetation composition alone or assessed against a single assumed hydrological template. Defra should therefore distinguish between condition arising from an identifiable management pressure and characteristics attributable, wholly or partly, to the site's natural ecohydrological setting.

14.34 The MA's upland SSSI compilation also illustrates the importance of evidential currency. The recorded date of last inspection for 582 of the 801 unit records examined (72.7%) is 2016 or earlier (see Annex 5). This does not establish that no subsequent site monitoring, management information or other ecological evidence exists, and the MA does not suggest that an older condition assessment is necessarily invalid. It does mean, however, that Defra should establish the date and current evidential status of any condition assessment on which it proposes to rely. A historic classification

should not automatically be treated as a current measure of either environmental performance or the effects of present-day management without checking whether the underlying evidence remains representative.

14.35 This does not mean that an unfavourable SSSI assessment should be disregarded. It means that condition status should not, by itself, be treated as proof of the cause of that condition or of the effectiveness of a proposed remedy. The Dartmoor Review also warned that, in a changing environment, historic protected-site targets may in some cases become difficult or impossible to achieve and that irreversible management responses should therefore be approached cautiously where ecological relationships remain uncertain (Dartmoor Review, 2023, paras 4.3-4.5). That is directly relevant to the interpretation of SSSI evidence in this Call for Evidence.

14.36 That caution is also reflected in current Government policy. Commitment 67 of the Environmental Improvement Plan 2025 is expressly to make terrestrial protected-site designation and management "more dynamic and adaptive to the changing climate". It commits Natural England to incorporate climate-change risk assessments into SSSI condition assessments and to develop adaptive delivery plans for sites identified as being at high climate risk (Defra, Environmental Improvement Plan 2025, Commitment 67). This reinforces the need to interpret condition and management requirements in the context of changing environmental pressures rather than assuming that ecological baselines, pressures or appropriate management responses remain static over time.

The evidential test for reliance on SSSI condition

14.37 Where Defra proposes to rely upon SSSI condition evidence in considering future policy on grouse shooting, the MA therefore considers that the evidence should identify:

- the notified feature concerned
- the particular condition criterion that is or is not being achieved
- the site's natural ecohydrological characteristics and realistic capacity to achieve the proposed hydrological and vegetation conditions, taking account of slope, geology, water balance and climate
- the specific pressure or management practice considered responsible
- the evidence linking that pressure to the condition of the feature
- whether the pressure results from the act of shooting itself or from a particular associated land-management practice
- what management change is proposed
- the evidence that the proposed intervention is likely to improve the notified feature without creating material unintended consequences

14.38 SSSI condition data should therefore not be used as a proxy for the environmental effect of grouse shooting unless the causal chain between the activity, the identified pressure and the notified feature has been demonstrated. The same evidential discipline should apply to positive outcomes. Where habitat management, lawful predator control, monitoring or other activities associated with grouse management contribute to maintaining protected wildlife or habitats, those effects should also form part of the assessment rather than being excluded because they arise from a land-management system associated with shooting.

Counterfactuals and future management

14.39 The counterfactual is equally important. If regulation materially changes the management of an upland SSSI, Defra should consider not merely which existing practices would cease but what management regime would replace them and how that alternative would affect the notified features. Neither continuation nor removal of grouse-moor management should be assumed to improve SSSI condition without evidence.

14.40 There is scientific evidence that changes in upland land use can themselves affect species of conservation concern. Warren et al. (2020), analysing 121 black-grouse leks in southern Scotland over the period 1989-2018, found that persistence was associated with larger contiguous areas of moorland and rough grassland and lower surrounding conifer cover; leks on driven grouse moors also held more males. Black grouse nevertheless declined across the region, including on grouse-managed land, so the study does not show that grouse management prevented decline or that woodland is inherently damaging. Its relevance is that habitat fragmentation and the nature and location of replacement land use can materially affect a protected upland species (Warren et al., 2020).

14.41 National-scale modelling provides a further counterfactual test. Mason et al. (2025) predicted reductions in red grouse, curlew and golden plover abundance if grouse-moor management ceased, with larger projected declines when management change was combined with future climate change. The analysis was correlative; climate and land cover explained more variation than management for curlew and golden plover; and the authors also identify potential benefits from cessation for controlled predators and raptors affected by illegal killing. The study therefore does not establish that current grouse-moor management is environmentally preferable overall. It does demonstrate that changing the management system can alter species outcomes and that the alternative regime cannot be treated as an ecologically neutral baseline (Mason et al., 2025).

14.42 The resulting approach to SSSI evidence should therefore be site-specific, feature-specific and causal. Where a particular practice is demonstrated to damage a notified feature, that pressure should be addressed; where management demonstrably supports the feature, that effect should also be recognised. Defra should identify both the effect of the existing management and the likely effect of the credible replacement regime. Neither the presence of grouse shooting nor an unfavourable SSSI classification should, by itself, be treated as evidence of causation.

Question 15: What evidence is there that particular factors influence compliance with high standards of practice in relation to protected sites and habitats?

15.1 The evidence indicates that compliance with high standards of practice on protected sites is influenced not simply by whether a requirement is mandatory, but by whether the requirement is clear, practically deliverable, proportionate to the identified risk, coherent with other regulatory requirements and capable of being connected to the environmental outcome sought. In the protected-site context these factors are particularly important because management may depend upon SSSI consent, Habitats Regulations Assessment, species licensing, vegetation-management rules, agri-environment agreements and other permissions operating together.

15.2 Several factors are therefore particularly relevant:

a. The requirement needs to be site- and feature-specific. A land manager is better able to comply effectively where the regulator identifies the protected feature concerned, the environmental risk or pressure being addressed, the management outcome sought and

the evidence linking the required action to that outcome. Generalised concern about a category of moorland management is less useful than a clear explanation of what needs to be protected on the particular site.

b. Connected regulatory requirements need to be coherent. Protected upland management may be affected simultaneously by SSSI controls, Habitats Regulations Assessment, species licensing, vegetation-management rules, agri-environment agreements and other permissions. Compliance is made more difficult where these regimes impose overlapping, duplicative or conflicting requirements. Regulatory coordination is therefore itself an important compliance factor.

c. Timescales, continuity and practical deliverability matter. Many upland management activities are seasonal and many conservation outcomes require continuity over several years. Short-duration permissions, late decisions or repeated reconsideration of materially unchanged activities can reduce certainty for staffing, investment and long-term management. Requirements also need to be capable of implementation with the skills, labour, equipment and funding available.

d. Evidence requirements need to be proportionate and capable of resolution. Where a regulator considers that information is insufficient, identifying the particular evidence gap and allowing it to be addressed through targeted information, monitoring, mitigation or changes to method is more likely to secure effective compliance than imposing broad or uncertain requirements which the practitioner cannot readily translate into action.

e. Training and operational clarity matter. Where a management intervention is potentially high risk, standards should specify the conditions, competence and safeguards required for its safe implementation. Baker et al. (2026), for example, measured eight UK prescribed burns undertaken by trained teams operating according to defined vegetation-fire standards. The study found very limited heating of the underlying organic soil under those operating conditions. It did not investigate why practitioners choose to comply with standards, but it demonstrates the practical value of translating an environmental risk into defined operating conditions, training and measurable outcomes against which compliance can be assessed (Baker et al., 2026).

f. Practical engagement matters. Those managing protected upland sites often hold long-term site knowledge concerning vegetation, wildlife, hydrology, grazing, wildfire and previous management. That knowledge does not displace scientific or regulatory evidence, but early engagement can help identify practical constraints, unintended consequences and proportionate ways of achieving the protected-site objective.

15.3 An anonymised case supplied to the MA in October 2026 illustrates how scheme prescriptions can affect the practical delivery of moorland management. In a proposed transition from Higher Level Stewardship to Countryside Stewardship Higher Tier on an English upland SSSI, a draft habitat management plan restricted dry-heath burning to 1 October–15 March. The existing HLS management-plan extract allowed burning between 1 October and 15 April, subject to suitable conditions and avoiding proposed burn areas where bird nesting activity had been noted. In accompanying correspondence, Natural England advised that the dry-heath burning parameters could not be edited or negotiated. The land manager reported that the final weeks of the existing season often provided essential opportunities for burning when conditions were suitable. Protection of breeding birds and sensitive habitats remains essential. The relevance to this question is whether

additional scheme conditions are accompanied by a clear explanation of their site- and feature-specific purpose, take account of seasonal practical constraints, and allow consideration of alternative approaches that achieve the required protection. This case concerns a draft proposal and anticipated operational effects; the final agreement terms and ecological consequences have not been established (Natural England and land-manager correspondence, October 2026; supporting plan extracts held by the MA).

15.4 Recent England-specific research provides evidence that scheme design and practical constraints can affect conservation delivery. Noyes et al. (2026), in a Defra Farming in Protected Landscapes-funded assessment of provision for curlew in the Yorkshire Dales, reviewed current agri-environment options and interviewed 18 farmers across 11 farms. The authors identified limitations in the availability of measures required for landscape-scale curlew conservation, including the absence of funding for lethal predator control and difficulties funding facilitators or multi-holding agreements. They also noted that the experienced landscape-scale predator management undertaken by grouse-moor gamekeepers was rarely replicated through agri-environment schemes.

15.5 The Noyes et al. study does not concern statutory compliance with SSSI consents and its farmer sample was small and self-selecting. Its relevance to this question is therefore narrower: it provides current English evidence that whether desired conservation management can actually be delivered depends in part upon whether the regulatory and incentive framework makes the necessary intervention, coordination and resourcing practically available (Noyes et al., 2026).

15.6 Peer-reviewed international evidence provides further support for the importance of regulatory design while requiring caution in transfer to English protected sites. Muyima, Kleynhans & de Lange (2025) examined prescribed-burning decisions among commercial farmers in South Africa's Langeberg Mountains. Their analysis found that prescribed burning was estimated to produce substantial net benefits through avoided wildfire losses and suppression costs, yet most farmers surveyed did not undertake it. Reported barriers included legal liability if fire escaped, permitting delays and labour costs. The sample was small, the findings were based partly on self-reported information and the South African legal and ecological context differs materially from the English uplands. The numerical findings should therefore not be transferred directly. The narrower relevance is that administrative delay, liability, transaction costs and practical capacity can influence whether a management standard is adopted and implemented even where the intervention itself is perceived to have environmental or economic value (Muyima, Kleynhans & de Lange, 2025).

15.7 Taken together, this evidence supports a compliance framework in which the regulator makes clear what feature is being protected, what risk is being controlled, what action is required, why it is required, what competence or operating conditions are necessary, how compliance and environmental performance will be demonstrated, and how any genuine evidence gap can be resolved. Formal compliance should remain necessary where the law requires it, but the effectiveness of that compliance should ultimately be judged by whether the requirement is practicable and demonstrably protects the relevant feature.

15.8 This is consistent with the MA's wider response to Defra's 2026 consultation on Habitats Regulations Assessment guidance, in which we supported clearer, site-specific and proportionate decision-making, reuse of relevant existing evidence and early identification of material evidence gaps. The issue is not whether protected-site safeguards should be weakened; it is whether those safeguards are expressed and administered in a way that enables land managers to understand and comply with them effectively.

15.9 Defra and Natural England should therefore assess compliance by whether requirements are clear, capable of practical implementation, supported by appropriate competence and resources, and demonstrably protecting the relevant feature, rather than by the volume of regulatory process completed. Monitoring should distinguish formal compliance with a prescribed process from evidence that the intended protected-site outcome has actually been achieved.

Section A: Call for Evidence Questions - Biosecurity and disease

Question 16: What evidence exists of links between grouse shooting, pheasant/partridge release and shooting, and mallard shooting and the spread of disease, including Highly Pathogenic Avian Influenza (HPAI) and other infectious diseases?

16.1 The Moorland Association's response to this question relates only to grouse shooting.

16.2 Red grouse are wild birds managed in situ; they are not bred, reared and released for shooting. The MA therefore considers it important to distinguish grouse shooting from activities involving the breeding, rearing and release of pheasants, partridges and mallard when considering potential disease risks.

16.3 The MA does not hold specialist veterinary or epidemiological evidence demonstrating a link between grouse shooting and the spread of Highly Pathogenic Avian Influenza or other infectious diseases.

16.4 We therefore do not provide a substantive response on disease transmission. This should not be read as evidence either that no such risk exists or that grouse shooting contributes to disease spread. Rather, the MA considers that conclusions in this area should be based on appropriate veterinary, epidemiological and surveillance evidence.

16.5 Where Defra assesses evidence submitted on this issue, the MA would encourage a clear distinction between:

- disease risks associated with breeding, rearing and release
- disease risks associated with wild bird populations
- the act of shooting itself
- other management or human activities which may affect transmission risk

16.6 Any future policy response should be directed at the activity for which a disease risk is actually demonstrated, rather than assuming that risks associated with released gamebirds apply equally to wild red grouse.

Section A: Call for Evidence Questions - Bird of prey crime

Question 20: What evidence exists of links between gamebird activities and bird of prey crime?

20.1 The Moorland Association's response relates principally to red grouse shooting and associated upland land management. The MA unequivocally condemns the illegal killing, injuring or taking of birds of prey, and unlawful interference with their nests or eggs. Any criminal offence should be properly investigated and, where the evidence permits, prosecuted. There is no place for wildlife crime within responsible grouse-moor management.

The nature and status of bird-of-prey crime evidence

20.2 There is peer-reviewed evidence that illegal killing has affected hen harrier populations and that mortality and disappearance are associated with land managed for grouse shooting. Earlier population work by Etheridge, Summers & Green (1997) examined the effects of illegal killing and nest destruction on hen harrier population dynamics in Scotland. More recently, Murgatroyd et al. (2019), using data from 58 satellite-tagged hen harriers, found that the likelihood of birds dying or disappearing increased with their use of grouse moors and concluded that the observed pattern was most likely explained by illegal killing. This is important evidence and the MA does not suggest that it should be disregarded.

20.3 A larger subsequent satellite-tag analysis provides further evidence of a population-level effect. Ewing et al. (2023) analysed survival using 148 satellite-tagged hen harriers in Britain and estimated that illegal killing associated with gamebird management accounted for up to three-quarters of annual mortality. The study found particularly substantial effects on immature birds, with estimated juvenile survival in the absence of illegal killing markedly higher than observed survival. This provides strong peer-reviewed evidence that illegal activity has been a material demographic pressure on the species (Ewing et al., 2023).

20.4 The most recent Natural England-commissioned population modelling is also relevant. Macgregor et al. (2025) modelled the rapid increase in English hen harrier breeding attempts during 2018-2024 using observed productivity data and survival estimates derived from Ewing et al. (2023). The modelling did not support increased productivity arising directly from brood management and diversionary feeding as the sole explanation for the population increase. Instead, the most parsimonious explanations required improvement in survival, settlement or both. The authors considered a reduction in killing and/or nest interference coincident with the availability of brood management as one plausible explanation, while stressing that illegal killing continued and that their modelling could not establish whether survival had actually increased or the extent to which illegal killing or nest interference had reduced (Macgregor et al., 2025).

20.5 These studies concern population-level patterns, demographic effects and statistical inference. That evidence is highly relevant to the existence and scale of the conservation problem, but it remains distinct from evidence establishing the fate of a particular bird or proving an individual criminal offence. Murgatroyd et al. (2019), for example, recorded four birds with direct evidence of illegal killing alongside 38 birds whose tags stopped unexpectedly and for which the birds were not recovered. An unexplained disappearance can legitimately contribute to a population-level statistical inference without, by itself, establishing how that individual bird died, whether an offence occurred or who was responsible. Both levels of evidence should therefore be reported accurately.

20.6 The MA therefore considers that evidence submitted under this question should distinguish clearly between:

- a confirmed criminal offence, where the available evidence establishes that a crime has occurred
- an incident suspected or considered likely to involve criminality, but where this has not been established
- intelligence or statistical association
- an unexplained disappearance or satellite-tag loss
- the geographical occurrence of an incident on or near land managed for grouse shooting
- evidence actually linking an offence, offender or motivation to grouse shooting or associated management

20.7 All of these may constitute relevant evidence, but they do not establish the same thing. Equally, the MA recognises that wildlife crime is difficult to detect and that conviction data alone cannot provide a complete measure of offending. The appropriate response is therefore not to disregard suspected incidents, but to be transparent about the evidential status and limitations of each category.

20.8 This distinction is also recognised in the Scottish Government's Grouse Moor Management Review Group report. The Group treated evidence of illegal raptor killing seriously and expressly cautioned that recorded incidents are unlikely to provide a complete measure of offending. It identified the relationship between the recorded and actual number of illegal-killing incidents as a significant evidence gap and concluded that discovered cases probably represent only a proportion of actual cases. It also warned that a decline in reported poisoned or shot raptors could not, by itself, be taken as evidence that illegal killing had declined (Grouse Moor Management Review Group, 2019).

20.9 At the same time, the Group distinguished that wider evidential inference from proof of an individual criminal offence. It stated that repeated disappearance of satellite-tracked birds on particular moors was not sufficient to obtain a criminal prosecution because, ordinarily, the disappearance could not be assigned to a particular individual and no carcass was available. The MA considers that both parts of that conclusion are important. Unexplained disappearances and spatial patterns can contribute legitimately to a wider evidential assessment of illegal killing or other bird-of-prey crime, but they should not be described as though they establish the fate of every individual bird, prove that a criminal offence occurred in each case or identify responsibility for it.

20.10 This is the distinction the MA is asking Defra to preserve in the present Call for Evidence: not to discount inferential or statistical evidence, but to describe clearly what each category of evidence establishes, what it supports by inference and what remains unknown.

Satellite-tag evidence

20.11 The MA has compiled a comprehensive hen harrier tracking register using information published or supplied by Natural England. The September 2026 edition contains 278 entries from 2002 onwards, comprising 99 birds fitted with terrestrial radio transmitters and 179 fitted with satellite transmitters. It brings together tagging information, final transmission locations, subsequent observations and reported outcomes. Annex 7 provides a technical summary of the register, its classification system and the limitations relevant to interpreting the results.

20.12 This is MA analysis rather than a peer-reviewed finding, and we recognise that aspects of its classification may legitimately be debated. We nevertheless believe it raises material questions about how satellite-tag evidence should be interpreted.

20.13 In particular, the analysis highlights that Natural England's "Missing Fate Unknown" category is not synonymous with criminality. The published definition encompasses circumstances including transmitter failure and birds which may have died in locations from which the transmitter could not subsequently be located or recovered. Satellite transmitters can also stop functioning for known technical and environmental reasons. A stopped signal is therefore evidence that transmission has ceased; its cause requires further evidence.

20.14 Using the April 2025 snapshot of 260 entries, the MA commentary calculated an approximately 53%/47% division between its combined green and red classifications. This calculation allocated 43 inconclusive entries equally between the two groups and included seven birds still transmitting in the green group. The classifications combine final transmission locations and reported outcomes; the resulting percentages should therefore not be interpreted as an observed division between natural mortality and illegal killing. Annex 7 explains the classification methodology and presents the updated September 2026 results.

20.15 The MA recognises an important methodological limitation to this comparison. Its classification of final locations is not a substitute for the spatial survival analysis undertaken by Murgatroyd et al. (2019). In particular, the MA analysis does not model each bird's exposure to grouse-moor habitat through time and should not be interpreted as disproving the statistical association reported in that study.

20.16 The purpose of the MA analysis is narrower. It tests what can reasonably be inferred from the final transmission location and recorded fate of an individual bird. On that question, an unexplained cessation of transmission, including one occurring on land managed for grouse shooting, does not by itself establish how the bird died, whether a criminal offence occurred or who, if anyone, was responsible.

20.17 The approximately 53%/47% comparison should therefore be treated as descriptive evidence rather than a competing estimate of the effect identified by Murgatroyd et al. For transparency, the MA will make available the underlying register, subject to appropriate redaction of sensitive locations and any legitimate legal, confidentiality or data-sharing restrictions, together with the classification rules used, the denominator on which the percentages are based and the treatment of unknown or ambiguous cases, so that the analysis can be independently scrutinised and alternative classifications tested.

20.18 The register also contains examples which provide useful context. It records 17 cases in which a bird was subsequently observed after what had been recorded as its final transmission; 15 of those birds were satellite-tagged. These cases demonstrate that cessation of transmission does not necessarily establish that a bird has died. Separately, the wider register records final transmissions in locations where driven grouse shooting cannot provide an explanation, including five in the Kielder Forest area and five on the Isle of Man, as well as final fixes well away from moorland, including the English Channel, the Spanish coast and residential areas. These observations do not resolve what happened to birds disappearing on grouse moors, nor do they exclude unlawful killing in individual cases. They demonstrate the narrower point that loss of transmission can occur for different reasons and in a range of land-use contexts.

20.19 The MA therefore believes that satellite-tag evidence is valuable, but that it should be presented with appropriate information about natural mortality, transmitter failure, recovery rates, spatial resolution and the evidential basis on which an individual fate has been classified. Annex 7 sets out specific

recommendations for transparent classification, reporting of uncertainty, independent scrutiny and correction of factual errors.

Concerns already raised with the police

20.20 These concerns have not been developed for the first time in response to this Call for Evidence. The MA has raised similar questions directly with the National Wildlife Crime Unit (NWCU) and senior policing representatives over an extended period.

20.21 In particular, we have sought greater clarity about the distinction between proven offences, suspected offences, intelligence, statistical associations and unexplained satellite-tag losses; the evidential threshold and methodology used to describe particular areas or estates as wildlife-crime "hotspots"; geographical attribution of incidents to individual estates; the treatment of contrary or qualifying evidence; and how wildlife-crime information is communicated publicly and supplied to government. These matters remain the subject of constructive engagement between the MA and senior policing representatives.

20.22 Those questions have now been partly clarified by successive NPCC responses: FOI 3132/2026 (17 September 2026), internal review 3175/2026 (5 October 2026) and FOI 3214/2026 (27 October 2026). The NPCC confirmed that the NWCU holds recorded methodology for identifying bird-of-prey crime hotspots and selecting estates for contact, including the assessment of confirmed offences, reported or suspected incidents, intelligence and satellite-tag disappearances. The detailed methodology was withheld under section 31 of the Freedom of Information Act 2000. In its latest response, the NPCC explained that responsibility for validating a crime hotspot rests with the senior officer on duty and confirmed that all police forces at hotspot locations are included in the process. It also confirmed that recorded processes for reviewing, correcting or removing hotspot designations exist within wider operational documents, although those processes remain withheld. The NPCC stated that it holds no separate hotspot-specific validation, approval or quality-assurance guidance, instead referring to wider policing requirements, including the Criminal Procedure and Investigations Act 1996 and Management of Police Information. These responses do not establish that hotspot assessments are inadequately validated or unreliable. They do, however, reinforce the importance of Defra establishing the definitions, evidential classifications, validation arrangements, quality-assurance safeguards and limitations before relying on such assessments for wider regulatory purposes.

20.23 This is directly relevant to the present Call for Evidence. The police have confirmed in writing that the NWCU reports quarterly to Defra and stated that, should Defra consult on gamebird shooting, "the work of the satellite tagged bird of prey taskforce would form part of the police reply". Material developed principally for operational policing may therefore contribute directly to the evidence considered by Defra in relation to sector-wide policy. Where the underlying methodology cannot properly be disclosed for operational reasons, that makes it more, not less, important that Defra understands the definitions used, the evidential status of the different categories of information, the applicable validation and quality-assurance arrangements, and the limitations on the conclusions which can properly be drawn from them.

20.24 A separate NPCC response dated 28 September 2026 (EIR 008/2026) provides a practical illustration of the importance of distinguishing reported incidents from established offences. Concerning seven RSPB-tagged hen harriers publicly reported in January 2026, the NPCC confirmed that all seven incidents had been reported to the NWCU but expressly cautioned that referral did not establish that a criminal offence had occurred. It declined to disclose the individual recorded

classifications, investigative statuses or high-level outcomes, citing exceptions under the Environmental Information Regulations 2004. Natural England separately confirmed the illegal poisoning of one recovered hen harrier but stated that it held no corresponding information concerning the other six (EIR2026/11330, 11 September 2026). The MA does not suggest that the six remaining incidents were innocent, that no further evidence of criminality exists or that the police lack relevant information. Rather, these responses illustrate why reported incidents, suspected offences, confirmed illegal killing and unexplained disappearances should be distinguished when information is aggregated or used to inform sector-wide policy. Where operational confidentiality prevents public disclosure, Defra should nevertheless obtain sufficient assurance about the evidential status and limitations of the underlying classifications.

20.25 The need for that discipline is reinforced by the NWCU's own recent public description of its work. Writing in the Autumn 2026 edition of *Magistrate*, Detective Inspector Mark Harrison described wildlife-crime investigations as "inherently difficult", acknowledged that delayed discovery can limit forensic opportunities and complicate causation, and explained that cases frequently depend upon specialist ecological, veterinary or forensic evidence. He also recognised that many wildlife activities are lawful when undertaken under licence and that establishing whether a licence did not exist, was breached or was improperly relied upon is "a nuanced area of law". These acknowledgements underline why material supplied to Defra should distinguish clearly between intelligence, suspicion, an unexplained event, a recorded crime and an offence established by evidence, and should identify the evidential basis and degree of confidence attached to wider claims about scale, location or organised offending.

20.26 In making this distinction, the MA's objective is not to diminish the seriousness of genuine wildlife crime. It is to ensure that evidence, intelligence and suspicion are not inadvertently presented as though they were interchangeable, particularly where the resulting material may subsequently inform regulation affecting an entire land-management sector.

Improving the evidence base

20.27 The MA has consequently proposed a single central register of satellite-tagged raptors, subject to legitimate restrictions concerning live investigations and sensitive locations. Such a register could bring together tag and fitting information, final transmissions, recoveries, post-mortem findings, subsequent police information and the evidential basis for conclusions about individual birds. The MA has compiled its own register and has set out its methodology in Annex 7 in support of greater transparency. It will make the underlying register and classification framework available for independent scrutiny, subject to appropriate redaction of sensitive locations and any legitimate legal, confidentiality or data-sharing restrictions.

20.28 There is an important precedent for this approach. In December 2017, Defra published, through the Government's MAGIC mapping system, official Raptor Persecution Priority Delivery Group data on confirmed bird-of-prey crime incidents in England and Wales. Defra stated at the time that the maps, initially covering confirmed incidents between 2011 and 2015, would be updated annually.

20.29 That commitment was important because it offered the prospect of a common, publicly accessible evidence base rather than different organisations relying upon different datasets and definitions. However, the publicly available dataset appears not to have been updated beyond the original 2011-2015 period. A 2019 report still recorded the intention that it should be updated annually, and by 2020 it was being reported that only confirmed incidents from 2011-2015 remained available through MAGIC.

20.30 The MA considers that the loss of an up-to-date, authoritative public record has compounded the present difficulty. In its absence, policymakers and stakeholders increasingly have to rely upon datasets assembled by individual organisations, which may use different definitions, inclusion criteria and evidential thresholds. That makes disputes about the scale, location and attribution of bird-of-prey crime harder rather than easier to resolve.

20.31 The need for this is also recognised in Defra's *Future of Rural England Report*. The report describes rural crime (including wildlife offences) as under-reported and poorly understood and concludes that better data and coordinated policing strategies are required. That supports the establishment of a common and authoritative evidence base which distinguishes confirmed offences, suspected offences, intelligence and unexplained incidents, rather than allowing policy to depend upon datasets compiled using different definitions and evidential thresholds.

20.32 Defra, the police and relevant partners should therefore re-establish a single authoritative and regularly updated public evidence base, with transparent definitions distinguishing confirmed crime, suspected crime, intelligence and unexplained incidents. Satellite-tag information could form part of that wider framework, with appropriate safeguards.

20.33 This approach is consistent with the stated purpose of Defra's Call for Evidence, which is expressly intended to improve the evidence base in areas where evidence is limited, incomplete, uncertain or contested.

20.34 Where wildlife-crime evidence is relied upon in considering sector-wide policy, its provenance, definitions, classifications, spatial attribution and evidential thresholds must be sufficiently transparent to permit independent scrutiny of the conclusions drawn from it.

Question 21: What evidence exists on whether, and how, high standards of practice reduce these risks?

21.1 High standards of practice should form an important part of reducing the risk of bird-of-prey crime, but the available evidence does not justify claiming that adoption of a particular code, assurance scheme or regulatory mechanism has, by itself, caused a measured reduction in offending. Wildlife crime is unlawful behaviour which is inherently difficult to detect, and an offence successfully prevented leaves no directly observable event. The absence of recorded crime following adoption of a standard therefore does not necessarily demonstrate causation, just as an allegation or unexplained incident does not establish that a standard has failed. That absence of causal evidence applies equally to voluntary and statutory mechanisms: it does not establish that standards are ineffective, or that licensing would produce a greater reduction in offending.

21.2 There is, however, a strong scientific basis for identifying the risk which effective standards are intended to address. Etheridge, Summers & Green (1997), Murgatroyd et al. (2019) and Ewing et al. (2023) provide evidence, using different methods and periods, that illegal killing has materially affected hen harrier populations and that mortality risk is associated with grouse-moor or gamebird-management contexts. Ewing et al. (2023), using 148 satellite-tagged birds, estimated a particularly substantial demographic effect on juvenile and subadult survival. Effective standards should therefore address a demonstrated conservation risk rather than an abstract or hypothetical one.

21.3 The subsequent recovery of the English breeding population provides potentially important evidence about how that risk may be reduced, but it requires careful interpretation. Macgregor et al. (2025) found that direct productivity gains from brood management and diversionary feeding could not

explain the rapid increase in breeding attempts during 2018-2024. Their population models instead required improvements in survival, settlement or both. The authors considered it plausible that survival and settlement had responded positively to reduced killing and/or nest interference coincident with the availability of brood management as a mechanism for alleviating conflict between hen harriers and grouse-moor management. They nevertheless stressed that illegal killing continued and that their analysis could not establish whether survival had actually increased or to what extent illegal killing had reduced.

21.4 This is important evidence for the present question because it indicates a plausible pathway through which high standards and conflict-management measures could reduce risk without establishing that any one intervention caused the observed recovery. Brood management, diversionary feeding, monitoring, cooperation with statutory bodies and clear legal expectations operate within a wider management system. The appropriate evidential test is therefore whether implementation of such measures is associated over time with improvements in relevant outcomes (including survival, settlement, breeding persistence and confirmed offences against birds of prey) while recognising alternative explanations and continuing unlawful activity.

21.5 The evidence also distinguishes between addressing unlawful behaviour and addressing the underlying ecological conflict. Langholm demonstrated that lawful protection of hen harriers and restoration of grouse-moor management could deliver important conservation outcomes, including increases in several breeding waders and hen harriers, while nevertheless failing to restore red grouse to the project's predetermined level for commercially viable driven shooting. Diversionary feeding substantially reduced the number of grouse chicks taken to hen-harrier nests but did not, in combination with the other management undertaken, restore grouse densities sufficiently for driven shooting. The RSPB itself acknowledged this conflict in its Gamebird Shooting Policy Review – Q&As, updated on 17 December 2020. Referring readers to the Langholm project, it stated that "in some situations, birds of prey have been shown to reduce grouse numbers to the point where the underpinning management and shooting is no longer economically sustainable" (RSPB, 2020, p. 15). The conflict therefore cannot be characterised solely as a problem of compliance with wildlife law.

21.6 This distinction is relevant when considering possible interventions. Licensing may provide a regulatory mechanism for setting conditions, monitoring compliance or responding to offending, but it does not itself alter the lawful predation pressure which gave rise to the original hen-harrier/grouse conflict. The RSPB's own material reflects that distinction: its proposed mechanism for reducing hen-harrier predation on grouse is diversionary feeding, while its case for licensing is directed principally at unlawful killing and wider management standards.

21.7 Brood management provides a different form of conflict-mitigation mechanism because it can reduce local nesting density while allowing hen harriers to breed successfully and their young to be returned to the wild. Natural England's final evaluation concluded that the availability of brood management probably contributed to increased nesting on some grouse moors, while recognising uncertainty over the mechanism and continuing illegal killing. It should therefore be assessed alongside diversionary feeding, monitoring, engagement and enforcement as a potential means of addressing the ecological conflict as well as the conservation objective, rather than assuming that a regulatory mechanism alone resolves both problems.

21.8 The Langholm partnership's final report is relevant here because it records that additional adaptive management was considered necessary to address the remaining conflict, but was not undertaken. The Project Board also acknowledged that differences of opinion among the partners probably impeded further action. Langholm therefore cannot establish that all potential lawful conflict-

management approaches had been exhausted. Equally, it does not demonstrate that the additional approaches contemplated would necessarily have succeeded. This reinforces the importance of properly evaluated trials and adaptive management alongside high standards of conduct and effective enforcement (Langholm Moor Demonstration Project Board, 2019, pp. 13–16).

21.9 High standards can therefore reduce risk where they establish unequivocal expectations of lawful conduct, ensure practitioner competence and management accountability, facilitate monitoring and reporting, support cooperation with regulators and police, and provide mechanisms for intervention where poor practice or offending is identified. Their effectiveness should be evaluated against transparent evidence rather than inferred simply from the existence of a written code.

Elements of an effective standard

21.10 In the context of grouse moor management, the MA considers that effective high standards should include:

- an unequivocal requirement that all birds of prey and other protected wildlife are treated in accordance with the law;
- clear expectations from owners, employers and managers that wildlife crime will not be tolerated;
- appropriate training so that gamekeepers and other staff understand the legal framework governing protected species and lawful predator management;
- clear separation between lawful predator control and any activity involving protected species;
- effective supervision and management accountability;
- procedures for reporting suspected wildlife crime or relevant incidents;
- cooperation with the police and statutory authorities where an incident requires investigation;
- appropriate monitoring and record keeping; and
- consequences where individuals fail to meet required standards.

The police operational framework

21.11 These elements are also reflected in the police's own operational framework for tackling bird-of-prey crime. The NWCU Bird of Prey Crime 4P Plan identifies responsibilities including prompt reporting and sharing of intelligence, proactive identification of problems, collaborative development of solutions, intelligence and crime-data sharing, use of Police crime-recording standards when seeking official comment, promotion of best practice, advice and guidance, and targeted early intervention with individuals considered at high risk of offending. The Wildlife Crime Tactical Delivery Group Terms of Reference similarly identify prevention, detection, reduction and disruption of wildlife crime, sharing of best practice, confidence-building, training and collaborative working as core objectives (NWCU/NPCC, Bird of Prey Crime 4P Plan and Wildlife Crime Tactical Delivery Group Terms of Reference).

21.12 These documents do not demonstrate that any one of those interventions has itself caused a measured reduction in bird-of-prey crime. They do, however, provide official policing support for the proposition that effective prevention depends upon a combination of clear standards, training,

accurate reporting, intelligence-sharing, collaboration, targeted intervention and continuing review rather than upon enforcement alone.

Demonstrating compliance and earned recognition

21.13 The MA believes there is an important distinction between setting standards and demonstrating that those standards are actually being maintained. A written code is only one component of effective prevention: its value depends on implementation, management accountability, monitoring and appropriate enforcement. Standards are likely to be more credible where compliance can be evidenced through management systems, records, monitoring or other forms of independent scrutiny.

21.14 For that reason, the MA supports the broader principle of earned recognition. Where an estate or land manager can demonstrate consistently high environmental and legal standards, that performance should be capable of recognition within the regulatory system. Conversely, where there is robust evidence of non-compliance, regulatory and enforcement attention should be directed towards the activity and individuals concerned.

21.15 A proportionate regulatory approach should distinguish demonstrably compliant, high-performing operators from circumstances in which robust evidence identifies elevated risk or non-compliance. Treating both as presenting the same regulatory risk would disregard relevant evidence of performance and weaken the incentive for continued improvement.

21.16 There is an important distinction between maintaining zero tolerance of bird-of-prey crime and assuming that any regulatory system can guarantee that no individual will ever offend. The elimination of such crime should remain the objective. Regulation can reduce opportunities for offending, strengthen accountability, improve detection and increase the likelihood of effective sanction, but the continued occurrence of an incident does not, by itself, demonstrate that the only rational response is progressively greater restriction of an otherwise lawful activity.

21.17 If the success test for regulation is the complete absence of any future offence, the regime may have no attainable or stable endpoint. Each subsequent incident could be treated as proof that existing controls have failed and as justification for further restriction, irrespective of wider trends, the performance of compliant operators or whether the additional measure would address the particular cause of offending. That would create a regulatory ratchet rather than an objective assessment of effectiveness.

21.18 An outright prohibition would remove lawful grouse shooting, but it would not itself guarantee that protected birds would never be killed unlawfully. It could also remove or diminish environmental, economic and social benefits supported by lawful grouse-moor management. The relevant policy question is therefore which proportionate combination of standards, monitoring, enforcement, incentives and targeted intervention is most likely to reduce offending while retaining demonstrable benefits and directing regulatory attention towards identified risks and non-compliance. This is not an argument for tolerating any level of wildlife crime; it is an argument for assessing regulatory effectiveness against realistic, transparent and evidence-led measures.

Measuring performance against reliable evidence

21.19 Assessing whether standards are reducing risk requires a consistent baseline and more than one measure of performance. Confirmed offences, suspected incidents, unexplained satellite-tag disappearances and intelligence should remain separately identifiable because they represent different evidential categories. At the same time, demographic measures can provide an additional and

scientifically relevant line of evidence. Ewing et al. (2023), for example, estimated survival and the demographic effect of illegal killing from satellite-tag data, while Macgregor et al. (2025) used productivity, survival and settlement to test competing explanations for the subsequent increase in the English breeding population.

21.20 These demographic measures are not substitutes for crime data. Improved survival or increasing breeding numbers do not prove that offences have ceased, while a recorded offence does not by itself establish the trajectory of the population as a whole. Used together, however, confirmed-crime data, satellite-tag survival, breeding attempts, productivity and settlement can provide a more informative assessment of whether conservation risk is changing than any one indicator in isolation. Macgregor et al. explicitly concluded that the population increase required improvement in survival, settlement or both, while also concluding that their modelling could not determine whether illegal killing had in fact reduced. That distinction should be preserved in future monitoring.

21.21 The authoritative, regularly updated public evidence base proposed in response to Question 20 would therefore serve two purposes: establishing the scale and evidential status of reported bird-of-prey crime, and providing a consistent baseline against which the effectiveness of particular standards and interventions can be evaluated. Where possible, that assessment should combine transparent crime classifications with relevant population and survival evidence rather than collapsing different forms of evidence into a single measure.

21.22 The MA would therefore support Defra working with practitioners, Natural England, policing bodies and other relevant organisations to identify standards capable of reducing the risk of bird-of-prey crime, establish transparent means of monitoring their effectiveness and adapt them in response to evidence. The objective should remain the elimination of bird-of-prey crime, with effective standards recognised and regulatory or enforcement attention targeted where evidence demonstrates elevated risk or non-compliance.

Question 25: What evidence exists on the number of birds shot and how many enter the food chain?

25.1 The Moorland Association's response to this question relates only to red grouse.

25.2 Red grouse differ fundamentally from the released gamebirds considered elsewhere in this Call for Evidence. They are wild birds which live and breed naturally on the moor and are not bred, reared or released for shooting.

Population monitoring and sustainable harvest

25.3 As a wild population, red grouse numbers fluctuate considerably between years as a result of factors including breeding success, weather, disease, predation and habitat conditions. There is therefore no fixed annual number of grouse available for shooting, and the number harvested can vary substantially between seasons and between individual moors. GWCT notes that where populations fall to levels at which further shooting could jeopardise the breeding stock required for recovery, estates may restrict their shooting programme or cancel shooting altogether.

25.4 An important feature of responsible grouse management is consequently the monitoring of the wild population before decisions are made about shooting. Grouse counts are conventionally undertaken in spring and again after breeding in summer. Spring counts provide information on the pre-breeding population, while summer counts measure post-breeding density and breeding success by recording

adults and young. GWCT has used standardised spring and summer counts across the uplands for decades.

25.5 The July/early-August count is particularly important in determining whether shooting should take place. The number of adults and young, breeding productivity and the stage of the population cycle can be used to estimate the harvestable or "shootable" surplus which can be taken while retaining an appropriate breeding population. That assessment informs both the number of shooting days and, in poor years, whether any shooting should take place at all.

25.6 That approach is consistent with international conservation guidance on the sustainable harvesting of wild gamebirds. The IUCN Species Survival Commission's gamebird conservation guidance emphasises that sustainable harvesting should be accompanied by population monitoring so that the effects of harvest can be assessed and appropriate levels determined. It recognises that harvest need not necessarily result in long-term population decline where populations can compensate for losses, but stresses that sustainability should be established through monitoring rather than assumed (IUCN SSC/WPA/BirdLife, *Partridges, Quails, Francolins, Snowcocks, Guineafowl and Turkeys: Status Survey and Conservation Action Plan*, 2000).

25.7 More directly, the IUCN SSC Grouse Specialist Group's conservation action plan expressly identifies the British red grouse as the subspecies *Lagopus lagopus scoticus*, records the long-established management of its British heather-moorland habitat for sporting harvest, and recommends population monitoring to ensure the sustainability of exploitation where hunting pressure may be high (IUCN SSC/WPA/BirdLife Grouse Specialist Group, *Grouse: Status Survey and Conservation Action Plan 2006-2010*, 2007). The Action Plan is historical and should not be relied upon as evidence of current population status or present-day harvest levels, but its management principle remains directly relevant: sustainable harvest of a wild grouse population should be linked to population monitoring and adjusted according to the condition of that population.

25.8 This means that the number of grouse shot in any particular year should not be interpreted in the same way as the number of reared gamebirds released and subsequently shot. In the red grouse system, the population determines the harvest rather than the intended harvest determining the number of birds produced.

Available bag and food-chain data

25.9 The MA does not currently hold a sufficiently robust national dataset from which to provide Defra with a definitive annual figure for the number of red grouse shot in England or the proportion entering the human food chain.

25.10 Available evidence on grouse bags is collected principally through voluntary recording, including the Game & Wildlife Conservation Trust's National Gamebag Census and records held by individual shoots and estates. These sources are valuable, but their coverage and methodology should be made clear when they are used to estimate total national harvest.

25.11 Shot red grouse are a recognised food resource. Birds may be retained for private consumption, distributed locally or enter the commercial food chain through game dealers and other outlets. However, the MA does not currently hold sufficiently robust evidence to quantify the proportion passing through each route and does not wish to provide an unsupported estimate.

25.12 If Defra considers more precise information necessary for future policy, the MA would support proportionate evidence-gathering with grouse moor managers, shoots, game dealers and relevant

sector bodies, using clear definitions and a methodology capable of distinguishing between the number of birds shot, birds retained privately, birds entering commercial supply chains and any birds not entering the food chain.

25.13 The MA would also encourage Defra to make use of existing voluntary datasets and established grouse-counting systems wherever possible rather than assuming that the absence of a compulsory national bag return means that reliable information on population size, productivity or harvest is unavailable.

Question 26: What evidence exists on the impact of birds that enter the food chain?

26.1 The Moorland Association's response relates only to red grouse. As explained under Question 25, red grouse are a naturally reproducing wild population and shooting takes place only where monitoring indicates an appropriate harvestable surplus.

26.2 Grouse which are shot may be retained for private consumption, given to others or enter commercial supply chains through game dealers, butchers, retailers and the hospitality sector. Harvested grouse suitable for consumption therefore constitute a food resource rather than waste.

26.3 The MA does not hold sufficiently robust quantitative evidence to assess the wider impacts of red grouse entering the food chain or the proportion passing through different routes to consumption. If Defra requires further evidence, that work should distinguish wild red grouse from reared and released gamebirds because their production, harvest and supply-chain models are materially different.

Question 27: What evidence exists on waste or disposal issues associated with shot birds?

27.1 The Moorland Association's response to this question relates only to red grouse.

Evidence of a systemic waste problem

27.2 The MA is not aware of evidence from its membership of a systemic waste or disposal problem associated with shot red grouse. Members have not reported concerns to the Association about significant quantities of otherwise usable grouse being discarded because there is no use or market for them.

27.3 This is relevant operational and experiential evidence. Defra's Call for Evidence expressly welcomes well-documented operational and experiential evidence alongside published research and monitoring data. The experience reported to the MA does not indicate that disposal of unwanted red grouse is a material or systemic problem.

Proper utilisation and responsible disposal

27.4 There is also an established commercial market for red grouse as food. Birds are supplied through game dealers, butchers, retailers and the hospitality sector, as well as being retained or distributed for private consumption. This provides an established route by which harvested grouse suitable for human consumption are used as food.

27.5 The principle that harvested wildlife should be properly utilised is also reflected in European conservation guidance. Principle 7 of the Council of Europe's European Charter on Hunting and Biodiversity is to "ensure that harvest is properly utilised and wastage avoided". Its associated guidance encourages proper handling and processing of harvested wildlife, care of game meat to prevent wastage and contamination, and appropriate hygiene standards (Council of Europe, *European Charter on Hunting and Biodiversity*, 2007, Principle 7).

27.6 The relevant evidential distinction is between birds appropriately excluded from the food chain because they are unsuitable for consumption and otherwise usable birds being unnecessarily discarded. The former is part of responsible handling and should not itself be treated as evidence of a waste problem.

27.7 The MA does not hold a national quantitative dataset measuring the proportion of harvested grouse entering different routes to consumption or the proportion appropriately excluded. We therefore do not claim that unnecessary waste never occurs. However, the existence of established outlets for shot grouse, together with the absence of reports from MA members of significant quantities of usable birds having no outlet, provides no indication to the MA of a systemic waste or disposal problem.

27.8 If evidence is submitted suggesting otherwise, the MA considers that Defra should establish the scale, frequency and circumstances of the alleged problem. In particular, it should distinguish between:

- birds appropriately excluded from the food chain because they are unsuitable for consumption; and
- otherwise usable birds being unnecessarily discarded because no outlet exists.

27.9 Defra should also distinguish clearly between wild red grouse and reared and released gamebirds before drawing conclusions across different forms of gamebird shooting.

Section A: Call for Evidence Questions - Other impacts

Question 28: What evidence exists of links between gamebird activities and:

a. use of lead shot;
b. misuse of medicated products;
c. antimicrobial resistance;
d. misuse of pesticides;
e. other environmental or social impacts.

Respondents should address only those topics for which they have evidence.

28.1 The Moorland Association's response relates principally to red grouse shooting and associated upland land management. Red grouse are wild birds managed in situ and are not bred, reared and released for shooting, a distinction recognised within Defra's Call for Evidence.

28(a) Use of lead shot

28.2 The MA does not seek to duplicate specialist evidence on the use of lead ammunition which is better provided by organisations with detailed technical evidence in this area. We therefore do not provide a substantive response under this heading.

28(b) Misuse of medicated products

28.3 Medicated grit is relevant to the management of wild red grouse. It is used to control *Trichostrongylus tenuis*, a parasitic strongyle worm which, at high burdens, can reduce grouse survival and breeding success.

28.4 It is important to distinguish the lawful and appropriate use of a veterinary medicine from its misuse. The existence or use of medicated grit should not itself be regarded as evidence of misuse.

28.5 Current best-practice guidance requires its use to be targeted according to evidence of parasite burden and local circumstances. Medicated grit containing flubendazole is available under veterinary prescription, with evidence of strongyle burdens required before it is prescribed. GWCT guidance recommends monitoring worm burdens, avoiding unnecessary treatment and maintaining comprehensive records of its use. (Game & Wildlife Conservation Trust, 2020, Medicated Grit Guidelines)

28.6 The guidance also requires medicated grit to be withdrawn at least 28 days before shooting so that the drug does not enter the human food chain. Old medicated grit should be removed from the moor and appropriately disposed of, while grit trays should be positioned and managed to minimise contamination, including avoiding proximity to watercourses. (Game & Wildlife Conservation Trust, 2020, Medicated Grit Guidelines)

28.7 Avoiding unnecessary use is also important because excessive exposure can increase the risk of anthelmintic resistance developing in strongyle worms, potentially reducing the future effectiveness of the treatment. GWCT therefore recommends targeted rather than routine treatment and continued parasite monitoring. (Game & Wildlife Conservation Trust, 2020, Medicated Grit Guidelines)

28.8 The MA does not hold evidence indicating that misuse of medicated grit is a systemic problem amongst its members. However, that should not be taken to mean that environmental questions require no further investigation.

28.9 A 2025 rapid evidence assessment by GWCT identified important gaps in the evidence concerning the environmental fate of flubendazole on UK grouse moors. Its initial search found no studies directly examining environmental impacts under UK upland grouse-moor conditions. After widening the evidence base, the review found little or no toxic effect in terrestrial environments but evidence of potential effects in aquatic environments. It concluded that current best practice should substantially minimise those risks if consistently followed, while recommending further field research into concentrations of flubendazole and its metabolites in upland water, grouse faeces and moorland vegetation. (Meister, Williamson & Hesford, 2025)

28.10 The need for field evidence was also recognised in the RSPB's 2020 review. Thompson and Wilson reported that laboratory studies of flubendazole and fenbendazole warranted concern about potential risks to aquatic ecosystems, while evidence of field concentrations sufficient to cause serious impacts was limited. The review also identified a lack of formal field studies of the effects of these medicines on aquatic systems and called for further research into effects on other species and routes of exposure (Thompson & Wilson, 2020, pp. 22 and 31). This assessment describes the evidence available at that time and does not establish environmental safety. It supports distinguishing potential toxicity, actual environmental exposure and demonstrated ecological effects when assessing the evidence.

28.11 The MA therefore supports evidence-led, targeted use of medicated grit, veterinary oversight, adherence to withdrawal and environmental safeguards, and further research where genuine evidence gaps remain. Where new evidence identifies improvements to existing practice, guidance should be updated accordingly.

28(c) Antimicrobial resistance

28.12 The MA has identified one recent peer-reviewed study directly concerning antimicrobial-resistance pathways in red grouse microbiota. Ahmad et al. (2025) used metagenomic sequencing of caecal samples from 15 red grouse shot on three managed Scottish moorland estates and identified microbial functions including antimicrobial-resistance pathways. The study is the first modern metagenomic characterisation of the red grouse gut microbiome and demonstrates considerable previously undescribed microbial diversity (Ahmad et al., 2025).

28.13 The study does not, however, examine antimicrobial use, compare birds from managed and unmanaged moorland, identify management practices responsible for the detected pathways or establish any causal relationship between grouse shooting and antimicrobial resistance. It therefore provides evidence that AMR-related genetic pathways occur within the natural microbiota of sampled red grouse, but not evidence that gamebird management has caused or increased antimicrobial resistance.

28.14 For clarity, the potential development of resistance by strongyle worms to flubendazole referred to under 28(b) is anthelmintic resistance rather than antimicrobial resistance and should not be conflated with this question. On the evidence presently available to the MA, no sector-wide conclusion about a link between red-grouse management and antimicrobial resistance can properly be drawn.

28(d) Misuse of pesticides

28.15 The MA does not hold evidence which would enable it to provide a substantive sector-wide assessment of misuse of pesticides and therefore does not seek to make claims beyond its evidence.

28(e) Other environmental or social impacts

28.16 One important environmental and social impact which the MA considers should form part of Defra's assessment is the relationship between active upland land management, vegetation fuel and wildfire risk and resilience.

Wildfire risk and environmental consequences

28.17 Wildfire can itself cause significant environmental and social harm, including damage to peat and vegetation, wildlife and designated features, as well as risks to carbon stores, water quality, infrastructure, neighbouring communities and public safety. Any assessment of future upland management therefore needs to consider not only the effects of management interventions under normal conditions, but also their consequences for wildfire behaviour and the ability to prevent and respond to fires.

Observed wildfire outcomes: Lees et al. (2026)

28.18 Recent peer-reviewed research by Lees et al. (2026), based on a database of 206 wildfires in England and Wales, provides unusually direct evidence because it examines observed wildfire size and severity rather than relying solely on proxies such as vegetation condition or fuel load. The study found significant differences in wildfire characteristics according to vegetation type. Molinia-

dominated landscapes experienced larger fires, while higher heather cover was associated with greater fire severity.

28.19 Importantly, the study also examined associations between management and wildfire outcomes. Fires occurring in areas managed by burning were significantly smaller than fires in areas with no management, although there was no significant difference in fire severity. The authors describe this as partial support for the proposition that managed burning can reduce wildfire spread by reducing fuel loads and creating firebreaks. Cutting may have similar effects, but there were too few wildfires in cut areas for the study to test this robustly.

28.20 The same study did not find evidence that restoration reduced wildfire size or severity. That finding should itself be treated cautiously: only five sites with visible restoration management could be identified, restoration is often targeted at already degraded or fire-prone locations, and the authors identify limitations in the available management data and potential confounding between vegetation type and management. The appropriate conclusion is therefore not that restoration is ineffective, but that claims about wildfire outcomes should reflect what has actually been measured and the limitations of the evidence.

28.21 The study is particularly relevant to the present Call for Evidence because it demonstrates that vegetation type and management matter and that there is unlikely to be a single appropriate approach to wildfire resilience across all upland landscapes. Lees et al. conclude that management should respond to the characteristics of particular vegetation communities, including the distinctive risks associated with Molinia, heather and mixed moorland vegetation.

Site-specific vegetation and fuel management

28.22 The need for a differentiated approach is supported by a growing body of UK peer-reviewed research. Davies et al. (2016), examining British moorland wildfires, found that burn severity varied substantially within individual fires according to vegetation structure and fire weather, while surface-fuel consumption increased approximately linearly with the amount of fuel present before the fire. Estimated carbon release ranged from approximately 0.36 to 1.00 kg C m^{-2}. The authors identified drier moorland vegetation types as particularly vulnerable to severe burning and suggested that differences in moss and litter flammability may help explain why wildfire can consume substantially more carbon than prescribed fire. The number of wildfires examined was limited and the study did not test whether any particular management intervention reduced wildfire occurrence or extent (Davies et al., 2016).

28.23 More recent field measurements reinforce the importance of fuel condition. Lewis et al. (2024) measured live heather, dead heather and moss/litter moisture on blanket peat in the North York Moors and found substantial variation both seasonally and within individual days. Moisture in moss and litter could move above and below estimated ignition thresholds within a single day, while ignited moss and litter could add materially to the amount of available fuel. The study was undertaken on one managed estate and did not compare managed and unmanaged ground, so it does not establish the effect of prescribed burning. Its relevance is that fuel moisture and structure vary dynamically and need to be considered directly when assessing wildfire risk rather than inferred from vegetation classification alone (Lewis et al., 2024).

28.24 Minsavage-Davis et al. (2024) provide a wider northern-European assessment based on 296 fuel samples from heathland and blanket-mire vegetation in England, Scotland and Norway. Their generalised fuel models predicted the highest rates of fire spread in mature and tall building-stage heather, with substantially lower predicted spread in blanket-bog communities. Moss and litter could

constitute a large proportion of the total fuel load and substantially increase predicted fire spread when dry. The modelling indicates that unmanaged mature Calluna can constitute a greater wildfire hazard and identifies vegetation management and, over longer timescales, restoration of wetter conditions as potentially relevant risk-reduction measures. Fire behaviour was modelled rather than measured in landscape-scale wildfires, although the models were evaluated against experimental burns (Minsavage-Davis et al., 2024).

28.25 The significance of fuel moisture under extreme weather is demonstrated further by Ivison et al. (2025). Across 43 peatland, heathland and acid-grassland sites in Great Britain, the authors collected 5,845 fuel-moisture samples during 2021-2023. During the July 2022 heatwave, normally different moisture controls affecting live heather, dead heather and the organic surface layer became aligned: dead-heather moisture fell exceptionally low and the organic layer reached its driest measured condition. Fire-behaviour modelling predicted substantially faster spread, longer flames and greatly increased ignition probability under those conditions. The study did not test burning, cutting or another particular management intervention; its direct implication is that extreme weather can create conditions in which above-ground fuel becomes an increasingly important determinant of fire behaviour and suppression difficulty (Ivison et al., 2025).

28.26 Independent Scottish landscape evidence is also relevant. Fielding et al. (2024), in a Scottish Government-funded analysis covering approximately 39,000 km² of moorland, found limited spatial overlap between mapped prescribed burning and wildfire: prescribed burning was mapped across 13.1% of moorland, wildfire across 1.1%, and 96% of mapped wildfire area occurred outside moorland identified as managed by prescribed burning. However, the authors expressly state that their analysis provides no mechanistic evidence that prescribed burning itself caused the lower wildfire occurrence. Wildfire incidence was not progressively lower with increasing burning intensity, and the authors identify other plausible explanations including grazing, wildfire-prevention strategies, firebreaks, trained personnel and equipment, and differences in recreational ignition pressure. They also recognise the risk of prescribed fires escaping. This is therefore evidence of an association between wider management systems and wildfire occurrence, not proof that greater burning necessarily reduces wildfire risk (Fielding et al., 2024).

28.27 International evidence provides supporting but less directly transferable evidence that fuel treatment can alter subsequent wildfire behaviour. Collins et al. (2023), studying extreme fires in south-eastern Australia, found that recent fuel-reduction burning reduced fire occurrence and severity, although the effect declined with time and extreme fire weather became increasingly dominant. Jones et al. (2025), examining the 2022 Black Fire in New Mexico, likewise found substantially less high-severity fire in previously treated areas. These studies concern forest and shrubland systems very different from British blanket bog and should not be used quantitatively to predict outcomes on English moorland. Their narrower relevance is that experimental and observational evidence from other fire-prone systems supports the general mechanism by which prior fuel treatment can moderate subsequent wildfire behaviour (Collins et al., 2023; Jones et al., 2025).

28.28 That wider evidence is consistent with the Scottish Government's Grouse Moor Management Review Group, which recognised that prescribed burning can operate in two directions: poorly controlled burning can itself initiate wildfire, while well-managed burning may reduce accumulated fuel and create firebreaks. Cutting and grazing can also reduce fuel, while the appropriate combination of interventions remains site-specific (Grouse Moor Management Review Group, 2019).

28.29 Defra should therefore assess different land-management approaches against the quantity, structure, continuity and moisture of combustible vegetation; hydrological condition; the effectiveness of

firebreaks; access and water availability; surveillance and early detection; availability of trained personnel and appropriate equipment; and observed wildfire outcomes. The relevant policy question is not whether one technique should be used universally, but which combination of hydrological restoration, vegetation management, grazing, ignition prevention and response capacity produces the best evidenced environmental outcome at the particular site.

Hydrology and surface-fuel management

28.30 It is particularly important to distinguish between different components of wildfire risk. Restoring hydrology can materially reduce the vulnerability of peat to deep combustion and prolonged smouldering, whereas surface-fire behaviour is also influenced by the quantity, structure, continuity and moisture content of above-ground vegetation. This distinction is reflected in government material disclosed to the MA. A July 2026 COBR Directorate wildfire risk assessment, released by the Cabinet Office under EIR2026/18017 on 8 October 2026, recognised that although human activities frequently initiate wildfires, their intensity and consequences are strongly influenced by fuel conditions, vegetation structure, weather and topography. Separately, scientific advice supplied within Defra on 13 August 2026, disclosed under EIR2026/21532 on 15 October 2026, emphasised the long-term wildfire-resilience benefits of restoring wet peatlands while acknowledging that restoration is gradual and vegetation fuel may remain during the transition. That advice also raised concerns that repeated rotational burning could impede longer-term restoration and resilience. These disclosures are official risk-assessment and briefing material rather than controlled scientific comparisons of management interventions. Nevertheless, they reinforce the importance of assessing both immediate surface-fuel conditions and longer-term hydrological change. Depending on the site, effective wildfire resilience may require an appropriate combination of peatland restoration, proportionate vegetation management, ignition prevention, access, surveillance and emergency-response capability, rather than treating any single intervention as universally sufficient.

28.31 Recent operational evidence from the 2025 Fylingdales Moor wildfire illustrates the practical relevance of surface-fuel continuity to wildfire containment. The North Yorkshire Local Resilience Forum records that, on the advice of Wildfire Tactical Advisors, operational commanders adopted a hybrid firebreak approach involving surface-fuel separation to reduce the risk of surface-fire spread. It also records that sections adjoining an existing fire track were cut to maximise the distance between fuels. The fire subsequently breached that firebreak, demonstrating the limits of such measures under severe conditions. This evidence does not establish that any particular preventative vegetation-management regime would have prevented the incident, but it does confirm that surface-fuel continuity and separation are operationally material considerations in wildfire response and containment (North Yorkshire Local Resilience Forum, 2026).

28.32 The achievable hydrological response may itself differ materially between peatland settings. Ecohydrological work commissioned by the Environment Agency identifies important differences in water inputs, landscape position, slope, underlying geology and the capacity of individual peatlands to retain water. These characteristics influence achievable water-table conditions, vegetation and ecological function. Defra should therefore avoid assuming that the same restoration intervention will produce an equivalent hydrological, vegetation or wildfire-resilience outcome on all blanket-bog sites (Wheeler et al., 2023; Glatzel et al., 2024).

Operational evidence from conservation management

28.33 There is also relevant operational evidence from conservation-led upland management outside grouse moors. At Lake Vyrnwy, the RSPB and Hafren Dyfrdwy have combined large-scale peatland restoration with active management of above-ground vegetation. Denny (2025a) records that both organisations are conscious of wildfire risk; that heather has been mown to reduce potential fuel load as well as to create different vegetation heights; and that rewetting, mowing and managed grazing are all expected to contribute to reducing fire risk. Hafren Dyfrdwy is also leading work to identify wildfire risk across the area.

28.34 This should not be treated as evidence that those measures have yet produced a quantified reduction in wildfire size, severity or probability at Lake Vyrnwy. The report provides operational case-study evidence rather than a controlled assessment of wildfire outcomes. Its relevance is narrower: it demonstrates that, in a large conservation-managed upland landscape undergoing peatland restoration, rewetting is not being treated as a complete substitute for management of surface vegetation and fuel. Hydrological restoration, mowing and grazing are instead being used as potentially complementary elements of wildfire-risk management.

28.35 That practical approach is consistent with the MA's wider argument that Defra should assess the different components of wildfire risk separately. Measures which increase peat moisture may reduce vulnerability to deep combustion, while management of above-ground vegetation may influence fuel continuity and fire spread. The appropriate question is therefore which combination of interventions produces the best evidenced wildfire-resilience outcome at a particular site, rather than whether one management technique should automatically displace another.

Peatland restoration on grouse moors

28.36 There is also practical evidence that grouse-moor management and peatland restoration are not mutually exclusive. GWCT's 2022 audit records that grouse moors had blocked approximately 7,000 km of historic drainage channels to re-wet peatland and had restored or re-vegetated more than 27,000 hectares of peatland over the preceding two decades. Those cumulative figures drew on Moorland Association member reporting, including more recent restoration and drain-blocking activity alongside work undertaken in earlier years.

28.37 These figures should be treated as member-reported evidence rather than as an independently audited national inventory, and they do not by themselves demonstrate the environmental outcome achieved on every hectare restored. Their relevance is narrower but important: substantial peatland restoration has taken place within a land-management system that also supports grouse shooting. Defra should therefore avoid treating "grouse-moor management" and "peatland restoration" as necessarily competing land uses. The appropriate question is how restoration, vegetation management, grazing and wildfire-risk management can be combined to deliver the best evidenced outcomes at individual sites.

Wildfire, carbon and whole-system assessment

28.38 The consequences of severe wildfire need to be included in any environmental and carbon assessment of upland management. Research on the 2025 Dava Moor fire found above-ground fuel load substantially above the recent average and concluded that fuel accumulation probably contributed to rapid fire spread while exceptionally dry climatic conditions primed the system to burn. Approximately 84% of the estimated carbon emitted by that fire came from peat. This does not identify which management regime would have prevented the fire, but it demonstrates that fuel, drought and peat combustion can interact to generate carbon losses on a scale very different from routine vegetation-management emissions.

28.39 National peer-reviewed modelling supports the significance of that risk. Baker et al. (2025) estimated that UK wildfires burning peat emitted approximately 776 kt of carbon between 2001 and 2021, with emissions strongly concentrated in dry years; the modelling attributed approximately 24 kt of carbon to the Saddleworth Moor fire alone. The estimates depend upon assumptions concerning peat bulk density, soil moisture and burn depth, and subsequent field evidence has demonstrated that those assumptions can overestimate losses at particular sites. The study also does not identify which management intervention would reduce emissions. Its relevance is the national-scale evidence

that peatland wildfire is a material and episodic component of the UK carbon balance (Baker et al., 2025).

28.40 Emerging field evidence also bears directly on the potential effect of vegetation management during severe wildfire. A 2026 preprint arising from the NERC-funded IDEAL UK FIRE programme examined the 1,239-ha Langdale Moor wildfire in the North York Moors and estimated approximately 25 kt of soil-carbon loss. Recently managed vegetation patches, most of which had previously been prescribed burned, were reported to be predominantly unburned or of low severity, with no high-severity burning recorded within those patches; the authors estimated that recent vegetation management avoided almost 7 kt of soil-carbon loss (Baker, Franz Bodenham, Little, Doerr et al., 2026).

28.41 That result should presently be treated as supplementary rather than determinative evidence. It is a preprint and has not yet completed peer review; it concerns one wildfire; management history and timing were partly reconstructed from remotely sensed data; site access was restricted; and carbon density was modelled rather than comprehensively measured by coring. It does not demonstrate that vegetation management prevents wildfire. It does, however, provide an important testable indication that recent fuel management may alter wildfire severity and resulting peat-carbon loss under severe English moorland fire conditions.

28.42 Where peatland restoration or changes in upland management are justified partly on carbon grounds, Defra should therefore assess the complete carbon system. That should include routine management emissions and sequestration, vegetation and peat recovery, greenhouse-gas fluxes and the probability and consequences of episodic wildfire loss. The relevant comparison is not between a management intervention with measurable routine emissions and an alternative assumed to have no fire-related carbon cost, but between the expected whole-system carbon outcomes of realistic alternative management regimes.

Carbon stocks, fluxes and time horizons

28.43 The same whole-system approach is required when assessing peatland carbon itself. Carbon stock and carbon flux are different measures, and the environmental effect attributed to a management intervention can depend materially on the period over which it is measured. GWCT's 2020 *Peatland Report*, drawing on the peer-reviewed literature available at that time, noted that much of the evidence on carbon fluxes from managed upland peat came from a relatively small number of sites and short-duration studies. Measurements made in the year of a vegetation-management intervention, or shortly afterwards, may therefore capture an immediate carbon loss without necessarily capturing subsequent vegetation recovery or other carbon pathways over the full management cycle. The same caution applies to the interpretation of visible peat erosion. Fenton (2022), using Antarctic moss peat as a simplified system through which to examine wider peatland processes, reports that peat growth can cease and surface erosion can develop in the absence of anthropogenic influence. This does not establish that erosion on English blanket bog is generally natural, benign or unrelated to land management. Its relevance is methodological: the observation of erosion should not, without additional evidence of causation, be treated as proof of anthropogenic damage or attributed automatically to a particular management practice.

28.44 Physical stability provides a further potential constraint on peatland carbon accumulation. Mahdiyasa et al. (2026) modelled interactions between ecological, hydrological and mechanical processes and compared predicted stability thresholds with existing peat-failure observations and Scottish peat-depth data. Their results indicate that peat thickness, slope and material strength may constrain long-term net peat accumulation through mechanical instability and erosion. This is modelling rather than

a field trial of restoration, burning or grouse-moor management, and it does not establish the cause of erosion at any particular English site. The MA considers that projections of additional peat-carbon accumulation should therefore take account of site-specific physical constraints and the durability of the anticipated carbon gain. This must be distinguished from protecting carbon already stored in peat: limits on further accumulation do not remove the potential benefits of avoiding losses from existing stocks or establish that restoration is ineffective.

28.45 Field evidence concerning burning and peat accumulation includes the long-running Hard Hill experiment at Moor House reported by Marrs et al. (2019). Using peat cores from replicated experimental plots subject to different burning frequencies, the authors estimated apparent peat and carbon accumulation. Accumulation continued under both burned and unburned treatments. The reduction relative to long-unburned reference plots was statistically significant in the most frequently burned treatment, operating on an approximately ten-year rotation, but not in the treatment operating on an approximately twenty-year rotation. An analysis across treatments nevertheless indicated that estimated accumulation declined with increasing numbers of burns. The study also reported changes in vegetation composition, including increases in some peat-forming species.

28.46 These findings require careful interpretation. The study used peat-core-derived estimates of accumulation, rather than direct measurement of the complete greenhouse-gas balance over a management cycle. The approximately ten-year burning interval was also relatively frequent in the context of the slower heather regrowth at Moor House. Consequently, the findings do not establish that burning is necessarily beneficial for peatland carbon, that burning frequency has no environmental consequences, or that the results can be transferred uncritically to every upland peatland. Equally, the results should not be represented as demonstrating that all prescribed burning prevents peat accumulation. The appropriate conclusion is that burning frequency, monitoring method, site conditions and the carbon outcome being measured must be distinguished when assessing this evidence.

28.47 More recent primary research provides evidence about one specific mechanism by which prescribed burning may affect peatland carbon: direct heating of the underlying soil. Baker et al. (2026) measured soil temperatures, above-ground temperatures and fire severity during eight prescribed burns undertaken across the UK by trained teams operating under current prescribed-burning guidance. Across the burns studied, both organic-rich peaty soils and mineral soils experienced little heating; mean maximum soil temperatures were below 43.4°C and the fire-severity assessments recorded no below-ground organic-matter loss. The authors concluded that, under the conditions studied, prescribed burns undertaken in accordance with current training and guidance did not expose the underlying soils to temperatures likely directly to damage long-term carbon stores (Baker et al., 2026).

28.48 These findings should not be interpreted as demonstrating that prescribed burning has no carbon or ecological effects, or that the same result would occur under all sites, weather conditions or burning practices. The study examined eight burns conducted under relatively mild conditions and assessed direct soil heating rather than the complete carbon balance over a management cycle. Its relevance is therefore specific but important: evidence concerning the effects of uncontrolled wildfire or poorly conducted fire should not automatically be treated as evidence of the direct soil-heating effects of a properly planned prescribed burn.

28.49 Other primary research demonstrates why environmental assessment needs to extend beyond the immediate heating effect of an individual burn. Whitehead & Baines (2018) and Whitehead, Weald & Baines (2021) examined post-burning vegetation responses on blanket peat. The latter found higher

Sphagnum cover on plots eight to ten years after burning than on unburned controls, higher cotton-grass cover across burned plots and no overall reduction in plant or moss diversity across the burn-age sequence. These were observational studies at particular sites and do not demonstrate that burning is appropriate or beneficial on all blanket bogs; they do show that long-term vegetation response cannot be inferred simply from the immediate removal of above-ground vegetation (Whitehead & Baines, 2018; Whitehead, Weald & Baines, 2021).

28.50 Alternative management techniques also have measurable effects. Heinemeyer, Berry & Sloan (2019) compared cutting and burning on English blanket bog and found no lasting plot-scale effect of tracked cutting machinery on peat depth or bulk density, while identifying changes to microtopography and potential site-specific effects associated with machinery. Heinemeyer et al. (2025a) subsequently reported, from a ten-year replicated experiment on three northern English blanket-bog grouse moors, that burning, cutting and non-management produced different effects on heather nutrient composition, with most treatment differences reducing as vegetation recovered. These studies do not establish that burning is superior to cutting; they demonstrate that management alternatives have different ecological consequences and should be compared on equivalent outcomes rather than assuming that one constitutes a no-impact control.

28.51 International experimental evidence further illustrates the sensitivity of peatland greenhouse-gas and carbon responses to site context. Cui et al. (2025), in a 90-day laboratory experiment using degraded Danish organic soils, found that controlled surface burning before rewetting greatly reduced the short-term methane pulse associated with rewetting, but expressly cautioned that field trials were required before the approach could be recommended. Ji et al. (2025), in a three-year experiment on a permafrost-influenced peatland in north-east China, recorded greater soil organic carbon following low-intensity prescribed burning. Neither system is directly comparable with British blanket bog, and neither study should be used to advocate equivalent treatment in England. Their relevance is narrower: peatland carbon responses to fire, rewetting and vegetation recovery are strongly context-dependent and should not be represented by a universal direction of effect (Cui et al., 2025; Ji et al., 2025).

28.52 The interpretation and wider applicability of the study were subsequently challenged by Baird et al. (2019). They argued that the experiment had been conducted on a degraded, gullied and unusually Calluna-dominated site and that its findings should not be extrapolated to natural or rewetted peatlands more generally. Marrs et al. responded in defence of the relevance and interpretation of the experiment. That published exchange is itself important evidence: the measurements made at the experimental site are not necessarily disputed, but their interpretation and transferability to other peatland conditions remain contested.

28.53 The wider literature also identifies pyrogenic carbon (charcoal produced by incomplete combustion) as a potentially long-lived component of peat carbon storage which has not been treated consistently in carbon assessments. That possibility does not establish that burning produces a net carbon benefit, but it reinforces the need for comparisons to use a complete and consistent carbon account. Heinemeyer has also identified treatment of the charcoal component of the carbon budget among the findings which he considers were omitted or insufficiently reflected in NEER155 (Heinemeyer, pers. comm.).

28.54 Defra should therefore distinguish between what the individual studies measured, the conclusions which can properly be drawn at the study site and the wider policy conclusions subsequently advanced by different authors. Comparisons between burning, cutting, grazing, rewetting and non-intervention should use comparable time horizons and account, so far as the evidence permits, for

peat accumulation, vegetation recovery, greenhouse-gas fluxes, dissolved and particulate carbon, pyrogenic carbon and the risk of episodic loss through severe wildfire.

Fylingdales Moor: the consequences of severe wildfire

28.55 An English example illustrates the potential scale of those consequences. The North Yorkshire Local Resilience Forum's report into the 2025 Fylingdales Moor fire records that, at its height, the fire extended across approximately 20 square kilometres and posed an active risk to RAF Fylingdales, part of the UK's critical national-security infrastructure. Initial analysis by the University of Exeter estimated emissions from the direct combustion of peat soil at 54,258 tonnes CO_2e. The incident began in June and the fire was not formally closed until December.

28.56 This example does not establish what particular management intervention, if any, would have prevented the fire, and it should not be used to infer such a causal conclusion. It does, however, demonstrate the scale of the environmental, operational and public-safety consequences that can arise from severe upland wildfire. Those consequences form part of the relevant counterfactual when assessing policies which may affect vegetation condition, fuel accumulation, access, prevention and wildfire-response capability.

28.57 Wildfire also has social and health consequences extending beyond the vegetation and carbon directly affected by the fire. Peer-reviewed international evidence demonstrates that wildfire-smoke exposure is associated with measurable respiratory and cardiovascular harm. Barros et al. (2025), using paired biomonitoring samples from wildland firefighters in Portugal, recorded post-exposure increases in biomarkers associated with lung injury, oxidative stress and exposure to combustion products. The study involved only 23 firefighters and the vegetation and operational context differ from the UK, but it provides direct physiological evidence of occupational exposure during wildfire suppression (Barros et al., 2025).

28.58 Population-level epidemiological work similarly identifies health effects from wildfire smoke. Riss et al. (2025), analysing 173,954 emergency and urgent-care visits associated with smoke from 217 fires in Nevada, found associations between PM2.5 exposure and acute cardiorespiratory outcomes, with the magnitude and type of response differing according to fire characteristics. Importantly, the paper also cautions against assuming that smoke from low-intensity or managed fire is harmless. These results concern a different ecological and healthcare context and should not be transferred quantitatively to England, but they establish that smoke is a material externality which should form part of a whole-system assessment (Riss et al., 2025).

28.59 The potential geographical reach of those impacts is illustrated by Zhang et al. (2025), whose analysis of the exceptional 2023 Canadian wildfire season found measurable increases in wildfire-derived fine-particle exposure across Europe. The scale and forest-fire context bear little resemblance to an English moorland wildfire and mortality estimates remain sensitive to modelling assumptions. The narrower policy point is nevertheless relevant: the environmental and social costs of severe wildfire can extend well beyond the land burned and should not be excluded from the comparison of management scenarios (Zhang et al., 2025).

Restoration, wildfire and unresolved evidence gaps

28.60 Recent discussion of peatland restoration and wildfire resilience illustrates why this evidential distinction matters. Rewetting and restored hydrology can provide important environmental benefits and can reduce vulnerability to deep peat combustion. However, evidence of a raised water table, wetter vegetation or improved water retention should not, without further evidence, automatically

be treated as equivalent to measured effects on wildfire ignition, rate of spread, fire intensity, severity or final area burned.

28.61 Written evidence submitted to the EFRA Committee by Heinemeyer (2026, CWR0088) raises a related methodological concern. Examples of an individual rewetted area, blocked drainage channel or naturally wet hollow appearing to resist wildfire do not, without further information about fire behaviour, wind, topography, fuel distribution and moisture conditions across the wider site, establish that rewetting itself caused the observed outcome. This is expert commentary rather than a controlled wildfire experiment, but it reinforces the need to distinguish observations at individual locations from demonstrated changes in landscape-scale wildfire risk.

28.62 This distinction is also important because restoration is a process rather than an instantaneous change in wildfire behaviour. Existing surface vegetation may remain for a considerable period while hydrological and ecological restoration develops. The House of Commons Environment, Food and Rural Affairs (EFRA) Committee reached a related conclusion in its October 2026 wildfire report. While recognising the long-term benefits of peatland restoration, which may take years or decades to be fully realised, it concluded that restoration alone does not address the immediate challenge of managing hazardous fuel loads and that a clear plan is needed to reduce wildfire risk during the transition. It recommended that government set out how it would support the full range of land-management tools over the following one to two years alongside its longer-term restoration ambitions. The Committee expressly declined to identify prescribed burning, cutting, grazing or rewetting as universally the best approach, recognising that each has a place in the management toolbox (EFRA Committee, 2026, paras 160-161). This provides parliamentary support for treating peatland restoration and proportionate, site-appropriate fuel management as potentially complementary interventions rather than assuming that one necessarily substitutes for the other.

28.63 The Government's own Environmental Improvement Plan recognises that further work is required to understand the relationship between restored hydrology and wildfire resilience. That continuing research programme is important because it indicates that material questions remain about how different restoration and vegetation-management approaches perform under wildfire conditions.

28.64 The unresolved nature of this question has also previously been recognised by the RSPB. Its 2020 review of the environmental impacts of grouse-moor management identified as key research questions whether prescribed burning increases or reduces wildfire risk, whether controlled managed burning can reduce the spread and impact of wildfire, and what contribution cutting and peatland restoration can make to reducing wildfire spread and impact. It also recognised the proposition that reducing vegetation fuel load may be important in high wildfire-risk areas (Thompson & Wilson, RSPB, 2020).

28.65 The significance of that review is not that it resolves which intervention is preferable, but that it records these relationships as unresolved research questions. Subsequent Government and academic research should therefore be understood as addressing an acknowledged evidence gap.

28.66 More recent peer-reviewed literature provides a further reason not to treat existing evidence reviews as the final position. Heinemeyer et al. (2025b) concluded that assessment of peatland-management evidence needs to account more explicitly for site-specific and pre-management differences, study design, confounding, temporal and spatial scale and comparison with alternative management regimes; the authors specifically identified Noble et al. (2025; NEER155) among reviews which they considered should be re-examined. Their methodological concerns include the risk of drawing wider management conclusions from short-term responses to an initial disturbance, from

localised plot-scale effects where longer-term or larger-scale outcomes are relevant, or from studies in which important environmental differences between treatment and comparator sites limit causal interpretation.

28.67 Those concerns are not solely retrospective. In correspondence with the MA on 31 October 2026, Dr Andreas Heinemeyer confirmed that related methodological criticisms had previously been raised directly with Natural England in relation to its evidence reviews, including concerns about confounding, temporal and spatial scale, assessment of study quality and the omission or interpretation of relevant findings. He stated that the University of York had sought substantive reconsideration of Natural England's earlier vegetation-cutting review and had subsequently offered expert input during development of the managed-burning review, but that, in his assessment, the detailed concerns were not substantively addressed (Heinemeyer, pers. comm.).

28.68 This correspondence is expert commentary rather than an independent finding that NEER155 is incorrect, and Natural England may take a different view of the criticisms or the extent to which they were considered. Its significance is narrower but important: material published and formally raised methodological criticism exists and forms part of the evidential context in which NEER155 should be assessed. Defra should therefore consider the underlying primary studies, published critiques, subsequent evidence and material contrary findings alongside the conclusions of the review, and should be able to demonstrate how substantive scientific criticism has been evaluated rather than treating any one synthesis as determinative.

28.69 The evidence base has also continued to develop since NEER155 was published. Whitehead, Aebischer & Baines (2026) report a randomised before-after-control-impact experiment replicated across five blanket-bog sites in northern England. Over the first five years, prescribed burning and mechanical cutting both reduced heather dominance and vegetation height, with increased cover of peat-forming vegetation including Sphagnum and Eriophorum vaginatum; all management treatments reduced fuel loads, while leaving cut brash slowed Sphagnum recovery and was identified as potentially increasing wildfire-ignition risk. The study does not establish the long-term superiority of either burning or cutting, and the authors call for further longer-term research. It does, however, provide new primary evidence which post-dates NEER155 and should form part of any current assessment of the relative effects of vegetation-management options (Whitehead, Aebischer & Baines, 2026).

Current research and statutory scrutiny

28.70 The Government has itself treated wildfire resilience as an area requiring further evidence. The Third National Adaptation Programme committed Defra to commission wildfire research, including an England wildfire-risk map and work to define "effective wildfire risk reduction measures", and to run a wildfire-risk programme for 2023-2027 intended to adapt land management to wildfire risk (HM Government, Third National Adaptation Programme, 2023). However, the EFRA Committee concluded in October 2026 that Defra had not implemented the promised wildfire-risk programme. It described this as a significant missed opportunity to improve resilience and reduce future risk, and recommended that government explain the non-implementation, including any assessment it had made of the implications. It also recommended that government set out what action it would now take to support land managers in adapting to increasing wildfire risk, including whether it intended to introduce a replacement programme and a timetable for delivery (EFRA Committee, 2026, paras 103-104). This reinforces the need to distinguish policy commitments from implementation and demonstrated outcomes.

28.71 The IDEAL UK FIRE research programme similarly identifies "major uncertainties" in the costs and benefits of wildfire-management tools and describes the evidence concerning their ecological and carbon effects as limited and sometimes conflicting. It is testing approaches including prescribed burning, mowing, managed succession and rewetting across different landscapes and timescales, including whether fuel-management interventions reduce wildfire spread at landscape scale and how the long-term carbon effects of repeated intervention compare with severe wildfire (IDEAL UK FIRE, Toward Informed Decisions on Ecologically Adaptive Land Management for Mitigating UK FIRE, Case for Support).

28.72 Independent statutory scrutiny points in the same direction. The Office for Environmental Protection's 2024/25 assessment states that "resilience to wildfires in England is largely unevidenced", identifies continuing weaknesses in coordination and evidence concerning wildfire adaptation, and recognises a role for peatland restoration in reducing wildfire risk. The appropriate conclusion is therefore not that restoration lacks value, but that no single intervention should be assumed to provide the complete answer to wildfire resilience where the relevant wildfire outcome has not itself been demonstrated (Office for Environmental Protection, Progress in improving the natural environment in England 2024/2025, 2026, pp. 177-181).

28.73 Parliamentary scrutiny has also identified the need to assess explicitly the wildfire consequences of changes to land-management regulation. In its October 2026 report, the EFRA Committee expressed concern that the implications of expanded burning restrictions for wildfire resilience had not been assessed with the same degree of rigour as peatland, biodiversity and carbon outcomes. It recommended that government explain what assessment had been undertaken and, if no such assessment had preceded implementation, commission and publish one within three months. The Committee also expressed concern about significant changes affecting fuel management and wildfire resilience being introduced while evidence gaps remained, and recommended reviewing the Heather and Grass etc. Burning (England) (Amendment) Regulations 2025 once the findings of the IDEAL UK Fire programme become available (EFRA Committee, 2026, paras 174-177). Although these recommendations concern burning regulations, the MA considers that the underlying principle is also relevant to any future regulatory proposal affecting grouse-moor management: the implications for wildfire risk and resilience should be assessed explicitly alongside other environmental outcomes, and the regulatory approach should be capable of revision in response to relevant new evidence.

28.74 This is also consistent with the Government's wider climate-policy framework. The Environmental Improvement Plan 2025 distinguishes between reducing greenhouse-gas emissions and adapting the natural environment to the effects of climate change. It commits government to measurable and time-bound climate-resilience objectives, improved monitoring and evaluation, and more dynamic management of protected sites in response to changing climate risk. Wildfire resilience should therefore be assessed as an adaptation outcome in its own right, rather than assumed to follow automatically from a management intervention undertaken principally for carbon or habitat objectives.

28.75 Peer-reviewed climate science reinforces the importance of treating wildfire as an adaptation issue. Arnell, Freeman & Gazzard (2021), applying UKCP18 climate projections to indicators used in the UK Fire Severity Index, projected increases in the frequency of conditions conducive to wildfire across every UK region under future climate scenarios. The study models fire danger rather than actual fire occurrence and does not assess any particular land-management intervention: ignition remains heavily influenced by human behaviour. Its relevance is that the climatic background against which upland-management choices are being made is itself changing, so the effectiveness of present

management prescriptions cannot safely be assumed to remain constant (Arnell, Freeman & Gazzard, 2021).

28.76 That projected change is consistent with the field measurements of Ivison et al. (2025), which demonstrate how an extreme UK heatwave can simultaneously dry live vegetation, dead vegetation and organic surface fuels to conditions associated with greatly increased ignition probability and modelled fire spread. Together, the projection and field evidence strengthen the case for evaluating management options against future rather than only historic wildfire conditions (Arnell et al., 2021; Ivison et al., 2025).

28.77 Defra should therefore distinguish between evidence that a management intervention changes an intermediate condition (such as fuel load or water table) and evidence that it changes the wildfire outcome ultimately relevant to policy, including ignition, spread, intensity, severity or area burned. Where that final relationship has not been measured, the limitation should be stated rather than causation assumed.

28.78 An independent peer review of the post-2013 peatland-burning evidence provides a useful framework for dealing with that uncertainty. Stewart's peer-review evidence statement for Ashby (2020) identified substantial difficulties in synthesising studies conducted at different spatial and temporal scales, inconsistency of effects between studies, and risks of confounding and inappropriate causal attribution. It concluded that, alongside precaution on particularly sensitive sites, an adaptive-management framework could address uncertainty by applying different management approaches in appropriate locations, monitoring their outcomes and using the resulting evidence to improve future decisions. This supports a site-specific, monitored approach rather than assuming that one management prescription will produce the same outcome across all peatland settings (Stewart, independent peer-review evidence statement in Ashby, 2020).

The counterfactual and climate-adaptation capacity

28.79 This also requires consideration of the counterfactual. If regulation materially changes or reduces the management associated with grouse shooting, Defra should consider what happens not simply to grouse shooting itself but to the vegetation management, grazing, monitoring, firebreaks, infrastructure, equipment, specialist knowledge and year-round practitioner presence currently associated with that land-management system.

28.80 That counterfactual should include climate-adaptation capacity as well as direct environmental effects. Tracks, firebreaks, water access, equipment, surveillance and experienced people on the ground can all affect how quickly a wildfire is detected, contained and suppressed. If future regulation materially changes the management system which currently supports those capabilities, Defra should assess what will replace them and whether the alternative provides equivalent or better resilience under hotter, drier and more fire-prone conditions.

28.81 The environmental counterfactual extends beyond wildfire. Mason et al. (2025) modelled the combined effects of grouse-moor management change and climate change on red grouse, curlew and golden plover across Great Britain. Their modelling predicted declines in all three species under cessation of grouse-moor management, with larger projected declines when management change was combined with future climate change. However, climate and land cover explained considerably more variation than grouse-moor management for curlew and golden plover, the management relationship was correlative and the authors also identify potential benefits of cessation for controlled predators and raptors affected by illegal killing. The study therefore does not establish that continuation of existing management is environmentally preferable overall. It does demonstrate

that the environmental counterfactual to management change contains its own species effects and must be assessed rather than treated as a neutral baseline (Mason et al., 2025).

28.82 Defra's assessment should therefore consider simultaneously the likely effects of alternative management scenarios on wildfire resilience, peat and greenhouse-gas outcomes, vegetation structure and species populations. The relevant comparison is between plausible whole management systems under a changing climate, not between the measurable impacts of existing management and an alternative assumed to have no environmental costs or trade-offs.

28.83 There is a related social consideration. Grouse-moor management supports a body of practical upland knowledge and skills concerning habitat management, wildlife monitoring, lawful predator management, fire prevention and response, and working safely across difficult and remote terrain. These capabilities have value beyond the act of shooting itself.

28.84 The MA does not suggest that grouse shooting automatically produces good wildfire or environmental outcomes, nor that prescribed burning or any other particular technique should be used universally. Where a management practice is demonstrated to create environmental harm, that should be addressed. Equally, where a practice or combination of practices demonstrably improves wildfire resilience or other environmental outcomes, that evidence should form part of the assessment.

28.85 This is not merely a theoretical consideration. The official multi-agency debrief of the 2025 Fylingdales Moor wildfire recommends that future wildfire risk assessment should make greater use of local knowledge and input from existing groups such as the North Yorkshire Wildfire Group. It also recommends involving organisations able to provide specialist equipment at short notice in future planning and exercises, and recognises that organisations outside formal Local Resilience Forum structures can contribute valuable capabilities, knowledge and skills during major incidents. This evidence does not demonstrate that such capacity depends uniquely on grouse shooting, but it does confirm that locally retained knowledge, practitioner capability and rapidly deployable equipment are recognised components of effective wildfire preparedness and response. Defra should therefore consider how alternative land-use and regulatory scenarios might affect the continued availability of that capacity (North Yorkshire Local Resilience Forum, 2026).

28.86 The EFRA Committee's October 2026 report also recognises the importance of this practical capacity. It concluded that wildfire prevention and response rely heavily on the expertise, equipment, local knowledge and goodwill of land managers, many of whom make substantial voluntary contributions to tackling fires and supporting Fire and Rescue Services. It warned that government could not afford relationships characterised by frustration, mistrust and disengagement, and recommended that Defra and Natural England hold a stakeholder roundtable to rebuild trust and address concerns about policy transparency, communication of scientific evidence, stakeholder engagement and the implementation of burning licences (EFRA Committee, 2026, paras 179-180). The MA considers that these conclusions reinforce the need to assess how proposed changes to upland management may affect the people, skills, equipment and working relationships on which effective wildfire prevention and response depend. These conclusions concern land managers generally; they do not establish that this capacity depends uniquely on grouse shooting.

28.87 Recent practitioner evidence provides an indication of the scale of that locally retained capacity in practice. An unpublished operational return supplied to the Moorland Association following the July 2026 Tintwistle wildfire records a reported total of 48 personnel from participating estates and other contributors providing a total of 2,392 person-hours of wildfire response, alongside the

deployment of specialist off-road vehicles and firefighting equipment (Annex 2). This is operational evidence from a single incident rather than a controlled assessment. It quantifies the scale of personnel and practical response capacity that can be mobilised from the managed uplands during a serious wildfire. That capacity should form part of the counterfactual when assessing policy changes which may affect employment, equipment investment and year-round practitioner presence.

28.88 Comparable practitioner evidence from the 2025 Carrbridge and Dava wildfires in Scotland provides further evidence of the scale and nature of this capacity. A targeted survey by Scottish Land & Estates recorded at least 101 employees of responding land-based and rural businesses engaged in containment, of whom 67 had completed approved muirburn training and a further 13 had practical experience of making muirburn: 80 of the 101 therefore had previous experience of using fire in land management. Respondents also deployed substantial privately owned equipment, including 34 ATVs and 27 fogging units, and reported using techniques including tactical back-burning, fogging, leafblowers and the excavation or swiping of firebreaks. The report is sector-produced practitioner evidence rather than an independent controlled assessment, and its Scottish context should not automatically be transferred to England. It nevertheless provides relevant comparative evidence that the people, skills and specialist equipment maintained for routine upland land management can also constitute a substantial wildfire-response capability (Scottish Land & Estates, 2025).

28.89 The report also identifies a potential counterfactual which Defra should test rather than assume. Scottish Land & Estates notes that ATVs and fogging units used during the fires are commonly, though not exclusively, purchased for muirburn operations, and argues that future restrictions on that management could affect both investment in such equipment and retention of associated skills. That is an inference from sector evidence rather than evidence that regulatory change has already caused those capabilities to be lost. Its relevance is that it identifies a plausible mechanism which should form part of policy appraisal: where regulation changes the management activity which currently sustains specialist personnel, training and equipment, Defra should assess whether those capabilities would also change and, if so, how equivalent wildfire-response capacity would be maintained or replaced (Scottish Land & Estates, 2025).

28.90 Recent correspondence with Natural England provides a further example of why the practical operation of wildfire-management arrangements matters alongside their formal availability. On 23 October 2026, Natural England confirmed to the MA that, where it is the relevant authority, there is no provision for a new application under section 25 of the Countryside and Rights of Way Act 2000 to be considered outside normal office hours. An application received out of hours would instead be picked up on the next working day, prioritised and processed as quickly as practicable. Natural England also explained that the legislation had envisaged emergency powers for access restrictions in certain circumstances, but that the regulations required to bring those powers into effect were never made. It identified advance outline fire-prevention directions as an important part of the existing system because, once agreed, they can be triggered automatically when the relevant Fire Severity Index threshold is reached. Natural England is reviewing fire-prevention restrictions and open-access processes and is discussing the Fire Severity Index with the Met Office (Natural England correspondence, 23 October 2026). This evidence does not establish that any particular access restriction would have prevented a wildfire. It does demonstrate an operational constraint in the present system: where no outline direction is already in place, a newly arising need for an urgent restriction may not be capable of determination until the next working day. Defra should therefore consider whether wildfire-prevention arrangements provide sufficiently timely mechanisms for periods in which risk can develop rapidly, and whether appropriate advance arrangements are in place before high-risk conditions arise.

28.91 Wildfire risk and resilience must therefore form part of Defra's assessment of the environmental and social consequences of any policy affecting upland management. That assessment should include vegetation-fuel condition, hydrological condition, emergency-response capability, access, equipment, practitioner presence and the retention of specialist upland-management knowledge.

Anticipatory and cumulative regulatory impacts

28.92 The regulatory effect should not be measured only from the date on which any future intervention formally takes effect. Expectations of possible regulatory change, uncertainty about its eventual scope and the prospect of repeated changes can influence employment, investment and land-management decisions before any decision has been taken on whether further intervention is required. Estates and other rural businesses make decisions about recruiting and training staff, retaining vacant posts, maintaining infrastructure and funding long-term habitat management over periods extending well beyond a single season. Where the future legal or operational position remains unclear, investment may be deferred and posts may be left unfilled before any new regulatory mechanism has been selected or implemented.

Evidence from Scotland

28.93 There is relevant practitioner evidence from Scotland. On 7 June 2023, the Scottish Gamekeepers Association launched a survey of its members seeking information about gamekeeping, wildlife-management and ghillie jobs lost, gained or phased out over the preceding five or ten years. It stated that the purpose was to establish an aggregated regional picture of changing employment and the positive or negative effects of legislative change (Scottish Gamekeepers Association, *Take our JOBS survey—and receive a free gift*, 7 June 2023).

28.94 On 12 August 2023, while the Wildlife Management and Muirburn Bill was still before the Scottish Parliament, the SGA reported that responses received to that point indicated that positions were being lost and posts were not being replaced. It described the overall trend as clear and concerning. The SGA associated this with several interacting pressures, including estate sales and land-use change linked to woodland and carbon schemes, poor grouse-shooting years, cumulative regulatory change and uncertainty surrounding the proposed Bill and other wildlife-management regulation (Scottish Gamekeepers Association, *Warning to Scottish Government that gamekeeping profession is "close to breaking point"*, 12 August 2023).

28.95 This is relevant member-reported and practitioner evidence, but its limitations should be recognised. The published SGA material does not state how many people responded to the survey, quantify the total number of jobs lost or not replaced, provide a regional breakdown, or establish the cause of each employment decision. Nor could it demonstrate the subsequent effect of the grouse-shoot licensing regime, because it was published before that regime became operational. It nevertheless provides evidence that employment contraction and reduced confidence were already being reported during the period of prolonged regulatory and land-use uncertainty. Any assessment of a future policy intervention should therefore include anticipatory and cumulative effects rather than measuring impacts only from the date on which that intervention, if adopted, formally takes effect.

Periodic review, investment drag and the regulatory ratchet

28.96 The Scottish Government's own arrangements add to the importance of long-term certainty. Its Business and Regulatory Impact Assessment states that the statutory codes of practice for grouse-moor management and muirburn are to be reviewed at least every five years (Scottish Government, *Wildlife Management and Muirburn (Scotland) Bill: Business and Regulatory Impact Assessment*, 2023, section 17). Periodic review can support evidence-led and adaptive regulation, but only where the assessment process, evidential thresholds and possible outcomes are clear.

28.97 Otherwise, repeated review can itself create an investment "drag". Businesses making long-term decisions about staff, infrastructure and habitat management may reasonably perceive that requirements can be progressively tightened while there is no equivalent mechanism by which evidence of compliance, successful outcomes or overstated risks will produce stability, simplification or relaxation. That creates the risk of a regulatory ratchet: successive reviews respond to continuing pressure for additional restriction, while the regulated activity never reaches a sufficiently settled position to support confident long-term investment.

28.98 Over time, the resulting uncertainty can reduce employment and management capacity without any express prohibition. The endpoint may be the practical loss of an activity because investment has withdrawn, posts have not been replaced or lawful operation has become unviable or unobtainable in practice - not because Parliament has expressly considered and justified a ban. Where licensing is adopted, the nominal availability of a licensed activity should not by itself be treated as meaningfully permitting that activity if the cumulative requirements, uncertainty or administration produce an equivalent outcome.

28.99 Rayment's RSPB-commissioned appraisal provides a related assessment of how licensing could influence land-management decisions. It envisaged relatively light administrative requirements and expected most businesses to absorb the additional costs. Nevertheless, it acknowledged that licence fees could lead some moors to cease shooting, particularly where owners were already considering selling or changing land use or management. Its wider licensing scenario anticipated that a minority of moors would cease to be managed for grouse, with a greater rate of change than under business as usual, while most moors would continue. The report also anticipated environmental benefits from improved legal compliance. These were prospective judgements in a 2022 policy appraisal, not measured outcomes of an implemented licensing regime (Rayment, 2022, pp. 70-73 and 82). The MA considers that this reinforces the need to assess the actual requirements and costs of any proposed regime, and the likely responses of land managers, alongside its intended environmental benefits, rather than assuming that the continued legal availability of shooting would necessarily preserve existing management activity.

28.100 The practical operation of existing licensing arrangements is relevant to the appraisal of any proposed additional regime. In its October 2026 report, the EFRA Committee recorded ministerial evidence that 24 managed-burning licence applications had been submitted over the preceding twelve months, of which two had been granted: one for wildfire mitigation and one for training. The Committee concluded that the low numbers of applications and approvals suggested that the regime was not functioning as effectively as intended, pointing to potential problems with the application process and guidance. It welcomed the government's recognition of these shortcomings and its commitment to address them, and expected improvements in accessibility, clarity and effectiveness (EFRA Committee, 2026, paras 172-173 and 178). These figures describe the position reported to the Committee; they do not establish that the remaining applications were refused. The MA considers that this experience reinforces an important distinction: the formal existence of a licensing route does not, by itself, demonstrate that it is accessible or effective in practice. Any future proposal affecting grouse-moor management should therefore assess the proportionality of administrative requirements, the clarity of guidance, decision-making capacity and timeliness, alongside the environmental outcomes the regime is intended to secure.

28.101 This is not an argument against review or against stakeholders advocating regulatory change. It is an argument for transparent and symmetrical review. If Defra subsequently proposes a new regulatory regime, it should be capable of tightening requirements where evidence demonstrates continuing

harm, but also of retaining, simplifying or relaxing them where outcomes are being achieved or anticipated risks have not materialised. The baseline, methodology, assessment criteria, evidential thresholds and range of possible outcomes should be published before any such intervention is implemented. This would allow those affected to understand what success looks like, enable them to invest with reasonable confidence and reduce the risk that beneficial land management is lost alongside the particular harms regulation is intended to address.

Rural proofing and integration of economic evidence

28.102 This requirement is reinforced by Defra's own *Future of Rural England Report*, published in July 2026. The report rejects rural proofing as an "end of pipe" exercise undertaken after policy has been developed. It instead commits government to taking rural needs into consideration at every stage of policymaking and to ensuring that departments systematically assess the real-world effects of policy and investment decisions on rural communities. It also recognises that rural employment is dominated by small and medium-sized enterprises, that those businesses require a supportive regulatory environment, and that regulatory barriers increase costs and constrain growth.

28.103 Any policy option emerging from this Call for Evidence should therefore be rural-proofed before options are selected, rather than assessed only after an intervention has been designed or implemented. That appraisal should identify the distributional and place-based effects on permanent, seasonal and casual employment; recruitment and retention; tied accommodation; local contractors, hospitality and other rural businesses; specialist land-management skills; private conservation expenditure; and the capacity of remote communities to replace any economic and management activity lost. Policy options should not therefore be selected on the basis of the environmental evidence alone and subjected to economic and rural assessment afterwards. Defra's commissioned economic assessment must form part of the evidence considered before the case for, and design of, any intervention is determined.

28.104 The duration and continuity of replacement employment also require examination. Rayment's RSPB-commissioned appraisal anticipated that a moderate reduction in gamekeeping employment under licensing would likely be offset by new jobs in peatland restoration, woodland planting and natural-capital management, with additional growth in ecotourism. However, it also anticipated that major employment gains from peatland restoration and woodland planting would mostly be short term, followed by lower levels of employment in ongoing maintenance (Rayment, 2022, pp. 74-75). These were prospective assessments, not measured employment outcomes following implementation of a licensing regime. The MA considers that Defra's comparison should therefore examine the duration, location, skills requirements and accessibility of replacement jobs to affected workers, alongside the continuity of land-management capacity. Temporary project employment should not automatically be treated as a like-for-like replacement for continuing employment and the management functions it supports.

28.105 Any review mechanism attached to a future intervention should therefore be transparent and genuinely capable of moving in either direction. Its methodology, evidential thresholds and possible outcomes should be clear enough to give affected businesses reasonable regulatory certainty, while allowing requirements to be tightened where evidence demonstrates continuing harm or simplified where outcomes are being achieved.

Conclusion: an outcomes-based and evidence-led approach

28.106 Taken together, the MA considers that Question 28 reinforces the need for an outcomes-based approach: genuine risks should be identified and addressed through evidence and high standards, but the environmental and social benefits associated with responsible management must also be included

when assessing the consequences of future policy. The appropriate objective should be to determine which combination of interventions produces the best evidenced environmental outcome under realistic alternative land-management scenarios, rather than assuming in advance that any one management model is inherently preferable.

Question 29: Are there any additional positive or negative impacts, not covered above, for example recreational benefits?

29.1 The Moorland Association's response relates principally to red grouse shooting and associated upland land management.

29.2 The MA considers that there are important recreational and social impacts associated with red grouse shooting which should form part of Defra's assessment. These should not be confused with the economic impacts which Defra is assessing separately.

Evidence base and interpretative limitations

29.3 An important source of evidence is *Sustainable Driven Grouse Shooting? A review of the evidence of the economic, environmental and social sustainability of driven grouse shooting* (Denny, 2023). The second edition reviewed a substantial body of published and other evidence and was produced with independent oversight by Professor James Crabbe and review by academics from three UK universities who, according to the report, were not involved in shooting or field sports.

29.4 A central conclusion of that review is that driven grouse shooting should not be considered simply as the act of shooting a bird. It forms part of a wider system of integrated moorland management and participation, producing environmental, social and economic effects. The report argues that these effects, and the consequences of alternative land-management models, need to be considered together when assessing sustainability.

29.5 These social effects are also recognised in research commissioned by the RSPB. Rayment's independent assessment of future options for grouse-moor management concluded that grouse moors are generally recognised as playing a role in maintaining some upland rural communities through employment and local economic activity, and may contribute to cultural heritage and community identity. The report also recognised evidence of localised population retention and maintenance of cultural and community identity, while identifying both negative impacts and uncertainty about the extent to which alternative land uses could reproduce the same benefits (Rayment, *Driven Grouse Shooting: Assessing the economic and social impacts of future options for grouse moor management*, report commissioned by RSPB, 2022).

29.6 Social evidence of this kind requires careful interpretation. Much of it is observational or survey-based and can identify associations, reported experiences and plausible mechanisms without necessarily establishing that grouse shooting itself caused the observed outcome. Participation studies may also be affected by self-selection: people who choose to participate in shooting or associated rural activities may differ from the wider population in ways relevant to wellbeing, identity or community attachment. The MA therefore relies on this evidence as demonstrating social impacts which merit consideration, rather than as proof that every observed difference was caused solely by grouse shooting.

29.7 More recent evidence provides a complementary English-upland perspective. The Regional Moorland Groups' *People's Plan for the Uplands* reports an online survey of 196 respondents connected with

the English uplands, including people involved in gamekeeping, farming, conservation, hospitality, policing and healthcare. Of those responding, 62.8% identified biodiversity as what they valued most about the uplands, while 41% identified a decline in traditional ways of living as their principal concern; the report records respondents linking changes in traditional land management with concerns about the condition of the moors, employment, businesses and community continuity. The survey was self-selected, with participants recruited principally at agricultural shows and through Regional Moorland Group channels, and was not designed as a representative sample of the English upland population. Its percentages should therefore not be extrapolated to the wider population. It is nevertheless relevant as documented experiential evidence of how some people who live, work in or use the uplands perceive the relationship between environmental management and social outcomes (*The People's Plan for the Uplands*, 2024).

29.8 A further contemporary English source provides evidence about the wider roles performed by people employed within grouse-moor management. Denny (2025b) surveyed 58 English grouse moors covering approximately 444,000 acres and employing 194 gamekeepers. The report records gamekeepers undertaking activities extending beyond preparation for shooting, including habitat and wildlife management, wildfire preparedness and response, liaison with Fire and Rescue Services, and practical support on land not itself managed for grouse shooting. Between 2021 and 2024, respondents reported attending 114 meetings with Fire and Rescue Services and providing wildfire-management training to Fire and Rescue personnel on 111 occasions. They also reported responding to wildfires on grouse moors other than their own and on land where grouse shooting did not take place, including land managed by utilities, conservation organisations, military interests and National Nature Reserves (Denny, 2025b).

29.9 This is commissioned, self-reported practitioner evidence rather than peer-reviewed research and should be weighted accordingly. The survey covered 58 of the approximately 140 moors represented through the Regional Moorland Groups and was commissioned by organisations representing the sector. Its methodological safeguards included checking returns against incident logs, work records and estate accounts and excluding returns considered unreliable. Its relevance to this question is therefore not to establish a quantified national public benefit, but to demonstrate that employment and participation associated with grouse-moor management can maintain practical skills, relationships and local response capacity which are used for purposes extending beyond the recreational activity itself.

29.10 Further interim evidence from an ongoing 2026 study extends this picture of the wider roles undertaken by grouse-moor gamekeepers. The survey responses available at the time of the interim review covered 75 keepers working on 27 English grouse moors across six Regional Moorland Group areas (Denny, 2026). For the 12 months from October 2025 to September 2026, respondents reported 556 occasions on which they assisted people in difficulty on their moors, including people who were lost, required first aid or rescue, had broken-down or bogged vehicles, or had lost dogs. They also reported 177 incidents to the police, called for police support on 90 occasions and assisted with recovery of stolen property on 26 occasions. Over the same period they reported clearing litter on 3,920 occasions and fly-tipping on 88 occasions, and asking members of the public to alter behaviour in order to reduce disturbance, damage or unlawful activity on 9,105 occasions. These are self-reported interim survey data from a non-random sample and should not be extrapolated to all English grouse moors. They do not establish the monetary value of the activity, the public expenditure that would otherwise have been incurred, or that equivalent functions could not be delivered under another land-management system. They nevertheless provide contemporary operational evidence that the existing grouse-moor management system can support first-response,

police-support, access-management and environmental-stewardship functions extending beyond the recreational activity of shooting itself (Denny, 2026, interim report).

Recreation and participation

29.11 Red grouse shooting is a recreational activity involving the managed harvest of a wild bird population, with shooting taking place only where annual productivity produces a harvestable surplus. Participation is considerably wider than the individuals who shoot. A driven grouse day may involve gamekeepers, beaters, flankers, pickers-up with dogs, drivers and other participants, as well as those shooting. The report notes that a driven day can involve more than 50 people and describes an extensive network of roles associated with the activity.

29.12 This broad participation is relevant when considering recreational benefit. For many participants the activity involves spending substantial periods outdoors, physical activity, working with dogs, wildlife observation and participation in a shared rural activity.

Community cohesion and sense of belonging

29.13 A 2020 study of upland communities in areas where grouse-moor management is practised, cited by Denny (2023) as Denny & Latham-Green (2020), found that 74% of respondents participated in driven grouse shooting in some capacity, with participation spanning both sexes and different age groups. The study also reported comparatively high levels of community attachment and sense of belonging. These findings are relevant evidence of the extent to which grouse shooting can be embedded within some upland communities, but they should be treated as evidence from the communities studied rather than assumed to be representative of every English upland community.

29.14 Separate research cited in the review found that a majority of respondents in two Scottish study areas perceived community-level benefits from grouse shooting: 70% in the Angus Glens and 53% in the Monadhliath. The MA recognises that these are Scottish case studies rather than direct measurements of English upland communities, but they provide relevant comparative evidence that residents in some grouse-moor areas perceive community-level benefits. Because these are Scottish case studies, Defra should be cautious in generalising the percentages directly to English upland communities.

29.15 The evidence also suggests that employment and participation associated with grouse moors can help maintain an intergenerational mix within rural communities. This is potentially important in areas affected by the outward migration of younger people and an ageing population.

Mental health, wellbeing and physical activity

29.16 Research cited by Denny (2023), principally Latham-Green (2020), surveyed 2,424 participants in driven game shooting, including grouse shooting, and used the recognised Short Warwick-Edinburgh Mental Well-being Scale. Participants reported statistically higher wellbeing scores than the national comparison used in the study.

29.17 This is relevant evidence of an association between participation and wellbeing, but it should not be interpreted as demonstrating that shooting itself caused the difference. The study population consisted of people who had chosen to participate in driven game shooting and was not a random sample of the general population. Factors associated with participation (including outdoor activity, exercise, social interaction, shared purpose and contact with the natural environment) may themselves contribute to the observed difference. The appropriate conclusion is therefore that participation can be associated with positive wellbeing effects and that these effects should form part of the policy assessment, not that a quantified causal health benefit has been established.

29.18 Physical activity is another potentially important benefit. Beating and other participation can involve substantial walking over difficult upland terrain. The evidence review also notes that estate tracks and paths maintained in connection with moorland management may facilitate access and exercise by local communities and visitors throughout the year.

Rural identity, skills and cultural heritage

29.19 The same study of 2,424 driven-game-shooting participants found that 91.3% of respondents indicated that a connection to the countryside was a reason for their participation. There was no statistically significant difference in this measure between rural and urban respondents. This is evidence of a strong association between participation in driven game shooting and rural identity among those surveyed. It does not establish whether participation created that identity, reinforced a pre-existing identity, or attracted people who already identified strongly with the countryside. Nevertheless, it demonstrates that countryside identity and sense of place are relevant social dimensions of participation which should not be omitted from the assessment.

29.20 The cultural significance of red-grouse management has also been recognised outside the shooting sector. The IUCN SSC Grouse Specialist Group's 2007 conservation action plan described red-grouse management as having a long tradition and considerable cultural and economic importance in Britain (IUCN SSC/WPA/BirdLife Grouse Specialist Group, 2007). This historical international source does not quantify the present scale of that cultural significance, but it demonstrates that the association between red-grouse management and British upland culture is longstanding rather than a recent sector characterisation.

29.21 In the community research undertaken by McMorran, Bryce & Glass (2015) in the Monadhliath and Angus Glens, 75% of community-survey respondents agreed or strongly agreed that grouse shooting was an important part of the culture and history of the community. This should be treated as evidence of perceived cultural significance within the two Scottish study areas rather than assumed to represent every upland community.

29.22 The 2023 evidence review places evidence of this kind within the wider concept of intangible cultural heritage: social practices, seasonal activities, knowledge and skills that communities may regard as part of their cultural heritage.

29.23 Further contemporary evidence of this cultural significance comes from the Our Upland Living Heritage initiative undertaken in early 2026, before the present Call for Evidence was launched. The initiative sought community consent for the proposed inclusion of "Community Grouse Conservation and Shooting" in the UK Inventories of Living Heritage. Participants were asked not simply to register support, but to identify their role within the community (including gamekeepers and land managers, farmers, beaters and flankers, dog handlers, local businesses, rural residents and sporting participants) and were invited to describe the moorland traditions and cultural practices they wished to see acknowledged and preserved.

29.24 By 17 March 2026, more than 1,500 people had pledged their support. The UK Living Heritage process itself places particular emphasis on evidence that a tradition is recognised, maintained and transmitted by a living community of practice, and requires evidence of free, prior and informed community consent. The response to the initiative should not be treated as a representative opinion poll of the wider public or as evidence that every upland resident shares the same view. It does, however, provide relevant contemporary evidence that a substantial community of participants

regards grouse-moor management and its associated skills, traditions and social practices as part of its cultural heritage.

29.25 The relevance of this cultural evidence is not confined to identity or tradition. It also concerns the maintenance and transmission of practical knowledge. Denny (2025b) records gamekeepers undertaking wildlife and habitat management, vegetation management, wildfire preparedness and response and cooperation with other land managers and emergency services. That evidence indicates that at least some of the specialist knowledge associated with grouse-moor management is applied beyond the act of shooting itself.

29.26 There is also peer-reviewed ecological literature recognising the existence of this practitioner capability. Whitehead, Weald & Baines (2021), in their study of prescribed burning and blanket-bog vegetation at Langholm, note the practical fire-management experience and equipment held by gamekeepers and identify the potential loss of that capability if the associated management activity ceases. The study was ecological rather than sociological, was conducted on a single Scottish moor and was written by GWCT-affiliated authors, so it should not be treated as evidence that such skills could not be supplied under another land-management system. Its relevance is narrower: specialist practitioner capability is a real component of the existing management system and should form part of the counterfactual where policy could materially change that system (Whitehead, Weald & Baines, 2021).

29.27 This is consistent with Defra's Future of Rural England Report, which recognises the importance of heritage, traditional skills and husbandry within a sustainable and diverse agri-environmental sector. The appropriate policy question is therefore not simply how many jobs or shooting opportunities would remain under an alternative scenario, but which specialist skills and community functions would continue, which would be replaced through other arrangements and which might be lost.

Negative social impacts

29.28 A balanced assessment should also acknowledge potential negative impacts. Research cited in the report records concerns from some respondents about matters including temporary disturbance, noise or smoke associated with particular activities, perceived access restrictions, public-safety concerns and impacts on some wildlife. In one community study, positive impacts were reported substantially more frequently than negative ones, but those negative experiences should not simply be disregarded.

29.29 The MA considers that such impacts should be assessed according to their nature, scale and frequency and, where appropriate, addressed through good practice and engagement with other users of the uplands.

The importance of the counterfactual

29.30 Defra should also assess how these social and recreational effects would change under credible alternative land-management scenarios. Rayment's RSPB-commissioned assessment expressly recognised that different options for the future of grouse moors could have different consequences for employment, land management, community identity and cultural heritage and that the ability of alternative land uses to reproduce existing benefits was uncertain (Rayment, 2022). The relevant counterfactual is therefore not simply "shooting" versus "no shooting", but the complete social and management system which would operate under each realistic alternative.

29.31 That comparison should avoid assumptions in either direction. It should not be assumed that community networks, outdoor participation, practical conservation skills or wildfire-response

capability would automatically disappear if grouse shooting ceased: some might continue under farming, conservation, forestry, tourism, public funding or other land uses. Equally, it should not be assumed that they would continue at their present scale, in the same places or without replacement funding and organisation. The evidence required is therefore evidence about what activities, people, institutions and resources would actually replace the existing system.

29.32 The contemporary English evidence indicates that the existing system supports a network of participation and practical activity wider than the people who shoot. The People's Plan for the Uplands records perceptions of community continuity and traditional ways of life; the Our Upland Living Heritage initiative provides evidence that a substantial community regards the associated practices as part of its living cultural heritage; and Denny (2025b), together with interim evidence from the continuing 2026 study, records practitioner roles extending into conservation management, emergency response, assistance to the public, police cooperation and wider stewardship of heavily visited upland landscapes. Each source has limitations and none demonstrates that grouse shooting is the only mechanism capable of producing those outcomes. Together, however, they establish that the social counterfactual has substantive components which should be identified and assessed rather than treated as zero.

29.33 These benefits do not override demonstrated environmental, animal-welfare or other social harms. Conversely, the existence of alternative recreational or conservation uses does not establish that existing social benefits would automatically be replaced. Defra's assessment should therefore compare the recreational, cultural and social consequences of credible alternative land-management scenarios on the same evidential basis, including participation, wellbeing, community networks, specialist knowledge, access and any negative effects experienced by other users of the uplands.

29.34 Red grouse shooting should consequently be assessed not simply at the point at which a wild bird is harvested, but as one component of a wider system of recreation, land management, participation and community activity. The policy-relevant question is how those effects—positive and negative—would change under each realistic alternative rather than whether they can be assigned a single overall value to grouse shooting itself.

Question 30: Would you like to answer questions about gamebird welfare during breeding or rearing?

No [skip to end]

Supporting Annexes to the Moorland Association Submission

Defra Call for Evidence on Gamebird Release and Shooting

1 November 2026

These seven annexes accompany the Moorland Association's response. They identify the principal evidence relied upon and provide the supporting records, analyses and methodological qualifications referenced in the main submission.

Annex	Title and scope	Main text
1	**Evidence Register and Assessment of Sources** Principal sources, their evidential status, relevance and limitations.	Introduction 8.57
2	**Tintwistle Wildfire 2026 Operational Return** Personnel, hours contributed and specialist equipment recorded during the July 2026 wildfire.	28.87
3	**SSSI Condition at Moor House Upper Teesdale** Published condition classifications for the 25 SSSI units at Moor House.	14.16
4	**SSSI Condition on England's National Nature Reserves** Analysis matching 221 National Nature Reserves to 3,509 SSSI unit records.	14.19-14.21
5	**SSSI Unit Condition Records in Six Upland Areas** Pooled analysis of 801 unit records.	14.22-14.23; 14.34
6	**RSPB Reserve Monitoring Analysis and Correspondence** Exploratory NBN Atlas comparison, method, limitations and RSPB clarifications.	9.33-9.35
7	**Comprehensive Hen Harrier Tagging Register** Technical summary of recorded outcomes, classification methods, percentage comparisons and evidential limitations.	20.11-20.19

Note: Paragraph references correspond to the main MA response. Each annex should be read alongside the relevant discussion and its stated evidential limitations.

Annex 1 – Moorland Association, Evidence Schedule

Purpose of this schedule

This schedule identifies the principal evidence relied upon in the Moorland Association's response. It is intended to assist Defra in assessing the provenance, relevance, evidential status and limitations of that material, and in distinguishing between peer-reviewed primary research, government and statutory evidence, independent or commissioned reviews, sector-produced evidence, operational and practitioner evidence, and analysis undertaken by the Moorland Association.

The schedule is not intended to imply that all sources carry equal evidential weight. The appropriate weight will depend on matters including study design, sample size, geographical and temporal relevance, whether an association or causal effect has been demonstrated, the existence of controls or appropriate comparators, the quality of the underlying data, and the extent to which findings have been replicated or remain uncertain. Where material limitations are relevant to the propositions relied upon by the MA, they are identified either in this schedule or in the corresponding answer.

The inclusion of a source does not imply that the Moorland Association accepts every finding, interpretation or policy recommendation contained within it. Some sources are relied upon for particular empirical findings, others for evidence of uncertainty or evidential gaps, and others for principles of regulatory design or evidence assessment. Where a report contains conclusions or recommendations with which the MA does not necessarily agree, its inclusion should be understood only as reliance upon the particular evidence or proposition identified in the relevant response and in this schedule.

Where secondary reviews or evidence syntheses are cited, the MA encourages Defra, where material, to consider the underlying primary studies rather than relying solely upon the interpretation provided by the reviewing organisation. Conversely, sector provenance should not itself determine whether evidence is accepted or rejected: the relevant questions are the quality of the underlying evidence, the transparency of the methodology and whether the proposition relied upon is adequately supported.

A number of sources concern Scotland, Ireland, the wider UK or other jurisdictions rather than England alone. These are included where they provide relevant comparative evidence concerning the ecology, management or regulation of broadly comparable upland systems, or evidence relevant to the counterfactual where an established land-management system changes or is absent. The MA does not assume that findings from another jurisdiction or landscape are automatically transferable to England. Their applicability should be considered in light of differences in habitat, management, species populations, land use, legal frameworks and local circumstances.

Operational, practitioner and member-reported evidence is included where it addresses matters that may not be captured fully by published experimental research, including management practice, restoration activity, monitoring, participation and practical delivery. Such evidence should be treated according to its provenance and limitations and should not be represented as equivalent to independently audited or peer-reviewed evidence where it is not. Equally, its practical relevance should not be disregarded solely because it originates from practitioners.

The schedule should therefore be read alongside the substantive answers, which identify the particular proposition for which each source is relied upon and, where necessary, the qualifications that attach to it. The MA's wider submission is based on the principle that evidence should be described according to what it can reasonably establish: observed outcomes should be distinguished from proxies, correlation from causation, population-level inference from proof in an individual case, and scientific findings from the subsequent policy judgements made on the basis of them.

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Denny, S. (2023), *Sustainable Driven Grouse Shooting?* A review of the evidence of the economic, environmental and social sustainability of driven grouse shooting, 2nd edition	Sector-commissioned secondary evidence review, produced with independent academic oversight	Principally UK uplands / driven grouse shooting	Environmental, economic and social evidence concerning driven grouse shooting and associated moorland management	Used as a route into a substantial body of primary and secondary evidence concerning biodiversity, protected sites, management practices, standards and social effects	Commissioned by Regional Moorland Groups and is a secondary review rather than a primary experimental study. Individual propositions should therefore be considered against the underlying studies where material. Evidence quality and applicability vary between topics and studies	**Q10, Q12, Q14, Q29**
Fletcher, K.L., Aebischer, N.J., Baines, D., Foster, R. & Hoodless, A.N. (2010), *Changes in breeding success and abundance of ground-nesting moorland birds in relation to the experimental deployment of legal predator control*, Journal of Applied Ecology, 47, 263–272, DOI 10.1111/j.1365-2664.2010.01793.x	Peer-reviewed experimental study	Northern England uplands	Effect of legal predator control on breeding success and abundance of upland birds	Eight-year field experiment. Predator control was associated with an average threefold increase in breeding success of lapwing, golden plover, curlew, red grouse and meadow pipit, followed by population responses in several species	Findings concern the experimental areas, species and management regime studied. Effects should not automatically be generalised to every species, site or form of grouse-moor management; snipe did not show the same population response	**Q8, Q9, Q12, Q14**
Aebischer, N.J., Ewald, J.A. & Tapper, S.C. (2010), *Driven grouse shooting in Britain: a form of upland management with wider conservation benefits*, in Allen, P. (ed.), Ecologic and Economic Benefits of Hunting, pp.186–201	Published landscape-scale synthesis	Britain / upland grouse-management landscapes	Distribution and trends of upland birds in relation to grouse management	Relevant to evidence that breeding waders can be more numerous on grouse-managed land and that range contraction differed between areas retaining and losing grouse management	Primarily synthesis and observational evidence rather than a controlled landscape experiment. Associations do not alone establish that grouse management caused observed differences; other landscape and land-use factors may contribute	**Q9**
Ludwig, S.C., Roos, S. & Baines, D. (2019), *Responses of breeding waders to restoration of grouse management on a moor in South-West Scotland*, Journal of Ornithology, 160, 789–797	Peer-reviewed observational / before-and-after study	Langholm, south-west Scotland	Response of breeding waders following restoration of grouse-moor management, including predator control	Reports increases in curlew, golden plover and snipe following restoration of grouse management and is relevant to potential biodiversity effects of the wider management package	Single Scottish landscape. Management involved a package of interventions and attribution to any individual component requires caution. Applicability elsewhere depends on local ecological circumstances	**Q9, Q12, Q14**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Ludwig, S.C., Roos, S., Rollie, C.J. & Baines, D. (2020), *Long-term changes in the abundance and breeding success of raptors and ravens in periods of varying management of a Scottish grouse moor*, Avian Conservation and Ecology, 15(1), Article 21.	Peer-reviewed longitudinal observational study using 27 years of monitoring data.	Langholm Moor, south-west Scotland; periods with and without gamekeeper management between 1992 and 2018.	Relationships between grouse-moor management and the abundance and breeding success of hen harriers, merlins, peregrines, buzzards and ravens.	Found that ground-nesting hen harriers and merlins increased and had higher nesting success during managed periods, whereas tree- and crag-nesting raptors did not demonstrate equivalent management-related responses. Supports the need to distinguish the effects of lawful generalist-predator management on individual species, including protected raptors, rather than assuming uniform outcomes.	Observational study at one Scottish moor. Several management and ecological variables changed between periods, limiting causal attribution. The authors expressly recognise that, nationally, the local benefits to hen harriers from grouse-moor management are outweighed by illegal killing associated with grouse-moor interests. Local findings must therefore not be extrapolated as evidence of an overall UK conservation benefit to hen harriers.	**Q9, Q12, Q21**
Baines, D., Fletcher, K.L., Hesford, N., Newborn, D. & Richardson, M. (2023), *Lethal predator control on UK moorland is associated with high breeding success of curlew, a globally near-threatened wader*, European Journal of Wildlife Research, 69:6	Peer-reviewed field research	UK moorland	Relationship between legal generalist-predator control and curlew breeding productivity	Across paired study sites, curlew productivity was around four times higher on grouse moors than non-grouse moors, with breeding outcomes associated with lower indices of foxes and corvids	Observational paired-site study rather than experimental manipulation. Findings concern the sites examined and should not be assumed to demonstrate identical effects in every landscape	**Q8, Q9, Q12, Q14**
Baines, D., Fletcher, K., Howarth, D., Newborn, D. & Richardson, M. (2014), *Grouse moor management: effects on other upland birds in the UK*	Published review / synthesis	UK uplands	Effects of grouse-moor management on non-target upland birds	Provides supporting synthesis concerning relationships between predator management, habitat management and distribution or breeding performance of upland birds	Review/synthesis rather than a new controlled experiment. Conclusions depend upon the underlying studies and should be considered alongside them	**Q9**
Newey, S., Mustin, K., Bryce, R., Fielding, D., Redpath, S., Bunnefeld, N., Daniel, B. & Irvine, R.J. (2016), *Impact of Management on Avian Communities in the Scottish Highlands*, PLoS ONE, 11(5), e0155473	Peer-reviewed observational study	Scottish Highlands; 26 landholdings	Bird-community composition under different upland management regimes	Shows that intensive grouse management was associated with differences in occurrence and abundance of individual bird species and emphasises that responses vary substantially among species	Observational comparison. Management categories contain several associated practices and environmental differences, limiting attribution to individual interventions. Results include positive and negative species associations	**Q8**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Newey, S., Fielding, D.A., Miller, D.G., Matthews, K.B. & Thomson, S. (2020), Biodiversity considerations on grouse moors: Part 4 of Research to assess socioeconomic and biodiversity impacts of driven grouse moors and to understand the rights of gamekeepers, report to the Scottish Government	Government-commissioned biodiversity analysis	Scotland	Relationship between grouse-management intensity and distribution of selected upland indicator species	Relevant because it assesses individual species rather than treating grouse-moor management as having one uniform biodiversity effect	Wide-scale correlative analysis rather than experimental evidence. Management intensity may covary with habitat, geography and other pressures. Associations for individual species should not automatically be interpreted causally	**Q9**
Littlewood, N.A., Mason, T.H.E., Hughes, M., Jaques, R., Whittingham, M.J. & Willis, S.G. (2019), *The influence of different aspects of grouse moorland management on nontarget bird assemblages*, Ecology and Evolution	Peer-reviewed regional field study	Northern England and southern Scotland; 18 estates	Relative effects of legal predator control and heather burning on non-target birds	Found positive associations between predator-control effort and golden plover, curlew and, more weakly, snipe abundance; evidence of effects from burning was weaker	Observational study. Associations do not prove causation and benefits appeared to plateau at relatively low levels of predator-control effort	**Q8, Q12**
Mustin, K., Arroyo, B., Beja, P., Newey, S., Irvine, R.J., Kestler, J. & Redpath, S.M. (2018), *Consequences of game bird management for non-game species in Europe*, Journal of Applied Ecology, 55, 2285–2295	Peer-reviewed systematic literature review	Europe, with most underlying studies from the UK	Effects of gamebird-management practices on non-target wildlife	Review found effects differed substantially according to practice; legal predator control was generally associated with positive or neutral effects on non-target populations, while other practices produced mixed outcomes	Evidence base was uneven across management practices and heavily weighted towards UK studies. Review covers gamebird management more widely and should not be treated as evidence specifically about every grouse-moor practice	**Q8, Q12**
Whitehead, S., Hesford, N. & Baines, D. (2018), *Changes in the abundance of some ground-nesting birds on moorland in South West Scotland*, GWCT research report	Sector-commissioned longitudinal / comparative research report	South-west Scotland	Long-term changes in ground-nesting moorland birds alongside changes in land use and grouse management	Relevant to the counterfactual discussion because it documents bird declines in landscapes experiencing changes including afforestation, agricultural change and reduced grouse management	Commissioned research report rather than peer-reviewed experimental evidence. Multiple land-use changes occurred simultaneously, making attribution to loss of grouse management alone inappropriate	**Q9**
Natural England (2024), *The Influence of Recreational Activity on Upland Ecosystems in the UK: A Review of Evidence*, NEER025	Natural England-commissioned evidence review	UK uplands	Evidence concerning recreational uses of uplands, including grouse shooting and associated management	Relevant because it identifies both positive and negative effects and evidence gaps rather than assigning a uniform ecological effect to grouse-moor management	Secondary evidence review. Natural England notes that commissioned evidence reports do not necessarily represent its policy position. Conclusions depend upon quality and availability of underlying studies	**Q8–14, Q28**
Natural England (2023), *The Impacts of Vegetation Cutting on Peatlands and Heathlands*, NEER028	Natural England evidence review	UK peatlands and heathlands	Ecological, hydrological and related effects of vegetation cutting	Relevant to comparison of management alternatives. Natural England found relatively few studies and reported that no relevant studies were available on impacts of cutting on wildfire risk	Limited evidence base; many studies lacked unmanaged controls. Absence of wildfire studies is an evidence gap, not evidence that cutting has no wildfire effect	**Q13–15, Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Natural England (2025), *An evidence review update on the effects of managed burning on upland peatland biodiversity, carbon and water*, NEER155	Government / statutory-body evidence review	UK upland peatlands	Effects of managed burning on biodiversity, carbon, water and hydrology	Updates Natural England's earlier evidence base using 102 additional studies. Relevant to both environmental effects and remaining uncertainty; Natural England records that UK evidence on burning and wildfire remains limited	Secondary review rather than primary experimental evidence. Effects vary according to habitat, severity, frequency and other management. Limited wildfire evidence does not establish that burning universally reduces wildfire risk. Subsequent peer-reviewed criticism by Heinemeyer et al. (2025b) questions aspects of the synthesis, including treatment of study design, confounding, scale and comparison with alternative management. That criticism does not itself establish that NEER155 is incorrect, but should be considered alongside the review and its underlying studies.	**Q8, Q12–15, Q28(e)**
Natural England (2026), *Schedule 2 Species Assessment Proforma – (Common) Snipe, Natural England Technical Advice to Defra*, January 2026	Government / statutory species assessment	England, drawing on wider UK evidence	Status, pressures and evidence relating to common snipe	Records evidence that grouse-moor management including predator control may benefit snipe, while also noting that the northern England predator-control experiment did not demonstrate the same benefit	Species-specific assessment. Identifies multiple pressures and demonstrates why findings for one study, management practice or species should not automatically be generalised	**Q8, Q9, Q12, Q14**
Stanbury, A.J. et al. (2021), *The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain*, British Birds, 114	National conservation-status assessment	UK	Conservation status of UK bird species	Used to identify upland species of conservation concern, including curlew, lapwing, black grouse, woodcock, hen harrier, merlin and ring ouzel	Red or Amber listing establishes conservation concern; it does not identify the cause of decline or demonstrate that a particular land use is responsible	**Q9**
Principles of Sustainable Gamebird Management and associated sector codes and guidance	Industry standards / voluntary guidance drawing together legal and good-practice requirements	UK game management	Standards covering sustainable game management and responsible practice	Demonstrates an existing architecture of voluntary standards against which uptake, implementation and environmental performance can be assessed	Existence of a code is not evidence that it has been implemented or that the intended outcome has been achieved. Effectiveness requires evidence of adoption, compliance and outcomes	**Q10, Q21**
Defra & Natural England (2025), *Heather and Grass Management Code 2025*	Official Government good-practice code	England	Planning and conduct of vegetation management, including burning and cutting, sensitive habitats, soil carbon and wildfire considerations	Provides an official example of an outcomes-based management framework and recognises that management techniques have different advantages, disadvantages and site applications	Government guidance rather than evidence of environmental outcomes. Compliance with the Code does not itself demonstrate biodiversity or wildfire benefit	**Q10, Q13, Q15, Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Game & Wildlife Conservation Trust (2026), membership survey concerning voluntary restraint on woodcock and snipe shooting	Practitioner / membership survey	UK shooting community	Reported uptake of voluntary restraint	Reports that 89% of respondents did not shoot woodcock before the recommended date and 92% did not shoot snipe before 30 September; relevant to whether voluntary guidance can influence behaviour	Membership survey subject to self-selection, self-reporting and representativeness limitations. Demonstrates reported behaviour among respondents rather than population-wide compliance or biodiversity outcome	**Q11**
Corry, D. (2025), *Delivering economic growth and nature recovery: an independent review of Defra's regulatory landscape*	Independent Government-commissioned review	Environmental regulation in England	Regulatory effectiveness, proportionality, outcomes, adaptability and relationships with regulated parties	Supports outcome-focused, proportionate and adaptive regulation and the principle that demonstrably good performers can receive greater autonomy or earned recognition	Not a review of grouse shooting and provides no ecological evidence about gamebird activities. Used solely for principles of regulatory design and implementation	**Q10**
Cottam, H. / Defra (2026), *Towards a flourishing uplands: phase 1*	Defra-published participatory / policy review	English uplands	Relationships between people, place, nature, governance and delivery in upland policy	Supports local knowledge, co-design, longer-term approaches and recognition that upland challenges are interconnected	Did not investigate gamebird regulation or establish ecological effects of grouse shooting. Used for governance and implementation propositions rather than ecological evidence	**Q11**
Defra (2025), *Environmental Improvement Plan 2025*	Government environmental policy and monitoring framework	England	Environmental targets, SSSI features, biodiversity indicators, climate adaptation, monitoring and evaluation	Supports outcomes-based management, monitoring, adaptive delivery and treatment of wildfire resilience as a climate-adaptation issue	Policy framework rather than primary scientific evidence. Establishes Government objectives and delivery principles rather than proving effects of particular management practices	**Q14, Q28(e)**
Defra (2026), *Environmental Improvement Plan: Annual Progress Report 2025 to 2026*	Government monitoring / progress report	England	Progress against EIP goals, actions and Environment Act targets	Relevant to emphasis on measurable delivery, monitoring, evaluation and multiple interacting pressures rather than simple attribution of protected-site condition to one land use	Programme-level reporting does not establish causation at individual protected sites and should not substitute for feature- and site-specific evidence	**Q14, Q28(e)**
Natural England SSSI unit-condition data for Moor House–Upper Teesdale	Official statutory monitoring data	Moor House–Upper Teesdale NNR / SSSI	Formal condition classifications of individual SSSI units	Used to illustrate the distinction between condition and causal attribution: MA review records five of 25 units as favourable and 20 within an unfavourable category	"Unfavourable" includes different trajectories, including unfavourable recovering. The data do not demonstrate that Natural England or current management caused the condition; historic and multiple current pressures may apply	**Q14**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Natural England (2021), *An update on another encouraging year for breeding Hen Harriers in England*, 13 August 2021	Official statutory-body breeding update	England / hen harrier population	Hen harrier breeding attempts, successful nests, fledged young and delivery of the Hen Harrier Action Plan	Records 31 breeding attempts, 24 successful nests and 84 fledged chicks in 2021 and provides context on developing population recovery	Single-year monitoring does not establish cause of longer-term population increase. Natural England continued to identify illegal killing and other bird-of-prey crime as a principal constraint on sustained recovery	**Q9**
Natural England (2023), Holmes, J., *Update on the Hen Harrier Brood Management Trial*, 16 March 2023	Official statutory-body interim trial assessment	England / brood-management trial	Changes in hen harrier nesting attempts during the trial	Records an increase from 12 nesting attempts in 2018 to 49 in 2022, with the increase occurring mainly on land managed wholly or partly for grouse shooting	Interim assessment produced before completion of the trial. At that stage Natural England stated that the relationship between brood management and the increase could not yet be established conclusively	**Q9**
Natural England (2026), *Hen Harrier Brood Management Trial Evaluation: The effectiveness of brood management as a mechanism for supporting hen harrier recovery*, NERR153	Government / statutory-body final scientific evaluation	Northern England / trial period 2018–24	Effectiveness of brood management in supporting hen harrier recovery	Natural England records substantial growth in wild nesting hen harriers, with the strongest increases on grouse moors where brood management was available, and concludes that availability of brood management appears likely to have led to more hen harriers breeding successfully on grouse moors	Does not conclude that brood management alone caused recovery. Illegal killing continued and remains a significant constraint. Findings support contribution rather than sole causation	**Q9, Q21**
Murgatroyd, M., Redpath, S.M., Murphy, S.G., Douglas, D.J.T., Saunders, R. & Amar, A. (2019), *Patterns of satellite tagged hen harrier disappearances suggest widespread illegal killing on British grouse moors*, Nature Communications, 10, 1094	Peer-reviewed spatial survival / satellite-tracking study	Britain / tagged hen harriers	Relationship between disappearance/mortality and use of grouse moors	Important evidence reporting an association between use of grouse moors and increased probability of birds dying or disappearing; authors concluded illegal killing was the most likely explanation for the observed pattern	Population-level spatial analysis does not establish the fate, perpetrator or circumstances in every individual case. The study recorded direct evidence of illegal killing in a smaller number of birds alongside a larger number of unexplained disappearances	**Q20–21**
Moorland Association satellite-tagged hen harrier register and analysis	MA-compiled observational dataset and analysis	Hen harriers tracked by Natural England and MA since 2002	Final transmissions, recorded fate and geographical classification of satellite-tagged birds	Used to examine what can reasonably be inferred from individual final transmissions and to demonstrate that unexplained disappearance/tag cessation also occurs away from driven-grouse land	Not peer reviewed. Final-location classification is not a substitute for Murgatroyd et al.'s spatial survival analysis and does not model exposure to grouse-moor habitat through time. The approximately 53%/47% comparison is descriptive and dependent on MA classification rules and denominators	**Q20–21**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Defra / Raptor Persecution Priority Delivery Group confirmed bird-of-prey crime incident data published through MAGIC (2017; covering 2011–15)	Official Government / multi-agency crime dataset	England and Wales	Geographical record of confirmed bird-of-prey crime incidents	Provides precedent for an authoritative public dataset based on defined confirmed incidents and supports the MA proposal for a transparent, regularly updated evidence base	Historical dataset and cannot describe current incidence of crime. MA notes that the stated intention to update it annually does not appear to have resulted in an equivalent current public dataset	**Q20**
Police / National Wildlife Crime Unit information and correspondence referred to in the response	Official operational / stakeholder information	England / UK wildlife-crime policing	Classification, communication and reporting of wildlife-crime information and information supplied to Government	Relevant to the MA request that confirmed offences, suspected incidents, intelligence, statistical inference and unexplained events are clearly distinguished in evidence used for policymaking	Operational information may be incomplete or legitimately constrained by investigation and intelligence sensitivities. MA correspondence records questions and concerns; it does not establish the incidence of wildlife crime	**Q20–21**
Game & Wildlife Conservation Trust (2020), Medicated Grit Guidelines: Best practice use of medicated grit, together with current GWCT best-practice guidance	Technical practitioner guidance	UK red-grouse management	Veterinary use of flubendazole, parasite monitoring, withdrawal periods, grit management and environmental safeguards	Relevant to distinction between lawful targeted use and misuse and to measures intended to reduce environmental and food-chain risk	Guidance is not evidence that all practitioners comply or that all environmental risks have been eliminated. Effectiveness depends upon implementation and veterinary oversight	**Q28(b)**
Meister, F.J., Williamson, L. & Hesford, N. (2025), *The Environmental Impact of Medicated Grit*, Game & Wildlife Conservation Trust	Rapid evidence assessment	Wider evidence potentially relevant to UK grouse moors	Potential environmental effects of flubendazole/fenbendazole	Identifies an important evidence gap under UK upland conditions. Review found little or no toxicity in most terrestrial evidence but clearer potential risks in aquatic environments and recommends further field research	Initial search found no directly relevant UK grouse-moor studies. Evidence had to be broadened to other contexts and should therefore not be treated as definitive proof of either safety or harm under grouse-moor conditions	**Q28(b)**
Lees, K.J. et al. (2026), *Wildfire size, severity and timing vary with dominant vegetation in open landscapes in England and Wales*, Ecological Solutions and Evidence, 7(3), e70254, DOI 10.1002/2688-8319.70254	Peer-reviewed empirical wildfire study	England and Wales; 206 wildfires	Relationships between vegetation type, management, wildfire size and severity	Provides direct observed-fire evidence. Reports larger fires in Molinia-dominated landscapes, greater severity with higher heather cover and significantly smaller fires in areas associated with managed burning than in unmanaged areas	Observational study; vegetation and management may be confounded. Too few fires in cut areas for robust testing and only a small number of visibly restored sites could be identified. Does not demonstrate that burning universally reduces wildfire severity or that restoration is ineffective	**Q28(e)**
Schoenecker, J. et al. (2026), *Widespread peat carbon losses driven by the 2025 Scottish megafire*, Nature Geoscience, 19, 763–766	Peer-reviewed wildfire / carbon study	Dava and Carrbridge fire, Scotland	Peat and vegetation combustion, drought, fuel conditions and carbon emissions	Demonstrates potential carbon consequences of severe peatland wildfire; approximately 84% of estimated carbon emissions were attributed to peat combustion	Single major Scottish fire. Does not establish what management intervention would have prevented or reduced the incident. Exceptional drought and soil-moisture conditions were central	**Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Denny, S. & Latham-Green, T. (2020), *What Impacts does Integrated Moorland Management, including Grouse Shooting, have on Moorland Communities?* A Comparative Study, report for the Uplands Partnership	Commissioned community / comparative social research	UK upland communities	Participation in grouse shooting, social impacts, community attachment, employment and rural life	Study involved 644 participants. Of 396 survey respondents living in moorland communities, 74% reported participating in shooting in some capacity. Relevant to evidence that participation extends beyond those who shoot and can be embedded within some upland communities	Commissioned by the Uplands Partnership and not a peer-reviewed population survey. Participation and respondents were self-selecting and results should not be assumed to represent all English upland communities	**Q29**
Latham-Green, T.L. (2020), *Understanding the social impact of participation in Driven Game Shooting in the UK*, Doctoral Thesis, University of Northampton	Doctoral mixed-methods social-impact research	UK driven-game-shooting participants	Social capital, identity, mental wellbeing, physical activity and social networks associated with participation	Provides the primary wider evidence base behind the 2,424-response participant survey and qualitative research concerning wellbeing, identity, outdoor activity and social connection	Participant-based observational research rather than a random population sample. Associations do not establish that driven game shooting itself caused observed wellbeing or identity differences. Participants who choose the activity may differ systematically from non-participants	**Q29**
Latham-Green, T., Hazenberg, R. & Denny, S. (2021), *Examining the role of driven-game shooting as a psycho-social resource for older adults in rural areas: a mixed-methods study*, Ageing & Society, 43(4), 902–928	Peer-reviewed mixed-methods social-science study	UK driven-game-shooting participants	Social capital, friendships, loneliness, identity and mental health and wellbeing	Provides peer-reviewed support for the social-impact findings. Reports a statistically significant positive association between participation and mental health and wellbeing across the 2,424-response dataset	Association rather than proof of causation. Participants were self-selected and the paper has a particular focus on older adults and rural wellbeing. Outdoor exercise, social interaction, pre-existing identity and other factors may contribute to observed effects	**Q29**
McMorran, R., Bryce, R. & Glass, J. (2015), Grouse shooting, moorland management and local communities: Community perceptions and socio-economic impacts of moorland management and grouse shooting in the Monadhliath and Angus Glens	Commissioned community survey / social research	Monadhliath and Angus Glens, Scotland	Community perceptions of grouse shooting, employment, local businesses and wider social effects	Provides comparative evidence that residents in the two study areas perceived community-level social and economic benefits from grouse shooting and associated management	Scottish case studies based substantially on reported perceptions. Results should not be assumed to represent all English upland communities, and reported benefits do not demonstrate that grouse shooting caused every observed community characteristic	**Q29**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Our Upland Living Heritage (2026), community-consent exercise supporting the Expression of Interest for *Community Grouse Conservation and Shooting in the UK* Inventories of Living Heritage, supported by the Moorland Association and partner organisations	Contemporary community-consent / experiential evidence	Upland communities and participants across the UK	Whether grouse conservation and shooting are recognised by a participating community as a continuing cultural practice involving shared skills, knowledge, traditions and identity	The exercise pre-dated the present Defra Call for Evidence and was designed to document community practice and consent rather than to respond to this regulatory process. Participants were asked to identify their role within the community and describe relevant traditions and practices. By 17 March 2026 more than 1,500 people had pledged support. “Community Grouse Conservation and Shooting” was subsequently listed in the official UK Living Heritage Expressions of Interest across England, Scotland, Wales and Northern Ireland. This provides contemporary evidence that a substantial community of participants itself attributes cultural and heritage significance to the activity.	Self-selecting community-consent exercise rather than a representative public-opinion survey. The number of supporters demonstrates the existence and scale of an engaged community of practice but cannot establish the proportion of upland residents or wider public who share those views. Listing as an Expression of Interest is not equivalent to formal acceptance or recognition on the final UK Inventory.	**Q29**
Moorland Association member evidence concerning red-grouse harvest, use and disposal	Organisational / practitioner evidence	MA membership / English and Welsh grouse moors	Practical experience of grouse harvest, routes into consumption and disposal	MA reports no evidence from members of a systemic disposal problem involving significant quantities of otherwise usable red grouse	Not a statistically representative national survey and no comprehensive quantitative dataset exists. Absence of reports to the MA does not establish that unnecessary waste never occurs	**Q25–27**
Game & Wildlife Conservation Trust National Gamebag Census and established grouse-counting practice	Long-running practitioner / monitoring datasets and methodologies	UK game management	Grouse population monitoring, breeding productivity and harvest records	Relevant to distinction between harvesting a naturally reproducing wild population and release-based systems, and to availability of voluntary population and bag data	Voluntary coverage is incomplete and may not represent every shoot or moor. MA does not rely upon it to provide a definitive national annual harvest figure	**Q25**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Appleton, H. & Smith, A. (2022), *Sustaining ecosystems – English grouse moors*, Game & Wildlife Conservation Trust, Fordingbridge	Sector-produced natural-capital evidence audit and policy analysis drawing on published scientific, government and practitioner evidence	English uplands / grouse-moor management	Contribution of grouse-moor management to environmental goods and services identified in Defra's 25 Year Environment Plan, including biodiversity, water, climate, wildfire and other environmental hazards; evidence gaps, management trade-offs and approaches to future delivery	Provides an earlier worked example of assessing grouse-moor management as a multi-functional land-management system rather than as a single pressure. The report structures evidence around upsides, downsides, challenges and opportunities and explicitly considers trade-offs between environmental outcomes. It also proposes moor-level environmental management plans, routine practitioner monitoring, collaborative delivery and adaptive rather than prescriptive management. The report records substantial peatland-restoration activity within grouse-managed landscapes, including approximately 7,000 km of historic drainage blocking and more than 27,000 ha of peatland restoration or re-vegetation, supporting the proposition that active grouse-moor management and peatland restoration are not necessarily mutually exclusive.	Produced by GWCT rather than an independent statutory or academic body and is primarily an evidence audit and policy framework rather than a peer-reviewed primary study. Individual ecological propositions should therefore be assessed against their underlying sources where material. Some quantitative figures, including restoration activity, rely partly on Moorland Association or practitioner reporting rather than independently audited national datasets. The report predates more recent evidence cited elsewhere in this response and should not be treated as superseding newer primary research.	**Q8, Q11, Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Game & Wildlife Conservation Trust (2020), Peatland Report 2020: A review of the environmental impacts including carbon sequestration, greenhouse gas emissions and wildfire on peatland in England associated with grouse moor management	Sector-produced secondary evidence review and policy analysis drawing on peer-reviewed research, government datasets, expert input and some MA spatial data	English upland peatlands / grouse-moor management	Peatland carbon stocks and fluxes; greenhouse-gas emissions; effects of vegetation management; pyrogenic carbon; wildfire; biodiversity; and evidence gaps relevant to peatland policy	Relevant to the treatment of carbon evidence in Q28(e). The review distinguishes carbon stock from carbon flux and highlights that conclusions can depend materially on the time horizon over which management effects are measured. It notes that much of the available upland carbon-flux evidence was based on a small number of sites and relatively short study periods; reports longer-term carbon-stock evidence showing peat and carbon accumulation under both burned and unburned wet blanket-bog treatments, with outcomes varying by management regime; and identifies pyrogenic carbon as a potentially long-lived carbon pathway not consistently incorporated into carbon assessments. Supports the MA's argument that comparisons between burning, cutting, grazing, rewetting and non-intervention should use comparable time horizons and, so far as possible, account for all material carbon gains and losses.	Produced by GWCT rather than an independent statutory or academic body and is a secondary review rather than a peer-reviewed primary study. Its conclusions reflect the evidence available in 2020 and should be considered alongside the newer evidence cited elsewhere in this response, including subsequent Natural England reviews and wildfire research. The report itself identifies substantial limitations in the underlying evidence, including small numbers of study sites, short study durations and incomplete carbon budgets. Evidence concerning pyrogenic carbon is relevant to completeness of carbon accounting but does not establish that prescribed burning necessarily produces a superior net carbon outcome.	Q28(e)

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Langholm Moor Demonstration Project (2014), *The Langholm Moor Demonstration Project: Seven Year Review* – December 2014, Langholm Moor Demonstration Project Ltd, ISBN 978-1-901369-23-6	Multi-partner scientifically monitored demonstration-project review; partnership comprising Scottish Natural Heritage, Buccleuch Estates, Game & Wildlife Conservation Trust, RSPB and Natural England	Langholm–Newcastleton Hills SSSI/SPA, south-west Scotland; 11,960 ha project area	Effects and progress associated with restoration of grouse-moor management, including habitat condition, hen harriers and other raptors, red grouse, waders, black grouse, predator management and achievement of SPA/SSSI and sporting objectives	Provides a documented protected-site counterfactual. The review records that after grouse shooting became unviable and keepering largely ceased, fox and crow numbers increased, red grouse declined further, breeding waders fell to very low levels, hen harrier numbers fell from their earlier peak and the SSSI/SPA were found to be in unfavourable condition. Following restoration of active management, the project met its heather-habitat targets and by 2014 exceeded its hen-harrier target; merlin and black grouse also increased. Red grouse nevertheless remained below the level required for commercially viable driven shooting. Relevant to the MA's argument that different species and protected features can respond differently within the same management system and that the counterfactual to changing grouse-moor management should be assessed explicitly.	The project itself states that it was a scientifically monitored demonstration project, not a controlled experiment. Multiple management and ecological factors changed over time, including habitat restoration, grazing, legal predator control and natural variation in prey and weather. The reported associations should therefore not be interpreted as demonstrating that grouse-moor management alone caused each observed change. Later peer-reviewed studies, including Ludwig, Roos & Baines (2019), should be used for specific species-response conclusions where available.	**Q9, Q12, Q21**

Grouse Moor Management Review Group (2019), Grouse Moor Management Review Group: Report to the Scottish Government, November 2019	Independent expert review commissioned by the Scottish Government, drawing on published research, statutory and NGO evidence, stakeholder submissions, questionnaire responses, oral evidence and field visits	Scotland / grouse-moor management and regulation	Environmental impacts and regulation of grouse-moor management, including evidence gaps, regulatory options, Codes of Practice, training, accreditation, illegal killing of raptors, bird-of-prey crime and predation, muirburn, Mountain Hares, medicated grit and wildfire	Provides independent evidence relevant to the treatment of uncertainty, the design of proportionate regulation, interpretation of wildlife-crime evidence and assessment of wildfire and vegetation management. The Group identified significant evidence gaps and contested science and considered a range of regulatory mechanisms rather than licensing alone. It stated that regulation should be transparent, accountable, consistent, proportionate, accessible, effective and targeted only where needed, and identified accreditation as a means of rewarding good behaviour. It recommended training and refresher courses for land managers to support compliance with Codes of Practice and development of an accreditation scheme following consultation with the grouse-shooting sector. In relation to illegal raptor killing, the Group recognised both that recorded incidents were unlikely to capture the full scale of illegal killing and that repeated satellite-tag disappearances could contribute to wider evidence of illegal killing, while distinguishing such inference from proof sufficient to establish an individual criminal offence. On wildfire, it identified increasing risk under climate change, recognised that prescribed burning can create risk if it escapes but can also	Scottish rather than English policy context and published in 2019, so subsequent evidence, legislation and regulatory developments must also be considered. The report is an expert review rather than a primary experimental study. Its recommendations on accreditation and regulatory design do not themselves demonstrate that those measures have produced biodiversity outcomes. Its conclusion that repeated satellite-tag disappearances were insufficient for criminal prosecution concerns proof of an individual offence and should not be interpreted as meaning that such disappearances have no evidential value at population or spatial level. The Group considered there to be substantial evidence of illegal raptor killing and recommended additional statutory regulation in several areas and a conditional route to licensing of grouse shooting; its findings should therefore be represented in their full context. Its wildfire assessment reflects the evidence available in 2019 and should not substitute for the more recent Natural England reviews and empirical wildfire research cited separately in this response.	**Q8, Q11, Q20, Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
				potentially reduce fuel loads and create firebreaks, identified possible roles for cutting and grazing, and recorded important uncertainty over how those interventions should best be combined. It also noted that burning and cutting are not operationally interchangeable on all sites.		
NPCC / National Wildlife Crime Unit correspondence with the Moorland Association (2024-26); Wildlife Crime Tactical Delivery Group Terms of Reference (2025); Bird of Prey Crime 4P Plan – NGO accountabilities	Official policing correspondence, operational governance documents and partnership framework	UK wildlife-crime policing / bird-of-prey crime	Classification and communication of wildlife-crime information; information supplied to Government; prevention and partnership arrangements; training, intelligence-sharing, crime reporting and best practice	Police correspondence confirms that the NWCU reports quarterly to Defra and that work of the satellite-tagged bird-of-prey taskforce could form part of a police response to a Defra consultation on gamebird shooting. The 4P Plan and TDG Terms of Reference provide official policing support for practices including prompt crime reporting and intelligence-sharing, use of police crime-recording standards, training, collaborative problem-solving, promotion of best practice and targeted prevention. Relevant to the MA's request that evidence supplied for policy purposes distinguishes confirmed offences, suspected incidents, intelligence, statistical inference and unexplained events, and to Q21's consideration of mechanisms intended to reduce wildlife-crime risk.	Operational and governance material rather than scientific evidence measuring the incidence of bird-of-prey crime or experimentally testing the effectiveness of particular interventions. Some information is legitimately constrained by live-investigation and intelligence sensitivities. Correspondence between the MA and police also records disputed matters and should not itself be treated as establishing the incidence or cause of wildlife crime. The 4P Plan and TDG framework identify intended approaches to prevention and partnership working but do not demonstrate that each intervention has produced a quantified reduction in offending.	**Q20-21**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Harrison, M. (2026), *Protecting the Wild: The work of the UK National Wildlife Crime Unit and the challenges of securing justice*, Magistrate, Autumn 2026, pp. 36-38	Public-facing practitioner commentary by a serving NWCU Detective Inspector	UK wildlife-crime investigation, prosecution and sentencing	The NWCU's role; difficulties caused by delayed discovery and causation; reliance on specialist ecological, veterinary and forensic evidence; licensing complexity; and the treatment and sentencing of wildlife offences	Supports the MA's request that Defra distinguish intelligence, suspicion and unexplained events from recorded crimes and offences established by evidence. The article itself acknowledges that evidential sufficiency may depend upon specialist evidence and nuanced questions about whether a licence existed or was breached	Explanatory and advocacy commentary rather than a technical report or primary study. It provides no underlying data and does not quantify offending, test hotspot designations or establish the prevalence of organised criminality. It represents the published account of its author and should not automatically be treated as a formal NWCU evidential assessment	**Q20**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
RSPB (2020), AGM statement on review of our gamebird shooting policy, 10 October 2020, pp. 1–2; and RSPB (2020), Gamebird Shooting Policy Review – Q&As, updated 17 December 2020, pp. 6, 8 and 15.	Organisational policy review, stakeholder-consultation material and interpretation of existing evidence; not primary scientific research	UK gamebird shooting, with specific reference to driven grouse shooting and the Langholm Moor Demonstration Project in south-west Scotland	Conservation benefits and risks of shooting-related land management; interpretation of Langholm; lawful generalist-predator management; raptor predation and the economic viability of grouse shooting; dependence of management on shooting revenue; hen-harrier conservation; and proposed regulatory reform.	Records the RSPB's recognition that land well managed for shooting can provide considerable wildlife benefits and that it has common ground with well-managed shoots (AGM statement, p. 1). The Q&A acknowledged that lawful control of widespread predators can improve some species' breeding success in the short term, and that loss of shooting rights could greatly reduce revenue supporting management (p. 8). Referring to Langholm, it recognised that, in some situations, birds of prey can reduce grouse numbers until shooting and its underpinning management become economically unsustainable (p. 15). These statements support the MA's case for assessing lawful conflict-management measures, the funding and replacement of beneficial management, and the effects of individual practices. The Q&A also described potential compatibility between wider public benefits at Langholm and modest grouse bags, and diversionary feeding as a legal, highly successful approach that helped deliver the productive hen-harrier population required for SPA obligations (p. 6).	Organisational policy material and interpretation of existing evidence, published in 2020; it should be assessed alongside the underlying Langholm reports and subsequent research. The RSPB also advocated licensing and tighter regulation. Benefits are conditional on well-managed shooting. Predator-control benefits are qualified by species, the short term and wider ecosystem effects; the RSPB also sought ways to reduce predation without predator control. The raptor-predation statement applies only "in some situations" and does not endorse brood management. The revenue passage explains licence withdrawal's intended deterrent effect and does not establish that withdrawal necessarily causes biodiversity loss. The discussion of modest grouse bags does not demonstrate that Langholm achieved commercially viable driven shooting or financially sustainable management.	**Q8, Q9, Q12, Q21**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Denny, S. (2025a), *Conserving Birds and Nature in Wales: Land Management Regimes and Taxpayers' Money*, Regional Moorland Groups	Commissioned mixed-methods case-study and evidence review, combining literature review, documentary analysis, repeated site visits and qualitative interviews with land managers, conservation practitioners and other stakeholders	Wales, with particular focus on the RSPB-managed Lake Vyrnwy reserve and the Berwyn SSSI/SPA/SAC; comparative consideration of other Welsh land-management regimes	Long-term upland land management, protected-site objectives, bird-population outcomes, grazing, predator management, peatland restoration, vegetation management, wildfire resilience and the relative performance of different management regimes	Provides a relevant protected-site comparator showing that long-term conservation-led management can produce mixed outcomes across habitats and species. Drawing substantially on RSPB management plans and monitoring information, the report records significant habitat-restoration activity and positive responses for some species, while other priority species, including curlew and black grouse, remained substantially below earlier abundance or management-plan targets. This supports the MA's argument that protected-site condition and species trends should be attributed to particular pressures and management mechanisms rather than assumed to result from a particular land-use label. The report also provides operational evidence from Lake Vyrnwy that peatland rewetting is being combined with active surface-vegetation management: mowing has been used to reduce potential fuel load as well as create varied vegetation structure, while rewetting, mowing and managed grazing are all expected to contribute to wildfire-risk reduction. This supports consideration of hydrological restoration and fuel management as potentially complementary interventions rather than automatic alternatives.	Commissioned by Regional Moorland Groups and not a peer-reviewed primary ecological study; the contents and conclusions are the responsibility of the author. The report combines secondary evidence with interviews and case-study material, so individual ecological propositions should be traced to the underlying monitoring data or primary sources where material. Lake Vyrnwy is subject to multiple management influences and constraints, including the RSPB, landowners, water interests, statutory bodies, grazing, forestry and historical management change; observed species trends therefore do not demonstrate that RSPB management caused either declines or improvements. The wildfire material is operational case-study evidence and records management expectations and practice rather than measured effects on wildfire probability, size or severity. Welsh findings should not automatically be assumed to transfer directly to English uplands.	**Q14, Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Defra (2023), *Independent Review of Protected Site Management on Dartmoor* (Fursdon Review), particularly paras 4.2–4.5 and 16.1–16.5	Independent Defra-commissioned review drawing on stakeholder evidence, field visits and expert panel assessment	Dartmoor, England; upland protected sites, principally SSSIs and SAC	Protected-site condition, adequacy of monitoring and baselines, attribution of ecological change, changing environmental pressures and the management of SSSIs	Provides independent support for distinguishing condition from causation. The review found incomplete historic monitoring, uncertainty about whether SSSIs were favourable when notified or their subsequent trajectory, unresolved causal relationships and a need for proper data capture, suitable baselines and scientific evaluation alongside condition assessment. It also cautioned that changing environmental conditions may make some historic management targets unattainable and against irreversible responses where ecological effects remain uncertain	Dartmoor differs ecologically and institutionally from grouse moors elsewhere in England and the review did not assess the effects of grouse shooting. Its relevance is methodological rather than evidence that the same causes operate on other protected uplands. It should therefore not be used to infer the cause of SSSI condition on grouse moors, but to demonstrate the limitations of condition status alone as evidence of causation	**Q11, Q14**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Office for Environmental Protection (2026), *Progress in improving the natural environment in England 2024/2025*, Chapter 9: Reduced risk of harm from environmental hazards, pp. 177–181	Independent statutory assessment of Government progress under the Environment Act 2021, drawing on Government reporting and wider evidence	England; national environmental policy and climate-adaptation context	Wildfire risk and resilience; adequacy of evidence, targets, coordination, policy development and adaptation measures	Provides independent support for treating wildfire resilience as a distinct and incompletely evidenced environmental outcome. The OEP states that assessing progress is difficult because clear long-term targets are lacking and that "resilience to wildfires in England is largely unevidenced". It records limited coordination between land managers and emergency services, inconsistent treatment of wildfire risk in local planning, and stalled progress on the Wildfire Strategy and Action Plan. This supports the MA's case that Defra should distinguish measured wildfire outcomes from intermediate indicators or proxies and should assess hydrology, vegetation/fuel management, prevention, access and response capability separately rather than assuming that any single intervention demonstrates overall wildfire resilience	The report is a national policy/progress assessment, not a primary experimental study of grouse-moor management or individual vegetation-management techniques. It also recognises peatland restoration as relevant to wildfire resilience. It should therefore be used to demonstrate the present evidence and policy gap, not as evidence that restoration is ineffective or that prescribed burning is necessarily the preferred intervention	**Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
IDEAL UK FIRE, *Toward Informed Decisions on Ecologically Adaptive Land Management for Mitigating UK FIRE*, Case for Support	Interdisciplinary research programme / research proposal involving UK universities and a wide stakeholder partnership including Government, statutory bodies, conservation organisations, utilities and land managers	UK fire-prone landscapes, including heathland, peatland, grassland and related upland and lowland systems	Comparative effects of wildfire-management tools on wildfire risk, carbon balance, biodiversity and habitat condition across different spatial and temporal scales; approaches include traditional and prescribed burning, mowing, managed succession and rewetting	Demonstrates that important questions about the relative costs, benefits and trade-offs of wildfire-management interventions remain unresolved and are the subject of active research. The project identifies "major uncertainties" and a limited and sometimes conflicting evidence base, and is designed to test whether different fuel-management interventions reduce landscape-scale wildfire spread, how short-term impacts compare with medium- and long-term outcomes, and how different interventions or combinations affect carbon and biodiversity. It also recognises that limited or no management may itself expose landscapes to severe episodic wildfire impacts. Supports the MA's case for site-specific, adaptive management and against assuming that any single intervention or proxy demonstrates overall wildfire resilience	This is a research programme rather than completed research, so its research questions are evidence of recognised uncertainty, not evidence that any particular intervention is effective or ineffective. It should not be cited as proof that burning reduces wildfire spread, that rewetting is insufficient, or that any one management tool is preferable. Its value is in demonstrating the acknowledged evidence gaps, need for comparative testing and importance of landscape-specific trade-offs. The document also involves MA and sector stakeholders, so it should be presented transparently as a collaborative research programme rather than as independent evidence of grouse-moor outcomes	**Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Carroll, J.P., Fuller, R.A. & McGowan, P.J.K. (eds) (2000), *Partridges, Quails, Francolins, Snowcocks, Guineafowl and Turkeys: Status Survey and Conservation Action Plan 2000–2004*, IUCN/SSC and World Pheasant Association	IUCN Species Survival Commission conservation action plan / international expert synthesis	Global; ground-dwelling gamebirds other than grouse, including partridges and quails	Conservation status and management of wild gamebird populations, including hunting, sustainable use, monitoring and habitat conservation	Provides international conservation precedent for treating harvest of wild gamebirds as a question of sustainability rather than harvest per se. The Action Plan recognises that hunting mortality does not necessarily cause long-term population decline where losses are sustainable, but stresses that sustainable-use programmes require population monitoring and management informed by population status. Relevant to the MA's distinction between the monitored harvest of a naturally reproducing wild population and systems based on rearing and release, and to the proposition that harvest should be adjusted according to biological evidence rather than assumed to be inherently sustainable or unsustainable.	Published in 2000 and prepared principally from evidence available in the late 1990s. It does not cover grouse directly and should not be used as evidence of the current status, productivity or sustainable harvest level of English red grouse. Its relevance is principally the general conservation-management principle that wild-gamebird harvest should be monitored and demonstrably sustainable. More recent species-specific and UK evidence should determine present-day conclusions	**Q25**
Storch, I. (ed.) (2007), *Grouse: Status Survey and Conservation Action Plan 2006–2010*, IUCN Species Survival Commission / WPA-BirdLife-SSC Grouse Specialist Group	IUCN SSC species-group conservation action plan / international expert synthesis	Global grouse populations, including British red grouse (Lagopus lagopus scoticus)	Status, threats, hunting, habitat management and conservation requirements of the world's grouse species	Provides grouse-specific international conservation context for the management and sustainable harvest of wild grouse populations. The Action Plan includes British red grouse within its assessment and treats hunting as an established ecological, cultural and socio-economic feature across parts of the grouse range. It supports the principle that exploitation of wild grouse populations should be informed by population status and monitoring rather than by a predetermined harvest. It also provides historical independent recognition of the longstanding cultural and management significance of grouse hunting in Britain.	Published in 2007 and intended as a conservation action plan for 2006–10. It should not be relied upon for current red-grouse abundance, present harvest levels, current conservation status or proof that contemporary driven grouse shooting is sustainable. Its value is principally in the enduring management principles and historical context it records; present-day sustainability must be established using current population, harvest and ecological evidence	**Q25, Q29**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Council of Europe (2007), European Charter on Hunting and Biodiversity, Bern Convention; together with IUCN World Conservation Congress Resolution 4.026 (2008)	International conservation-policy / good-practice framework for sustainable hunting; subsequently welcomed and promoted through an IUCN World Conservation Congress resolution	Europe; hunting of wild birds and terrestrial mammals and its relationship with biodiversity conservation	Sustainable harvest; adaptive management; regulation; population and harvest monitoring; stakeholder participation; habitat conservation; responsible use of harvested wildlife; waste avoidance; cultural and social dimensions of hunting	Provides a directly relevant international good-practice framework for assessing sustainable hunting. Principle 3 requires harvest to be ecologically sustainable and links sustainable use to reliable science, local knowledge and adaptive management. The Charter also advocates understandable and proportionate regulation, stakeholder involvement, healthy habitats for harvestable populations, responsible utilisation of harvested wildlife and avoidance of waste; Principle 7 specifically requires that harvest be properly utilised and wastage avoided. This supports the MA's propositions that regulation, monitoring, practitioner responsibility and adaptive management should operate together; that harvest of wild red grouse should respond to population evidence; and that usable harvested birds should be treated as a food resource rather than unnecessarily discarded. IUCN subsequently identified the Charter as specific guidance on hunting and conservation and requested its members to promote it.	A non-binding good-practice framework, not primary ecological evidence and not specific to English red grouse. It does not demonstrate that current grouse shooting satisfies its sustainability criteria; that question requires evidence of population status, harvest, implementation and environmental outcomes. Nor does the Charter argue against regulation: regulation is integral to its sustainable-use framework. It should therefore be used as a benchmark for good governance and sustainable harvest, not as proof that additional regulation is unnecessary	**Q10, Q27**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Austin, L. (2019), *Grouse moor licensing in Scotland: Where next? A report for RSPB Scotland*, March 2019, particularly pp. 3 and 12–13.	Consultant policy analysis commissioned by RSPB Scotland; appraisal of regulatory options and proposed licensing arrangements.	Scotland / grouse-moor management and regulation, with reference to European hunting systems examined in an earlier Scottish Natural Heritage review.	Options for regulating grouse-moor management; the distinction between individual-hunter licensing and a proposed system directed at those controlling grouse-moor management; and the distinction between the existence of regulation and its effectiveness in securing sustainability.	Supports scrutiny of the comparability of overseas licensing arrangements and their applicability to England. Distinguishes the existence of regulation from whether it achieves sustainability. Relevant to the MA's request that Defra identify the activities and persons regulated, the problems addressed and the outcomes measured before drawing conclusions about the additional biodiversity benefits of a proposed licensing model (pp. 12–13).	The report expressly states that it represents the consultant's perspective and does not represent RSPB Scotland policy (p. 3). It supports licensing but does not evaluate conservation outcomes from an implemented grouse-moor licensing scheme. Its account of European systems draws on an earlier review. Published in 2019 in a Scottish policy context; it is not primary ecological research or evidence of the effects of subsequent legislation.	**Q10**

Thompson, P.S. & Wilson, J.D. (2020), *A review of recent evidence on the environmental impacts of grouse moor management*, RSPB	RSPB evidence review / secondary synthesis of published scientific literature	Principally UK uplands, especially England and Scotland; driven grouse-moor management	Environmental effects of grouse-moor management, including vegetation burning and wildfire, predator control, disease management, including medicated grit, biodiversity, cultural/economic context and identified knowledge gaps	Relevant because the RSPB review itself recognises that grouse-moor management does not produce a single uniform environmental outcome. It records that, in the absence of illegal raptor killing, management at Langholm was associated with benefits for hen harrier, curlew, golden plover and snipe, while also identifying substantial negative impacts associated with other practices. It is also important to the wildfire evidence because the review describes the science concerning managed burning as complex and contested and states that further evidence was required to determine the relative roles of managed burning, fuel reduction and peatland rewetting in mitigating wildfire risk and severity. The report is additionally relevant to interpretation of Langholm because its later statement that smaller grouse bags "would have been sustainable" should be distinguished from the project's predetermined driven-shooting viability objective, which was not achieved. Also relevant to medicated grit: the review reports laboratory evidence warranting concern about flubendazole and fenbendazole toxicity to aquatic organisms, alongside limited evidence of field concentrations sufficient to cause serious impacts. It identifies a lack of formal aquatic field studies and calls for research on other species and exposure routes. This supports distinguishing potential toxicity, actual environmental exposure and demonstrated ecological effects (pp. 22 and 31).	Produced by the RSPB as part of its policy review rather than as an independent systematic review, and it reflects the evidence available in 2020. The RSPB advocated statutory licensing and identified numerous environmental harms associated with intensive driven grouse management; those conclusions should be represented alongside the qualifications on which the MA relies. Its statements about what might have been sustainably shot at Langholm are retrospective interpretations rather than observed project outcomes and should not be substituted for the demonstration project's agreed success criteria. More recent evidence, including Natural England reviews and 2026 wildfire research, should take precedence where it updates the science. The assessment of medicated grit describes the evidence available in 2020. Its identification of limited field evidence does not establish environmental safety or demonstrate that the same evidence gaps remain today.	**Q12, Q28(b), Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Rayment, M. (2022), *Driven grouse shooting: Assessing the economic and social impacts of future options for grouse moor management*, report commissioned by the RSPB	Independent consultant report commissioned by the RSPB; evidence review, stakeholder consultation, seven case studies and policy-option appraisal	Great Britain; driven and walked-up grouse shooting and alternative grouse-moor policy scenarios	Economic, social and environmental consequences of grouse-moor management under three policy scenarios: business as usual, licensing and a ban on driven grouse shooting. Examines land-use and management responses, licensing costs, employment and community effects, biodiversity and ecosystem services, including the investment required for alternative management and the limitations of quantitative comparison between policy options.	Supports assessment of realistic alternatives to existing grouse-moor management, including changes in vegetation and predator management and geographically varying effects on wildlife, investment, employment, cultural heritage and community identity. Distinguishes driven and walked-up shooting as different financial and management models; equivalent outputs should not be assumed. Its Geltsdale case study illustrates differing species responses to conservation-led management. The licensing appraisal recognises that fees could prompt some moors to cease shooting and that licensing could accelerate land-use and management change beyond business as usual (pp. 70-73). It links the anticipated carbon, water-quality and flood-management benefits of a ban to ongoing restoration investment (p. 80). Major employment gains from peatland restoration and woodland planting are expected to be mostly short-term, followed by lower maintenance employment (pp. 74-75). These points support appraisal of actual regulatory costs, funded and deliverable alternatives, and the duration, location and continuity of replacement employment and management.	An independent consultant's report commissioned by the RSPB; it expressly does not represent RSPB policy. Its 2022 policy scenarios are prospective appraisals, not observed outcomes of subsequent licensing. The author acknowledges that evidence gaps and uncertainty prevented a robust quantitative assessment of alternative policies' costs and benefits (p. 82). Projections depend on assumptions about regulatory design, behavioural responses, future land use and investment. The report anticipates environmental benefits from reform, expects most businesses to absorb additional licensing costs, and considers moderate gamekeeping employment losses under licensing likely to be offset by new activity. It should not be presented as demonstrating inevitable closures or a general net loss from reform. Case-study findings are site-specific and do not establish that management change alone caused every recorded species trend.	**Q8, Q9, Q14, Q28, Q29**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
RSPB (2023a), *Economics of driven grouse shooting: Short form briefing*, particularly PDF pp. 2–4 and the table "Summary of expected impacts of policy options" on PDF p. 3.	Organisational summary of commissioned research and prospective policy appraisal, accompanied by RSPB policy recommendations; secondary evidence.	Great Britain; driven and walked-up grouse shooting and alternative policy scenarios: business as usual, licensing and a ban on driven grouse shooting.	Expected economic, social, land-management and environmental consequences of alternative grouse-moor policies, including changes in management, breeding waders, raptors, vegetation and species diversity.	Records the RSPB's recognition that changes to driven shooting can affect local employment and associated management. Its licensing scenario describes biodiversity trends as "similar but slightly magnified" compared with business as usual, which includes small declines in heather moorland, red grouse and breeding waders alongside a small increase in vegetation and species diversity. It also anticipates reduced illegal killing of raptors and possible benefits from improved regulation of heather burning. Supports assessment of realistic management alternatives and species-specific gains and losses, including the effects of proposed conditions on management supporting breeding waders.	A short-form account of the appraisal discussed under Rayment (2022), accompanied by RSPB policy recommendations; it should not be counted as a separate empirical study or independent corroboration of that appraisal. The scenarios are prospective assessments, not measured outcomes of an implemented licensing scheme. Predictions depend on regulatory design, management responses and subsequent land use. The briefing supports licensing and anticipates environmental benefits as well as trade-offs; it does not establish that licensing necessarily causes wader declines or an overall loss of biodiversity.	**Q8**
Thompson, P.S., Douglas, D.J.T., Hoccom, D.G., Knott, J., Roos, S. & Wilson, J.D. (2016), *Environmental impacts of high-output driven shooting of Red Grouse Lagopus lagopus scotica*, Ibis, 158, 446–452, DOI: 10.1111/ibi.12356	Journal-published Viewpoint and narrative synthesis of published evidence	UK uplands / high-output driven grouse shooting and associated management	Environmental benefits, adverse impacts and societal costs associated with intensive grouse-moor management, including predator control, vegetation burning, disease management and regulation	Provides one interpretation of the available evidence. The authors acknowledged benefits for heather moorland and some ground-nesting birds but concluded that there was growing evidence of negative environmental impacts and societal costs. Its subsequent publication, including its sources and reasoning, enabled its evidential selection and interpretation to be scrutinised and challenged	Written by RSPB scientists and presented as a Viewpoint rather than primary research or a systematic review. It does not report a formal search strategy, predetermined inclusion and exclusion criteria or structured quality assessment. It combines consideration of published evidence with interpretation and policy conclusions. It reflects the evidence available in 2016 and should be considered alongside subsequent research and contrary or qualifying evidence	**Q8**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Sotherton, N.W., Baines, D. & Aebischer, N.J. (2017), *An alternative view of moorland management for Red Grouse Lagopus lagopus scotica*, Ibis, 159, 693–698, DOI: 10.1111/ibi.12489	Journal-published response Viewpoint and narrative synthesis of published evidence	UK uplands / driven grouse shooting and associated moorland management	Reassessment of the evidence and conclusions presented by Thompson et al. (2016), including additional published studies, contrary findings, positive outcomes and areas of uncertainty	Demonstrates that authors may accept many individual observations and acknowledge published evidence of damage while reaching a materially different overall assessment when additional evidence, conflicting findings and uncertainty are included or weighted differently. The exchange provides a practical illustration of why Defra should publish its evidence base, inclusion and weighting decisions and analytical reasoning so that its conclusions can be tested against omitted or contrary evidence	Written by GWCT scientists and reflects a sector-linked institutional perspective. It is a narrative response rather than primary research, an independent replication or a systematic review, and does not report a formal search protocol or structured quality assessment. Its additional references and interpretations should themselves be assessed against the underlying studies. Neither this article nor Thompson et al. should be treated as providing a definitive synthesis of the evidence	Q8
Mason, L.R., Bicknell, J.E., Smart, J. & Peach, W.J. (2020), *The impacts of non-native gamebird release in the UK: an updated evidence review*. RSPB Research Report No. 66, RSPB Centre for Conservation Science, Sandy. Relevant pages: 15, 40–45 and 51–53.	RSPB evidence review with structured literature assessment and ecological-impact scoring.	UK; non-native pheasant and red-legged partridge release and associated management.	Ecological effects of released gamebirds and associated management; classification and scoring of positive and negative effects.	Provides a methodological example for Q8. Describes benefits of habitat management, supplementary feeding and legal predator control as “secondary”, while including them within a broad game-estate-management theme. Supports assessment of benefits by ecological significance and transparent grouping and weighting of evidence.	Concerns released gamebirds, not wild red grouse. Includes and positively scores management benefits. The terminology does not itself demonstrate that these benefits were formally discounted. Counts of positive and negative themes do not measure net environmental effects.	Q8
Madden, J.R. (2023), *A Review of the Ecological Effects of Gamebird Release and Management in Wales*. NRW Report No. 681, Natural Resources Wales, Bangor. Relevant pages: 15–16.	Evidence review commissioned by Natural Resources Wales; comparison of earlier reviews and assessment of subsequent research and submissions.	Wales, drawing on wider UK evidence concerning released pheasants and red-legged partridges.	Comparison of evidence-review methods, particularly the classification, grouping and interpretation of ecological effects.	Records GWCT’s criticism that grouping management benefits within one theme could distort the apparent balance of effects. Distinguishes this objection to interpretation from criticism of evidence collection or basic analysis. Supports the MA’s request for transparent grouping and weighting, with conclusions grounded in ecological outcomes rather than category counts.	Concerns released-gamebird management and is not direct evidence about wild grouse. Records a methodological dispute rather than establishing that the RSPB review is invalid. The author co-authored one of the reviews compared. The report’s views and recommendations are not necessarily those of NRW.	Q8

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Department for Environment, Food and Rural Affairs (2026), *Future of Rural England Report*, published 16 July 2026	Government policy report informed by official statistics, stakeholder evidence and cross-government workshops	Rural England; cross-government policy	Rural proofing; rural economic resilience; SMEs; traditional skills; community resilience; rural crime; monitoring and accountability	Supports the MA's position that rural impacts should be considered from the outset of policy development and assessed through published metrics. Its recognition that rural crime, including wildlife offences, is under-reported and poorly understood supports the need for better data, coordinated policing and a common authoritative evidence base distinguishing confirmed offences, suspected offences, intelligence and unexplained incidents.	Does not examine grouse shooting, grouse-moor management or licensing specifically. Does not quantify impacts attributable to the sector or provide a gamebird-specific crime dataset. It is relied upon as an authoritative statement of Defra's policy commitments and recognition of evidential deficiencies, rather than as primary evidence of the effects of grouse shooting.	**Q20, Q28(e), Q29**
Robertson, P.A., Park, K.J. & Barton, A.F. (2001), *Loss of heather Calluna vulgaris moorland in the Scottish uplands: the role of red grouse Lagopus lagopus scoticus management*, Wildlife Biology, 7, 37–42, DOI: 10.2981/wlb.2001.004	Peer-reviewed longitudinal observational study	Scottish uplands; land-cover change at 229 National Countryside Monitoring Scheme sites between the 1940s and 1980s	Changes in heather, woodland and other upland land cover in areas retaining grouse management compared with areas where grouse management ceased. Sites retaining grouse management lost an average of approximately 24% of heather cover, compared with approximately 41% where management had ceased; woodland expansion was also greater following cessation	Provides quantified evidence relevant to the land-use counterfactual. It demonstrates that the cessation of grouse management was associated historically with materially different habitat outcomes, including greater loss of heather and conversion to woodland or other vegetation. Supports the need for Defra to assess the likely replacement land use and its ecological consequences rather than assuming that existing habitat and management outcomes would remain unchanged	Observational rather than experimental evidence; association does not establish that cessation of grouse management alone caused the differences. The study concerns Scotland, historic change between the 1940s and 1980s, and policy conditions—including agricultural and forestry incentives—which may differ from England today. Heather retention is a habitat outcome and does not by itself demonstrate the response of individual species. The authors noted, however, that the compared groups did not differ significantly in land-cover composition at the initial 1940s baseline	**Q9**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Tharme, A.P., Green, R.E., Baines, D., Bainbridge, I.P. & O'Brien, M. (2001), *The effect of management for red grouse shooting on the population density of breeding birds on heather-dominated moorland*, Journal of Applied Ecology, 38, 439–457.	Peer-reviewed, large-scale comparative observational study. The authors included four researchers affiliated with the RSPB and one with the Game Conservancy Trust.	320 one-kilometre squares on 122 estates in eastern Scotland and northern England.	Compared the densities of 11 breeding-bird species on heather-dominated moorland managed for red grouse shooting with those on otherwise comparable moorland. Golden plover and lapwing densities were approximately five times higher, and red grouse and curlew densities approximately twice as high, on grouse moors.	Provides important landscape-scale evidence that grouse-moor management can be associated with substantially higher densities of some species of conservation concern. Its collaborative authorship also demonstrates that evidence originating partly from an organisation critical of aspects of grouse shooting can nevertheless identify positive ecological associations. It supports assessment by species and management practice rather than treating all effects of grouse management as uniformly positive or negative.	Observational association does not by itself demonstrate causation. The study could not isolate the separate effects of predator control, vegetation management and other estate practices, and residual differences between sites may have contributed to the results. The surveys are now relatively old, and the findings were not positive for every species examined.	Q9
Roos, S., Smart, J., Gibbons, D.W. & Wilson, J.D. (2018), *A review of predation as a limiting factor for bird populations in mesopredator-rich landscapes: a case study of the UK*, Biological Reviews, 93, 1915–1937; see also the 2022 corrigendum.	Peer-reviewed systematic review and evidence synthesis.	UK bird populations, considered in the context of the relatively high abundance of generalist predators in UK landscapes.	Examined predator trends and the evidence that predation limits bird populations. It found the strongest evidence of population-level limitation among ground-nesting seabirds, waders and gamebirds, while evidence was weaker or less consistent for a number of other groups.	Supports the proposition that predation can be a population-level constraint for some ground-nesting species and that lawful predator management may therefore have conservation relevance. It reinforces the need for Defra to assess what happens to predator-management capacity if grouse-moor management is reduced or displaced.	This is a UK-wide review, not a direct evaluation of grouse-moor management. Evidence strength varied considerably among species and studies. It does not establish that predator control is necessary, effective or proportionate in every location, and habitat condition and other pressures remain important. The corrected journal record should be used.	Q9
Game & Wildlife Conservation Trust (2019), *The Moorland Balance: The Science Behind Grouse Shooting and Moorland Management*, 2nd ed., written by Jennifer Brewin and edited by Dave Baines, Joe Dimbleby, Nick Hesford, Sonja Ludwig, David Newborn, Jonathan Reynolds, Adam Smith and Sian Whitehead. Game & Wildlife Conservation Trading Ltd, ISBN 978-1-901369-33-5.	Sector-produced scientific synthesis and evidence map, drawing together primary studies and other published material across multiple topics.	British uplands, including evidence from England and Scotland.	Reviews evidence relating to biodiversity, burning, peat formation, carbon, water, wildfire, rewetting, disease and predator management, raptors, mountain hares, alternative land uses and moorland economics.	Provides Defra with a consolidated route into a substantial body of scientific literature and identifies competing findings, management trade-offs and important counterfactual questions. It is particularly useful as an evidence map from which Defra can identify and appraise the underlying primary studies, including evidence that may not appear in narrower reviews.	It is a narrative synthesis produced by an organisation with an institutional interest in game and wildlife management, rather than an independently conducted systematic review. Selection and interpretation of evidence should therefore be tested against the underlying studies and other reviews. It was published in 2019, so Defra must also incorporate subsequent research and policy developments. It should not be treated as primary evidence for every proposition it reports.	Q8

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Marrs, R.H. et al. (2019), *Experimental evidence for sustained carbon sequestration in fire-managed, peat moorlands*, Nature Geoscience, 12, 108–112.	Peer-reviewed analysis of a long-term, replicated burning experiment.	Hard Hill experimental plots, Moor House National Nature Reserve, northern England. The plots had experienced different burning frequencies over several decades.	Examined long-term peat and carbon accumulation under unburned and periodically burned treatments. Peat and carbon accumulated under all treatments, although accumulation was significantly reduced under the most frequently burned treatment. The study also reported effects on vegetation composition and diversity.	Demonstrates that the relationship between managed burning and peat carbon is not adequately represented by a simple assumption that any burning necessarily prevents carbon accumulation. Supports distinguishing burning frequency, site condition and measured outcome, and considering long time horizons when assessing effects.	Evidence comes from one long-running experiment at Moor House, on a historically modified, gullied and Calluna-dominated blanket-bog site. The estimated reduction in carbon accumulation was statistically significant for the approximately ten-year burning treatment but not the twenty-year treatment. Estimates were derived from peat cores and do not constitute direct measurement of the complete greenhouse-gas balance or all carbon pathways. Interpretation depends on peat-core dating, carbon-content assumptions and the extent to which charcoal-related variation was captured. The unusually frequent shorter burning rotation and specific site conditions limit generalisation. The study does not establish that burning is universally beneficial or harmful to peatland carbon.	**Q28**
National Police Chiefs' Council (2026), FOI 3132/2026, *Raptor-persecution hotspot methodology and validation*, response dated 17 September 2026; Internal Review 3175/2026, dated 5 October 2026; and FOI 3214/2026, *Governance of raptor-persecution hotspot assessments*, response dated 27 October 2026.	Official NPCC Freedom of Information responses and internal review; recorded operational and governance evidence concerning wildlife-crime policing.	England; National Wildlife Crime Unit (NWCU) assessment of bird-of-prey crime hotspots, including the identification of areas and estates for operational engagement.	Recorded methodology for identifying hotspots; treatment of confirmed offences, suspected or reported incidents, intelligence and satellite-tag disappearances; validation and approval arrangements; involvement of territorial police forces; and processes for reviewing, correcting or removing hotspot designations.	Confirms that recorded hotspot methodology exists and that processes for reviewing, correcting or removing designations are held within wider operational documents. The NPCC explained that a senior officer on duty validates a crime hotspot and confirmed that police forces at hotspot locations are included in the process. It stated that no separate hotspot-specific validation or quality-assurance guidance is held, referring instead to wider policing procedures including CPIA and MoPI. Supports the MA's request that Defra establish the evidential classifications, validation arrangements and quality-assurance safeguards before using hotspot-derived material in sector-wide policy assessment.	Detailed methodology and review processes were withheld under FOIA section 31 on law-enforcement grounds. The explanation concerning senior-officer responsibility was provided outside the formal statutory disclosure. Confirmation that territorial forces are involved does not establish precisely what factual verification they undertake. The absence of separate hotspot-specific guidance does not establish that assessments are unvalidated, unreliable or procedurally deficient. These responses concern evidence governance rather than measuring the incidence or causes of bird-of-prey crime.	**Q20–21**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
National Police Chiefs' Council (NPCC) (28 September 2026), Environmental Information Regulations response EIR 008/2026, concerning the recorded status, classification and investigation outcomes of seven RSPB satellite-tagged Hen Harriers reported during 2025.	Official NPCC response under the Environmental Information Regulations, confirming information held by the National Wildlife Crime Unit (NWCU) and explaining the withholding of case-specific classifications and investigative assessments.	England. Seven RSPB satellite-tagged Hen Harriers reported during 2025, involving locations in northern England, including North Yorkshire, County Durham, Lancashire and the North Pennines.	Whether the seven incidents publicly identified by the RSPB had been reported to the NWCU and whether recorded classifications, assessments, investigation status and outcomes could be established. The NPCC confirmed that all seven incidents had been reported to the NWCU. It expressly stated that confirmation of referral does not establish that a criminal offence has occurred. The NPCC confirmed that it held further case-specific information but withheld the recorded classifications, investigative assessments, status and outcomes under EIR regulations 12(5)(b) and 12(5)(g), citing potential prejudice to wildlife-crime investigations and environmental protection.	Provides official confirmation of the distinction between an incident being reported to police and a criminal offence being established. Supports the MA's recommendation that Defra distinguish clearly between reported incidents, suspected offences, confirmed offences and cases in which responsibility has been established when assessing wildlife-crime evidence and the potential justification for additional regulation. Demonstrates the importance of clearly defined evidence categories and appropriate transparency about the basis of publicly reported wildlife-crime statistics, while recognising legitimate law-enforcement confidentiality.	The NPCC withheld the individual recorded classifications and investigation outcomes. Consequently, this response does not establish the investigative status of each bird or how many of the seven incidents police regard as confirmed offences, suspected offences or unexplained disappearances. It would be inappropriate to infer either that all seven incidents involved criminal offences or that the six birds not recovered were lost through non-criminal causes. The response does not establish that the police assessments are incorrect or that the withholding decision is unjustified. It identifies a limitation on what can be independently verified from the information disclosed. Natural England's separate EIR2026/11330 response identifies one confirmed illegal poisoning case; that evidence should be recorded separately and must not be overlooked.	Q20–21

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Ashby, M.A. (2020), The Effects of Managed Burning on Upland Peatland Biodiversity, Carbon and Water: A Review of the Post-Glaves et al. (2013) Evidence, including independent peer-review evidence statement by Dr Gavin Stewart	Evidence review of post-2013 research, with independent scientific peer review	UK upland peatlands / managed burning	Effects of managed burning on upland peatland biodiversity, carbon and water; quality and certainty of the underlying evidence; implications for policy, practice and future research	Relevant to the MA's argument that the peatland-burning evidence base contains substantial uncertainty and that policy should distinguish between well-supported findings and questions which remain unresolved. Stewart's independent peer-review statement identified difficulties arising from studies measuring different outcomes at different spatial and temporal scales, inconsistency between studies and risks of confounding and inappropriate causal attribution. It also identified adaptive management—different management approaches applied at appropriate sites and monitored for outcomes—as a possible response to uncertainty, rather than reliance on a single management prescription.	Secondary evidence review rather than a new primary experiment. The review covered literature available up to 2020 and should therefore be read alongside subsequent research. Stewart did not conclude that precaution was inappropriate: his evidence statement identified precautionary management as potentially appropriate on high-value sites and deeper peat where hydrological functioning is intact or readily restored, while identifying adaptive management as an alternative approach in other circumstances. The findings therefore support differentiated, evidence-led management rather than demonstrating that prescribed burning is appropriate on every peatland site.	Q28(e)
Wheeler, B., Eades, P., Tratt, R., Shaw, S. & King, L. (2023), Working towards the Development of Ecohydrological Guidelines for Blanket Bogs and Allied Minerotrophic Habitats (Phase 2), report to the Environment Agency	Environment Agency-commissioned technical / ecohydrological report	UK blanket bogs and associated peatland habitats	Ecohydrological variation between blanket-bog systems, including differences in water inputs, landscape position, slope, underlying geology and the capacity of sites to retain water	Relevant to the MA's argument that peatlands should not be treated as hydrologically uniform and that the same restoration intervention cannot be assumed to produce equivalent outcomes at every site. Supports consideration of site-specific hydrological potential when assessing rewetting, vegetation response and the appropriate combination of management measures. Helps explain why management and restoration should be adapted to the physical and hydrological characteristics of individual peatland systems rather than prescribed uniformly.	Technical report rather than a controlled experiment evaluating wildfire outcomes or comparing specific management interventions. It provides evidence about ecohydrological variation and site potential, not direct evidence that any particular burning, cutting or rewetting regime is superior. Its relevance to wildfire is therefore indirect: it supports the proposition that hydrological outcomes and vegetation responses may differ between sites, which should be considered alongside direct wildfire evidence.	Q28(e)

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Whitehead, S.C., Aebischer, N.J. & Baines, D. (2026), *Vegetation responses to experimental prescribed burning and cutting of heather on blanket peat sites managed as grouse moors in northern England*, Applied Vegetation Science, 29, e70066, pp. 1–15	Peer-reviewed, replicated Before-After-Control-Impact field experiment	Five blanket-peat sites managed for red grouse in the Pennine Hills, northern England	Effects over the first five years of prescribed burning, cutting with brash retained, cutting with brash removed and no-management controls on vegetation structure, heather, peat-forming vegetation and fuel loads	Provides recent primary evidence directly comparing prescribed burning and alternative cutting treatments. Management reduced heather cover and vegetation height relative to baseline and unmanaged controls and was associated with increases in Eriophorum vaginatum and Sphagnum. All management treatments reduced fuel loads, while retaining cut brash slowed Sphagnum recovery and was identified as potentially increasing wildfire-ignition risk. Particularly relevant because it post-dates NEER155 and therefore forms part of the evidence Defra should consider when comparing management alternatives.	Reports the first five years following management and the authors expressly identify a need for longer-term research. Conducted on five northern-English grouse-moor sites and should not automatically be extrapolated to all peatlands. Cutting produced broadly comparable vegetation outcomes to burning in the study, so the paper should not be presented as demonstrating that burning is generally superior to cutting. The reported wildfire implication of retained brash concerns potential ignition risk rather than direct measurement of landscape-scale wildfire occurrence, spread or severity.	**Q28(e)**
Baker, S.J., Belcher, C.M., Vitali, R., Little, K., Doerr, S.H. & Kettridge, N. (2026), *Assessing soil heating beneath prescribed burns undertaken by teams according to the first UK vegetation fire standards*, International Journal of Wildland Fire, 35(3), WF25224, DOI 10.1071/WF25224	Peer-reviewed primary field research	Eight prescribed burns across UK upland and lowland heath/moorland sites, including organic-rich peaty and mineral soils	Direct measurement of soil and above-ground temperatures and fire severity during prescribed burns carried out by trained teams in accordance with current guidance	Provides recent direct evidence concerning one specific mechanism by which prescribed burning may affect peatland carbon: heating of the underlying soil. Across the eight burns studied, organic-rich and mineral soils experienced limited heating; mean maximum soil temperatures were below 43.4°C and fire-severity assessments recorded no below-ground organic-matter loss. Supports the need to distinguish the effects of well-planned prescribed burning from those of uncontrolled wildfire and to assess individual causal mechanisms rather than transferring evidence between materially different fire types.	Eight burns conducted under mild weather conditions by trained teams following prescribed-burning guidance; results should not be extrapolated to poorly conducted burns, different weather/fuel conditions or all peatland settings. The study measured direct soil heating and below-ground organic-matter loss during the burns, not the complete carbon balance, biodiversity effects or long-term consequences of repeated management. It therefore addresses a specific pathway rather than demonstrating that prescribed burning has no wider environmental impacts.	**Q10, Q13, Q15, Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Heinemeyer, A., Ashby, M.A., Liu, B., Mycroft, A., Burn, W.L., Holmes, T., Lloyd Jones, A. & Andrews, L.O. (2025b), *Prescribed heather burning on peatlands: A review of ten key claims made about heather management impacts and implications for future UK policy*, Mires and Peat, 32, Article 12, DOI 10.19189/001c.143335	Peer-reviewed critical evidence review	UK heather-dominated peatlands / prescribed burning and alternative peatland-management approaches	Reviews the evidence underlying ten commonly made propositions concerning prescribed burning, peatland carbon, Sphagnum, hydrology, wildfire, water and biodiversity, and considers implications for evidence synthesis and policy	Relevant to the MA's argument that evidence concerning peatland management remains contested and context-dependent and that Defra should examine the strength, limitations and applicability of underlying studies rather than treating the conclusions of any one evidence synthesis as determinative. The authors emphasise site-specific and pre-management differences, temporal and spatial scale, confounding and the need to compare burning robustly with alternative management scenarios. They also specifically identify Natural England's 2025 managed-burning review, NEER155 (Noble et al., 2025), among evidence syntheses which they consider should be re-examined. This supports the MA's request that Defra consider the underlying studies, subsequent evidence and published methodological criticism rather than treating any one review as determinative.	Review paper rather than new experimental evidence and represents the authors' critical interpretation of a contested literature. Its criticisms of other reviews, including Natural England material, should not themselves be treated as demonstrating that those reviews are incorrect. Individual propositions should be checked against the underlying studies and contrary evidence.	**Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Heinemeyer, A. (2026), correspondence with the Moorland Association concerning Natural England evidence reviews, 31 October 2026. Unpublished personal communication held by the MA.	Expert correspondence / personal communication from a University of York peatland researcher concerning published and formally submitted methodological criticisms of Natural England evidence reviews.	England / Natural England evidence reviews concerning vegetation cutting and managed burning on upland peatlands, including NEER028 and NEER155.	Whether methodological criticisms concerning confounding, temporal and spatial scale, assessment of study quality, interpretation and omission of findings had previously been raised with Natural England and whether they were subsequently addressed in later evidence reviews.	Heinemeyer confirmed that related methodological concerns had been raised directly with Natural England, including through University of York representations concerning the vegetation-cutting review, and stated that expert input had subsequently been offered during development of the managed-burning review. In his assessment, the substantive concerns were not adequately addressed. He also identified particular issues concerning confounding, inappropriate inference across temporal and spatial scales, weighting of study quality and omission or interpretation of relevant findings. Relevant to the MA's request that Defra examine how substantive scientific criticism has been considered when relying on evidence syntheses.	Personal communication and the author's account of engagement with Natural England, not an independent finding about Natural England's review process. Natural England may take a different view of whether, and how adequately, the concerns were considered. Some underlying criticisms are published, including Heinemeyer et al. (2025b), while criticism of NEER028 was not separately published. The correspondence should therefore not be treated as demonstrating that NEER155 or NEER028 is scientifically invalid.	**Q8, Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
North Yorkshire Local Resilience Forum (2026), Report to the Fylingdales Moor Fire 2025: Part 1 - Response	Official multi-agency incident / debrief report	North York Moors, England; major 2025 upland wildfire	Scale, duration and environmental consequences of severe wildfire; critical-infrastructure risk; emergency-response capability; firebreaks and operational surface-fuel management	Demonstrates the potentially substantial environmental, operational, public-safety and critical-infrastructure consequences of severe upland wildfire. Records initial University of Exeter analysis estimating 54,258 tonnes CO_2e from direct peat-soil combustion. Also provides operational evidence that vegetation and fuel continuity were material to wildfire containment: Wildfire Tactical Advisors informed a hybrid firebreak approach involving surface-fuel separation to reduce surface-fire spread, while sections adjoining an existing fire track were cut to maximise separation between fuels. Supports the MA's case that wildfire assessment should distinguish hydrological condition from above-ground fuel management and consider firebreaks, access and response capability alongside restoration.	Incident/debrief evidence rather than an experimental comparison of land-management regimes. Does not establish that prescribed burning, cutting or any other preventative management intervention would have prevented or reduced the fire. The fire occurred during exceptionally warm, dry conditions and response was materially complicated by unexploded ordnance. The fire subsequently breached an existing strengthened firebreak, demonstrating that fuel separation and firebreaks are risk-reduction measures rather than guaranteed containment. Carbon figure is an initial estimate rather than a complete audited carbon account.	Q28(e)
Moorland Association / participating land managers (2026), Tintwistle Wildfire, July 2026 – operational response return (unpublished; reproduced at Annex 2)	Unpublished operational / practitioner evidence	Peak District, England; July 2026 Tintwistle wildfire	Personnel, person-hours and specialist equipment mobilised by participating estates and other contributors during wildfire response	Provides quantified operational evidence of locally retained wildfire-response capacity. The return records 48 personnel contributing 2,392 person-hours, alongside specialist off-road vehicles and firefighting equipment. Relevant to the counterfactual concerning practitioner presence, staffing, equipment investment and the capacity available to support emergency wildfire response.	Single-incident, unpublished practitioner return rather than a controlled or peer-reviewed assessment. Not all personnel recorded were gamekeepers. It does not establish that grouse-moor management prevented the wildfire or reduced its size or severity. Equipment values should not be presented as the marginal cost of responding to the incident. The underlying return is supplied at Annex 2 so that Defra can inspect the evidential basis directly.	Q28(e)

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Scottish Land & Estates (2025), *The Response to the Carrbridge and Dava Wildfires by Land-Based and Rural Businesses: A Report for the Scottish Government*, 16 July 2025	Sector-produced targeted practitioner survey / operational wildfire report	Carrbridge and Dava wildfires, Scotland; survey of 34 respondents from land-based and rural businesses involved in the 2025 response	Scale and nature of privately provided wildfire-response capability; personnel, training and experience; specialist equipment; containment and suppression techniques; cooperation with emergency services; implications for retention of skills and resources	Provides quantified operational evidence of land-management capacity mobilised during a major wildfire. Records at least 101 employees, of whom 80 (79%) had practical muirburn experience, including 67 who had completed approved training. Respondents deployed substantial specialist equipment, including 34 ATVs and 27 fogging units, and reported techniques including tactical back-burning, fogging, leafblowers and creation of firebreaks. Relevant to the MA's counterfactual concerning practitioner presence, specialist skills, equipment investment and wildfire-response capability if the underlying land-management system materially changes.	Sector-produced and based on a targeted, self-reported survey rather than an independent or controlled study. Scottish legal and land-management context should not automatically be transferred to England. Does not demonstrate that muirburn reduced wildfire size or severity, or that future regulatory change will necessarily cause loss of skills or equipment. The estimated £3.094m equipment value is an indicative capital value of equipment deployed, not the cost of the wildfire response. SLE's policy recommendations and predictions concerning future licensing should be distinguished from the empirical survey findings.	**Q28(e)**
Macgregor, C.J., Ewing, H., Franks, S.E. et al. (2026), *Review of Curlew-focused conservation interventions in the UK and Western Europe, and assessment of intervention scenarios using population modelling*, BTO Research Report 797	Statutory-funded research report (Defra / Natural England Species Recovery Programme via NE–BTO Research Partnership), combining practitioner questionnaire and population modelling	UK and Western Europe; case studies on proposed northern England Wader Recovery Areas and Wales	Effectiveness of curlew recovery interventions (fencing, predator control, habitat management) and levels of intervention required for population stability	Survey of 28 recovery projects found interventions improved nest success, but chick survival generally remained low. Modelling suggests about 1.06 chicks hatched per breeding pair is needed for stability. The high-productivity scenario is based on grouse-moor-adjacent farmland with intensive predator control (nest success 0.81), and modelled loss of that favourable management cut population growth from 18.3% to 8.0% a year. Notes grouse moors support an estimated 36% of the UK breeding curlew population	Questionnaire sample too small for formal statistics and interventions were usually combined, limiting attribution. Modelling rests on small datasets (e.g. 20 tagged birds; about 500 nest records) and scenarios are explicitly hypothetical. Report also notes contentiousness of predator control and evidence of illegal killing of raptors	**Q8, Q9**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Baker, S.J., Franz Bodenham, R.C., Little, K., Doerr, S. et al. (2026), *Vegetation management saved 7,000 tonnes of soil carbon losses in one of the UK's highest severity peatland fires*, Research Square preprint, DOI 10.21203/rs.3.rs-10626235/v1	Preprint of empirical wildfire / carbon study (not yet peer reviewed); NERC IDEAL UK Fire funded	Langdale Moor, North York Moors, England; 1,239 ha fire, August 2025	Burn severity, peat burn depth and soil carbon loss, and the effect of recent vegetation management patches	Estimates 25 kt of soil carbon lost, with burning up to 20 cm into peat. Recently managed patches (mostly burned) were 77% unburned or low severity, with no high-severity burning, and management is estimated to have saved almost 7 kt of carbon. Directly relevant to whether fuel management reduces wildfire severity and peat carbon loss	Preprint; findings may change at peer review. Single fire. Management type and timing inferred from satellite imagery and a limited transect; field access was restricted by unexploded ordnance, and carbon densities were modelled rather than cored. Does not show that management prevents wildfire	**Q28(e)**
Davies, G.M., Domènech, R., Gray, A. & Johnson, P.C.D. (2016), *Vegetation structure and fire weather influence variation in burn severity and fuel consumption during peatland wildfires*, Biogeosciences, 13, 389–398, DOI 10.5194/bg-13-389-2016	Peer-reviewed empirical field study	British moorland wildfires, 2011–2012	Drivers of burn severity, fuel consumption and carbon release in peatland wildfires compared with prescribed burns	Burn severity varied up to 1.7-fold within fires; surface fuel consumption was a linear function of pre-fire fuel load; carbon release was 0.36–1.00 kg C m^{-2}. Flammability of moss and litter layers may explain higher carbon release in wildfires than prescribed burns, and drier moorland types were at greater risk of severe burns than blanket bog	Limited number of wildfires sampled. Comparison with prescribed burns relies on published estimates rather than paired measurements. Does not directly test whether management reduces wildfire occurrence or extent	**Q28(e)**
Noyes, P., Winn, V., Jarrett, D. & Wilson, M. (2026), *Can upland agri-environment schemes in England support Curlew recovery? A review of current scheme options with farmer perspectives*, BTO Research Report 815	Research report (Defra Farming in Protected Landscapes funded, with Yorkshire Dales National Park Authority) combining policy review and qualitative farmer interviews	Yorkshire Dales, principally Wensleydale (upland farmland and grouse-moor mosaic), England	Whether ELM options (SFI and Countryside Stewardship Higher Tier) meet curlew breeding requirements, and farmer views and costs of interventions	Found no SFI or CSHT option provides for lethal predator control and schemes cannot fund facilitators or multi-holding agreements. Notes the intensive, experienced predator control delivered by grouse-moor gamekeepers has rarely been replicated elsewhere. All participating farmers supported lethal predator control in ELM. Relevant to the counterfactual of reduced grouse-moor management and to wader outcomes	Small sample (18 farmers, 11 farms) already engaged with a wader project, so views may not represent the wider farming community. Scheme review is theoretical rather than based on breeding-outcome data. Cost estimates are indicative	**Q11, Q15**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Baines, D. & Aebischer, N.J. (2026), *High and stable Eurasian Curlew Numenius arquata numbers on low-intensity farmland and moorland managed for Red Grouse Lagopus scotica recreational shooting in northern England*, Bird Study, DOI 10.1080/00063657.2026.2685164	Peer-reviewed field survey and nest-monitoring study	Upper Teesdale, North Pennines National Landscape, England; 114 1-km squares surveyed 2020–21; nest cameras 2022–23	Curlew abundance by habitat, breeding success, clutch predators and population trend in a grouse-moor-dominated landscape with legal predator control	Estimates 1,764 curlew pairs (about 3% of the UK population). Blanket bog managed by burning or cutting held more than twice the curlew density of unmanaged bog. Curlews fledged about 1.0 chick per pair (1.1 across seven grouse moors), roughly double the 0.5–0.6 needed to sustain numbers, and repeat surveys about ten years apart showed stable numbers (non-significant −3% change) against a national decline of about 49% (1995–2021)	Observational study without an unmanaged comparison landscape in the same design; habitat, altitude, farming and management are intertwined, so effects cannot be attributed to predator control or vegetation management alone. Fledging success came from adult behaviour in a single year with an assumed brood size. Authors are GWCT-affiliated and funding came via GWCT donations, including a local estate. Paper acknowledges illegal killing of raptors on some grouse moors as a possible confounder	**Q8, Q9, Q14**
Andersen, R., Bischoff, M., Johnstone, H. & Large, D. (2026), *Active peatland and peatland condition*, NatureScot Research Report 1404	Statutory-body commissioned research report (NatureScot)	Scotland; planning and development-on-peat context	Definitions of 'active' and 'functioning' peatland, peatland condition assessment methods, and a condition tool for the Scottish Planning Biodiversity Metric	Examines how definitions and condition concepts for peat and peatland can affect regulatory classification, including ambiguity around 'active' peat formation and the use of threshold-based definitions. Relevant to the MA's argument that protected-site and peatland assessment should identify the ecological feature and causal pressure rather than rely on a single proxy or threshold.	Prepared for Scottish planning and development rather than grouse-moor management. The proposed condition tool was tested on synthetic scenarios and includes normative scoring choices; the authors state that the report does not necessarily represent NatureScot policy. Transfer to English protected-site regulation therefore requires caution.	**Q14**
Heinemeyer, A., Morton, P.A., David, T., Holmes, T., Jones, A.L. & Liu, B. (2025a), *Ecological implications of changes in vegetation elemental composition under different heather (Calluna vulgaris) managements on British blanket bog*, Journal of Environmental Management, 392, 126720	Peer-reviewed long-term replicated field experiment with before-after control-impact design	Three blanket bog grouse moors in northern England (Nidderdale, Mossdale, Whitendale), ten years	Effects of burning, cutting and no management on nutrient content of heather and cotton-grass	A ten-year replicated field experiment found that burning, cutting and non-management produced different effects on the elemental composition and nutritional quality of heather, with treatment differences generally diminishing as vegetation recovered. Relevant to demonstrating experimentally that alternative vegetation-management treatments are not ecologically interchangeable and that effects change through time.	Three northern English blanket-bog grouse moors and a single management event. The study measured plant chemistry rather than bird abundance, livestock performance, carbon balance or biodiversity outcomes. Cotton-grass sampling lacked a pre-management baseline. Funding and declared affiliations should be considered alongside the study design and results.	**Q8, Q12, Q14, Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Minsavage-Davis, C.D., Davies, G.M., Haugum, S.V., Thorvaldsen, P., Velle, L.G. & Vandvik, V. (2024), *Development and evaluation of generalized fuel models for predicting fire behaviour in northern European heathlands*, iForest, 17, 109–119, DOI 10.3832/ifor4394-017	Peer-reviewed fuel-modelling study using field fuel data and fire behaviour simulation	England, Scotland and Norway; 296 fuel samples across heathland and blanket mire	How heathland fuel structure varies with vegetation age and habitat, and the resulting predicted rates of fire spread	Produced five generalised fuel models and found that mature and tall building-stage heather produce much the highest predicted rates of spread, while blanket bog communities produce the lowest. Concludes that unmanaged Calluna represents a greater wildfire hazard and that management burning may be an appropriate tool for reducing wildfire risk, while noting that restoration raising water tables may reduce hazard in the longer term. Moss and litter layers, up to 90% of the fuel load on bog, sharply increase spread when dry	Fire behaviour is modelled using the Rothermel system rather than measured, although predictions were validated against 27 experimental burns. Analysis covers the dormant season only, and fuel sampling methods and grazing regimes differed between the UK and Norway. It does not measure whether burning reduces wildfire extent in practice	Q28(e)
Szczygieł, R., Tyburski, Ł., Kwiatkowski, M. & Czubak (2025), *Controlled burning as an active method of protecting heathlands – methodology of the procedure*, Folia Forestalia Polonica, Series A – Forestry, 67(4), 313–321, DOI 10.2478/ffp-2025-0024	Peer-reviewed methodological article with supporting monitoring results	Dry heathland (Natura 2000 habitat 4030) on former military training ground, Przemków Forest District, Poland	How to plan and conduct controlled burning safely as an active conservation method, and its ecological effects	Provides an independent European example of controlled burning used as a conservation tool, with burning legalised for active conservation in Poland in 2016 because mowing, grazing and turf stripping proved inadequate or too costly. Monitoring found about 85% vegetative regeneration of heather in the first year, a habitat-appropriate mosaic after five growing seasons, and no reduction in plant, fungal or invertebrate diversity. Also sets out planning, weather windows, crewing and training requirements comparable to UK burning codes	Polish lowland dry heath on mineral soils rather than blanket peat, so carbon questions do not arise in the same way. Chiefly methodological guidance rather than a controlled experiment, drawing on three pilot burns, and the five-year monitoring results are reported from an unpublished manuscript	Q10
Doerr, S.H., Girona-García, A., Sánchez-García, C., Badía-Villas, D., Bryant, R., Dickson, M.B., Hsieh, R., Mataix-Solera, J., Miesel, J.R., Robichaud, P.R., Stoof, C.R. & Santín, C. (2025), *Soil heating during wildfires and prescribed burns: a global evaluation*, International Journal of Wildland Fire, 34(12), WF25103	Peer-reviewed global evidence compilation and evaluation	Global, across vegetation types including shrublands	How much soils actually heat, and for how long, during wildfires and prescribed burns	Provides an international benchmark demonstrating wide variation in soil-heating intensity and duration between wildfires and prescribed burns according to vegetation, fuel, soil and fire conditions. Relevant to distinguishing UK cool prescribed burns from materially different fire contexts.	Global compilation spanning very different vegetation and fire types, so findings are not directly transferable to UK cool burns on peat. Applicability depends on fire behaviour, fuel, soil type, measurement depth and other site conditions.	Q13

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Rainsford, F.W., Campedelli, T., Londi, G. et al. (2026), *Restoring Mediterranean heathlands for declining birds: Initial responses to mosaic cutting and prescribed burning in the Natura 2000 LIFE program*, Journal of Applied Ecology, 63, e70283	Peer-reviewed five-year field study with reference areas (EU LIFE Granatha project)	Pratomagno Natura 2000 site, Tuscany, Italy; European dry heaths	Bird and vegetation responses to a mosaic of mechanical cutting and prescribed burning	Found that mosaic cutting and burning regenerated heathland, reduced tree encroachment and supported declining open-habitat birds: the Dartford warbler and cirl bunting declined significantly in untreated reference areas but not in treated areas, and prescribed burning gave slightly faster heathland recovery than cutting. Supports the principle that small-scale, staggered management mirroring historic disturbance sustains bird populations, and that repeat management is needed because vegetation and fuel recover quickly	Mediterranean tree-heath on mineral soils, not UK blanket bog, and only short-term (five-year) responses. Treatment and reference blocks were not interspersed, which the authors acknowledge, and most treatment was mechanical cutting, so burning and cutting could not be compared statistically. Birds recently treated areas avoided in the first year, showing short-term disturbance effects	**Q8**
Arnell, N.W., Freeman, A. & Gazzard, R. (2021), *The effect of climate change on indicators of fire danger in the UK*, Environmental Research Letters, 16(4), 044027	Peer-reviewed climate projection study	United Kingdom, all regions; UKCP18 low and high emissions scenarios applied to the Met Office Fire Severity Index	How often conditions conducive to wildfire will occur across the UK under climate change	Projects increasing frequency of conditions conducive to wildfire across every UK region under future climate scenarios. Supports treatment of wildfire resilience as a climate-adaptation issue and the need to assess management options against changing rather than solely historic fire-danger conditions.	Models fire danger rather than ignition or realised wildfire occurrence, and does not test any particular land-management intervention. Human ignition and future management responses are outside the model, so the study identifies changing climatic hazard rather than the effectiveness of a specific mitigation measure.	**Q28(e)**
Muyima, G., Kleynhans, T.E. & de Lange, W.J. (2025), *Determining the direct benefits and costs of prescribed burning: a case study of the Langeberg Mountain veld area, Western Cape, South Africa*, Environmental and Sustainability Indicators, 28, 101048	Peer-reviewed financial cost-benefit analysis based on farmer questionnaires	Langeberg Mountains, Western Cape, South Africa; 13 commercial livestock and flower farmers	Whether prescribed burning pays for itself, and why farmers do not do it	Provides evidence that practical and regulatory factors can affect uptake of prescribed burning even where the intervention is estimated to have substantial economic benefits. Reported barriers included liability, permitting delays, labour requirements and transaction costs; relevant to Q11 and Q15 on adoption and deliverability of standards.	South African fynbos shrubland on mineral soils under a different legal system, not English blanket peat. Very small sample of 13 farmers and partly self-reported financial data. Numerical benefit-cost estimates should not be transferred directly to England.	**Q11, Q15**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Lewis, C.H.M., Little, K., Graham, L.J., Kettridge, N. & Ivison, K. (2024), *Diurnal fuel moisture content variations of live and dead Calluna vegetation in a temperate peatland*, Scientific Reports, 14, 4815	Peer-reviewed field measurement study	Blanket peat bog with wet heather moor, Cleveland Hills, North York Moors; 554 samples across seven days, March to August 2022	How the moisture content of heather and the underlying moss, litter and peat layers changes through the day and the season	Finds that current wildfire danger models do not perform well in heather, and that moss and litter moisture can rise above and fall below their ignition thresholds within a single day — so models using daily averages understate the risk. A 10% change in live heather moisture is the difference between a fire developing rapidly and failing to ignite, and ignited moss and litter can add 13–67% to available fuel. Live heather moisture was lowest in March. The paper describes the study site's centuries of rotational burning as creating a mosaic 'to improve grouse habitat and prevent the build-up of fuel', a neutral academic statement of what managed burning is for	A single estate over one season, with sampling days deliberately chosen to avoid wet antecedent conditions. It does not compare managed with unmanaged ground or test burning as an intervention, and ignition thresholds for dead heather remain unknown	**Q28(e)**
Bowgen, K., Jarrett, D., Franks, S., Langlois Lopez, S., Clark, N., Clark, J. & Noyes, P. (2025), *GPS-tracking breeding Curlews in the Yorkshire Dales: breeding success, home range size, and habitat use*, BTO Research Report 793	Peer-reviewed research report using GPS tracking with field ground-truthing	Bolton Estate and neighbouring farms, Wensleydale, Yorkshire Dales National Park; 19 tagged adults, 30 breeding attempts, 2023–2024	Breeding success, home range and habitat use of curlew across a moorland-to-farmland gradient	GPS-tracking study of breeding curlew across a moorland-to-farmland gradient in the Yorkshire Dales. Records breeding productivity and notes high-density curlew farmland adjoining moorland subject to landscape-scale predator control; relevant as supporting evidence on curlew recovery and management context.	Small, non-random sample and habitat differences in breeding success were not statistically significant. Improved-grassland nests in the monitored sample were protected from mowing, and the authors caution against extrapolating beyond the Yorkshire Dales. The study does not isolate predator control as the sole causal factor.	**Q9**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Mason, T.H.E., Littlewood, N., Willis, S.G. & Whittingham, M.J. (2025), *Predicting the combined impacts of future management and climate change on moorland bird species*, Journal of Applied Ecology, DOI 10.1111/1365-2664.70196	Peer-reviewed national modelling study	Upland moorland across Great Britain; 8,095 2-km grid cells; BTO Bird Atlas 2007–11 with UKCP18 climate projections	How red grouse, curlew and golden plover would respond to an end to grouse moor management, alone and combined with climate change	Predicts that if grouse moor management ceased, red grouse would decline 33%, curlew 11% and golden plover 6%; combined with climate change by the 2040s those figures become 52–62%, 25–32% and 30–37%. Regionally the North Yorkshire Moors would lose 88–92% of red grouse and 68–72% of golden plover. Abundance of all three species was positively associated with management intensity, at 2.3, 1.4 and 1.1 times unmanaged levels at median intensity. The authors also state the study species would decline strongly if woodland cover increased significantly	The authors describe the effect on curlew and golden plover as 'surprisingly weak': climate and land cover explained far more variation than management, and only about a third of each species was recorded on ground with evidence of burning. They conclude predator control would have only modest mitigatory effects for these two species, note that ending driven shooting would benefit controlled predators and raptors affected by illegal killing, and argue their findings question the long-term future of driven grouse shooting in England as climate suitability falls. Burning extent is a proxy for management because no national predator control data exist, and the analysis is correlative	**Q8, Q9, Q14, Q28(e)**
Collins, L., Trouvé, R., Baker, P.J., Cirulus, B., Nitschke, C.R., Nolan, R.H., Smith, L. & Penman, T.D. (2023), *Fuel reduction burning reduces wildfire severity during extreme fire events in south-eastern Australia*, Journal of Environmental Management, 343, 118171	Peer-reviewed observational analysis of fire severity mapping	Victoria, Australia; ten wildfires from the 2018-19 and 2019-20 'Black Summer' seasons	Whether fuel reduction burning moderates wildfire severity under extreme fire weather, and for how long	Found that fuel availability limited fire occurrence and severity within the first 18 months after treatment irrespective of fire weather, with severity moderated for 2–3 years in shrubland and 3–5 years in forest. One of the few studies testing fuel treatment under genuinely extreme conditions, and it shows the effect is real but time-limited. A 2024 meta-analysis of the western United States citing it found prescribed burning reduced subsequent wildfire severity by 62–72%	An important caution as well as a support: the landscape-scale effect was marginal and highly uncertain, fire weather became the dominant driver within 3–5 years, and average burn coverage inside treated perimeters was only 40%, leaving considerable residual fuel. Australian eucalypt forest and shrubland, with severity measured by canopy scorch, which does not transfer directly to treeless blanket bog	**Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Cui, S., Guo, H., Pugliese, L., Nielsen, C.K. & Wu, S. (2025), *Controlled burning of peat before rewetting modifies soil chemistry and microbial dynamics to reduce short-term methane emissions*, Communications Earth & Environment, 6, 346	Peer-reviewed laboratory incubation experiment	Degraded organic grazing soils near Viborg, Denmark; 90-day microcosms at 10°C and 20°C	Whether burning the soil surface before rewetting reduces the methane surge that follows rewetting	Laboratory experiment showing that controlled surface burning before rewetting materially altered short-term methane emissions and soil chemistry in degraded organic soils. Relevant as comparative evidence that greenhouse-gas responses to rewetting and fire can be context-dependent rather than having a universal direction of effect.	A 90-day laboratory incubation on degraded Danish agricultural organic soils, not a field trial or UK blanket bog study. The authors explicitly call for field testing before application and identify possible leaching and smouldering risks. It should not be used to advocate equivalent treatment in English peatlands.	**Q28(e)**
Ivison, K., Little, K., Orpin, A., Belcher, C.M., Clay, G.D., Doerr, S.H., Smith, T.E.L., Andersen, R., Graham, L.J. & Kettridge, N. (2025), *Unprecedented UK heatwave harmonised drivers of fuel moisture creating extreme temperate wildfire risk*, Communications Earth & Environment, 6, 727	Peer-reviewed national field measurement and fire behaviour modelling study	43 peatland, heathland and acid grassland sites across Great Britain; 5,845 samples over 2021–2023, with intensive sampling during the July 2022 heatwave	How the moisture of live heather, dead heather and organic ground layers responds to extreme heat, and what that means for fire behaviour	Normally the drivers of moisture in these three fuel layers are out of phase, which the authors say gives these ecosystems considerable resistance to wildfire. The July 2022 heatwave harmonised them: dead heather moisture fell to an average of 4.2% against 17.7% the previous July, and the organic layer reached its lowest in three years. Modelled rate of spread more than doubled against spring and was more than four times a typical July, and flame length rose above 1.5 metres, the threshold above which direct attack with hand tools is not permitted. Probability of ignition rose to 87%. The authors conclude that effective fuel management strategies will be required, and that fuel management will become essential because otherwise flame lengths and rates of spread will exceed traditional direct attack, calling for resources for firefighters and the land management community	The study does not test burning or any specific fuel management method, and does not compare managed with unmanaged ground: the call for fuel management is a conclusion drawn from the fire behaviour, not a test of it. Fire behaviour figures are BehavePlus simulations rather than observed fires, and the intensive sampling covers three days in a subset of regions, with the Scottish Highlands excluded as too wet	**Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Heinemeyer, A., Berry, R. & Sloan, T.J. (2019), *Assessing soil compaction and micro-topography impacts of alternative heather cutting as compared to burning as part of grouse moor management on blanket bog*, PeerJ, 7, e7298	Peer-reviewed plot-scale field experiment	English blanket bog grouse moor sites within the Defra BD5104 programme	Whether heavy machinery used for cutting compacts peat or damages surface micro-topography compared with burning	Finds no lasting plot-level effect of tracked cutting machinery on peat depth or bulk density under the conditions studied, while identifying site- and operation-specific caveats, including machinery resting and turning points, cutting height and microtopography. Relevant to comparison of burning with alternative cutting treatments rather than as evidence that either technique is universally preferable.	The findings largely address concerns about plot-level peat compaction from cutting under the conditions studied rather than providing evidence in favour of burning.	**Q12, Q14, Q28(e)**
Zhang, Q., Wang, Y., Xiao, Q., Geng, G., Davis, S.J. et al. (2025), *Long-range PM2.5 pollution and health impacts from the 2023 Canadian wildfires*, Nature, 645, 672–678	Peer-reviewed satellite, machine learning and chemical transport modelling study	Global, focused on North America and Europe; the 2023 Canadian wildfire season	How far wildfire smoke travels and what health burden it imposes across continents	The 2023 Canadian fires burned 15 million hectares, more than seven times the long-term annual mean, and produced the highest fire emissions in at least twenty years. Smoke crossed the Atlantic: annual mean fine particulate exposure rose by 0.41 μg/m³ across Europe, where 620 million people — 90% of the population — were affected. In the United States the Canadian fires contributed four times more particulate pollution than America's own fires that year. The authors estimate 64,300 chronic deaths across North America and Europe, of which 22,400 were in Europe. The clearest available demonstration that the health cost of a large wildfire is not confined to the burnt area	Canadian boreal forest at a scale no UK fire approaches, and a modelling study rather than direct measurement. The authors are explicit that mortality estimates vary by a factor of four for acute and five for chronic deaths depending on the exposure-response function chosen, that fire emission inventories differ substantially, and that chronic mortality had to be estimated using an all-source rather than wildfire-specific function because the epidemiology does not yet exist.	**Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Riss, C.S., Faulstich, S.D., Reuther, P.S., Metcalf, W.J., Darrow, L.A., Holmes, H.A. & Strickland, M.J. (2025), *Influence of fire characteristics on the associations between smoke PM2.5 exposure and acute cardiorespiratory health events*, Environment International, 201, 109577	Peer-reviewed epidemiological time-series study	Reno/Sparks, Nevada; 173,954 emergency and urgent care visits across the 2012–2019 fire seasons, with smoke attributed to 217 individual source fires	Whether the health effects of smoke differ according to the intensity and fuel type of the fire that produced it	Large epidemiological analysis testing whether characteristics of source fires modified associations between smoke PM2.5 and acute cardiorespiratory healthcare use. Relevant to the MA's whole-system assessment because it shows that wildfire smoke is a material health externality and that health effects can differ with fire characteristics.	Nevada forest, shrub and grassland context, not English heather moorland. Low-intensity fire was used as a proxy for prescribed-fire conditions and only a small number of documented prescribed fires contributed to exposure. Associations do not establish that any particular UK management regime would increase or reduce population health impacts.	**Q28(e)**
Jones, G.M., Spannuth, A., Chongpinitchai, A. & Hurteau, M.D. (2025), *Prescribed fire, managed burning, and previous wildfires reduce the severity of a southwestern US gigafire*, Forest Ecology and Management, 580, 122540	Peer-reviewed landscape-scale observational analysis	The 2022 Black Fire, Gila National Forest, New Mexico; over 131,000 hectares burned, 54% of it previously treated	Whether earlier fuel treatment changed how a very large wildfire burned	Previously treated area was the single most important predictor of high-severity fire at every scale examined, outweighing both fire weather and vegetation. A fully treated area experienced 51% less high severity fire than an untreated one, and where high-severity fire ran into a treated area severity fell by 21–55% within 250 metres of the boundary. Only about 4% of this very large fire burned at high severity, which the authors conclude made it restorative rather than catastrophic. Crucially they identify the reason fuel treatment often appears ineffective: as a fire grows, the proportion of the landscape treated must grow with it, and in most places treatments are far too small relative to the area burned	Ponderosa pine and mixed conifer forest in New Mexico, a fire-adapted system quite unlike blanket bog, with severity measured through canopy effects that do not transfer to treeless moorland. Observational rather than experimental, a single fire event, and much of the 'treatment' was previous wildfire rather than deliberate burning.	**Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Ahmad, A.A., Fletcher, K., Hesford, N. & Glendinning, L. (2025), *Metagenomics reveals fibre fermentation and AMR pathways in red grouse (Lagopus scotica) microbiot*a, BMC Microbiology, 25, 520	Peer-reviewed metagenomic sequencing study	Caecal samples from 15 red grouse shot on three managed Scottish moorland estates, 2023 season	The gut microbiology that allows red grouse to live on heather	The first characterisation of the red grouse gut microbiome using modern sequencing. Eleven of the twelve bacterial genomes reconstructed could not be matched to any known species, suggesting they are new to science. The bacteria carry the enzymes for digesting cellulose, hemicellulose and pectin and for breaking down the phenolic compounds in heather — the machinery that lets grouse live on a diet that is a quarter fibre and only 7% protein. The authors note that shot game birds provide these samples as a by-product, making research possible that would otherwise require killing birds	The study does not examine burning, management, wildfire or predator control and provides no evidence for or against any particular management practice. It is based on 15 birds from three estates with no unmanaged comparison; 89% of the sequence data were host contamination, and the authors identify the small number of recovered genomes as a principal limitation. Its relevance is confined to evidence of novel microbial diversity and research access, rather than to any management-effect claim.	Q28(c)
Brüggeshemke, J., Henning, O. & Fartmann, T. (2025), *Territory densities of heathland breeding birds are enhanced by fire on military training areas*, Global Ecology and Conservation, 58, e03447	Peer-reviewed comparative field study	Lüneburg Heath, northern Germany; 91 randomly selected 30-hectare plots across a fire-managed military training area and a grazed nature reserve; 2,496 bird territories of 11 characteristic species	Whether heathland managed by fire supports more breeding birds than heathland managed by grazing and cutting	Comparative German heathland study found higher densities of characteristic open-heathland birds on the fire-managed area and discusses how different management methods affect vegetation structure and nutrient cycling. Relevant as supporting evidence for the ecological importance of habitat heterogeneity and disturbance history.	German lowland dry heath on mineral soil rather than English blanket bog. Two sites differed in management history and other disturbance, including military activity, so fire effects cannot be isolated cleanly. Results should not be transferred to peat-carbon outcomes.	Q8
Rittl, T.F., Farsund, P.G., Pommeresche, R., Sørheim, K.M., Wibe, A., Hellekås, J. & Velle, L.G. (2025), *Traditional Norwegian farming practices drive biodiversity – a case study from coastal heathlands*, Agriculture, Ecosystems & Environment, 388, 109662	Peer-reviewed multi-taxon field study	Coastal Calluna heathland, Nerlandsøy, western Norway; pioneer, building and mature phases under winter burning and year-round sheep grazing	Whether burning and grazing reduce biodiversity or create the heterogeneity that sustains it	Multi-taxon Norwegian coastal-heathland study found distinct communities associated with different managed successional phases and higher overall biodiversity across the management-created mosaic than within any single phase. Relevant to the principle that habitat heterogeneity can support different species assemblages.	Single coastal-heathland system on shallow peaty/mineral soils, not deep English blanket bog. Burning and grazing effects could not be separated and immediate post-fire effects were not sampled. It should not be used to infer peat-carbon outcomes.	Q8

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Barros, B., Paiva, A.M., Azevedo, R., Alves, S., Esteves, F., Fernandes, A., Vaz, J., Alves, M.J., Slezakova, K., Teixeira, J.P., Costa, S., Almeida, A., Oliveira, M. & Morais, S. (2025), *Impact of wildfire emissions exposure on the associations between levels of lung injury, lipid peroxidation, DNA oxidation, and exposure biomarkers*, Science of the Total Environment, 993, 180012	Peer-reviewed occupational biomonitoring study	23 wildland firefighters in Bragança, northern Portugal, with paired pre- and post-exposure urine samples, 2021–2022	The physiological harm wildfire smoke does to the people fighting it	Paired biomonitoring of wildland firefighters before and after wildfire response found increases in biomarkers associated with lung injury, oxidative stress and combustion-product exposure. Relevant to the health and occupational externalities of severe wildfire response.	Small sample of 23 firefighters in Portugal, without an external control group, and a different vegetation and operational context. The study does not quantify health effects from UK moorland fires and does not imply that prescribed burning is exposure-free.	**Q28(e)**
Ji, S., Li, G., Cong, J., Xu, H., Han, D. & Gao, C. (2025), *Prescribed burning effects on carbon and nutrient cycling processes in peatlands of Greater Khingan Mountains, Northeast China*, Science of the Total Environment, 963, 178441	Peer-reviewed three-year field experiment	Peatland in the Greater Khingan Mountains, northeast China, burned annually each autumn to stop fire spreading into adjacent forest	Whether prescribed burning on peatland depletes or builds soil carbon	Three-year field experiment in north-east China reported greater soil organic carbon in low-intensity prescribed-burn plots than unburned plots and explored mechanisms involving vegetation recovery and ash effects. Used only to illustrate that peatland carbon responses to burning can be context-dependent.	Permafrost-influenced peatland with very different climate and soil conditions from British blanket bog; single site and short duration. The findings should not be used to advocate equivalent treatment in England.	**Q28(e)**
Baker, S.J., Perry, M.C., Betts, R.A., Schoenecker, J. & Pellegrini, A.F.A. (2025), *Spikes in UK wildfire emissions driven by peatland fires in dry years*, Environmental Research Letters, 20, 034028, DOI 10.1088/1748-9326/adafc6	Peer-reviewed national wildfire-emissions modelling study	United Kingdom, 2001–2021	Carbon emissions from UK wildfires and the contribution of peat combustion in dry years	Estimates about 776 kt of carbon emitted from fires burning peat in the UK between 2001 and 2021 (including about 24 kt from Saddleworth Moor), with emissions spiking in dry years. Relevant to the scale of wildfire carbon risk on peatland and the need for effective wildfire mitigation	Model-based estimates using a national bulk density and a soil-moisture scaler; later field work at Dava Moor found the model overestimated peat burn depth and bulk density there. Does not assess which management interventions reduce emissions	**Q28(e)**
Whitehead, S.C. & Baines, D. (2018), *Moorland vegetation responses following prescribed burning on blanket peat*, International Journal of Wildland Fire (ResearchGate record 327794635)	Peer-reviewed field study	Blanket peat moorland, northern England	Vegetation change, including heather and peat-forming species, following prescribed burning	Provides site-specific primary evidence on blanket-bog vegetation responses following prescribed burning, including responses of Sphagnum, cotton-grass and heather. Relevant to testing claims about post-burn vegetation recovery and protected-habitat condition.	Observational study of particular sites and burn histories rather than a randomised experiment. Results may not generalise across peat depth, hydrology, burning regime or site condition and do not demonstrate that burning is appropriate on every blanket-bog site.	**Q12, Q14, Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Denny, S. (2025b), *Wildlife Warden, Conservation Manager, Fire Fighter, and Educator: The Grouse Moor Gamekeeper in England in the Twenty-First Century*, March 2025, commissioned by the Regional Moorland Groups and the National Gamekeepers' Organisation.	Commissioned survey-based research report	58 English grouse moors totalling 444,370 acres with 194 keepers — 43% of the 140 moors in the Regional Moorland Groups	What upland gamekeepers actually do, and the economic, environmental and social effects of that work	Survey of 58 English grouse moors records gamekeepers undertaking habitat and wildlife management, wildfire preparedness and response, liaison and training with Fire and Rescue Services, and assistance on land not managed for grouse shooting. Relevant to practical skills, employment, community functions and wildfire-response capacity within the existing management system.	Commissioned, self-reported practitioner evidence rather than peer-reviewed research. The sample covered 58 moors and should not be treated as nationally representative. Returns were checked against incident logs, work records and estate accounts and unreliable returns were excluded, but reported figures remain sector-supplied and do not establish causal ecological effects.	**Q28(e), Q29**
Denny, S. (2026), *The Social Impacts of the Work of Grouse Moor Gamekeepers in England: New evidence from an ongoing 2026 research project*. Interim report prepared for the Moorland Association, October 2026. Unpublished.	Interim practitioner survey and interview evidence. The wider 2026 project includes interviews with four grouse-moor owners and 17 gamekeepers; the interim quantitative results reported here are based on survey responses from 75 gamekeepers working on 27 English grouse moors.	England; 27 grouse moors across six Regional Moorland Group areas. Survey evidence relates principally to activities undertaken during the 12 months October 2025 to September 2026.	Wider social and community roles undertaken by grouse-moor gamekeepers, including assistance to people in difficulty, liaison with police, recovery of stolen property, litter and fly-tipping clearance, and interventions intended to reduce disturbance, damage or unlawful activity on moorland.	Provides contemporary operational evidence that gamekeepers undertake functions extending beyond grouse shooting itself. Across the 27 moors, respondents reported 556 occasions assisting people in difficulty; 177 incidents reported to police, 90 calls for police support and 26 occasions assisting with recovery of stolen property; 3,920 occasions clearing litter and 88 clearing fly-tipping; and 9,105 occasions asking members of the public to alter behaviour in relation to access, disturbance, damage or unlawful activity. Relevant to Q29's consideration of the wider social and community impacts associated with grouse-moor management.	Interim, self-reported evidence from an ongoing study and a non-random sample of 27 moors. The sample has not been demonstrated statistically to be representative of all English grouse moors. The MA therefore does not extrapolate the reported totals nationally. The evidence does not establish the monetary value of the activities, the amount of public expenditure that would otherwise have been incurred, or that equivalent functions could not be delivered under a different land-management system. Reported incidents and interventions have not been independently verified for the purposes of this submission.	**Q29**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Warren, P., Land, C., Hesford, N. & Baines, D. (2020), *Conserving Black Grouse Lyrurus tetrix in southern Scotland: evidence for the need to retain large contiguous moorland habitat within a forest-moorland landscape*, Bird Study, 66, 494–502	Peer-reviewed long-term survey analysis	121 black grouse leks across southwest and southeast Scotland, surveyed between 1989 and 2018	What determines whether black grouse persist in a landscape of mixed forest and moorland	Long-term analysis of 121 black-grouse leks found persistence associated with larger contiguous moorland, more rough grassland and less conifer woodland; leks on driven-grouse moorland held more males. Relevant to habitat fragmentation, replacement land use and the ecological counterfactual for a Red-listed species.	Observational rather than experimental. Black grouse declined across the study region, including on managed grouse moors, so the study does not show that grouse management prevented the wider decline. Associations with management are correlative and other habitat and predator-management factors may contribute.	**Q9, Q14**
Whitehead, S., Weald, H. & Baines, D. (2021), *Post-burning responses by vegetation on blanket bog peatland sites on a Scottish grouse moor*, Ecological Indicators, 123, 107336	Peer-reviewed field chronosequence study	Langholm Moor, southwest Scotland; average peat depth 155 cm; 48 burns aged four to ten years plus 16 unburned controls across nine blocks	How blanket bog vegetation, and Sphagnum in particular, responds in the years after a prescribed burn	Provides site-specific evidence on post-burning vegetation trajectories on blanket bog. The study recorded higher Sphagnum cover on plots eight to ten years after burning than on unburned controls, higher cotton-grass cover across burned plots and no overall effect of burn age on plant or moss diversity. It is also cited in Q29 for its observation that gamekeepers hold specialist fire-management experience and equipment.	Observational chronosequence at one Scottish grouse moor using historic burn locations rather than a randomised experiment. Water table, weather, grazing history and other site factors may confound responses. The authors were GWCT-affiliated and the study should not be treated as demonstrating that burning is appropriate on all blanket bogs.	**Q12, Q14, Q28(e), Q29**
Baines, D. (2025), *Ten years on from a predator removal experiment in the English uplands: changes in numbers of ground-nesting birds and predators*, Journal for Nature Conservation, 84, 126788	Peer-reviewed resurvey of an earlier controlled experiment	Four plots of 9 to 14 km² around Otterburn, North Northumberland; experiment 2000–2008, resurvey 2018–2019	What happened to ground-nesting birds when predator control stopped	Provides long-term follow-up evidence from the Otterburn study area. About ten years after the earlier predator-control programme ceased, carrion-crow abundance and the fox index had increased while golden plover, snipe, red grouse and curlew had declined substantially; black grouse and grey partridge were no longer recorded on the study plots. Relevant to the potential population consequences of changes in generalist-predator abundance.	Observational resurvey of four plots in one study area rather than a continuation of the original controlled experiment. The paper notes wider national declines in some species, identifies released pheasants and partridges as a possible contributor to high generalist-predator densities, and records continuing illegal killing of protected raptors. It does not isolate predation as the sole cause of the later changes.	**Q8, Q9, Q12, Q14**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Ludwig, S.C., Aebischer, N.J., Richardson, M., Roos, S., Thompson, D.B.A., Wilson, J.D. & Baines, D. (2020), *Differential responses of heather and red grouse to long-term spatio-temporal variation in sheep grazing*, Biodiversity and Conservation, 29(8), 2689–2710	Peer-reviewed long-term study	Langholm Moor, southwest Scotland	How heather cover and red grouse respond to changes in sheep grazing pressure over decades	Long-term Langholm analysis examining relationships between sheep grazing, heather cover and red grouse. Relevant to identifying grazing as a separate vegetation driver and to the MA's argument that changes in heather condition can reflect multiple interacting pressures rather than one management practice alone.	Single Scottish site with a distinctive management history and observational long-term design. Changes in grazing, vegetation, grouse abundance and other environmental factors occurred through time, limiting attribution of all responses to one variable.	**Q8, Q12, Q14**
Fielding, D., Newey, S., Pakeman, R.J., Miller, D., Gagkas, Z., Matthews, K. & Smith, S.W. (2024), *Limited spatial co-occurrence of wildfire and prescribed burning on moorlands in Scotland*, Biological Conservation, 296, 110700	Peer-reviewed national spatial analysis	Scottish moorlands totalling 39,000 km²; muirburn mapped from aerial imagery for 2018, wildfire from satellite and fire service records 2015–2020	Whether wildfires happen on the same ground as prescribed burning	Scottish Government-funded spatial analysis found limited overlap between mapped prescribed burning and wildfire: 96% of mapped wildfire area occurred outside moorland identified as managed by muirburn. Relevant to the relationship between management systems, fuel treatment and wildfire occurrence.	The study expressly provides no mechanistic evidence that prescribed burning caused lower wildfire occurrence. Wildfire was not progressively lower with increasing muirburn intensity, and alternative explanations include grazing, prevention strategies, firebreaks, trained personnel, equipment and differences in recreational ignition pressure. Prescribed burns can also escape.	**Q13, Q28(e)**
Macgregor, C.J., Pearce-Higgins, J.W., Siriwardena, G.M., Wilson, M.W. & Robinson, R.A. (2025), *Assessment of recent Hen Harrier population trends in England through population modelling*, BTO Research Report 778, Natural England Commissioned Report	Commissioned population modelling study	England, covering the brood management trial period 2018–2024 and 221 recorded breeding attempts	What caused the rapid rise in English hen harrier breeding attempts during the brood management trial	Natural England-commissioned population modelling of 221 hen-harrier breeding attempts during 2018–2024. The modelling found that the direct productivity effect of brood management and diversionary feeding was too small to explain most of the increase in breeding attempts; the observed increase required improvements in survival, settlement or both. Reduced illegal killing or nest interference coincident with brood-management availability was identified as one plausible mechanism.	Population modelling cannot establish that survival actually increased or determine the extent to which illegal killing reduced. Illegal killing continued during the trial period. The report does not attribute recovery solely to brood management and should be used to distinguish direct productivity effects from wider conflict-mitigation mechanisms.	**Q9, Q20–21**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Etheridge, B., Summers, R.W. & Green, R.E. (1997), *The effects of illegal killing and destruction of nests by humans on the population dynamics of the Hen Harrier Circus cyaneus in Scotland*, Journal of Applied Ecology, 34, 1081–1105, DOI 10.2307/2405296	Peer-reviewed population study	Scotland / hen harrier population	Effects of illegal killing and nest destruction on hen-harrier population dynamics	Provides historical peer-reviewed evidence that illegal killing and nest destruction materially affected hen-harrier population dynamics. Used with later satellite-tracking and modelling evidence to establish the conservation risk which standards and conflict-management measures are intended to address.	Historic Scottish evidence from a different period and regulatory context. It establishes population-level effects but does not describe current incidence or prove the circumstances of any present-day individual event.	**Q20–21**
Ewing, S.R., Thomas, C.E., Butcher, N. et al. (2023), *Illegal killing associated with gamebird management accounts for up to three-quarters of annual mortality in Hen Harriers Circus cyaneus*, Biological Conservation, 283, 110072, DOI 10.1016/j.biocon.2023.110072	Peer-reviewed satellite-tracking / survival study	Britain; 148 satellite-tagged hen harriers, 2014–2021	Survival, causes of mortality and spatial/temporal association of mortality with grouse-moor use	Provides recent population-level evidence that illegal killing was a major demographic pressure on hen harriers and was strongly associated with use of land managed for grouse shooting. Forms part of the scientific baseline used in Q20–21.	Population-level statistical inference does not establish the fate, offender or circumstances in every individual case. The paper's policy recommendations are distinct from its empirical survival analysis and should be treated separately.	**Q20–21**
Baird, A.J., Evans, C.D., Mills, R. et al. (2019), *Validity of managing peatlands with fire*, Nature Geoscience, 12, 884–885, DOI 10.1038/s41561-019-0477-5	Peer-reviewed scientific comment / critique	UK blanket peatland / critique of the Moor House long-term burning experiment	Transferability and interpretation of experimental evidence on managed burning and peat-carbon outcomes	Provides published scientific challenge to the wider applicability of the Marrs et al. experiment, arguing that results from a degraded, gullied and Calluna-dominated site should not automatically be extrapolated to natural or rewetted peatlands. Used to demonstrate continuing scientific disagreement over interpretation and transferability.	Scientific comment rather than a new field experiment. It challenges interpretation and generalisation but does not invalidate the underlying measurements; it should be read alongside Marrs et al.'s response and the later evidence base.	**Q28(e)**
Fenton, J.H.C. (2022), *The contribution of Antarctic moss peat to the understanding of global peatland processes*, Antarctic Science, 34(3), 266–278, DOI 10.1017/S0954102022000141	Peer-reviewed conceptual / comparative peatland study	Maritime Antarctic moss peat, with relevance discussed to wider peatland processes	Natural peat growth, creep, erosion and peatland dynamics	Used narrowly to illustrate that visible peat erosion can occur through natural peatland processes and therefore should not, without additional causal evidence, automatically be attributed to a particular land-management practice.	Antarctic moss peat is a highly simplified and very different system from English blanket bog. The study does not establish that erosion on English moors is generally natural, benign or unrelated to management.	**Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
IUCN Species Survival Commission (2023), *IUCN SSC Guidelines on Human-Wildlife Conflict and Coexistence*, 1st edition	International conservation guidance / good-practice framework	Global / human-wildlife conflict and coexistence	Evidence assessment, causal reasoning, stakeholder participation, policy instruments, monitoring and adaptive management in contested wildlife-management situations	Provides methodological principles used in the response: avoid premature causal assumptions, consider ecological and social context, assess unintended consequences, involve affected stakeholders and use monitoring and adaptive management.	Not specific to grouse shooting, English uplands or any particular ecological effect. Used for decision-making and regulatory-design principles rather than as evidence of the environmental impacts of gamebird activities.	**Q8, Q10–11**
RSPB (2023b), *Time for change: Driven Grouse Shooting Advocacy Report – Commit to licensing*.	Organisational advocacy / policy report drawing on existing evidence	England / driven grouse shooting	RSPB case for licensing, environmental impacts and future policy options for driven grouse shooting	Used principally to distinguish organisational advocacy from underlying scientific evidence and, with the Rayment work, to illustrate the RSPB's own recognition that changes to driven shooting can have economic, management and species consequences.	Advocacy document rather than an independent scientific review or primary study. Its policy conclusion should not be counted as additional scientific evidence beyond the underlying sources on which it relies.	**Q8**
Office for National Statistics (2022), Habitat extent and condition, natural capital, UK: 2022 - mountain, moorland and heath indicators	Official national statistics / experimental natural-capital indicators	Great Britain / UK mountain, moorland and heath	Bird, moth and other habitat-condition indicators used in natural-capital accounting	Provides national context for wider moorland biodiversity trends, including the reported 12% increase in the unsmoothed moorland bird index from 1994 to 2019 and a fourfold increase in the moth-abundance index from 1991 to 2019.	The moorland bird index is an experimental natural-capital indicator, not the official bird index; results apply to broad mountain, moorland and heath habitats rather than specifically to grouse moors and conceal substantial species-level variation.	**Q9**
RSPB Annual Reserve Avian Monitoring dataset, published through the NBN Atlas; Moorland Association matched reserve/species analysis reproduced at Annex 6	Public monitoring dataset with MA secondary analysis	RSPB reserves / UK; MA comparison of 2014–2018 with 2019–2023, excluding 2020	Recorded changes in selected upland bird counts on RSPB reserves	Used as a methodological comparator showing mixed trajectories among upland bird species on land managed principally for conservation purposes, reinforcing the need for species- and mechanism-specific analysis.	The dataset was not designed as a controlled comparison of management systems. Survey effort and reporting vary among reserves and years; the records do not establish causation or equivalent survey coverage. MA analysis should not be represented as showing that RSPB management caused recorded changes.	**Q9**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
NatureScot (2024/26), Code of Practice for Grouse Moor Management	Statutory code of practice supporting the Scottish grouse-licensing regime	Scotland / licensed red-grouse land	Legal requirements, licence compliance and good-practice standards for grouse-moor management	Used to distinguish the existence of a statutory licensing/code framework from an evidential threshold defining acceptable or unacceptable shooting intensity. The Code requires compliance and monitoring but does not itself establish a scientifically defined intensity threshold.	Scottish legal and regulatory context. A code specifies requirements but does not by itself demonstrate that the required practices have produced particular biodiversity outcomes or that licensing is the appropriate response to an undefined concern about intensity.	**Q10**
Peak District Moorland Group, *The Blanket Approach is Failing: An independent review into Sphagnum inoculation on Peak District moors*	Independent review / operational case-study report	Peak District, England; deep-peat SSSI restoration sites	Sphagnum inoculation following approved vegetation cutting and observed establishment success	Provides site-specific operational evidence used to illustrate why a prescribed management process should be tested against the ecological outcome achieved and adapted where monitoring shows poor establishment.	Not a controlled scientific experiment and not evidence that Sphagnum inoculation is generally ineffective. Results concern particular sites, planting methods and hydrological conditions and should not be generalised without further evidence.	**Q10**
HM Government (2023), The Third National Adaptation Programme (NAP3) and the Fourth Strategy for Climate Adaptation Reporting	Government climate-adaptation programme	United Kingdom / England	Climate adaptation priorities, including wildfire-risk research and effective wildfire-risk reduction measures	Provides policy context for treating wildfire resilience as an adaptation outcome requiring dedicated evidence, including commitments to wildfire-risk mapping and research on effective risk-reduction measures.	Policy programme rather than primary scientific evidence. It identifies adaptation needs and research commitments but does not establish the effectiveness of any individual vegetation-management intervention.	**Q28(e)**
Regional Moorland Groups (2024), *The People's Plan for the Uplands*	Sector-commissioned community survey / policy report	English upland communities; online survey of people connected with upland areas	Community perceptions of upland management, rural identity, field sports, conservation and traditional land-management practices	Provides contemporary evidence of how respondents connected with the English uplands perceive community, cultural and management outcomes, and is used alongside other social evidence in Q29.	Self-selecting online survey commissioned by Regional Moorland Groups rather than a representative population survey. Reported percentages describe respondents, not all upland residents or the wider public, and perceptions do not establish causal ecological or economic effects.	**Q29**
Scottish Government (2023), Wildlife Management and Muirburn (Scotland) Bill: Business and Regulatory Impact Assessment, section 17	Government business and regulatory impact assessment	Scotland / proposed grouse-moor and muirburn regulation	Regulatory review cycles, business impacts and implementation of new wildlife-management regulation	Used to show that statutory grouse-moor and muirburn codes were expected to be reviewed at least every five years, supporting the need for clear baselines, evidential thresholds and genuinely symmetrical review.	Scottish policy appraisal prepared for a different legal regime. It does not demonstrate the environmental or economic effect of English regulation and should be used only as comparative regulatory evidence.	**Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Scottish Gamekeepers Association (2023), *Take our JOBS survey* (7 June 2023) and Warning to Scottish Government that gamekeeping profession is 'close to breaking point' (12 August 2023)	Sector member survey / practitioner commentary	Scotland / gamekeeping and rural employment during regulatory and land-use change	Reported changes in gamekeeping and related employment and perceptions of regulatory uncertainty	Used as practitioner evidence that employment contraction, non-replacement of posts and reduced confidence were being reported before the Scottish grouse-licensing regime became operational, relevant to anticipatory and cumulative effects.	Published material does not state the number of respondents, quantify total jobs lost or provide a regional breakdown, and cannot establish the cause of each employment decision. It predates operation of the licensing regime and therefore cannot measure its subsequent effects.	**Q28(e)**
Moorland Association (2026), upland SSSI unit-condition and last-inspection compilation reproduced at Annex 5	MA compilation and analysis of official SSSI unit data	English upland SSSIs	Recorded SSSI condition categories and currency of inspection records	Used to illustrate the need to distinguish condition classification from causation and to check evidential currency; the MA records that 582 of 801 unit records examined had a recorded last-inspection date of 2016 or earlier.	MA secondary analysis of official records. Older inspection dates do not prove that no subsequent monitoring or management evidence exists, and condition categories do not establish the cause of favourable or unfavourable status.	**Q14**
Cummins, S., Bleasdale, A., Douglas, C., Newton, S., O'Halloran, J. & Wilson, H.J. (2010), *The status of Red Grouse in Ireland and the effects of land use, habitat and habitat quality on their distribution*, Irish Wildlife Manuals No. 50, National Parks and Wildlife Service	Government-published national field survey / habitat and distribution analysis	Republic of Ireland; national Red Grouse survey 2006–08	Status and distribution of Red Grouse and relationships with land use, habitat extent, fragmentation and habitat quality	Provides an independent Irish comparator concerning Red Grouse status and the consequences of land-use and habitat change outside the British grouse-moor system. Relevant to the MA's counterfactual argument because it documents a substantially depleted Red Grouse population in a landscape where active commercial grouse management is much less extensive than in Great Britain, and examines habitat and land-use pressures affecting its distribution.	Irish land use, agricultural policy, forestry history, ownership and grouse-management traditions differ materially from England. The study is observational and does not demonstrate that the absence or reduction of grouse shooting caused Red Grouse decline. Habitat loss, fragmentation and other environmental pressures need to be considered separately. The survey predates more recent Irish conservation work and should be read alongside the subsequent Species Action Plan and conservation-status evidence.	**Q8, Q9**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
National Red Grouse Steering Committee (2013), *Red Grouse Species Action Plan 2013–2023*, National Parks and Wildlife Service	Official species action plan / multi-stakeholder conservation assessment published by NPWS	Republic of Ireland / Red Grouse and peatland and moorland habitat	Causes of Red Grouse decline; habitat and land-use change; historic grouse management; monitoring, habitat management and lawful predator control	Particularly relevant to the counterfactual. The Plan records the historic break-up of keepered estates, notes that there were more than 500 gamekeepers in the 1901 census and states that the subsequent decline in grouse keepers may have accelerated Red Grouse decline because less land was managed specifically for the species. Its objectives include increasing the area of peatland and moorland under active grouse management and supporting habitat management through grazing, burning or cutting and legal predator control. This provides official Irish recognition that the loss of management capacity associated with grouse management can itself be relevant to conservation outcomes.	Species action plan rather than a controlled experiment and some historical propositions rely on earlier evidence. Its wording is appropriately cautious: it says the decline in keepers may have accelerated decline and does not establish causation. Ireland is not a direct analogue for English grouse moors, and the Plan should not be interpreted as demonstrating that commercial grouse shooting is necessary for Red Grouse conservation in every landscape.	**Q8, Q9**
RSPB (2026), *Wildlife on RSPB reserves in 2025*, RSPB, Sandy, pp. 4, 12–13	Conservation NGO annual monitoring and operational report	RSPB nature reserves across the UK, with upland examples from Airds Moss East, Scotland, and Dove Stone, England	Reserve-level conservation monitoring, adaptive management and reported responses of breeding waders to combinations of vegetation, grazing, hydrological and predator management.	Provides an external conservation-management comparator illustrating why outcomes should be evaluated at site and intervention level. At Airds Moss East, curlew increased from 10 to 20 pairs and lapwing from three to 23 pairs between 2021 and 2025, alongside grazing, cutting, habitat restoration and targeted predator control. At Dove Stone, curlew increased from 23 pairs in 2019 to 34 in 2025 without predator control. The report also describes annual monitoring and periodic review of conservation objectives. Supports the MA's argument for consistent evidential standards and realistic counterfactuals.	RSPB-produced operational report rather than an independent controlled comparison. Case studies describe selected outcomes and management packages whose individual effects cannot be isolated. Differences in habitat, monitoring periods, predator pressures and wider environmental conditions restrict direct comparison. The findings neither demonstrate that predator control is universally necessary nor that habitat restoration alone will produce the same outcomes everywhere.	**Q9**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Heinemeyer, A. (2023), *Restoration of heather-dominated blanket bog vegetation for biodiversity, carbon storage, greenhouse gas emissions and water regulation: comparing burning to alternative mowing and uncut management. Final 10-year Report to the Project Advisory Group of Peatland-ES-UK*, University of York.	Long-term replicated field research report, externally reviewed in collaboration with Defra.	Three previously grouse-managed blanket-bog sites in northern England: Nidderdale, Mossdale and Whitendale.	Comparative effects of burning, mowing and no further vegetation management on vegetation composition, Sphagnum, hydrology, carbon and greenhouse-gas dynamics over approximately ten years.	Provides direct comparative evidence that different management interventions can produce different outcomes over time. Reports increases in Sphagnum under both burning and mowing, alongside site-specific vegetation and hydrological responses. Particularly relevant to assessing the counterfactual and avoiding conclusions based solely on immediate post-management measurements.	Three sites with existing grouse-moor management histories; not a comparison with pristine bogs. Ten-year findings represent only part of a longer management cycle. Carbon-balance interpretation remains scientifically contested. A research report with external scientific review, not a conventional peer-reviewed journal article. Does not establish universal superiority of burning or cutting, or directly measure landscape-scale wildfire outcomes.	**Q8, Q12, Q14, Q28(e)**
Glatzel, S., Worrall, F., Boothroyd, I.M. & Heckman, K. (2024), *Comparison of the transformation of organic matter flux through a raised bog and a blanket bog*, Biogeochemistry, 167, 443–459.	Peer-reviewed comparative biogeochemical field study	Raised bog in Austria and blanket bog at Moor House, northern England.	Differences in peatland hydrology, organic-matter transformation, carbon export and accumulation associated with contrasting landscape settings.	Provides primary scientific support for distinguishing the natural functioning of raised and blanket bogs. Relevant to the MA's argument that condition assessments, restoration expectations and management comparisons should account for physical and ecohydrological site characteristics rather than assuming all peatlands have identical potential outcomes.	Comparison of two contrasting sites, not a controlled assessment of burning, cutting or rewetting. Does not quantify achievable restoration outcomes across English uplands or demonstrate that rewetting is ineffective. Its relevance is to natural ecohydrological differences and the limitations of generalisation.	**Q14, Q28(e)**
Peatland-ES-UK, University of York, "Vegetation dynamics", research-programme monitoring update containing observations to 2025 (accessed 30 October 2026)	Research-programme monitoring data and descriptive online update	Three experimental English blanket-bog grouse-moor sites: Nidderdale, Mossdale and Whitendale; vegetation monitoring from 2012 to 2025.	Long-term changes in heather, Sphagnum, cotton-grass, species richness and vegetation structure following burning, mowing and no further management.	Extends the information available from the 2023 ten-year report. Describes Sphagnum cover continuing to increase on burned plots and reaching the highest reported mean cover among treatments by 2025. Supports the need to distinguish short-term effects from longer-term vegetation trajectories and consider pre-treatment differences.	Research-team website rather than a separately peer-reviewed publication of the latest results. Updated observations and graphical comparisons should not be treated as formal statistical conclusions. Pre-management vegetation differences existed between treatment plots; responses varied by site. Results do not demonstrate that burning is necessarily preferable to cutting or other interventions.	**Q14, Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Heinemeyer, A. (2026), Considerations around 10 rewetting claims about wildfire resilience of peatlands, written evidence CWR0088 to the House of Commons EFRA Committee	Expert written parliamentary evidence and critical assessment of policy claims.	UK upland peatlands, with particular reference to heather-dominated blanket bog and wildfire resilience.	Evidential basis for claims about rewetting, natural hydrological potential, vegetation fuel, wildfire outcomes and interpretation of site-specific examples.	Supports the distinction between intermediate restoration outcomes and demonstrated wildfire protection. Identifies the importance of site hydrology, seasonal conditions, fuel distribution, topography and suitable comparators when evaluating claims that restoration has prevented or reduced wildfire.	Expert submission rather than independently peer-reviewed experimental research. Contains interpretations, hypotheses and field examples that have not all been subjected to controlled evaluation. Its inclusion should not be interpreted as evidence that rewetting is generally ineffective or that alternative management necessarily provides better wildfire protection.	**Q28(e)**
Langholm Moor Demonstration Project Board (2019*), Managing Moorland for Birds of Prey and Red Grouse: The Final Report of the Langholm Moor Demonstration Project Partners 2008–2017*, ISBN 978-1-901369-35-9.	Multi-partner final evaluation of a scientifically monitored demonstration project, incorporating project monitoring, financial information and summaries of associated scientific studies. Partners included Buccleuch Estates, Scottish Natural Heritage, GWCT, RSPB and Natural England.	Langholm Moor, south-west Scotland; approximately 11,492 ha study area, including the Langholm–Newcastleton Hills SSSI/SPA. Active grouse-moor management was restored in 2008 and keepering ceased in February 2016; monitoring continued through 2017.	Effects of restoring grouse-moor management on habitat, red grouse, hen harriers, other raptors and breeding waders; the effectiveness of diversionary feeding; achievement of conservation and commercial objectives; economic costs and the consequences of withdrawing management.	Documents improvements in heather habitat, hen harriers, merlins, curlew, golden plover and snipe alongside failure to achieve commercially viable driven shooting. Confirms that the 1,000-brace project milestone was not financial break-even, estimated at approximately 3,000 brace. Records substantial management investment, cessation of keepering and the failure to test further adaptive management approaches. Provides evidence relevant to the ecological and financial counterfactual of changing grouse-moor management.	A single Scottish demonstration landscape rather than a controlled experiment. Grazing pressure, habitat management, predator management and other factors changed together, limiting attribution. The report combines research findings with the Project Board's interpretation, and acknowledges differences of opinion among partners. The economic estimates reflect Langholm's circumstances and 2008–2017 costs and market conditions. Peer-reviewed studies should be preferred for specific causal or species-response claims where available.	**Q8, Q9, Q12, Q21**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Moorland Association (2026), North York Moors Merlin monitoring – annual gamekeeper records coordinated by George Thompson; 2026 results reported by the Moorland Association, October 2026.	Practitioner-led longitudinal monitoring; annual gamekeeper observations coordinated through the North York Moors monitoring programme and reported by the Moorland Association. Non-peer-reviewed, descriptive monitoring evidence.	North York Moors National Park, England. Eight years of annual monitoring involving gamekeepers, covering more than 90% of the National Park's moorland. Records coordinated by George Thompson.	Recorded Merlin breeding activity and fledgling production on managed moorland, together with the contribution of gamekeepers to monitoring a Red-listed raptor.	Gamekeepers recorded 46 Merlin fledglings and 51 adult birds exhibiting behaviour consistent with breeding in 2026, compared with 27 fledglings and 32 adults in 2025. Across the eight years, recorded fledgling numbers averaged approximately 45 annually. At least 12 fledglings were ringed in 2026 by BTO-registered ringers. The evidence demonstrates sustained practitioner monitoring and recorded breeding activity on managed moorland, supporting recognition of land-manager contributions to biodiversity monitoring and conservation.	Observational records collected principally through annual reports from participating gamekeepers, rather than a standardised experimental study. Adults exhibiting breeding behaviour should not automatically be equated with confirmed nesting pairs. Survey coverage, weather and breeding conditions may influence annual totals. The increase between 2025 and 2026 does not independently establish a population trend or demonstrate that grouse-moor management caused the recorded outcomes.	**Q8, Q9**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Yorkshire Dales Bird of Prey Partnership Steering Group (2024), *Yorkshire Dales National Park and Nidderdale National Landscape Bird of Prey Evidence Report 2022 and 2023*, April 2024, Merlin species account, pp. 24–25.	Published multi-stakeholder bird-of-prey monitoring and evidence report, incorporating records supplied by the Yorkshire Dales Merlin Project. Grey literature / official partnership evidence incorporating licensed practitioner monitoring.	Yorkshire Dales National Park and Nidderdale National Landscape, England. The Merlin findings include records from the Yorkshire Dales Merlin Project, established in 2016 and involving moorland owners and gamekeepers working under Schedule 1 licensing arrangements on participating estates.	Merlin breeding activity, nesting success and fledgling production, including the contribution of licensed gamekeepers to long-term monitoring on managed grouse moors.	The report acknowledges the Yorkshire Dales Merlin Project as a long-running, landowner-supported monitoring programme. For 2022, the project reported 29 nesting areas monitored, 19 pairs located and 62 young fledged from 18 nesting attempts. Across its first seven years, the project reported 108 monitored nesting attempts, 101 successful attempts and more than 310 fledged young. The findings provide documented evidence of Merlin breeding success on participating managed moors and demonstrate the contribution of gamekeepers and land managers to species monitoring. They support the case for integrating existing practitioner records and expertise into national biodiversity assessments. Subsequent ten-year monitoring information supplied directly by the Yorkshire Dales Merlin Project coordinator is recorded separately below.	The figures are derived from records supplied by the participating monitoring project and do not constitute a representative census of the entire National Park or a controlled comparison with unmanaged moorland. Monitoring coverage and effort may vary between years. The observations do not isolate the effects of predator management, habitat condition, weather or other ecological factors. The partnership report states that no Yorkshire Dales Merlin Project information was received for 2023; its published project findings therefore relate to 2022 and earlier years.	**Q8, Q9, Q21**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Orchel, J. (2026), Yorkshire Dales Merlin Project, Summary of Report (in preparation), "A Study of Merlins *Falco columbarius* Breeding on Managed Moorlands in the Yorkshire Dales National Park, 2016–2025", personal communication to the Moorland Association, 31 October 2026.	Unpublished practitioner monitoring summary / personal communication from the Yorkshire Dales Merlin Project coordinator, drawing on ten years of nest monitoring undertaken with participating landowners and gamekeepers.	Yorkshire Dales National Park, England; selected managed grouse moors monitored during 2016–2025. Nesting places were identified by gamekeepers in the course of their normal duties, who also monitored nests as accredited agents of a project coordinator licensed by the British Trust for Ornithology.	Merlin nesting success, fledgling production and the contribution of gamekeepers to long-term monitoring of a Red-listed raptor on managed grouse moors. The ten-year summary records more than 140 successful nests and fewer than ten failed nests; more than 90% of monitored pairs reared at least one young to fledging, and approximately 70% of successful pairs produced broods of three or four fledged young.	Provides contemporary ten-year observational evidence of sustained successful Merlin breeding on participating managed grouse moors and demonstrates the contribution of gamekeepers to systematic species monitoring. Particularly relevant to Q8 and Q9 as evidence that practitioner monitoring can provide substantial long-term biodiversity data and that managed grouse moors can support successful breeding by a Red-listed bird of prey. The evidence complements the earlier published Yorkshire Dales Bird of Prey Partnership figures by extending the monitoring period to 2016–2025.	Unpublished observational monitoring rather than a controlled experiment or peer-reviewed study. The monitored sites were selected managed moors and do not constitute a representative census of the whole Yorkshire Dales National Park or a matched comparison with unmanaged moorland. Predator control, habitat, weather and other ecological factors were not experimentally separated. The reported breeding success therefore does not establish that predator control, grouse-moor management or any single intervention caused the recorded outcomes. The full ten-year report remains in preparation; the MA relies only on the summary expressly authorised by the project coordinator for use in this submission.	**Q8, Q9**
Defra (2026). *Wild bird populations in the UK and England, 1970 to 2025*. Accredited Official Statistics, published 13 October 2026. Section 6: Breeding upland bird populations, Table 6 and *Factors affecting upland bird populations*.	Accredited Official Statistics, using national bird-population indices compiled from monitoring data, with Defra's accompanying synthesis of evidence reviews.	UK and England upland habitats, 1994–2025. Includes 32 upland bird species in the UK and 28 in England, of which 15 and 12 respectively are upland specialists.	Long- and short-term population trends among upland specialists and generalists, and evidence concerning pressures on open-nesting moorland birds.	England's upland specialist index declined by 39.3% since 1994 and 20.2% over 2020–2025, while generalists increased by 21.1% over the longer period. Defra identifies reduced site-based predator control among several major pressures on open-nesting moorland species. Supports assessment of the conservation consequences of reducing or withdrawing existing lawful predator management.	National indicators do not distinguish grouse moors from other upland habitats or establish the causes of population change. The discussion of pressures summarises reviews rather than measuring individual causal contributions. Other pressures and continuing illegal killing and other offences against birds of prey are acknowledged. Not directly comparable with the earlier ONS experimental natural-capital indicator.	**Q9**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Douglas, D.J.T., Bellamy, P.E., Stephen, L.S., Pearce-Higgins, J.W., Wilson, J.D. & Grant, M.C. (2014), *Upland land use predicts population decline in a globally near-threatened wader*, Journal of Applied Ecology, 51, 194–203. DOI: 10.1111/1365-2664.12167.	Peer-reviewed observational resurvey and statistical modelling. All six authors were affiliated with the RSPB at publication.	Southern Scotland and the South Pennines, UK; observational resurvey of curlew populations.	Curlew population change and nesting success in relation to gamekeeper density and surrounding woodland cover.	Curlew population change and nesting success were positively associated with gamekeeper density and negatively associated with nearby woodland. Modelling suggested approximately 48% greater gamekeeper density would be required to maintain curlew stability with woodland cover increasing from 0% to 10% within 1 km. Supports integrated assessment of predator control, afforestation and alternative land uses.	Observational associations rather than a controlled experiment. Gamekeeper density was used as a proxy for predator-control intensity. The 48% estimate is modelled and should not be generalised to all landscapes. The paper also acknowledges illegal raptor killing and wider potential costs associated with intensive grouse management.	**Q8, Q9**
The Wildlife Trusts (2026). *Future of The Rothbury Estate secured for nature and the nation*, 30 October 2026; Northumberland Wildlife Trust (2026), New research starts to unlock the wild secrets of vast nature recovery project, 5 May 2026.	Public project announcements and descriptions of planned ecological monitoring.	Rothbury Estate, Northumberland; approximately 9,500 acres acquired for landscape-scale nature recovery.	Proposed changes in land management and arrangements for establishing ecological baselines and monitoring biodiversity outcomes.	Provides a prospective case study through which long-term wildlife outcomes under different upland management approaches could be assessed. Reinforces the need for consistent monitoring and transparent reporting of changes in bird abundance and breeding productivity.	Announcements describe project ambitions and monitoring arrangements, not demonstrated biodiversity outcomes. No causal conclusions about the effects of new management can yet be drawn.	**Q8; potentially Q9.**
Defra (2026). *30by30 on land: assessing whether land can contribute.* Published 13 July 2026.	Government policy guidance and biodiversity assessment framework.	England; protected areas and other land potentially contributing towards the Government's 30by30 target, including upland habitats.	Criteria for demonstrating effective biodiversity conservation, including management objectives, ecological baselines, monitoring of species and habitat trends, evaluation of outcomes and adaptive management.	Supports the MA's argument that conservation outcomes should be measured consistently across different land-management models. Reinforces the importance of historical baselines, repeatable monitoring, transparent reporting and assessment of changes in biodiversity, including at Rothbury.	Policy and assessment guidance, not empirical evidence of the comparative effectiveness of different management systems. Requirements apply to land seeking to qualify for 30by30; they do not establish that Rothbury has already qualified or that particular monitoring conditions are attached to its Defra funding.	**Q8, Q9**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
RSPB (2026*), 2026 Breeding season summary – United Utilities Bowland Estate*, printed pp. 1–5.	Primary site-level field monitoring; conservation NGO breeding-season summary report and operational evidence (grey literature).	Bowland, Lancashire, England. United Utilities estate managed for water quality, wildlife conservation, livestock farming and gamebird shooting, with RSPB monitoring undertaken through a longstanding partnership with United Utilities and its tenants.	Hen harrier breeding outcomes and age composition; curlew counts in Breeding Bird Survey squares and selected in-bye fields; differences between species outcomes and the coverage and currency of monitoring.	Records nine hen harrier nesting attempts in 2026, of which eight were successful, fledging 30 young. Fifteen of 16 aged breeding birds were adults (94%), compared with 38% in 2020; the RSPB interprets the age pattern as suggesting a sustained increase in adult survival. Curlew counts in 14 BBS squares were 52, 57 and 38 birds in 2024, 2025 and 2026 respectively; selected in-bye fields held 15, 17 and 10 pairs in those years. The report also distinguishes renewed BBS and selected-field monitoring from intensive standardised curlew surveys last undertaken in 2014. Supports assessment of current demographic indicators, species-specific outcomes and clearly defined monitoring coverage within a mixed-use upland landscape.	Descriptive monitoring rather than a controlled or matched management comparison. The small breeding-age sample does not provide a direct survival estimate: 94% is the adult proportion, not an annual survival rate, and does not establish reduced illegal killing or a brood-management effect. Curlew BBS bird counts and selected-field pair counts measure different things and must not be combined or treated as an estate-wide census. Annual differences are observed changes in surveyed samples, not validated estimates of estate-wide population trends or management effects. The report does not establish which nests or survey plots were on actively grouse-managed ground, or isolate the effects of shooting, conservation management or predator control.	**Q9**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
House of Commons Environment, Food and Rural Affairs Committee (EFRA Committee) (2026), *A burning issue: managing wildfire risk*, Third Report of Session 2026–27, HC 713, published 21 October 2026; particularly paragraphs 103–104, 160–161 and 172–180.	Parliamentary select committee inquiry report synthesising oral and written evidence from government, statutory bodies, researchers, emergency services, environmental organisations and land managers, with the Committee's own conclusions and recommendations.	Principally England, drawing on UK-wide and comparative evidence. Wildfire prevention, preparedness and response, including upland and peatland management and the operation of England's managed-burning licensing arrangements.	Management of immediate wildfire risk during peatland restoration; assessment of the wildfire consequences of regulatory change; evidence gaps and adaptive policy review; accessibility and effectiveness of burning licensing; land managers' contribution to prevention and response; and implementation of the promised 2023–2027 wildfire-risk programme.	Provides parliamentary support for treating peatland restoration and proportionate, site-appropriate fuel management as potentially complementary. Recommends explicit assessment of the wildfire implications of burning restrictions and review of the 2025 regulations when IDEAL UK Fire findings become available. Identifies potential shortcomings in the operation of burning licensing and recognises the importance of land managers' expertise, equipment, local knowledge and working relationships. Supports assessing the practical operability of future regulation and its effects on wildfire-prevention and response capacity. Also records the Committee's finding that the promised 2023-2027 wildfire-risk programme was not implemented, reinforcing the distinction between policy commitments and delivery.	Parliamentary scrutiny rather than primary experimental or causal research. Adopted Committee conclusions should be distinguished from witness evidence, including the MA's own submissions. The Committee recognises peatland restoration's benefits and does not identify any management tool as universally preferable. Its recommendation for a new wildfire-impact assessment is conditional on none having been undertaken before implementation. Licensing figures concern the period reported to the Committee: two approvals do not establish that other applications were refused. Recommendations are not evidence of government adoption or implementation. The report does not establish the net effects of grouse shooting or that wildfire-response capacity depends uniquely on it.	**Q28(e)**
Mahdiyasa, A.W., Large, D.J., Icardi, M., Grebby, S. & Muljadi, B.P. (2026), *Mechanical thresholds constrain global peatland carbon accumulation*, Scientific Reports, published 8 August 2026.	Peer-reviewed ecohydrological–mechanical modelling study with comparisons against existing observational data; published in accepted-manuscript form.	Global peatland implications; temperate model parameterisation, comparisons with recorded peat failures and Scottish peat-depth data. Relevance to English uplands is methodological.	Relationships between peat thickness, slope, material strength, mechanical instability and erosion, and their implications for long-term peat accumulation and carbon-storage potential.	Supports accounting for site-specific physical constraints when projecting additional peat-carbon accumulation and interpreting erosion. Reinforces the distinction between additional sequestration and protecting existing stocks. Complements Fenton (2022), rather than demonstrating that particular management practices are beneficial.	Idealised model; predictions depend on geometry and peat-strength assumptions, with some parameters calibrated against failure observations. Natural confinement and substrate variability may alter stability. Not a trial of burning or restoration. Does not establish that degradation at particular English sites is natural, that restoration is ineffective, or that management pressures are unimportant.	**Q28(e)**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Natural England (2026), Working together sustains Hen Harrier numbers in 2026, Natural England blog, 14 October 2026. https://naturalengland.blog.gov.uk/2026/10/14/working-together-sustains-hen-harrier-numbers-in-2026/	Official annual monitoring summary published as a Natural England blog, drawing on records collected by Natural England, the RSPB and other partners.	England; 2026 hen-harrier breeding season, with comparisons against 2025.	Recorded hen-harrier breeding attempts, breeding success and fledgling production; monitoring coverage and comparability between years and land-management categories.	Records 45 breeding attempts, 33 successful attempts and 112 fledged chicks in 2026, compared with 39, 33 and 106 respectively in 2025. Nine recorded attempts were on moors managed for grouse. Provides contemporary national context for Q9 and supports assessing monitoring coverage before interpreting differences between years or land-management categories.	Coverage is incomplete. Natural England cautions that reduced monitoring could explain the relatively small number recorded on grouse moors. Breeding attempts are not equivalent to distinct breeding pairs. Descriptive annual results do not establish causal management effects, relative conservation performance or changes in illegal killing.	**Q9**
Natural England and land-manager correspondence (October 2026), anonymised Higher Tier burning-window case: draft habitat management plan supplied on 26 October 2026 (Table 2, p. 26); Natural England adviser email of 26 October 2026; existing HLS management-plan extract (section 4.1.7, p. 13); and land-manager correspondence supplied to the Moorland Association on 27 October 2026. Unpublished documents held by the MA.	Documentary case evidence comprising a draft scheme-management prescription, an existing agreement extract and regulator correspondence, together with a land manager's account of anticipated operational implications.	An English upland SSSI undergoing a proposed transition from Higher Level Stewardship to Countryside Stewardship Higher Tier, October 2026. Site and individuals anonymised.	Proposed shortening of the dry-heath burning window from 1 October–15 April to 1 October–15 March; scope for adapting scheme prescriptions to local circumstances; and the interaction between breeding-bird protection, suitable burning conditions and practical delivery of vegetation management.	Provides a documented example of a proposed scheme condition reducing the period available for vegetation management. Natural England advised that the dry-heath burning parameters could not be edited or negotiated, while the land manager reported that the final weeks of the existing season often provided essential opportunities for burning. Relevant to Q15's consideration of clear environmental justification, seasonal practicality, engagement with land managers and coordination between scheme conditions and other management requirements.	Single case involving an initial draft plan. The supplied material does not establish the final agreement terms, the full policy and ecological rationale for the proposed restriction, or its subsequent effects. Operational concerns reflect the land manager's reported experience and anticipated consequences; no ecological outcomes were measured. Stewardship agreements can impose additional management conditions, so the difference from the existing burning window does not itself establish that the proposed restriction is inappropriate. Wider application cannot be inferred from this case alone.	**Q15**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Natural England (2026), correspondence from Dr Ruth Waters, Regional Director for the North of England, to the Moorland Association concerning section 25 fire-prevention restrictions under the Countryside and Rights of Way Act 2000, 23 October 2026; complaint reference CMPT22026/11745. Unpublished correspondence held by the MA.	Official statutory-body correspondence clarifying the current operational arrangements for urgent fire-prevention access restrictions.	England; open-access land for which Natural England is the relevant authority; operation of section 25 CROW Act fire-prevention restrictions during periods of heightened wildfire risk.	Availability and timing of urgent section 25 access restrictions; out-of-hours decision-making; advance outline fire-prevention directions; Fire Severity Index triggers; and review of current operational arrangements.	Natural England confirmed that a new section 25 application cannot be considered outside normal office hours where it is the relevant authority and would be picked up on the next working day. It also confirmed that emergency powers envisaged in the legislation were not brought into effect because the necessary regulations were never made. Natural England identified advance outline fire-prevention directions as important because they can be triggered automatically once an agreed Fire Severity Index threshold is reached. Provides current official evidence of an operational timing constraint relevant to wildfire prevention and the need for advance contingency arrangements.	The correspondence concerns circumstances in which Natural England is the relevant authority and a new application is required. It does not establish that restrictions cannot operate out of hours where an outline fire-prevention direction has already been agreed and its trigger is met. It does not establish that any particular restriction would have prevented or reduced a wildfire. Natural England stated that fire-prevention restrictions and open-access processes were under wider review and that discussions concerning the Fire Severity Index were ongoing, so future arrangements may change.	**Q28(e)**
Colhoun, K., Flannelly, F., O'Neill, J., Phelan, E., Servignat, H., O'Donoghue, B. & Kelly, S. (2022), *Status and distribution of breeding Eurasian Curlew in Ireland 2021*, Irish Wildlife Manuals No. 138, National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.	Government-published national species survey / conservation-status assessment drawing on standardised field survey and comparison with previous national estimates.	Republic of Ireland; national breeding Curlew population, with comparison against historical estimates from the 1980s.	Status, distribution and change in the Irish breeding Curlew population; identification of pressures associated with the species' severe decline, including habitat loss and change, agricultural intensification, afforestation, peat extraction and predation.	Provides comparative evidence relevant to the counterfactual considered in Questions 8 and 9. The survey estimated approximately 105 confirmed or probable breeding Curlew pairs in 2021 and records a decline of about 98% since the 1980s. The report identifies several interacting pressures, including habitat change and predation. It is relevant to the MA's argument that the reduction or absence of grouse-moor management should not be treated as an ecologically neutral counterfactual: alternative land uses, vegetation change, forestry, farming practice and predator abundance can themselves affect species of conservation concern.	Irish ecological, land-use, farming, forestry and policy circumstances differ from those in England. The survey does not establish that the decline of grouse management caused the decline in Irish Curlew, nor that continuation of grouse shooting would have prevented it. It should therefore be used as comparative evidence about the consequences of wider land-use and management change, not as a direct prediction of outcomes following regulatory change in England.	**Q8, Q9**

Source	Evidence type	Geography / context	Principal issue or outcome examined	Relevance to MA response	Important limitations / qualifications	Question
Moorland Association (2026), *SSSI Condition Records Associated with National Nature Reserves in England*, analysis of Natural England SSSI unit-condition records accessed through Defra MAGIC; reproduced at Annex 4.	MA-compiled analysis of official Natural England statutory condition records / secondary administrative-data analysis.	England; Sites of Special Scientific Interest associated with National Nature Reserves included in the MA compilation. Original workbook contains 221 reserve entries; after exclusion of two internally inconsistent rows, the aggregate analysis contains 219 reserve entries and 3,496 compiled SSSI-unit entries.	Recorded SSSI condition classifications associated with National Nature Reserves; distinction between favourable, unfavourable recovering, unfavourable no change, unfavourable declining, part destroyed, destroyed and not assessed categories; methodological issues arising from duplication, differing assessment dates and lack of area weighting.	Supports the MA's argument in Question 14 that SSSI condition categories require careful interpretation and should not be treated, without further evidence, as measures of management effectiveness or causation. Of the 3,496 compiled entries, 1,796 (51.4%) are favourable, 1,182 (33.8%) unfavourable recovering, 249 (7.1%) unfavourable no change and 255 (7.3%) unfavourable declining, with the remaining entries recorded as part destroyed, destroyed or not assessed. The analysis illustrates the importance of distinguishing favourable condition from recovery status and of identifying the relevant unit, feature, assessment date, area and management history before comparing conservation outcomes between management systems.	This is an MA compilation and analysis of official records, not a new ecological survey. Some reserve entries refer to the same SSSI source records and may overlap; the dataset has not been de-duplicated at individual SSSI-unit level. The figures are not area-weighted and cannot be treated as a national estimate of NNR condition or as a ranking of owners or management systems. Assessment dates vary, and the compilation does not establish causation or show that Natural England or any present management regime caused the recorded condition. Two inconsistent reserve rows were excluded rather than corrected or inferred.	**Q14**

Annex 2 - Tintwistle Wildfire Operational Return

This annex records the personnel time and equipment reported by participating upland land managers and other local contributors during the July 2026 Tintwistle wildfire. The unpublished practitioner return illustrates locally retained wildfire-response capacity and is cited in the Moorland Association's answer to Question 28(e), paragraph 28.87. It is an account of resources mobilised, not an independent assessment of their effectiveness or the environmental outcome of the incident.

1. Scope and headline findings

Measure	Recorded amount	Interpretation
Response period	10 days	Recorded attendance during a critical phase of the wildfire. Further attendance continued beyond this period at a reduced level and is not quantified in this return.
Person-hours	2,392	Sum of the displayed contributor entries
Contributor records	20	17 estate or land-management teams; 3 other contributor categories
Personnel	48 reported	Individual entries sum to 49; see verification note below

2. Anonymised personnel and time return

Estate and land-manager names are replaced with arbitrary codes A to Q. The three additional contributor categories are shown as R to T. Codes preserve the source row sequence but do not disclose identities. Personnel are shown as entries in the source return rather than a verified count of unique individuals.

Code	Contributor type	Personnel entries	Person-hours
Estate A	Estate or land-management team	3	173
Estate B	Estate or land-management team	2	36
Estate C	Estate or land-management team	2	50
Estate D	Estate or land-management team	1	10
Estate E	Estate or land-management team	3	171
Estate F	Estate or land-management team	2	116
Estate G	Estate or land-management team	1	40
Estate H	Estate or land-management team	2	104
Estate I	Estate or land-management team	1	12
Estate J	Estate or land-management team	2	144
Estate K	Estate or land-management team	2	43
Estate L	Estate or land-management team	3	391
Estate M	Estate or land-management team	3	210
Estate N	Estate or land-management team	3	115

Code	Contributor type	Personnel entries	Person-hours
Estate O	Estate or land-management team	2	86
Estate P	Estate or land-management team	2	73
Estate Q	Estate or land-management team	2	106
Other contributor R	Other local contributor	9	277
Other contributor S	Other local contributor	1	94
Other contributor T	Other local contributor	3	141
Total of entries	**20 contributor records**	**49**	**2,392**

Operational context and duration
The ten days recorded represent a critical period of the wildfire response, rather than the entirety of land-manager involvement. Attendance continued beyond this period, although at a reduced level. Consequently, the 2,392 person-hours reported should not be interpreted as the total contribution made throughout the incident.

During this critical period, there was particular concern that the western flank near Higher Swineshaw, where Greater Manchester Fire and Rescue Service was managing the relevant sector, might not be contained. This raised the possibility of the fire spreading across Stalybridge Moor towards the communities of Stalybridge and Carrbrook. This account provides important operational context for the personnel and equipment mobilised.

3. Equipment recorded and illustrative capital value

The following quantities and approximate unit purchase-price assumptions are reproduced from the original return. The figures indicate the scale of equipment reported as mobilised; they are not invoices or expenditure associated specifically with this fire.

Equipment category	Quantity	Approximate unit price	Indicative capital value
Argocat	9	£32,000	£288,000
Sit-in 4 × 4 vehicle	3	£25,000	£75,000
Sit-in 6 × 6 vehicle	6	£32,000	£192,000
Tracked dumper	1	£30,000	£30,000
Quad bike	8	£19,000	£152,000
Fogger	13	£5,000	£65,000
Leaf blower	15	£1,000	£15,000
Hilux pickup	33	£50,000	£1,650,000
Transport trailer	15	£5,000	£75,000
Scotty pack	28	£300	£8,400
Heather beater	5	£60	£300
Indicative equipment total			**£2,550,700**

4. Illustrative valuation of personnel time

Calculation	Illustrative value
2,392 person-hours × £35 per hour	£83,720

The £35 hourly rate is an assumption used in the original return. The resulting £83,720 is a notional value of recorded time, not a verified wages bill, commercial contractor quotation or cost charged to the emergency services.

5. Interpretation and important limitations

- The return is a single-incident, unpublished practitioner record compiled from participating contributors. It has not been independently audited.
- Not all contributors were gamekeepers, and neither the equipment nor every hour can be attributed exclusively to grouse shooting.
- The equipment total of £2,550,700 is an approximate purchase-price valuation of the listed stock. Vehicles and equipment may have other uses and different ages; the record does not establish hire rates, unit-days used, depreciation or the incremental cost of this wildfire.
- The source worksheet adds £2,550,700 of equipment values to £83,720 of notional labour to give £2,634,420. These are different types of valuation and that sum must not be interpreted as the cost of fighting the fire or of commercially replacing the response.
- Fuel, consumables, repairs, mileage, lost income and some additional plant are excluded from the figures above.

6. Relevance and source information

The return provides a documented example of skilled personnel, local knowledge, vehicles and equipment available from the managed uplands during a serious wildfire. It is relevant to Defra's consideration of the realistic counterfactual: how different policy and land-management scenarios might affect year-round staffing, equipment investment, readiness and the capacity to assist statutory fire services. The appropriate policy question is what would happen to this capacity under credible alternative arrangements, not whether one incident proves the merits of a particular land-management system.

Source: Peak District Moorland Group (2026), Tintwistle Wildfire July 2026, unpublished operational return supplied to the Moorland Association on 25 August 2026; attendance period confirmed in correspondence of 25 September 2026. This annex is an anonymised presentation.

The Moorland Association retains the estate-identifiable original. It can consider supplying further supporting details to Defra upon request, subject to contributor agreement and appropriate confidentiality arrangements.

Annex 3 - SSSI Condition at Moor House Upper Teesdale

This annex reports the condition classifications attributed to 25 Sites of Special Scientific Interest (SSSI) units at Moor House, Upper Teesdale National Nature Reserve (NNR). The compilation identifies the reserve as managed by Natural England. It illustrates the care needed when using condition categories to assess upland management outcomes.

1. Recorded SSSI unit conditions
The workbook categorises the 25 units as follows. Percentages use the 25 recorded units as the denominator.

Recorded condition category	Number of units	Share of units
Favourable	5	20%
Unfavourable recovering	15	60%
Unfavourable declining	4	16%
Destroyed	1	4%
Total	**25**	**100%**

Headline interpretation. Five units (20%) are favourable. Twenty (80%) are not recorded as favourable: 15 recovering, four declining and one destroyed. Nineteen units (76%) are explicitly classified as unfavourable; the destroyed unit is recorded separately.

2. How the classifications should be interpreted
Unfavourable recovering and unfavourable declining are different classifications. The recovering category is not evidence of continuing decline, but neither does it mean favourable condition has been achieved. Destroyed is a separate category. An undifferentiated 80% headline would obscure these distinctions.

3. Evidence scope and limitations

- **Unit counts, not area.** Percentages represent units, not land area or habitat extent. Units can differ substantially in size.
- **Causation.** Condition status does not establish cause. Historic pressures, environmental conditions, recovery time and management may all matter. These figures cannot establish management effectiveness or a causal comparison with grouse moors.

4. Relevance to the Defra Call for Evidence
Moor House, Upper Teesdale illustrates why condition, recovery trajectory and measurement quality must be considered together. The MA does not suggest that these figures demonstrate failure by Natural England or prove that a different land use would deliver better outcomes.

Defra should apply consistent standards across management systems: comparable species and habitat evidence, assessment dates, recovery trajectories and a counterfactual for changes to existing management. Designation or regulation alone is not a measure of conservation success.

Source
The SSSI unit-condition information was obtained from Natural England data accessed through Defra's MAGIC mapping service (https://magic.defra.gov.uk/).

Annex 4 - SSSI Condition Records Associated with National Nature Reserves in England

This annex reviews the condition counts for Sites of Special Scientific Interest (SSSIs) associated with National Nature Reserves (NNRs) in the Moorland Association (MA) compilation of Natural England records accessed through Defra MAGIC. It describes the recorded categories and the checks needed before using this compilation for comparisons of conservation outcomes.

1. Scope of the evidence

Some reserve entries refer to the same SSSI source page and repeat identical condition totals. For example, Elmley and The Swale each cite the same SSSI and each record 60 units, comprising 57 favourable and three unfavourable no change. Individual unit identifiers are needed to determine whether those counts overlap.

The aggregate therefore describes compiled unit entries, not a verified count of unique SSSI units or the proportion of NNR land in each condition. It must not be used as a national estimate of NNR condition or as evidence of relative management performance.

2. Recorded condition categories

After excluding the two inconsistent reserve rows identified below, 219 reserve entries contribute 3,496 unit entries. The table summarises those entries only.

Recorded condition category	Unit entries	Share of entries
Favourable	1,796	51.4%
Unfavourable recovering	1,182	33.8%
Unfavourable no change	249	7.1%
Unfavourable declining	255	7.3%
Part destroyed	7	0.2%
Destroyed	6	0.2%
Not assessed	1	Less than 0.1%
Total compiled entries	**3,496**	**100.0%**

Percentages use 3,496 compiled entries as the denominator. They are rounded and are not area-weighted. Repeated source references have not been de-duplicated.

Favourable and unfavourable recovering together account for 2,978 entries (85.2%). This must not be described as 85.2% in favourable condition. Recovering is a separate category: it does not mean that favourable condition has been achieved and should not be treated as evidence of continuing decline.

The no change and declining categories together account for 504 entries (14.4%). Part destroyed, destroyed and not assessed remain separate categories. These compiled classifications do not, by themselves, establish a trend over time.

3. Arithmetic checks and exclusions

The source workbook contains 221 reserve entries, with 3,509 reported units but 3,510 condition-category entries. Two rows fail the same check: their seven condition counts do not sum to the reported number of units. Both rows are excluded in full, without attempting to infer a correction.

Excluded reserve entry	Reported units	Condition entries
Berry Head	11	13
Malham Tarn	2	1

Berry Head records 11 favourable and two recovering entries. Malham Tarn records one favourable entry. Blank category cells are treated as zero for summation. The remaining 219 rows reconcile to 3,496 on both measures. Arithmetic agreement does not verify the underlying records or resolve overlap between reserves.

4. Methodological limitations

Units and reserve boundaries. The workbook gives reserve-level counts rather than an itemised list of unit identifiers and areas. The overlap between the cited SSSIs, individual units and NNR boundaries has not been established. An unduplicated estimate for NNR land requires unit-level records and spatial reconciliation.

Assessment dates and area. Individual assessment and extraction dates are not recorded in the workbook. This is not a new 2026 field survey. Counts give each entry equal weight and cannot be interpreted as proportions of land area or compared directly with area-based condition statistics.

Coverage and comparability. The reserve list is the population in the MA compilation, not a verified current census of all English NNRs. Differences in habitats, notified features, historic pressures and assessment timing prevent an uncontrolled comparison from establishing which owner or management system performs best.

5. Relevance to the Defra Call for Evidence

The MA asks Defra to apply consistent, traceable standards when assessing conservation outcomes. Evidence should distinguish favourable condition from recovery status and identify assessment dates, units, areas and site boundaries. Comparisons of management systems should consider habitat condition, species abundance and breeding success, alongside the likely consequences of retaining, changing or removing existing management.

This annex should be read alongside the Moor House Upper Teesdale case study in Annex 3. Neither the aggregate above nor the comparison of individual reserves establishes causation or a ranking of management effectiveness. Designation and regulation should not be treated as substitutes for evidence of ecological outcomes.

Source

Natural England SSSI unit condition records accessed through Defra MAGIC. Links to the underlying Natural England Designated Sites pages are retained in the MA source workbook.

The Moorland Association originally compiled the dataset in May 2025, with subsequent updates incorporated in October 2026. The figures presented in this annex were checked and recalculated on 30 October 2026.

Individual SSSI condition assessments were undertaken on different dates. The compilation date should not be interpreted as the date on which every SSSI unit was assessed.

Annex 5 - SSSI unit condition records in six upland areas

This annex supports the MA response to Question 14 of Defra's Call for Evidence. It summarises selected Sites of Special Scientific Interest (SSSI) unit-condition records and a comparison by recorded shooting status. The findings support careful interpretation of condition categories. They do not establish whether grouse shooting, or any other management activity, caused the recorded condition.

1. Scope and disclosure protection

The analysis contains 801 classified unit records from six upland areas in England: the North York Moors, Calderdale, Bowland, the Peak District, Nidderdale and the Yorkshire Dales. These are geographical groupings in the MA compilation, not a representative sample or a census of all upland SSSI units. The records must not all be assumed to relate to grouse moors.

Results are pooled across the six areas. Individual estates, owners, managers, SSSIs and units are not named. Regional condition breakdowns, unit identifiers, precise locations and record-level links are omitted. Less frequent categories are combined and detailed subgroup counts are not published, to reduce the risk of linking records to particular holdings.

2. Pooled condition counts

Table 1 summarises the 801 classified records. Each record is counted once within this calculation; the figures measure records, not hectares or the number of estates.

Recorded classification	Records	Share
Favourable	104	13.0%
Unfavourable recovering	598	74.7%
Unfavourable no change	76	9.5%
Unfavourable declining or destroyed	23	2.9%
Total	**801**	**100.0%**

Percentages are rounded to one decimal place and may not sum exactly to 100.0%. Unfavourable declining and destroyed are combined solely for disclosure protection. They remain distinct official condition categories and are not ecologically equivalent.

Of the 801 records, 104 (13.0%) are favourable and 598 (74.7%) are unfavourable recovering. Recovering is not the same as favourable: the classification does not mean that favourable condition has already been achieved, nor does this extract establish a measured rate of improvement.

Conversely, a headline that 697 records (87.0%) are not favourable would conceal the fact that most records are classified as recovering. The classification should therefore be reported with its qualification, rather than treated automatically as evidence of continuing deterioration.

3. Preparation of the analysis

The MA counted rows with one populated condition category in the six relevant worksheets of its internal register. Headers, section headings and blank rows were excluded. The category counts reconcile to 801. Percentages use the pooled record count as their denominator; no area weighting or extrapolation to England as a whole has been applied.

The comparison below uses the workbook's recorded shot-over and not-shot-over classifications. These are separate from Natural England's condition categories. A blank shooting-status field was not treated as evidence that a unit was not shot over. The regional subset is already included in the pooled total, not an additional sample.

4. Peak District comparison
Within the Peak District subset, both recorded shooting-status groups are predominantly classified as unfavourable recovering, at approximately three quarters of the records in each group. Exact subgroup denominators, detailed condition counts and more precise percentages are not published in this annex to limit disclosure risk.

This is an unmatched descriptive comparison. It does not demonstrate that shooting improves or worsens SSSI condition, or that the groups have equivalent ecological outcomes. The limited finding is that a recovering classification occurs widely in both groups. Establishing a management effect would require evidence about the relevant notified features, pressures and management history.

5. Limits on interpretation
Selection and independence. The basis on which every record entered the original compilation has not been independently validated. Multiple units may relate to the same holding. Unit-record counts cannot therefore be treated as numbers of independent estates or as a representative estimate of management performance.

Timing and comparability. Inspection dates in the register differ substantially. The analysis is a historical compilation, not a new 2026 field survey or a verified current condition assessment. Habitat, notified feature, unit size, ownership, historic pressures and assessment timing have not been controlled for. The shooting-status classifications have not been independently validated for this analysis.

Classification and causation. A single condition classification does not identify the activity responsible for it. It also does not, on its own, establish a time trend. These qualifications apply to both favourable and unfavourable outcomes and to all forms of land management.

6. Relevance to the Call for Evidence
The MA asks Defra to distinguish condition status from evidence about its causes. When assessing grouse-moor management, the relevant evidence should identify the notified feature, the pressure affecting it, the management intervention and the basis for attributing an outcome to that intervention. The same evidential standards should apply to conservation-managed and other land. This annex complements Annexes 3 and 4; it does not provide a ranking of owners or management systems.

Source and compilation
Natural England SSSI unit-condition information, as transcribed in the MA internal register. Official source services are Defra MAGIC and Natural England Designated Sites View. Shooting-status labels are those in the MA compilation. The underlying register is not embedded in or attached to this annex. Any wider disclosure of record-level material would require a separate confidentiality review.

The recorded date of last inspection for 582 of the 801 unit records (72.7%) is 2016 or earlier. This does not establish that no subsequent monitoring, management information or other ecological evidence exists, nor that an older condition assessment is necessarily invalid. It does mean that the date and current evidential status of a condition assessment should be checked before it is treated as a measure of present-day management performance.

Annex 6 - RSPB Reserve Bird Monitoring Analysis

Supporting evidence for Question 9 of the Defra Call for Evidence on Gamebird Release and Shooting

Purpose and scope

This annex records an exploratory examination by the Moorland Association (MA) of publicly available RSPB reserve breeding-bird monitoring records. The purpose was to establish what conclusions could reasonably be drawn from the published information, including whether it could support comparisons of conservation outcomes. The exercise is not a validated population-trend analysis and does not assess the effectiveness of RSPB reserve management.

The 20 species were selected to illustrate the range of numerical outcomes recorded in the published dataset, with particular attention to species associated with upland habitats and moorland management. Other species were included to provide a broader illustration of the dataset's characteristics. The selection was purposive rather than random or exhaustive, and the results should not be interpreted as representative of overall RSPB reserve performance.

Data source and analytical method

The source is the RSPB Annual Reserve Avian Monitoring occurrence dataset, published through the NBN Atlas (dataset dr478, CC0 1.0; DOI 10.15468/ssn119). The MA downloaded the records on 30 August 2026 and prepared the analysis workbook dated 18 September 2026. The dataset contains UK-wide reserve monitoring summaries, not a sample restricted to upland reserves. Its published description says that records summarise breeding populations for reserve areas and that presence-only entries may be provided where a whole-reserve survey was not possible.

For 20 selected species the MA retained records marked PRESENT with a numerical Individual count. Records recording presence without a number were excluded from numerical calculations, not treated as zeros. For each species, a reporting location was included if it had at least one numerical record in both 2014-2018 and 2019-2023. The latter period excluded 2020 because numerical reporting was markedly reduced during the Covid-19 disruption.

The MA calculated the average reported count within each period for each matched location using only years with numerical records, summed those location-level averages for each period, and calculated the arithmetic percentage difference. Locations did not need a record in every year, and no adjustment was made for differing survey effort, reserve area, survey method or habitat. For some sensitive species, public location information was generalised to country or grid-reference level, so the reporting units are not individual reserves.

What the comparison records

Of the 20 selected species, 12 have lower summed numerical averages in the later period and eight have higher values. Illustrative arithmetic differences include curlew (-6.6%, 29 matched units), lapwing (-6.6%, 95), snipe (-10.3%, 46), skylark (+21.7%, 63) and meadow pipit (+43.7%, 51). Schedule A reproduces the results for all 20 species, including the number of reporting units used in each comparison.

These figures are differences in published numerical summaries, not estimates of population growth or decline. They do not establish that RSPB management caused any of the differences, nor can they be used to compare the effectiveness of RSPB reserves and grouse moors.

Limits on interpretation

- Survey methods, coverage and surveyed areas may differ between locations and years; the published records do not enable the MA to standardise those differences.
- Numerical reporting is incomplete. A matched location may have only one count in each period, and presence-only records do not provide a numeric denominator or a zero count.
- Sensitive-species location generalisation prevents a like-for-like reserve comparison for black grouse, merlin, short-eared owl and red grouse.
- The public dataset does not provide the site-specific management histories, objectives, habitat conditions or other covariates required to attribute observed differences to management.

- The MA workbook contains summary outputs rather than the underlying location-by-year data and calculation steps, so this annex is not independently reproducible from that workbook alone.

Correspondence with the RSPB

The correspondence cited in the MA's main response records the RSPB's clarification, in replies dated 29 September and 27 October 2026, that the publicly available NBN summaries are unsuitable for formal population-trend analysis. The RSPB has explained that survey coverage and methods may differ and that sensitive records can be withheld or generalised. The MA accepts these qualifications. The more detailed survey-effort information, monitoring metadata and management histories needed for robust like-for-like assessment are not contained in the public extract examined here. The four letters in the exchange are provided.

In its letter of 27 October 2026, the RSPB further confirmed that it holds more complete reserve-level monitoring information, uses established species-monitoring methodologies, sets species-specific conservation targets and publishes summaries of monitoring outcomes in its Wildlife on RSPB Reserves reports. It also confirmed that monitoring data for 2024 and 2025 exist and are intended for publication through the NBN Atlas, and that material changes in management have occurred on its reserves. The MA welcomes these clarifications. However, the correspondence has not provided the detailed site-level monitoring information, management histories and associated assessments necessary to undertake the particular like-for-like comparisons considered in this annex.

Relevance to Defra's evidence assessment

The significance of this exercise is methodological. Conservation objectives and published summaries are useful, but neither alone establishes whether the intended outcomes have been achieved, what caused them, or how they compare with the likely outcome under an alternative management regime. Defra should apply the same evidential tests when considering benefits and harms attributed to grouse-moor management and to other forms of conservation management.

In particular, the MA recommends that Defra:

- state the species and habitat outcomes being assessed, with clear baselines and monitoring periods
- identify survey methods, effort, geographic coverage and comparability before relying on differences in recorded numbers
- consider relevant management interventions and external pressures, with credible comparators and causal qualifications
- make the evidence, calculation methods and material limitations available for independent scrutiny, subject to appropriate safeguards for sensitive species

The MA does not invite Defra to infer any positive or negative assessment of RSPB management from these calculations. Rather, this example illustrates why consistent standards of monitoring and transparency are needed across competing land-management proposals.

Source

1. Royal Society for the Protection of Birds (2025), RSPB Annual Reserve Avian Monitoring, NBN Atlas dataset dr478, CC0 1.0, https://doi.org/10.15468/ssn119 (MA download: 30 August 2026).
2. Moorland Association, MA analysis of RSPB Annual Reserve Avian Monitoring data, 18 September 2026. The Moorland Association's supporting analytical workbook, containing the summary results, methodological notes and reporting-coverage information, is available to Defra on request. Independent replication would require access to the underlying location-by-year records from the published NBN dataset.

Schedule A Full twenty species comparison

Values are reproduced from the MA's 18 September 2026 summary workbook. Each period column shows the sum of the averages for matched reporting units, not a total reserve population or a formally estimated species trend.

Species	Reporting units	Average sum 2014-2018	Average sum 2019, 2021-2023	Difference %
Curlew	29	454.0	424.0	-6.6%
Lapwing	95	3,096.8	2,892.2	-6.6%
Golden Plover	6	97.0	82.5	-14.9%
Red Grouse (scotica) *	6	574.0	486.3	-15.3%
Black Grouse *	3	65.5	40.3	-38.4%
Merlin *	3	5.2	7.1	+36.2%
Short-eared Owl *	3	9.7	8.7	-10.1%
Dunlin	11	160.1	153.1	-4.4%
Snipe	46	1,052.1	943.7	-10.3%
Redshank	79	2,326.1	2,241.0	-3.7%
Skylark	63	2,045.1	2,489.1	+21.7%
Meadow Pipit	51	1,753.4	2,519.8	+43.7%
Ring Ouzel	4	35.6	26.3	-26.0%
Oystercatcher	89	1,141.5	1,187.7	+4.0%
Grey Partridge	9	21.4	17.3	-19.0%
Bittern	2	4.6	6.6	+43.1%
Avocet	2	75.8	110.2	+45.4%
Marsh Harrier	3	7.2	7.5	+4.7%
Nightjar	3	12.7	16.7	+31.1%
Woodlark	1	7.0	6.8	-2.1%

*** Generalised reporting units.** Black grouse, merlin and short-eared owl are compared at country level; red grouse uses generalised grid-reference units. They are not counts of separately identified reserves.

Correspondence between the Moorland Association and RSPB concerning interpretation of Annual Reserve Avian Monitoring data, September-October 2026.

1. MA to RSPB - 18 September 2026.
2. RSPB to MA - 29 September 2026.
3. MA to RSPB - 5 October 2026.
4. RSPB to MA - 27 October 2026.

The Moorland Association

Beccy Speight
Chief Executive
Royal Society for the Protection of Birds
The Lodge
Potton Road
Sandy
Bedfordshire SG19 2DL

18 September 2026

Dear Ms Speight,

RSPB reserve bird monitoring data and Defra Call for Evidence

The Moorland Association is currently preparing its response to Defra's Gamebird release, shooting and welfare during rearing in England: call for evidence.

As part of that work, we have been examining publicly available evidence concerning the outcomes for upland bird species under different forms of land management. This has included analysis of the RSPB's Annual Reserve Avian Monitoring data published through the NBN Atlas.

Our analysis has identified some interesting patterns, but also a number of important questions about the interpretation of the data which we would be grateful if the RSPB could help us resolve. In particular, when numerical counts from matched reserves/units are compared between the periods 2014-18 and 2019-23, excluding 2020 because of the obvious disruption to monitoring, the data show mixed outcomes.

The analysis produces higher average numerical counts for some species, including merlin, skylark and meadow pipit. For others, including curlew, golden plover, red grouse, black grouse, snipe and ring ouzel, the calculated average numerical counts are lower. We would particularly welcome the RSPB's explanation of why these lower recorded counts occur.

We are conscious that these figures must be treated with considerable caution. They do not, by themselves, demonstrate that RSPB management caused the differences in recorded counts. Indeed, one of the striking features of the dataset is the variation in monitoring and reporting between years and reserves. In some cases the balance between numerical counts and presence-only records changes substantially between years, while some reserve/species combinations have no apparent annual count. The effect is particularly obvious in 2020 but appears to occur in other years as well.

For transparency, we have enclosed the matched-reserve analysis and methodology on which these questions are based.

Before drawing any conclusions from the data, we would therefore be grateful if the RSPB could clarify the following:

1. **Meaning and comparability of numerical counts**
   What precisely does the numerical Individual count field represent in the Annual Reserve Avian Monitoring dataset? Depending on the species and survey, does it represent individual birds, breeding pairs, territories, nests or another measure? Are these numerical values intended to be directly comparable between years and reserves, and could you provide the relevant monitoring protocol or data dictionary?

2. **Survey coverage and effort**
   What factors affect the comparability of annual numerical records, including the number of reserves surveyed, survey frequency and timing, observer effort and changes in survey methodology? Is reserve/species/year-level information on survey effort available, and could the RSPB provide the relevant survey protocols?

3. **Presence-only records**
   Where a species is recorded as present but without a numerical count, what does that signify? In particular, should such a record be interpreted as evidence that no full count was undertaken, rather than as evidence of low abundance?

4. **Missing records**
   Where no record appears for a species at a reserve in a particular year, does this normally mean that the species was not detected, that it was not surveyed, or that the relevant data were not submitted to the published dataset?

5. **Comparable annual data**
   Does the RSPB hold more complete reserve-level monitoring data, including survey-effort information and metadata, which would allow genuine like-for-like comparisons of these species through time? If so, would it be willing to provide those data together with the relevant metadata and survey-effort information? Does the NBN Atlas dataset represent the complete Annual Reserve Avian Monitoring record, or a subset of the information held by the RSPB? Are equivalent data available for 2024 and 2025 and, if so, would the RSPB be willing to provide them?

6. **Suitability of the dataset for trend analysis**
   Is the Annual Reserve Avian Monitoring dataset intended or considered suitable by the RSPB for analysing changes in species abundance or population trends through time, either at individual reserve or reserve-network level? If it is suitable only for particular species, reserves, periods or subsets of the data, please identify those circumstances. If it is not considered suitable for such analysis, what limitations prevent such use, and what dataset or monitoring methodology does the RSPB use instead when assessing trends across its reserve network?

7. **Management information**
   Is information available showing significant changes in management at the relevant upland reserves over the same period, including grazing, predator management, burning or cutting, rewetting, forestry or woodland establishment and other habitat-management interventions? Did any material changes also occur in reserve boundaries, survey plots, transects, monitoring areas or the area included within annual monitoring during the period? If so, we would be grateful if the RSPB could provide that information or direct us to where it is published.

8. **Explanation for lower recorded counts**
   Our matched-reserve/unit analysis identifies lower average numerical counts in 2019-23 than in 2014-18 for a number of upland species, including curlew, golden plover, red grouse, black grouse, snipe and ring ouzel. **What does the RSPB consider explains these lower recorded counts?** Has the RSPB itself analysed trends in these species across its reserve network and, if so, we would be grateful for copies or links to that analysis and its assessment of the factors that may explain the recorded differences.

9. **Measuring the success of upland management**
   How does the RSPB assess whether management interventions on its upland reserves have been successful in delivering outcomes for the bird species identified above? What species-specific objectives or outcomes, if any, are set, what monitoring metrics, baselines or benchmarks are used to assess success, over what period, and how are those results used to inform subsequent management decisions?

10. **The appropriate counterfactual**
    More broadly, what does the RSPB consider to be the appropriate evidence-based comparator when assessing the biodiversity consequences of grouse-moor management? Does the RSPB consider outcomes on appropriately selected upland RSPB reserves to be relevant evidence for that comparison? If so, what criteria should be used to identify an appropriately comparable subset of reserves? If not, what comparator does the RSPB consider appropriate, and what evidence supports that choice?

11. **Evidence supporting policy conclusions**
    Where the RSPB has advocated changes to grouse-moor management or regulation on biodiversity grounds, what empirical evidence does it rely upon to establish the expected biodiversity outcomes of those changes? In particular, what evidence demonstrates the likely outcomes for the upland bird species identified above?

These questions are particularly relevant to Defra's Call for Evidence.

Where land is presently managed for grouse shooting, assessing the environmental consequences of that management requires consideration not only of the present system but also of the likely outcomes under realistic alternative forms of land management. Those alternatives may involve changes in grazing, habitat management, predator management, forestry, rewetting, public access, conservation expenditure and other interventions.

We therefore consider that the counterfactual should itself be evidence-based rather than assumed.

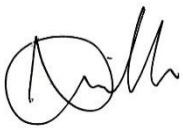
The RSPB's reserve network potentially provides valuable evidence with which to examine some of these questions. Equally, the published monitoring data illustrate why great care is needed before changes in recorded numbers are interpreted as changes in populations or attributed to particular management practices.

Our intention is to approach this evidence transparently. We are not suggesting that the published data demonstrate that RSPB management has caused the lower recorded counts identified above. We are seeking the information necessary to understand what the data can and cannot reliably tell us.

As this information is intended to inform our evidence to Defra, we would be very grateful for any clarification, supporting data or published analysis that the RSPB can provide and, if possible, **for a response by Friday 2 October**.

We would, of course, be happy to discuss the analysis with your conservation science team if that would be helpful.

Yours sincerely,



Andrew Gilruth
Chief Executive
Moorland Association
agilruth@moorlandassociation.org

Cc: Jeremy Wilson, Director of Science, RSPB
Baroness Hayman of Ullock, Parliamentary Under-Secretary of State, Defra
Stephen Darling, Defra Gamebirds Team
Professor James Pearce-Higgins, Director of Science, British Trust for Ornithology
Dr Andrew Hoodless, Director of Research, Game & Wildlife Conservation Trust

Encl: Matched-reserve analysis and methodology – RSPB Annual Reserve Avian Monitoring data

This letter is sent by email only:
agilruth@moorlandassociation.org

Mr A Gilruth
Chief Executive
The Moorland Association
Box No 75
Leyburn
DL8 9AQ

29 September 2026

Dear Andrew,

Re: RSPB reserve bird monitoring data and Defra Call for Evidence

Thank you for your letter of 18 September 2026.

It is unclear to us what science question you are seeking to answer with your collation of data. The lack of supporting information to explain either the rationale for the selection of species presented in your tables or the methods used to derive 'matched reserve +unit comparison' and comparison across years limits our ability to respond to your queries.

Furthermore, we are unsure what relevance this has to the Defra Call for Evidence that you reference, the purpose of which we understand to be to explore the available evidence regarding impacts (both detrimental and beneficial) of a range of activities associated with the gamebird industry. Comparisons of species abundance on different land uses appears somewhat tangential to the Call.

For clarity, the data provided on the NBN Atlas is a year-specific count for each RSPB reserve. However, because underlying survey methods may differ between sites, because data for sensitive species may be withheld or provided at reduced resolution, and because surveyed land areas may change over time, these heavily summarised data are not appropriate for formal trend analysis. The relevant caveats are summarised on the NBN Atlas web site: https://registry.nbnatlas.org/public/show/dr478

Yours sincerely,

Beccy Speight
RSPB Chief Executive

cc: Jeremy Wilson, Director of Science, RSPB
Baroness Hayman of Ullock, Parliamentary Under-Secretary of State, Defra
Stephen Darling, Defra Gamebirds Team
Professor James Pearce-Higgins, Director of Science, British Trust for Ornithology
Dr Andrew Hoodless, Director of Research, Game & Wildlife Conservation Trust

RSPB Headquarters
RSPB The Lodge
Potton Road
Sandy
SG19 2DL

Tel: 01767 680 551
@TheRSPB
@rspb
rspb.org.uk

The RSPB is part of BirdLife International, a network of passionate organisations, working together to save nature across the world.

Patron: His Majesty The King **President:** Dr Amir Khan **Chief Executive:** Beccy Speight
The Royal Society for the Protection of Birds (RSPB) is a registered charity: England and Wales no. 207076, Scotland no. SC037654.
Registered address: The Lodge, Potton Road, Sandy, Bedfordshire, SG19 2DL

The Moorland Association

Beccy Speight
Chief Executive
Royal Society for the Protection of Birds
The Lodge
Potton Road
Sandy
Bedfordshire SG19 2DL

5 October 2026

Dear Ms Speight,

RSPB reserve bird monitoring data and Defra Call for Evidence

Thank you for your letter of 29 September in response to mine of 18 September.

Your clarification that the data published through the NBN Atlas comprise year-specific counts for individual RSPB reserves is helpful. It is also helpful to have the RSPB's confirmation that, because survey methods may differ between sites, sensitive-species data may be withheld or presented at reduced resolution, and surveyed areas may change over time, the published data are not appropriate for formal trend analysis.

That clarification does, however, make a number of the questions in my original letter more important rather than less.

I was slightly surprised by the suggestion that there was insufficient information about our methodology. The spreadsheet supplied with my letter included the methodology and calculation basis used for the matched reserve/unit comparison. If there is a particular aspect of that methodology which remains unclear, we would of course be very happy to explain it.

The purpose of our analysis was not to present the NBN dataset as a formal population trend analysis. As we made clear in our original letter, we were seeking to establish what the published data can and cannot reliably tell us, and what fuller evidence the RSPB holds and uses when assessing outcomes across its reserve network.

Your response now confirms that the RSPB does not consider the published NBN data appropriate for formal trend analysis. That leaves an important question: **what data and methodology does the RSPB itself use to assess whether management on its upland reserves is delivering the intended outcomes for bird populations?**

I would therefore be grateful if the RSPB could respond to the following outstanding points from our original letter:

1. Does the RSPB hold more complete reserve-level monitoring data, including information on survey effort, methodology and the area surveyed, which would permit more robust like-for-like comparison through time?

2. Does the NBN Atlas dataset represent the complete Annual Reserve Avian Monitoring record held by the RSPB, or only a subset of the information available internally?

3. Are equivalent reserve monitoring data available for 2024 and 2025 and, if so, can these be made available?

4. What does a presence-only record signify, and how should the absence of a record for a species/reserve/year combination be interpreted?

5. What significant changes in habitat or land management occurred on the relevant upland reserves over the period considered, including changes in grazing, predator management, burning or cutting, rewetting, forestry or woodland establishment; and did any material changes occur in reserve boundaries, survey plots, transects, monitoring areas or the area surveyed?

6. What species-specific objectives, metrics, baselines or benchmarks does the RSPB use to assess the success of management on its upland reserves, and are the resulting assessments published?

7. Has the RSPB undertaken its own analysis of changes in curlew, golden plover, red grouse, black grouse, snipe, ring ouzel or other relevant upland bird populations across its reserve network and, if so, could you provide that analysis?

You also suggest that comparisons between species abundance under different land uses are somewhat tangential to Defra's Call for Evidence. We take a different view. If policy changes affecting grouse-moor management are being considered on environmental grounds, the relevant question is not simply what impacts are associated with the existing system, but what environmental outcomes are likely under realistic alternatives.

Those alternatives may involve different approaches to grazing, predator management, vegetation management, rewetting, forestry, public access, monitoring and conservation expenditure. Assessing the consequences of regulatory change therefore requires evidence about those alternative outcomes as well.

The same evidential standard should apply to every form of upland management.

That is why we also asked what the RSPB considers to be the appropriate evidence-based comparator when assessing the biodiversity consequences of grouse-moor management, and what empirical evidence it relies upon when advocating changes to grouse-moor management or regulation on biodiversity grounds.

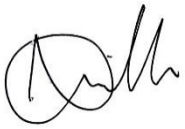
I would be grateful if you could address those questions as well.

We are not seeking to attribute changes in recorded bird numbers to RSPB management on the basis of the published NBN data. Your response confirms why that would be inappropriate. We are instead seeking to understand what evidence is sufficiently robust to assess outcomes, and to ensure that the same standard of evidence is applied when different approaches to upland management are compared.

Given the relevance of these questions to the evidence currently being considered by Defra, I would be very grateful for a substantive response to the outstanding points.

We would, as before, be very happy to discuss these questions with Jeremy and the RSPB conservation science team if that would be helpful.

Yours sincerely,



Andrew Gilruth
Chief Executive
Moorland Association
agilruth@moorlandassociation.org

Cc: Jeremy Wilson, Director of Science, RSPB
Baroness Hayman of Ullock, Parliamentary Under-Secretary of State, Defra
Stephen Darling, Defra Gamebirds Team
Professor James Pearce-Higgins, Director of Science, British Trust for Ornithology
Dr Andrew Hoodless, Director of Research, Game & Wildlife Conservation Trust

This letter is sent by email only:
agilruth@moorlandassociation.org

Mr A Gilruth
Chief Executive
The Moorland Association
Box No 75
Leyburn
DL8 9AQ

27 October 2026

Dear Andrew,

Re: RSPB reserve bird monitoring data and Defra Call for Evidence

Thank you for your further letter of 5 October 2026. I respond to the points raised below.

With regard to the methods appended to your letter of 18 September, we reviewed your excel spreadsheet but found it did not include any rationale for the suite of species chosen, and nor was it clear what question you are seeking to answer.

In terms of the data and methods the RSPB uses to assess whether management on our upland reserves is delivering the intended outcomes, we monitor species on our reserves using standard methodologies as set out in Gilbert, G., Gibbons, D.W., & Evans, J. (1998) *Bird Monitoring Methods: A Manual of Techniques for Key UK Species.* This 464-page RSPB manual provides standardized survey and monitoring techniques for over 120 UK bird species, covering breeding and wintering, sampling, statistics, and national monitoring schemes. A summary of the results of this monitoring is published in our regular Wildlife on Reserves reports – the most recent of which is accessible here https://base-prod.rspb-prod.magnolia-platform.com/dam/jcr:a4cc12a2-a46b-418a-90d5-66779709df9c/Wildlife%20on%20reserves%202024.pdf.

We would welcome the Moorland Association directing its energies into a commensurate long-term monitoring commitment across the range of species present on the land managed by your members. As stated in my previous letter of 29 September 2026, the current Call for Evidence calls specifically for evidence of the impacts of management associated with shooting and were such data available it would no doubt be a valuable contribution to the evidence base.

In answer to your additional questions (as numbered in your letter):

1. Yes, and as stated above we publish summaries of the results in our Wildlife on Reserves Reports

2. No, as set out in our previous response

3. Yes, and these will be uploaded to the NBN in due course.

RSPB Headquarters
RSPB The Lodge
Potton Road
Sandy
SG19 2DL

Tel: 01767 680 551
@TheRSPB
@rspb
rspb.org.uk

The RSPB is part of BirdLife International, a network of passionate organisations, working together to save nature across the world.

Patron: His Majesty The King **President:** Dr Amir Khan **Chief Executive:** Beccy Speight
The Royal Society for the Protection of Birds (RSPB) is a registered charity: England and Wales no. 207076, Scotland no. SC037654.
Registered address: The Lodge, Potton Road, Sandy, Bedfordshire, SG19 2DL

4. A presence-only record signifies confirmed presence of the species, but that no count is available.

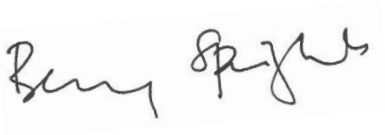
5. Yes – material changes have occurred – as you would expect over large tracts of land under active management.

6. Species-specific targets are set for RSPB reserves. Progress against those is monitored using standard methods as set out in Gilbert et al (1998), as stated above, and summaries of the results across the reserve network are published in our Wildlife on Reserves reports.

7. Yes – and summaries are published in our Wildlife on Reserves reports. Indeed, results for four of the species you list were highlighted in the 2025 report (linked above).

We consider that this response addresses the key questions in your further letter and hope that you will consider publishing annual species data for the moorland estates.

Yours sincerely,



Beccy Speight
RSPB Chief Executive

cc: Jeremy Wilson, Director of Science, RSPB
Baroness Hayman of Ullock, Parliamentary Under-Secretary of State, Defra
Stephen Darling, Defra Gamebirds Team
Professor James Pearce-Higgins, Director of Science, British Trust for Ornithology
Dr Andrew Hoodless, Director of Research, Game & Wildlife Conservation Trust

RSPB Headquarters
RSPB The Lodge
Potton Road
Sandy
SG19 2DL

Tel: 01767 680 551
@TheRSPB
@rspb
rspb.org.uk

The RSPB is part of BirdLife International, a network of passionate organisations, working together to save nature across the world.

Patron: His Majesty The King **President:** Dr Amir Khan **Chief Executive:** Beccy Speight
The Royal Society for the Protection of Birds (RSPB) is a registered charity: England and Wales no. 207076, Scotland no. SC037654.
Registered address: The Lodge, Potton Road, Sandy, Bedfordshire, SG19 2DL

Annex 7 - Comprehensive Hen Harrier Tagging Register

Technical summary supporting Question 20 of the Defra Call for Evidence on Gamebird Release and Shooting.

Purpose and principal finding

The Moorland Association (MA) asks Defra to distinguish recorded bird fates, unexplained losses of transmission and statistical evidence of illegal killing when assessing links between gamebird management and bird-of-prey crime. This annex summarises the MA's comprehensive tagging register and related commentary. It explains the evidence behind the register's classifications and the limits of the comparisons drawn from them.

Unexplained disappearances can contribute to a wider statistical inference about illegal killing, but a final transmission location alone does not establish the fate of an individual bird or identify responsibility. Equally, an absence of recovered bodies does not establish that illegal killing has not occurred.

Evidence base and coverage

The September 2026 commentary draws on Natural England's tracking information, including its August 2026 update and information supplied directly to the MA. It records 278 entries from 2002 onwards, including the 2026 cohort. Of these, 99 concern birds fitted with terrestrial radio transmitters and 179 concern birds fitted with satellite transmitters. The combined total therefore covers both tracking technologies. [1]

The register brings together tagging information, last recorded locations, subsequent observations and reported outcomes. It assigns categories using the available information and an assessment of whether the final transmission location was associated with land used for driven grouse shooting. The separate Murgatroyd commentary examines birds included in the 2019 study using later tracking updates. [1, 2]

Status of the analysis

This is an MA descriptive analysis and has not been independently peer reviewed. The categories below are the register compiler's classifications; they are not Natural England's official outcome categories or independently verified findings for every bird. The register does not cover all hen harriers tracked by every organisation, and the combined totals are not a representative estimate of mortality in the wider population.

Classification results in September 2026
This table reproduces the category counts reported in the September 2026 commentary, before any allocation of uncertain cases. Percentages have been recalculated from the full denominator of 278 entries. [1]

Table 1.

Category	Classification used in the register	Number	Share
Green 1	Final transmission on land classified as unassociated with driven grouse shooting	71	25.54%
Green 2	Recovered and/or attributed to natural causes in the register	52	18.71%
Red 1	Final transmission on land classified as used for driven grouse shooting	88	31.65%
Red 2	Recovered with death reported as due to illegal killing	7	2.52%
Orange 1	Inconclusive	25	8.99%
Orange 2	Inconclusive, but bird observed after its final transmission	17	6.12%
Blue	Still transmitting at the September 2026 reporting point	18	6.47%
Total	**All tracking types combined**	**278**	**100%**

Note: rounded shares may not sum to 100%. Green 2 is a broad source category: the commentary also places some losses at sea or on the continent within it. The count of 52 should not be read as 52 independently confirmed natural deaths. Red 2 records reported illegal killing; it is not a count of convictions or an estimate of all illegal killing.

How the 58 per cent and 42 per cent figures arise
The commentary combines 123 green entries and 95 red entries, divides the 42 orange entries equally between them, and adds all 18 blue entries to green. This produces 162 green entries (58.27%) and 116 red entries (41.73%). [1]

The equal division of inconclusive cases is an assumption. Including transmitting birds in green also combines ongoing observations with completed tracking records. These percentages are therefore the result of an allocation convention, not observed proportions of natural mortality and illegal killing, or a comparison of mortality risk between land uses. The MA presents the unallocated counts above as the primary description.

Results for satellite-tagged birds alone
The register separately identifies 179 satellite-tagged birds and 99 birds fitted with terrestrial radio transmitters. Within the satellite-tagged group, 78 entries are classified green, 53 red, 30 inconclusive and 18 still transmitting. Applying the commentary's equal allocation of inconclusive cases and adding transmitting birds to green produces 111 green entries (62.01%) and 68 red entries (37.99%). [1]
These remain allocations within the register's classification system, rather than estimates of mortality or illegal killing. Differences between the radio and satellite groups cannot be attributed to tracking technology alone because tagging periods, follow-up and the proportion still transmitting also differ.
Of the 17 entries recording a bird observed after its final transmission, 15 concern satellite-tagged birds. The evidence that transmission can cease while a bird remains alive is therefore not confined to the terrestrial radio records. These observations do not establish the eventual fate of those birds or explain other disappearances. [1]

Earlier April 2025 comparison
The approximately 53%/47% comparison referred to in the main submission relates to the earlier April 2025 snapshot of 260 entries, covering both radio and satellite tracking. That snapshot contained 110 green entries, 100 red entries, 43 inconclusive entries and seven birds still transmitting. Allocating the inconclusive entries equally between the two groups and adding the transmitting birds to green produced calculated totals of 138.5 green (53.27%) and 121.5 red (46.73%). The fractional totals reflect the allocation assumption, rather than counts of birds with established outcomes. [1]

The earlier 53%/47% and updated September 2026 58%/42% comparisons apply the same allocation convention to different versions of the register. Neither represents an observed division between natural mortality and illegal killing. The September 2026 figures incorporate additional entries and revised classifications.

What the register can establish
The 17 Orange 2 entries are particularly relevant: the register records birds observed after their last transmission. They illustrate why the end of transmission need not mark a bird's death. They do not establish the subsequent fate of those birds or the cause of other unexplained disappearances. [1] Green 1 and Red 1 describe the classification of a location, not a diagnosed cause of death. A last recorded location may differ from where a bird subsequently died or where an offence occurred. A location away from a driven grouse moor cannot exclude illegal killing; a location on one cannot by itself establish it. The precision of a map reference should also not be mistaken for the measured accuracy of a transmitter fix.

The commentary identifies gaps in location information and subsequent updates to individual outcomes. Interpretation therefore depends on the reporting date, the tracking technology, the evidence available for each entry and the consistency of the land-use classification. Natural mortality, predation and technical failure are possible explanations in individual cases; their relative frequency cannot be established simply by listing possible causes. [1]

Relationship to Murgatroyd and colleagues
Murgatroyd et al. (2019) analysed 58 satellite-tagged hen harriers after excluding two early transmitter failures. The study examined mortality and disappearance in relation to grouse-moor use and concluded that the observed association was most likely explained by illegal killing. The MA recognises the relevance of that peer-reviewed evidence. [2, 3]

The MA's separate commentary examines final transmission locations and later recorded outcomes for birds in that cohort. Some of its comparisons use Natural England's April 2025 update, while the original study had a cut-off of 5 October 2017. Later observations can clarify individual histories, but a later snapshot is not a reproduction of the original analysis. Any direct comparison must use consistent dates, definitions and denominators. [2]

The MA's descriptive classification does not model each bird's exposure to grouse-moor habitat through time, account for different tracking durations, or reproduce the study's survival analysis. A similar number of final locations in two land-use categories would not demonstrate equal risk if birds spent different amounts of time in those categories. The register therefore does not disprove the statistical association reported by Murgatroyd et al.

Its contribution is to make individual records, classification decisions and uncertainty available for scrutiny. Population-level inference can be informative even where the fate of particular birds remains unresolved. Both types of evidence should be described accurately when informing gamebird policy.

Recommendations to Defra

Where tracking evidence informs gamebird-management policy, the MA asks Defra to apply the following reporting and scrutiny principles.

1 **Define the evidential categories.** Distinguish reported or confirmed illegal killing, suspected criminality, unexplained disappearance, technical failure, natural mortality and continuing transmission. Record subsequent sightings separately where the eventual fate remains unknown.

2 **Make the basis of classifications traceable.** State the source, reporting date, denominator, tracking technology and evidence supporting each outcome. Publish classification rules and a dated record of material changes, including the treatment of ambiguous cases separately by tracking technology and tagging period.

3 **Keep assumptions explicit.** Separate observed information from imputed outcomes. Explain how unknown fates and birds still transmitting are handled, and show whether alternative reasonable assumptions materially change the result.

4 **Enable independent scrutiny and correction.** Provide appropriately qualified reviewers with access to the information needed to examine methods and disputed classifications. Provide a route to correct factual errors, with safeguards for sensitive locations and ongoing investigations.

5 **Match conclusions to the evidence.** Explain separately what the evidence supports about population-level effects and about particular incidents or properties. Identify uncertainty and the relevance of the finding to any proposed regulatory intervention.

Sources and supporting material

[1] Moorland Association (September 2026). Comprehensive Satellite Tagging Register and Commentary: Hen Harrier Radio Tracking and Satellite Locational Data, commencing 2002. Fully revised edition incorporating the August 2026 Natural England update. The classification definitions and September 2026 results are the sources of Table 1 and the allocation calculation.

[2] Moorland Association (September 2026). Murgatroyd Study: Commentary with Full Schedule. Fully revised edition. This is an MA examination of the study and later tracking information.

[3] Murgatroyd, M., Redpath, S. M., Murphy, S. G., Douglas, D. J. T., Saunders, R. and Amar, A. (2019). Patterns of satellite tagged hen harrier disappearances suggest widespread illegal killing on British grouse moors. Nature Communications. https://doi.org/10.1038/s41467-019-09044-w

The detailed register and accompanying analyses are held by the MA and may be made available for appropriate scrutiny, subject to checks on the versions supplied, attribution and sensitive information. This annex presents aggregate results and does not reproduce individual grid references or maps.